



ANNUAL FINANCIAL REPORT

2019 Universal registration document

(New version of the Reference Document)



Be the energy
for change.

CONTENTS

1.	The Group, its strategy and activities	3	5.	The Group's financial performance and outlook	243
	Key figures	5	5.1	Operating and financial review in 2019	244
	Business model	6	5.2	Subsequent events	275
	1.2 History and Organisation of the Group	8	5.3	Changes in market prices at the end of February 2020	275
	1.3 Group strategy	12	5.4	Outlook	275
	1.4 Description of the Group's activities	16			
	1.5 Legislative and regulatory environment	82			
	1.6 Research & development, patents and licences	98			
2.	Risk factors and control framework	103	6.	Financial statements	277
	2.1. Risk management and control of activities	104	6.1	Consolidated financial statements	278
	2.2 Risks to which the Group is exposed	110		Notes to the consolidated financial statements	285
3.	Non-financial performance	129	6.2	Statutory auditors' report on the consolidated financial statements	394
	3.1 EDF, a responsible company	130	6.3	Financial statements	399
	3.2 EDF, a company committed to the energy transition	136	6.4	Statutory Auditors' report on the financial statements	454
	3.3 EDF, a company committed to a just and fair transition	146	6.5	Dividend policy	457
	3.4 Indicators and methodology	179	6.6	Other items	458
	3.5 Non-financial rating	186	6.7	Information relating to the allocation of proceeds raised through Green Bonds issued by EDF	460
	3.6 Appendices, concordance tables and report from Statutory Auditors	187	7.	General information about the Company and its capital	465
4.	Corporate governance	205	7.1	General information about the Company	466
	4.1 Corporate Governance Code	206	7.2	Incorporation documents and articles of association	467
	4.2 Members and functioning of the Board of Directors	208	7.3	Information regarding capital and share ownership	470
	4.3 Executive Management	235	7.4	Market for the Company's shares	477
	4.4 Conflicts of interest and interests of corporate officers and executives	237	7.5	Related-party transactions	478
	4.5 Shareholding by corporate officers and trading in EDF securities by corporate officers and executives	238	7.6	Material contracts	482
	4.6. Compensation and benefits of corporate officers	239	8.	Additional information	483
			8.1	Person responsible for the Universal Registration Document and the Certification	484
			8.2	Auditors – Statutory Auditors	484
			8.3	Publicly available documents and financial reporting calendar	485
			8.4	Appendices – remuneration policy	485
			8.5	Concordance tables	490
				Glossary	498

UNIVERSAL REGISTRATION DOCUMENT 2019

Annual Financial Report

The “raison d’être” of EDF ⁽¹⁾

To build a net zero energy future with electricity and innovative solutions and services, to help save the planet and drive wellbeing and economic development.

38.9
million customer sites

557.6TWh
of electricity generated worldwide

90%
decarbonised generation ⁽¹⁾

(1) Direct CO₂ emissions, excluding life-cycle analysis (LCA) of fuel and production means.

A key player in the energy transition, EDF group is an integrated energy company, active in all areas of the business: generation, transmission, distribution, trading, energy supply and energy services. As a global leader in low-carbon energy, The Group has developed a diversified generation mix based on nuclear power, hydropower, new renewable energies and thermal energy.

BE THE ENERGY FOR CHANGE.



On 13 March 2020 the French language version of the Universal Registration Document (URD) was filed with the Autorité des Marchés Financiers (French Financial Markets Authority or AMF) as the competent authority under EU Regulation 2017/1129, without prior approval in accordance with Article 9 of said Regulation. This Universal Registration Document may be used for the purpose of a public offer of securities or the admission of securities to trading on a regulated market if it is supplemented by a securities note and, where appropriate, a summary and any amendments to the Universal Registration Document. All of these documents are approved by the AMF in accordance with EU Regulation 2017/1129.

The URD has been prepared by the issuer and its signatories are liable for its content. However, the version of the URD issued in French as mentioned above is the only binding version. The English language version is provided solely for the convenience of English speaking readers. All possible care has been taken to ensure that the translation is an accurate presentation of the original. However, in all matters of interpretation, views or opinion expressed in the original language version of the document in French take precedence over the translation.

Copies of this universal registration document are available free-of-charge at EDF's registered office (22-30 avenue de Wagram - 75382 Paris Cedex 08) and on its website (<http://www.edf.fr>), as well as on the AMF website (<http://www.amf-france.org>).

(1) Subject to shareholder approval at the General Meeting of 7 May 2020.

In this Universal Registration Document (the "Universal Registration Document"), unless otherwise stated, the terms "Company" and "EDF" refer to Électricité de France SA, and the terms "EDF group" and "Group" refer to EDF and its subsidiaries and affiliates.

In addition to the information contained in this Universal Registration Document, investors should carefully consider the risk factors described in chapter 2 ("Risk factors and control framework"). These risks, or one of these risks, could negatively impact the Group's business, position, financial results or outlook. Furthermore, other risks not yet identified or considered as material by the Group, could have the same negative impact, and investors could consequently lose all or part of their investment in the Company.

This Universal Registration Document also contains information relating to the markets in which the EDF group operates. This information has been taken from surveys carried out by external sources. Given the rapid changes affecting the energy sector in France and throughout the world, it is possible that this information could prove to be erroneous or no longer up-to-date on the filing date of this Universal Registration Document or thereafter. The Group's activities may therefore evolve in a manner different to that described in this Universal Registration Document, and the declarations or information presented in this Universal Registration Document may prove to be erroneous.

Forward-looking statements in this Universal Registration Document, specifically in section 1.3 ("Group Strategy"), could also be impacted by risks, uncertainties and other factors that may cause the future income, performance and achievements of the Group to differ significantly from the objectives expressed and suggested. These factors may include changes in the economic and commercial environment, in regulations, as well as factors set forth in chapter 2 ("Risk factors and control framework").

Pursuant to French and European legislation, RTE and Enedis, regulated subsidiaries managed independently within the meaning of the French Energy Code, respectively responsible for the transmission and distribution of electricity within the EDF group, are not allowed to communicate certain information they gather while conducting their activities to other Group entities, including its Management. Similarly, certain data specific to Generation and supply activities cannot be communicated to the entities responsible for transmission and distribution. This Universal Registration Document has been prepared by the EDF group in compliance with these rules. For the sake of brevity, further references in this Universal Reference Document made to RTE and Enedis will not always specify their independent nature as within the meaning of the French Energy Code.

A glossary of the main technical terms is provided at the end of this Universal Registration Document.

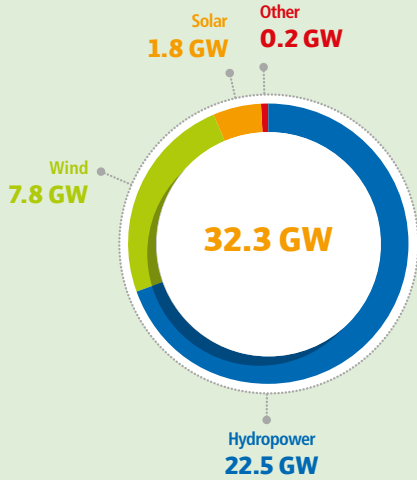
The Group, its strategy and activities

CONTENTS

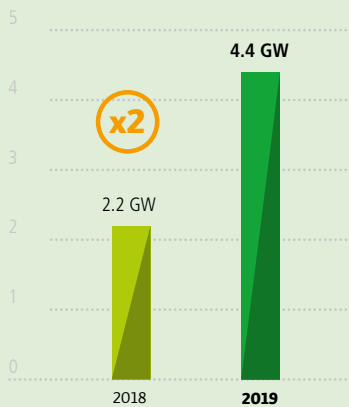
Key figures	5	1.5 Legislative and regulatory environment	82
Business model	6	1.5.1 EDF: a public undertaking with a public service mission	82
1.2 History and Organisation of the Group	8	1.5.2 Energy markets	84
1.2.1 History of the Group	8	1.5.3 Regulations applicable to EDF group facilities and activities	91
1.2.2 Organisation of the Group	10	1.6 Research & development, patents and licences	98
1.3 Group strategy	12	1.6.1 R&D priorities	98
1.3.1 Environment and strategic challenges	12	1.6.2 Intellectual property	101
1.3.2 EDF group's climate strategy	13		
1.3.3 Priorities of the CAP 2030 strategy	13		
1.3.4 Investment policy	15		
1.4 Description of the Group's activities	16		
1.4.1 Electricity generation activity	16		
1.4.2 Sales and supply activities in France	43		
1.4.3 Optimisation activities for EDF in France	46		
1.4.4 Regulated transmission and distribution activities in France	48		
1.4.5 International activities of the Group	56		
1.4.6 Energy services and other activities	76		

EDF, the renewable energy leader in Europe

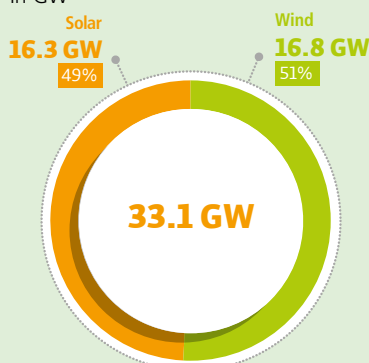
→ Net capacity by technology In GW



→ Doubling of construction start (wind and solar) In GW

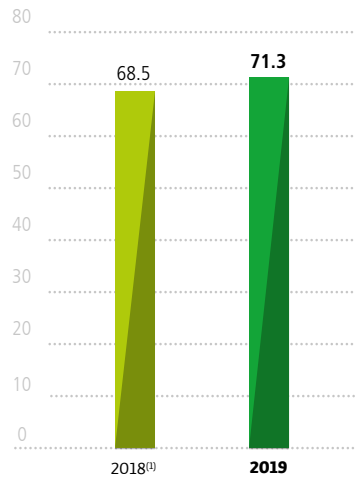


→ A balanced portfolio of wind and solar projects (gross) In GW

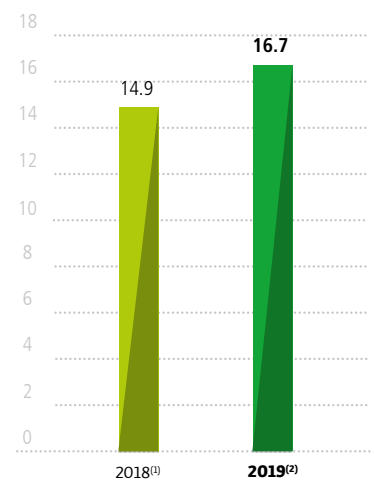


2019 KEY FIGURES

→ Sales In billion of euros

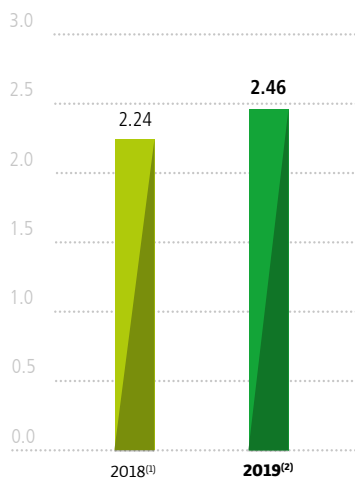


→ EBITDA In billion of euros

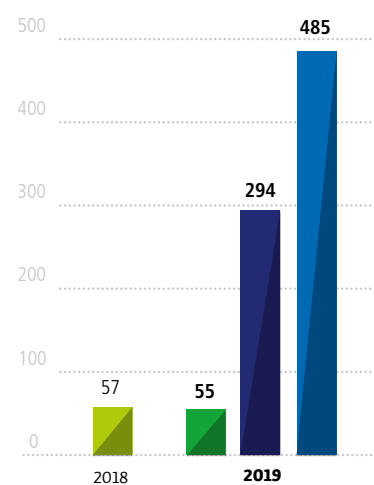


(1) The 31/12/2018 published amounts were restated of the impact linked to the E&P activity presentation as a discontinued operation.
(2) The 31/12/2019 financial statements are prepared applying the IFRS 16 standard. The comparative data was not restated.

→ Net financial debt⁽³⁾/EBITDA



→ Carbon intensity In gCO₂/KWh

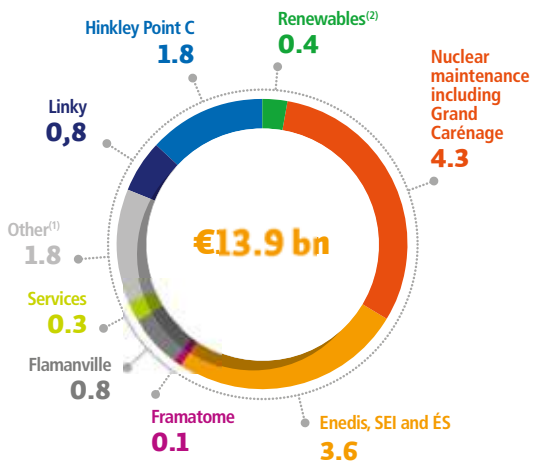


(1) The 31/12/2018 published amounts were restated of the impact linked to the E&P activity presentation as a discontinued operation.
(2) The 31/12/2019 financial statements are prepared applying the IFRS 16 standard. The comparative data was not restated.
(3) Significant impact on net financial debt of the entry into force of IFRS 16 on 1 January 2019 (€4.5 billion) and of the net buyback of hybrid securities (€1.1 billion) in H2 2019.

■ EDF group in 2018
■ EDF group in 2019
■ European sector's average
■ Worldwide sector's average

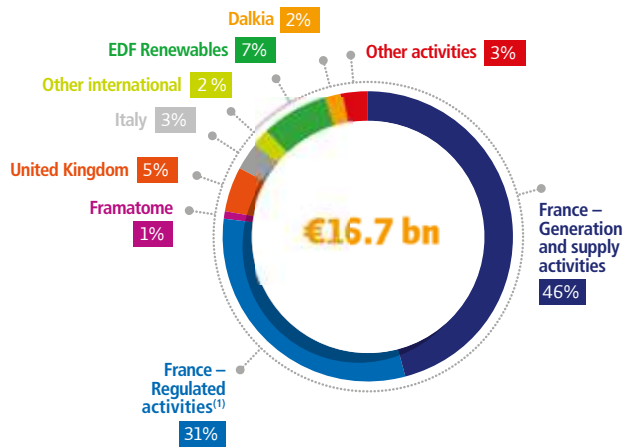
NB: The values correspond to the expression to the first decimal or integer closest to the sum of the precise values, taking into account rounding.

→ **Net investments excluding Group disposal plan**
In billion of euros



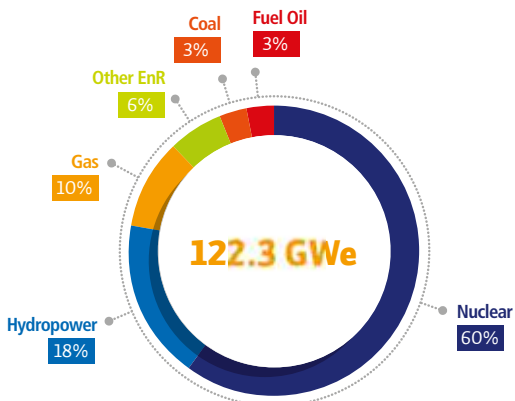
(1) Mainly nuclear maintenance excluding France, thermal maintenance, France and UK nuclear development.
(2) The amount of net investments would be around €1.5 billion adjusted for the debt reduction effect resulting from the sale of 50% of shares in the NiG offshore project.

→ **Breakdown of EBITDA**
In billion of euros



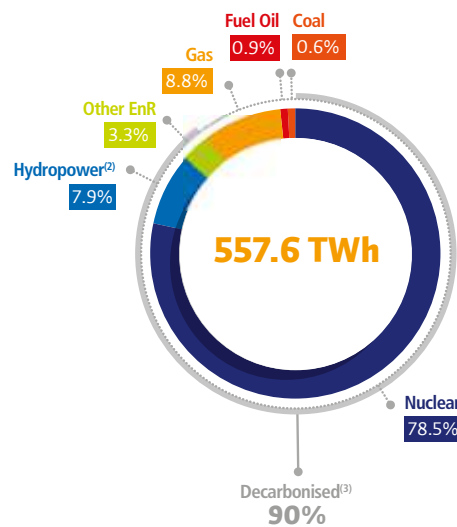
(1) Regulated activities: Enedis, ES and island activities; Enedis, an independent EDF subsidiary as defined in the French energy code.

→ **Installed capacity⁽¹⁾**
In GWe



(1) Consolidated data.

→ **Electricity generation⁽¹⁾**
In TWh



(1) Consolidated data.
(2) Hydro output is 44.3TWh in 2018 and 37.9TWh in 2019 (after deduction of pumped volumes).
(3) Direct CO₂ emissions, excluding life-cycle analysis (LCA) of fuel and production means.

2019

Assets and resources

Business model

Customer proximity

- **33.6** million customers in electricity and **5.3** million customers in gas⁽¹⁾
- Leading brands : EDF, Edison, Luminus, Dalkia
- **47** million customer visits on digital consumption monitoring platforms⁽²⁾

A human ambition

- **165,000** employees ⁽³⁾
- **80%** of employees attended a training during the year⁽³⁾

An ambitious innovative ecosystem

- EDF Pulse Croissance, a structure dedicated to incubation and support for start-ups, with a financing capacity of some **€60M** in 2019
- More than **2,700** R&D employees⁽⁴⁾
- R&D consolidated budget of **€713M** en 2019

Major industrial assets

- **122.3GW** of electricity generation capacity⁽³⁾
- An integrated nuclear industry
- EPR technology
- A **33GW** pipeline of renewable wind and solar projects⁽³⁾
- **1.4** million km of distribution network⁽⁵⁾
- **26** million smart meters installed⁽³⁾
- **340** heating and cooling networks operated by Dalkia

A solid financial base

- Total consolidated balance sheet: ~ €300 billion
- No. 1 investor among European utilities (€14bn in 2019)

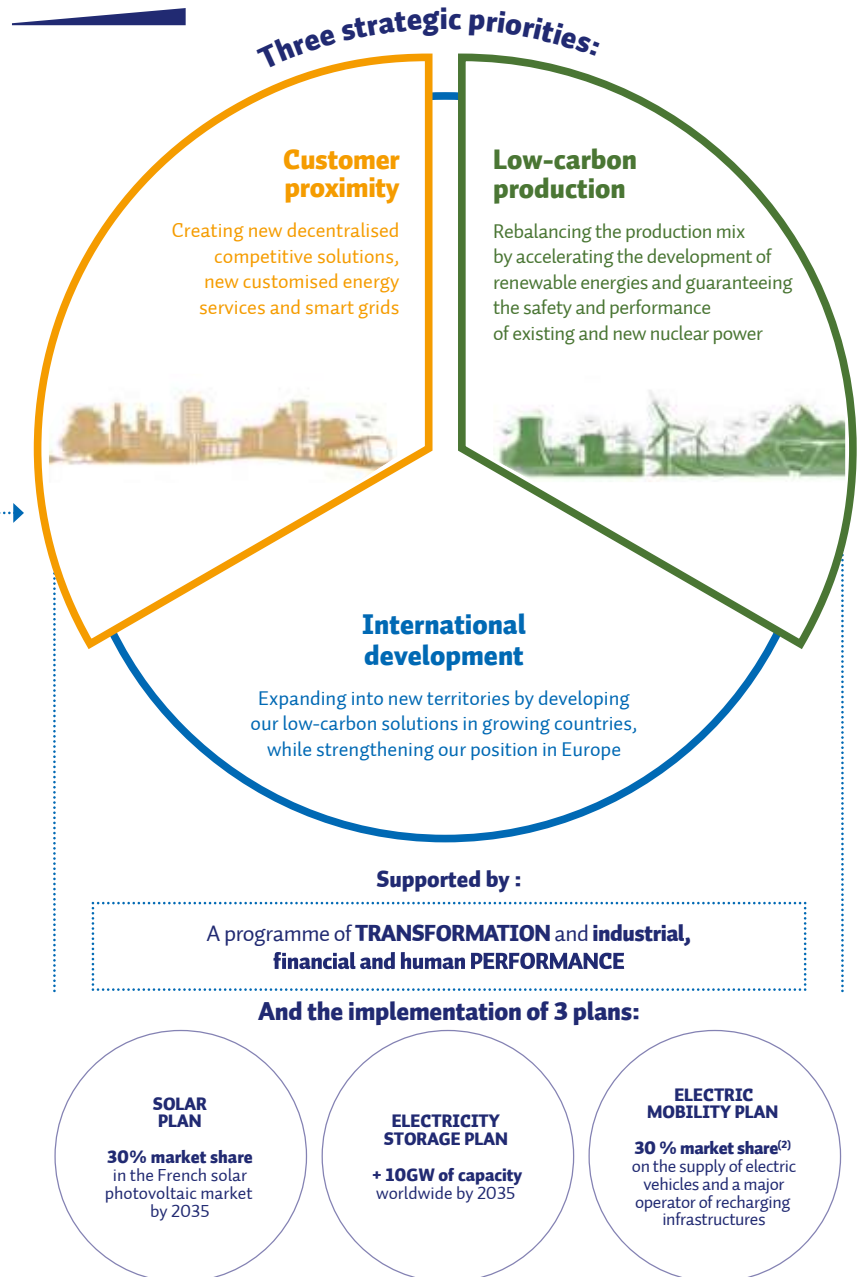
A strong CSR commitment

- A rating **CDP** Climate Change
- No. 2 **S&P** Sustainability
- Nearly €10bn of green & sustainable funding

« Raison d'être » of EDF⁽¹⁾

To build a net zero energy future with electricity and innovative solutions and services, to help save the planet and drive wellbeing and economic development.

CAP 2030



(1) Consolidated scope. Counted per site.
 (2) EDF SA scope excluding French overseas departments and Corsica.
 (3) Group scope.
 (4) FTEs (full-time equivalent) at Group level.
 (5) Enedis distribution network under concession.

(1) Subject to shareholder approval at the General Meeting of 7 May 2020.
 (2) In France, the United Kingdom, Italy and Belgium.

Value creation - 2019

CSR performance at the heart of our businesses, with 6 targets:

Climate Change

Human Development


Energy precariousness

Energy efficiency

Dialogue and consultation

Biodiversity

For the climate

• A carbon neutrality ambition by 2050 committed 

• Electricity output of **557.6TWh, 90%** decarbonised⁽¹⁾ with emissions of **55g of CO₂/kWh⁽²⁾** in 2019

• EDF, a water sharing player: water intensity of **0.87 l/kWh** in 2019⁽³⁾



For customers

• High customer satisfaction level

• **more than 894,000** struggling customers received energy assistance⁽⁴⁾



For partners and territories

• **~ 100** academic and industrial partnerships

• SMEs account for between **22** and **26%** of EDF and Enedis procurements

• Nearly **213,000** direct and indirect jobs generated⁽⁵⁾

• Nearly **90%** of projects are subject to consultation⁽⁶⁾



For employees

• An employee engagement index of **64%**⁽⁷⁾

• Women represent **27.3%** in Management Committees⁽⁸⁾

• An average salary equity ratio⁽⁹⁾ of **6.8**



Sales €71.3bn
EBITDA €16.7bn
Net income excl. non-recurring items **€3.9bn**

Sharing added value with our stakeholders



Suppliers
Purchases⁽¹⁰⁾

€44bn

EDF Group Global CSR Agreement



States and territories
Taxes⁽¹¹⁾

€5.4bn



Employees
Remuneration⁽¹²⁾

€14bn



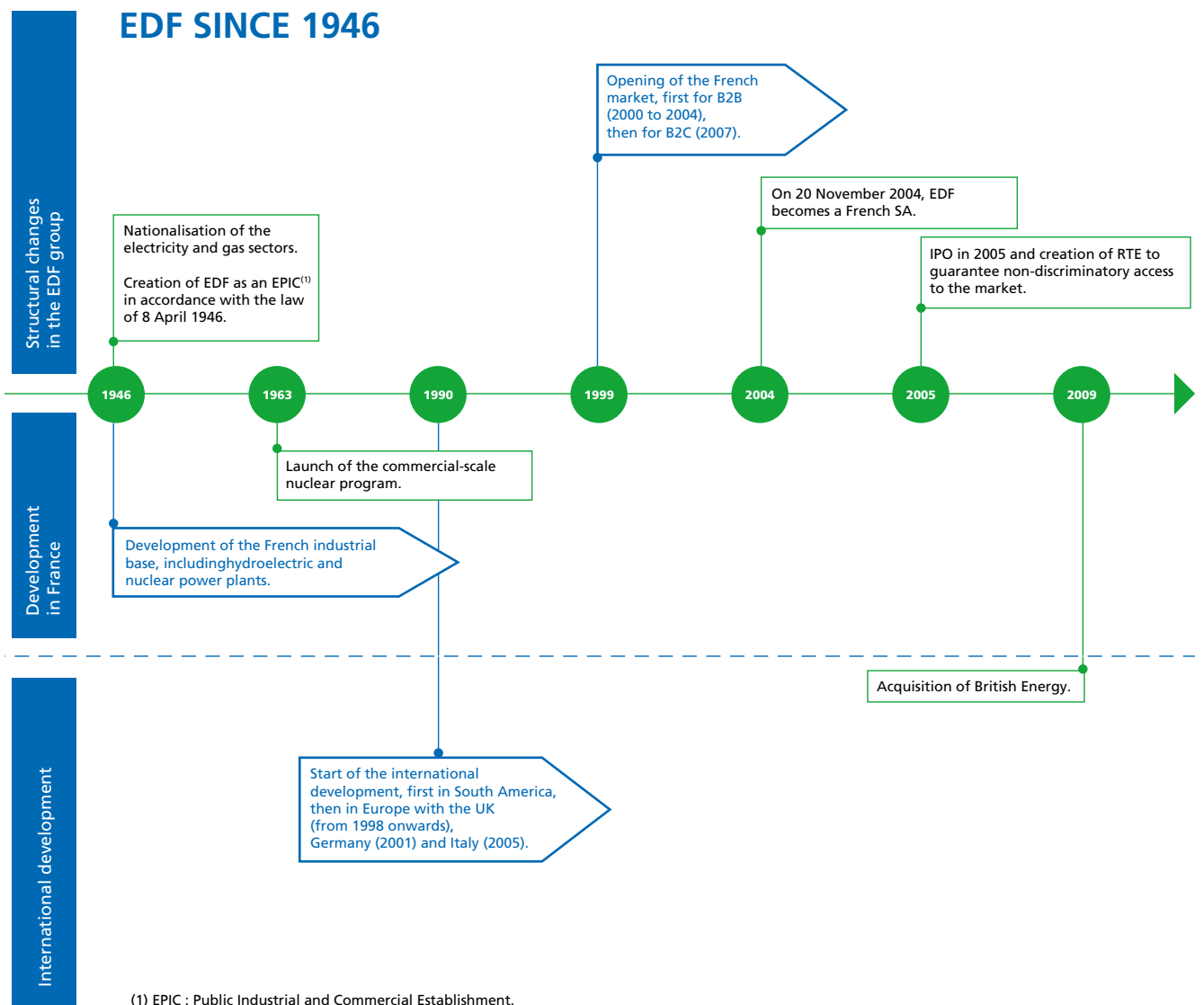
Shareholder Dividends
Target distribution rate⁽¹³⁾

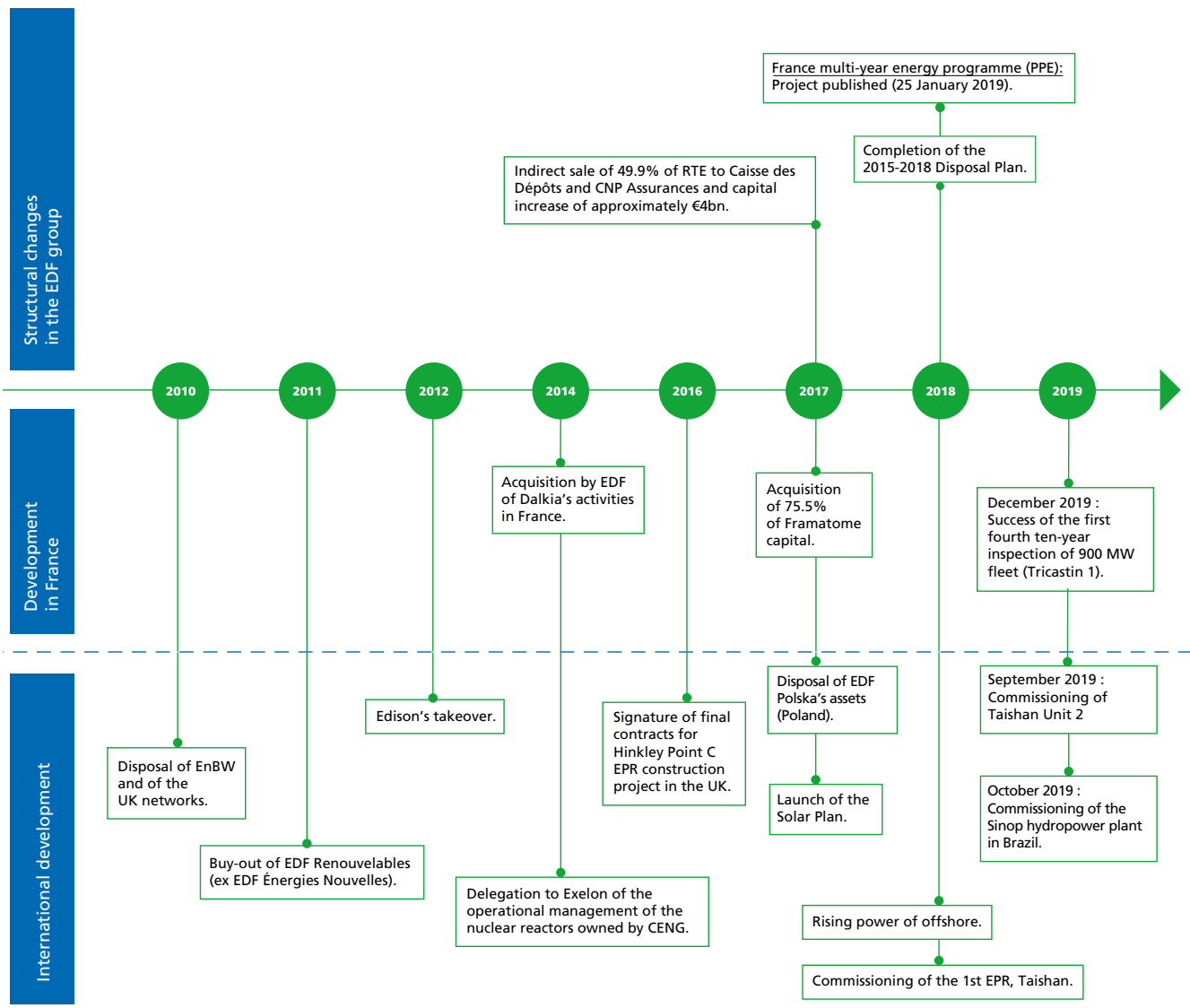
45%-50%

(1) Direct CO₂ emissions, excluding life-cycle analysis (LCA) of fuel and production means.
(2) CO₂ emissions due to heat and electricity generation. Group scope.
(3) Water consumed / electrical production of fleet. Group scope.
(4) Scope: EDF SA + ES.
(5) France excluding Corsica and Overseas. Nuclear DPNT and DIPNN (including EDVANCE) and DTEAM and non-fuel purchases.
(6) In accordance with the Equator Principles - Group Scope.
(7) MyEDF Group internal survey.
(8) Group Scope.
(9) EDF SA perimeter - ratio established in accordance with the guidelines published by AFEP.
(10) Consolidated purchases and other external expenses.
(11) Consolidated taxes, including income taxes.
(12) Consolidated personnel expenses.
(13) Rate applied to net income excluding non-recurring items adjusted for the remuneration of hybrid bonds accounted for in equity.

1.2 History and Organisation of the Group

1.2.1 History of the Group

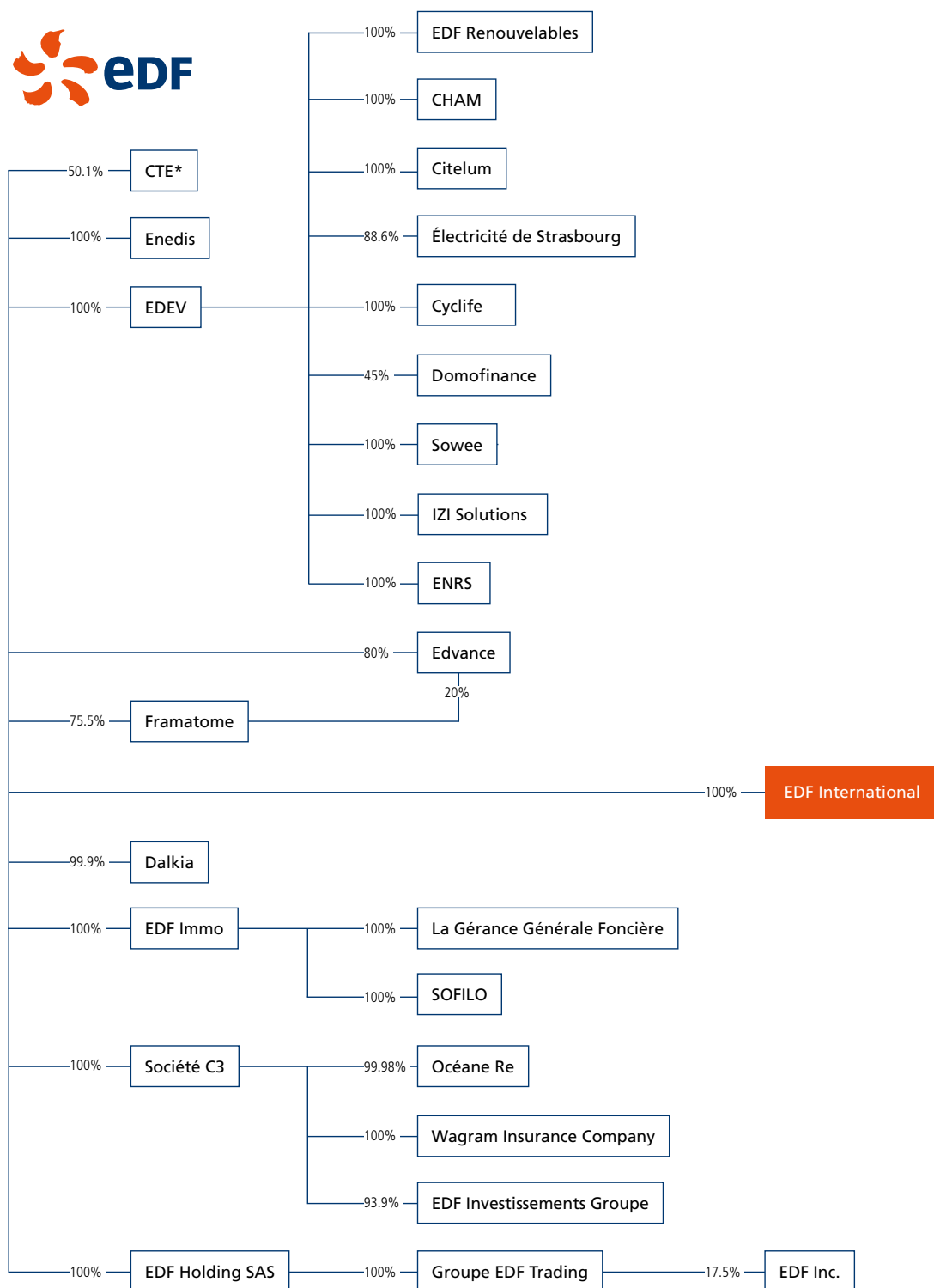




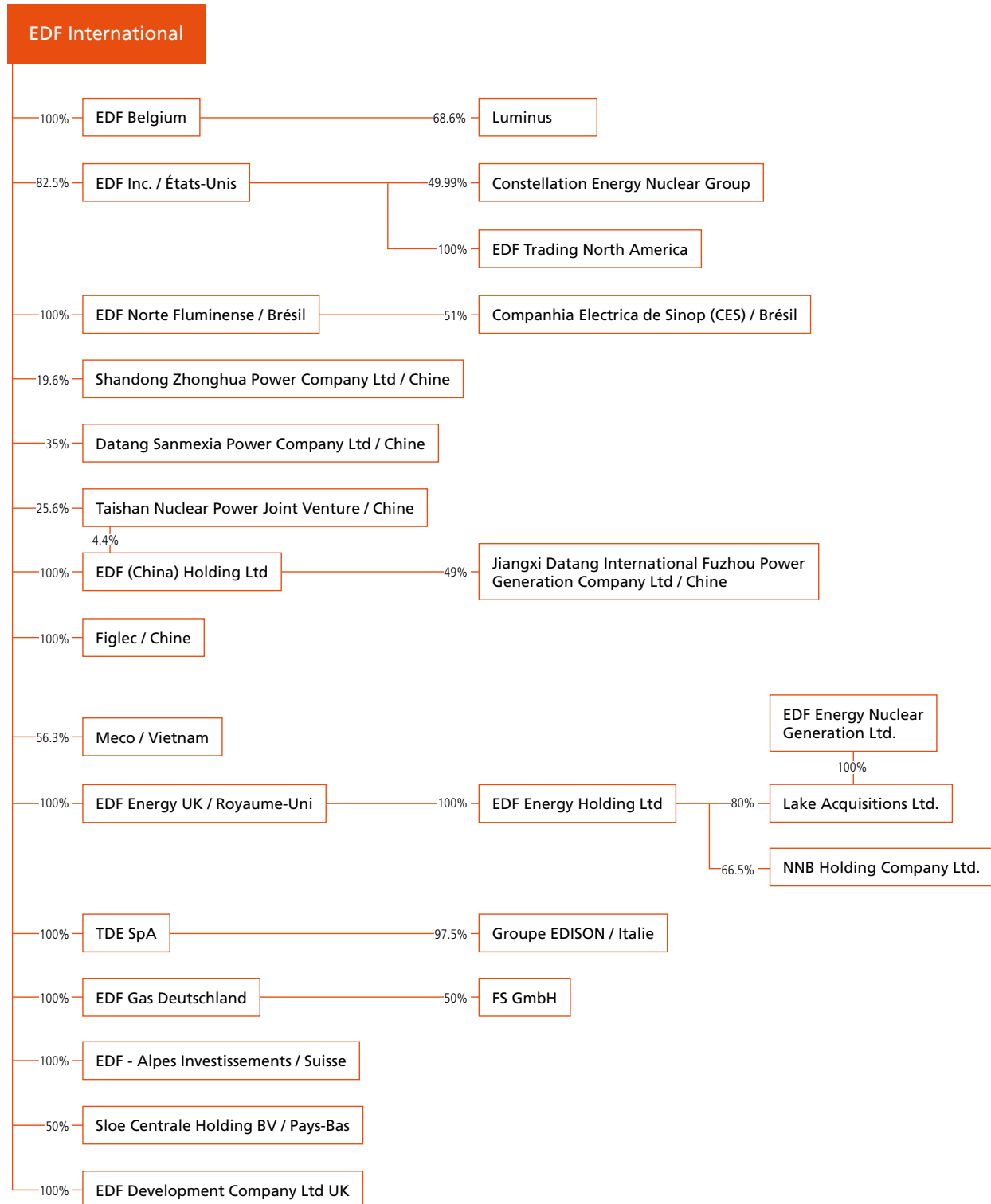
1.2.2 Organisation of the Group

A simplified organisational chart for the Group, as of 31 December 2019, is presented below. The percentages for each entity correspond to the ownership interest in capital.

The companies or groups of companies within the Group's scope of consolidation are indicated in note 53 to the consolidated financial statements for the year ended 31 December 2019.



* Coentreprise de Transport d'Electricité or CTE, the company holding 100% of RTE.



1.3 Group strategy

1.3.1 Environment and strategic challenges

The fight against climate change, by curbing greenhouse gas emissions, has entered a crucial phase with a view to limiting global warming to a maximum of +2°C, while continuing efforts to limit it to 1.5°C.

The agreement reached in Paris at the 21st session of the Conference of Parties (COP 21) in 2015 confirms the effort being made to combat climate change and the ramping up of energy transitions beyond Europe. This agreement, which was ratified by 168 countries as well as the European Union, came into force on 4 November 2016.

With the Climate Change and Clean Energy Packages in 2008 and 2019, the European Union has set itself ambitious goals for 2020 and 2030. It is currently considering raising its decarbonisation objectives for 2030 and adopting a carbon neutrality target for 2050. In December 2019, the new European Commission announced a Green Deal to make this ambition a reality.

In 2019, France adopted a National Low-Carbon Strategy, which incorporates the carbon neutrality target for 2050 set by its 2017 Climate Plan.

The UK, which must undertake a major renewal of its electricity generation facilities, adopted the Climate Change Act in 2008 and established a market model consistent with that policy (Carbon Price Floor, Contracts for Difference, capacity market, consideration of a regulated asset base model for new nuclear generation facilities).

Given that fossil fuel energy accounts for most CO₂ emissions worldwide, it is crucial to rapidly reduce their use in order to meet the climate target. To this end, the two major levers of actions are: lowering energy consumption by developing energy efficiency solutions and increasing the use of carbon-free energy sources, *i.e.* renewable energies – thermal (wood, biomass) or electric (hydro, photovoltaic or wind) – and nuclear energy.

Thus, uses currently covered by fossil fuels must be replaced by carbon-free energy solutions, first and foremost electric power solutions. Today, electricity accounts for about 20% of energy consumed worldwide. Shifting uses to electric power primarily concerns the two sectors with the highest emissions: construction and transport. Given that electric power solutions are very often seen by consumers as being synonymous with energy efficiency, they contribute to the joint objective of reducing energy consumption and moving away from fossil fuels for transport, buildings and industry: heat pumps as a replacement for fuel-oil or gas boilers, electric vehicles as replacement for combustion-powered vehicles.

Although electricity consumption is rising fast in emerging markets, especially in Asia, with forecasts ⁽¹⁾ of around +171TWh per year in China between 2018 and 2040 (+2.2% per year on average), and +45TWh per year in Africa (+4.1% per year), it is more gradual in the European Union: +28TWh per year (+0.9% per year). In Europe, the market and regulatory environment provide very little visibility as to revenues from power generation assets, despite the fact that major investments are still required to maintain existing assets and, in the longer term, to renew generation facilities:

- commodity prices are highly volatile and are expected to remain so in spite of the abundance of fossil fuels. They remain very sensitive to geopolitical tensions, changes in economic growth, adverse climatic and technical conditions;
- the price of CO₂ is directly dependent on the applicable regulations. In Europe, the emissions quota system currently in place does not ensure a minimum CO₂ price;
- the electricity market price depends directly on the above factors and impacts the breakeven point of electricity generation plants.

Under these circumstances, most production capacity is brought on stream under subsidy and/or guaranteed revenue schemes.

In France, the Climate and Energy Law of 8 November 2019 sets out several medium and long term objectives relating to greenhouse gas emissions, energy consumption and the energy mix in France. This law is implemented by a multi-year energy programme (PPE) that manages these targets. The PPE defines the orientations and action priorities of public authorities for managing all the different energy forms for five-year periods.

The proposed PPE for the periods 2019-2023 and 2024-2028 was submitted for consultation by the government in January 2020. This document restates that the French energy targets relate to the reduction of energy consumption, by focusing on lowering the consumption of high-carbon energies and replacing carbon energies by carbon-free energies. It states that electricity is a decarbonisation lever for a number of uses. In particular, it sets the following targets:

- reduction of greenhouse gas emissions to 277Mt CO₂ in 2023 and to 227Mt CO₂ in 2028;
- decrease in the primary consumption of fossil fuels of 20% in 2023 and 35% in 2028 compared with 2012;
- development of renewable energies (consumption of renewable heat of 196TWh in 2023 and a range of between 218 and 247TWh in 2028; installed capacity of renewable electricity in France of 74GW in 2023 and a range of between 102 and 113GW in 2028);
- development of electric vehicles (1.2 million private electric cars on the road in 2023);
- end to the sale of new greenhouse gas emission vehicles in 2040;
- 500,000 energy efficient home renovations every year.

It sets as its objective for 2035 a share of 50% nuclear power in the French energy mix, with the closure of 14 reactors by 2035, two of which are the Fessenheim reactors, and 2 to 4 other reactors shutting down by 2028: two reactors to close in the second period of the PPE, in 2027 and in 2028, subject to complying with the security of supply requirement; furthermore, if certain conditions relating to electricity prices and the development of the European electricity market are met, two additional reactors could close by 2025-2026, based on a decision to be taken in 2023. The proposed 2019-2028 multi-year energy programme also provides for ceasing coal-fired power generation by 2022.

For the long term, the PPE project states that it is important to maintain the capacity to build new nuclear reactors based on national industrial capacities and technology. The government asked the EDF group to prepare by mid 2021 a file with the nuclear industry relating to its industrial capacity, a "de-risking" programme of the new EPR 2 reactor model proposed by EDF, comprising the valuation of the costs of this reactor, a review of the financing options of a programme for new reactors for the French electricity system and the necessary actions for the approval by the European Commission of the programme's financing mechanism and implementation.

Furthermore, this PPE project provides that "the French government will propose the terms of a new system of regulations for existing nuclear plants that will protect consumers against rising market prices after 2025 by allowing them to benefit from the competitive advantage of investments made in the historical nuclear power plant fleet, while giving EDF the financial capacity to ensure economic sustainability of generation facilities and meet the requirements of the PPE in low-price scenarios". To achieve this objective, the French government plans to introduce economic regulation requiring EDF to provide a service of general economic interest (SGEI) to all French consumers, in a transparent and non-discriminatory manner, focusing on consumer and climate protection. This SGEI would be based on economic regulation of the existing nuclear fleet in order to reconcile and contribute to the following objectives:

- providing all consumers in France, regardless of their supplier, with long-term protection by allowing them to take advantage, for a portion of their basic power needs, of the stable conditions offered by the carbon-free and controllable electricity generated by the existing nuclear fleet they helped finance;

(1) Sources: AIE, World Energy Outlook, November 2019, Sustainable Development Scenario

- meeting the climate targets France has set itself, as well as the objectives of maintaining the security of energy supply and energy independence, by retaining the carbon-free electricity supply of France and, more broadly, of Europe, by securing the long-term financing and return on investment required to operate the existing nuclear facilities necessary for this supply.

Customers are looking to increasingly take ownership of their consumption, and local communities of their energy policy. These new expectations are forcing energy producers to come up with new solutions and new, more decentralised models, facilitated by innovations in telecommunications and digital technologies and the emergence of new uses, including electric vehicles.

The electricity sector is thus changing more than ever, at the centre of medium- and long-term societal and technological trends.

EDF group has therefore established its business model and its CAP 2030 strategic priorities in response to this context.

1.3.2 EDF group's climate strategy

EDF has proposed to its shareholders at the next General Meeting to be held on 7 May 2020 to adopt a "*raison d'être*". Thus, EDF's *raison d'être* would be to "to build a net zero energy future with electricity and innovative solutions and services, to help save the planet and drive wellbeing and economic development".

In line with this *raison d'être*, EDF's ambition is to achieve carbon neutrality by 2050 thanks to virtually zero direct emissions, a reduction in indirect emissions that is as significant as possible within the framework of national policies, and offsetting residual emissions by compensation through negative-emission projects. To this end, EDF aims to move away from coal-fired power generation by 2030 in all geographical areas. EDF's *raison d'être* also reinforces its ambition to develop solutions in France and internationally so that everyone can play a part in the energy transition.

The EDF group's climate strategy is based on three levers: mitigation, adaptation and transformation.

Mitigation: By joining the "Business Ambition for 1.5 degrees" coalition on 26 February 2020, alongside 200 other companies worldwide, the EDF group is demonstrating its ambition on climate issues by setting its greenhouse gas emission reduction trajectories so that they respond to a rise in temperatures limited to 1.5 degrees, and is aiming for carbon neutrality by 2050. It is also committed to obtaining the Science Based Target initiative certification, with a reduction in the Group's direct emissions raised from 40 to 50% by 2030 ⁽¹⁾ and the desire to set, for the first time in 2020, a commitment to reduce indirect emissions (Scope 3). To achieve this, the EDF group is relying on its generation, already 90% decarbonised thanks to nuclear and hydropower ⁽²⁾, and aims to move away from coal-based generation by 2030 with, in particular, the closure of the last plants running exclusively on coal by 2022 in France, and in the United Kingdom by 2024 ⁽³⁾.

The Group is investing massively in the development of renewable energies in France and worldwide ⁽⁴⁾, with a target of doubling installed renewable energy capacity between 2014 and 2030 to reach 50GW by 2030.

Adaptation: EDF group is implementing a strategy to adapt all its activities to the impacts of climate change in order to make its existing facilities less sensitive and more resilient to increasingly frequent extreme weather events (heat waves, droughts, storms, floods, etc.), as well as to incorporate long-term climate change (average temperatures, sea levels, etc.) into the design of new facilities, particularly those with a lifespan of over 40 years, such as hydroelectric and nuclear plants.

Transformation: EDF group is expanding its activities to enable local areas to achieve carbon neutrality: promotion of the increased use of electricity, investment in innovation and R&D, development of energy services, solar plan, support for shifting uses to electric power, electric mobility plan, smart cities, smart meters, storage plan, new business and new commercial offers. Because energy transition will be successful only if it is fair and solidarity-based, EDF group helps its customers to consume more efficiently, combats fuel poverty and works for climate-friendly laws.

EDF group's climate strategy is headed by the Group Senior Executive Vice-President in charge of Innovation, Corporate Responsibility and Strategy, who is a member of the Group's Executive Committee.

1.3.3 Priorities of the CAP 2030 strategy

For EDF, the fight against climate change is based on two levers: energy efficiency and energy decarbonisation. This conviction drives our strategy, which focuses on three priorities:

- proximity to customers and local communities;
- very low-carbon generation by rebalancing the mix between nuclear and renewable energy;
- international expansion.

The Group, a producer of low-carbon electric power, develops solutions that enable everyone, at their own level, to play a role in the energy transition and promotes its low-carbon model internationally. These goals are pursued through three major plans and a strategic work programme (some twenty strategic projects managed at the Executive Committee level are being carried out and concretely implement each of the three strategic priorities):

- through the **electric mobility plan**, launched in October 2018, EDF aims to be the leading supplier of energy for electric vehicles in France, the United Kingdom, Italy and Belgium, with an overall market share target of 30%. It also aspires to be the leading operator of charging stations in these countries and the European leader in smart charging. In 2022, EDF aims to supply 600,000 electric vehicles with electric power, deploy 75,000 charging stations, provide its customers in Europe access to 250,000 interoperable charging stations and, by 2020, operate 4,000 smart charging stations. Today, EDF assists local authorities in deploying electric mobility solutions on a wide scale;
- storage is the key to stabilising the frequency of the grid, using hydroelectric pumping stations and giga-batteries, or to manage micro-grids in isolated areas without access to the grid. The **electricity storage plan**, launched in March 2018, provides for the development of 10GW of new storage facilities in the world by 2035, increasing the Group's storage capacity by then to 15GW;
- through its **solar plan**, EDF aspires to become the leader in solar photovoltaic energy in France with a 30% market share of the sector between 2020 and 2035. EDF Renewables operates 2GW of gross installed capacity in France, of which nearly 230MWp of gross installed solar capacity. To meet these objectives, EDF is mobilised to locate available land and make targeted acquisitions. In 2019, the company acquired the Luxel group, an independent solar energy player in France, which holds a portfolio of one gigawatt peak (1GWp), consisting of wind farms already in operation and projects ready to be built or under development.

This goal will also be achieved through a transformation programme based on simplification, innovation and digital technology, accountability and performance, human ambition and skills.

In connection with CAP 2030, EDF group has also made a commitment to six Corporate Social Responsibility Goals (see section 3.1 "EDF, a responsible company").

(1) See section 3.2.1.1.1 "EDF group's ambition".

(2) See section 1.1 "Key figures".

(3) See section 1.4.1.4.2 "Issues relating to thermal generation" – § "Coal-fired fleet in transition" and section 1.4.5.1.1 "Strategy – Overview".

(4) See section 1.3.4.2 "Investment programme".

1. The Group, its strategy and activities

Group strategy

1.3.3.1 Strategy and organisation

Pursuant to the CAP 2030 strategy, and in line with the guidelines adopted by the French authorities for the PPE, EDF group is mobilised to meet all aspects of the challenges of energy transition, in all territories in which it operates.

In France, this ambition requires an overall reform of the electricity market and of the conditions for obtaining a fair return on nuclear assets. In this context, the French government launched a consultation on adopting a new regulatory framework to replace the ARENH (see section 2.2.1 "Market regulation, political and legal risks - 1B Evolution of the regulatory framework") and has requested the Group's Executive Management to reflect on a new organisation in connection with this reform. This possible change in the Group's organisation, which is envisaged only if the regulatory framework reform projects are carried out, could lead in particular to a spin-off of the downstream and services activities, the renewable energies and distribution activities, which would be grouped together in a structure in which a minority interest would be listed (called "GREEN"), and which would be majority-owned and controlled by the parent company (called "BLUE"), which would itself directly operate all nuclear activities, as well as EDF hydropower fleet. The respective scopes of these entities have by no means been conclusively determined at this stage and will be clarified in due course if this reorganisation project ("HERCULE" project) is actually undertaken.

In any event, the HERCULE project should maintain BLUE and GREEN as two integrated entities within the Group. This possible change in the Group's organization, which is exclusively subject to the successful completion of the project to review the regulatory framework, would aim at strengthening the Group's investment and financing capacities to enable it to be the leader in the energy transition, while safeguarding an integrated Group. Discussions are currently underway on this subject, and are conditional on the reform of the nuclear regulatory framework.

1.3.3.2 Proximity to customers and local communities

Increasingly, individuals, businesses and cities want to change the way they light, heat, produce, consume and travel. This momentum, an aggregate of individual initiatives and public decisions, is gradually expanding everywhere. EDF's goal is to assist customers and local areas to achieve CO₂ neutrality with accessible and innovative carbon-free and energy-efficient solutions.

In doing so, EDF relies on its customer portfolio in key European countries (France, UK, Belgium and Italy) with an unparalleled customer relationship and an enhanced range of services and supply offers:

- EDF positions itself as a major player in energy efficiency and carbon-reduction services by working to replace fossil fuels with new efficient uses of electricity (electric mobility, heat pumps, low-carbon housing, carbon-free hydrogen, etc.). Dalkia develops, implements and manages innovative energy solutions that are more environmentally friendly and more economical. EDF supports the development of carbon-free and decentralised electricity generation capacities, such as the "My Sun and me" ("Mon Soleil et moi") self-consumption offer, and innovative solutions to help customers and local areas consume better and less, and contributes to the development of smart cities;
- in 2019, EDF continued to innovate by proposing new offers, accelerated its development of services for individuals and businesses, and stepped up its energy services activities for businesses and communities. These are the actions EDF takes to maintain its customers' confidence in an increasingly competitive environment: with the launch of "My Zen days" ("Mes jours Zen") in 2019, EDF expanded its range of electricity market offers for individual customers, comprising Electric Green (*Vert Electrique*), Weekend Electric Green (*Vert Electrique Week-end*), Auto Electric Green (*Vert Electrique Auto*) and Digiwatt. "My Zen days" is a range of offers aimed at customers who want electricity prices that are adapted to their consumption practices;
- after Ding Done in Belgium (Luminus), Hoppy in GB (EDF Energy) and Assistenza Casa in Italy (Edison), the launch of the first service platform, IZI by EDF, positions the Group to become the preferred partner offering peace of mind for the French in their homes and businesses. The digital platform IZI by EDF puts individuals and businesses in touch with independent tradesmen and building professionals to carry out minor works or renovation projects. EDF also launched "My sustainable heating" ("*Mon chauffage durable*"), a complete offer for replacing fossil fuel boilers (oil, gas,...) with heat pumps, in order to reduce French consumers' energy bill and CO₂ emissions;
- in 2019, EDF created its Hynamics subsidiary to provide a competitive, carbon-free hydrogen offer, primarily for industrial and heavy mobility customers, which are difficult sectors to decarbonise;

- thanks to its expertise, Dalkia helped its customers save 6.7TWh in 2019. To date, Dalkia operates 340 heating and cooling networks: in 2019, Dalkia's actions averted the emission of 4.3 million tonnes of CO₂.

1.3.3.3 Very low-carbon generation: nuclear and renewable energies

The commitment made by all countries at the COP21 aims to keep the rise in temperatures well below 2°C. It triggered a collective movement to act differently. In its 2019 report on "Nuclear Power in a Clean Energy System", the International Energy Agency (IEA) stated that nuclear power is an indispensable tool for keeping global warming below 2°C compared to the pre-industrial period: without nuclear power, the IEA's experts believe that achieving the objectives of the Paris Agreement will be much more costly and will require insurmountable efforts from the international community.

Because 97% of electricity in France is carbon-free thanks to nuclear and renewable energies, EDF is playing a leading role in achieving this objective by accelerating the development of renewable energies while guaranteeing the safety, performance and competitiveness of existing nuclear facilities and Nuclear New Build investments.

EDF's ambition to achieve a very low-carbon generation goal starts with the consolidation of its hydropower and nuclear asset base:

- EDF regularly invests in hydropower concessions in order to combine economic, energy and environmental performance, and proposes solutions to strengthen hydropower generation;
- EDF is investing in order to continue operating the nuclear fleet in France and the United Kingdom under the best possible safety conditions, as well as in preparation for the decommissioning of the nuclear fleet and waste management operations.

At the same time, the EDF group is actively pursuing its development in renewable energies (with the objective of doubling the installed capacity of the Group's ENR and hydropower fleet from 28GW in 2014 to 50GW in 2030) and in Nuclear New Build.

With regard to renewable energy, the new means developed will be essentially onshore and offshore wind power, solar energy and hydropower. The development of these assets outside France is undertaken in line with the EDF group's international strategy.

1.3.3.4 International expansion

To deal with the challenges of demographics, urbanisation and air pollution, many countries are looking for solutions that can improve the situation. EDF, which operates on all continents, supports this energy transition by exporting its expertise in nuclear power, renewable energies and energy services.

The EDF group wants to be a key player in the energy market in France and in its core countries in Europe (United Kingdom, Italy, Belgium) by playing a role in energy security, the enhancing of economic competitiveness and the European economy low-carbon transition, in line with public policies.

EDF is also expanding outside Europe, thanks to a targeted approach in geographic terms and steering its investment choices by giving priority to low-carbon generation projects, in particular hydraulic, wind and solar generation projects as well as energy services and engineering activities. It is expanding storage capacities and developing gas production projects in areas where these are key factors for energy transition, in line with the Group's commitments to low CO₂ emissions.

1.3.3.5 Transformation

Health and safety, digital and new work practices, responsibility and simplification, skills and the recognition model are the five major levers of the Group's transformation.

The Group adapts its managerial practices by empowering the teams, streamlining its organisations and modus operandi, as illustrated by a number of concrete examples since 2016 (introduction of fixed numbers of working days for managers, boosting career paths and promoting internal mobility and promotional training, streamlining and simplification of Group policies, etc.) and other more recent examples, such as the digital signature of contracts and the simplification of financial and non-financial reporting. In 2018, EDF also signed a new global agreement on Corporate Social Responsibility ("CSR agreement") which includes improvements in favour of diversity and to the benefit of Group employees. In 2019, a new management-labour dialogue approach was adopted, simplified and set up, in accordance with new legal requirements (see section 3.3.3.1.7 "A renewed social dialogue").

Moreover, the promotion of innovation, based on experiments ("labs" and co-construction platforms with customers) and on an open innovation programme contributes to this transformation. The creation at end-2017 of the EDF Pulse Croissance incubator and corporate venture, which is responsible for "new businesses", supplements the range of tools that EDF is gradually acquiring to meet the challenges in this area. It uses the levers of incubation, investment in external start-ups (through the Electranova funds) and technological partnerships (see section 1.4.6.1.3 "EDF Pulse Croissance").

The digital transformation involves employees and internal modus operandi, customer relations and the management and design of industrial assets. The creation at end 2016 of a Transformation and Operational Efficiency Department, which combines the Group's activities relating to information systems, purchasing, real estate and shared services, reflects the Group's desire to speed up in this field. Since several years, the EDF group has placed the focus of digital transformation at the strategic level and has carried out an in-depth review of its internal organisation and training. In particular, in 2019, an internal academy dedicated to the new digital professions was created.

In the field of data, the Group has adopted in 2018 a data management policy and set up a "data analytics" plant for nuclear, thermal and renewable electricity generation, with the pooling of expertise. In 2019, this plant expanded its scope and a second plant was created for tertiary data (real estate, purchasing, etc.).

Performance improvement has always been a priority for the EDF group. The current economic and financial context further increases the urge for such improvement. The Group is strengthening control of its costs to bring them into line with its environment. The approach is adjusted depending on the scopes involved (cross-disciplinary functions, operating entities, etc.) and a number of projects have already produced results in terms of reduction of operating expenses, optimisation of the working capital requirement and improved management (cash-based management, project management team, cyber-security management), with the aim of enhancing the competitiveness of support activities and giving businesses performance levers.

"Let's Talk Energy", a collective intelligence initiative to support transformation initiated in the first half of 2018 to harness the intelligence of EDF employees towards the construction of the Group's medium- and long-term scenarios, was continued in 2019 in connection with the publication of the multi-year energy programme (see section 3.3.1.2.5 "Dialogue and consultation about our projects").

Lastly, in the nuclear sector, 2019 was also marked by the launch at year-end of the "excell" plan, which seeks to enhance the industrial quality, expertise and governance of major nuclear projects (see section 1.4.1.2.4).

1.3.3.6 Research & Development to support energy transition

Research & Development (R&D) has a crucial role to play in developing low-carbon solutions, all the while reinforcing the safe and economically efficient operation of existing and future facilities (See section 1.6 "Research & development, patents and licences").

1.3.3.7 CAP 2030 success factors

CAP 2030 enables the Group to develop a portfolio of assets focused on low-carbon, renewable and nuclear energy, services for customers, decentralised energy solutions.

The key success factors of CAP 2030 are:

- the expansion of the range of offers and exemplary customer relations;
- the management of major projects, in particular the new models for nuclear reactors, the "Grand Carénage" programme or the development of Nuclear New Build;
- the selectiveness of investments in projects;
- cost control;
- the transformation of the Group's modus operandi and the commitment of all.

In this context, the implementation of the Group's performance plan announced on 22 April 2016 has made it possible to achieve the following goals:

- a reduction in operating expenses⁽¹⁾ of €1.24 billion from 2015 to 2019, with target savings of €1.1 billion on the same period;
- an asset disposal plan of approximately €10 billion between 2015 and 2020, already achieved in 2018;
- strengthening of the balance sheet *via* a capital increase totalling €4.0 billion and the option of dividend payment in shares in respect of financial years 2015-2016-2017, chosen by the State in particular (cumulative €5 billion).

The Group is pursuing its investment programme in line with its CAP 2030 strategy (see section 1.3.4 "Investment Policy").

Moreover, the Group is continuing the work on its modus operandi through its transformation programme, "accountability, simplification and innovation/digital technology":

- structuring of the Group's operations into 20 business units, and overhauling of management indicators;
- professionalisation of project managers, with the setting up of an external certification programme;
- simplification of some processes: purchasing, training, reporting, etc.;
- development of innovation, with the creation of new services in start-up mode supported and financed by "EDF Pulse Croissance" (see section 1.4.6.1.3 "EDF Pulse Croissance"), support for participative innovation, with more than 30 places of innovation throughout the Group and the internal and external EDF Pulse Awards;
- deployment of a digital strategy: cultural transformation with the new season of the "Y Project" (participation of 30 young people), increasing use of collaborative tools and structuring to harness data to support customers, and to optimise maintenance and operating costs.

1.3.4 Investment policy

1.3.4.1 Investments in 2019

The Group continued its programme of gross operating investments for a total amount of €16.7 billion in 2019, versus €16.2 billion in 2018.

Total net investments excluding disposal plan were €13.9 billion in 2019. These include Linky (headed by Enedis) for €0.8 billion and HPC for €1.8 billion. Excluding Linky and HPC, the main net investment items, excluding strategic disposals, were those made in nuclear maintenance (mainly "Grand Carénage") for €4.3 billion, the Flamanville 3 project for €0.8 billion, regulated activities in France and the islands (excluding Linky) for €3.6 billion and services for €0.3 billion. Lastly, in renewable energies, net investments totalled €0.4 billion, a reduced amount due to the disposal of 50% of the Scottish NnG facilities, which initiated a deconsolidation of the associated debt and thus reduced the nominal amount of net investments.

Asset disposals represented €0.5 billion in 2019. The Group's disposal plan reached its target of €10 billion by the end of 2018 and was extended to 2019 and 2020 with an additional target of €2 to €3 billion.

(1) At comparable scope and exchange rates. At constant pension discount rates. Excluding change in the operating expenses of the service activities.

1. The Group, its strategy and activities

Description of the Group's activities

1.3.4.2 Investment programme

In the short and medium term, the Group aims to:

- complete major industrial projects such as the Flamanville 3 EPR in France as well as the smart meters in France (Linky, driven by Enedis), representing capital expenditure of respectively €12.4 billion⁽¹⁾ and nearly €4.0 billion⁽²⁾ (see respectively sections 1.4.1.2.1 "Flamanville 3 EPR project" and 1.4.4.2.4 "Future challenges");
- continue its investment in Nuclear New Build in the UK in order to deliver the Hinkley Point C project for an estimated cost on completion of between £₂₀₁₅21.5 and 22.5 billion⁽³⁾ for 100% of the project (see section 1.4.5.1.2.4 "Nuclear New Build Business"). The Group is also continuing its studies of the Sizewell C project;
- continue its "Grand Carénage" industrial programme for nuclear power in France for an investment of about €₂₀₁₃ 45 billion over the period 2014-2025 (see section 1.4.1.1.2 "Operation and technical performance of the nuclear fleet");
- intensify its investments in renewable energies in France and internationally, with an average gross investment in renewables above €2 billion per year over the 2017-2020 period, and develop its installed capacities in solar power; the Group announced the launch on 11 December 2017 of the Solar Plan, to be mainly financed through partnerships;
- continue the turnover of Edison's assets, which started, firstly, with the disposal of its head office in Milan, the disposal of a portfolio of gas assets in 2017 and the project to sell its E&P business (in progress) and, secondly, with the

acquisition in 2018 of the customer portfolio of Gas Natural (GNVI) and the service company Zephyro, as well as the launch of two new CCGT projects in Italy which has been announced in 2019;

- develop 10GW of new electricity storage facilities in the world by 2035, in addition to the 5GW already operated by the Group, with the announcement on 27 March 2018 of the Electricity Storage Plan. EDF is also boosting its capacity for Research and Development and for innovation in this field in order to support the rapid development of storage technologies;
- become the leading electricity company in electric mobility from 2022 in four large European markets (France, United Kingdom, Italy and Belgium), with the launch on 10 October 2018 of the Electric Mobility Plan, which is based on an ecosystem of innovative players through strategic partnerships.

With respect to the here above Flamanville 3, Linky, Hinkley Point C and "Grand Carénage" projects, as well as the investments in renewable energies, the firm commitments made by the Group on the acquisitions of tangible and intangible assets are set out in note 49.1 of the appendix of consolidated financial statements as at 31 December 2019.

Lastly, as part of its CAP 2030 strategy, the Group will selectively target, in line with its policy and financial constraints, new development projects in addition to those already initiated, namely the EPR 2 project, British Nuclear New Builds, new renewable energy projects, as well as international equity investments.

Given its financial constraints, the Group will whenever possible, use partnerships to finance its new projects.

1.4 Description of the Group's activities

The EDF group is an integrated energy company, active in all electricity businesses: nuclear, renewable and fossil-fuel generation, transmission (through RTE⁽⁴⁾ an entity accounted for using the equity method), distribution (through Enedis⁽⁵⁾), sales and marketing, efficiency and energy services, and energy trading. It is the leading player in the French electricity market and holds strong positions in Europe (mainly in the United Kingdom (UK), Italy and Belgium), which makes it one of the world's leading electric energy companies and a renowned gas player. It is also present in the design and manufacture of equipment and fuel for nuclear reactors, and in related services (activity carried out by Framatome).

With a global installed generation capacity of 122.3GWe⁽⁶⁾ as at 31 December 2019, generating 557.6TWh worldwide, the Group has one of the largest generation fleets in the world. Among the ten largest global power suppliers, it produces the smallest amount of CO₂ per kilowatt-hour⁽⁷⁾ generated thanks to the share of nuclear, hydro and other renewable energies in its generation mix.

The EDF group supplies energy and provides services to 38.9 million customer sites⁽⁸⁾ worldwide (of which 28.8 million in France) including:

- 33.6 million customers⁽⁹⁾ in electricity, of which 27.1 million in France;
- 5.3 million customers⁽¹⁰⁾ in gas, of which 1.7 million in France.

The Group is thus implementing an integrated model for the joint operational management of its portfolio of assets upstream (generation and procurement of energy and fuels) and downstream (wholesale and retail) to guarantee supply of energy to its customers through the best possible management of operational and market risks and with a view to maximising gross margin.

1.4.1 Electricity generation activity

In mainland France, the electricity generation activities are split across the Nuclear and Thermal Fleet Department and the Renewable Energy Division. In addition to these two departments, the Engineering and New Nuclear Project Department is responsible for the development projects for the Group's new nuclear generation assets, in France and abroad. Each of these three departments has all the expertise and performance drivers required to operate the leading European electricity generation fleet and ensure its development and sustainability, and offer their technical and industrial expertise to the whole Group in these three areas.

(1) 2015 euro cost of the construction of Flamanville 3, excluding interim interest. Abnormal additional costs incurred in connection with non-current assets built by the Company will be expensed (see section 1.4.1.2.1).

(2) The programme completion costs were reviewed downward, from €4.5 to €3.97 billion for the period 2014-2021, after taking into account prices of the latest contracts signed for equipment (meters and concentrators) and for installation services.

(3) Excluding interim interest and the currency effect compared with a benchmark project exchange rate of £1 = €1.23.

(4) RTE, transmission network operator, independently managed within the meaning of the French Energy Code.

(5) Enedis is an independently managed subsidiary within the meaning of the provisions of the Energy Code.

(6) Figures calculated according to consolidation accounting rules, excluding Cottam.

(7) Source: comparison based on data published by these ten groups.

(8) As of 2018, customers are counted per site; a customer can have 2 delivery points: one for electricity and another one for gas.

(9) The number of electricity sites at end-2018 was 34.7 million, of which 28.2 in France (EDF excluding ES and overseas departments).

(10) The number of gas sites at the end-2018 was 5.1 million, of which 1.5 in France (EDF excluding ES and overseas departments).

Strengths of the generation fleet

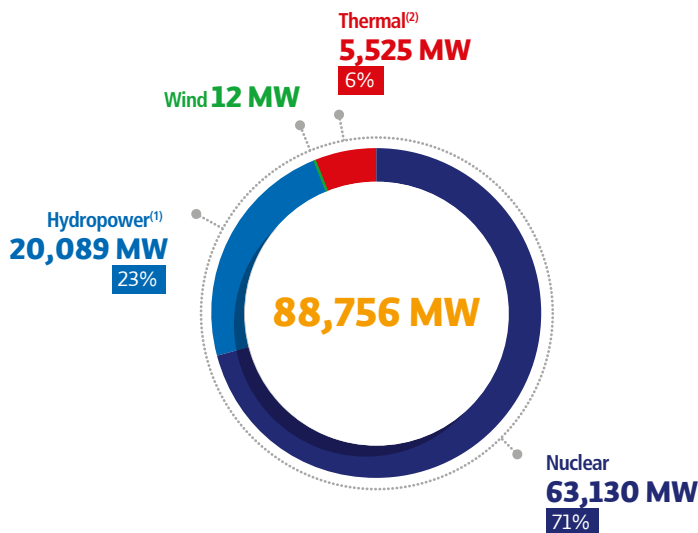
The Group's generation fleet has significant strengths:

- a competitive generation mix with low variable generation costs⁽¹⁾;
- a variety of means of generation, which enable adequate coverage of EDF's downstream portfolio needs (end users, sales to alternative suppliers, sales on the wholesale markets, etc.). Use of the fleet's various components is managed by giving priority, at any given time, to the generation type offering the lowest variable costs: run-of-river hydropower plants are used for base generation; nuclear plants, because of their low variable generation costs, are used for base and mid-merit generation; adjustable hydropower generation (coming from dams) complemented by pumped-storage hydropower plant (STEP)⁽²⁾ and thermal fleet are used for mid-merit and peak generation;
- a significant standardised fleet of nuclear facilities, for which EDF provides full control over their entire life cycle. Moreover, EDF is working towards extending the operating lifespan of its power plants and improving their technical performance;
- a fleet generating at 90% without CO₂ emissions due to the predominance of nuclear and hydropower generation facilities, in an increasingly restrictive environmental regulatory context;
- a geographical position at the junction of electricity exchanges between the continental platform and the electric peninsulas (Italy, Spain and the UK).

→ Installed capacity and production in mainland France

Installed capacity

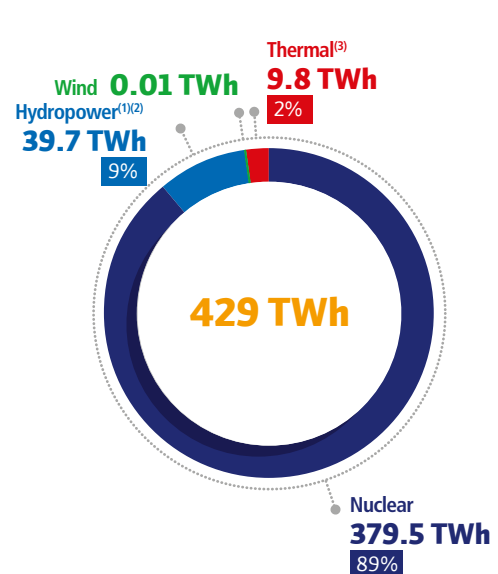
in MW



Expressed in megawatts of maximum capacity linked to the network.
(1) Excluding Corsica and overseas departments, 439 MW in 2019 and including tidal generation capacity of 240 MW.
(2) Excluding Corsica and overseas departments, 1,621 MW in 2019.

Output

in TWh



(1) Excluding Corsica and overseas departments, representing 1.2 TWh in 2019.
(2) Generation including pumped storage consumption: the electricity consumption needed for the operation of pumped storage power plants (STEP) amounted to 6.3 TWh in 2019, resulting in net hydropower generation (including pumped storage consumption) of 33.4 TWh, and including generation from the tidal power on the Rance river of 0.5 TWh.
(3) Excluding Corsica and overseas departments, 4.6 TWh in 2019.
NB: The values correspond to the expression to the first decimal or integer closest to the sum of the precise values, taking into account rounding.

- (1) Variable generation costs correspond to all costs that vary directly with the amount of energy generated. Variable costs for electricity generation are mainly fuel costs.
- (2) EDF operates 5GW of STEP in France and its engineering is referenced to the tune of 30GW abroad (e.g.: Israel, Chile).
- (3) Excluding Corsica and French overseas departments.
- (4) Calculation based on the ENTSO-E statistics for the year 2018, as the statistics for the year are only available on 30 April of the following year
- (5) Arithmetic mean.

1. The Group, its strategy and activities

Description of the Group's activities

Other geographic areas and subsidiaries

At the end of 2019, the Group also has an installed capacity for electricity generation of 33.5GW (with 129TWh of electricity generated in 2019):

- through EDF Renewables (see section 1.4.1.5.4 "EDF Renewables") with a consolidated installed capacity of 6GW and output of approximately 15TWh;
- through overseas departments' Island Energy Systems and PEI with an installed capacity of 2.1GW and output of approximately 6TWh in 2019 (see section 1.4.4.3 "Island Energy Systems");
- through EDF Energy in the UK with an installed capacity of 12.2GW⁽¹⁾ and nearly 60TWh generated in 2019 (see section 1.4.5.1 "United Kingdom");
- through Edison with an installed capacity in electricity of 7GW and 22TWh generated in 2019⁽²⁾ (see section 1.4.5.2 "Italy");
- in the rest of the world with a consolidated installed capacity of 4GW and output of 22TWh (see section 1.4.5.3 "Other international");
- through contribution from Dalkia (see section 1.4.6.1.1 "Dalkia"), excluding heat generation, with an installed capacity in electricity of 2.2GW and output of 4TWh in 2019.

1.4.1.1 Nuclear power generation in France

The electricity generated by EDF in France from its fleet of nuclear power plants represented 89.8% of its total electricity generation in 2019 excluding pumped storage hydropower.

1.4.1.1.1 EDF's nuclear fleet in France

EDF's PWR model is divided into three series of available electrical power:

- a 900MW series consisting of 34 units of approximately 900MW (for a total power capacity of 30,770MW) with an average age of 38 years;
- a 1,300MW series consisting of 20 units of approximately 1,300MW (for a total power capacity of 26,370MW) with an average age of 31 years;
- the N4 series, which is the most recent with an average age of 19 years, consisting of 4 units of approximately 1,500MW (for a total power capacity of 5,990MW);

for a total of 58 units spread over 19 sites owned by EDF, and constituting a total authorised capacity of 63,130MW as at 31 December 2019. With an average age of approximately 34 years, EDF's nuclear fleet is about average compared to the fleets installed worldwide.

The commissioning and most recent ten-year inspection (VD) dates for these units as of end-2019 are as follows:

Units	Year of industrial commissioning	Most recent ten-year inspection	Next ten-year inspection	Units	Year of industrial commissioning	Most recent ten-year inspection	Next ten-year inspection
Fessenheim 1	1978	2009	n/a	Gravelines 6	1985	2018	VD4
Fessenheim 2	1978	2011	n/a	Cruas 3	1984	2014	VD4
Bugey 2	1979	2010	VD4	Cruas 4	1985	2016	VD4
Bugey 3	1979	2013	VD4	Chinon B3	1987	2009	VD3
Bugey 4	1979	2011	VD4	Chinon B4	1988	2010	VD3
Bugey 5	1980	2011	VD4	Paluel 1	1985	2016	VD4
Dampierre 1	1980	2011	VD4	Paluel 2	1985	2018	VD4
Gravelines 1	1980	2011	VD4	Paluel 3	1986	2017	VD4
Gravelines 2	1980	2013	VD4	Paluel 4	1986	2019	VD4
Tricastin 1	1980	2019	VD5	Saint-Alban 1	1986	2017	VD4
Tricastin 2	1980	2011	VD4	Flamanville 1	1986	2018	VD4
Dampierre 2	1981	2012	VD4	Saint-Alban 2	1987	2018	VD4
Dampierre 3	1981	2013	VD4	Flamanville 2	1987	2008	VD3
Dampierre 4	1981	2014	VD4	Cattenom 1	1987	2016	VD4
Tricastin 3	1981	2012	VD4	Cattenom 2	1988	2018	VD4
Tricastin 4	1981	2014	VD4	Nogent 1	1988	2019	VD4
Gravelines 3	1981	2012	VD4	Belleville 1	1988	2010	VD3
Gravelines 4	1981	2014	VD4	Belleville 2	1989	2019	VD4
Blayais 1	1981	2012	VD4	Nogent 2	1989	2010	VD3
Blayais 2	1983	2013	VD4	Penly 1	1990	2011	VD3
Blayais 3	1983	2015	VD4	Cattenom 3	1991	2011	VD3
Blayais 4	1983	2015	VD4	Golfech 1	1991	2012	VD3
Saint-Laurent 1	1983	2015	VD4	Cattenom 4	1992	2013	VD3
Saint-Laurent 2	1983	2013	VD4	Penly 2	1992	2014	VD3
Chinon B1	1984	2013	VD4	Golfech 2	1994	2014	VD3
Cruas 1	1984	2015	VD4	Chooz B1	2000	2010	VD2
Chinon B2	1984	2016	VD4	Chooz B2	2000	2019	VD3
Cruas 2	1984	2018	VD4	Civaux 1	2002	2011	VD2
Gravelines 5	1985	2017	VD4	Civaux 2	2002	2012	VD2

Of note in 2019 is the success of ten-year inspection no. 4 (VD4) on the Tricastin unit (see section 1.4.1.1.5 "Preparing for the future of the nuclear fleet in France"). The unit was decoupled on 1 June 2019 and diverged after the ten-year inspection on 19 December 2019. The VD2 ten-year inspection of the Chooz B2 unit, decoupled on 15 March 2019 and re-coupled after the ten-year visit on 6 August 2019, was also successful.

(1) Excluding Cottam

(2) These amounts include production and capacity outside the Italian market.

EDF first-generation design plants have been gradually shut down and are currently being decommissioned (see section 1.4.1.1.6 "Decommissioning of nuclear power plants").

Generation allocation contracts

In the 1970-80's, EDF developed industrial cooperation with European operators in the nuclear industry, in the form of generation allocation contracts backed by units of the EDF French nuclear fleet.

In its fleet, EDF has twelve generating units participating in the contracts (up to 1.5GW) with the following European energy companies:

- Fessenheim 1-2: EnBW (17.5%);
- Cattenom 1-2: EnBW (5%);
- Bugey 2-3: Électricité de Laufenbourg⁽¹⁾ (17.5%);
- Tricastin 1 to 4: Electrabel⁽²⁾ (12.5%);
- Chooz B1-B2: Luminus, EDF subsidiary in Belgium (3.3%).

The purpose of these generation allocation contracts is to make available to each partner the proportion of energy generated actually due to him, based on the share of the capacity allocated to him – in return for payment of their share of the construction costs, annual operating costs (including upstream and downstream fuel costs), local taxes and taxes specific to nuclear energy, and the costs relating to decommissioning. In these transactions, the partners have shared with EDF the industrial risks in the development of the fleet and assume the risks linked to performance concerning the current operation of the power plants. On the other hand, they have no operational role.

Furthermore, EDF signed a second type of generation allocation contract relating to a pool of power plants (totalling approximately 2GW) under which EDF makes available to its partners a share of the electricity determined by the level of availability of all or part of a standard fleet, applied to the capacity share reserved to the partners for the units concerned. These contracts mainly concern the following power plants:

- Chooz B1-B2 (N4 initial series unit): Electrabel (21.7%);
- Cattenom 3-4: Électricité de Laufenbourg (7.8%) and the Swiss electricity group CNP (21.8%).

1.4.1.1.2 Operation and technical performance of the nuclear fleet

Nuclear power is a means of generation whose variable cost, mainly fuel-related costs, is low since it represents less than 30% of operating costs⁽³⁾. The main competitive levers of the nuclear fleet in its operating phase are thus the amount of generated energy and the optimisation of fixed operating and maintenance costs. The levers relating to the fuel cycle are further discussed in section 1.4.1.1.4 "The nuclear fuel cycle and related issues".

Operation methods of the nuclear fleet

Generation cycle and planned outages

To reconcile the challenges linked to the strong variations in seasonal consumption in France, due to its strong temperature sensitivity, the availability of maintenance resources and the efficient use of reactor fuel, EDF has now adopted generation cycles of 12 and 18 months for its fleet. At the end of 2019, this breakdown was as follows:

- 28 units of the 900MW series have an operating cycle of approximately 12 months;
- 6 units of the 900MW series, 20 units of the 1,300MW series and 4 units of the N4 (1,450MW) series have an operating cycle of approximately 18 months.

At the end of these operating cycles, shutdown periods are programmed in order to replace a fraction of the fuel loaded in the core and perform maintenance work.

Two types of planned outages are alternated at the end of each generation cycle:

- an ordinary shutdown for refuelling, for a standard period of approximately 35 days, during which unloading spent fuel and reloading new fuel is the main operation performed; although maintenance or periodic testing is taking place during this type of outage;
- a partial inspection for refuelling and maintenance for which the standard period⁽⁴⁾ lasts approximately 70 days.

Every ten years, the power plant is shut down for a period of 150 days⁽⁵⁾ in average to carry out a ten-year inspection. This length of time varies according to the works and maintenance programme, as well as the series concerned. The programme for a ten-year inspection includes the following:

- unloading of spent fuel and reloading of fresh fuel, as at each outage;
- hydropower test of the primary coolant system, a leak test of the containment, and inspection work of the reactor's pressure vessel;
- modification work, associated with ten-year safety re-evaluations;
- other specific maintenance operations, in particular renovation or replacement of major components.

At the end of the ten-year inspection, the ASN decides whether to approve the restart of the reactor and then issues technical prescriptions setting the conditions for continuing operation.

Operation of EDF's nuclear fleet

Nuclear generation resources, owing to their low variable cost are first used for base-load generation, immediately after run-of-river hydropower and other unavoidable renewable energies, as well as the energy purchased under buying obligations from decentralised energy producers. Variations in energy consumption over one year (summer-winter, day-night) and the currently restricted fluidity of wholesale markets due to limited interconnections on the borders lead nuclear energy to be used also for mid-merit generation. High variations in seasonal consumption in France and its major variation during winter months require that planned nuclear fleet outages be concentrated between April and October.

Generation and technical performance

The nuclear fleet produced 379.5TWh in 2019, down 13.7TWh compared to that of 2018.

Nuclear generation expressed in annual energy corresponds to a load factor rate referred to as "Kp" for the French nuclear fleet (defined as the ratio of energy generated to the maximum theoretical energy, or the energy generated if the installed capacity were operated year-round). This rate is obtained by multiplying two coefficients ($K_p = K_d \times K_u$):

- the availability factor ("Kd") (the available energy⁽⁶⁾ as a percentage of the theoretical maximum energy, or the energy generated if the installed capacity were operated year-round). The Kd depends on outage durations, and is therefore impacted by standard durations and the work programme to be performed;
- a utilisation factor, ("Ku") (energy generated compared to energy available). The Ku factor reflects environmental, regulatory and social constraints, supply of system services and optimisation implemented by EDF (fuel and modulation).

(1) Axpo Group.

(2) Engie Group.

(3) Operating costs are defined as follows: fuel costs (including downstream expenses in the fuel cycle), operating expenses (purchases and external services, employee expenses) and maintenance costs (expenses and investments). They do not include investments related to construction or decommissioning expenses.

(4) Standard durations represent optimised and realistic reference durations by outage types. They take into account the feedback from past outages. Outage planned durations fluctuate around these standard durations, depending on the work programme to be performed.

(5) Normal period, excluding extreme or exceptional circumstances

(6) Available energy is equal to the maximum theoretical energy less generation losses due to technical reasons inherent to power plants, such as planned outages, unplanned outages due to failure or safety requirements, and performance of regulatory tests.

1. The Group, its strategy and activities

Description of the Group's activities

In 2019, the Kp factor reached 68.6%, on a slight decrease compared with that of 2018 (71.1%). This results from a Kd of 74.0%, lower than in 2018 (76.5%) and a Ku of 92.7%, relatively stable compared to 2018 (92.8%).

In 2019, generation performance was impacted by exceptional incidents and large-scale contingencies (totalling approximately 12TWh), longer outage extensions than expected (totalling approximately 12TWh) and environmental constraints (totalling approximately 4TWh, including the Le Teil earthquake, accounting for 2.3TWh). The outage extensions experienced in 2019 were caused in equal measure by maintenance and operational quality issues, technical failures and project management deficiencies. Performance losses related to unplanned outages rose slightly from a rate of 3.7% in 2018 to 3.95% in 2019 because of several exceptional incidents. Without these, the rate of unplanned outages would have been 2.1%. These figures do not undermine the maintenance strategy implemented in 2007 to renovate and replace major components which has brought the overall rate of unplanned outages down to 30% since 2009.

The main technical incidents that impacted generation in 2019 are:

- two instances of technical damage on the Dampierre 4 and Chinon 2 alternator rotors caused lengthy unexpected outages;
- the turbo supply pumps ("TPA") for the installation's secondary circuit experienced several contingencies, not only during the outage campaign, but also during the production cycle in question. The damage at Saint-Albain 1 and Flamanville 1 led to significant generation losses;
- the emergency diesel installations generated multiple impacts on the 2019 generation process, with long and significant compliance works both during outage periods (Penly 2 and Flamanville 2) and during the production cycle (Flamanville 1), as well as damage requiring the complete replacement of diesel installations, as was the case at Dampierre 1 and Paluel 4 (during their respective ten-year inspections).

2019 was not impacted by the investigations into quality discrepancies detected in several instances when tracking the manufacturing of forged parts (referred to as the "cancelled" and "non-cancelled" cases) in Framatome's Creusot Forges plant.

In summer 2019, Framatome detected non-compliance with temperature ranges during the application of certain local stress-relieving heat treatments (SRHT) on welded steam generator and pressurizers seals (see section 1.4.1.3.2 "Framatome activities"). Following this discrepancy, declared to the ASN, EDF drew up a list of the affected equipment: 16 steam generators (GVs) installed for 6 nuclear reactors in operation (Blayais, Bugey, Fessenheim, Dampierre, and Paluel). The Flamanville 3 GV and pressuriser were also impacted, as were 6 GV's destined to replace those for the two reactors at Gravelines. EDF and Framatome supplied the ASN with evidence that the integrity of the components had not been compromised. On the basis of this evidence, after analysis, the ASN took the view that "the reactors in question could continue to operate in their current condition". Technical investigations in this respect, in liaison with the ASN, are ongoing.

EDF has also continued its structuring process to guarantee the compliance of the equipment of its nuclear facilities. EDF has thus presented to the ASN an action plan so as to prioritise and arrange for the treatment of anomalies taking into account safety issues. Its implementation involves all nuclear power plants and national engineering units.

Investment programme for the existing nuclear fleet in France

EDF's industrial strategy is to operate the existing nuclear fleet well beyond 40 years, under the best conditions of nuclear safety (integrating, in particular, post-Fukushima modifications), of environmental safety and protection, which requires to keep on performing significant maintenance operations over the 2014-2025 period. The "Grand Carénage" programme was implemented, so that the Group can integrate, with its industrial partners, the significant amount of work to be done on the fleet.

On 22 January 2015, EDF's Board of Directors approved in principle a major overhaul programme (the "Grand Carénage") aimed at refurbishing the French nuclear fleet, enhancing reactor safety and, if conditions allow, continuing their operation. The authorised investment amount stood at a maximum of €₂₀₁₃55 billion (€60 billion in current euros) in total over the 2014-2025 period for the 58 reactors currently operating ⁽¹⁾.

For the existing nuclear fleet, the programme covers both usual maintenance spending and investments required to extend the lifespan of equipment (replacement of the steam generators, VD4 900, VD3 1300).

The optimisation work undertaken since (reductions and postponements) led to a downward revision of the overall cost of the programme to €₂₀₁₃45 billion (or €48 billion in current euros) over the 2014-2025 period. This revision is largely a result of continued optimisation efforts regarding the adopted technical solutions and component replacement strategies and greater precision in their application by integrating the capacities of the industrial base, which enabled certain expenses to be postponed. Bringing forward the shutdown date for the Fessenheim plant (2020 in the most recent forecast) has also been taken into account.

By dint of these industrial measures, around €₂₀₁₃6 billion (or €7.5 billion in current euros) in costs was reduced and around €₂₀₁₃3.8 billion (or €4.7 billion in current euros) of spending was postponed to after 2025 for total savings of close to €₂₀₁₃10 billion (or €12 billion in current euros) from initial estimates.

The contribution of postponements to this overall revision was therefore revised slightly up in 2018 compared with 2017. Although additional savings have been identified regarding the ten-year inspections and the application of feedback from Fukushima (for a total of €₂₀₁₃6.2 billion or €7.2 billion in current euros), the replacement of steam generators and major components (for a total of €₂₀₁₃4 billion or €4.6 billion in current euros) and other engineering projects (for a total of €₂₀₁₃1.8 billion or €2.1 billion in current euros), they were offset by an increase of approximately €2 billion in current euros. Indeed from 2019 onward, usual maintenance spending, primarily due to better identification of expenses for regular inspections will be recognised as investments.

In order to complete the programme, a separate entity was created, the "Grand Carénage". The programme's sponsor is the Nuclear and Thermal Fleet Department (DPNT) which approves the programme's scope, currently broken down into 20 projects, and financial trajectory. The programme's supervision is taken care of by the Nuclear Generation Division, which defines the content of the activities. Project management is handled by the programme Director assisted by the project managers over the life of the project in all areas: deadlines, quality control, financial trajectory. The Board of Directors examines the main investments for each major category of projects whose chief characteristics are presented to it, approves contracts or deals above a predefined amount, and conducts the annual review of the programme's implementation on the basis of indicators showing the extent of its physical and financial progress, what remains to be completed and the final costs.

This industrial programme is being gradually implemented in compliance with the objectives of the Energy transition for green growth Law, multi-year energy programmes and the opinions and orders of the ASN as well as the procedures for authorisation for reactors to run for more than 40 years (see section 1.4.1.1.5 "Preparing for the future of the nuclear fleet in France").

Under this programme, the planned renovation or replacement of major components of power stations such as generators, transformers or steam generators will continue.

At end 2019:

- the alternator stator renovation programme, covering 49 units, was completed;
- the programme for preventive replacement of the poles in the main transformers is ongoing. 138 main transformer poles out of 174 had been replaced, *i.e.* approximately 79% of the programme;
- the steam generators of 28 out of the 34 units of the 900MW series were replaced.

⁽¹⁾ The figures presented by the French Cour des Comptes in its report of 10 February 2016 cover a longer time horizon, up to 2030, and included, beyond the investment, operating and maintenance expenses. Both assessments are consistent, as stated by the Cour des Comptes in its report. Indeed, among the overall estimates calculated by the Cour des Comptes and amounting to close to €100 billion for the 2014-2030 period, the investment expenditures estimated at €74.73 billion should be distinguished from the operating expenditures estimated at €₂₀₁₃25.16 billion. Within the €₂₀₁₃74.73 billion of investment expenses between 2014 and 2030, €₂₀₁₃55 billion are dedicated to the 2014-2025 period, which allows the two estimates established by the EDF group and the Cour des Comptes to be connected.

Industrial work will continue beyond 2025 on the occasion of the third and, if needed, fourth series of ten-year inspections of 1,300MW units, the fourth series of ten-year inspections of 900MW units and the second and third series of ten-year inspections of N4 units. This programme provides the opportunity to incorporate the additional safety improvements identified following the Fukushima accident as well as modifications allowing the operation of facilities to be extended significantly beyond 40 years, in line with the multi-year energy programme (see sections 1.4.1.1.5 "Preparing for the future of the nuclear fleet in France" and 1.5.1.2 "Public service in France").

1.4.1.1.3 Environment, nuclear safety, radiation protection

Environmental protection

EDF bases its environmental procedure on an ISO 14001-certified SME environmental management system (see section 3.1.2.4.2 "The environmental management system (EMS)"), rolled out in 2002 at a number of sites and then extended to all nuclear generation units.

In terms of radioactive waste management, Very Low-Level Waste (VLLW) has been removed to the Morvilliers storage facility in the Aube (CIREs) since 2004. There is a storage facility at Soulaines, Aube (CSA) for Low and Intermediate-Level radioactive Waste (LLW and ILW). EDF is continuing work to reduce the quantities in question and improve processing, in collaboration with the Centraco factory (Cyclife France, a subsidiary of the EDF group).

For a description of radioactive waste processing downstream of the fuel cycle as well as decommissioning, see sections 1.4.1.1.4 "The nuclear fuel cycle and related issues" and 1.4.1.1.6 "Decommissioning of nuclear power plants".

An ever-present nuclear safety procedure

EDF, in its capacity as a nuclear operator, takes responsibility for nuclear safety and, in a rapidly-changing context (market competition, environmental issues, etc.), reaffirms as its absolute priority the protection of the human and environmental health, among other things, through the prevention of accidents and the limiting of their consequences as regards nuclear safety. Moreover, the Codified Law of 13 June 2006 on nuclear transparency and safety (see section 1.5 "Legislative and regulatory environment") grants public access to information regarding in particular the nuclear safety measures taken by the operator and establishes a formal basis for transparency on nuclear safety.

The implementation of the French nuclear power programme led EDF to establish a safety procedure that:

- takes into account, from the design stage, the risks that might arise during the operation of the power plants, whether relating to the actual operation of the facilities or to internal or external attacks;
- is based both on the application of strict rules of operation, and on the cautious and inquiring attitude of the technical teams by means of the establishment of a true safety culture;
- is based on the cumulative experience of a standardised fleet of 58 reactors (*i.e.* more than 2,030 reactor-years of operation, the arithmetic sum of years of operation of EDF's pressurised water reactor [PWR]);
- incorporates a continuous improvement approach that is notably embodied by the ongoing efforts to decrease the number of automatic reactor trips;
- benefits from integrated nuclear engineering and Research & Development within the Group in order to anticipate the correction of failures, maintain the facilities in good working order, develop equipment on an ongoing basis, reassess safety margins and monitor technology advances, as well as the implementation of more effective new technologies and the management of sites being decommissioned;
- relies strongly on the development of skills; with this objective in mind, each nuclear generation site is equipped with a simulator used for training to cope with any type of situation.

Nuclear safety is subject to numerous controls, both internal and external.

- EDF has implemented internal control procedures. For example, every three to four years, EDF performs overall safety assessments for each nuclear power plant, which take place over a three-week period and involve approximately

30 inspectors. In addition, the General Inspector for nuclear safety and radiation protection, reporting to and appointed by EDF's Chairman and CEO, performs annual audits, issues an opinion on the overall safety of the nuclear fleet and suggests improvement actions to the Company's management. Efforts by EDF, notably to improve human performance, have made it possible to decrease the annual average number of automatic reactor trips in recent years, and do so by a factor of four over a period of 16 years to the end of 2018. However, in 2019, they totalled 31 throughout the fleet;

- the external control of the safety of nuclear facilities in France is carried out by the ASN:
 - at the national level, there are two types of inspections;
 - scheduled or unannounced inspections carried out by the ASN (about 400 inspections in 2019 over all EDF nuclear facilities);
 - a periodic (ten-year) review process designed to improve the compliance of nuclear plants with applicable rules and update assessments of the risks facilities pose to the environment and public health, taking into account the state of the facilities, the experience gained during their operation, new developments in nuclear science, and rules applying to similar facilities. The targets are established by the ASN which monitors compliance; EDF proposes solutions to meet these targets and implements them after obtaining the approval of the ASN (see section 1.4.1.1.1 "EDF's nuclear fleet in France"). The periodic review is an important step in continuing the operation of power plants (see sections 1.4.1.1.5 "Preparing for the future of the nuclear fleet in France" and 1.5.3.2 "Specific regulations applicable to basic nuclear facilities");
 - at the international level, regular inspections are held making it possible to share the experience gained worldwide:
 - the OSART (Operational Safety Review Team) of the IAEA (International Atomic Energy Agency) performs reviews at the request of the French government with the objective of formulating recommendations and promoting best practices. In particular, EDF's first Corporate OSART was held in 2014 and concluded that EDF is fully compliant with the standards defined by the IAEA; the Follow Up Corporate OSART took place at the end of 2016. An OSART review took place in 2019 in Civaux;
 - the international "peer review" inspections carried out by the WANO (World Association of Nuclear Operators) are organised at the request of EDF to assess safety performance compared to best international working practices. A Corporate Peer Review took place in 2017, aimed at assessing the mode of governance and relations between corporate HQ and the facilities. Following the Corporate Peer Review, WANO identified two best practices and issued four recommendations giving rise to an action plan. In 2019, there were six Follow Up reviews and three peer reviews (Nogent, Dampierre and Cruas).

Whistleblowing system

In the event of an accident, a crisis plan is in place to limit impacts on the environment and people, and to ensure the safety of the facility. This crisis system is based on two closely coordinated plans, designed for both local and national use. These are:

- the Internal Emergency Plan for each nuclear site, developed by EDF;
- the Special Intervention Plan, prepared by French prefectures in collaboration with the French government and EDF.

In order to provide greater effectiveness and thus improved protection of populations, these plans in particular take into account external risks (flooding...) and internal risks (fire...). The relevance of the system for warning, informing and protecting people is regularly assessed through accident simulation exercises. Each year, approximately 100 exercises are organised for the entire French nuclear fleet, *i.e.*, approximately one drill every three days. Approximately ten exercises are on a national level, under the management of the ASN and involve EDF and the public authorities, in particular the prefectures. In 2019, 12 drills with a national scope were organised, one of which was postponed until 28 January 2020, at the request of the Prefect. The most recent national-scale exercise pertaining to the physical protection of facilities (a security crisis) was conducted in 2017 (the next drill will take place in 2020).

1. The Group, its strategy and activities

Description of the Group's activities

After its initial analyses following the Fukushima accident in March 2011, EDF supplemented its crisis management organisation with a national team capable of quickly delivering material and human assistance to a site in great difficulty. This system, called the Nuclear Rapid Action Force (FARN), has had many simulation exercises from regional bases located at Civaux, Paluel, Dampierre and Bugey and can be sent to a unit at any site in difficulty. The FARN is capable of a simultaneous response at six units on a single site.

Significant events regarding safety

The operational safety of nuclear facilities is taken into consideration from the initial design stage, and is regularly monitored, together with the implementation of an employee mobilization policy and large-scale investment programmes. The Group's nuclear safety policy is incorporated into training for both EDF employees and subcontractors.

Control and surveillance systems

Nuclear safety is subject to internal controls (annual reviews, internal control plans and nuclear inspection audits in France) and external controls (peer reviews between corporate members of WANO and OSART audits conducted by experts from the IAEA).

In France, the safety of nuclear facilities is controlled by the ASN. Events are classified on a scale from one to seven, with seven being the most serious, called the INES scale⁽¹⁾. Incidents of no consequence for nuclear safety are called "level 0 events". Since the establishment of a scale of this kind in France in 1987, no level 3 event (serious incident – very low external emission, and exposure of the public representing a fraction of regulatory limits) or above has occurred in the French nuclear fleet.

The ASN also approved the creation of an additional crisis management system, the Nuclear Rapid Action Force (FARN) following additional safety evaluations carried out by EDF after the Fukushima accident.

Events in 2019

As in 2018, no major safety or radiation protection events were recorded in France.

In 2019, EDF's Nuclear and Thermal Fleet Department (DPNT) in France declared 738 significant safety events (ESS) classified at INES 0, 87 ESS at INES 1, and 3 at INES 2.

Overall, the results for 2019 improved compared to those obtained in 2018, with the average number of unclassified events (level 0) up to 12.72 ESS per reactor compared with 10.05 in 2018 while the average number of level 1 events per reactor increased slightly to 1.50 versus 1.27 in 2018.

The number of automatic reactor trips (AAR) reached 0.53 per reactor (0.31 in 2018, 0.38 in 2017, 0.48 in 2016 and 0.66 in 2015).

The 2019 detailed results on nuclear safety are published in the annual report created by the General Inspector for Nuclear Safety and are available on the Internet.

Radiation protection

The mobilisation of ground players has allowed a continuous improvement of performance on the protection of employees against the effects of ionising radiation.

Thus, the average annual collective dose of all workers, both employees of EDF and outside companies intervening in power plants, has been halved in less than ten years. In 2019, the average collective dose was 0.74man-Sievert per reactor (or a collective annual dose of 43 man-Sieverts). The collective dosimetry in 2019 is up compared with 2018 (38.8 man-Sieverts) due to a higher activity level (dosimetry/time spent on the zone remains stable). EDF is proactively implementing an ALARA (As Low as Reasonably Achievable) policy to limit the collective dose in parallel with an increasing workload involved in the industrial project on the fleet in operation.

EDF is furthermore committed to continuing to lower exposure to radiation below the regulatory limit of 20mSv over 12 rolling months for the whole body. Accordingly, throughout 2019 and over 12 rolling months, no participant (among the EDF employees and contractors) was exposed to an individual dose of higher than 14mSv.

In the coming years, given the levels already achieved, efforts will have to be focused on power plants with the poorest dosimetric results, in particular by cleaning their circuits.

1.4.1.1.4 The nuclear fuel cycle and related issues

The average annual normative volume for nuclear fuel used by reactors in the EDF fleet in France is approximately 1,200 tonnes (of heavy metals: natural enriched uranium, enriched reprocessed uranium, plutonium) of which approximately 1,080 tonnes corresponds to ENU fuel (Enriched Natural Uranium), 110 tonnes to MO_x fuel (produced from reprocessed plutonium) and 10 tonnes to ERU fuel (enriched reprocessed uranium).

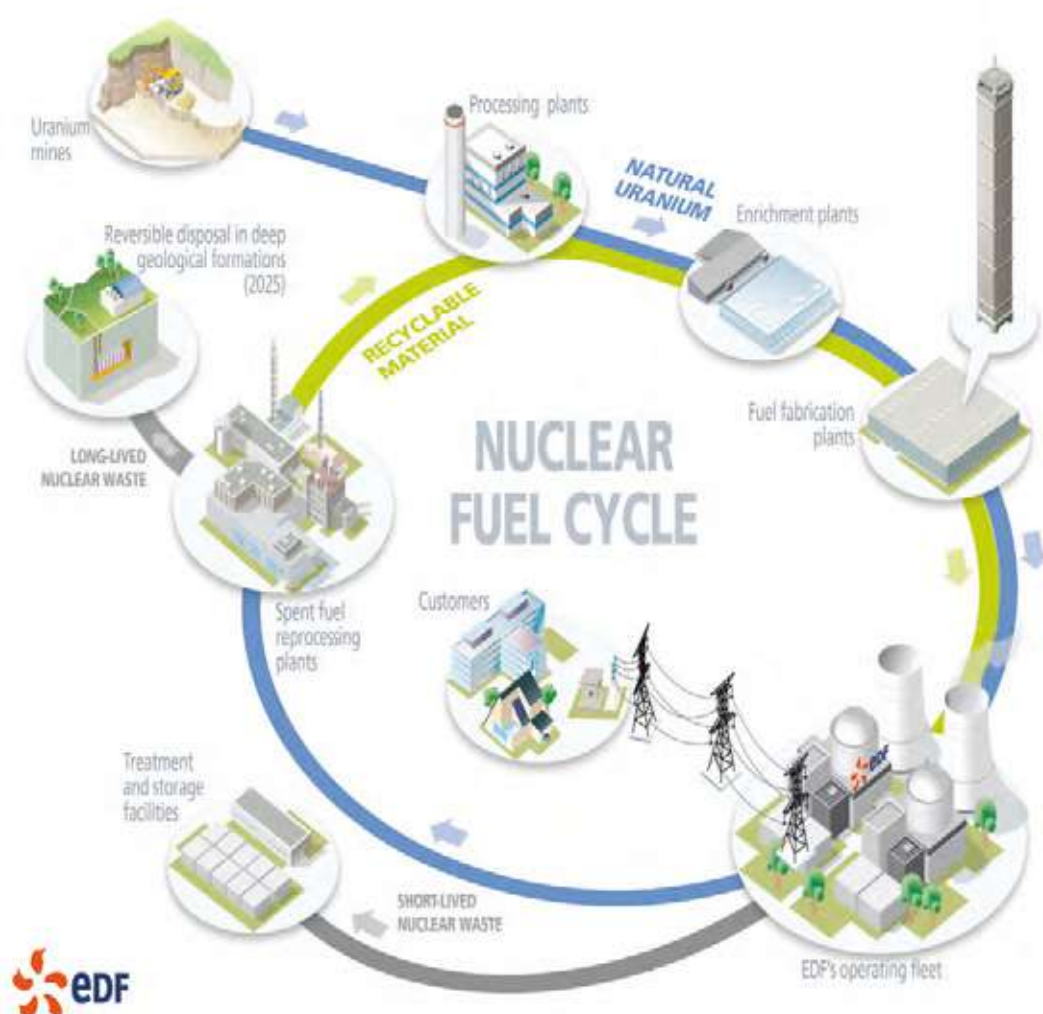
The nuclear fuel cycle encompasses all industrial operations in France and abroad which enable the supply of the fuel to generate energy in a reactor, then to unload and process it. The cycle can be broken down into three stages:

- front-end (upstream) the purchase of concentrates from uranium ore, fluorination (or conversion), enrichment and production of fuel;
- the core cycle, corresponding to the use of fuel in the reactor: receipt, loading, operation and unloading; the fuel stays four to five years in the reactor;
- back-end (downstream), for the reactor fleet in France: pool storage, reprocessing of spent fuel, conditioning of radioactive waste and recycling of reusable materials, the intermediate storage of treated waste prior to storage, as required by the French Law of 28 June 2006 on the sustainable management of radioactive materials and waste.

EDF coordinates all the operations in the fuel cycle. Generally speaking, upstream and downstream operations are carried out by subcontractors or suppliers, generally on the basis of multi-year contracts. EDF acquires most of the raw materials as uranium concentrates (U₃O₈), with transformation into more processed products carried out by industrial operators through service contracts (fluorination, enrichment and manufacture), and provides core cycle operations. EDF is the owner in most cases and is responsible for the fuel and materials it uses throughout all different stages of the cycle.

(1) International Nuclear Event Scale.

→ Stages of the nuclear fuel cycle in France



Upstream

To ensure the continuity and security of the supply of its reactors in France and the UK, EDF retains overall control of all operations at each stage of the cycle, through a portfolio of contacts and by stockpiling at different stages of the front-end stage of the fuel cycle (natural uranium, fluorinated enriched or unenriched uranium, and warehousing of new assemblies).

Orano is, in this respect, an important supplier (see section 2.2.4, "Operational Performance – 4E Operational continuity of supply chains and contractual relations").

Where necessary, the Group implements a strategy of currency hedging for its uranium supplies.

Natural uranium supply

EDF's uranium supplies are guaranteed by long-term contracts for periods of up to 20 years with a policy of diversification in terms of sources and suppliers.

In 2019, EDF continued the securing of its long-term supplies with a number of major market suppliers.

Indexation formulas for portfolio contracts of natural uranium supply include fixed prices (base prices whether inflated or not) and variable prices (indexed according to

market price indexes) and are sometimes limited by floor and ceiling prices. Consequently, the effects of fluctuations in market prices of natural uranium on supply costs are limited.

With manufacturers in the nuclear industry meeting within the World Nuclear Association (WNA), which brings together, among other, companies representing most of worldwide uranium production, EDF is making sure to implement best practices in mineral extraction so as to contribute to making overall progress in this sector. Since 2011, EDF has been periodically conducting mine audits based on a method drawn in collaboration with the WNA, which constitutes a standardised framework recognised by all stakeholders in the sector. Recommendations may be made, together with an improvement plan if necessary.

These principles defined by the WNA aim to perpetuate the best practices observed on the field and share them with all sector stakeholders; they notably reassert the principles defined by the International Council on Mining and Metals for sustainable extraction and use of uranium ⁽¹⁾. The clauses listing EDF's expectations in terms of enforcement of the fundamental rights and main international standards by suppliers and sub-contractors have progressively been inserted in contracts signed by EDF. In particular, they stress transparency and EDF's faculty to come and audit the supplier.

⁽¹⁾ These ten principles concern the health of workers and local populations (safety and protection against radiation and emissions); environmental preservation (waste management and protection of drinking water resources); the need for a legal framework in accordance with current legislation and international standards (AIEA) to monitor and manage radiation, health and safety for stakeholders and the general public, waste management and environmental protection; information, transparency and dialogue with stakeholders; responsible management of hazardous waste and contaminated materials by using the best available technologies; the development of a quality management system upstream of the project (Environmental impact study) including risk analysis; accident management preparation; transport of hazardous waste in complete safety and security; regular staff training.

Fluorination (or conversion)

EDF's needs are covered by Orano in France, as well as other international producers such as Cameco in Canada, Converdyn in the United States and Tenex in Russia.

Enriching natural uranium into uranium 235

EDF meets its enrichment needs through global enrichers Orano (France), Urenco (UK, Germany, the Netherlands, United States) and Tenex (Russia), primarily through fixed-price contracts decreasing on a constant currency basis.

Enriched reprocessed uranium

Since the 1990s, reprocessing has made it possible to recycle within the reactors uranium from processing spent fuel, which represents approximately 95% of the spent fuel mass.

Reprocessing was suspended in 2013, pending the availability of a new industrial scheme.

In 2018, the Board of Directors approved the restart of a robust, competitive and efficient sector, with the first assemblies planned to be loaded in 2023, subject to technical changes made and the necessary authorisations obtained from the safety authority. The corresponding contracts were signed with the respective suppliers in 2018. Pending the effective restart of the sector, the reprocessed uranium is stored in a stable form.

Fuel assembly manufacturing

EDF has two sources of fuel assemblies: one is internal, via its Framatome subsidiary, while the other is external, the main external supplier being Westinghouse.

Downstream

EDF is responsible for what happens to its spent fuel and how it is processed and for the related waste, without any possibility of transfer of responsibility or limitation in time. Orano is responsible for processing spent fuel and ANDRA for the management of the long-term storage of final waste, in accordance with the Codified Law of 28 June 2006 on the long-term management of radioactive materials and waste.

EDF's current strategy for the nuclear fuel cycle, in agreement with the French government, is to process spent fuel and wherever possible recycle substances such as plutonium separated in this process in the form of MO_x fuel. The processed quantities are determined by the amount of recycled plutonium in reactors allowed to load MO_x fuel ("equal flows" principle). The recycling capacity of nuclear units in the French fleet has allowed the processing of around 1,100 tonnes of spent fuel per year.

In addition, and in anticipation of the storage needs of the nuclear generation fleet, EDF is currently working on the design of a large spent fuel storage pool. This will make possible the long-term storage (for around 100 years) of spent MO_x and ERU fuel from PWRs and from fuel assemblies of the Superphénix fast-neutron reactors, currently stored in the spent fuel storage pool at the Creys-Malville power plant pending multi-recycling in third-generation pressurised water reactors, or recycling in fourth-generation reactors (Gen IV).

The French National Plan for the Management of Radioactive Materials and Waste (PNGMDR) for 2016-2018 identified the need for additional spent fuel storage capacity by 2030; in the light of this, it also required EDF to lodge a request for permission to create one by 2020.

The fifth edition of the PNGMDR for 2019-2021 was the subject of a public debate in 2019, organised by France's national public debate commission (CNDP), the minutes of which were published on 25 November 2019. In their capacity as owners, France's Nuclear Safety Authority (ASN) and government also published their conclusions in the form of a decision published in the OJ, noting "the continuation of work related to the implementation of new centralized storage capacities under water" and "[the evolution of] the regulatory framework applicable to the management of very low-level waste", two improvements proposed by EDF in its stakeholder report.

Processing of spent fuel from EDF's nuclear power stations

Spent fuel awaiting processing is temporarily stored underwater in cooling pools, first in pools at the plants and subsequently in those of Orano's reprocessing plant in La Hague. The storage conditions are recognised as being safe over a century-scale period of time. Approximately ten years after the spent enriched natural uranium fuel has been unloaded from the reactor, it is processed to separate the recyclable products from waste. The waste is subsequently conditioned and temporarily stored at the La Hague site in specific premises.

The relationship between EDF and Orano concerning the transport, processing and recycling of spent fuel was formalised for the 2008-2040 period by a framework agreement signed on 19 December 2008.

In February 2016, EDF and Orano signed an implementation agreement covering the 2016-2023 period as well as the associated supply contracts for the MO_x assemblies.

The fuel supply of the two EDF reactors at Hinkley Point (United Kingdom)

In September 2016, EDF, Orano and Framatome entered into an agreement providing for the supply of uranium, conversion and enrichment services, and assembly manufacturing for the fuel supply of the Hinkley Point C reactors.

Storing conditioned ultimate waste

Radioactive waste, depending on its nature, level of radioactivity and the lifespan of its radionuclide components, has been classified into different categories: from High-Level Waste (HLW), to Very Low-Level Waste (VLLW) passing by Low-Level Waste (LLW) and Intermediate-Level Waste (ILW). It is called Long-Lived (LL) when it remains active for more than 31 years.

Long-Lived High-Level Waste (HLW-LL)

The processing of spent fuel enables the vitrification of HLW-LL, which provides very high-quality conditioning with a reduced volume. The waste is then temporarily stored at La Hague in specific facilities. For example, all of the Long-Lived High-Level Waste produced in this way, corresponding to the operation of the early plants and to 50 years of operation of the current PWR facilities, would represent a volume of approximately 9,300 cubic metres (the electricity consumption of one million people for one year generates approximately 3 cubic metres of HLW-LL).

Long-Lived Intermediate-Level Waste (ILW-LL)

The structures of the assemblies (shells and nozzles, clad pieces, etc.) separated during the processing of spent fuel, constitute ILW-LL. They are currently compacted and conditioned in stainless steel containers. ILW-LL waste also results from certain operating, maintenance and dismantling activities. For example, the total volume of ILW-LL waste, including in particular the waste from the operation and decommissioning of shut down facilities, including Uranium Natural Graphite Gas reactors and the waste from the current PWR facilities, taking into account the 50-year operating life of the power plants and the decommissioning operations, would represent about 37,000 cubic metres. It generates less heat compared to HLW-LL and thus is suitable for faster storage than HLW-LL because it does not require cooling.

HLW-LL and ILW-LL wastes from the reprocessing of spent fuel are temporarily stored in dedicated facilities in La Hague, pending the implementation of the storage in deep geological layers, as is currently envisaged as part of ANDRA's *Centre industriel de stockage géologique* (Cigéo) project.

Cigéo is also the French deep geological storage facility project for ILW-LL and HLW-LL radioactive waste. It is designed to store highly radioactive and long-lived waste produced by all current French nuclear facilities until their decommissioning, and by the processing of spent fuel used in nuclear power plants. After 15 years of research, evaluation and public debate, the principle of deep geological storage was adopted by Law no. 2006-739 of 28 June 2006 on the sustainable management of radioactive materials and waste as a safe long-term solution to manage this type of waste without shifting the burden onto future generations.

The centre is to be located in the east of France at the border of the Meuse and Haute-Marne departments. Cigéo will consist of surface facilities that will be used to receive and prepare waste packages as well as to excavate and build the necessary underground structures. The waste will be stored in underground facilities some 500 metres below ground in an impermeable argillaceous rock formation able to contain radioactivity over very long periods (several hundreds of thousands of years). Cigéo is designed to operate for at least 100 years and provide flexibility in order to give future generations a maximum number of possibilities to adapt it as needed.

The codified Law no. 2016-1015 of 25 July 2016, which specifies the details of the creation of a reversible deep storage facility, represents the fulfilment of an important prerequisite before obtaining approval of the Cigéo project for the management of HLW-LL, ILW-LL radioactive waste. ANDRA is continuing its design studies with a view to an application for permission to build the facility being submitted by the end of 2020.

ANDRA's schedule calls for a pilot industrial phase by 2030, followed by the start of delivery of the first waste (at this stage, the baseline for producers is still for intake of the first waste packages in 2031). On 15 January 2018, the ASN gave its opinion on the DOS (list of safety options) submitted by Cigéo in which it considered the project had on the whole reached a satisfactory technological maturity at that stage. The ASN's draft opinion requires that alternatives to storing bituminous waste untreated at Cigéo be studied. In September 2019, the expert panel instructed by DGEC in September 2018 to review the management of bituminous waste concluded that in principle, various handling options were feasible (storage or neutralisation), whilst emphasising the importance of further research to identify the most appropriate option.

Long-Lived Low-Level Waste (LLW-LL)

LLW-LL waste comes from the decommissioning of the old NUGG reactors (graphite, processing waste – see section 1.4.1.1.6 “Decommissioning of nuclear power plants”). The Law of 28 June 2006 provides for a specific near-surface storage for this waste. In July 2015, ANDRA transmitted a report on the feasibility of a storage centre on a site located in the Soulaïnes region (Aube) in France. This report was submitted to the ASN for its opinion. Work is currently ongoing, as part of the national plan for the management of radioactive materials and radioactive waste (PNGMDR) to identify the waste that could be taken on. Furthermore, studies conducted by EDF to characterise more precisely the radiological inventory of this waste have led to significant gains. As a result the possibility of storing part of the graphite (particularly that of the Chinon A2 reactor) in existing surface facilities can be reconsidered.

Short-Lived Low- and Intermediate-Level Waste (LILW-SL) and Very-Low-Level Waste (VLLW)

Short-Lived Very Low-, Low- and Intermediate-Level Wastes come from the operation of nuclear facilities (gloves, filters, resins, etc.) and their decommissioning (concrete, scrap, lagging, piping, etc.). They are stored above ground in the Soulaïnes and Morvilliers storage facilities run by ANDRA in the Aube département.

In order to minimise volumes, some waste is treated beforehand by melting or incineration at the Centraco plant owned by Cyclife France (part of Cyclife Holding, a subsidiary of EDF). In 2016, following the acquisition of the English and Swedish assets of Studsvik, the holding company “Cyclife” was created to bring together all the newly acquired assets and centralise the Group's internal and external activities in regard to waste treatment. 2019 also saw an expansion in the scope of the Cyclife holding company to include decommissioning, with the creation of two new subsidiaries: Cyclife Engineering and Graphitech (owned jointly by EDF and Veolia), tasked with developing decommissioning solutions for various technologies (in the main, Cyclife Engineering handles light water reactors and waste processing installations, while Graphitech deals with graphite reactors).

Consideration of future charges relating to the management of spent fuel and long-term management of radioactive waste

Each year, EDF makes provisions for the downstream side of the nuclear fuel cycle in France (see note 32 of the appendix to the consolidated financial statements for the year ended 31 December 2019 in section 6.1).

1.4.1.1.5 Preparing for the future of the nuclear fleet in France

EDF's industrial goal for the preparation for the future of the nuclear fleet rests primarily on the following strategic areas:

- the implementation of technical conditions allowing the extension of the operational life of nuclear power plants beyond 40 years. In the first half of 2016, all technical, economic and governance conditions required to align the accounting amortisation period of the 900MW power plants in the French nuclear fleet with the Group's industrial strategy were fulfilled; EDF's Board of Directors therefore approved on 28 July 2016 the extension of the accounting amortisation periods of the power plants of the PWR 900MW series in France (excluding Fessenheim) from 40 to 50 years from 1 January 2016, without prejudice to the approvals for continued operation, granted on a unit-by-unit basis by the ASN after each ten-year inspection;
- continued safety improvements, primarily by integrating lessons learned from the Fukushima accident in Japan;
- implementation of a preventive policy with respect to ageing or obsolete equipment.

Continued operation of the operating units well after 40 years

Additional Safety Assessments (ASA) following the Fukushima accident

On 15 September 2011 and in light of the accident at the Fukushima nuclear plant in Japan, EDF submitted 19 Additional Safety Assessment reports to the ASN, one for each of its nuclear sites, encompassing all its existing reactors and all those under construction.

These assessments consisted of re-examining the defences of existing power plants and those under construction, in light of the events in Japan, taking into account issues set out in the specifications drafted by the safety authorities. Thus, the safety margins were reassessed against the risks of earthquakes and flooding, when dealing with situations of simultaneous loss of the cooling source and power supplies and the consequences of severe accidents. These assessments also led to inquire whether certain changes to the scenarios planned beyond situations used for the sizing of the protection systems, would lead to a worsening of the consequences in terms of safety (“cliff effects”) and finally to deterministically consider the extreme situations that substantially exceed those used in the design of nuclear installations and subsequent safety reviews. The safety of EDF's nuclear fleet is based on the principle of continuous improvement: existing and new facilities continuously benefit from feedback from all power plants, and lessons are learnt from incidents and accidents that may occur in the world.

Finally, the ASAs also re-examined the rules applied in outsourcing.

These analyses confirmed first and foremost the adequate level of security throughout the EDF nuclear power fleet, particularly because of the periodic reviews carried out in France since the end of the 1980s and codified by the Law on nuclear transparency and safety (the TSN Law) of June 2006, and codified later in the French Environmental Code. EDF also proposed additional measures to the ASN that exceed those considered for sizing safety systems, to contribute to further improving the current safety level of power plants.

In its opinion to the government published on 3 January 2012, the ASN states, on the basis of the analyses of its technical support, that “*after the additional safety assessments on priority nuclear facilities, the ASN considers that the facilities examined show an adequate level of safety, and that it will not thus request the immediate shutdown of any of them*”. At the same time, the ASN considers that “*continuing to operate these facilities requires increasing their robustness, as soon as possible, to an extent beyond existing safety margins, to handle extreme situations*”.

The ASN also recommended the “hard core” concept and the FARN system (see section 1.4.1.1.3 “Environment, nuclear safety, radiation protection”). The “hard core” will be made up of the plant's structures, systems and components that can withstand situations studied in connection with ASAs. On 26 June 2012, the ASN made 19 decisions requiring EDF to follow over 600 technical requirements, which set regulatory requirements according to the post-Fukushima action plan. These technical rules require that all nuclear sites must have an organisation and local crisis centres resistant to the occurrence of a large-scale event affecting several facilities. For EDF power plants, the prescribed “hard core” must in particular have “bunkerised” electrical resources in each unit. In the meantime, a temporary back-up diesel generator was installed at each of the 58 units in 2013. The complete definition of the “hard core” was covered in technical rules issued by the ASN in January 2014.

Operating life of EDF's PWR fleet

The provisions of the French Environmental Code do not set a limit on operating life but require a review of facilities every ten years in light of applicable rules and updates of assessments of the risks facilities pose to protected interests, taking into account the state of the facilities, the experience gained during their operation, new developments in nuclear science, and rules applying to similar facilities (safety standards).

1. The Group, its strategy and activities

Description of the Group's activities

As part of the studies related to the third ten-year inspections of the 900MW series, in early July 2009 the ASN publicly stated that it had not identified a generic problem that called into question EDF's ability to control the safety of its 900MW reactors for up to 40 years. The ASN's general opinion is supplemented by a decision on each reactor.

EDF's industrial strategy is to operate the fleet beyond 40 years in the best conditions of safety and performance, considering the significant investment linked to the third ten-year inspections and the post-Fukushima improvements on the one hand, and the energy needs of France on the other. This target is consistent with trends observed around the world for reactors using similar technologies. To this end, EDF has implemented industrial and R&D action plans. Actions have been launched to renew the major components that can be renewed (see section 1.4.1.1.2. "Operation and technical performance of the nuclear fleet"), and solutions are being studied to demonstrate the capacity of non-replaceable equipment such as the confinement containment building and reactor vessels, to ensure their operation up to 60 years.

An extension to the life of the current nuclear fleet would enable, whilst respecting the absolute priority of nuclear safety and as part of the multi-year energy programme (see section 1.4.1.1.2 "Operation and technical performance of the nuclear fleet"), better use of the industrial base it represents and the spreading of the commissioning of new plants over time.

The decision on 1 January 2016 to extend the useful lives of the 900MW PWR series of power plants (excluding Fessenheim) from 40 to 50 years, was enacted in June 2016 once all the relevant technical, economic and governance conditions for aligning the amortisation period of the French nuclear fleet are met. It is based on the technical capacity of the PWR 900MW fleet facilities to operate for at least 50 years, supported by international benchmarks, as well as by the investments made progressively under the "Grand Carénage" programme. These investments will enable the PWR 900MW series to reach a level of safety as close as possible to that of the EPR, and one of the highest internationally, after its fourth ten-year inspection (VD4).

The extension of the operating life of the 900MW units will be aligned on the current revision of the multi-year energy programme for the periods 2018-2023 and 2024-2028.

Concerning safety improvements required to extend the operating life of certain facilities beyond 40 years, the ASN indicated that following the meeting of the Expert Committee in April 2015 it would issue an initial position on the major strategic decisions of the periodic review relating to the fourth series of ten-year inspections of the 900MW reactors. Initially, this was to provide a definitive position on the "generic" phase of this review in 2018-2019. On 20 April 2016, the ASN sent a letter to EDF in which it defines its expectations to allow a potential operational extension of the 900MW French nuclear reactors. After reviewing the report submitted by EDF presenting its approach and its methodology to extend the use of the 34 reactors in question beyond 40 years, the ASN considered that EDF had adequately responded to safety issues and that its programme did not call for any comments in principle. However, the ASN asked EDF to complete its programme regarding several aspects, including the scope of control programme and the goals relating to improving investigations.

In its letter dated 28 September 2018 on the NRO (Memorandum on Response to Objectives) of the 4th periodic review of the 900MW units, the ASN stated that "the works carried out and the planned arrangements will significantly improve the safety of the facilities and contribute to the attainment of the objectives of the review." The ASN is expected to give a generic opinion in 2020. Until then, the examination will continue and EDF is considering additional ASN requests in terms of studies, inspections and works.

In September 2018, EDF, along with the IRSN and the ANCCLI (French National Association of Local Information Committees and Commissions), also launched a public consultation over 6 months on the generic phase of the 4th periodic review of the 900MW reactors in order to involve the general public in the debate and talk with experts from EDF, ASN and IRSN in public meetings, organised by the Local Information Commissions (CLI) of the concerned sites. A digital platform will complement these public meetings.

The accounting period of the other series of France's nuclear fleet (1,300MW and 1,450MW), which are more recent, currently remains at 40 years, because the conditions for an extension have not been met. The subsequent extension of the most recently installed reactors in the French nuclear fleet is at the heart of the Group's industrial strategy.

At end-2019, 32 of the 34 units of 900MW had undergone their third ten-year inspections. The VD3 inspection for Chinon B3, which started in 2019, will be

completed in 2020. The last VD3 900MW reactor inspection (Chinon B4) is scheduled for 2020.

Tricastin 1 was the first 900MW reactor unit to undergo its fourth ten-year inspection (VD4), which was a success. It was decoupled on 1 June 2019, and diverged at the end of its ten-year inspection on 19 December 2019.

For the 1,300MW reactor, 11 VD3 inspections were carried out; one VD3 was underway as of the end of December 2019 (Flamanville 2); 8 VD3 inspections were outstanding as of the end of December 2019, including two in 2020 (Belleville 1 and Nogent 2).

1.4.1.1.6 Decommissioning of nuclear power plants

EDF takes full regulatory, financial, and technical responsibility for the decommissioning of its plants and the other nuclear installations it operates (including BCOT, St Laurent Silos, and ICEDA). EDF has taken steps to ensure that throughout decommissioning, it controls the entire life cycle of nuclear power generation resources.

The reference scenario adopted by EDF since 2001 is for decommissioning without a waiting period, consistent with French regulations, which provide for decommissioning "in as short a time as possible on acceptable economic terms and in line with the principles set out in Article L. 1333-2 of the French Public Health Code and Article L. 110-1 II of this Code" (see Article L. 593-25 of the French Environmental Code).

The regulatory process for decommissioning is governed by the French Environmental Code (see section 1.5.3.2 "Specific regulations applicable to basic nuclear facilities"). It is characterised, for a given site, by:

- a final shutdown declaration, to be made at least two years prior to the planned shutdown date;
- a decommissioning request resulting, following examination by the authorities and a public inquiry, in a decree allowing for decommissioning;
- key progress reviews with the ASN, included in a safety reference system relative to dismantling;
- finally, once the work and final shutdown has been completed, the declassification of the facility to remove it from the legal regime governing basic nuclear facilities.

Decommissioning of shut down power plants

Concerning power plants that have been shut down (a pressurised water reactor (PWR), Chooz A; a heavy water reactor (HWR), Brennilis; a fast-neutron reactor (FNR), Creys-Malville; and six graphite-gas-moderated reactors (NUGG) in Bugey, Saint-Laurent and Chinon), EDF has chosen to fully decommission them as soon as possible in line with the principles of the French Public Health Code and the French Environmental Code while ensuring that the technical risks associated with these activities are managed.

The sites remain the property of EDF, and they will remain under its responsibility and monitoring.

Given its role as responsible operator, EDF will act as the contracting authority for the decommissioning.

The decommissioning of EDF's nine first-generation units in final shutdown will produce approximately one million tonnes of primary waste materials, of which 80% is standard waste material and none is High-Level Waste. The remaining 20% comprises Very-Low to Intermediate-Level Waste including about 2% Long-Lived Waste requiring the availability of a storage facility for ILW-LL and LLW-LL.

Existing means for removal of short-lived VLLW and LILW will be supplemented by:

- the Conditioning and Storage Facility for Activated Waste (ICEDA) for the conditioning and storage of activated waste from operations and deconstruction (ILW-LL) located at Bugey, as of 2020;
- the LLW-LL storage centre provided for by the Law of 28 June 2006 concerning the long-term sustainable management of radioactive materials and waste. Following an unsuccessful initial site search by ANDRA in 2008, and the sending of a report to the government at end-2012, in 2013 ANDRA restarted the search and in July 2015 submitted a report on the feasibility of a storage facility on a site located in the Soulaïnes region in France (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). Moreover, the new dismantling schedule of the NUGG plants provides for the construction of a storage facility for the LLW-LL liners of the silos at Saint-Laurent, pending the availability of a definitive disposal outlet (first removal of graphite in 2044).

Deconstruction of the Chooz A plant is continuing to schedule with cutting and extraction of the internal components of the reactor vessel (following the filling of the reactor pool in 2018). Chooz A is a pressurised water reactor using a technology similar to the 58 units in operation, but of an older design. It was commissioned in 1967 and operated until 1991 (final ending date for power generation). The reactor location, in a rocky cave in a hillside, means that access conditions and entry and exit of materials are more difficult than those of the rest of the existing PWR fleet. After EDF chose to opt from 2001 for a strategy of decommissioning without any period of dedicated waiting time for radioactive decrease and following adoption in 2007 of the decree for complete decommissioning, the decommissioning was launched and is expected to come to an end by 2022, that is to say 15 years after it was authorised. This duration was chosen by EDF for the decommissioning of the Pressurised Water Reactors.

Following the filling of the Crey-Malville reactor vessel at the end of 2017, the decommissioning process continued with construction of the cutting workshop for caps of the reactor vessels, followed by opening of the vessel in 2019 and the removal of its two central caps.

Regarding Brennilis, pursuant to a 2008 agreement ⁽¹⁾ with the CEA, EDF has become fully responsible for deconstruction of this facility (pursuant to French Decree no. 2000-233 of 19 September 2000, EDF became responsible for the operation of the Brennilis plant, taking over from the CEA). The deconstruction works included in the scope of the Decree authorising partial decommissioning are currently being finalised: the safety concrete for the effluent processing station has been demolished, and the spoil removed. The results of the final inspections of the spoil will allow the area to be backfilled: this will be the end of the authorised works. Meanwhile, in 2018 EDF made a decommissioning application with a view to the publication of a complete decommissioning decree, allowing decommissioning of the reactor block itself.

The decision of the Administrative Court of Appeal of Lyon of 4 December 2014, by restoring the validity of the ICEDA building permit, led EDF to relaunch the study of a file on the complete dismantling of Brennilis, taking into consideration any new regulations arising since the creation of the previous file, in particular the application of the BNF regulations. The complete dismantling file was thus submitted at the end of July 2018.

The industrial strategy of the dismantling of the NUGG reactors was thoroughly reviewed at the end of 2015 with the shift from "in-water" dismantling to "in-air" dismantling. This new alternative combined with the proposed sequencing of operations took into account the results of the 2013-2015 pre-project studies, which show a significant prolongation of the operations to dismantle the caisson (about 25 years instead of 10 as originally planned), and the need to make the operation less risky by completely dismantling an initial series unit before dismantling the other 5 units. The new dismantling strategy was presented to the ASN's Audit Council in March 2016 and June 2017. At the ASN's request, a group of independent experts was commissioned to assess the robustness of the proposed dismantling whose chief features were confirmed. The update of the industrial scenario for the dismantling of first generation plants, in particular in regard to the NUGG reactors, had led to an increase in the provision of €590 million on 31 December 2015 (see note 29.1 of the appendix to the consolidated financial statements at 31 December 2015).

The strategy file, the safety option report for the reactors, and the detailed timetable for operations over the 2017-2032 period were sent to the ASN in 2017. These provided supporting grounds for the technical options adopted, in particular the decommissioning sequencing for the six reactors:

- construction of an industrial demonstrator to test the tooling to be used during the "in-air" dismantling of the first caisson;
- realisation of an "in-air" dismantling of an initial series unit, followed by the realisation of a complete feedback procedure before engaging in the industrial dismantling of the other NUGG reactors;
- for the other caissons, work to develop a secure configuration after electromechanical dismantling and the demolition of the peripheral buildings and structures (reactor buildings, pool hall, etc.) will be carried out for some in advance in regard to the previous scenario.

This new scenario forecasts an initial removal of the graphite from the first NUGG reactor by 2044 and pushes back the need for a disposal outlet for the other graphite waste to after 2070.

In 2018 the ASN issued its main questions and conclusions about the NUGG strategy file. The "in-air" dismantling of all the reactors, the relevance of an industrial demonstrator, and the planning of the first "initial series unit" dismantled reactor (Chinon A2) is globally accepted. Discussions went on with regard to the schedule for dismantling the other five reactors. The schedule proposed by EDF would allow substantial feedback (decommissioning of a first reactor) before beginning virtually simultaneous decommissioning of the other five reactors. EDF was heard on 12 February 2019 by the ASN's Audit Council on this particular topic in order to present all information supporting the planning proposed by EDF. In view of this, draft ASN resolutions were made available for consultation by the public between July and November 2019. These drafts specify the date on which the regulatory applications allowing decommissioning operations will be made, as well as the decommissioning programme which must be included in these applications. In these drafts, the ASN recognises the complex nature of the operations to be undertaken, the soundness of the risk management strategy put forward by EDF (industrial demonstrator and significant feedback from the first reactor). The final resolutions are due to be approved by the ASN College during 2020 (see note 32.1.3 of the appendix to the consolidated financial statements at 31 December 2019 "Decommissioning provisions for nuclear power plants").

Shut down of the Fessenheim plant

Article L. 311-5-5 of the French Energy Code, introduced by the French Energy Transition Act promoting green growth dated 17 August 2015, caps installed nuclear power in France at 63.2GW, thus requiring EDF to take all necessary measures to close the two Fessenheim reactors.

The early closure of the Fessenheim plant would give EDF the right to compensation, as recalled by the Constitutional Council in its decision of 13 August 2015, on the occasion of the review of the constitutionality of the aforementioned law.

Discussions have taken place between EDF and the French State with a view to a memorandum of understanding including both a schedule of detriment issues granting entitlement to compensation and determination of the terms of this compensation.

Having been advised of the favourable opinion of the working group made up of independent Directors, in a meeting on 6 April 2017, EDF's Board of Directors took note of the inevitable and irreversible closure of Fessenheim subject to a number of conditions being met, and then authorised the Chairman and CEO to sign the compensation agreement negotiated with the French State, as approved by the European Commission, no later than the date on which the request to terminate the authorisation to operate the Fessenheim plant would be submitted.

On 25 January 2019, the Ministry of Ecological and Solidarity Transition published the draft multi-year energy programme for the 2019-2023 and 2024-2028 periods which specifies that "the Fessenheim nuclear power plant should be decommissioned by spring 2020".

In view of this, and in the light both of the production capping referred to above, deadlines for new hydraulic tests and the periodic safety inspections specified in Articles L. 593-18 and L. 593-19 of the French Environment Code, and the fact that EDF could not continue to operate the Fessenheim plant, fresh negotiations were undertaken with the aim of adjusting some of the draft agreement requirements.

Meeting on 4 April and 20 September 2019, the EDF Board of Directors authorised EDF to conclude the amended agreement. This was signed on 27 September 2019. On 30 September 2019, EDF sent the French Ministry for Ecological and Inclusive Transition and the Nuclear Safety Authority the request to terminate the operating authorisation, together with a declaration of the definitive shutdown of the Fessenheim nuclear power plant's two reactors: shutdown of reactors 1 and 2 was planned for 22 February and 30 June 2020 respectively.

(1) Following this agreement, the CEA has become fully responsible for the decommissioning of Phénix.

1. The Group, its strategy and activities

Description of the Group's activities

The compensation for closing the Fessenheim site defined in the compensation agreement covers the anticipated costs of closing the plant and the loss of earnings after operations cease. Compensation for the anticipated costs of closure, estimated when the agreement was concluded, vary between €370 million and €443 million depending on the payment schedule determined by the French State. An initial payment of €11 million should be received in 2020, the year in which the plant closes. One or more additional payments, scheduled at the discretion of the French State, will be made between the shutdown date and no later than four years thereafter (no later than the end of 2024). Compensation also comprises subsequent payments in compensation for any loss of earnings, i.e. income from future power generation, based on Fessenheim's previous output figures, up until 2041, calculated "ex post" on the basis of nuclear output selling prices, including observed market prices.

EnBW, EDF's partner in the plant, will under certain conditions be entitled to a share of lost earnings in proportion to its contractual rights to the plant's generation capacity. For its part, the Swiss company CNP decided to end its involvement in the partnership. Once EDF took note of CNP's decision the contract between the two firms ended on 31 December 2017.

Decommissioning costs

EDF nuclear power plants

Since the beginning of operations at its power plants, EDF has made provisions to cover decommissioning operations, engineering, monitoring and maintenance of facilities, and site security (see section 6.1, note 32 of the appendix to the consolidated financial statements for the fiscal year ended 31 December 2019). The final outcome of decommissioning is intended to make industrial use possible: the sites will be restored, following which the land may be reused for industrial purposes.

EDF continues to reinforce its analyses through international intercomparisons while making sure to take account of certain elements that could distort direct comparisons such as differences in the estimate scopes or national and regulatory contexts.

The cost estimate for the dismantling of second-generation power plants (Gen II – PWR plants in operation) was revised in 2016 to take into account both the recommendations of the audit mandated by the DGEC (the French government's department for energy and climate change) on the decommissioning costs of PWRs, conducted between July 2014 and August 2015 on the basis of the "DA09" model (study on the Dampierre facility), and the feedback gathered from the decommissioning of first-generation power plants (Gen I – in particular the Chooz A plant).

Reviewing these cost estimates consisted in implementing a detailed analytical process, identifying all the engineering, work, operation and waste treatment costs linked to future decommissioning of units currently operated. It resulted in figures based on detailed plant decommissioning feedback. This implemented process allowed to deepen the assessment of the costs specific to leading models and of the series and pooling impacts, those costs and impacts being indeed inherent to the size and the design of the fleet.

There are several types of mutualisation effects:

- some of them relate to the fact that several reactors may share common buildings and facilities on the same site, and these buildings and facilities will not have to be decommissioned twice. Structurally, decommissioning a pair of reactors on the same site costs less than decommissioning two standalone reactors on two different sites. In France, unlike other countries, there are no single reactors but sites with two or four, and in one case six reactors;
- certain costs are not higher when two or four reactors are decommissioned on the same site. This is usually the case for surveillance costs and cost of maintaining safe operating conditions on the site;
- waste processing in centralised facilities (for example for dismantling major components) costs less than having several waste processing facilities at the decommissioning location.

There are mainly two types of learning effects:

- a first effect comes from the fact that on a fleet driven by a single technology, a large amount of the studies does not need to be performed again each time;
- a second effect comes from the fact that on a fleet driven by a single technology, robots and tooling can be largely reused from one site to another.

Such learning effects are comparable in nature to the effects observed during construction of the fleet, in terms of studies or component manufacturing plants.

As an example, for the 900MW fleet, a series effect of approximately 20% is expected on an average 2 units reactor in comparison to a 2 units leading model.

Learning and mutualisation effects in particular explain why it is not appropriate simply to compare the average decommissioning cost per reactor between the French fleet and other countries' nuclear fleets.

However, figures does not include the evolution of productivity and learning effect.

For reasons of caution, the estimate also includes an assessment of risks and uncertainties.

Third-party facilities: La Hague (Orano) and Phénix (CEA)

As the responsibility for the decommissioning of facilities is incumbent on their operator, EDF wished to free itself financially from these operations.

As such, the agreements signed with Orano in July 2010 and the CEA in late 2008 clarified the financial responsibilities of the parties. Following a cash payment, EDF was released from any obligation to finance the decommissioning of the Phénix facilities, which have been shut down, and the La Hague plant.

1.4.1.1.7 Assets available to cover long-term nuclear commitments (outside the operating cycle)

Dedicated assets have been gradually established since 1999 to cover long-term nuclear commitments (see section 6.1 "Consolidated financial statements at 31 December 2019", note 48.2 "Content and evaluation of dedicated assets" of the appendix to the consolidated financial statements for the fiscal year ended 31 December 2019).

Article L. 594 of the French Environment Code and its implementing regulation specified which liabilities are not associated with the operating cycle and must therefore be covered by dedicated assets (see section 6.1 "Consolidated financial statements at 31 December 2019", note 48.4 "Coverage of long-term nuclear obligations" of the appendix to the consolidated financial statements for the fiscal year ended 31 December 2019).

1.4.1.2 New Nuclear projects

See also section 2.2.4 "Operational Performance, risk factor 4A Management of large and complex industrial projects (including EPR)".

1.4.1.2.1 Flamanville 3 EPR project

EDF is both the owner and manager of the Flamanville 3 EPR (European Pressurised water Reactor) project.

Interactions with the Nuclear safety authority (ASN) and administrative authorisations

The request for application for commissioning, submitted in March 2015, has been examined once and was updated in June 2017. A file amending this request was submitted in April 2019. Following the decision to repair the penetration welds, a further update to the request for application for commissioning is scheduled for mid-2021. A full update of the impact study has also been commenced, for submission at the same time.

In addition, rewording of five technical specifications for the Flamanville 3 design, dealing with imprecise aspects and risks of misinterpretation, is currently underway with the ASN. These specifications must be updated prior to the commissioning authorisation. It should be borne in mind that this procedure is not accompanied by any request to alter the installation or the terms of its operation.

The request for authorisation for a partial commissioning in order to allow the reception of fuel on site, is under final examination by the ASN. The ASN has no further technical requests relating to this matter. The next stage will be a public consultation during the first quarter of 2020: this is the first phase of the administrative process leading up to the decision to authorise partial commissioning.

An application to change the commissioning deadline in the construction authorisation Decree was made to the French Ministry for Ecological and Inclusive Transition in July 2019, with additions following discussions with the Ministry in September 2019. The aim is to postpone the deadline to April 2024, as opposed to the current deadline of April 2020, in order to take into account the welding repairs, whilst leaving some flexibility.

Progress of on-site implementation

As of the end of December 2019, electrical and mechanical assemblies were over 98% complete; the remaining activity will be carried out as and when system performance testing is conducted.

2019 was marked by:

- the remainder of the initial electrical and mechanical assemblies being completed;
- the satisfactory completion of phase 1 Hot Tests (EAC1) in early 2019, with completion of almost 95% of the planned test programme, the start of phase 2 Hot Tests (EAC2) on 21 September achieving the stable threshold (303° C, 154bar) on 18 October with completion of the tests on 17 February 2020;
- commissioning of the Controlled Access Area and the Enhanced Protection Area;
- finishing and handover of a number of buildings to operational teams. For instance, responsibility for the release building, fuel intake building, and backup diesel buildings has now been transferred to the operator, demonstrating the high level of finishing of these installations.

By the end of December 2019, tests were 61% complete and finishings were 79% complete.

Equipment manufacturing and quality

By the end of 2019, almost all the equipment for the nuclear section and the conventional island, had been delivered and assembled on site. The situation as regards the quality of equipment manufactured by Framatome for the primary system is described in the following paragraphs.

Reactor vessel

In the first half of 2017 the ASN examined "higher-than expected" carbon levels in the vessel head and bottom on the basis of documentation submitted by Framatome, under the supervision of EDF. Based on the opinion of a group of ASN-appointed experts, the ASN issued an opinion on 11 October 2017 concluding that the mechanical properties of the vessel head and bottom head were adequate for their uses, including in the event of an accident.

On 9 October 2018, the ASN authorised:

- the commissioning of the vessel bottom, subject to functional checks;
- the commissioning of the vessel head, for a limited operating life until 2024 unless the technical feasibility of checks comparable to the vessel bottom checks can be demonstrated.

EDF is in the process of carrying out a project to develop inspection of the vessel head during service, so that a proposal can be made to the ASN to keep the existing head if this type of operation is industrially feasible, as an alternative to ending use of the existing head by the end of 2024, as requested by the ASN. EDF has nevertheless asked Framatome to begin work on the supply of a new equipped vessel head, in the event of a need to replace it in 2024. The costs incurred for the manufacture of a replacement vessel head are not included in the target construction cost due to the fact that they would be incurred, if applicable, after commissioning. Furthermore, EDF SA has initiated arbitration proceedings against AREVA SA on this matter.

Break preclusion and quality deviations in the welds of the main secondary system

On 30 November 2017, EDF declared a significant event to the ASN regarding the detection of a quality deviation in the welding of the secondary system that conducts the steam from the steam generators to the turbine of the Flamanville 3 EPR.

The circuit that transfers the steam from the steam generators to the turbine of the Flamanville 3 EPR (main steam line) was designed and manufactured according to

the "break preclusion concept". This approach consists in strengthening requirements for design, manufacture and monitoring in service. These strengthened requirements, requested by EDF, also involve a "high quality" requirement in the building of these systems⁽¹⁾.

Although these requirements were applied during the design phase, they were not properly incorporated into the welding work. Failure to meet these requirements does not necessarily entail non-compliance with the nuclear pressure equipment regulations.

After 21 March 2018, during the initial comprehensive inspection, EDF also identified quality deviations on the welding of the pipes of the main secondary system of the Flamanville EPR. The initial comprehensive inspection, is a regulatory requirement prior to the plant commissioning, which consists, in particular, in examining the welds of the primary and secondary systems. It gives rise to an initial benchmark report on the state of plant before it begins operation.

In accordance with industrial procedures, the welds had been inspected by the consortium of contractors in charge of manufacturing the system. Each weld had been declared compliant by the consortium just as they were being completed.

On 10 April 2018⁽²⁾, EDF notified the ASN of a significant event relating to the detection of deviations in the inspection of these welds (part of the main secondary system was already subject to a deviation with respect to the correct application of "break preclusion" requirements).

EDF therefore began a further inspection during the second quarter of 2018 of all welds concerned in the main secondary system. For eight of these, known as reactor containment building penetration welds, on 3 December 2018 EDF provided a specific justification file to the ASN.

On 9 April 2019, the ASN convened the permanent experts' group for pressurised nuclear installations (GP ESPN) as part of its investigation of the discrepancies impacting welds on the main steam pipework for break preclusion at the Flamanville EPR. In its consultative opinion, the permanent group recommended to the ASN that if EDF could not abandon all or part of break preclusion, it should carry out compliance work on these penetration welds. This consultative opinion forms part of the decision-making procedure within the remit of the ASN College. The decision was handed down on 19 June.

In a letter dated 7 June 2019, EDF sought the ASN's opinion on the possibility of repairing these welds after commissioning of the reactor, taking the view that commissioning of the installation in its current state presented no risks to safety (since the integrity of these lines had been demonstrated), and that post-start-up upgrading would allow the upgrading method used to be developed and optimised.

In a letter dated 19 June 2019, the Nuclear Safety Authority (ASN) asked EDF to rework the eight penetration welds on the Flamanville EPR reactor containment building that deviated from the break preclusion reference document.⁽³⁾ EDF therefore assessed three reworking scenarios⁽⁴⁾.

This work led to discussions with ASN; on 4 October, the latter sent EDF a letter discussing the technical acceptability of these three scenarios.

EDF's preferred scenario for reworking the penetration welds is the use of remotely controlled welding robots, designed to conduct high-precision operations within the pipework in question. This technology has been developed for the fleet in operation, and must be qualified for reworking penetration welds. The aim is for this scenario to be qualified and approved by the ASN no later than the end of 2020, at which time EDF would be able to commence works. A second scenario, involving extraction and upgrading in auxiliary backup buildings, is presently being kept as an alternative solution.

(1) Given that these requirements were stated, the potential for pipes rupturing did not have to be considered during the safety demonstration. This proves, with a high degree of confidence, that accidents are physically impossible or extremely unlikely and that their consequences are limited to acceptable economic conditions.

(2) See EDF press release of 10 April 2018 "EDF has detected quality deviations on certain welds of the main secondary system of the Flamanville EPR and has begun additional controls".

(3) See EDF's press release of 20 June 2019: "Flamanville EPR: EDF is reviewing decision from French Nuclear Safety Authority".

(4) See EDF's press release of 26 July 2019.

1. The Group, its strategy and activities

Description of the Group's activities

In view of this strategy for reworking the penetration welds, in its meeting on 8 October 2019, EDF's Board of Directors approved the continuation of works at the Flamanville EPR site.

Furthermore, the technical investigation into reworking the welds located on the main secondary circuit with quality shortfalls and/or not complying with the requirements of the break preclusion reference document defined by EDF is ongoing, with a view to recommencing welding as soon as possible.

Commissioning schedule and construction costs

In view of the above, on 9 October 2019 ⁽¹⁾ the Group submitted a new schedule and a new estimate of construction costs for the Flamanville EPR. If the above goal regarding the validation of the chosen repair scenario by the ASN is achieved, the provisional schedule for implementing the preferred scenario for repairing the penetration welds will involve fuel loading to take place in late 2022 and re-estimating construction costs at €12.4 billion ⁽²⁾, an increase of €1.5 billion. Most of these additional costs will be booked as other operating income and expenses ⁽³⁾ and not investments.

Furthermore, due to the change in the date of fuel loading, in 2020 there will no longer be any income from the phase of installation tests to be booked when calculating net investments ⁽⁴⁾. The new schedule and construction cost targets remain dependent on the investigations conducted by the ASN, notably regarding the procedures envisaged by EDF for dealing with the welds in the main secondary system, and in particular the qualification of the welding robots for the penetration weld repairs.

If the alternative scenario referred to above were ultimately to be adopted, this would entail more additional costs and potentially significant additional delays. Other risks may also emerge (see section 2.2.4 "Operational Performance, risk factor 4A Management of large and complex industrial projects [including EPR]").

1.4.1.2.2 Other "New Nuclear" projects

UK

In the UK, EDF Energy owns 66.5% of the construction project of two nuclear plants at Hinkley Point, with the remaining 33.5% owned by China General Nuclear Power Corporation (CGN). The project company Nuclear New Build (NNB) is the project owner and the New Nuclear Projects and Engineering Department together with Edvance are responsible for the design studies.

EDF is also working, as part of its partnership with CGN, on two nuclear construction projects in the UK: Sizewell C and Bradwell B (see section 1.4.5.1.2.4 "Nuclear New Build business").

Taishan EPR

In China, EDF owns 30% of TNPJVC (Taishan Nuclear Power Joint Venture Company Limited), which was set up to build and operate two EPR nuclear reactors in Taishan, in the province of Guangdong in China. CGN holds a 51% stake and Yudean a 19% stake.

Unit 1 operated without any noteworthy incidents during its first year of operation. Net annual output for 2019 was 11.953TWh for unit 1 and 4.225TWh for unit 2.

In 2019, unit 2 achieved all the major milestones, opening up the way for its commercial commissioning on 7 September 2019.

EDF continued to provide technical support to the Taishan project, while simultaneously incorporating feedback from start-up and operation activities for other EPR projects. In 2020, the main challenge relates to the successful full inspection of unit 1, scheduled to begin in early July for a period of 80 days.

To date, the commercial commissioning of unit 1 has been implemented with a tariff that is lower than that expected by EDF and that will remain in force until the end of

2021 (see section 2.2.4 "Operational Performance, risk factor 4A Management of large and complex industrial projects [including EPR]"). Discussions between electricity producers and the Chinese authorities will lead to a definitive tariff which will apply to the 3rd generation nuclear plants. Work is ongoing with the competent authorities with a view to determining future evolution of the tariff.

Preparation of a programme to build new nuclear reactors in France

On 25 January 2019, the French government published the main guidelines of the multi-year energy programme. In accordance with these guidelines, the government asked the EDF group to prepare by mid 2021 a file with the nuclear industry relating to a programme of renewal of nuclear facilities in France. The sector contract signed on 28 January 2019 by the French government and the Nuclear Sector Strategic Committee (CSFN) contains a section on the preparation of the industrial capacity necessary for the performance of a programme of construction of new reactors in France. In order to keep in line with this initiative, EDF has started to prepare economic and industrial proposals based on the EPR2 technology. EDF will provide the information to enable the French government to define an appropriate regulatory framework for the financing of such an industrial programme.

EPR 2

EDF submitted a safety options file for the "New Model EPR" (NM EPR) project at the end of 2016 to the Nuclear Safety Authority which examined it in 2017. In early 2018, the Permanent Group of experts for nuclear reactors submitted its conclusions on the safety options file. In particular, it found that "most changes in the design used for the NM EPR project take into account the lessons learned from the feedback on Flamanville EPR and on the reactors currently operating as well as lessons learned from the accident at Fukushima Daiichi," and "is of the opinion that the design options used for the NM EPR project, complemented or modified in the light of the discussions held during the technical examination which have led to a number of commitments, are likely to ensure a safety level at least equivalent to that of the Flamanville 3 EPR reactor and complies with the recommendations of ASN Guide 22 (on the design of Pressurised Water Reactors)." In its opinion 2019-AV-0329 of 16 July 2019, the French Nuclear Safety Authority "considers that the safety handbook adopted for the planned NM EPR reactor is on the whole satisfactory, in particular as regards legislation, the guide dated 18 July 2017 [...] and international recommendations".

Furthermore, the work undertaken by EDF and Framatome on the New Model EPR project led to the finalising in 2017 of the technical configuration of a model named EPR2 which could replace the nuclear fleet currently operating in France and ultimately expand the French nuclear industry's export offers.

EPR2 is an optimised version of the EPR, following on from the EPR in industrial terms, whilst integrating feedback from EPR worksites and power plants currently in operation.

Projects under development

In March 2018, EDF signed a non-binding industrial cooperation agreement with the Indian national electricity company Nuclear Power Corp. of India Ltd. (NPCIL) for the construction of six EPR reactors in India at the Jaitapur site. This agreement sets out the industrial plan, the roles and responsibilities of partners, and the next steps in the project. In this regard, EDF and its partners will be supplying all the studies and equipment for the nuclear island, the conventional island, the auxiliary systems, and the cooling sources and galleries. EDF will not be investing in this project. A comprehensive conditional non-binding offer was submitted to NPCIL at the end of 2018 by EDF and its partners. 2019 was characterised by significant progress on technical convergence.

(1) See EDF's press release of 9 October 2019 "Flamanville EPR: EDF has adopted a scenario for upgrading the main secondary system penetration welds with robots and has adjusted the construction schedule and estimated cost accordingly".

(2) In euros 2015, excluding interim interest.

(3) IAS 16 paragraph 22 on abnormal costs incurred in connection with assets constructed by the Company. These costs will affect the years 2020, 2021, and 2022. Other things being equal, the impact on EDF's net income for 2020 is estimated to be -€0.4 billion, and will not affect net income.

(4) Standard IAS 16 paragraph 17.

EDF is also participating in the call for tenders initiated in Saudi Arabia by K.A. CARE (King Abdullah City for Atomic and Renewable Energy) for a construction project relating to two EPR reactors. EDF made a successful bid in the first phase of the consultation process known as FEED (Front End Engineering and Design), and is currently taking part in the development phase of the project; this should result in a formal call for tender process, currently expected in late 2020.

In the medium power segment, EDF relies on its historic partnerships with China (UK HPR1000 with CGN) and Japan (ATMEA with MHI). For the UK HPR1000 technology, EDF and CGN are collaborating through a joint venture (GNS with 66.5% to CGN and 33.5% to EDF) for the certification of this Chinese-based technology by the British safety authority.

In the small power segment, in 2019 progress was made in the development of a pressurised water solution in the 300-400MW range, intended mainly for the export market with a view to replacing the oldest fossil fuel-fired plants that will be decommissioned in the coming decades. This product, known as NUWARD™, is being developed with the CEA, Naval Group and TechnicAtome, and is also a potential source of cooperation with foreign partners. Exploratory discussions have begun to this end with US firm Westinghouse.

1.4.1.2.3 The digital transformation of nuclear engineering (SWITCH programme)

Launched in July 2017, this programme feeds into EDF's CAP 2030 strategy, under sections related to managing current new nuclear projects, extending the operating life of the fleet in operation, expanding abroad and embracing digital transformation. It is a multifunctional programme involving all EDF players in the nuclear sector, including Framatome.

The programme seeks to mark a turning point in engineering through two axes:

- transforming and simplifying processes and methods to better grasp the complexity of large-scale industrial projects throughout their lifecycle by applying systems engineering standards, among other methods;
- digitise processes using a data-centric approach based on an integrated, collaborative and industrial high-performance information system within an extended enterprise model.

In this context, the call for tenders launched in 2017 led to the selection in the 2nd quarter of 2018 of Dassault Systèmes as supplier of the PLM (*Product Lifecycle Management*) solution and Cap Gemini as integrator covering PLM (*Plant Life Management*) tools.

The SWITCH programme has entered its operational phase; several projects are currently being carried out, in particular in ESPN (nuclear pressure equipment), RTI (engineering technical baseline), EPR 2, and HPC.

In this regard, the first ESPN and RTI services were made available to users in September 2019.

1.4.1.2.4 Excell

In December, EDF unveiled "excell", a plan that will drive the nuclear industry to achieve the highest standards of craftsmanship, quality and excellence⁽¹⁾. The execution of this plan will be overseen by a senior officer in charge of manufacturing standards, training and qualification, reporting directly to EDF's Chairman and Chief Executive Officer.

Excell will start being rolled out in 2020. The plan will rest on three cornerstones:

1. Enhancement of manufacturing quality:

- an in-depth overhaul of the customer-supplier relationship seeking a more balanced risk sharing, as well as the establishment of contracts that align with manufacturing standards. The choice of suppliers will put stronger emphasis on quality requirements. Suppliers will also be more actively involved in the drafting of specifications and the assessment of manufacturability;
- a new supplier qualification scheme will be implemented for the construction of new reactors, making expectations more stringent and potentially extending to level-2 sub-contractors and beyond;

- for the most critical operations, stricter qualification criteria and record-keeping systems will be used, thereby guaranteeing the quality of parts;
- the senior officer in charge of manufacturing standards, training and qualification will investigate malfunctions and will ensure that best practices are implemented by EDF, Framatome and the nuclear industry as a whole;
- these guiding principles have been transposed into Framatome's strategic plan with a view to improving the quality of its manufacturing process.

2. Boosting skills:

- EDF will consolidate the initiatives taken by the business alongside GIFEN with the founding of a University specifically dedicated to nuclear disciplines;
- a knowledge management system will be used to capitalise on the industry's knowledge and disseminate this knowledge within EDF's engineering centres;
- diversified career paths will be established within EDF and the industry as a whole, as well as between the manufacturing, construction and operations disciplines;
- the nuclear industry will establish a specific plan for the hiring and training of welders, who will be qualified to meet the industry's standards.

3. Tighter governance of major nuclear projects:

For each major project, EDF's Chairman and Chief Executive Officer will chair a Strategic Committee whose role will be to review the project's initial data, to set its objectives, costs and timeframes, to review the associated financial commitments and to approve key contracts. The Board of Directors will be regularly briefed on the progress of these major projects.

1.4.1.3 Framatome

Framatome is a key player in nuclear energy, acclaimed for its innovative solutions and high added value technologies for the nuclear fleet worldwide. Benefiting from its global expertise and backed by sound references, the company designs, maintains, and installs components and fuel, as well as instrumentation & control systems for nuclear power plants. With a workforce of some 14,000 employees, Framatome is able to supply its clients with an increasingly clean, safe, and cheap low-carbon energy mix on a daily basis.

Framatome is jointly owned by Groupe EDF (75.5%), Mitsubishi Heavy Industries (MHI – 19.5%), and Assystem (5%).

Framatome has a significant industrial presence in France (17 sites), Germany (4 sites), the United States (8 sites) and China (9 sites). The company also has an industrial or sales presence in South Africa, Argentina, Brazil, Bulgaria, Canada, South Korea, Spain, Finland, Hungary, Japan, Czech Republic, United Kingdom, Russia, Slovakia, Kazakhstan, Sweden and Ukraine.

1.4.1.3.1 Framatome's strategy, market and commercial opportunities

Framatome's strategy is based on its core business *i.e.* nuclear steam supply systems, and aims to offer safe and competitive solutions, industrialise them and carry out the projects as part of an industrial sector.

The company's customer base includes leading international energy players and it works on over 300 reactors in the world.

With Framatome's experience in reactors of all types of technologies it can meet the specific needs of its customers worldwide.

With a current global fleet of 450 reactors representing close to 396GWe in service in 31 countries⁽²⁾, and new forthcoming nuclear capacities, the nuclear market offers opportunities in the field of fuel, modernisation and services. Framatome's goal is to expand its market share through a differentiated offer and export partnerships.

1.4.1.3.2 Framatome's activities

With an experience built up over 60 years in the design and construction of nuclear plants, Framatome is present at every stage of the process, across all types of reactor technologies. With its highly skilled engineers and operators, the company has completed more than 90 nuclear power plant projects around the world to date.

(1) See EDF's press release of 13 December 2019 "EDF unveils excell, an excellence plan for the nuclear industry".

(2) Source: CEA – ÉlecNuc – 2019 Edition, figures at 31 December 2018 (<http://www.cea.fr/english/Documents/scientific-and-economic-publications/ElecNuc-2019.pdf>).

Engineering

Framatome's experts are specialised in the design of the principal items of equipment making up nuclear steam supply systems, and that includes mechanics and metallurgy, neutronics, the scientific calculation work, fluid mechanics and risk and nuclear safety analysis. Framatome's engineering services include the heart of the power plant, referred to as the "nuclear island", and the main components of the reactor's primary circuit such as steam generators, pumps, pressurisers, as well as the nuclear reactor pressure vessel itself. Its specialists and technicians are actively involved in major new nuclear power plant construction projects such as the new EPR reactors.

Equipment manufacturing

Framatome components equip more than 100 power plants in 11 countries. At its plants in Le Creusot, Saint Marcel and Jeumont, in France, Framatome's manufacturing plants produce the key equipment for nuclear steam supply systems for electrical utilities all over the world to equip new-build power plants or to replace items of equipment at power plants in operation. The company manufactures advanced technology heavy equipment (reactor pressure vessels, steam generators, etc.) and mobile components (reactor coolant pumps and control rod drive mechanisms). Since 1970, around 10,000 components have been produced at its manufacturing sites by Framatome's forge workers, machinists, materials technicians, mechanical test technicians, boilermakers and welders. An arbitration procedure has been commenced with respect to the manufacturing discrepancy for the HS bottom casing on reactor no. 2 in Fessenheim and the HS top casing to be installed on reactor no. 5 in Gravelines.

In 2019, the company continued to ramp up production at its Le Creusot plant in Burgundy, specialising in the manufacture of heavy components for the nuclear industry, and received ISO/CEI 17025 accreditation for the Le Creusot and Saint Marcel mechanical test labs. The Le Creusot plant will also supply the main forged components for new construction projects abroad, in particular for the EPR reactor project of Hinkley Point C in the UK, as well as parts for replacement components intended for French reactors.

In summer 2019, Framatome detected non-compliance with temperature ranges during the application of certain local stress-relieving heat treatments (SRHT) carried out on welded steam generator and pressurizers seals in the summer of 2019 ⁽¹⁾. The causes of this discrepancy have been identified by Framatome, allowing a response to be put together to ensure that the integrity of those components concerned that are in service is not questioned (see section 2.2.5 "Risks specific to nuclear activities, risk factor 5A Failure to observe operating goals and/or extension of the nuclear fleet operating period"). Files with supporting evidence have been submitted to EDF and other operators that are Framatome clients; these are currently being investigated with the relevant safety authorities. An action plan was proposed to the ASN on 13 November 2019. Framatome has launched a programme to consolidate knowledge of the performance of other local SRHT processes used on equipments supplied by Framatome, both in plant and on the worksite. On completion, this programme is likely to result in the revision of some of the equipments in question.

Instrumentation & control systems

Framatome designs, manufactures and installs safe nuclear instrumentation solutions and instrumentation & control systems for plants in operation or under construction. Its solutions range from safety instrumentation & control systems to operational instrumentation & control system, from nuclear instrumentation to maintenance in operational conditions solutions, from simulators to global I&C engineering expertise, from human-machine interface design to human factors engineering. Framatome has installed over 300 complete instrumentation and instrumentation & control systems on reactors of all types worldwide.

In September 2019, the new SPEC 200 plant was inaugurated in the Lynchburg operational excellence centre in Virginia, thus heralding the complete integration of the SPEC 200 product line (analog instrumentation & control system) in the solution portfolio. The plan was recently audited by the Nuclear Procurement Issues Corporation, receiving an unrestricted approval recommendation for the supply of the SPEC 200 platform.

Fuel

Framatome designs, develops and manufactures fuel assemblies for pressurised water reactors, boiling water reactors and research reactors. The company's know-how spans the entire process: from the design of the fuel assembly, to the production of zirconium and its alloys – zirconium being vitally important for fuel production – on to fuel fabrication and related services, right through to operations on the nuclear power plants. The company performs all relevant calculations from general fuel management up to dedicated licensing for the highest performance and safety. Over 226,000 Framatome fuel assemblies are loaded in more than 100 reactors in operation around the world.

After two and a half years of work, a new melting furnace (vacuum arc furnace) was inaugurated in April 2019 on the Uguine site, enabling different alloys to be melted using state-of-the-art equipment.

Commissioning and licensing of nuclear power plants

Framatome has substantial international experience working with nuclear safety authorities on all types of reactors currently in service around the world. The company also offers support for operators through relationships with their respective safety authority and in the application of existing regulations. In France, Framatome has expertise in the application of the Order relating to nuclear pressure equipment (*arrêté relatif aux équipements sous pression nucléaire* – ESPN). Technical centres and test facilities are available to the company's customers to qualify equipment and to provide assistance in the preparation of the qualification studies and associated documentation.

Services and solutions to maintain and modernise nuclear power plants and extend their operating lifetime

Framatome offers innovative solutions and services to maintain and modernise existing nuclear power plants, and extend the lifetime of existing installations, while guaranteeing the safety, performance and availability of operations. Framatome has 60 years' international experience of all types of technologies and maintenance of more than 300 reactors worldwide. Its teams have expertise and knowledge in maintenance, component replacement, inspections and checks, refuelling operations, and optimised management of reactor shutdowns for maintenance. More specifically, its activities cover supply of fuel assemblies and related services, management of equipment and spare parts, modernisation of I&C, and chemistry and radiochemistry services.

In the United States, a new system for inspecting partition screws inside reactor vessels using ultrasound was rolled out, complementing the SUSI underwater inspection robot. Framatome can now deploy either of these two solutions, depending on customer requirements.

In addition, US firm FoxGuard Solutions was bought out in October 2019. It provides further resources for the cyber security offering directed at the energy industry, including consultancy, the installation of managed solutions, specific safety hardware, and control system hardware.

Management of large projects

Framatome's participation in the construction of new-build nuclear reactor projects spans across design, through procurement and supply, and onto commissioning. With recognised expertise in the management of complex projects, its teams are tasked with delivering to the most stringent security standards and fulfil the requirements of its customers. In the case of new-build construction projects, the company proposes solutions for the nuclear island scope. Framatome is actively involved with EDF in the construction and commissioning of 5 EPR reactors worldwide: in France (Flamanville 3), in China (Taishan 1&2), and in the United Kingdom (Hinkley Point C, reactor 1 and 2). The commercial commissioning of Taishan 2, the second EPR in the world to enter service, took place on 7 September 2019.

In 2017, EDF and Framatome created Edvance, a joint engineering subsidiary for the construction of new nuclear power plants in France and in the world (see also section 1.2 "History and organisation of the Company").

(1) See EDF's press release of 10 September 2019 "Deviation in technical standards governing the manufacture of nuclear-reactor components by Framatome".

1.4.1.3.3 Key achievements by Framatome in 2019

In January, Framatome delivered the first Enhanced Accident Tolerant Fuel (EATF), consisting of improved fuel pellets and cladding tubes, to the Vogtle Electric power plant in Georgia, USA.

In February, changes to the Preventive Protection System for the I&C system at the Loviisa nuclear power plant, operated by Finnish electricity company Fortum, were finalised. This system contributes to the power plant's operational safety, and forms part of the programme to modernise the power plant's I&C system commenced in 2016.

An agreement was also entered into for the manufacture of fuel and related services for unit 2 of the Palo Verde nuclear power plant, operated by Arizona Public Service near Phoenix, Arizona.

An agreement has also been signed with Wolf Creek Nuclear Operating Corporation to implement a new maintenance technique at the Coffey County nuclear power plant in Kansas, USA.

After having completed renovation of the four backup diesel generators at the Gösgen power plant operated by Swiss electricity firm Kernkraftwerk Gösgen-Däniken AG, Framatome entered into a new agreement in April to modernise the protection system for the nuclear power plant's reactor: as a result, this will be equipped throughout with Framatome's TELEPERM XS digital safety I&C system.

In July, Framatome and Kinectrics joined forces with Bruce Power in the USA to develop a key medical isotope, known as Lutetium-177, used in the treatment of prostate cancer.

In October, the Franco-German consortium formed by Siemens and Framatome concluded an agreement for the supply of the main I&C system for the Hanhikivi nuclear power plant in Finland, as well as an agreement for the supply of automated process control systems for the Paks-2 nuclear power plant in Hungary.

Also in October, ITER awarded a major contract to a Franco-Chinese consortium that includes Framatome. This contract relates to the assembly and installation of the Tokamak facility at ITER's nuclear fusion project facility.

In November, a new hot rolling mill was inaugurated in the Rugles factory in Normandy. This installation can roll large strips of zirconium, used to produce sheet metal which is in turn used to manufacture fuel assemblies for nuclear power plants.

1.4.1.3.4 Nuclear facilities

Basic nuclear facilities (BNF)

There are two basic nuclear facilities (BNF) at the Framatome site of Romans, BNF no. 63 (fuel elements fabrication for research reactors – CERCA) and BNF no. 98 (fabrication of fuel assemblies for nuclear power reactors).

1.4.1.4.1 EDF's thermal generation in mainland France

At 31 December 2019, the thermal generation facilities operated by EDF were of different types, both in terms of fuel and power:

Fuel	Unit capacity (in MW)	Number of units in operation at 31/12/2019	Total capacity (in MW)	Year commissioned	Output (in TWh)	
					At 31/12/2019	At 31/12/2018
Coal-fired	580	3	1,740	in 1983 and 1984	0.8	3.9
	85	4	340	in 1980 and 1981		
	203	1	203	in 1992		
	134	1	134	in 1996		
	125-129	2	254	in 1998 and 2007		
Fuel oil, gas and dual-fuel combustion turbines (gas and fuel oil)	185	2	370	in 2010	0.2	0.2
	179-182	3	542	in 2008 and 2009		
	427	1	427	in 2011		
Combined Cycle Gas Turbine	465	2	930	in 2012 and 2013	8.8	6.9
	585	1	585	in 2016		

(1) The objective of Framatome is to detect, report and treat in the best possible manner all deviations and anomalies occurring in connection with its activities. The purpose of this indicator is to enhance the sharing of experience, broaden analysis and the importance given to weak signals. Events declared at level 0 on the INES scale are safety deviations, considered as "weak signals". It is essential to take them into account as part of a continuous improvement process for a better management of risk prevention in the conduct of activities. In order to facilitate the reporting on "weak signals" and the sharing of experience, Framatome detects and records any deviation. The analysis of the latter, by the Filière indépendante de sûreté (independent safety reviewer), assesses the level of reporting to the safety authority.

1. The Group, its strategy and activities

Description of the Group's activities

1.4.1.4.2 Issues relating to thermal generation

Coal-fired fleet in transition

After having shut down ten units between 2013 and 2015, EDF retained three generation plants based on recent technology and located in Le Havre (1 unit) and Cordemais (2 units). A renovation programme for these units was completed between 2014 and 2016 in order to improve their reliability and efficiency.

They are equipped with flue gas desulphurisation and denitrification systems (90% reduction in sulphur dioxide emissions and 80% reduction in nitrogen oxide emissions) as well as dust collectors that trap virtually all dust. These treatments allow the units to meet environmental regulatory requirements in force since 2016.

France's 2019-2028 multi-year energy programme (PPE) calls for the cessation of electricity production based on this fuel by 2022. However, RTE's most recent provisional review reveals the need, in some scenarios, to maintain limited production at the Cordemais power plant until 2024, or perhaps even 2026. The depreciation periods for the Le Havre and Cordemais power plants were therefore adjusted in 2019. Furthermore, the French "Climate and Energy" Act specifies a maximum threshold for CO₂ emissions for these plants that restricts their operating potential to no more than several hundred hours a year after 2022. This legal mechanism makes the operator responsible for deciding whether or not to continue operating such installations after 2022, and makes no provision for compensation.

At the end of 2019, EDF announced that it had decided to halt production at the Le Havre power plant on 1 April 2021.

In another development, in 2016 EDF launched the Ecocombust project to develop fuel from green waste and wood waste. On 24 January 2019, EDF and the Ministry for Ecological and Solidarity Transition approved a working programme prior to a decision on the Ecocombust project. In 2020, this working programme should qualify the technical tests, environment impact studies and the project's business model. Subject to satisfactory conclusions at the technical and environmental levels, and following continued discussions with the French government and local authorities, EDF aims at starting the industrialisation phase for fuel production from 2022. This fuel would be used in co-combustion with a small percentage of coal in the Cordemais power plant boilers from 2022 onwards.

More generally, the Group is working to optimise the performance of all of its thermal fleet.

Closure of the oil-fired fleet

EDF decided to permanently shut down the Aramon thermal plant on 1 April 2016 and the Porcheville and Cordemais unit 2 thermal plants in the spring of 2017 as they had been scarcely used over the past number of years.

EDF also permanently shut down the last oil-fired unit (Cordemais 3) in the spring of 2018.

Modernising the thermal generation fleet with natural gas combined cycle turbines

EDF commissioned the first Combined Cycle Gas Turbine (CCGT) plant in France at Blénod in 2011, then two CCGT plants at Martigues in 2012 and 2013 followed by a next-generation CCGT plant at Bouchain in 2016 in partnership with General Electric. This modernisation of the thermal generation fleet reduces its atmospheric emissions of CO₂, nitrogen oxides and sulphur oxides.

The CCGTs in Martigues are the result of the repowering of former oil-fired units, a part of whose facilities, such as the steam turbine, the condenser and the water treatment facilities, were reused. The repowering of a unit of this capacity is a first in Europe. The installed capacity of the Martigues site is 930MW and the return is over 50%, markedly higher than the return from coal-fired thermal units, for example.

The CCGT plant at Bouchain is equipped with General Electric's new high-capacity "9HA" turbine. The innovative 9HA CCGT delivers improved capacity (600MW achievable in under 30 minutes) and return (over 60%, versus an average return for a standard CCGT of 57-58%) and offers good environmental performance with CO₂ emissions of around 360g/KWh on average, one-third of those of the old neighbouring coal-fired plant shut down in 2015. Under specific operating conditions it generated a record return of 62.22%. As a prototype it underwent testing from when it was commissioned in the spring of 2016 to when ownership was transferred from General Electric to EDF in December 2017. The facility operated steadily in 2019 (6,015 hours) and generated 2.8TWh.

Evolution of the environmental regulatory framework

Today, EDF's thermal power plants are operated within the context of regulations that apply to installations classified for environmental protection purposes (Installations classées pour la protection de l'environnement – ICPE), as well as regulations relating to greenhouse gas emissions and a specific regulation for air quality (see section 1.5.3.1 "Regulations applicable to fossil fuel-fired energy generation").

In 2019, EDF's thermal power plants in mainland France emitted 5.4 million tonnes of CO₂ (6.4 million tonnes in 2018) for a net electricity generation of about 9.85TWh (11TWh in 2018). The CO₂ content per kWh generated by EDF's thermal power plants in mainland France in 2019 is 545g/kWh net *i.e.* the lowest CO₂ footprint in EDF's entire thermal history (579g/kWh net in 2018). This decarbonisation of EDF's thermal kWh is the direct result of the ramp up of the share of CCGT plants in EDF's thermal generation mix, which contributed over 89% of the production of the thermal generation fleet in 2019 (compared with 62% in 2018). It is to be noted that in 2010, the CO₂ content per kWh generated by EDF's thermal fleet in mainland France was still more than 900g CO₂/kWh net.

In 2019, EDF's thermal generation fleet in mainland France also emitted 0.7kt of SO₂, 2.6kt of NO_x and 0.02kt of dust. Per kWh generated, polluting emissions from EDF's thermal plants have fallen compared with 2010 by four times for NO_x, by over ten times for SO₂ and by over twenty times for dust. These drastic reductions in emissions were made possible by the shutdown of the oldest thermal plants, the renovation and installation of smoke treatment equipment using the best techniques available at the most recent plants, the use of low sulphur fuel and the commissioning of low pollution natural gas combined cycle turbines.

The environmental performance of the thermal fleet in mainland France is fully in keeping with the objectives set out in the new Sustainable Development policy of the EDF group signed in June 2018 and in particular:

- reduce GHG emissions of the EDF group in line with the path defined by the Group in order to fall under 30 million tonnes in 2030 (no. 1 Corporate Social Responsibility Goals of the EDF group);
- reduce the EDF group's SO₂, NO_x and dust emissions in the air by 50% between 2005 and 2020.

1.4.1.4.3 Generation and technical performance

Thermal generation in 2019 amounted to 9.85TWh with a lower level of operation than in 2018 given the stagnating consumption in France.

In 2019, coal units supplied 0.8TWh, CCGT plants 8.8TWh and oil-fired units 0.2TWh. Minimising unplanned outages is the essential aim for facilities such as thermal plants, used for mid-merit and peak generation. The priority for these means of generation required on a variable basis all year round is to ensure system security by ensuring maximum reliability and availability.

The reliability of the thermal fleet was confirmed in 2019 and meets European standards. The fleet's adaptability to a sustained level of operation was demonstrated. The response rate achieved by combustion turbines to requests from optimisation services and from RTE was very good. In a tense balance between supply and demand, the combustion turbines fully played their role in maintaining the system's safety.

Decommissioning of shutdown units

EDF has planned all of the decommissioning operations on its thermal fleet units which were shut down or whose shutdown is scheduled. The provisions for these operations have been made in an amount that corresponds to the cost of decommissioning all of the units being operated and the clean-up of the sites (see section 6.1 "Consolidated financial statements at 31 December 2019", note 33 of the appendix to the consolidated financial statements at 31 December 2019).

In 2019, EDF continued the decommissioning work on sites that had been definitively shut down. Most of the work carried out in 2019 related to asbestos removal from the Cordemais and Le Havre units and deconstruction at Cordemais, Vitry, and Richemont.

Following on from this work, EDF commissioned and carried out a number of expert appraisal and ground depollution works, in particular at Ambès, Loire-sur-Rhône, and Porcheville.

EDF is careful to preserve the potential of its sites to the greatest extent possible, with precision allocation of space and the implementation of local monitoring of planning regulations so as to secure its own needs.

This differentiated ground and space management has made it possible to free up EDF land from occupancy issues (freeing up new land resources, biodiversity potential, and restoring natural land), taking into account the Group's new needs and assisting local authorities with the development of new types of activity.

1.4.1.5 Renewable energy generation and storage

Renewable energy ⁽¹⁾ (hydropower, wind power, solar, biomass, geothermal, marine etc.) has seen robust growth worldwide.

Hydropower is the electric renewable energy leader in the world, with an aggregate installed capacity estimated at 1,293GW ⁽²⁾, of which 121GW of storage capacity through pumping. It has significant prospects for development in certain regions, even though it is close to its maximum operating potential in many developed countries. According to the International Energy Agency (IEA), from 2019 to 2040, hydropower is expected to account for about 8% of new capacity.

The combined installed onshore wind capacity reached 540GW ⁽³⁾ in 2018 worldwide (of which 180GW in China) compared with 496GW a year before (of which 162GW in China). According to the IEA, from 2019 to 2040, wind power is expected to account for 20% of new capacity.

The combined installed offshore wind capacity reached 23GW ⁽⁴⁾ in 2018 worldwide compared with 19GW a year before. According to the IEA, the installed capacity of offshore wind farms could increase by a factor of fifteen between 2019 and 2040.

In solar photovoltaic power, total global installed capacity stood at 480GWc ⁽⁵⁾ compared with 386GWc a year before, up 24%. Today, it is largely wind, solar and biomass that are driving growth in renewable energy. According to the IEA, from 2019 to 2040, solar photovoltaic power is expected to account for 35% of new capacity.

The EDF group is now the renewable energies leader in Europe and specifically the leading supplier of hydropower in the European Union; hydropower generation represents the Group's most important renewable energy, with an installed capacity of 23GW and 267 ⁽⁶⁾ large dams in the world. The Group is also leader in developing competitive industrial sectors, primarily wind and solar. EDF's goal is to achieve 18.0GW of net installed capacity in solar and wind power by the end of 2023. Renewable energies already account for a quarter of the Group's overall installed capacity.

The EDF group's commitments in terms of developing renewable energy are also described in section 3.2.1.2 "EDF, a company committed to the development of renewable energy".

NET GROUP INSTALLED CAPACITY IN RENEWABLE ENERGY AT END 2019

<i>(in MW)</i>	Hydro power	Wind	Photovoltaic	Biomass	Geothermal	Marine	Total
France	20,548	1,503	260	231	1	240	22,783
Europe excl. France	1,079	1,778	96	4	-	-	2,957
America	205	3,943	833	-	-	-	4,980
Asia	432	279	179	-	-	-	890
Africa	-	323	381	-	-	-	705
TOTAL NET INSTALLED CAPACITY	22,264	7,827	1,749	235	1	240	32,315

Electricity storage has been developed ever since the 1970s, with the construction of pumped-storage hydropower plants (STEPs) for water from dams, thereby demonstrating the economic benefits of electricity storage in France and several other countries.

Today, a variety of electricity storage solutions are available. These include storage in the form of mechanical energy (inertia flywheels, water storage at height), electrochemical energy (batteries, flow batteries), and chemical energy (gas produced by electrolysis then used to power a fuel cell), each of which has its own

characteristics in terms of maturity, power, energy recovery performance, energy density, response time, lifespan, etc.

While further challenges remain before storage technologies can be massively rolled out, the swift progress achieved in recent years is already creating new opportunities to develop solutions addressing consumers' expectations of having access to reliable, affordable or renewable and local electricity. According to the IEA, worldwide installed battery storage capacity amounts to 8GW, and this figure is likely to increase sharply. The IEA forecasts that worldwide installed battery storage capacity could be 300-550GW in 2040.

(1) Renewable, or "green" energies, are derived from natural resources that are replenished quickly enough to be considered non-depletable in human terms.


(2) Source of hydraulic capacities worldwide: Renewable capacity statistics 2019, International Renewable Energy Agency (IRENA)

(3) Source of onshore wind power capacity worldwide: Renewable capacity statistics 2019, International Renewable Energy Agency (IRENA)

(4) Source of offshore wind power capacity worldwide: Renewable capacity statistics 2019, International Renewable Energy Agency (IRENA)

(5) Source of photovoltaic capacity worldwide: Renewable capacity statistics 2019, International Renewable Energy Agency (IRENA)

(6) Counting done in 2019, according to the French classification (decree 2015-526) relating to class A and B dams (with a height exceeding 10 metres). Number of large dams in gross data, regardless of the equity interest EDF group holds in these dams. Net consolidated total of large dams: 262.

 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). Power generation capacity, in proportion of the share the EDF group held in each asset.

1. The Group, its strategy and activities

Description of the Group's activities

1.4.1.5.1 Hydropower generation in France

The electricity hydro-generated by EDF in mainland France in 2019 (including pumped storage) totalled 39.7TWh, 9% of its total electricity output.

1.4.1.5.1.1 EDF's hydropower generation fleet

Hydroelectricity is the second source of electricity generation after nuclear power and the first source of renewable electricity in France. This is an important sector for the

electricity system for many reasons, particularly in terms of grid security and balancing.

EDF SA's hydropower fleet ⁽¹⁾ in mainland France is constituted of 432 plants at the end of 2019 with an average age of 75 years ⁽²⁾:

Hydropower plants	31/12/2019	31/12/2018
TOTAL MAXIMUM CAPACITY (IN GW)	20.1	20.0
TOTAL OUTPUT INCLUDING PUMPING* (IN TWH)	39.7	46.5
Consumption by pumping operations (in TWh)	6.3	7.3

* Corresponds to the sum of the exact values rounded to one decimal place.

EDF also operates other power plants via subsidiaries, affiliated to EDF SA or Edev. Operation of these infrastructures benefits from EDF SA's competencies and expertise in hydropower technology.

Within mainland France, hydropower plants are mainly located in mountainous areas in the Pyrenées, the Alps, the Massif Central and the Jura, as well as on the Rhine. In all, they represent an installed capacity of approximately 20GW (excluding French overseas departments and Corsica), or 23% of EDF fleet's installed capacity, for an annual producible energy around 40TWh.

The various hydropower facilities are designed to optimise the use of water resources in the valleys where they are situated, as part of multi-purpose water management (detailed in section 1.4.1.5.1.4 "Hydropower generation issues"). Given the size and variety of its fleet, EDF has facilities able to respond to all types of desired uses, from

base to peak generation which also offer levers for optimisation due to their flexibility: "run-of-river" plants, like the ones on the Rhine, which have almost no storage capacity and generate electricity depending on the available water flow; plants with pondage, thus accessing average-sized reservoirs (smaller than lakes) for occasional use during the week or during the day, to cover peaks in demand; lake plants (seasonal reservoirs) located in mountainous areas (Alps, Massif Central and Pyrenées); pumped-storage plants, which pump water from a lower reservoir to an upper reservoir during periods of low demand when electricity is also lower in cost, in order to build up reserves used to generate energy at peak times (by releasing the stored water through turbines from the upper reservoir to the lower reservoir); and a tidal power plant on the River Rance (Brittany) which, using the up and down movement of the tides, provides a very regular supply of electricity.

Facility category	Turbine capacity	Average generation capability over 50 years
Run-of-river	3.6GW	16.5TWh
Lake-supplied	8.2GW	14.5TWh
Pondage	3.1GW	8.1TWh
Pumped-storage	5.0GW	1.5TWh
Tidal	240MW	0.5TWh

1.4.1.5.1.2 Hydropower safety

Hydropower safety comprises all the measures taken when designing and operating hydropower plants to reduce risks and hazards to people and property associated with water and the presence or operation of facilities. Hydropower safety is the major and permanent concern of the producer (see section 2.2.4 "Operational Performance", risk factor 4B "impact on hydropower safety"). It involves three main activities:

- the management of operational risks, by providing information to users (communication campaigns, information of the people operating on waterways, hiring "hydro-guides" during the summer months) about changes to water levels or flow fluctuations in powerplants downstream waterways;
- the management of facilities during periods of exceptionally high water levels, in order to ensure safety at the facilities and for the surrounding communities;
- measures to address the major risk associated with dam or reservoir failures, through the regular monitoring and maintenance of facilities under the supervision of public authorities. Of the largest dams, 67 of them are subject to a special administrative procedure ("Special Intervention Plan") implemented by the relevant prefect.

EDF performs regular monitoring and maintenance of dams, in particular by means of continuous structural health monitoring.

In addition, for each of the 239 A and B class dams (categories established in French legislation based on decree 2015-526 of 12 May 2015 pertaining to applicable rules for infrastructures built or developed with a view to the prevention of flooding and safety regulations for hydraulic infrastructures, enshrined in the French Environment Code), a hazard study is carried out every ten or fifteen years (for class A and class B dams respectively). These studies consolidate a satisfactory overview of the structures and associated countermeasures ⁽³⁾, and include a complete assessment made using underwater equipment or by emptying the reservoir. These operations are carried out under the strict supervision of public authorities. Since 2006, the engineering programmes for the safety and performance components of the hydropower fleet in operation have continued with a high level of investment, ensuring the careful management of major safety-related activities and providing them with national visibility. The goal is the technical updating and improved maintenance of the facilities, in order to maintain a high level of hydropower safety and preserve the technical performance of the fleet over the long-term.

(1) EDF Hydro, i.e. EDF SA in mainland France, including both non-controlled and controlled subsidiaries and borderland entities

(2) Arithmetic average

(3) For further details, see the annual report of the Inspector of Hydropower Safety, available on EDF's website.

1.4.1.5.1.3 Performance of the hydropower generation fleet

In 2019, EDF spent more than €470 million in mainland France for the development and maintenance of its hydropower generation fleet to ensure optimum and safe operation.

A highly-automated and remotely-managed fleet

In order to take advantage of the flexibility of its hydropower generation facilities, for some years now EDF has been initiating ambitious programmes involving automation, remote control of hydropower plants and centralised management for each valley. Currently, the largest plants in EDF's hydropower fleet, representing over 15GW (around 75% of its installed hydropower capacity) are remote-controlled from four control centres able to make adjustments to the plants' operating programmes at any time in order to respond to the needs of the electrical system and to economic opportunities arising on the electricity market.

To improve the reliability of its largest power plants, EDF monitors physical parameters (including temperature and vibration) of machinery, from five regional operations centres. This enables any discrepancy to be speedily detected; incidents can be avoided thanks to greater familiarity with the status and operational behaviour of the equipment.

Technical performance of the fleet and hydro power conditions in 2019

Hydropower generation may witness substantial variations from one year to the next, depending on climatic fluctuations in water resources. Key points for 2019 were: good production performance, with the implementation of transformation worksites; cash-oriented management; downtime optimisation based on market needs and prices; and production being impacted by very poor hydrological conditions through until October.

Hydropower electricity generation before the deduction of the power needed to operate pumped-storage plants was 39.7TWh in mainland France.

The 2019 generation indicators show a highly satisfactory level of performance with a low rate of internal loss ⁽¹⁾ of 4.0% (4.5% in 2018). The overall availability of the hydropower fleet, *i.e.* the percentage of time over the year during which the power plants are available at full capacity, was 99.3% in 2018 compared with 99.2% in 2018. The damage rate was 4.0% in 2019.

After having modernised maintenance and operation of its hydropower fleet, in particular through the renovation of electrical installations, I&C, and computerised management, maintenance, and operation solutions, EDF is continuing work to optimise and modernise its assets.

Anticipating needs relating to the expansion of variable renewable energy (solar and wind power), the emphasis is on increasing the flexibility of hydroelectric production resources and adaptation of power plant operation to capture the opportunities opened up by the development of European intraday power trading.

1.4.1.5.1.4 Hydropower generation issues

France's "Climate and Energy" Act of 8 November 2019 made hydroelectric development a French energy policy goal. EDF has decided to implement an appropriate structure to address the challenge of improving the hydropower potential of its installations. Over and above the production of renewable energy and its expansion, hydroelectric power also plays a major role in managing water resources locally.

Issues surrounding concession renewals

In France, hydropower generation facilities are operated under concessions awarded by the French State for structures of 4.5MW or more and within the framework of prefectural authorisations for structures of less than 4.5MW (see section 1.5.3.3. "Regulations applicable to hydropower facilities and other renewable energy installations" and 2.2.1 "Market regulation; political and legal risks", risk factor 1C Changes to the regulatory framework for hydraulic concessions).

EDF operates 80% of continental France's hydroelectric capacity, and 66% of hydroelectric power production.

Concessions have an initial term of 75 years, pursuant to the French Law of 16 October 1919 relating to hydropower use. The majority of concessions expired before 2012 were renewed for terms of 30 to 50 years. The French State has however not yet renewed 13 concessions that had expired at 31 December 2018. Since their expiry these concessions have fallen under the "rolling delay" situation defined by Article L. 521-16 par. 3 of the French Energy Code as when a concession that has expired but not been renewed is extended under its former conditions until such time as a new concession is granted so as to ensure the continuity of operations in the meantime.

In this context, EDF is preparing for the renewal of concessions under the legal framework set out in this section 1.5.3.3, combining improved energy efficiency, attention to aquatic environments, compensation of the government and municipalities through fees and regional development, while ensuring the safety and security of operations. Discussions between the French State and the European Commission (EC) to resolve to formal warnings in this respect are ongoing. Indeed, the European Commission (EC) initiated proceedings against the French State regarding hydropower concessions, based on Article 106 section 1 of the Treaty on the Functioning of the European Union (TFEU) read in conjunction with Article 102 of the same treaty. The European Commission therefore sent the French State a formal notice on 22 October 2015, stating that it considered that the French State has infringed the above-mentioned provisions by awarding the majority of the hydroelectric concessions in France to EDF and renewing them with EDF as these steps strengthen EDF's dominant position on the French retail electricity markets. The State replied to this notice, which marked the beginning of an adversarial exchange of positions between the State and the EC, which does not affect the final decision that will be adopted by the EC. As the chief interested party, EDF received a copy of the formal notice and sent its observations to the EC on 4 January 2016, firmly contesting the EC's analysis and the grounds for this analysis. EDF has since been involved in certain exchanges between the French State and the EC, particularly to provide technical details on the operation of the French market. In 2019, these discussions continued, in particular in view of the performance of the French market.

Furthermore, on 7 March 2019, the European Commission sent the French government formal notification concerning the renewal of hydropower concessions contracts. Seven other Member States also received formal warnings: Austria, Germany, Poland, Sweden, Portugal, and the UK, with Italy also receiving a second, additional formal warning. More specifically concerning France, the Commission alleged problems with the application of European law concerning public orders to these renewals as well as issues of non-compliance of French legislation governing these renewals with the same European Public Order law. The French State had two months to reply to the EC.

Development

In recent years, EDF has undertaken a number of major development projects for its hydropower fleet that are now coming to an end:

- construction of a new 240MW pumped-storage plants at La Coche, inaugurated in Q4 2019;
- renovating and increasing the generator output at the La Bathie power plant, increasing its capacity to 600MW: this work was completed in 2019;
- a new project at Romanche Gavet (93MW capacity with production potential of 55GWh), due to be commissioned in 2020.

EDF is intending to continue this expansion. Indeed, hydropower is a key component in energy transition, due both to the low-carbon nature of output and to its flexibility and storage capacity, which outperforms other energy storage solutions by far.

(1) Internal loss is the energy from flows that do not pass through turbines which were not stored. The rate of internal loss is obtained by dividing the internal loss by the generation performed during the year, and then adding the internal loss.

1. The Group, its strategy and activities

Description of the Group's activities

This goal is being leveraged in a number of ways:

- development of hydropower projects in France's overseas departments and territories to address the needs identified in these localities' multi-year energy programs (PPE);
- continuing to develop reserved-flow turbines. The purpose is to equip a certain number of dams in order to recover part of the energy associated with these minimum regulatory flows, by adding an additional total capacity of 4.5MW already commissioned since 2015; a number of new projects are being studied for commissioning between now and 2020;
- increasing the capacity of infrastructures managed under concession. A provision in France's "Climate and Energy" Act of 8 November 2019 makes it possible to use a declaration procedure to implement a capacity increase, subject to a number of conditions, including acceptance by the administrative authority in question. EDF is planning to launch capacity increase studies for a number of developments in 2020;
- strengthening its ambition in the small hydropower segment in metropolitan France (corresponding mostly to small and medium-output installations, producing less than 12MW for the most part, but sometimes up to 20-30MW), in two ways. The first involves improving performance of this segment in the existing fleet by means of dedicated asset management for these 237 power plants (with a production potential of 5,500GWh in 2019), using a profit & loss approach. The second aims to boost this segment by an additional 60MW, by means of acquisitions and a few disposals, in particular by developing so-called greenfield projects as part of CRE calls for tender (For instance, via its SHEMA subsidiary, EDF has won 5 tenders for a total of 9.4MW), as well as by increasing capacity within the existing fleet;
- major projects are also being developed to address storage requirements linked to energy transition and the growing need to compensate for very low water levels in view of climate change. Pumped-storage plants thus play a major role in energy transition and in integrating variable power sources in the French electricity system. EDF fully intends to enhance this hydropower asset via its storage plan, both in France and internationally. In particular, EDF is heading up a major project in the La Truyère Valley, extending the La Truyère and upstream part of the Lot concessions to address storage requirements. This was submitted by the French State in April 2017 to the European Commission. An authorisation in principle is awaited prior to the formal notification process.

Regional anchoring in hydropower valleys

EDF has always taken care to ensure the sustainable and shared development of the hydropower valleys and the economic regions close to generation facilities. These regions, often rural and sometimes isolated, are always looking to adapt to the changes in their environment: economic, societal or even climatic.

EDF has a clear commitment to strong local roots in this respect, combining a stance as a responsible concession manager based on dialogue with co-building alongside all stakeholders, supporting local economic development through its *Une rivière, un territoire* ("One River, One Territory") agencies:

- EDF's "responsible hydroelectric concession manager" policy is characterised by collaborative work with economic, political, and non-profit stakeholders, together with residents living close to the hydropower infrastructures being operated. It is structured around two main pillars: maximising economic outcomes of hydroelectric activity for "hydro territories", thus providing networks of local industrial resources (supplier panels list over 1,000 local companies specialising in various hydro lines of business), together with local services that benefit all stakeholders in the valley. An initial assessment of the employment footprint of EDF's hydroelectric activity in metropolitan France suggests the existence of some 3,280 indirect jobs;
- ongoing dialogue with stakeholders in "hydro territories" through consultation (the *Parlons Tourisme* ("let's talk tourism") consultation in Corrèze (Massif Central) and preparation of the new water level handbook for the Rance estuary, applicable in 2020, to ensure water levels are in line with the requirements of the seaward end of the Rance); co-building added-value projects with local stakeholders (local development policies such as "I Lac it" for the Tarn); development of day-to-day, multi-service information and data exchange interfaces (*Ma Rivière & Moi* ("My River and Me")) application for several valleys in the Alps, Pyrenées, and the Massif Central).

These two pillars are also brought into play for major worksites as part of the *"Chantier d'Avenir"* ("Worksite for the Future") policy. In 2019, this policy helped embed the hydroelectric worksites at La Coche, Savoie and Sabart, Ariège at the local level, on the basis of benefit-sharing with the locality in terms of economic outcomes, local jobs, and enhanced, ongoing dialogue with local residents and other local stakeholders.

In 2012, EDF launched a dedicated programme entitled *Une rivière, un territoire* ("One River, One Territory"). This has continued to expand, with the opening of an eighth agency devoted to the Rhine Valley. Since 2013, this local programme has created or maintained over 340 jobs in the valleys by means of loans to over 40 local companies. The 8 "One River, One Territory" agencies roll out action strategies tailored to their respective localities, aimed at integration through (and benefiting) employment, developing sustainable economic activity in the valleys, assisting public and private-sector project promoters, and developing innovation in these largely rural areas.

Managing access to water

The dams operated by EDF in France provide storage capacity for over 7 billion cubic metres of water. As well as generating electricity, hydropower infrastructures are also used to help with water management, and thus represent a major contribution by EDF to local life and economic development.

For instance, EDF provides a degree of flow capping during floods, and low water level support during periods of drought.

These initiatives are undertaken by EDF to benefit aquatic environments and other uses of water in the Garonne, Aude, Ardèche, Vienne, and Moselle river basins. EDF also maintains water levels commensurate with tourism at major reservoirs, allowing the development of recreational activities and the tourist economy as part of concerted policy initiatives. Similarly, EDF also ensures certain rivers have water levels that can accommodate sports and leisure activities such as canoeing and kayaking.

The Durance-Verdon and Saint-Cassien (Alpes-Maritimes) reservoirs also play a fundamental role in crop irrigation in Provence and the drinking water supply for the French Riviera.

Water management is carried out in consultation with the various stakeholders; in some cases, this includes agreements with local councillors, fishermen, farmers, and the managers of tourist destinations and industrial sites. EDF is thus a major stakeholder in local water management governance. For instance, EDF has set up an innovative "Basin coordinator delegate" scheme, so that all EDF's business lines have representation in water-related authorities such as basin committees and water agency boards of Directors. This representation and coordinated action within EDF as regards water management ensures its business is sustainable and nurtures shared management of water resources.

EDF is constantly seeking to minimise the impact of its infrastructures on aquatic biodiversity, abiding by reserved flow levels, fitting infrastructures with fishways on listed waterways, and adapting operating procedures where fragile environments so dictate.

1.4.1.5.2 Solar and wind power

1.4.1.5.2.1 Wind power

Wind turbines capture energy from the wind and turn it into electrical power. There are various categories:

- onshore wind power, a proven and increasingly competitive sector which is now close to competing with, if not matching, traditional sectors in certain areas. It benefits from economic incentives in various countries, although an increasing number of projects are developed without a financial support mechanism (see section 1.5.3.3.2.2 "Regulations applicable to wind power generation"). On average, the rated capacity of onshore wind turbines installed worldwide is more than 2MW, a figure which is increasing steadily. The subsidiary responsible for developing wind power within the Group is EDF Renewables. The Luminus and Edison subsidiaries are also active in onshore wind power;
- offshore wind power: this sector is expanding rapidly, and costs have decreased considerably in recent years. Development of the sector has been especially helped by the organisation of dedicated calls for tender in various countries. The advantages of this sector are the higher rated capacity of each wind turbine (typically over 5MW, and now up to 12MW) and increased productivity due to more reliable winds. The sector faces specific challenges in terms of construction, operation, and maintenance, due to the particular nature of the marine environment. The EDF group has decided to ramp up its investment in offshore wind generation which offers interesting development prospects in some of the Group's key countries including France and the United Kingdom.

1.4.1.5.2.2 Solar photovoltaic power

The operating principle of solar photovoltaic power is to convert sunlight directly into electricity. Photovoltaic solar power is used in two ways: it can either be connected to the grid, or it can generate electricity at isolated sites. Grid-connected photovoltaic systems have witnessed steady growth around the world in two markets: ground-based solar farms and rooftop installations on buildings and homes.

The cost of generating solar power has fallen considerably in recent years. However, there is still considerable room for improvement, especially in the field of innovation and enhanced industrial processes. EDF R&D also conducts research on photovoltaic technology, under the aegis of the French Institute for Photovoltaic Power Research and Development (IRDEP), established in partnership with CNRS (National Centre for Scientific Research) and ENSCP (Paris National School of Chemistry).

1.4.1.5.3 Other renewable energies

1.4.1.5.3.1 Biomass and biogas

Technologies based on biomass mainly consists of burning certain types of waste, particularly from the timber and farming industries, or exploiting wood fuel forests, to produce heat or electricity.

Biofuels can come from a wide range of sources. There are three different energy streams: combustion plants for plant matter (wood, agricultural waste) or animal matter; biogas generation plants (gas generated from the fermentation of organic animal or plant matter); household waste incineration plants.

Lastly, through its holdings, the Group owns shares in France (notably through its subsidiary Dalkia, see section 1.4.6.1.1 "Dalkia"), and abroad in several dozen heating networks and small-scale, mainly wood-fired generating plants.

1.4.1.5.3.2 Geothermal energy

The temperature of the rocks in the earth's crust increases with depth (3°C on average every 100 metres). In some regions, geothermal energy reaches the surface in the form of hot springs, water or steam. The hot water is used directly in the form of heat: central heating in homes or heating of greenhouses.

Steam extracted from the ground is also used to generate electricity: as in a classic thermal power station, it drives a turbine. It is also possible to use hot and dry rocks as a source of electricity production from steam. To develop this type of energy, EDF has joined forces with several partners (including ES and German energy companies) as part of a European consortium that develops and operates a prototype geothermal power plant in the hot, naturally fractured crystalline rock around Soultz in Alsace.

1.4.1.5.3.3 Battery storage

Electrochemical batteries consist in a system of cells, each of which consists of electrodes, a separator, and an electrolyte. The type of electrode and electrolyte varies depending on the battery technology in question: lead, lithium, nickel-cadmium, etc. The cost of batteries has come down considerably in recent years.

Energy storage is a rapidly-growing sector; EDF is involved in it *via* its Storage Plan (see section 1.4.1.5.4, "EDF Renewables"), part of which calls for the deployment of batteries to allow in particular to spread power generation from intermittent renewable energies.

1.4.1.5.3.4 Other technologies

Renewable energies cover a wide range of sectors and technologies. To prepare for the future, EDF Renewables responsible within the EDF group for identifying promising sectors and, with the support of the Group's R&D teams or industrial partners, contributes to the emergence of new technologies.

So-called concentrated solar power is one of the promising avenues being explored by EDF Renewables. As well as producing electricity, this technology allows energy to be stored.

1.4.1.5.4 EDF Renewables

Apart from hydropower, the EDF group's involvement in renewable energy is largely conducted by its a wholly-owned subsidiary EDF Renewables. The companies in the EDF Renewables group had a workforce of 3,685 employees at 31 December 2019.

EDF Renewables has the expertise required to ensure EDF's development in renewable energies, particularly in the fields of onshore and offshore wind power and solar photovoltaic power. EDF Renewables is fully engaged in the renewables market dynamic, with a strong presence in onshore and offshore wind power, as well as accelerating its solar power business. EDF Renewables is also expanding into the storage sector, in line with EDF's Storage Plan, which calls for 10GW of new capacity by 2035, including 4GW from large-scale batteries. Lastly, EDF is present in the decentralised renewable energy sector (rooftop solar power) for individuals and corporate customers in France (*via* the EDF ENR subsidiary), and more recently in the US and China for corporate customers (through EDF Renewables subsidiaries).

EDF Renewables has seen marked growth in installed capacity (up 11%/year on average over the past five years). As of 31 December 2019, EDF Renewables had gross installed capacity of 12,606.6MW, net installed capacity of 8,123.2MW and 5,041.3MW gross currently under construction. Excluding storage projects, the project portfolio totalled 30.4GW at the end of 2019⁽¹⁾. The EDF group aims to achieve net installed capacity in renewables (excluding hydropower) of 18GW by 2023.

With operations in over 20 countries, EDF Renewables is one of the benchmark players in the development and production of electricity from renewable energy sources, in particular in its main historic locations of North America (USA, Canada, and Mexico) and Europe (led by France and the United Kingdom). EDF Renewables has also undertaken a geographical rebalancing of its activities, increasing its presence in other countries with high potential for the development of renewable energy, including Brazil, China, India, UAE, Saudi Arabia, and Egypt.

EDF Renewables is an integrated operator in renewable energies and is involved in every stage of the value chain. EDF Renewables operates upstream, in project development, as well as in engineering during the construction of power plants and their operation and maintenance. EDF Renewables develops projects on its own or in partnerships, as appropriate.

As part of its business model, the Group is also involved in the Development and Sale of Structured Assets (an activity referred to as "DSSA"), which consists of selling projects it has built, in whole or in part, to third-party investors. With regard to DSSA, the net capacity sold in 2019 amounted to 1,337MW.

(1) The project portfolio total is 32GW if storage projects are included.

1. The Group, its strategy and activities

Description of the Group's activities

INSTALLED CAPACITY BY SEGMENT AND COUNTRY

(in MW)	At 31/12/2019		At 31/12/2018	
	Gross ⁽¹⁾	Net ⁽²⁾	Gross ⁽¹⁾	Net ⁽²⁾
Wind				
United States	3,424.5	2,605.4	3,704.5	2,605.5
France	1,652.6	1,485.3	1,536.0	1,328.1
UK ⁽³⁾	591.7	184.6	591.7	184.6
Turkey	661.6	267.4	661.6	267.4
Portugal	546.5	205.0	546.5	205
Canada	784.7	618.4	724.7	588.4
Mexico	391.5	229.5	391.5	229.5
Italy	39.8	25.2	424.2	298.1
Belgium ⁽⁴⁾	325.2	26.9	325.2	26.9
Greece	264.5	238.2	264.5	238.2
China	219.3	102.6	219.3	102.6
South Africa	110.6	55.8	110.6	55.8
Morocco	0	0	50.4	50.4
Poland	0	0	106.0	106.0
India	269.0	176.5	164.0	82.0
Brazil	182.0	182.0	182.0	182.0
Denmark	6.0	6.0	6.0	6.0
Germany	187.3	185.3	185.8	183.8
Chile	115.0	57.5	115.0	57.5
Total Wind power ⁽⁵⁾	9,771.6	6,651.6	10,309.2	6,797.8
Solar power				
France	334.5	210.8	230.4	174.9
United States	151.8	151.8	394.0	205.4
Decentralised energy (France) ⁽⁶⁾	0	0	66.3	40.1
Israel	295.1	192.5	295.1	192.5
India	207.0	99.7	207.0	99.7
Italy	0	0	76.9	74.3
Canada	61.4	42.4	61.4	42.4
Greece	12.1	12.1	12.1	12.1
Brazil	398.5	199.3	398.5	199.3
Chile	261.0	130.5	261.0	130.5
UAE	660.2	105.6	266.0	42.6
China	98.3	79.1	14.0	10.5
Mexico	119.6	119.6	119.6	119.6
Total Solar power ⁽⁵⁾	2,766.0	1,426.6	2,402.3	1,343.8
Other segments				
Hydropower	0	0	0.0	0.0
Biogas	0	0	70.0	70.0
Biomass	0	0	40.0	40.0
Storage	69.0	45.0	69.0	45.0
Total other segments ⁽⁵⁾	69.0	45.0	179.0	155.0
TOTAL ⁽⁵⁾	12,606.6	8,123.2	12,890.5	8,296.6

(1) Gross capacity: total capacity of the facilities in which EDF Renewables has a stake.

(2) Net capacity: capacity corresponding to EDF Renewables' stake.

(3) EDF Renewables owns 51% of EDF Renewables UK (the other 49% is owned by EDF Energy).

(4) MW in offshore wind exclusively.

(5) Corresponds to the sum of the exact values rounded to one decimal place.

(6) Transferred within the EDF group in 2019

In 2019, the electricity production of EDF Renewables' fully consolidated and equity-accounted fleet across all segments and countries was 23.4TWh. The load factor reached at end 2019 31% in onshore wind power generation and 14% in solar power generation.

Wind power

Onshore wind power

During the course of 2019, EDF Renewables actively pursued its development in onshore wind power, thus contributing to the EDF group's CAP 2030 strategy. EDF Renewables had a gross operating total of 9,771.6MW in onshore wind power as of the end of 2019. Onshore wind farms with a gross capacity of 714.4MW were commissioned in 2019, onshore wind farms under construction represented a gross capacity of 2,496.7MW at 31 December 2019.

France

EDF Renewables pursued its development in wind power, commissioning almost 119.7MW more in 2019, in wind farms in Les Taillades (27.2MW), Lozère (Occitanie) and Pays d'Anglure (22MW), Marne (Grand Est). In addition to these new capacities, several wind farms are under construction for a total of some 171.2MW, including Longues Roies (47MW). The development of onshore wind power in France also involves innovation by means of repowering or renewal (overhaul of a facility at the end of its service life) and the contractualisation of the first corporate PPAs. In liaison with Agregio, a subsidiary of EDF, corporate PPAs have been entered into with Maïsadour, a cooperative group based in Landes, and FEDA (Forces électriques d'Andorre). Maïsadour's sites thus benefit from the supply of 12MW of energy produced by the EDF Renewables wind farm located in the municipality of Fitou, Aude. FEDA uses renewable energy from EDF Renewables wind farms in the Occitanie region.

UK

In 2019, EDF Renewables signed two electricity sales agreements with Tesco for a period of 15 years for 54MW of wind power to be produced in Scotland. For the implementation of these agreements, EDF Renewables plans to construct two wind farms, including the Burnfoot East wind farm with capacity of 10.8MW.

Germany

In 2019, EDF Renewables acquired a portfolio of wind power projects with capacity of approximately 300MW currently being developed from Altus AG, a German player that is well-established in the sector.

Italy

In 2019, EDF Renewables transferred its assets to Edison (see section 1.4.5.2.4 "EDF Renewables in Italy").

Poland

In 2019, EDF Renewables disposed of all of its wind farms in Poland (106MW).

United States

In 2019, EDF Renewables continued its sustained development of onshore wind power, with construction commencing on 1.132GW worth of projects. EDF Renewables also commissioned the Stoneray wind farm (100MW) in Minnesota and the repowering project at Bobcat Bluff (162MW).

In addition to conventional electricity contracts, EDF Renewables North America has developed the sale of electricity through private contracts. Private contracts worth over 1,300MW of wind power capacity have been signed with companies such as Google, Microsoft, Procter & Gamble, and Salesforce.

Canada

The Romney project (60MW), 50% owned by EDF Renewables Canada, has been commissioned. EDF Renewables Canada has also signed a RESA (*Renewable Electricity Support Agreement*), a support agreement with AESO (*Alberta Electricity System Operator*), manager of the Alberta electricity grid. This 20-year contract relates to the Cypress project, of a capacity of 201.6MW. This project is part of a partnership between EDF Renewables, Canada, and the Kainai Nation.

India

At the beginning of 2019, EDF Renewables and SITAC group signed power purchase agreement covering 300MW of wind project in India.

Brazil

EDF Renewables Brazil is developing wind power, winning long-term electricity supply agreements in auctions organised by the Brazilian regulatory authority and distributors. In 2019, 292MW worth of wind power projects put forward by EDF Renewables won at these auctions.

Saudi Arabia

In 2019, EDF Renewables gained a foothold in Saudi Arabia, winning the call for tender for the Dumat Al Jandal wind power project in a consortium with Masdar. With installed capacity of 416MW, this will be the first wind farm in Saudi Arabia and the most powerful one in the Middle East. Construction of the wind farm began in 2019 summer.

Mexico

EDF Renewables had a gross total of 391.5MW onshore wind power capacity in operation as of the end of 2019.

In December 2019, EDF responded to a formal notice sent pursuant to the French "Duty of Care" Act pertaining to the planned Gunaa Sicaru wind farm, managed by a subsidiary of EDF Renewables in Mexico. In 2018, one of the NGOs signing this formal notice had referred the same project to the OECD's French national contact point (NCP). During the course of the OECD mediation process, the EDF group took part in two dialogue meetings with the plaintiffs and has already provided some responses to the concerns raised.

Offshore wind power

Offshore wind power represents a strong area in EDF Renewables' development. The company is already present on the offshore wind power market through several projects under development, in service or under management and maintenance across Europe (Germany, Belgium, France, UK) and aims to contribute significantly to the development of the offshore wind power sector in the US.

In France it won three projects in 2012 under the call for tenders issued by the French government, namely the offshore wind farms in Fécamp, Saint-Nazaire and Courseulles-sur-Mer. Together they make up a capacity of nearly 1,430MW and cost around €6 billion. All relevant permits for the three wind farms were granted. The partnership arrangement brings together EDF Renewables, Enbridge, and wpd for the Fécamp and Courseulles-sur-Mer projects. For the Saint-Nazaire project, EDF Renewables is associated with Enbridge. In 2018, the French State confirmed these three offshore wind farm projects and, in the summer of 2019, the French Council of State dismissed the appeals against the authorisation to operate the Saint Nazaire offshore wind farm project. It also dismissed the appeals against the maritime public domain occupation concession for the Courseulles-sur-Mer and Fécamp offshore wind farm projects. Construction of the Saint Nazaire wind farm commenced in September 2019.

The Dunkirk project was won in June 2019, following the call for tender launched by the French State. The future Dunkirk wind farm will have installed capacity of some 600MW. The successful consortium consists of EDF Renewables, Innogy, and Enbridge, and will carry out the design, construction, operation, and maintenance of the future Dunkirk offshore wind farm.

In addition, in 2019, EDF Renewables UK commenced construction of the future Neart na Gaoithe offshore wind farm in partnership with Irish electricity company ESB. This 450MW project is located in the Firth of Forth on the eastern coast of Scotland. All the necessary administrative authorisations have been acquired; the project also has a fifteen-year Contract for Difference (CfD) at a tariff of £114.39/MWh (2012 values), as well as grid connection agreements. EDF Renewables has joined forces with ESB, the leading provider in Ireland, with the latter taking out a 50% stake in the project.

EDF Renewables US set up at the end of 2018 with Shell New Energies US, LLC (Shell) a joint-venture equally owned, called Atlantic Shores Offshore Wind, LLC. This joint-venture focuses on the development of offshore wind projects, in the New Jersey Wind Energy Area (WEA), as part of a lease issued by US Federal authorities. The area covered by the lease has a potential for wind power generation of about 2,500MW. The area offers strong and steady wind resources in relatively shallow water, close to large population centres with high electricity demand.

Lastly, in 2019, EDF entered into a partnership with the China Energy Investment Corporation (CEI) electricity company with a view to the joint construction of two offshore wind farm projects in China. The Dongtai IV and V offshore wind power projects represent total capacity of 500MW: they would be the EDF group's first offshore achievements in China.

1. The Group, its strategy and activities

Description of the Group's activities

Photovoltaic solar power

EDF Renewables continued to expand in solar power with a view to rebalancing different technologies. At end 2019, gross installed solar capacity was 2,766.0MWp (1,426.6MWp net), up by 82.8MWp net *i.e.* +6%, compared to end 2018. EDF Renewables also has a portfolio of solar projects under construction comprising 1,479.8MWp gross.

France

EDF Renewables has structured its policy in such a way as to contribute to EDF's Solar Plan, launched by the Group in December 2017 with the aim of developing and constructing 30% of the new solar power capacity in France for the 2020-2035 period. EDF thus aims to become the leader in solar power in France, with 10GWp in 2028 and 30GWp in 2035. In order to step up its growth in solar power, EDF is implementing a strategy covering all market segments, based on an integrated development model for projects up to their operation, the quest for industrial excellence and continued investment in innovation. This strategy leverages EDF's research and development and the territorial networking of EDF's teams dedicated to local authorities and businesses. The lands targeted as a priority are sites referred to as "damaged", *i.e.* industrial wastelands, polluted, abandoned or former quarry sites, which can be rehabilitated with the development of photovoltaic projects.

Since announcing its Solar Plan, EDF has successfully completed the preparatory phase of the Plan. 2,000 hectares of land have been secured, projects for 500MWp have been authorised, and in 2019, EDF's market share in CRE calls for tender increased significantly, with 23 successful projects totalling 180MWp. The solar power projects commissioned in 2019 account for a total of 24.2MWp, amounting to growth of 20%. In addition, in 2019, EDF Renewables acquired the Luxel Group, an independent solar power player in France. Luxel's portfolio, totalling one gigawatt peak (1GWp), comprises solar farms that are already being operated together with projects ready to be constructed or currently being developed. This acquisition has helped accelerate the growth of EDF Renewables in solar power and achieve the Solar Plan targets.

Innovation also supports the development of solar power, notably in the form of projects for floating power plants and crowdfunding campaigns. Lazer, the first floating solar plant of the EDF group on the Buëch, in the Hautes Alpes, was selected for the ground-based solar call for tenders launched by the Ministry of Ecological and Solidarity Transition. The solar panels of this project of a maximum power of 20MWp will be installed on 24 hectares on the hydroelectric reservoir *i.e.* three-quarters of the water surface's total area.

Some projects include a crowdfunding campaign, enabling the inhabitants of a region to be involved with the funding of the projects in question. This was the case, for example, for the Aramon project (5MWp) in Gard and the Saint-Pargoire project (11MWp) in Hérault, for which a crowdfunding campaign was organised on the leading digital investment platform WISEED.

Italy

In 2019, EDF Renewables transferred its assets to Edison (see section 1.4.5.2.4 "EDF Renewables in Italy").

United States

In 2019, EDF Renewables North America won a long-term contract for the Morris Ridge solar power project, with installed capacity of 212MWp/170MWac. In addition to conventional electricity sales contracts, EDF Renewables North America has developed the sale of electricity through private contracts, resulting in private contracts totalling over 200MWp of solar capacity being entered into with companies.

Mexico

The Group entered the Mexican solar power market in 2016 by winning the Bluemex project following a national call for tenders. Located in the state of Sonora, the plant (119.6MW) was commissioned in July 2019.

India

The Group is developing its solar power business in India through EDEN, a joint subsidiary created for this purpose in 2016 by EDF and EREN Renewable Energy. In 2019, the subsidiary entered into four electricity sales contracts in northern India for total capacity of 716MWp.

United Arab Emirates (Dubai)

EDF Renewables joined the consortium led by Masdar to develop the "DEWA III" project which is the third phase (800MWac) of one of the most powerful solar farm projects in the world, the Mohammed bin Rashid Al Maktoum solar farm, which is being developed in partnership with Dubai Electricity and Water Authority (DEWA) near Dubai.

Commissioning of the power plant is planned in three successive phases. The first two phases (500MWac in total) were commissioned in 2018 and 2019 respectively. The commissioning of the last unit is planned for 2020.

Egypt

EDF Renewables joined forces with Elsewedy Electric to develop, build and operate two photovoltaic plants with a total installed capacity of 130MWac. Located in the south of the country the two plants form part of the Benban solar complex (1.8GWac) and come with a 25-year power purchase agreement (PPA) with the Egyptian Electricity Transmission Company (EETC). The Benban solar power plants were commissioned in August 2019.

In 2019, EDF Renewables announced the strategic acquisition of a stake in Karm Solar, a major player on the emerging independent solar power producers' market in Egypt aimed at domestic customers. Karm Solar has a total portfolio of 170MW of solar power plants, including operational plants and plants under construction or development.

Morocco

In 2019, EDF Renewables, in a consortium with Masdar and Green of Africa, successfully bid for the first phase of the Noor Midelt 1 solar project in Morocco, using a hybrid solar-storage technology that is a world first. This hybrid solar project with installed capacity of 800MW innovatively combines two technologies: concentrated solar power (CSP) and photovoltaic solar power.

Operating & Maintenance

As an integrated operator, EDF Renewables operates and maintains most of its own wind and solar facilities. Dedicated first and foremost to EDF group wind and solar assets, this activity is also carried out on behalf of third parties. Worldwide, EDF Renewables operates 15.0GW at end-December 2019 with over 1200 experts, engineers and technicians across nine countries. EDF Renewables has long been active in the operation-maintenance field in North America where it manages close to 11.3GW. The business in Europe and the rest of the world exceeds 3.6GW at end 2019.

This activity is driven by commissioning new plants and choosing which facilities to operate on a case-by-case basis according to technology and region. The aim is to achieve maximum efficiency in every facility in conjunction with providers throughout the expected or extended useful life of equipment.

Accordingly, EDF Renewables recently set up a predictive maintenance oversight centre (e-Diagnostic Center) drawing on specific in-house expertise centralised and coordinated with the EDF group's R&D Department. It complements the facility remote monitoring and control system made up of three real-time oversight centres in Colombiers (France), Emden (Germany) and San Diego (California).

Since 2017, EDF Renewables owns *via* its subsidiary REETEC GmbH a subsidiary specialising in the operation and maintenance of offshore wind farms, the German firm Offshore Wind Solutions GmbH (OWS). OWS operates and maintains the BARD Offshore 1 wind farm (400MW) located 95km off the German coast in the North Sea.

EDF Renewables owns several European maintenance centres: in Belgium, Greece, United Kingdom, Germany and France. These operation-maintenance units are designed to place technical teams as close to wind or solar farms as possible to ensure faster response times and thus operational performance.

Decentralised Energy

France

EDF ENR is an integrated player in decentralised solar power production, carrying out design, development, construction, operation, and maintenance of rooftop and car park canopy installations. A wholly-owned subsidiary of the Group, it markets solar power offers for domestic customers, professionals, and local authorities in metropolitan France and overseas departments and territories. With over 10,000 installations of its residential self-consumption "Mon Soleil & Moi" (My Sun & Me) solution, first launched in 2016, EDF ENR now enjoys a leading position on the market. On the professional market, the offering features in the "EDF Energy Solutions" catalogue, under the responsibility of business market sales teams. EDF Renewables Technologies, a wholly-owned subsidiary of EDF Renewables, also operates upstream in the sector. It owns 100% of EDF ENR PWT (Photowatt brand) which designs and manufactures photovoltaic modules using crystalline silicon technology with various applications ranging from residential equipment to land-based solar farms. Since late 2018, Photowatt has been rolling out a new industrial model focusing on low-carbon production of high-technology silicon wafers and ingots. The generation capacity is gradually reaching over 500MWp a year at Photowatt's existing facility at Bourgoin-Jallieu (38) in the Auvergne-Rhône-Alpes region in France. Alongside this joint project, Photowatt focuses on its R&D activities, renamed Photowatt Lab, in conjunction with the EDF group's R&D Department and solar energy research centres such as INES or the Photovoltaic Institute of

Île-de-France region with a view to fostering the emergence of new technology in the field of photovoltaic cells and modules and testing it in pre-industrial conditions.

United States

EDF Renewables is engaged in a growth strategy in the USA on the decentralised energy market. A number of acquisitions have fuelled growth since 2016. Following the acquisition in 2016 of Global Ressources Options, Inc. (groSolar), which specialises in the installation and sale of photovoltaic plants for local authorities, service companies and industrial players, in 2018, EDF Renewables North America entered into a strategic partnership with EnterSolar, a leading supplier of solutions for the decentralised generation of solar energy for commercial and industrial (C&I) customers. This partnership concerns the EDF Renewables equity investment in EnterSolar to the tune of 50%. It will allow both companies to offer C&I customers the most comprehensive range of solutions for "behind the counter" decentralised electricity generation and to capitalise on the sharp growth in demand for decentralised generation solutions from the C&I sector.

In 2019, EDF Renewables North America acquired PowerFlex Systems with the aim of speeding up large-scale deployment of infrastructures for electric vehicles in the USA. Based in Los Altos, California, PowerFlex System is a pioneering firm in the field of charging technology. This acquisition has allowed the creation of a unique decentralised energy ecosystem combining smart charging solutions for electric vehicles and power charging for buildings, together with solar power production and storage facilities.

China

In 2018, EDF Renewables together with Asia Clean Capital (ACC), one of the main developers in China of rooftop photovoltaic installations for local businesses and multinationals, launched a joint venture aimed at building and operating a portfolio of decentralised solar energy projects on rooftops. The joint venture shall leverage the local reputation of ACC as a key decentralised solar player in the country and the international expertise of EDF Renewables in decentralised solar power and in self-consumption solutions for industrial players. In 2019, EDF Renewables acquired a majority stake in an asset portfolio comprising 77MWp of rooftop solar power installations with Asia Clean Capital.

Storage sector

In 2018, the Group launched an Electricity Storage Plan which provides for the installation of 10GW new storage facilities for electricity systems by 2035, to which EDF Renewables contributes.

In a context marked by the strong growth of renewable energy generation and by the closure of large-scale electrical facilities, battery storage technology, combined with a smart control system, helps smooth out the generation of electricity of the national grid. In this context, through its subsidiaries, EDF Renewables develops innovative storage systems in the US, the United Kingdom and France.

In 2015, for instance, EDF Renewables North America commissioned an innovative storage system. The McHenry facility provides nearly 20MW of capacity (40MW of dynamic capacity) and helps monitor an energy reserve to stabilise the frequency of the electricity grid at a local level.

In 2018, EDF Renewables commissioned the battery storage system with a capacity of 49MW located in the West Burton B plant in Nottinghamshire in the UK. This facility is the most important project of the new frequency control system to be rolled out across the entire UK. The objective is to improve electricity grid stability and quickly respond to grid frequency fluctuations.

In 2018, EDF Renewables also signed two twenty-year power purchase agreements in the US relating to the construction of the Big Beau Solar+Storage solar project, in California (see section Solar photovoltaic power North America), and connected to the battery storage system of 40MW (160MWh).

In 2019, EDF Renewables bought UK start-up Pivot Power, specialising in battery electricity storage and charging infrastructures for electric vehicles. The EDF group is already the UK's leading producer of low-carbon electricity; this acquisition will now enable it to become one of the country's leading battery storage installers, too.

Lastly, the Noor Midelt I solar power project in Morocco (see section 1.4.1.5.2.2, "Solar photovoltaic power") is a major project for the storage industry.

1.4.2 Sales and supply activities in France

1.4.2.1 Presentation of the market in France

1.4.2.1.1 Demand

In 2019, gross consumption stood at close to 474TWh, i.e. 1% down compared with the previous year. This decrease is due to generally milder temperatures, in particular at the start of the year, and slower economic growth than in 2018.

1.4.2.1.2 Competition

Since 1 July 2007, the French market for electricity and gas has fully opened-up each customer able to choose their energy supplier.

Over the last four years, the number of active electricity suppliers in France excluding historical suppliers has doubled from 24 at end-2015 to 47 at 30 September 2019 according to the Energy Regulation Commission (CRE).

In the electricity and gas markets many suppliers have been proposing offers to businesses and local authorities since the early 2000's. For residential customers, competition has intensified significantly since 2017 with the entry into the market of gas and electricity suppliers well established in other activities or geographical areas.

To supply their customers in 2019, EDF's alternative suppliers had access to their own generation capacities as well as to the wholesale electricity market and ARENH ("Regulated Access to Historic Nuclear Energy") for around 100TWh. During the November 2019 application process, the demand from alternative providers reached 147TWh for an ARENH distribution volume of 100TWh (see also section 1.4.3.3 "Regulated Access to Historic Nuclear Energy (ARENH)").

French Act 2019-1147 of 8 November 2019 on energy and the climate (known as the "Climate and Energy" Act) implemented the July 2017 decision by the French Council of State ruling that regulated gas sales tariffs contravene EU law. Regulated gas tariffs will disappear in late 2020 for professional customers using less than 30MWh/year, and on 30 June 2023 for domestic customers, in line with the procedures detailed in law. The "Climate and Energy" Act also specifies procedures for ending regulated electricity sales tariffs for certain customer categories (see section 1.4.2.1.3. "Regulated electricity sales tariff contracts").

1.4.2.1.3 Regulated electricity sales tariff contracts

Access to regulated electricity tariffs

Appeals were lodged by Anode and Engie before the Council of State against the tariff decisions of 28 July 2016 and 27 July 2017 on the grounds that the regulated electricity sales tariffs known as *tarifs bleus* for households and small companies do not comply with European law.

By decisions of 18 May and 3 October 2018, the Council of State accepted the principle of regulated electricity tariffs, recognising in particular that they pursue the objective of general economic interest of guaranteeing that consumers pay for electricity at a price which is more stable than market prices. The Council confirmed that this objective can only be met by a less restrictive state intervention than a general electricity unit price regulation and that the regulation on "Regulated electricity tariffs" (TRV in French) guarantees equal access to consumers by electricity companies and is not discriminatory.

However, the Council of State considered that the tariff regulation is disproportionate in its duration, which is permanent, and its scope of application, which currently covers large business sites with subscribed power levels below 36kVA. These elements justified the partial cancellation of the tariff decisions of 2016 and 2017.

1. The Group, its strategy and activities

Description of the Group's activities

In another development, EU Directive 2019/944 of 5 June 2019 now establishes the framework within which Member States may control electricity prices. For instance, the Directive provides for a derogation to maintain regulated sales tariffs for the sole benefit of domestic customers and micro-companies. Member States have until 31 December 2020 to transpose this Directive.

The provisions of the "Climate and Energy" Act implement the decisions of the French Council of State and transpose Directive 2019/944 of 5 June 2019.

Therefore, since the Energy-Climate Law entered into force, the situation for electricity, by category of customer, is as follows:

- domestic final consumers who have subscribed power for their site(s) not exceeding 36kVA: these customers benefit from regulated sales tariffs. They can freely switch back and forth between regulated tariffs and market offers;
- for non-domestic end consumers with subscribed power levels of 36kVA or less, only consumers with fewer than 10 employees and a turnover, total revenue, or balance sheet of less than €2 million will still be able to benefit from regulated sales tariffs after 31 December 2020. Consumers that do not fall into this category will lose the benefit of regulated tariffs on 31 December 2020, following the process described by the law;
- domestic and non-domestic final consumers who have subscribed power for their site(s) exceeding 36kVA: since 1 January 2016 these sites can no longer subscribe to regulated sales tariff products which were cancelled on 31 December 2015;
- domestic and non-domestic final consumers for their site(s) located in areas not connected to the continental metropolitan network: these customers have the right to regulated sales tariffs.

"Tarifs bleus" (blue tariffs applicable mainly to households and small companies) – tariff changes

Since 8 December 2015, in accordance with Articles L. 337-4 and L. 337-13 of the French Energy Code ("NOME law"), the CRE has been responsible for notifying the ministries in charge of the economy and energy of its justified proposals for regulated electricity sales tariffs (TRV). If no objections are made within three months, the proposals are deemed to have been approved.

For the tariff changes of 2019, the CRE, in accordance with the NOME Law, issued a decision on 7 February 2019 proposing that the Government should raise the "blue" regulated tariffs for residential customers and non-residential customers by +5.9% including taxes. This proposal, confirmed by a tariff decision dated 28 May 2019, published in the *Journal officiel* on 30 May 2019 was implemented on 1 June 2019.

Thereafter, the tariff level of summer 2019 was also changed in accordance with this process: given the change in the Network Access Tariff (TURPE) on 1 August 2018 and pursuant to the French Energy Code, the CRE proposed in a deliberation dated 25 June 2019 a reduction of 1.26% including tax in residential blue tariffs and an increase of 1.10% including tax in non-residential *tarifs bleus*. The CRE's proposal was approved in a tariff decision of 30 July 2019, published in the *Journal officiel* of 31 July 2019 and implemented on 1 August 2019.

With respect to 2020 tariff changes, the CRE proposed to the government, via the decision of 16 January 2020 published on 24 January 2020, that residential and non-residential *tarifs bleus* be increased by +2.4%, including tax. In this proposal, 1.5% corresponds to making up, within 2 years, the delay in the tariff coming into effect in 2019, and 0.9% corresponds to taking into account costs relating to the construction of regulated sales tariffs for electricity: wholesale prices for capacity and power, the effects of ARENH capping, and changes in marketing costs, including the costs of Energy Savings Certificates. The French Energy Regulation Commission (CRE) proposal was confirmed in a tariff ruling on 29 January 2020, published in the French Official Journal on 31 January 2020 and implemented on 1 February 2020.

1.4.2.1.4 Electricity supply contracts

In France, domestic and non-domestic customers with subscribed power levels of less than 36kVA are entitled to regulated sales tariffs, and may also choose a market offer put forward by any supplier, including EDF.

With the exception of customers directly connected to the transmission network, who must sign separate supply and delivery contracts, all other customers may enter into a single contract with the supplier of their choice for their electricity supply and transit. In this regard, a commission is paid by the distributor to any supplier offering a single

contract to its customers since in doing so, it provides customer management services on behalf of the distributor.

The quality of supply, which is the distributor's responsibility, is monitored on a regular basis under contracts with the distributors. EDF monitors the impact of outages and the quality of supply to its customers and their satisfaction with the aim of working with the distributor on a continuous improvement basis (see section 1.4.4.2.2 "Distribution activities").

1.4.2.2 The Customer Division

EDF's sales and supply activities in France (excluding overseas departments and Corsica) are managed by the Customer Division.

The power marketed by EDF in France is often combined with services. Almost 29 million delivery points are served by EDF offers (excluding French overseas territories and departments and Corsica). EDF is committed to earning its customers' trust by engaging in responsible marketing featuring commercial offers that are transparent, straightforward, and clear.

EDF sales on the electricity market in 2019 amounted to 264TWh, excluding transfers to Local Distribution Companies (ELDs).

EDF provides gas supply to all types of customers. In 2019, EDF marketed 31TWh of gas.

Besides gas and electricity supply, EDF accompanies its customers through energy efficiency offers and new decentralised energy solutions.

Implemented in 2006, the energy savings certificates (CEEs) scheme was amended on 1 January 2018: the national obligation for the fourth period (2018-2020) was fixed at 1,600TWh, of which 400TWh for households in a situation of energy poverty. The French Decree no. 2019-1320 of 9 December 2019 extended the fourth period from three to four years increasing the obligation proportionally to the duration, i.e. 2,133TWh. In view of its diversified supply strategy, EDF has covered its obligations by its own production coupled with partnerships, programmes, and direct purchases. In this respect, in 2019, EDF took part in 230,000 renovation projects, 53% more than in 2018.

1.4.2.2.1 Activity by customer category

1.4.2.2.1.1 Residential customers

EDF innovates on a daily basis and the satisfaction of residential customers is a priority: after contacting EDF, about nine out of ten customers are satisfied with the manner in which they were dealt with, whatever the channel or reason why they contacted the Company. The annual report of the French national energy mediator published in May 2019, shows that EDF has the lowest rate of disputes, far behind its competitors. The customer experience offered is both digital (customer space, chat, web call back, mobile application, digital solutions, social media, etc.) and human. 5,000 advisers, all based in France, are attentive to the needs of customers and offer them personalised advice. At end-December 2019, over 47,000 training hours were given to EDF advisers on commercial relation and sales.

Energy supply

EDF supplies electricity at the regulated sales tariff (TRV) and with a comprehensive range of market offers in electricity. To offer even more choice to its domestic customers in 2019, EDF extended its electricity market offering; as of the end of 2018, this comprised the Vert électrique, Vert électrique Weekend, Vert électrique Auto, and Digiwatt options. In June 2019, EDF launched "*Mes Jours Zen*" (*My zen days*), a range of electricity supply offers for domestic customers seeking electricity prices in line with their consumer habits. These offers allow customers to benefit from an attractive price per kWh (before tax) every weekend and on national public holidays, and, with "*Mes Jours Zen Plus*", an optional additional day of their choice during the week⁽¹⁾: Monday, Wednesday, or Friday. These offers are directed at customers equipped with a Linky smart meter⁽²⁾, of which there are now around 23 million in France.

EDF's range of market offers in gas includes three offerings. "*Avantage Gaz*" offers a fixed price per kWh (before tax) for a period of four years and one month. Over and above the characteristics of the "*Avantage Gaz*" offer, "*Avantage Gaz Durable*" offers carbon offsetting based on the customer's estimated gas use. Lastly, "*Avantage Gaz Connecté*" gives customers the possibility of managing their heating remotely and enhancing their comfort with the purchase of a connected thermostat.

(1) 30% cheaper as of the launch date. The price per kWh before tax is low at weekends, on national public holidays, and for "My zen days Plus", on the chosen day of the week (Monday, Wednesday, or Friday) compared to the price per kWh before tax on other days of the week.

(2) Led by Enedis.

Features and services

Alongside its supply offers, EDF helps domestic customers to achieve energy savings using "Mes Écos et Moi" digital solutions (available via the website customer space and the "EDF and Me" application) to track and understand their energy use. Customers who consult their energy use tracking tool more than 2-3 times a month can achieve savings of up to 12% on their bills ⁽¹⁾.

EDF, in partnership with AXA, offers a comprehensive range of support services, called "Solution Dépannage Confiance" with three rapid repair options applying to external electricity and gas installations ("electricity & gas" option), electricity, gas & water installations and plumbing/locksmith problems (home option) and equipment ("equipment" option). Also in partnership with AXA, EDF offers "Assurénergie" which allows customers to benefit from a flat rate reimbursement to enable them to pay their energy bills in the event of difficulties (loss of employment, inability to work, hospitalisation, invalidity or death).

On 7 February 2019, EDF launched IZI by EDF, its new local services interface for domestic customers and small businesses. Nine city districts (Bordeaux, Lille, Lyon, Marseille, Nantes, Nice, Paris, Rennes, and Toulouse) have been covered right from the launch; over 300 services have been offered to customers, including emergency repair work, minor works, indoor renovations, boiler maintenance, solar power repairs, electric vehicle charging points, and connected remote monitoring services.

EDF also assists customers engaged in energy renovation works through its network of Energy Savings Partners and its EDF Energy Bonus. As part of the "Coup de Pouce" ("helping hand") scheme, launched by the French government in January 2019 EDF developed its "Mon chauffage durable" ("My sustainable heating") offer, in which ageing heating systems are replaced by more efficient ones. This may involve replacing a legacy fossil fuel boiler (gas, fuel oil, ...) with a heat pump, or last-generation radiators with environmentally efficient models. For heat pumps, EDF goes further than the legislation, offering additional bonuses. If they so wish, households may also benefit from preferential rate financing, provided by EDF's financial partner, covering entire cost of the project ⁽²⁾.

Lastly, EDF is investing in open innovation with "EDF Pulse & You", a digital collaborative platform for co-construction with internet users and start-ups. Since its launch in March 2016, 8,000 Internet users have taken part in the development of innovative projects by testing new products and have made more than 100,000 contributions.

Earning of energy savings certificates (CEE)

EDF is of necessity an actor in energy savings certificate legislation, and encourages domestic customers to make energy savings, particularly by promoting home energy renovation through its Energy Savings Partners network (see section 1.5.2.1.2 "French Legislation: the Energy Code"). All residential customers who made energy efficiency alterations to their home qualify for a direct cash bonus from EDF by visiting www.prime-energie.edf.fr and providing the information and documents required.

Solidarity policy

Solidarity is a core value of EDF, which has been pursuing a policy dedicated to economically disadvantaged customers for close on 30 years (see section 3.3.1.1.3 "Energy poverty").

1.4.2.2.1.2 Business customers

EDF and business customers

EDF Entreprises supports businesses and professionals so as to contribute to their energy performance, in particular by helping them reduce their energy bills and participate in the energy transition. This action is at the core of the EDF group's strategy, which favours in particular the development of energy services.

EDF Entreprises' products

EDF Entreprises offers a range of competitive electricity and gas supply offers to companies and professionals, geared to each customer's expectations and types of energy use.

For small businesses and professionals, EDF Entreprises provides straightforward contracts combined with management services, enabling customers to focus on the business whilst optimising their energy supply. For those customers using more energy, contracts can be personalised (with specific durations and fixed or indexed prices) based on their expectations and budget forecasting capabilities. Lastly, EDF Entreprises is able to tailor solutions for the heaviest users depending on the structure of their consumption.

EDF Entreprises structures its products to encourage its customers to optimise consumption according to generation costs by offering different prices at peak and off-peak hours and even summer and winter prices for heavier users during these times of year.

EDF Entreprises offers all its customers across all its products the option to choose electricity from renewable sources to cover their consumption. For small and medium sized enterprises and professionals, it involves a specific offer, the renewable energy contract, which guarantees that 100% of their consumption will come from electricity generated from renewable energy sources and facilitates their communication with their own customers regarding their commitment. For larger customers, it involves an option that allows them to decide themselves what proportion of their consumption will come from guaranteed sources, between 20% and 100%.

EDF Entreprises has a diversified range of products intended for all its electricity and gas customers, whether small companies or large industrial customers: online consumption monitoring, electronic invoices, assistance and troubleshooting, advice (optimisation of subscribed power, efficiency and reduction of energy expenses, etc.), in particular for customers who want to use an energy management system.

EDF has put into place offers dedicated to large customers, not only with tailor-made electricity and gas supply offers and offers that reward customers that can shed load, but also support controlling their energy consumption and their CO₂ emissions as well as CO₂ trading for businesses subject to the national quota allocation plan (see section 1.5.2.1.2 "French legislation: the Energy Code").

Lastly, in order to assist its customers with the energy transition, EDF Entreprises gets involved into the promotion of eco-gestures by means of awareness-raising campaigns. In addition, EDF Entreprises carries out energy audits for its customers in order to help them better identify the possible energy savings. EDF Entreprises' certified teams assist their customers with the implementation of energy management systems (ISO 50001).

EDF also works with its Business and Local Authority customers as they seek to engage directly in energy transition. Optimised solar power solutions for self-consumption of electricity may be offered, together with a range of related services, including financing, maintenance, supervision, and performance monitoring, in liaison with EDF ENR. EDF also has new offers for its self-consuming customers to complement their electricity supply tailored to their profile, whereby they can maximise their savings from self-generation and, where necessary, manage their consumption. EDF is also innovating by experimenting with services and technical systems aimed to facilitate the organisation and management of collective self-consumption operations; EDF is engaged in several pioneering operations in France.

Customer satisfaction

EDF Entreprises has made customer satisfaction a key priority for many years. In a rapidly changing environment, it has undertaken major changes to significantly and constantly improve Customer Experience and the quality of service provided.

To achieve this, EDF Entreprises has implemented a customer attentiveness scheme covering every step of Customer Relations, thereby anticipating changes and expectations in terms of the supply of energy, services, information, and assistance. This policy resulted in a significant rise in overall satisfaction for all EDF Entreprises customer segments in 2017, stabilising in 2018 and 2019, with 90% of all customers reporting they were satisfied or highly satisfied.

(1) Internal survey, EDF R&D.

(2) Subject to using one of EDF's 3,000 Energy Savings Partners and examination and acceptance by EDF's financial partners Domofinance.

EDF and regional authorities, social housing landlords, local distribution companies ELDs and public service providers

Against the energy transition, EDF offers customised solutions for local authorities and public institutions with decentralised decision-making powers (hospitals, universities and major graduate schools, chambers of commerce and industry, CROUS student service centres, ports and airports).

As an operator in a competitive sector, the EDF group is active for these customers in three areas:

- the supply of electricity and gas at market price, responding to their energy problems (proposal of offers and solutions adapted to the needs described in calls for tender);
- the development of offers and services in terms of energy transition: local climate plans, eco-districts, local generation, road lighting, electric mobility, energy efficiency of buildings, etc.;
- in addition, with respect to its public service missions, EDF is in charge of:
 - the conclusion of concessions agreements to supply electricity at the regulated sales tariff,
 - the supply of electricity at the regulated sales tariff,
 - the fight against energy poverty.

In 2019, overall satisfaction of EDF Collectivités customers is stable with 9 customers out of 10 satisfied or very satisfied.

Managing energy consumption with local authorities

Agreements covering local demand-side management have been entered into with local authorities. In addition, local authorities with the power to make decisions in the area of energy arrange specific actions in their region in matters concerning control of energy transitions and renewable energies. A "Load Amount" device for social-housing lessors aims to improve the energy efficiency of social housing, and makes it possible for EDF to issue energy savings certificates. In 2019, 190,000 social housing homes received assistance for renovation works. EDF also funds Economy Savings Certificates programmes, in particular for local authorities (e.g. positive energy regions and "Watty at School").

1.4.2.2.2 For sustainable cities and regions

Cities and regions have to reconcile local appeal with responsible development. EDF addresses the needs of local development stakeholders by identifying the various energy solutions and services available in the light of projects' technical and economic characteristics, assisting with energy transition and low-carbon strategies.

EDF has developed a range of consultancy offerings with a view to designing low-carbon neighbourhoods, developing housing stock renovation strategies based on an asset strategy, vehicle fleet electrification, and charging station location plans with its subsidiary Izivia, and installing solar panels with its subsidiary EDF ENR or other partners. The *Bilan Énergétique* ("Energy Review") available on the EDF Collectivités website can be used to provide an initial appraisal of a locality's carbon status.

45 Development Managers are present across all regions so that EDF can better meet the needs of large cities, urban communities, medium sized cities, rural areas.

1.4.2.2.3 Customer data protection

The protection of data belonging to EDF customers is a major component of the Customer Department's action plan to secure assets/goods and information systems.

Measures taken under the plan are presented every year to suppliers' governance bodies.

Special attention is paid in particular to compliance with data processing regulations (general data protection regulation – GDPR). Works are regularly conducted to update the description of customer data processing and identify their Operational Data Controllers (ODCs). The Data Controller and the ODCs meet regularly as a dedicated group, the Data Protection Committee (*Comité de protection des données*).

All Customer advisers of the Residential Customers market and the Corporate Customers market have been trained to deal with requests from customers regarding the exercise of their rights. All employees in the Sales and Marketing Department are required to undergo GDPR training.

Every year, an internal audit on the capacity of the information systems to securely host customer data is conducted. It ensures that only employees in charge of customer relations have access to customer data.

(1) Network operator, independently managed.

(2) Source: RTE.

Access to customer data is granted only after a best practice charter has been signed; certification is also required for some experts. These personnel are subject to disciplinary sanctions if they fail to abide by the policy.

A Customer Preference Centre allows domestic customers to enjoy a central view of their consents and preferences and manage these via their customer space.

Vulnerability assessments for the main applications and business continuity plan drills are organised every year. The results are addressed by monitored improvement plans, either by the Sales Division, or by the Group.

1.4.2.2.4 Public electricity distribution concessions at regulated tariffs

Concessions hereby referred to cover two distinct public service missions:

- the development and operation of public distribution networks, which are the responsibility of Enedis⁽¹⁾ in mainland France, excluding Local Distribution Companies (ELD) (see section 1.4.4.2 "Distribution – Enedis") and of EDF in the non-interconnected areas (ZNI);
- the supply of electricity to customers benefiting from regulated sales tariffs connected to the public distribution networks, under the responsibility of EDF for mainland France (excluding ELDs) and ZNIs. This mission is carried out in compliance with the commitments of the concession specifications and general terms and conditions of sale (subscription terms, payment and delivery terms, contractualisation, etc.).

Each concession contract in continental metropolitan France is co-signed by EDF, Enedis and the licensing authority, and concerns a municipality or a grouping of municipalities. These public service missions are executed within the framework of 442 concession agreements of which 54 are at Department level.

2019 was the second year of the process concerning the implementation of the new national concession agreement model which was the subject matter of an agreement signed on 21 December 2017 between EDF, Enedis, the FNCCR (national federation of licensing authorities) and France Urbaine. As of 31 December 2019, over 170 licensing authorities had entered into a concession agreement on the basis of the new model.

2020 will be marked by the continued application of the new agreement model. An organisation and tools are maintained, particularly in order to renew concession contracts, mobilise both national and regional competences, develop the expertise of EDF's contacts in the contracting authorities, draw up each year the concession activity reports and respond to inspection requests from the granting authorities.

1.4.3 Optimisation activities for EDF in France

1.4.3.1 Role and activities of the Upstream/Downstream Optimisation & Trading Division (DOAAT)

The DOAAT is responsible for managing the balance of EDF's upstream/downstream electricity portfolio, optimising and securing the electricity gross margin created by this portfolio, as well as managing the associated risks.

The balance between electricity supply and demand is managed right down to a real-time basis, in line with the framework established by risk policies, developed in line with the directives issued by the Group's Risk Control Department and validated by EDF's Executive Committee (see section 2.2.2C "Financial and market risks", risk factor Energy market risk). Climate variations affect this management. Hence, a fall in temperature of 1°C in winter leads to a rise in electricity consumption in France of the order of 2,400MW⁽²⁾ and EDF's portfolio bears a large part of this thermosensitivity. In addition, depending on the run-off, the amplitude of hydraulic generation in the EDF scope, between one extreme year and another, can amount to around 20TWh. The DOAAT ensures that it has, in all timeframes, sufficient resources in order to enable it to meet its commitments. To do this, it manages a set of leveraged actions: scheduling of maintenance operations of generation means (in particular nuclear), management of inventory (fossil fuels, hydro-electric reserves and customer load shedding), purchases and sales in wholesale markets via EDF Trading, which is in charge of market access on behalf of DOAAT (see section 1.4.6.3 "Optimisation and trading: EDF Trading"). DOAAT also manages the exposure of

EDF's upstream/downstream portfolio to price variations in the energy and fuel wholesale markets (gas, coal, petroleum products) and in the CO₂ emissions licensing market, with the assistance of EDF Trading.

With respect to RTE, DOAAT plays the role of "balance responsible entity" on EDF's perimeter in mainland France. In this regard, EDF is committed to financially compensate RTE in the case of a deviation onto its balance group. The optimisation consists of offering RTE an offer schedule that is balanced with the demand, which makes it possible to minimise the supply cost of EDF's contractual commitments.

1.4.3.2 Long-term electricity purchase and sales contracts

EDF maintains commercial relations through energy purchase or sales contracts with European operators.

These contracts are of many types, and confer:

- rights to the energy generated by facilities, primarily nuclear, in which the counterparties hold a participating interest over the duration of the exploitation of the facility (see section 1.4.1.1.1 "EDF's nuclear fleet in France");
- drawing rights for totally or partially guaranteed electrical power, for a duration generally comprised between 15 and 25 years.

1.4.3.3 Regulated Access to Historic Nuclear Power (*accès régulé à l'énergie nucléaire historique, or ARENH*)

Implemented on 1 July 2011, the ARENH scheme grants alternative suppliers the right to purchase electricity from EDF to supply their end clients, once a framework agreement has been entered into, at a regulated price for set quantities determined in line with the provisions laid out in the French Energy Code. This mechanism can also be accessed by network operators for their losses. The CRE⁽¹⁾ is responsible for managing the mechanism and for calculating entitlements of which it notifies the co-contracting parties. Thus, suppliers wishing to exercise their right to access the ARENH can do so by submitting a request to the CRE. The detailed consumption forecasts, along with the entitlements calculated for each supplier, are only known by the CRE and the supplier. The payments are managed by the Caisse des dépôts.

The price of the ARENH, determined by the Minister of Energy and the Minister for the Economy, upon proposal by the Energy Regulation Commission (CRE), has been maintained at €42/MWh since January 2012. It includes the supply of electricity and the issue of the related capacity certificates.

The maximum ARENH overall volume that can be sold to suppliers, which make a request to cover the needs of the ultimate customers, is set at 100TWh per year.

France's "Climate and Energy" Act introduces new provisions that allow the government to alter the total ARENH amount up to a ceiling of 150TWh and, for a transitory period, revise the ARENH price by means of an Order. Article L. 337-16 of the French Energy Code also specifies that changes in the consumer price index and in the maximum overall volume may be taken into account when revising the ARENH price. However, no direct link is established between any increase in the price and any increase in the maximum overall quantity. In any case, the French Ministry for Ecological and Inclusive Transition has announced that neither the ARENH price nor the quantity would be changed in 2020.

ARENH demand for 2019 came to 132.98TWh. Alternative supplier demand capping mechanisms were therefore implemented by the CRE. In 2019, EDF supplied 100TWh to meet the needs of alternative suppliers and customers, plus 20.4TWh to offset losses by network managers.

ARENH demand for 2020 amounted to 147TWh. In view of the maximum global quantity being exceeded, the CRE carried out capping of alternative supplier demand. In 2020, EDF will supply 100TWh to alternative suppliers for the needs of their end clients, plus 26.2TWh to offset losses by network managers.

The capping of ARENH requests from alternative suppliers is mirrored in the regulated tariffs for electricity sales, pursuant to the method adopted by the CRE in its resolution dated 11 January 2018.

Pursuant to CRE resolutions nos. 2018-222 of 25 October 2018 and 2019-237 of 30 October 2019, all ARENH quantities requested by subsidiaries controlled by EDF for 2019 and 2020 were also capped. In view of this, EDF and its subsidiaries have implemented contracts that mirror the ARENH terms of supply.

(See also section 2.2.1 "Market regulation: political and legal risks", risk factor 1B Changes in the regulatory environment [ARENH, regulated sales tariffs, environmental legislation, and SNBC national low-carbon strategy]).

1.4.3.4 Capacity mechanism

Articles L. 335-1 *et seq.* of the French Energy Code, originating from the NOME Law, institute the obligation for each electricity supplier to contribute in mainland France to the security of electricity supply, in compliance with a default criterion set by the government. For this purpose, each supplier must acquire capacity guarantees corresponding to its obligation, calculated by reference to the power and energy consumption of its customers during a peak period defined by RTE.

To comply with this obligation, each supplier must therefore get capacity guarantees from producers, which must certify all their means of generation, or from demand response managers.

Once up and running, a number of auctions to exchange capacity will be held beginning four years before the delivery year and ending three years thereafter. Over-the-counter transactions remain possible.

Similarly, for integrated players such as EDF, which possess capacities as producers and have an obligation as vendors, internal capacity transfers are authorised in order to cover their obligations. They will be made at the market price.

The DOAAT, in charge of the management of this new system, proceeded with the certification of all the EDF means of production in France for the next few years. If necessary, these certifications will be the subject to regular rebalancing, either upwards or downwards.

As on the Energy market, the sales/purchases of capacity organised by EPEX Spot managed by the DOAAT on behalf of EDF, are carried out *via* EDF Trading.

1.4.3.5 Specific balancing and capacity perimeters for Purchase Obligations and sales to markets

EDF is a mandatory purchaser of the electricity generated by the generation facilities the government wishes to support and develop (renewable energy sources and energy efficient cogeneration). By law (Article L. 121-7 of the French Energy Code), the additional costs stemming from this obligation are offset for EDF on the basis of an electricity market benchmark price (the concept of "avoided cost").

Following the CRE resolution of 16 December 2014, all electricity purchased in this manner is managed within a dedicated "balancing perimeter" for installations subject to Purchase Obligation (OA) agreements, implemented on 1 July 2015. The DOAAT now organises the sale of the energy produced by the installations under Purchase Obligation contracts directly on the energy markets, which makes the management of this perimeter completely independent of that of the EDF portfolio. Thus, since 4 November 2015, electricity volumes under Purchase Obligations that can be forecast over the short-term (one day for the next, known as the "random component of the Purchase Obligations") are sold on EPEX Spot. As for the volumes which are foreseeable over the long term (share of the Purchase Obligations referred to as "quasi certain"), since January 2016 they have been sold *via* transparent and non-discriminatory requests for bids.

Similarly, within a dedicated Purchase Obligation perimeter, the Upstream-Downstream Optimisation & Trading Division (DOAAT) carries out certification of the capacity of production installations subject to Purchase Obligations, together with the necessary rebalancing and sales to the market of the related capacity guarantees.

Since 1 January 2017, the management costs for this public-service mission have also been offset.

(1) Energy Regulatory Commission.

1.4.4 Regulated transmission and distribution activities in France

The transmission and distribution of electricity in mainland France are regulated activities. They are carried out by RTE and by Enedis, grid operators which are managed totally independently, within the meaning of the provisions of the French Energy Code.

1.4.4.1 Transmission – Réseau de transport d'électricité (RTE)

Created on 1 July 2000 and a subsidiary since 1 September 2005, the Electricity Transmission Network (RTE) is the owner and operator of the French electricity transmission network, which it operates, maintains and develops. With 105,000 kilometres of high and extra high voltage circuits and 50 cross-border lines, this is continental Europe's largest network. Its geographical location places it at the core of the European electricity market. RTE guarantees the correct operation and safety of the electricity system, and provides free and fair access to all the network users. The company also pays special attention to supporting the development of renewable sources of energy in France and their integration into the electricity system, which requires the development of the transmission network and interconnections.

RTE is indirectly owned (50.1%) by EDF (*via* CTE) at 31 December 2019. Due to its specific conditions of governance, RTE is not fully consolidated by the Group, but rather accounted for using the equity method.

1.4.4.1.1 Governance of CTE and RTE

CTE

CTE is a public limited company (*société anonyme*) with a Board of Directors, owned by EDF (50.1%), Caisse des dépôts et Consignations (29.9%) and CNP Assurances (20%). CTE holds 100% of the share capital of RTE.

In accordance with its articles of association, the sole purpose of CTE is the acquisition and holding of RTE shares, and more generally, all commercial, financial, intangible and tangible property transactions relating directly or indirectly to its corporate purpose or which might facilitate its achievement or stimulate business growth.

The eight members of CTE's Board of Directors include four EDF representatives, two Caisse des dépôts et Consignations representatives and two CNP Assurances representatives. They are appointed for six years. RTE's compliance auditor also attends meetings of CTE's Board of Directors.

RTE

RTE is a public limited company (*société anonyme*) with both a Supervisory Board and an Executive Board.

RTE's Supervisory Board is comprised of twelve members appointed for five years:

- eight members appointed by the Shareholders' Meeting:
 - two State representatives, including the State as a legal entity, represented by an individual,
 - six representatives of the shareholder (three representatives of EDF, two representatives of the Caisse des dépôts et Consignations and one representative of CNP Assurances);
- four members elected by the staff.

A Government Commissioner attends Supervisory Board meetings in a consultative capacity.

An Auditor General (CGEFI), appointed by an official French Order, also attends the meetings of the Supervisory Board, in application of French Decree no. 2018-580 of 4 July 2018 relating to RTE Réseau de transport d'électricité being subject to the economic and financial control of the French State.

A Compliance Auditor General attends the meetings of RTE Supervisory Board, in application of Article L. 111-35 of the French Energy Code.

RTE's Executive Board is made up of five members, who perform their work under the supervision of the Supervisory Board, within the limits fixed by the French Energy Code and RTE's articles of association. After the consent of the Energy Minister, the Supervisory Board appoints the Chairman of the Executive Board and upon the latter's proposal, it appoints the other members of the Executive Board.

1.4.4.1.2 RTE's activities

In France, RTE manages the public transmission network and carries out its missions under the conditions set out in model specifications approved by applicable decree until 2051. In accordance with the French Energy Code, transmission network operators must be certified according to a process associating the CRE and the European Commission, which aims to ensure that the entity concerned fulfils the conditions of independence set out by this Code. RTE obtained certification from the CRE in 2012 as an ITO (*Independent Transmission Operator*). Following the change in its share ownership, RTE maintained its certified status following a CRE decision dated 11 January 2018.

Thus RTE manages the transmission infrastructure, guarantees access to the transmission network and manages energy flows.

RTE faces a variety of challenges in its mission as an electricity transmission network operator: integration of the European market, extensive restructuring of the generation fleet, societal changes reinforcing the constraints of integrating new infrastructure of general interest and maintenance of its industrial facilities to meet the requirements of customers and the community.

1.4.4.1.2.1 Maintenance of the transmission infrastructure

RTE manages the assets of the transmission network through maintenance, refurbishment and replacement of structures and emergency repairs.

The gradual integration of new technologies, in particular monitoring, will make it possible to optimise technical policy and to develop conditional and predictive maintenance, further enhancing the effectiveness of each intervention by limiting action to what is strictly necessary. Digitalisation of the grid and large-scale monitoring will make it possible to carry out remote diagnosis and deploy new maintenance technologies such as drones, 3-D visualisation, and augmented reality. Alongside this, test and simulation software will provide decision support for grid management. Mass data analysis will allow new asset management strategies to be developed, with the potential to achieve a different balance between maintenance, renovation, and renewal.

1.4.4.1.2.2 Development and completion of new capital investments

Energy transition is changing the fundamentals of the French electricity system. In response, RTE is adapting its business to prepare and support these major changes.

RTE draws up an annual investment programme that is submitted to the CRE. In 2019, RTE's total investments within the scope regulated by the CRE stood at €1,456 million. The main investments relate to the continuation of construction works on two direct current interconnections ("Savoie-Piedmont" between France and Italy and "IFA 2" between France and the UK), the launch of works for the planned reconstruction of the 400,000V Avelin-Gavrelle line between the south of Lille and the north-west of Arras, and the planned connection of the Saint-Nazaire offshore wind farm.

RTE's 2020 investment programme approved by the regulator amounts to €1,808 million. In view of contextual changes, in particular those relating to the European integration of markets and energy transition, the 2020 investment programme is characterised by ongoing major investments in grid expansion and renewal, more especially the progress of offshore network development works and major grid adaptation projects, as well as the development and renewal of IT systems and real estate.

In 2019, the Regulated Assets Base (RAB) increased by €127 million, up from €14,313 million as at 1 January 2019 to €14,440 million as at 1 January 2020 ⁽¹⁾. As a reminder, RAB is remunerated by the tariff at the weighted average cost of capital of 6.125% before tax on the TURPE 5. This represents RTE's industrial assets, less any investment subsidies, and is calculated excluding assets under construction (remunerated at 3.7% since 2017 in application of the TURPE 5 Network Access Tariff ruling of 17 November 2016).

(1) Amount to be confirmed by the CRE.

1.4.4.1.2.3 Operation of the electricity system

Management of the electricity system

RTE manages the flows on the transmission network in real time, and makes use of the resources available to it through the adjustment mechanism to ensure the balance between supply and demand in real time. The cost corresponding to the adjustments made by RTE and due to the negative differences between the projected flows and those already realised is passed on to the "Balance responsible entities" (producers, traders, suppliers, etc.) in proportion to their difference. In the case of a positive difference, RTE compensates the balance responsible entities financially.

Management of the interconnections

RTE manages access to international interconnections in collaboration with the neighbouring European transmission network operators. These interconnections ensure the transmission of energy from one country to another, the operating safety of the electricity transmission networks and the development of the European electricity market. They ensure that an electricity supplier can sell its energy to a customer in another European Union country, by taking advantage of the differences in the timing of peak load on either side of the border, and can better pool the means of generation at the European level (including renewable energies).

Network coordination in Europe

In December 2008, RTE and Elia⁽¹⁾ created a common company named Coreso, which aims to coordinate the operation of electricity networks comprising France and Belgium. The creation of Coreso fulfils the need of reinforcing its operational coordination between transmission network operators (TNO) expressed both by the European Commission and by the players of the electricity market. Coreso must allow better integration at the regional level of generation from renewable sources and guarantee secure management of rising cross-border flows.

RTE and Elia were then gradually joined by grid operators in Western Europe: National Grid ESO (UK), Terna (Italy), 50 Hertz (North-East Germany), REN (Portugal), REE (Spain) and recently Eirgrid and SONI (Ireland).

1.4.4.1.3 Energy report

2019 Summary

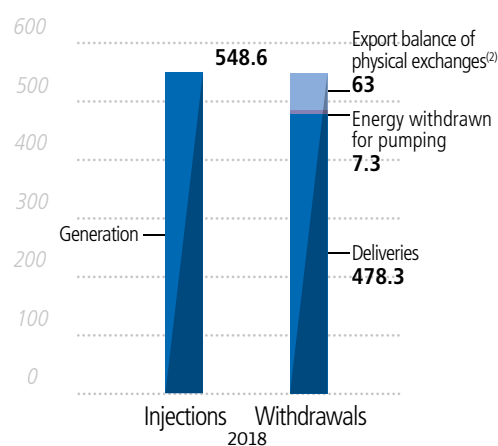
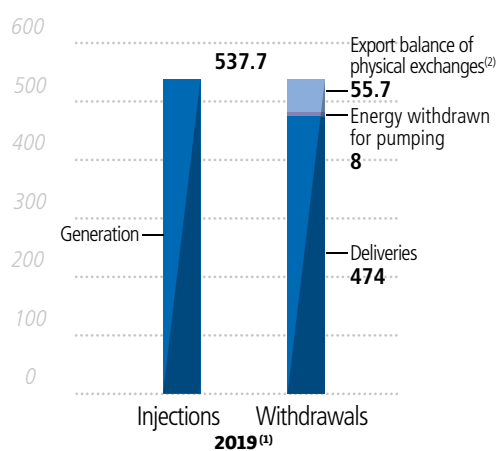
In 2019, gross consumption stood at close to 474TWh, i.e. 1% down compared with the previous year. This decrease is due to milder temperatures overall, especially at the very beginning of the year, and less sustained economic growth than in 2018. Electricity consumption peaked at 88.5GW at 7pm on Thursday 24 January during a heavy lowland snow episode. This peak is around average for the last twenty years in France.

Excluding the energy sector, consumption adjusted for climatic variations and calendar effects reached 471TWh in 2019, slightly decreasing compared with 2018 (-0.8%) and stayed fairly stable over the last ten years. The main structural factors behind this stabilisation are less sustained economic growth and the effects of consumption management (energy efficiency initiatives).

Energy use by heavy industry customers directly connected to the public grid amounted to 64.3TWh (including self-consumption, not including losses or energy sectors, and adjusted for seasonal variations). This amount was down 3% compared to 2018, and relates to the steel, paper and cardboard, automotive, and rail transport industries.

The quality of electricity supplied by RTE is estimated on the basis of two indicators: the equivalent outage time and outage frequency. The values of these indicators for 2019 are still provisional. Based on information available to date, the equivalent outage time is 3 min. 25 sec. (the target set by the CRE is 2min. 48 sec.) and 0.37 for outage frequency (the target set by the CRE is 0.46).

→ Simplified energy flows on the RTE network (in Twh)



(1) 2019 provisional data (the final data on the electricity generation for 2019 will be available on RTE's website in July 2020: www.rte-france.com).

(2) Including water right and exchanges via distribution network.

Renewable energies continue to grow, nurturing energy transition

As of 31 December 2019, installed wind power capacity was 16,494MW, 9% higher than in 2018. Wind power generation stood at 34.1TWh in 2019, up 21.2% compared with 2018. This increase is due not only to the increase in installed net capacity but also to particularly favourable weather conditions in 2019.

With 890MW of new solar capacity connected in mainland France, installed solar capacity reached 9,435MW at 31 December 2019. This represented an increase of 10.4% compared with 2018. Solar power, which totalled 10.6TWh in 2019, was 1.8% higher than in 2018; the new plants installed did not wholly offset the unfavourable weather conditions.

(1) Elia is the Belgian electricity transmission network operator for high voltage (from 30,000 to 380,000 Volts).

1. The Group, its strategy and activities

Description of the Group's activities

France remains Europe's leading exporter

The French balance of trade amounted to 55.7TWh in 2019, slightly down compared to 2018. Commercial export volumes were slightly down at 84TWh. However, import volumes increased, standing at 28.3TWh. France has retained its place as the leading country for exports in Europe.

The position of cross-border contractual exchanges in 2019 is as follows:

- Spain: the exchange balance with Spain remained in large surplus with 9.7TWh. However, this was down 19% compared to the previous year, particularly due to a limit on exchange capacity between April and the beginning of December;
- central and western Europe (Germany and Belgium): the balance of exchanges showed a surplus at 2.7TWh. However, this was less than in 2018. This was due in particular to better availability of Belgian nuclear plants this year, resulting in less need for Belgium to import electricity from France. Belgium even became a net exporter this year;
- Italy: the exchange balance with Italy was significantly in surplus, rising to 18.8TWh, stable compared to 2018 (+0.3TWh). Interconnection is primarily requested in the direction of export with only 247 import hourly periods (*i.e.* less than 3% of the time) compared with 330 in 2018;
- Switzerland: the exchange balance with Switzerland is increasing and stands at 13.2TWh, a 25% increase compared to 2018. There was far more exporting than

last year from May onwards (except for October); there were no net imports in any month;

- United Kingdom: the exchange balance with the UK showed a surplus of 11.3TWh. This was however lower than in 2018, in particular due to limited capacity between April and June as a result of maintenance on the IFA 2000 France-England Interconnector. These limitations were as high as 1,000MW throughout practically the whole of April.

1.4.4.2 Distribution – Enedis

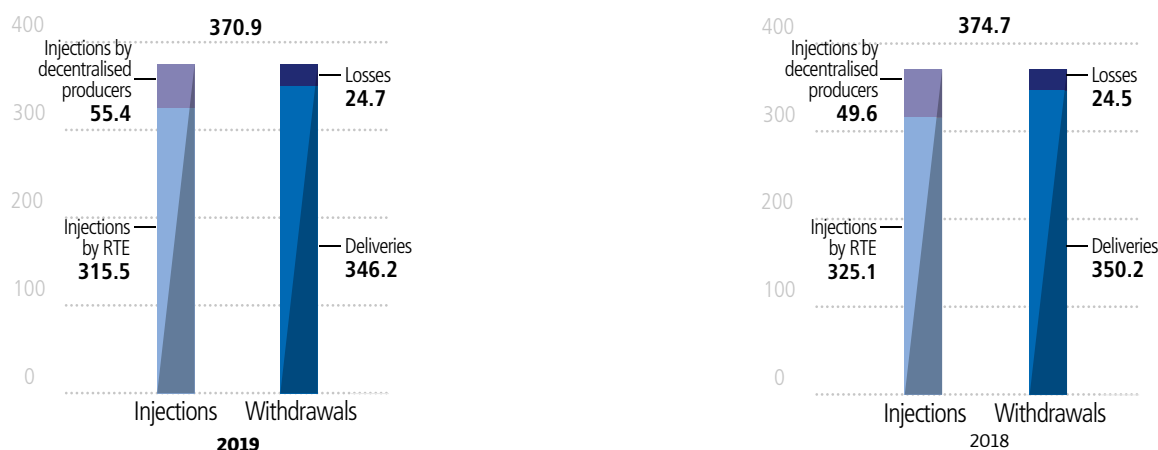
As a distribution network operator, Enedis' main objective is to operate and develop the public electricity distribution network, guaranteeing its security and safety, and overseeing the balance of electricity flows at all times. Enedis has been operational since 1 January 2008. Initially called ERDF, it changed its name to Enedis on 1 June 2016. Enedis services around 95% of the population in mainland France. The other 5% are served by Local Distribution Companies (LDCs).

In 2019, Enedis distributed electricity to more than 36.9 million customers (points of delivery) and provided for the injection from 441,600 production sites in mainland France, thanks to a network of around 1.38 million kilometres.

At 31 December 2019, Enedis employed 38,754 people.

→ Electricity volumes on the Enedis network

(in Twh)



NB: The values correspond to the expression to the first decimal or integer closest to the sum of the precise values, taking into account rounding.

Electrical losses are inherent to the functioning of the distribution network and mainly result from physical effects which are directly dependent on the amount of electricity delivered. Enedis must compensate these losses to complete the amount of energy delivered to the final customers. The volume of losses in 2019 stood at 24.7TWh (see Electricity report above), *i.e.* a rate of 6.38%⁽¹⁾. Losses recognised in the accounts, including restatements of prior financial years amount to €1,096 million. To compensate these losses, Enedis buys the corresponding electricity from the wholesale market, either through organised market platforms, or through calls for tender open to 19 qualified suppliers.

Technical specifications: the distribution network for which Enedis is the concession holder (see section 1.4.4.2.2 "Distribution activities") is, at 31 December 2019, made up of around:

- 651,952 kilometres of A-type high-voltage (HVA) lines of 20,000 volts;
- 725,317 kilometres of low-voltage (LV) lines of 400 volts;
- 2,182 HVB/HVA source substations;
- 792,112 HVA/LV transformer stations.

(1) This rate is now calculated as a ratio of losses for the year to gross inflows before deducting backflows to the transmission network.

1.4.4.2.1 Organisation of Enedis

Distribution activities on French soil are, pursuant to the legal framework, almost exclusively conducted by Enedis, a French public limited company (*société anonyme*) with an Executive Board and a Supervisory Board responsible for the management of the public electricity distribution network.

Pursuant to Directive no. 2003/54/EC, the principles of which are applied in Directive no. 2009/72/EC of 13 July 2009 and Directive no. 2019/944 of 5 June 2019, when the public distribution network operator is part of a vertically integrated company, its organisation and decision-making must be legally independent from other activities not related to distribution. Within this framework, the principle adopted by EDF and Gaz de France, now Engie, led them to spin out their distribution network. Enedis and GRDF share a "common service" pursuant to the legal framework (see section 1.4.4.2.3 "Service shared by Enedis and GRDF").

Pursuant to the Law of 9 August 2004, the business of public electricity distribution network operator was turned into a subsidiary in 2007.

The Supervisory Board of Enedis comprises fifteen members, of which eight are appointed by the Ordinary Shareholders' Meeting, five are representatives of the employees elected in accordance with the conditions set out in Law no. 83-675 dated 26 July 1983 relating to the democratisation of the public sector, one member is appointed by the French State by virtue of Articles 4 or 6 of Ordinance no. 2014-948 dated 20 August 2014, and one member, representing the organising authorities for the public electricity distribution network, is appointed by decree in application of Article 153 of Law no. 2015-992 relating to energy transition for green growth. In 2019, the Enedis Executive Board was made up of two members who performed their work under the supervision of the Supervisory Board. In application of the possibility offered by Ordinance no. 2014-948 dated 20 August 2014 (Article 15) and in compliance with Decree no. 2015-38 dated 19 January 2015, the French State appointed by a Decree dated 25 October 2018 a Government Commissioner for the purposes of attending the meetings of the Supervisory Board of Enedis. On 1 June 2016, the business name of the public distribution network operator was changed to Enedis, as a replacement for ERDF. This new name reflects the company's strong commitment to the energy transition in the wake of COP 21. It will also raise the profile of the network operator and clarify its purpose, as the CRE recommended.

Enedis' missions in France

Enedis, pursuant to the conditions set by law and the concession contracts signed with each of the public electricity distribution contracting authorities (see section 1.4.4.2.2 "Distribution activities"), performs its missions as the public distribution network operator in mainland France.

These missions are:

- define and implement operational, investment and development policies in relation to the electricity distribution network;
- provide connection and access for users to these networks under objective, transparent and non-discriminatory conditions, as well as inter-connection with other networks;

- supply users with the information necessary for effective access to networks, except for information protected by law and regulatory provisions, particularly by evaluating the impact on the grid of projects submitted to it in terms of the injection of renewable energy, the rollout of charging systems for electric and rechargeable hybrid vehicles, urban development, and energy planning;
- oversee relations with the energy regulation authorities (Ministry of Energy, the Energy Regulation Commission (CRE), public distribution contracting authorities) in line with its activities;
- oversee relations with local authorities;
- negotiate, conclude and manage concession contracts;
- operate, maintain and repair the electricity distribution networks;
- design and build infrastructure, as well as manage work on the networks;
- carry out metering activities for users connected to the networks, particularly as regards supply, installation, meter inspection, maintenance and renewal of metering devices, as well as managing data activities and any other missions relating to its work as a whole;
- encourage the integration of renewable energy in the grid and the implementation of energy efficiency initiatives;
- ensure the monitoring of the load sharing perimeters;
- be the guarantor for the distribution and accounting for the energy flows between the network user players, and the fair compensation of losses on these networks.

1.4.4.2.2 Distribution activities

Enedis' business is based on a number of activities: manage, in its capacity as the concession holder, the assets under concession; run and maintain the network in such a way as to ensure the continuity of supply; carry out work on the network (in particular, network connection, reinforcement and renewal work); provide access to the network to all users in the framework of contractual provisions in force; and manage the meter fleet, as well as obtaining, processing and transmitting data on network user consumption.

Change in investments

In 2019, €4,254 million was invested by Enedis, €1,623 million of which was devoted to connections (consumers and producers) and adjusting the grid to the load, while €2,266 million was devoted to quality of service, securing networks, safety, protecting the environment, and rolling out Linky meters, all areas in which the identified expectations of customers, local authorities, and concession contracting authorities are particularly high.

In addition, the contracting authorities invested €725 million in 2019. In all, almost €4,979 million were invested on the distribution networks in 2019 in mainland France.

GROSS INVESTMENTS MADE BY ENEDIS

(in millions of euros)

	2019	2018
Connections and reinforcement	1,623	1,464
Regulatory, safety and transmission channel obligations	445	415
Work instruments and operational resources	365	347
Network modernisation ⁽¹⁾	1,821	1,772
TOTAL INVESTMENTS OF ENEDIS	4,254	3,998
WORK ALLOWANCES BY THIRD PARTIES AND LOCAL AUTHORITIES ⁽²⁾	725	705
TOTAL NETWORK INVESTMENTS	4,979	4,703

(1) Of which Linky: €822 million in 2019, €792 million in 2018 and €612 million in 2017 (generalisation costs and those related to post experimentation).

(2) After deducting PCT ^(a) and Article 8 ^(b) for the share funded by Enedis.

(a) PCT (portion covered by the tariff): portion paid to project manager contractors from the contributions to the delivery tariff for financing a connection.

(b) Article 8 of Appendix 1 of the concession specifications relating to the integration of works into the environment (for example, the work to bury lines).

1. The Group, its strategy and activities

Description of the Group's activities

Furthermore, Enedis continues its efforts in the preventative maintenance of networks, including work relating to tree topping. This came to €319 million in 2019 (compared to €325 million in 2018).

Quality of service

Quality of service is one of Enedis' main objectives. In 2019, the average outage time, excluding transmission incidents and exceptional incidents, was 64 minutes, which is a good result for a year marked by frequent and sharp climate variations. The quality of service provided is also reflected by maintaining steady voltage levels, kept as close as possible to the level set by regulations, and by minimising the number of outages.

To respond to large-scale incidents, Enedis relies on an Electricity Rapid Intervention Force (FIRE), which allows it to mobilise, at any time, in an affected region, the teams and resources from other regions in order to restore customers' electricity as rapidly as possible. In 2019, FIRE was deployed 7 times: Storm Miguel, which hit Western France on 7 June, the thunderstorms on 1 July that affected the Rhône-Alpes region, Storm Amelie, which hit South-Western France on 3 November, the episode of sticky snow that affected South-Western France on 14 and 15 November, the episode of strong winds that hit South-Western France on 13 and 14 December, Storm Elsa, which hit the Auvergne-Rhône-Alpes region on 19 and 20 December, and Storm Fabien, which mostly affected Nouvelle-Aquitaine on 21 and 22 December. As regards insurance cover for the protection of the overhead distribution network against the effects of large scale storms, see section 2.1.2.6 "Insurance - Storm Insurance cover".

Development of renewable energies

Across the Enedis scope, the number of solar panel generation installations connected to the network grew again: in 2019, a growth in photovoltaic connections was observed with 858MW of new photovoltaic facilities connected (compared with 825MW at the end of 2018). The increase in wind power generation connected to the public distribution network also continued, with 1,202MW connected in 2019 (compared to 1,360MW in 2018).

At the end of 2019, a total of around 22.5GW in photovoltaic and wind power generation was connected to the Enedis grid, made up of 8.2GW from photovoltaic plants and 14.3GW from wind power generation. To the power thus generated are added other sources of power generation, in particular "historical" hydropower plants (1.5GW), cogeneration (2.4GW), biogas, biomass and dispatchable fossil-fuel thermal. In all, at the end of 2019, the generation fleet connected to Enedis was around 28.3GW.

In 2019, more than 25,200 photovoltaic self-consumption facilities were also connected, representing close to 92% of the year's connections for small producers.

In addition, Enedis has continued its efforts to develop capacities for accepting renewable energies, by implementing construction work on sources as part of the regulatory framework in the regional plans for the grid connection of renewable energies.

Electricity market

The French electricity sales market has been open to competition for all customers since 1 July 2007.

71 electricity suppliers, operating on the French market, have a contract with Enedis. This contract establishes the terms and conditions for the supplier and the distributor in the event that a customer subscribes to a single contract covering the supply and delivery of electricity.

The supply market is facing sharply increased levels of competition for subscribed power supply in excess of 36kVA since the elimination of regulated sales tariffs (TRVs) for this type of power at the end of 2016, as well as for subscribed power supply for less than 36kVA in view of the partial end of Professional TRVs announced for the end of 2020. Over 180 new service providers are exploiting customer consumption data, subject to the customers' permission, also making a significant contribution to the market dynamics.

Concessions

At 31 December 2019, Enedis and EDF were co-concession holders of 442 concessions contracts, covering around 95% of the population in continental metropolitan France. The concession contracts are generally concluded for a period of 25 to 30 years.

In France, public electricity distribution is operated under a concession plan that derogates from common law on local public service concessions. Enedis is thus designated by the law (Article L. 121-4 of the French Energy Code) to carry out the development and operation of the public distribution networks (rational service of French territory by public distribution networks, connection and access in accordance with non-discriminatory conditions to the public distribution networks). Enedis carries out this role over the majority of French territory, with the exception of the zones which are not interconnected to mainland France, in which this same role is the responsibility of EDF, and of the exclusive service zone of the LDCs (Local Distribution Companies).

On 21 December 2017, FNCCR, France Urbaine, EDF and Enedis signed a framework agreement based on a new concession agreement model. Twenty-five years after the 1992 agreement with FNCCR, this new framework agreement includes France Urbaine which represents municipalities, large urban inter-municipalities and cities of which the majority of the members have contracting authority status for the public distribution of electricity. The new standard agreement endorsed by this agreement restates the principles of the French concession model: public service, regional solidarity and national optimisation, while at the same time taking into account issues involving energy transition. The official introduction of this new model opens the way to a modernised and lasting relationship between Enedis and the concession contracting authorities. The renewal of concession agreements, commenced in 2018, continued at a sustained pace in 2019. As of 31 December 2019, over 170 licensing authorities had entered into a concession agreement on the basis of the new model. Other negotiations are in progress or planned with the aim of renewing all the agreements underway by the end of 2021.

Pursuant to Article L. 334-3 of the French Energy Code, concession contracts entered into or amended since the creation of Enedis (under its previous name ERDF), are jointly signed by the contracting authority (local authority or public cooperation institution), by EDF (or territorially competent LDC) for the "regulated tariff supply" portion, and by Enedis (or territorially competent LDC) for the "distribution network" portion. The concession agreements underway concluded before the creation of ERDF, now Enedis, have been deemed to have been entered into according to the same principles.

Within the limits fixed by the law and by the jurisprudence, the contracting authorities are the owners of the distribution networks which constitute returnable assets⁽¹⁾ (see also sections 1.4.2.2.4 "Public electricity distribution concessions at regulated tariffs" and 1.5.1.3 "Concession contracts for the distribution and supply of electricity in France").

1.4.4.2.3 Service shared by Enedis and GRDF

The common service function shared by Enedis and GRDF is defined by Article L. 111-71 of the French Energy Code. Its missions in the electricity and gas distribution sector are building structures, site project management, network operation and maintenance, and metering operations. This service is not a legal entity in its own right.

Enedis and GRDF's relations in this common service are governed by an agreement that defines the scope of the service and the resulting division of costs. The agreement has an unlimited term and can be terminated at any time subject to 18 months' notice: in such a case, the parties undertake to renegotiate the agreement during the notice period. It is updated regularly.

In July 2014, Enedis and GRDF issued a joint announcement that their joint activities of meter reading and work on meter panels would be discontinued in the future. To date, Enedis has favoured an organisation through the regional directorates integrating all its operational missions at the local level.

In March 2018, Enedis and GRDF decided to create two joint entities: UONRH-MS, which groups together employment contract activities, studies and medical and social services, and OIT, the IT & Telecoms operator, which groups together all telephone and office technology activities. The establishment of these two joint entities took effect on 1 January 2019.

For Enedis, other support functions (Vehicles and Machines, Litigation and Insurance, Training and Recruitment, and Purchase of services) are grouped under a Support Services Division.

In 2019, the governance agreements between Enedis and GRDF were completely reviewed (11 briefs were revised).

(1) Returnable assets are those that must be returned to the granting authority at the end of the concession. These assets are deemed to belong to the concessionaire's community from the outset. They are defined by the concession contract or even by law. Generally, assets that are essential to the performance of the concession service are qualified as such.

1.4.4.2.4 Future challenges

Smart grids and smart meters (Linky)

Enedis, guarantor of the electricity distribution public service, invests at all times to develop, modernise and secure the electrical network. The adaptation of the electricity grid to the new needs of French society is a major strategic challenge. To achieve this, Enedis continued the industrial deployment of the Linky system in 2019, based on a new generation of meters, called "smart meters" that can receive orders and send data without the physical involvement of a technician. This system represents the first stage of smart grid implementation or "Smart networks". It involves equipping the distribution network with connected objects, including the Linky meters, in order to integrate renewable energy electricity generation, which has undergone a significant expansion, further ensuring the balance between generation and consumption at all points of the electricity grid, and enabling suppliers to offer new energy solutions to their customers. In 2019, the latter accelerated the implementation of new contractual offers made possible by the large-scale advent of Linky meters (differentiated and lower tariffs, for example for the use of "green" electricity generated by solar panels). With Linky, electricity consumption curves per day, per week or per month are available to customers. This facilitates the management of energy consumption and is a concrete lever that meets the expectations of the public authorities responsible for energy transition. As of the end of 2019, two out of three French homes were equipped with a Linky meter.

Following successful experimentation approved by the French government, on 1 December 2015 Enedis launched the widescale deployment of Linky meters, representing total investment of €3,972 million over the 2014-2021 period ⁽¹⁾.

At the end of 2019, the cumulative investment (2014-2019) already carried out amounted to €2,733 million, for 23.4 million Linky meters installed (including those used in the experiment), of which 21.6 million open to all services. As of the end of 2019, the percentage of Linky meters installed was 62.3%, compared to a target determined by the CRE for the end of 2019 of 61.4% (see also section 1.5.2.1.2 "French Legislation: the Energy Code", Linky regulation).

Energy transition

Changes in the energy mix in Metropolitan France enshrined in the multi-year energy programme (PPE) herald the growing integration of decentralised intermittent renewable electricity production assets in electricity grids at the same time as the development of new types of energy use, in particular due to the expected growth in electric vehicles. Energy transition calls for the development of electricity storage capacity and services, allowing optimised management of grid supply and demand balancing, and involves the incorporation of innovative services and equipment for all electricity networks (from production to consumption).

Enedis is implementing of a number of solutions to provide a greatly modernised network to consumers and companies. These solutions cover the operation of low- and medium-voltage networks, the integration of renewable energies and electric vehicles, storage management, voltage stability. The challenge for the distributor is to support energy transition while developing the networks at the lowest cost for society. Thanks to new technologies, a more detailed and responsive oversight is possible, based on a better understanding of consumption, generation and the state of the network. This "intelligence" makes it possible to avoid over-investment by adjusting it to consumption peaks, while guaranteeing the reliability of the network, pursuant to Enedis' double public service objective of performance and security.

The smart solutions being rolled out relate to areas such as innovation for the network, flexibility, and the integration of renewable energy. As an example Enedis

also proposed technical solutions for individual and collective self-consumption, operational in multi-family housing and commercial buildings, storage, data management, and business models.

Industrialising technical solutions

Enedis is pursuing the industrialisation of cutting-edge solutions for smart grids and implementing technical changes to the network, based on a "network foundation": This concerns all the components of the network with digital technologies in the source control stations (PCCNs, or Digital Command and Control Stations, which provide central management of the network's transmission automation and FARs, or Functions for Automation of the Network, which facilitate management of the insertion of electricity from renewable sources), the distribution stations (HVA/LV Smart stations), the sensors on the network and all the information system tools (forecast, management, planning management, Linky network, etc.).

In 2020, Enedis will continue with the modernisation of the network, in order to facilitate the insertion of renewable energies and to assist all players in the electricity system.

Digitisation of energy systems: carry out the digital switch-over and the management of the data

The development of measurement systems combined with digital innovations (the internet of things) enables collection and analysis of network data to be increased with a view to optimising management. Blockchain or artificial intelligence both offer new possibilities for network managers and all the players in the value chain, in particular regarding traceability from production to consumption, scheduling network maintenance operations, and anticipating supply and demand balancing.

Against this backdrop, the digital programme undertaken by Enedis since 2014 has matured. This programme is based on four vectors: infrastructure management (remote management, predictive maintenance, etc.), dialogue with outside parties, management of data from electricity meters and sensors, and social and cultural transformation of the company, which is providing its employees with new tools connected to the Information Systems in order to deliver better services to customers. Enedis has organised itself to process, exploit and accumulate the collected data and provide it to the various players in the electricity system (suppliers, transmission network operators, local authorities, new entrants) in compliance with the confidentiality and security regulations.

Regional energy policies

In France, local territories are dealing with energy transition issues as a result of new prerogatives entrusted to local authorities by law. This ownership is demonstrated by the implementation of local energy policies, in particular with the adoption of Local Climate-Air-Energy Plans (PCAETs): these set goals for urban areas in terms of the development of renewable energy, electric mobility infrastructures, and lowering end consumption.

Enedis' action for the "cities of the future" or "smart cities", all local communities and citizens.

Self-consumption, self-supply, electric mobility, smart meters, data management and the optimisation in real time of networks – these are the new challenges facing electricity distributors in relation to regions as a whole, and especially cities. This has now become a reality.

Enedis is promoting the emergence of DSOs (distribution system operators), facilitators of energy transition for all uses at every level, including local (cities, neighbourhoods, etc.), not only in terms of the networks but also the associated data, necessary for regional players and cities aiming to become smart cities.

(1) The programme completion costs were reviewed downward, from €4,455 to 3,972 million for the period 2014-2021, after taking into account prices of the latest contracts signed for equipment (concentrator meters) and for installation services.

1. The Group, its strategy and activities

Description of the Group's activities

The role of Enedis is therefore constantly changing as it adjusts to regional reorganisations and the organisation of society into metropolises, whilst also ensuring a high-quality electricity supply is maintained in rural areas. Enedis makes its technical expertise available to local authorities to contribute to local energy policies, "positive energy territories for green growth", urban travel plans, and "smart cities" projects.

The Open Innovation policy developed by Enedis has also become popular in local communities which have organised many energy, technological and environmental initiatives, and rely on a number of start-ups. Enedis "enriches" these projects and developments with its own research and innovation, especially in the fields of smart grids and data. In 2019, Enedis has implemented its strategic development plan focusing on becoming a key industrial partner for all electric mobility players in order to jointly develop solutions to support its development on a large scale.

All charging stations will be directly or indirectly connected to the distribution network developed and operated by Enedis. In response to the collective challenge constituted by electric mobility, Enedis' contribution is expected by all stakeholders, in particular local authorities and industrial companies, for which Enedis is a partner on a day-to-day basis, with the stated aim of making electric mobility possible for everyone, everywhere.

In 2019, operational achievements on the ground accelerated: in close cooperation with local authorities, Enedis is now a partner in over 120 projects relating to light vehicles, coaches, buses, and boats.

These achievements bear witness to the feasibility and imminent industrialisation of electric mobility. Some projects use hydrogen produced by methods that do not emit CO₂. Such projects allow the players in the ecosystem to combine their complementary contributions and acquire more accurate knowledge of the cost of operations, as well as offering sources of leverage for simplification. Some changes, such as the electrification of bus fleets, are already in the industrial phase; others, such as equipping building car parks, are less advanced. The ability to use the energy available from batteries when vehicles are stationary and not recharging is also an area for development.

Focus on international expansion

In the field of smart grids, Enedis has gone from a simple concept to demonstrators, then to industrialisation with a high level of maturity in just a few short years. In addition to the smart meters being deployed, the objective is a large-scale deployment of smart grid solutions on the networks in major geographic regions. Belgium, Egypt, Indonesia and India have selected solutions led by Enedis and its expertise. In India in particular, deployment of smart meters in the region of New Delhi entered its operational phase in 2019.

Enedis has structured the French industrial sector for smart electricity grids with other French players in this sector through the "Thinksmartgrids" association which now numbers around one hundred members (major industrial players, start-ups, universities, research institutes, etc.).

IES KEY ELEMENTS

	Data at end-2019 Total
Number of customers	1,167,500 approximately
Network length (in km)	37,800 approximately
Net installed capacity of the EDF fleet (in MW)	2,060
of which hydropower fleet and other renewable energy sources	21%
of which thermal fleet*	79%
Output* (in GWh)	5,785
of which hydropower output	20%
Purchases of energy from third parties (in GWh)	4,162
of which renewable energies, including bagasse	39%
of which other energies	61%
TOTAL ENERGY GENERATED BY EDF AND PURCHASED FROM THIRD PARTIES	9,947

* Data including EDF Production Électrique Insulaire (PEI), a wholly-owned subsidiary of the EDF group

The goal of the French smart grids team is to maintain its leadership in Europe and to expand in the rest of the world.

Acquiring and developing tomorrow's skills.

The digital grid has enabled Enedis to become a data operator, revealing the need for skills in information technology, telecoms, and cyber security. Enedis is also enriching its customer relations via a digital strategy that includes a mobile application, a local authorities space on its website, and a higher profile on social media in 2019.

To develop the skills needed for the future, Enedis is devoting the equivalent of 8% of its payroll costs to training, compared to a statutory obligation of 1.6%. Recruitment policy is geared to a long-term perspective, targeting the company's core business (grid operation, maintenance, and development), as well as new business lines relating to digital transformation, with 2,100 new recruitments planned over the next four years.

Action to mitigate climate change

Enedis is reducing its carbon footprint by improving infrastructure performance (e.g. high-performance transformers minimising electricity losses, maintenance of source substations to prevent SF₆ greenhouse gas leakage), cutting its energy use in buildings, and accelerating the use of electric vehicles. The number of electric vehicles in a total company fleet of 17,500 vehicles will rise from over 2,200 at the end of 2019 to over 2,900 in 2020, 16.6% of the total.

Enedis is working to preserve biodiversity through initiatives designed to protect birds from the risk of electrocution. Enedis also aims to reduce, reuse, and recycle waste produced by its activity.

1.4.4.3 Island Energy Systems

Island Energy Systems (IES) brings together the electricity systems operated by EDF which are not interconnected, or only slightly connected, to the mainland: Corsica, the overseas departments (except Mayotte) and the overseas territories of Saint-Barthélemy, Saint-Martin and Saint-Pierre-et-Miquelon, as well as several Ponant islands (Sein, Ouessant, Molène, Chausey).

EDF's organisation in these regions is based on two structures:

- the Island Energy Systems Department, ensuring the supply and demand balance on a daily basis, overseeing all networks and providing a sales and marketing activity with regulated sales tariffs, guided by an active energy efficiency policy;
- the subsidiary EDF Production Électrique Insulaire, which is responsible for building and operating new means of generation.

The additional generation costs in these territories compared with equivalent costs on the mainland, which the legislator considers as a public service expense, are offset by the state budget (see section 1.5.1.2 "Public service in France").

Tariffs for Using the Public Transmission and Distribution Networks (TURPE) apply to users connected to the distribution networks (See also section 1.5.2.1.2 "French legislation: the Energy Code").

In view of the difference within these systems between the power generation costs and the sale price at the equalised tariff, EDF is applying demand-side management (DSM) strategies in these territories together with institutional players such as government departments, municipalities, the Energy Regulation Commission (CRE), the French Agency for Environment and Energy Management (ADEME), local institutions...

Changes and outlook

Investments to modernise and reinforce the electricity generation fleet

In accordance with the territorial PPEs, the EDF group has undertaken to replace the main power plants which are at the end of their useful lives. The new power plants will be constructed and operated by the EDF subsidiary PEI (Production Électrique Insulaire).

The construction sites for four motor power plants were completed successfully between 2012 and 2015, for a total net capacity of close to 746MW: Port-Est in La Réunion, Bellefontaine B in Martinique, Pointe-Jarry in Guadeloupe and Lucciana B in Haute-Corse. These new generation resources, equipped with innovative technologies, allow the Group to deliver better industrial and environmental results and contribute to satisfying a part of the emerging electricity demands in these regions. Two more plants are in the works in Corsica and French Guiana.

EDF PEI is currently a partner in a photovoltaic plant with battery storage project in French Guiana, and in a wind power plant with battery storage project in Martinique (commissioned in 2019). EDF PEI is also strengthening its renewable energy presence thanks to common projects with EDF Renewables.

The extension of the Saint-Barthélemy power plant (two new generators of 16MW) and the renewal of the power plant on Saint-Pierre-et-Miquelon (21MW) have respectively been operational since 2014 and 2015.

The Saint-Martin power plant was delivered in end June 2016 for an installed capacity of 40MW.

Investments in electricity networks

The continued growth in consumption in these regions despite the energy efficiency actions undertaken, as well as the development of renewable energies and the growing number of generation facilities coming online, have led the EDF group to continue the development and reinforcement of the electricity networks.

In total, EDF invested over €270 million in Production activities (including EDF PEI) and Networks in 2019.

A commitment to projects devoted to a better integration of renewable energies in the electricity generation mix and to optimising the management of electrical systems

France's Energy Transition Act establishes 2030 as the target date for energy autonomy for French overseas departments, and 2050 as the target date for Corsica.

The EDF group supports the emergence and development of electricity generation methods based on renewable energies adapted to IES. The methods favoured are those that provide abundant and guaranteed energy at competitive generation costs, but also sustainable in the long term, in such a way as to position them as credible alternatives to thermal generation: biomass, marine and river energies, waste recovery, biogas.

EDF also contributes to making advances in technical capacities relating to the insertion of intermittent renewable energies into IES by suggesting improvements to their technical specifications, making the grid more resistant to power disruptions, and developing smart metering systems. EDF is also spearheading three 5MW battery projects, intended as a means of offsetting supply/demand fluctuations, out of a series of power storage projects selected by the CRE in 2018.

Work is also ongoing to create micro-networks 100% powered by renewable energies in certain isolated zones. In 2017, an innovative system combining photovoltaic, digital monitoring and storage was installed on the island of Sein, allowing for a 100% renewable electrical supply several hours each day, while part of Mafate on the island of Réunion receives solar power and is equipped with a battery and a hydrogen fuel cell. Several other projects are planned, especially for

remote communes in the interior of Guiana (Maripasoula, Papaïchthon, Saint Georges de l'Oyapock).

Energy efficiency is a crucial energy transition lever in the island systems. EDF contributes to the elaboration and implementation of the demand side management (DSM) territorial strategy, one of the main tools of which are public grants for equipment (over €600 million validated by the CRE for 2019-2023). EDF actively promotes DSM operations financed by these grants for all types of customers, particularly through the Agir Plus label.

EDF has committed to deploy 1.2 million digital meters in the overseas departments (excluding Mayotte) and Corsica by end-2023. This represents an investment of €268 million. These digital meters will introduce much more modern customer relations and amplify the energy transition levers. At end-2019, over 300,000 meters were installed.

1.4.4.4 Électricité de Strasbourg

Électricité de Strasbourg (ÉS) is an Alsatian energy producer which is committed to the long-term energy and economic performance of its territory *via* its four activities: the distribution of electricity, supply of energies, energy services and the production of renewable energies. This portfolio of activities makes it possible for the ÉS group to better provide support to its customers in the energy transition.

ÉS also provides services to Local Distribution Companies (*entreprises locales de distribution*, or LDCs) in eastern France.

The ÉS group is 88.64% owned by EDF, and the remaining shares are owned by the public and its employees. Its shares are traded on Euronext Paris.

1.4.4.4.1 Distribution

Strasbourg Électricité Réseaux is an independently managed subsidiary responsible for public electricity distribution network management.

Strasbourg Électricité Réseaux operates, maintains, develops and renews an electricity network of over 15,000 kilometres in the 400 Alsatian municipalities that chose ESR to operate their electricity distribution grids under concession agreement. These concession agreements were renewed between 1993 and 2001 for a term of 40 years. The territory serviced covers three quarters of the Bas-Rhin department and includes more than 560,000 points of delivery for low and high-voltage (A and B) power, as well as connections with the Enedis network and two other downstream network operators.

In order to comply with recent developments in the French Energy Code, ÉS engaged in a process to create subsidiaries for its distribution activities at 1 May 2017.

1.4.4.4.2 Sales and marketing

ÉS Énergies Strasbourg is the sales and marketing subsidiary of the ÉS group.

At end-2019, ÉS Énergies Strasbourg supplied power to more than 550,000 electricity customers (including renewable), and over 113,000 gas customers, to both residential and business customers (services and industrial sectors) or to local authorities.

In addition to supplying electricity and gas, ÉS Énergies Strasbourg offers related services such as electricity, gas and plumbing corrective maintenance and digital services designed to help customers better manage their consumption. For its residential customers, ÉS Énergies Strasbourg has continued the implementation of support services in renovation and construction of the home, *via* a portal enabling customers to be in direct contact with a network of local partners. For its part, ÉS Énergies Strasbourg is active in the development of solar power and the promotion of alternative soft mobility, for instance in electric vehicle recharging infrastructure.

1.4.4.4.3 Energy services

ÉS Services Énergétiques, an energy services subsidiary owned 50-50 by ÉS and Dalkia, is engaged in the design and operation of heating networks, energy renovation of buildings, and the technical management and optimisation of energy installations. It also carries out design, build, and operation works in electrical engineering, and industrial and road lighting, as well as work in engineering and mass catering.

1. The Group, its strategy and activities

Description of the Group's activities

1.4.4.4 Renewable energy generation

Deep geothermal energy

The ÉS group is one of the leading players in deep geothermal energy in France. It has been operating the first deep geothermal power plant for industrial use at Rittershoffen for three years now.

Output from the Rittershoffen power plant has constantly risen, and should achieve an annual average of approximately 180GWh (thermal) of renewable superheated water from a geothermal source located a depth of over 2,500 metres.

ÉS also operates the Soultz-sous-Forêts power plant, which generated 6.3GW (electric) in 2019.

In 2017, ÉS launched the Illkirch Graffenstaden geothermal project, designed to supply power to the future heating network of the Innovation Park and surrounding areas. This project is being carried out by the wholly-owned subsidiary, ÉS Illkirch Géothermie. This project is designed to produce both heat and electricity. The first borehole reached the target depth of 3,400 metres in August 2019. The second borehole is due to be drilled after additional studies to take on board the lessons learned from the first borehole, in particular as regards the geology.

Biomass

In the field of biomass, the biomass cogeneration power plant produces 70GWh of renewable electricity and 112GWh of renewable heat, supplied to two of the city of Strasbourg's three heating networks.

Hydropower

In September 2019, ÉS inaugurated the newly renovated Framont hydropower plant after several months of works. The only one of its kind in the Grand-Est region, with a drop of 70 metres *via* penstocks, the power plant, with a capacity of 400kW, will allow production of 1,500MWh/year, equivalent to the energy use of 350 homes.

1.4.5 International activities of the Group

1.4.5.1 United Kingdom

EDF group activity in the United Kingdom (UK) is led by EDF Energy and EDF Trading (see 1.4.6.3 "Optimisation and Trading: EDF Trading").

EDF Energy is principally active in the generation of electricity in the UK, the supply of electricity and gas to domestic and business customers, providing energy and technical services; in the construction of new nuclear generation and owns a minority stake in development and operation of renewable energy project through a joint-venture with EDF Renewables.

EDF Energy is one of the UK's largest energy companies and the largest producer of low-carbon electricity, producing around 15% of the nation's electricity from its nuclear power stations, coal and gas power stations and combined heat and power plants.

The company supplies gas and electricity to 5.36 million business and residential customer accounts as at December 2019.

In partnership with China General Nuclear Corporation (CGN), EDF Energy is building a power plant on its Hinkley Point site in Somerset (EDF holds 66.5% and CGN 33.5%) and participates in the development of further New Nuclear projects at Sizewell in Suffolk (EDF owns 80% and CGN 20% at development stage) and Bradwell in Essex (EDF owns 33.5% and CGN 66.5% at development stage).

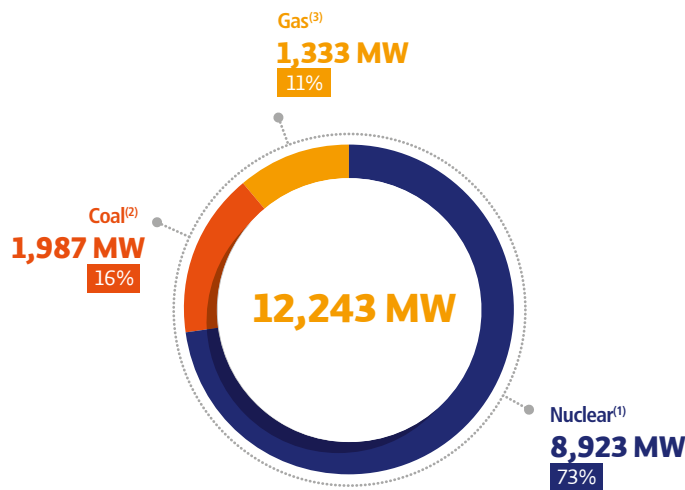
The company employs around 11,834 people at sites throughout the UK as at December 2019.

Total electricity generated overall in Great Britain in 2019 was c.336TWh and total electricity supplied in the UK was c.294TWh. Total gas supplied to UK domestic customers in 2019 was 289TWh.

→ 2019 Installed capacity and output in the United Kingdom

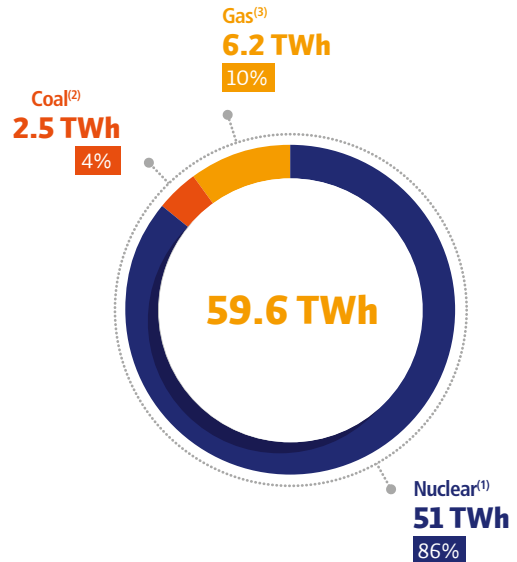
Installed capacity

in MW



Output

in TWh



(1) The figures shown represent 100% of Nuclear capacity and generation output, shared 80%/20% by EDF and Centrica.

(2) Coal capacity represents transmission entry capacity.

(3) Including 1.35 MW of Barkantine CHP.

NB: The values correspond to the expression to the first decimal or integer closest to the sum of the precise values, taking into account rounding.

EDF Energy	31/12/2019	31/12/2018
Electricity supplied ⁽¹⁾ (in GWh)	44,526	43,939
Gas supplied (in GWh)	28,527	28,944
Number of residential customer accounts (in thousands) ⁽²⁾	5,043	4,945
Number of employees ⁽³⁾	11,834	12,292
Total Recordable Incident Rate ⁽⁴⁾	1.03	1.12

(1) Power supplied to final consumer including previous year metering cut-offs.

(2) Year end figure.

(3) Headcount at the end of the period, including staff on maternity leave.

(4) Total Recordable Incident Rate: Annual total combined number of Lost Time Incidents, fatalities, Restricted Work Injuries and Medical Treatment Injuries (excluding First Aid)/number of hours worked x1,000,000. This covers all employees, agency and contractor staff. Excludes EDF Renewables and Hinkley Point C project. Accident Frequency Rate (AFR) for HPC is 0.084 at December 2019.

1.4.5.1.1 Strategy

Overview

EDF Energy's vision, "Our Future is Electric", is to lead the transition to a low-carbon energy system and the fight against climate change in five areas: serving customers; generating electricity; building new nuclear; providing energy and technical services; and renewables – in the latter two areas through joint ventures (JVs) with Dalkia and EDF Renewables, respectively. EDF Energy and the JVs aim to be the leaders in each area, while exploring its advantage from being the only company working in all five, and from being part of the EDF group. This strategy is entirely consistent with EDF group's CAP 2030 and underpinned by a focus on safety performance, cost efficiency across the business and R&D activity across the business areas.

In its energy supply business, EDF Energy is shifting focus from service efficiency to delivering outstanding customer experience, and has reached 4.4/5 score on Trust pilot as at Q4 2019. Following successful supply business transformation to its strongest profit level in 2018, the default tariff cap in force on the residential GB market since the start of 2019, combined with unprecedented levels of competition, now requires EDF Energy to deliver a new profit recovery plan.

At the same time, EDF Energy is delivering on its regulatory obligations through a cost-efficient roll-out of smart meters to customers' homes and small business premises, as part of the national programme. It is also developing new services and revenue streams by moving beyond supply, in response to market opportunities in flexibility, smart energy products and electrification of the economy, including through its innovation accelerator Blue Lab and products such as electric vehicle, smart charging and related electricity supply propositions, supported by EDF Energy's Generation Electric brand position.

EDF Energy aims to help businesses explore and develop solutions that deliver energy, carbon and cost savings, including through new capabilities such as the flexibility platform Powershift, and through Imtech – one of the largest technical and engineering service providers in the UK and Ireland that is co-owned with Dalkia and that recently also acquired Breathe, a UK energy performance contractor operating mainly in the public sector (also see section 1.4.6.1.1 "Dalkia").

In electricity generation, EDF Energy seeks to create value from both existing and new activities. It aims to secure value from its existing nuclear, coal and gas assets through continued operational excellence and safe, reliable generation.

Since 2009, EDF Energy has extended the lifetime of its nuclear Advanced Gas-cooled Reactors (AGRs) by an average of 8 years. However due to large non-replaceable components, there is a technical limit to AGR lifetimes. During a planned 2018 outage of Hunterston B Reactor 3 for graphite inspections, new keyway root cracks were discovered in the reactor core, resulting in a decision to take both Hunterston reactors (3&4) offline, and begin the most extensive graphite investigation programme ever undertaken. The graphite was always expected to change over time, and how it ages is one factor that will determine how long Britain's AGRs will

operate. In August 2019, the UK's independent nuclear safety regulator, ONR, gave permission for EDF Energy to re-start Reactor 4 for approximately four months operation. The unit was run continuously until December 2019 when it was shut down again for further inspections and safety case work. The safety case for the return to service of Reactor 3 has been submitted to the ONR for consideration. As the stations approach their technical lifetime limit, EDF Energy is aiming to optimise their end of life value and to develop new activities in nuclear decommissioning, building on its expertise in operating the UK's existing nuclear stations. The UK government's Department for Business, Energy and Industrial Strategy (BEIS) is working with EDF Energy and the Nuclear Decommissioning Authority (NDA) to consider how efficient and cost-effective decommissioning of the stations can be planned for and delivered, including how the stations will be owned and managed in the future.

The Sizewell B pressurized-water reactor (PWR) has a longer expected remaining life, and although work is yet to be carried out to support a life extension, EDF Energy expects that it should be possible to extend it by c.20 years from currently estimated decommissioning date of 2035.

EDF Energy is also decommissioning the Cottam coal power station that closed in 2019 after over 50 years of operation. A key element of these plans is a people plan to preserve and develop our capabilities as the business evolves from generation to decommissioning. Other important strategic actions concerning the generation fleet include optimising the operations of the West Burton B (Combined Cycle Gas Turbine power station) and the remaining lifetime value of West Burton A coal power station in the UK capacity market. This power plant has capacity agreements until September 2021. EDF Energy supports the government's policy aimed at ceasing coal-fired production by 2024, whilst continuing to examine the options beyond September 2021.

In partnership with China General Nuclear Corporation (CGN), EDF is building two new nuclear units (3.2GW capacity in total) at Hinkley Point in Somerset, based on the EPR technology. EDF Energy is also working with CGN to progress a similar 3.2GW EPR project at Sizewell in Suffolk. A further new nuclear power station proposal is being developed at Bradwell in Essex based on CGN's "UK HPR1000" Chinese technology.

Key milestones have included, in summer 2019, the Hinkley Point project achieving its first major construction milestone, J0, on schedule; and the UK government publishing a consultation on a new regulated asset base financing model for further new nuclear plant (see section 1.4.5.1.2.4 "United Kingdom – Nuclear New Build Business").

EDF Renewables UK, a joint venture between EDF Renewables and EDF Energy continues to operate and develop new renewable generation and storage projects. In 2019, EDF Renewables UK acquired the British start up Pivot Power, specialist in infrastructure for storage and electric vehicle charging, further strengthening the Group's position in the UK storage and electric vehicle market.

Regulation**Brexit and Euratom Treaty**

The UK voted to leave the membership of the European Union on 23 June 2016 (also see section 2.2.1 "Market regulation, political and legal risks").

Following the vote to leave, a Withdrawal Agreement (WA) and Political Declaration (PD), setting out the framework for the future relationship between the European Union and the UK after the UK's exit from the European Union and Euratom, were originally agreed in November 2018 but were subsequently revised in October 2019. The revised documents (WA and PD) have subsequently been approved by both the UK Parliament and the EU institutions in January 2020. As a result, the UK has left the EU on 31 January 2020 and has thereafter entered into a transition period that is currently due to end on 31 December 2020.

During the Transition Period, EDF Energy should not be significantly impacted by the UK's withdrawal, particularly with regards to UK trade with the EU and the Rest of the World and required access to EU labour (people/worker mobility arrangements).

Importantly, the elements of the WA and PD documents that relate specifically to "Energy" and "civil nuclear" were largely unchanged between the November 2018 and October 2019 versions. The civil nuclear section of the PD includes a commitment to a wide-ranging Nuclear Cooperation Agreement (NCA) between Euratom and the UK. The PD also states that both sides will keep the same high standards on state aid, competition, social and employment standards, the environment, climate change, and relevant tax matters.

The UK Government has made good progress in addressing a number of important key issues for the civil nuclear sector that require to be addressed (for Brexit) at a national level, including:

- all Euratom Withdrawal issues were agreed between UK and EU;
- the creation of a UK nuclear safeguards regime and its subsequent accreditation by the IAEA; and
- agreement of NCAs with the USA, Canada and Australia and a new nuclear cooperation agreement with Japan.

In spite of this Government progress and the mitigation actions that have been taken by EDF Energy and EDF group, risks to our business remain, particularly from a "no-deal" scenario, when it comes to a future relationship after 31 December 2020. Potential impacts from Brexit include tariffs and non-tariff barriers, the risk of delays at ports/airports creating disruption to supply chains (and potentially impacting plant performance and the Hinkley Point C construction schedule) and more limited access to the skilled labour required, including for the construction of Hinkley Point C.

Working with other stakeholders with respect to access to labour in a "no-deal" situation, EDF Energy is continuing to engage with UK Government on its outline proposals for its future (post Brexit) immigration system. EDF Energy will continue to monitor external events going forward and update our mitigation plans as appropriate.

Capacity Market

Following the decision on 15 November 2018 by the General Court of the Court of Justice of the European Union to annul the European Commission's decision not to object to the British Capacity Market scheme on State aid grounds, the UK Government put standstill arrangements in place under which payments to capacity providers were suspended but other elements of the scheme continued to operate where possible. On 21 February 2019, the European Commission opened an in-depth investigation into the scheme. On 24 October 2019, following this in-depth investigation, the Commission approved the British Capacity Market scheme on State aid grounds and on the following day, the UK Government ordered the reinstatement of the full operation of the Capacity Market. Deferred payments in respect of the standstill period were made to capacity providers in January 2020.

1.4.5.1.2 Activities of EDF Energy**1.4.5.1.2.1 Nuclear generation**

EDF Energy owns and operates eight nuclear power stations in the UK (15 reactors) with a total capacity of 8.9GW. Since 2009, Centrica plc. ("Centrica") has held a 20% shareholding in Lake Acquisitions Limited, the company in which the nuclear generation assets sit (except Nuclear New Build).

Nuclear generation fleet technology

Seven of the eight nuclear power stations are AGR power stations (Dungeness B, Hartlepool, Heysham 1, Heysham 2, Hinkley Point B, Hunterston B and Torness) and the eighth, Sizewell B, is a Pressurised Water Reactor (PWR) power station.

Safety and radiological protection

Nuclear safety is EDF Energy's overriding priority. In 2019, no safety events were recorded higher than Level 1 – anomaly – on the International Nuclear Event Scale (INES scale). In 2018 there was one event classed as INES 2 – incident.

EDF Energy operates to strict procedures to minimise and control the radiation doses received by employees and contractors at all of EDF Energy's existing nuclear power stations. In 2019, the average individual dose received by all workers on EDF Energy's existing nuclear sites was approximately 0.055mSv. The highest individual dose received in 2019 was 4.4mSv, with the legal dose limit being 20mSv per year.

The actual lifetime of each power station will be determined primarily by the technical and economic practicability of supporting its safety case. This is assessed at each statutory outage for the following operating period through inspection, maintenance, testing and assessment of plant performance. Following the outage, consent is required from the Office for Nuclear Regulation (ONR) before restarting the reactor. The operating period between statutory outages is normally three years for the AGR power stations and eighteen months for Sizewell B.

In addition, every ten years, the stations are subject to a more detailed and wide ranging Periodic Safety Review (PSR) of design, operational and organisational safety which must also be accepted by the ONR in order to secure continued operation. Since 2014, the following stations have received ONR acceptance for their respective PSRs: Sizewell B, Hinkley Point B, Hunterston B, Dungeness B, Hartlepool and Heysham 1. Heysham 2 and Torness PSR has taken place during 2018 with ONR acceptance received in January 2020. The next PSR due for submission to ONR is in January 2024 for Sizewell B, with their decision expected in January 2025.

The AGRs were designed with a nominal 25 year lifetime, and Sizewell B with a 40 year lifetime. However, with the aggregation of technical information, and operational and safety experience of EDF Energy, it has been possible to extend the expected AGR lifetimes.

Since British Energy was acquired by EDF, the AGR lifetimes have been further extended by an average of eight years. The last extensions were declared in February 2016. Hartlepool and Heysham 1 were extended by a further five years, and Heysham 2 and Torness were extended by seven years.

Although the work has not yet been carried out to support the extension of Sizewell B, EDF Energy expects that it should be possible to extend it by c.20 years.

CURRENT OPERATING LIVES* AND CLOSURE DATES

Power Plant	Type of reactor	Start of Generation	Power Station Lifetime (Formally Declared)	Life Extensions (Already Formally Declared)	Associated Scheduled Closure Date	Scheduled Periodic Safety Reviews
Hinkley Point B	AGR	Feb. 1976	47 years	22 years	2023	2017
Hunterston B	AGR	Feb. 1976	47 years	22 years	2023	2017
Dungeness B	AGR	Apr. 1983	45 years	20 years	2028	2018
Heysham 1	AGR	Jul. 1983	41 years	15 years	2024	2019
Hartlepool	AGR	August 1983	41 years	15 years	2024	2019
Torness	AGR	May 1988	42 years	17 years	2030	2020
Heysham 2	AGR	Jul. 1988	42 years	17 years	2030	2020
Sizewell B	PWR	Feb. 1995	40 years	-	2035	2025

* As formally recorded by EDF Energy and approved by the NDA.

CAPACITY AND OUTPUT BY POWER PLANT

Power Plant	Power ⁽¹⁾ (in MW)	Output ⁽²⁾ (in TWh)	
		2019	2018
AGR Power Plants			
Dungeness B	1,090	(0.2)	5.7
Hartlepool	1,185	7.6	8.1
Heysham 1	1,060	6.8	7.4
Heysham 2	1,240	10.3	8.9
Hinkley Point B	965	6.9	7.2
Hunterston B	985	1.0	3.8
Torness	1,200	10.1	8.6
PWR Power Plant			
Sizewell B	1,198	8.5	9.4
TOTAL	8,923	51.0	59.1
LOAD FACTOR ⁽³⁾		65%	76%

(1) Capacities are stated net of all power consumed for the power stations' own use, including power imported from the Grid.

(2) Output in each year reflects any refuelling, planned and unplanned outages.

(3) Load factors are obtained by dividing the actual output by the output that would have been achieved by each power plant operated at its stated capacity appropriate for the period.

Operational review of the existing nuclear generation fleet

The nuclear generation fleet produced 51.0TWh during 2019, 8.1TWh less than 2018 (59.1TWh). The reduction in output is largely due to the extended outages at Dungeness B to address corrosion on cooling water pipework and the discovery of steam pipework cracking and the extended outages at Hunterston B for graphite inspections and safety case work.

Planned statutory outages were completed on Hartlepool Reactor 2, Hinkley Point B Reactor 3, Hunterston B Reactor 3 and Sizewell B.

A statutory outage was started on Dungeness B Reactor 22 in August 2018 with an associated outage on Reactor 21 starting in September for work on common systems. These outages have been extended to address corrosion on cooling water pipework and the discovery of steam pipework cracking. The units are expected to return to service in May/April 2020.

Hunterston B Reactor 3 was shut down for a scheduled graphite core inspection in March 2018. Following the discovery of new keyway root cracks in the reactor core at a slightly higher rate than modelled in the current safety case, EDF Energy took the decision to keep the reactor offline for further inspections and safety case work. A graphite core inspection on Hunterston B Reactor 4 planned for 2019 was also brought forward to October 2018. A safety case for the return to service of Reactor 3

was submitted to the ONR in June 2019 and is being assessed. Meanwhile, Reactor 4 was returned to service in August 2019 but was shut down again in December 2019 awaiting approval of the Reactor 3 case. Both units are expected to return to service in Q1 2020, provided that the examination of the safety case confirms the proposed schedule. The scheduled dates for the return of these units have been postponed several times throughout the year 2019 due to the complexity of this case.

Radioactive Waste Management

In the UK, radioactive waste is classified into four categories:

- Low Level Waste (LLW), for which a near surface disposal route exists – including the LLW Repository at Drigg West Cumbria;
- Intermediate Level Waste (ILW), for which no disposal route is currently available in the UK;
- High Level Waste (HLW) is defined as radioactive waste in which the temperature may rise significantly as a result of the radioactivity, so this factor has to be taken into account in the design of storage and disposal facilities;
- Higher Activity Waste (HAW) – this is effectively HLW, ILW and any LLW that are unsuitable for near-surface disposal.

1. The Group, its strategy and activities

Description of the Group's activities

EDF Energy nuclear generation's strategy for LLW and HAW reflects that the UK and Scottish governments are focused on application of the waste hierarchy (reduce, reuse, recycle, recover). The use of a range of waste recycling and disposal routes will help to make the best use of the UK's Low Level Waste Repository (LLWR) in Cumbria. Only a disposal route for LLW currently exists in the UK.

HAW is stored for the medium-term in safe, purpose built facilities at EDF Energy's stations while longer term national solutions are being established within England and Scotland.

Under historic contractual arrangements, spent fuel from the AGRs is transported to Sellafield nuclear reprocessing site (owned by NDA) for reprocessing or long term storage. Heat generating HAW from the reprocessing of spent AGR fuel are converted into glass blocks for safe, long term storage.

Regarding Sizewell B, the spent fuel is stored on site and EDF Energy has built a further spent fuel dry storage facility on the Sizewell B site to allow the station to continue to safely store all of the spent fuel that will be generated over Sizewell B's life. Following long-term surface storage, the Sizewell B PWR spent fuel will be disposed to a future UK geological disposal facility.

The nature of EDF Energy nuclear generation's business and its historic government link means that the strategy for spent fuel and the management of radioactive waste from EDF Energy nuclear generation's power stations is approved by the NDA. However, EDF Energy has policies to continually improve and minimise the spent fuel and waste arising through the company's wider safety, sustainability and environmental policies.

Costs relating to radioactive waste management and decommissioning – Restructuring Agreements

Restructuring Agreements were originally entered into in 2005 as part of the restructuring of the former British Energy Group of companies in order to stabilise its financial situation. Since the acquisition of British Energy by EDF, EDF Energy Nuclear Generation Limited is a beneficiary of these agreements.

By virtue of these restructuring agreements:

- the Nuclear Liabilities Fund (NLF), an independent trust set up by the UK government, agreed to fund to the extent of its assets: (i) qualifying contingent and/or latent nuclear liabilities (including liabilities for management of spent fuel from the Sizewell B power station); and (ii) qualifying decommissioning costs for EDF Energy's existing nuclear power stations;
- the Secretary of State agreed to fund: (i) qualifying contingent and/or latent nuclear liabilities (including liabilities for the management of spent fuel from the Sizewell B power station) and qualifying decommissioning costs related to EDF

Energy's existing nuclear power stations, to the extent that they exceed the assets of the NLF; and (ii) subject to a cap of £2,185 million (in December 2002 monetary values, adjusted accordingly), qualifying known existing liabilities for EDF Energy's spent fuel (including liabilities for management of spent fuel from plants other than Sizewell B loaded in reactors prior to 15 January 2005);

- EDF Energy is responsible for funding certain excluded or disqualified liabilities (e.g. those defined as EDF Energy liabilities), and additional liabilities which could be created as a result of failure by EDF Energy to meet minimum performance standards under applicable law. The obligations of EDF Energy to the NLF and the Secretary of State are guaranteed by the assets of the principal members of EDF Energy.

Furthermore, EDF Energy entered into a separate contract with the Nuclear Decommissioning Authority (NDA) for management of AGR spent fuel and associated radioactive waste resulting from operation of power plants other than Sizewell B after 15 January 2005, and bears no responsibility for this fuel and waste once it is transferred to the processing site at Sellafield.

EDF Energy and the British authorities began discussions in 2019 to clarify the terms for implementing certain agreements concluded in January 2005 when British Energy was restructured, particularly the Nuclear Liabilities Funding Agreement (NLFA), in view of future nuclear plant closures. The purpose of these discussions is to have a more detailed definition of the dismantling costs to be recovered by EDF Energy from the Nuclear Liabilities Fund (and potentially from the UK Treasury which guarantees the NLF), and of the conditions in which the British authorities can exercise their option to purchase the nuclear power plants after the defueling phase (a right governed by the Option Agreement). A set of principles was agreed in 2019 as a result of these discussions, which are continuing with a view to achieving comprehensive binding agreements.

EDF Energy is drafting a modification for the Baseline Decommissioning Plan (BDP), which was approved in 2017 and is currently in force, in order to reflect the proposed change in the division of liability between EDF Energy during the defueling phase and the NDA (Nuclear Decommissioning Authority), a public body, during the decommissioning phase. In the first stage, concerning updating the estimated cost of removing the fuel, EDF Energy filed its Decommissioning Plan in January 2020 and the NDA's response is expected in April 2020. The second stage, concerning updating the estimated cost of decommissioning, is expected to take place in 2021.

This work led to an upward revision of the provision for decommissioning at the end of 2019. The receivable representing the reimbursements to be received from the NLF has increased by the same amount.

1.4.5.1.2.2 Thermal generation and gas storage

Power Plant	Location	Year commissioned	Number of units	Type of station	Capacity (in MW)	Output (in TWh)	
						2019	2018
Cottam	Nottinghamshire	1970	4	Coal-fired	2,000	1.7	2.7
West Burton A	Nottinghamshire	1969	4	Coal-fired and OCGT ⁽¹⁾	1,987	0.8	1.8
West Burton B	Nottinghamshire	2013	3	Combined Cycle Gas Turbine	1,332	6.2	6.8
TOTAL ⁽²⁾	UK		11		5,319	8.6	11.3

(1) Open Cycle Gas Turbine.

(2) Differences in total number due to the rounding.

In 2019, Cottam and West Burton A power plants generated 2.4TWh of electricity. This is 2.1TWh less than last year due to the impact of cold weather "Beast from the East" in 2018 and uneconomic market spreads in 2019 along with the closure of Cottam.

The decision to close Cottam power plant after more than 50 years of being in service was made on 7 February 2019. This decision reflects market changes and a drive to actively remove carbon from the power generation process.

West Burton B CCGT generated 6.2TWh of electricity in 2019, a decrease of 0.6TWh from 2018. This represented a good performance considering the market volatilities, plant challenges and associated extended outage periods during the year.

EDF Energy operates also two mid cycle gas storage facilities in Cheshire. Hill Top Farm became commercially operational in mid-January 2015 with three cavities. A fourth cavity became commercially operational in 2018 with the remaining cavity returning to service in December 2019. During 2018 the decision was made not to return the Hole House Facility to commercial operation for the foreseeable future due to challenging market conditions coupled with imminent requirements for some significant investment to the plant.

1.4.5.1.2.3 Customer business

	31/12/2019	31/12/2018
Customer electricity supplied (in GWh)	44,526	43,939
Customer gas supplied (in GWh)	28,527	28,944
Number of domestic customer accounts at the end of the period (in thousands)	5,043	4,945

The Customers business is responsible for the supply of gas and electricity to residential and business customers across the United Kingdom and the wholesale market optimisation of EDF Energy's generation and customer assets.

EDF Energy sells energy to two major customer segments: domestic and business customers. The size of business customers ranges from large public sector contracts to small privately-owned businesses. EDF Energy adopts different risk management strategies for domestic and business customers.

In the context of the Net Zero ambition, EDF Energy is developing innovative low-carbon products and services to better answer our customer needs and grow the business beyond supply, as an opportunity for EDF Energy to have longer customer relationships and create new revenue streams. The company deployed a first of a kind Electric Vehicle offer for B2C and B2B customers including tariff, charging point installation and car leasing. Early market take-up from both residential and business customers is promising, with more than 10,000 inquiries, including major B2B installation contracts such as Royal Mail Group.

EDF Energy has launched a smart home store offering connected devices and a battery offer for customers who generate the own power and apps for energy efficiency using smart meter data. For industry, solutions for renewable energy, storage, energy audits and a demand-side management aggregation trading platform have been successfully rolled out, providing ways to support EDF's customers in low-carbon transition.

Domestic

EDF Energy supplied 11.05TWh of electricity and 28.07TWh of gas for the domestic segment in 2019. As of 31 December 2019, EDF Energy had 3.025 million electricity accounts and 2.019 million gas accounts.

Competition

The latest data to the end of Q3 2019 showed that the combined market share of small and medium suppliers is now around 31%, compared to 27% at the end of Q3 2018. There were 49 small and medium suppliers at the end of Q3 2019 (excluding white labels and Licence Lites), compared to 60 small and medium suppliers at the end of Q3 2018.

EDF Energy had 5.043 million product accounts at December 2019, an increase of 98k since the beginning of the year. EDF Energy's market share as a whole fell from 9.52% in Q4 2018 to 9.45% in Q4 2019. This decrease is favourable compared to an average loss of market share of 2% for the other major suppliers.

Mergers and acquisitions are also driving change in the market. The asset swap between E.On and RWE has resulted in E.On acquiring the npower business and Ovo

Carbon Pricing

As the largest generator of low-carbon electricity in the country, EDF Energy benefits significantly from the increase in the wholesale power price as a result of the application of a carbon price to the carbon emissions of fossil fuelled generation. Electricity generators in Great Britain are subject to two main carbon pricing mechanisms, the EU Emissions Trading System (EU ETS) and the UK's Carbon Price Support tax.

The UK will remain part of the EU ETS until the end of the Brexit Transition Period in December 2020. In 2019, the UK Government consulted on options to replace the UK's membership of the EU ETS after Brexit; the Government's preferred option is the establishment of a UK ETS linked to the EU ETS, to come into effect in January 2021, which would require agreement between the UK and the EU to link the schemes. However, if this cannot be achieved, possible alternatives would be the introduction of a new carbon tax or of a stand-alone UK ETS.

The Carbon Price Support tax applied to electricity generators in Great Britain is currently set at £18/tonne until March 2021 and the tax rate for 2021/22 is expected to be set in the March 2020 Budget.

Energy sought approval to purchase SSE's domestic customer business in 2019, this was approved by the competition regulator and the sale was subsequently confirmed in early 2020.

Competition is also causing supplier failure and on 26 October 2019, it was announced that EDF Energy had been appointed Supplier of Last Resort for Toto Energy's c.134,000 domestic customers (c.240,000 accounts) and Solarplicity Supply Limited (c. 7,500 domestic and 500 business customers).

Regulatory Change

Default Tariff Cap

- Ofgem introduced a cap on default tariffs for domestic customers on 1 January 2019;
- The cap level is updated to reflect revised costs every 6 months, alongside the separate cap on tariffs for domestic customers with prepayment meters;
- During 2020 Ofgem will make a recommendation to Government about whether the default tariff cap should remain in place for the following year.

Smart metering Policy after 2020

- GB energy suppliers are required to take "all reasonable steps" to install smart meters for their domestic and small business customers before the end of 2020;
- Government has consulted on a new obligation on all suppliers for the period 2021 to 2024. The government received a number of responses from industry which challenged the level of ambition they set, and proposed alternative approaches. EDF Energy expects the next stage of the consultation process to begin by early Q2 which will provide more clarity on the governments preferred approach.

Supplier of Last Resort

- In the United Kingdom energy market there are licence arrangements to protect customers of failed suppliers. Ofgem appoints a Supplier of Last Resort (SoLR) to take on the customers of the failed supplier. The costs of failures, including unpaid contributions to environmental schemes, are then generally mutualised across all remaining suppliers;
- The number of failed suppliers has been significant in the last two years (13). In October 2019 EDF Energy was appointed as SoLR by Ofgem for two failed suppliers; Toto Energy and Solarplicity. Together these have increased EDF Energy's domestic customer portfolio by around 5%.

Ofgem Licensing Reforms

- Ofgem is undertaking a review of energy supplier licensing arrangements to ensure appropriate criteria are met by applicants and holders of supply licences, including to minimise risks and impacts of future supplier failures;
- The proposed reforms include increased regulatory monitoring of all suppliers to ensure effective risk management processes, and measures to secure customers' credit balances in the event of supplier failure. Ofgem will publish their final decision during the first half of 2020 with implementation later in the year.

Smart Metering

EDF Energy remains committed to delivering smart meters to all domestic and small business customers who want to benefit from this new technology. In 2019, EDF Energy has installed a further 550,422 smart meters and by the end of 2019, c.33% of EDF Energy customers in scope for the rollout have smart meters. In total 1.5 million smart meters have been installed to date. By Q1 2019 EDF Energy was able to complete the transition to the second generation smart meters and later in the year started the mass roll out of SMETS2 prepayment meters with EDF Energy having installed c.33,500 of them. In addition to delivering a similar number of installations in 2020, EDF Energy is in consultation with Ofgem regarding future targets and continues to have the full support and commitment of the Board of Directors to ensure it fully delivers on its regulatory commitments.

Domestic Customer Services

In the Q4 2019 Citizen's Advice Complaints (domestic) League Table, EDF Energy scored 4.45 stars (out of 5), rising from the 6th place to 2nd place behind SSE out of the 40 suppliers measured.

In 2019 customers have shown that they are very happy with the service they have received across all channels. The Trustpilot score has increased from 0.9 at the end of 2018 to 4.4 (score out of 5), securing a rating of "Excellent". The Advisor Recommendation Score⁽¹⁾ has steadily improved through the year to average +53 (on a scale from -100 to +100), with Digital Net Ease score scoring 4.4 out of 5. EDF Energy continues to work on reducing unnecessary customer contact with 67.5% of transactions completed by customers using inbound self-serve channels.

Non-domestic customers

In 2019, the non-domestic segment supplied a total of 33.47TWh of electricity, 2.16TWh to 176k small business customers ("SME") and 31.31TWh to medium and large business customers ("I&C") accounts. The business customer electricity market in the UK is c.182.5TWh in total, making EDF Energy the largest supplier to business customers. Almost half of the business electricity market is serviced by just four main players (EDF Energy, npower, SSE and E.ON UK).

Medium business has grown throughout 2019; volume has grown by 1TWh since the start of the year driven by improved performance with channel partners. A gas product in this market has also been launched.

In Large Business, Crown Commercial Service (CCS) has chosen EDF Energy to supply the UK's single largest annual energy supply agreement, for the third consecutive time. The four-year deal will run from April 2020 to March 2024. EDF Energy will be supplying >10TWh of electricity per year – equivalent of 3.2 million homes – and helping public buildings to become more energy efficient. This contract will also see our MPAN supply increase by 37k MPANs (*meter point administration number*).

In the Export market, Tesco are entering into a number of long-term Corporate PPAs with renewable generators to support their climate change commitments and EDF Energy is entering into off-take arrangements with Tesco for each of the sites (total c. 322GWh per year) and will provide balancing, route to market and settlement services for Tesco. The sites will commence operation between 2020 and 2021.

Wholesale Markets Optimisation**General principles**

The policies surrounding EDF Energy's energy purchasing and risk management activities are carried out in accordance with EDF group's policies and ensure that EDF

Energy's activities are optimised and its services delivered at a competitive price while limiting its gross margin volatility.

The Wholesale Markets Optimisation (WMO) Division's purpose is to manage the wholesale market risk of EDF Energy in one place within pre-defined risk limits and control framework. It provides an interface with the wholesale markets, via EDF Trading. WMO also provides modelling services to the whole of EDF Energy, as well as negotiating and managing asset backed commercial structures with third parties e.g. Nuclear Decommissioning Authority and Centrica.

Electricity sales and procurement

The power generated by the generation fleet is sold via the WMO Division within EDF Energy's customers business. Since April 2010, 20% of the output from nuclear generation is separately sold to Centrica, the minority shareholder of the current nuclear fleet, under the agreements entered into with Centrica. The remaining 80% is sold to WMO under the same transfer price as used for the transaction with Centrica, based on published market prices, smoothed over forward electricity prices where liquidity allows.

Over and above its own generation, EDF Energy also sources electricity through export power supplied from power purchase agreements which are mainly with renewable and CHP generators. In 2019, EDF Energy acquired approximately 6.4TWh through this channel.

The Powershift platform developed by EDF Energy's Blue Lab Innovation Department, gained its first customers in 2019. It offers customers flexibility to utilise storage and small scale generation to earn revenues from reducing or shifting energy demand.

For delivery in 2019, EDF Energy's net position on the wholesale market was a sale of approximately 7.6TWh (including structured trades). In 2019, EDF Energy sold approximately 38.2TWh and bought 30.7TWh⁽²⁾.

Gas, coal and carbon rights procurement

Coal and gas contracts (physical and financial) and CO₂ emissions rights are entered by EDF Energy to hedge the fuel requirements of its power plants, gas storage and gas consumers.

Purchases are based on generation forecasts and target fuels stock levels. In 2019, 50% of EDF Energy's coal deliveries were from domestic suppliers and 50% were from international sources.

1.4.5.1.2.4 Nuclear New Build business**New Nuclear activity**

Following the final investment decision (FID) made by EDF's Board of Directors on 28 July 2016, EDF and CGN signed final contracts for the construction and operation of two EPR reactors on Hinkley Point site in Somerset ("Hinkley Point C" or "HPC" project).

At the same time, agreements were signed for the development in the UK of two nuclear power plants at Sizewell in Suffolk ("Sizewell C" project, based on UK EPR technology) and Bradwell in Essex ("Bradwell B" project, based on UK HPR1000 technology) and the delivery of the Generic Design Assessment for the UK HPR1000 technology.

The EPR technology is already being deployed at the power stations at Flamanville in France (currently under construction and fully owned by EDF – see section 1.4.1.2.1 "Flamanville 3 EPR project") and at Taishan in China (active, see section 1.4.1.2.2 "Other New Nuclear projects – Taishan EPR").

Hinkley Point C (HPC)**Financing**

EDF's share in HPC is 66.5% and CGN's share is 33.5%.

EDF has taken note of the British Government requirement not to have the control of HPC sold down during the construction period without the previous approval of the British Government.

(1) Advisor Recommendation Score.

(2) The difference is due to the rounding of figures.

Project Costs and Timeline

The Hinkley Point C project successfully delivered J-0 milestone in June 2019, the completion of the nuclear island "common raft" for its first unit, in line with the schedule announced in September 2016.

Following this major milestone, a detailed review of the project's costs, schedule and organisation was performed. The review has concluded that ⁽¹⁾:

- the next milestone of completing the common raft for Unit 2 in June 2020, which was announced earlier in 2019, is confirmed;
- the previously communicated risk of COD delay of units 1 and 2 (of 15 months and 9 months respectively) has increased ⁽²⁾;
- the project completion cost is now estimated between £₂₀₁₅21.5bn and £₂₀₁₅22.5bn⁽³⁾, an increase of £₂₀₁₅1.9bn to £₂₀₁₅2.9bn⁽⁴⁾ compared to the previous estimate. The range depends on the effectiveness of action plans to be delivered in partnership with contractors.

The additional costs are mainly the result of difficult soil conditions, which made the earthworks more expensive than expected, the revision of the objectives of the operational action plans, and the additional costs related to the implementation of the functional design of a "first of a kind" plant adapted to the British regulatory context.

EDF's project rate of return for Hinkley Point C (IRR) is now estimated between 7.6% and 7.8% ⁽⁵⁾.

The management of the project remains mobilised to begin generating power from Unit 1 at the end of 2025. To achieve this, operational action plans overseen by the management team of the project are being put in place. These involve the EDF group's engineering teams in the UK and France, buildings and ancillary works contractors, and suppliers of equipment and systems throughout the supply chain.

The agreements between EDF and CGN include a capped compensation mechanism between both shareholders in case of cost overruns or delays. The additional costs announced in September 2019 will trigger the activation of this clause when the time comes. These agreements are part of a Shareholders' Bilateral agreement signed between EDF and CGN in September 2016 and are subject to a confidentiality clause (see section 2.2.4 "Operational Performance, risk factor 4A Management of large and complex industrial projects [including EPR]").

Progress of the project

At the end of 2019, the project confirmed the "J-0" target for unit 2 set for mid-2020 and has achieved four goals set for 2019:

- tunnel boring machine launch;
- J-0, completion of the nuclear island common raft of unit 1;
- completion of engineering for Inner Containment Lift 1;
- start of manufacturing of unit 1 Pressurizer.

In addition, other major works have been delivered, in particular the signature of a commercial alliance on electro-mechanical work, manufacturing of steam generator parts and legs by Framatome, handover of the electrical substation platform to National Grid, first boats docked at the jetty and opening of a welding school. Moreover, the Liner cup, which is part of the reactor's steel containment liner and weighs 170 tonnes, was lifted and successfully placed into the reactor building.

Progress on unit 2 Nuclear Island, Conventional Island and Pumping Station are 12 months after Unit 1, as planned.

At end 2019, the expenditure to date for the project as a whole stood at £9.4 billion (at nominal values), excluding interim interest, or £8.8 billion at real £2015 values.

Exchanges with the UK office for nuclear safety and regulation (ONR)

Discussions with the ONR are ongoing.

Next ONR Hold Point will be the start of bulk MEH erection. In addition, agreement from ONR will be needed for the dispatch of the first components coming from Framatome and for the delivery of fuel on site.

Contract for Difference (CfD)⁽⁶⁾

The HPC project company, NNB Generation company (HPC) Limited and the Department of Energy and Climate Change (DECC) have agreed, on October 2015, on the full terms of the CfD for HPC, which was approved by the European Commission in October 2014, ruling that the terms complied with EU state aid rules. The Commission's decision has been challenged by Austria, and is currently on appeal before the Court of Justice of the European Union, the claim before the General Court having been dismissed in a ruling on 12 July 2018.

The CfD was signed on 29 September 2016 alongside all the other contracts with the UK Government and it is a contract to provide security in respect of revenues generated from electricity produced and sold by HPC through compensation based on the difference between the Strike Price and the market price, for a period of 35 years from commissioning of Unit 2.

From the plant's start date, if the reference price at which the generator sells electricity on the market is lower than the strike price set under the terms of the contract, the generator will receive an additional payment. If the reference price is higher than the strike price, the generator will be liable for the difference.

The key elements of the CfD are:

- the strike price for HPC is set at £₂₀₁₂92.50/MWh; strike price will be reduced to £₂₀₁₂89.50/MWh if the Sizewell C project is launched (*i.e.* if a final investment decision is taken), with further compensation from Sizewell C to HPC, in order to share first of a kind costs of EPR across both projects;
 - the strike price is fully indexed to UK inflation through the Consumer Price Index (CPI);
 - the payment term is 35 years; any delay in the commercial commissioning of unit 1 exceeding 4 years after the deadline specified by the agreement for unit 2 (*i.e.* beyond 31 October 2033, unless this date is postponed pursuant to the terms of the agreement) authorises (but does not oblige) the government to terminate the agreement. Moreover, in the event of any delay to unit 1 or unit 2 resulting in the unit in question starting up after the commercial commissioning deadline, the corresponding 35-year payment term would be decreased commensurately with the deadline overrun.
- Regarding the risks identified in the deferral of delivery (15 months for Unit 1 and 9 months for Unit 2), these are within the deadlines set out in the signed contract;
- the project is protected against certain unfavourable regulatory and legislative changes; provision has also been made to review the costs (up or down depending on the assumptions used) in the fifteenth and twenty fifth years, and to review certain conditions for the costs corresponding to decommissioning and waste management operations (Funding Decommissioning Programme);
 - should there be savings from the construction of the HPC project, these will be shared with consumers through a lower electricity price.

There is no explicit volume guarantee in the CfD, nor is there a ceiling; however, the contract is protected against the risk of erasure in case of changes to regulations or to the market.

(1) Please refer to the Press release of 25 September 2019 "Update on Hinkley Point C project".

(2) As previously communicated in July 2017, if this risk were to materialise, it would entail an additional cost of around £0.7bn in 2015 sterling. Under this assumption the IRR for EDF would be lower by 0.3% (refer to the Press release of 3 July 2017 "Clarifications on Hinkley Point C project").

(3) In 2015 sterling, excluding interim interest and excluding forex effect versus the reference exchange rate for the project of 1 sterling = 1.23 euro.

(4) Additional costs net of action plans.

(5) EDF equity IRR calculated at the exchange rate 1 sterling = 1.15 euro and including the capped compensation mechanism in place between shareholders.

(6) Terms of the contract are available on the UK government website: <https://www.gov.uk/government/publications/hinkley-point-c-documents>.

1. The Group, its strategy and activities

Description of the Group's activities

HPC project is protected against power market price changes during the CfD period.

Principal project risks

These risks are detailed in section 2.2.4 "Operating performance" – 4A – Management of large and complex industrial projects (including nuclear).

As with any project of this scope, and even though the CfD has a protective role, the project presents risks in terms of timing and budget overruns at the end of the project.

In terms of foreign exchange, it is important to note that c.1/3 of the project costs are denominated in Euro. This exposes both the project and EDF group to the GBP/EUR exchange rate.

Should sterling fall against the euro, the sterling cost of the project will go up and its IRR will therefore drop. A hedging strategy has been implemented in 2019 at project level to limit exposure of Euro spending to a potential sterling devaluation and capture gains in case of Sterling appreciation.

Nevertheless, at EDF group level, a Sterling devaluation will trigger a fall in euro funding requirements and therefore lower Group debt. Given the long-term investment horizon in the HPC project, EDF group is implementing a gradual strategy to cover the risk of an increase in sterling value for its HPC investment. Beyond the commissioning phase, the IRR of the euro investment is dependent on fluctuations in sterling and UK inflation (in relation to the July 2017 baseline), as revenue is generated in sterling and linked to inflation.

Funded Decommissioning Programme (FDP)

Contracts for the Funded Decommissioning Programme (FDP) were signed on 29 September 2016. There is a statutory requirement for nuclear operators to have a FDP, under which an independent Fund Company will collect contributions and manage the money built up to pay for decommissioning of the nuclear reactor at the end of the generation.

The Nuclear Decommissioning Fund Company (FundCo) was set up in compliance with the Energy Act 2008 as its purpose is to provide costs of decommissioning by implementing the FDP.

The overall objective of the FDP is to ensure that operators make prudent provision for:

- the full costs of decommissioning their installations;
- their full share of the costs of safely and securely managing and disposing of their waste (including long term storage); in doing so, the risk of recourse to public funds is remote.

Sizewell C

EDF and CGN signed the Sizewell C Project equity documents on 29 September 2016 alongside the HPC contracts, for the development, building and operation of two EPR reactors (3.2GW).

During development phase previous to final investment decision, EDF's share is of 80% and CGN of 20%. After the final investment decision, the project is not aimed to be controlled at EDF level. As a result, it should not be consolidated. The objective is for other investors and lenders to step in in due course and for EDF to become a minority shareholder with *pari passu* rights. Final investment decision is targeted around 2021 year end.

Project development is based on a replication strategy from HPC which should enable costs to be driven down thanks to a decrease in construction costs combined with lower risks. The Sizewell C project will also be based on EPR technology, and will benefit from feedback and experience from HPC.

Financing of the project is under discussion with the UK government. It would use the Regulated Asset Base (RAB) model, which caps investor exposure to the risk of cost overruns above a specified amount, subject to terms to be defined. This model would provide a lower cost of capital, corresponding to a lower level of risk. Investors would receive income right from the start of construction. The government launched a consultation process from July to October 2019 to seek views from stakeholders on the considered Regulated Asset Base (RAB) model for New Nuclear projects. Feedback is expected first half of 2020.

This financing model has never been implemented for projects of that scale before and therefore would be one of the largest ever equity issuance and project financing on the European scene. Securing the appropriate risk-sharing mechanism and ultimately the corresponding financing structure ahead of the Final Investment decision is therefore key for the project, the UK Government and the current shareholders. EDF's ability to make a final investment decision on Sizewell C and to participate in the financing of this project beyond the development phase could depend on the operational control of the Hinkley Point C project, on the existence of an appropriate regulatory and financing framework, and on the availability of sufficient investors and financiers; such criteria are not met to date (see section 2.2.4 "Operational Performance", risk factor 4A Management of large and complex industrial projects [including EPR]).

Generic Design Assessment UK HPR1000 – Bradwell B

The cooperation between EDF and CGN encompasses the process to obtain the design certification of the Chinese-based design HPR1000 in the UK (UK HPR1000) by the Office of Nuclear Regulation and by the Environment Agency through the Generic Design Assessment (GDA) process. For that purpose, EDF and CGN have established a joint-venture, General Nuclear Systems Limited (GNS) (33.5% EDF – 66.5% CGN). The GNS joint-venture Shareholders' Agreement was signed on 29 September 2016.

The HPR1000 technology has been developed by CGN with a reference project under construction in China (FangChengGang 3-4).

The GDA is a 4 steps process, which started in January 2017, the first three steps have already been successfully achieved. Step 4 started in February 2020 and should be completed at the end of January 2022.

In parallel, EDF and CGN signed the Bradwell B Project Shareholders' Agreement on 29 September 2016 which consists in the development of a nuclear generation facility at Bradwell-on-Sea using the UK HPR1000 technology. To date, with respect to the development phase, CGN has a 66.5% interest and EDF of 33.5% interest.

1.4.5.2 Italy

1.4.5.2.1 EDF group market and footprint in Italy

Italy is one of EDF's four key markets in Europe alongside France, the UK and Belgium.

The Group is mainly present in Italy through its 97.446% shareholding in Edison ⁽¹⁾, which is a major player in the Italian electricity and gas markets and a well-known Italian brand.

In line with Edison's strategy goal of becoming a key player on the Italian renewable energy market against a backdrop of energy transition, in July 2019 Edison bought out from EDF EN Italia Spa (EDF EN Italia), a wholly-owned subsidiary of EDF Renewables, with a portfolio of 216MW of wind farms and 77MW ⁽²⁾ of solar farms. Furthermore, in 2016 Fenice, a wholly-owned subsidiary of EDF, was affiliated with Edison to strengthen its strategic engagement in the energy services sector, with a fuller, more diversified offering. The two transactions simplified EDF's business on the Italian market.

The EDF group is also present in Italy *via* Citelum.

1.4.5.2.2 Edison strategy

Like the majority of European energy systems, the Italian market is currently facing a certain number of challenges. Thanks to its current position and integrated presence in the sustainable gas and electric power value chain, Edison is well-placed to seize opportunities created by market changes, while pursuing efficiency and profitability, in line with the CAP 2030 priorities and international and Italian energy policies.

During 2019, Edison focused on implementing its transformation strategy, designed to pursue its repositioning as a responsible leader in the context of energy transition. The company has focused on increasing renewable production with low CO₂ emissions, and developing energy services on the upstream market. At the same time, the commitment to withdraw from oil and gas Exploration & Production (E&P) will enable it to focus on strategic business that is in line with Italy's National Climate and Energy Plan (*Piano Nazionale Integrato Per l'Energia e il Clima 2030*).

(1) Equity stake; 99.477% share of voting rights.

(2) Consolidated capacity; 75MW net capacity.

Going forward, the main drivers of development are as follows:

- regarding power generation, Edison aims to increase its renewable energy generation by targeting investments in hydropower, wind power and solar power projects to optimise its electricity generation portfolio in Italy and to reduce its carbon emissions. Another of its goals is to enhance its high-performance, low-emission thermal production assets, developing new high-performance power plants to supplement renewable production resources. In 2019, Edison thus bought out EDF EN Italia and announced the construction of two new-generation CCGT power plants at Marghera Levante and Presenzano;
- regarding sales to the final market: Edison's goal is to strengthen its position on the Italian market by means of an innovative offering, in particular through the development of energy services and a low-carbon offer tailored to the end market, in particular for customers in the industrial, services, and public administration sectors. This aim draws on the brand's strong positioning, a

diversified offering, and on synergies resulting from the strategy of increasing its gas and electricity customer portfolio for the residential and industrial segments;

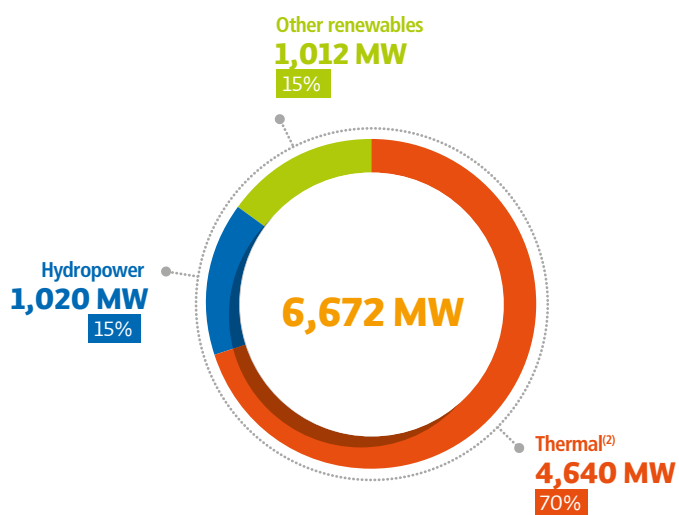
- regarding gas, Edison is the EDF group's gas platform. Thanks to skills cumulated over time, since 2017 the company has had a service agreement with EDF enabling it to provide integrated management of all assets and develop EDF's upstream gas business (in particular the supply of gas and LNG, contract management, medium to long-term optimisation, transport, and storage). The Group also benefits from EDF Trading, responsible for asset optimisation, as well as from short-term operations dealing with interventions on wholesale markets on the continent and in the UK. Over and above optimising the Group's gas business portfolio, Edison supports development of a sustainable fuel for maritime and road transport, with the construction of a supply chain for marketing small-scale LNG. The company also seeks to contribute to the development of the Italian gas market, as well as to the flexibility and security of supply in order to enhance its competitiveness and that of the EDF group.

1.4.5.2.3 Edison's business

→ Installed capacity and electric generation of Edison in Italy⁽¹⁾ – 2019

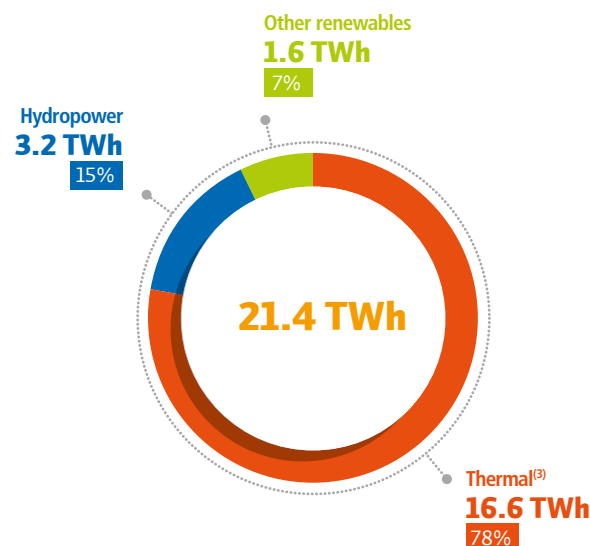
Installed capacity

in MW



Output

in TWh



(1) Consolidated data.

(2) Including Generation 4.5 GW and Services of Energy Efficiency with the customers 0.2 GW.

(3) Including Generation 15.9 TWh and Services of Energy Efficiency with the customers 0.8 TWh.

NB: The values correspond to the expression to the first decimal or integer closest to the sum of the precise values, taking into account rounding.

In 2019, Italian energy consumption amounted to 319.6TWh, 0.6% lower than in 2018.

Net output of 281.4TWh⁽¹⁾ covered 88% of national consumption, compared with 86% the previous year, thanks to net imports decreasing by 5.7TWh (-13% compared to 2018). The increase in thermal power production, which amounted to 186.8TWh in 2019 (2.5TWh more than in 2018), as well as solar and wind power (44.4TWh in 2019 vs 39.9TWh in 2018) was partially offset by a decrease in hydropower (47.0TWh, 5.9% less than in 2018) due to unfavourable weather conditions. Based on power generation data for 2018⁽²⁾, Edison is the third-largest producer at the national level, after Enel and Eni. In 2019 its net power output in Italy was 21.4TWh⁽³⁾ which accounted for around 8% of net Italian electricity generation.

National demand for gas was 73.7Gm³, up by 2.2% in comparison with 2018 due to a +10% increase in the use of gas for electricity production linked to a decrease in

net electricity imports and lower hydraulic and coal production. Both industrial and residential consumption decreased by 1.9%. Gas imports to Italy accounted for 96% of national demand. Edison carried out 21% of these imports, a total of 14.7 billion cubic metres.

By the end of 2019, the capacity market was established in Italy, with the launch of two auctions for delivery in 2022 and 2023. Edison won 2.8GW of existing capacity for both years, and a total of 1.4GW of new capacity benefiting from a fixed contribution for 15 years.

With respect to hydropower, the "simplification decree" (law dated 11 February 2019, no. 12) covering national regulation of concessions for hydropower plants was approved in law. The new provisions cover the allocation and fees for concessions, and must be implemented in specific regional laws that have not yet been published.

(1) Excl. pumping.

(2) Data published by the ARERA (ARERA report, vol. 1, p. 48, fig. 2.1); 2019 data will be released in mid-2020.

(3) See detailed output data (including energy efficiency services) in the chart below.

1.4.5.2.3.1 Electricity generation

In Italy, as of 31 December 2019 Edison's installed capacity (excluding energy efficiency services) amounted to 6.5GW, with net electricity production of 20.6TWh in 2019, an increase of almost 10% from the 2018 figure.

Edison's generation fleet is currently made up of 93 hydropower plants, 14 thermal power plants, 46 wind farms and 64 photovoltaic plants. Combined-Cycle Gas Turbines (CCGT) account for 78% of electricity generation, while hydropower accounts for 15% and combined wind and solar for 7%.

In 2019, Edison's hydropower output totalled 3.2TWh (up 3.6% from 2018), resulting from the operation of some 1.0GW of hydropower installations in Italy, approximately 80MW of which was from "mini hydropower" installations, some of them located on irrigation canals in Piedmont and Lombardy. Wind and solar power production increased by 0.6TWh in 2019, due in particular to the acquisition of EDF EN Italia power plants and the output from all the new wind farms following the public auction in 2016.

In the field of renewable energy, Edison has installed capacity of 0.9GW, making it the second-largest wind power operator on the Italian market after ERG⁽¹⁾. Edison operates wind power through E2i (Energie Speciali srl), a company set up in 2014 in partnership with the F2i fund, which owns a 70% stake; the remaining 30% is owned by Edison via Edison Partecipazioni Energie Rinnovabili srl.

E2i owns 711MW of renewable assets, 165MW of which correspond to eight construction, reconstruction, or extension projects for wind farms acquired following a public auction in 2016, construction of which was completed between late 2018 and 2019. All energy produced by E2i is transferred to Edison as part of the integrated management of its production portfolio.

Furthermore, in July 2019, with a view to increasing its size and exploit synergies on the client market, Edison bought out EDF Renewables' 100% stake in EDF EN Italia. The rationalisation of renewable business in Italy continued, with the acquisition by Edison from EDF Renewables Services SAS of 70% of EDF EN Services Italia Srl (previously, Edison owned a 30% stake): this company undertakes operation and maintenance of the Group's renewable installations (including those of E2i) (see section 1.4.1.5.4 "EDF Renewables").

In line with Italy's National Plan for the Climate and Energy (*Piano Nazionale Integrato Per l'Energia e il Clima 2030*), which supports the development of gas-powered electricity production and its integration with renewable production to ensure the flexibility and security of the national electricity system, in 2019 Edison started work on the first new-generation combined-cycle gas power plant (CCG) on the site of the Marghera Levante power plant. This 780MW installation is highly flexible and efficient (with energy efficiency of 63%), has a low environmental impact (with CO₂ emissions 40% lower than the national average and 70% fewer NO_x emissions); construction is scheduled to take three years. The company also announced that one of its aims for 2020 was to begin work on a 760MW greenfield project at Presenzano, in Campania, using the same technology, with construction over a period of some 30 months.

Internationally, Edison is well-established in Greece, where it owns a 50% stake in ElpEdison SA, one of the country's main electricity operators, alongside Hellenic Petroleum. ElpEdison owns two CCGT plants: one in Thessaloniki (400MW) and one in Thisvi (410MW), both built by Edison and whose electricity is sold on the retail market.

Last, Edison holds a 50% stake in Ibritermo, a subsidiary in Brazil, which operates a 226MW CCGT plant, and a 20% stake in Kraftwerke, which operates 626MW of hydropower in Switzerland.

1.4.5.2.3.2 Gas

For the implementation of its gas strategy, the EDF group, through Edison, benefits from experience along the entire value chain of natural gas.

Edison's Italian gas supply portfolio is based mainly on a series of long-term agreements; as of the end of 2019, these covered approximately 14.7 billion cubic meters of imports via gas pipelines and LNG; 5.3 billion cubic metres were bought on the market or produced in Italy by E&P activities (currently being disposed of).

In 2019, total sales of gas in Italy amounted to 20.0Gm³ (compared with 20.7Gm³ in 2018). Edison delivered 4.9Gm³ of gas to the industrial sector, 2.6Gm³ to the residential sector, 6.6Gm³ to the thermoelectric sector (including Edison's own internal needs), and 5.8Gm³ to the wholesale market.

With the aim of increasing its competitiveness and bolstering Italy's gas supply system, in late 2019 Edison extended the agreement to import one billion cubic meters of gas per year from Algeria through until 2027. The long-term import agreement for Russian gas came to end in 2019; Edison has entered into a new agreement for one billion cubic meters of gas starting in 2020.

In July 2019 Edison announced the disposal of its oil & gas exploration and production activities to Energean Oil and Gas for the sum of \$750 million, plus a price supplement of \$100 million on commencement of gas production from the Cassiopeia field. Completion of this transaction remains subject to obtaining the administrative permissions required in the various countries of operation, in particular Algeria, whose government has asked Edison to enter into discussions with Sonatrach with respect to assets in the Edison E&P portfolio located in Algeria. Disposal of E&P assets is expected to be finalised in 2020.

Gas infrastructures

Edison is involved in various gas import infrastructure projects (see section 1.4.6.2.2.2 "Infrastructures"), such as IGI Poseidon, 50%-owned by Edison (and 50%-owned by Depa SA), a company involved in the development of several projects that aim to connect Greece and Italy (Poseidon), Greece and Bulgaria (IGB, in 50/50 partnership with Bulgaria), as well as the gas resources from the Eastern Mediterranean area (Israel, Cyprus) to Greece (EastMed) and Italy (Poseidon). In particular, construction of the IGB gas pipeline, 182km long and capable of transporting three billion cubic meters per year, commenced in 2019. This project is one of the European Commission's Projects of Common Interest, and benefits from €84 million worth of EU aid. At the end of 2019, IGI Poseidon and Israel Natural Gas Lines Company Ltd (which operates infrastructures in Israel) entered into a collaborative agreement for the development of the Eastmed gas pipeline linking the eastern Mediterranean basin to Europe.

Edison also has the right of use of 80% of the Rovigo offshore regasification terminal's capacity (6.4Gm³ out of 8Gm³ a year) where LNG imported from Qatar with Ras Laffan Liquefied Natural Gas Company Limited II (RasGas II) is regasified.

Concerning LNG, since 2018 Edison engaged in building a Small Scale LNG supply chain to sell LNG and thereby support the development of a sustainable fuel for transport by road and sea. The first stage of the project consists of setting up an onshore depot at the port of Ravenna, where the LNG will be stored via a small dedicated LNG terminal, and will be undertaken by Depositi Italiani GNL, a new entity jointly held by Edison (49%) and Petrolifera Italiana Rumena (51%). Depositi Italiani GNL started the construction of the depot in 2019; Edison will have right of use to 85% of the depot's capacity of over 1Mm³ of LNG a year and will be able to supply LNG to 12,000 lorries and up to 48 ferries.

(1) Data published by ANEV (page 11 of the ANEV 2019 Brochure), taking into account the capacity of EDF EN Italia and E2i.

1.4.5.2.3.3 Sales and marketing

In 2019, Edison sold 31.2TWh of electricity in Italy (compared with 29.4TWh in 2018, *i.e.* up 6%), of which 20.6TWh were generated ⁽¹⁾ and 10.6TWh were purchased on the markets. Sales to end-customers amounted to 14.9TWh, up by 9% compared with 2018 across all segments (including the industrial sector). At the end of 2019, Edison was serving around 0.6 million electricity customers and around 0.9 million gas customers, both in the business and residential segments.

Development of marketing continues to be a priority for Edison, being seen as a foundational business to support expansion of energy services and renewable production. Following the acquisition of GNVI in the first half of 2018 (renamed Edison Energie and integrated into Edison Energia in 2019) and Attiva, in 2019 Edison expanded its offer of innovative services for the maintenance of domestic appliances, acquiring all the share capital of Assistenza Casa (in which Edison had had a 51% stake since 2017) from the HomeServe group. The company also bolstered its portfolio of services for domestic customers, with a full range of products for the home: home insurance, domestic solar power, and electric mobility services. In 2019, Edison increased the size of its sales outlet network in Italy ⁽²⁾ from 204 to 364, further enhancing its customer relations. In parallel, Edison intends to maintain its position as a leader in the business-customer market by developing an advisory approach in energy as well as innovative products and services made possible by market and regulatory changes. As in the domestic segment, B2B customers can benefit from a new, environmentally-friendly offering combining solar power, batteries, and the use of electric vehicles. Improvements in the sales process in recent years have resulted in better service to customers. Growing customer satisfaction and the development of low-carbon offers and value-added services targeted by segment should strengthen ties with the end market and expand the customer base.

1.4.5.2.3.4 Energy services

Edison develops, sells and manages energy and environmental services *via* a dedicated business unit called "Energy Services Market Division" (ESMD).

The activities of Fenice as well as those of Edison Energy Solutions have been integrated into this new unit. The proposed solutions are dedicated to the development of energy efficiency projects intended for major industrial clients, small and medium-sized enterprises and tertiary customers. With the acquisition of two firms active in public services, the ESMD aims to consolidate its position in a sector that is growing. The customer offering also includes assistance to comply with environmental standards on their sites.

The business models are adapted to the requirements of the customers: the ESMD designs, builds and manages, on behalf of its customers, assets such as cogeneration/tri-generation plants, photovoltaic installations, electricity substations, thermal power plants for industrial use, cold generation power plants, compressed air generating plants, fluid distribution systems (electricity, gas, hot or refrigerated air, compressed air, industrial gas, water) and industrial water treatment plants. The range of services is completed by a consulting activity in terms of energy, management of environmental securities and internal and external training for customers and partners. The Division has some 420 customers; contracts with the FCA group still make up a large share of major-account business.

Projects are developed with customers in the form of industrial partnerships or performance agreements. The business model can be adjusted to customer requirements, and may range from customer assistance to third-party financing or direct investment by Edison in the projects (the Esco model).

Edison is active in the public services sector *via* Edison Facility Solutions and Zephyro (acquired in 2017 and 2018 respectively), which specialise in energy efficiency and integrated energy management, notably for hospitals in the North and centre of Italy.

Energy efficiency operations are carried out abroad (Spain, Poland, Morocco) by Fenice subsidiaries.

EDF Fenice Iberica, a wholly-owned subsidiary of Fenice Spa, is growing its business by consolidating its *Global Energy Partner* business model. It is currently positioning itself as a benchmark in energy efficiency services to industry in the Spanish market. Moreover, in 2016 it set up a subsidiary in Morocco, EDF Fenice Maroc, following the signing of a contract with an international group in the agri-food sector to build and run a wastewater treatment plant.

Fenice Poland, 100%-held by Fenice SpA, operates principally in the field of outsourced management of industrial utilities (cogeneration, heating, cooling, compressed air, electricity grid, industrial gases) with FCA as its main customer. It also handles various energy and associated environmental services (potable water, waste treatment, and liquid effluents). Fenice Poland also has the administrative concessions which are necessary to supply customers connected to its distribution networks (electrical, gas, heating).

1.4.5.2.3.5 Regulated activities

Gas transport and storage

Edison owns 100% of the Edison Stoccaggio company, dedicated to regulated gas-storage activities. Edison also operates three storage facilities in depleted reservoirs (fields which have been depleted of natural gas): Cellino (since 1984), Collalto (since 1994) and San Potito & Cotignola (since 2013). The volume being worked upon on all of the sites is 1Gm³.

Distribution

Gas distribution in Italy is regulated and supervised by ARERA, the electricity and gas authority that establishes, in particular, quality and safety parameters, as well as network access rules.

Infrastrutture Distribuzione Gas SpA is the company dedicated to the distribution of natural gas within the Edison group. In 2019, it distributed 0.3mmc of natural gas to around 150,000 users in northern and central Italy.

1.4.5.2.4 EDF Renewables in Italy

In 2019, EDF Renewables transferred its assets to Edison (see section 1.4.5.2.3.1 "Electricity generation").

1.4.5.2.5 Citelum in Italy

The Group is also present in Italy through its subsidiary Citelum, which under the Consip Luce agreements holds numerous contracts in public lighting, traffic light signalling and global projects relating to smart cities (in conjunction with EBF Costruzioni Impianti Srl), such as the ones of Syracuse or Lonato del Garda. Citelum manages the public lighting of over 200 cities in Italy (see section 1.4.6.1.2 "Citelum").

(1) Production data calculated in line with consolidation criteria.

(2) Only a small part of which is owned by Edison.

1. The Group, its strategy and activities

Description of the Group's activities

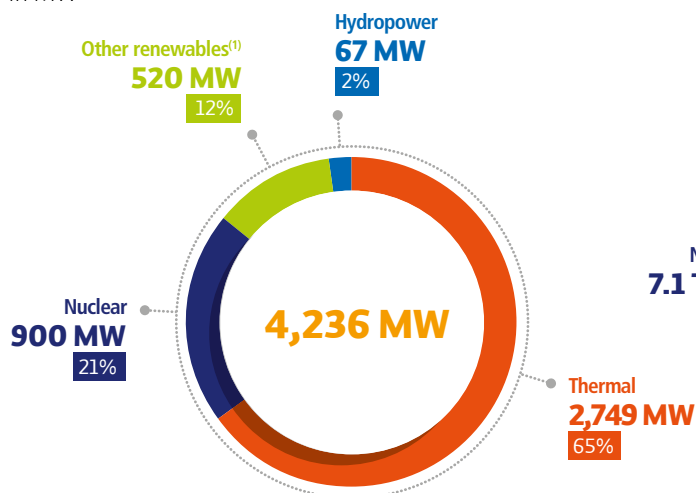
1.4.5.3 Other international

Under "Other international" segment, at end-2019, the Group has a consolidated installed capacity of 4.2GW, which generated 22.4TWh of power in 2019.

→ Installed capacity and Output for the "Other International" segment – 2019

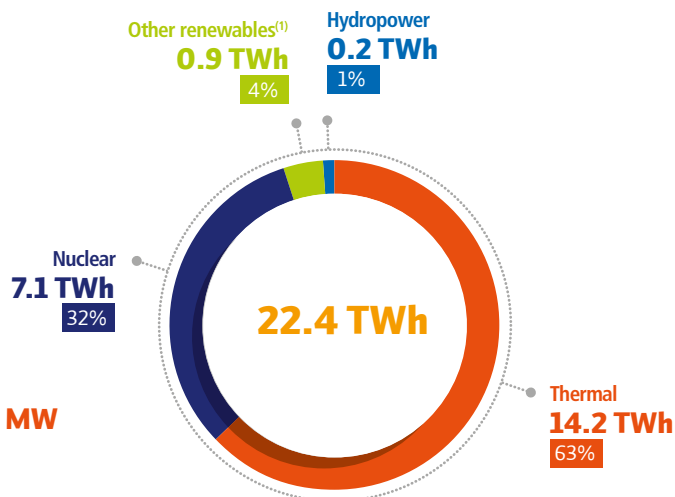
Installed capacity

in MW



Output

in TWh



(1) Excluding international data for EDF Renewables, see section 1.4.1.5.4 "EDF Renewables".
NB: The values correspond to the expression to the first decimal or integer closest to the sum of the precise values, taking into account rounding.

1.4.5.3.1 Northern Europe

Belgium

The Benelux region features important interfaces with the Franco-German electricity marketplace and projects for new links with Germany and with Great Britain are being examined. Benelux also constitutes an important node in the European gas market because of its numerous import and transit infrastructures, such as the Zeebrugge hub and the Dunkirk LNG terminal nearby.

The EDF group is present in Belgium through EDF Belgium, Luminus and Citelum.

EDF Belgium

As part of a long-term nuclear energy cooperation agreement with Electrabel, EDF holds 50% in undivided co-ownership of the Tihange 1 nuclear power plant, through its wholly-owned Belgian subsidiary, EDF Belgium. The capacity attributed to EDF represents 481MW (or 2% of Belgian generation capacity). Tihange 1 output, which is attributed to EDF Belgium is sold to EDF (via a long-term contract renewed at the end of 2015 for 10 additional years) which, in turn, resells the electricity to Luminus at a market price.

Belgium's 2003 nuclear phase-out legislation originally provided for the closure of Tihange 1 on 1 October 2015. Nevertheless, it was finally decided to extend its operation upon 2025, following the adoption in 2012 by the Belgian government of the Equipment Plan, and the Law of 2013 amending the Law of 2003 pertaining to the timeframe for the phasing out of nuclear energy. This extension was the subject of an agreement concluded on 12 March 2014 between Electrabel, EDF and the Belgian State, defining its terms and conditions.

The extension of the lifespan of Tihange 1 requires significant investment, with EDF's share amounting to around €300 million, spread over the period from 2011 to 2020.

Luminus

At the end of 2019, the EDF group held 68.63% of the Luminus company through its subsidiary EDF Belgium, with the remaining equity held by Belgian public shareholders.

Luminus is the second largest player in the Belgian energy market after Electrabel, and it holds a balanced upstream/downstream portfolio. The company, whose market share is close to 20%, possesses almost 10% of total Belgian generation capacity with 2,129MW installed at the end of 2018. The electricity generation of Luminus reached 5.2TWh in 2018. The company has 2,000 employees, including the newly-acquired subsidiaries.

As part of the Group's CAP 2030 strategic plan, Luminus has the ambition of developing its wind farm fleet and accelerating the deployment of its energy services in order to provide its customers with innovative and sustainable solutions, whilst pursuing its objective of reducing costs and rationalising its thermo-electrical generation fleet.

Luminus owns 10.2% (419MW) of Belgium's Tihange 2 and 3 nuclear power plants (commissioned in 1983 and 1985 respectively) and of the Doel 3 and 4 plants (commissioned in 1982 and 1985 respectively), which have a lifespan of 40 years. Luminus also has 100MW drawing rights on the French Chooz B nuclear power plant, based on a band of guaranteed output according to the average availability of the French fleet.

Apart from the drawing rights in the nuclear fleet, Luminus also possesses a thermal fleet comprising several power plants (combined cycles and open cycles) for an installed capacity of 1,208MW.

The Seraing steam gas turbine met its strategic reserve obligation for the period from November 2017 to the end of October 2018. The plant came back online after the strategic reserve mechanism was not renewed.

Luminus is moreover present in renewable energies: it operates 7 hydropower plants and owns 52 onshore wind farms totalling 189 turbines spread across Wallonia and Flanders. Since the end of 2015, the company has been the leader in onshore wind farms in Belgium and now has an installed capacity of 438.5MW. In 2018, Luminus erected 24 wind turbines for a total capacity of 62.8MW. It also bought MegaWindy CVBA, an onshore wind farm operator in Flanders. MegaWindy owns land titles which should allow for the development of around 40MW in power.

Sales and marketing

Under its "Luminus" brand, Luminus supplies electricity and gas to around 1.7 million residential and business customers (number of delivery points) in Belgium.

Energy services

The company is involved in the energy services segment for residential customers, through its subsidiaries Rami Services, Dauvister, Leenen and Insaver, by installing and maintaining boilers, selling and managing a smart thermostat (Netatmo), installing solar panels and providing Comfort services in the event of unforeseen damage to housing. At the end of 2018, the B2C portfolio for these last three services exceeded 175,000 contracts due to a sharp increase in sales in 2018.

For its industrial customers, Luminus together with ATS, Vanparijs, Dauvister and Neuelec, offers comprehensive integrated electricity and heating solutions to industrial customers. In addition, its subsidiary Luminus Solutions (in which Luminus and Dalkia own a 51% and 49% stake respectively) is dedicated to energy efficiency services for facilities such as administrative buildings, hospitals, schools, sports facilities, swimming pools and apartment complexes on the basis of an energy performance contract.

In 2019, Luminus continued its strategy of expansion into energy services, broadening its presence upstream in the value chain with the acquisition of design firm De Klerk Engineering and ERVAC (via Neuelec), specialising in heating, ventilation, and air conditioning control (HVAC). ATS also bought out Censatech, active in HVAC on the professional market (B2B2C). In another development, structuring the "complex energy solutions" business included the merger of Luminus Solutions and VMI staff.

Citelum

In 2019, SOFICO Wallonie and the Luwa consortium, consisting of Citelum (lead contractor), Luminus, CFE, and DIF, entered into a PPP for the design, modernisation, financing, management, and maintenance of road lighting equipment for the main road and motorway network in the Walloon region. Maintenance, which will be conducted throughout the agreement, as well as four years of works, also commenced this year. This 20-year "Light Plan 4.0" calls for the LED upgrading of 100,000 lights and the installation of traffic and detection sensors, as well as a remote management system.

The Netherlands

Through a joint venture, Sloe Centrale BV, the EDF group and PZEM (formerly Delta) (each holding 50%) own an 870MW CCGT power plant in the southwest of the Netherlands, whose two 435MW units were commissioned in 2009. Thanks to its excellent technical performance, further enhanced by recent innovations and optimised renegotiation of the maintenance agreement with Siemens (LTSA), the Sloe power plant was brought into service for almost 5,000 hours between the start of the year and the end of September 2019, with a service factor of 68%, up by 15 points compared to the average over the last two years for the same period.

Switzerland

On 5 April 2019, EDF announced the conclusion of a binding agreement on the disposal of its stake in Alpiq. After permission was granted by the German competition authority, EDF completed the disposal of its 25.04% stake in the Swiss energy company on 28 May 2019.

Germany

EDF Deutschland GmbH, a wholly-owned subsidiary of EDF International SAS based in Berlin, is in charge of the Group's activities in Germany. This entails concentrating on new energy business models and innovative solutions to facilitate Germany's energy shift (Energiewende). EDF Deutschland also represents the Group in leading German political and economic circles.

In June 2019, via EDF Pulse Croissance Holding, the EDF group acquired 100% of the share capital of German company Energy2market (e2m), specialising in the aggregation of renewable production and local flexibilities. e2m has a workforce of 85 employees and 2,000 customers, most of them in Germany. It manages and operates 4,500 connected, decentralised energy production and flexibility sites (wind farms, solar farms, biomass plants, etc.) with total installed capacity of over 3GW. Following this acquisition, the EDF group has become a major player on the German market for direct marketing and local flexibility. e2m's development is being coordinated by EDF Local Energy Management (LEM).

Based in Erlangen (Bavaria), Framatome GmbH has 3,400 employees, making the subsidiary Framatome's second largest engineering concern in the world. Its main business is maintaining, prolonging and upgrading nuclear plants all over the world (especially Instrumentation & Control systems). It is also involved in the building of EPRs in France, Finland, China and the UK. Framatome is also active in electricity and hydrogen storage in Germany. Framatome's other German subsidiary, Advanced Nuclear Fuels GmbH (ANF), makes fuel assemblies for PWRs (pressurised water reactors) and BWRs (boiling water reactors) in Germany and Europe and has 430 employees in Lingen (head office) and Karlstein.

Including the installed capacity of Futuren, EDF Renewables had 185.8MW of gross installed wind power capacity in Germany at 31 December 2019. The Eckölstadt wind farm was also brought back online and repowered. Repowering (or upgrading) consists of replacing old or used plant equipment. EDF Renewables also owns Off-Shore Wind Solutions (OWS), a German firm specialising in the operation and maintenance of offshore wind farms, which it acquired in 2017 via its German subsidiary REETEC, a provider of onshore and offshore wind power services (see section 1.4.1.5.4 "EDF Renewables"). In September 2019, EDF Renewables announced that it had acquired a portfolio of wind farm projects with total capacity of around 300MW currently under development in Germany from German company Altus AG.

At the April 2019 Hanover Fair, the international meeting-place for the industry sector, EDF announced the creation of Hynamics, a new subsidiary of the Group tasked with providing a high-performance, low-carbon hydrogen offering for industry and mobility. Germany is one of the target countries for the development of Hynamics.

In October 2019, EDF Deutschland bought a 33.3% stake in Hypion GmbH, a company that originates and develops hydrogen-related projects in the north of Germany. Electranova Capital holds a stake of around 13.4% in Sunfire, a Dresden-based company which develops high-temperature electrolysers (Power-to-Gas and Power-to-Liquids).

The Group owns 50% of a run-of-river hydropower plant located in Iffezheim on the Rhine River (148MW, 5 turbines, extension work on this plant was completed in 2013).

The EDF group also has storage for natural gas in salt cavities located in Etzel in Lower Saxony. The aboveground facilities are operated through a 50/50 joint-venture with EnBW (see section 1.4.6.2.2 "Gas assets and projects"). Via its subsidiary EDF Gas Deutschland, EDF also holds a 16% stake in BEP gas pipelines (Bunde-EtzelPipelineGesellschaft).

EDF Deutschland increased its stake in the share capital of Ubitricity to 18.94%. The Berlin-based start-up offers a street lamp charging solution for electric vehicles. Its innovations will further enrich the EDF group's electric mobility offering.

EIFER, a research centre which reports to EDF's R&D Department, is based in Karlsruhe and has more than 110 employees. Its work focuses on the optimisation of energy resources and decentralised generation (integration of renewables), energy in cities and local communities as well as energy conservation and the environment (electro-mobility, Power-to-Gas, Smart Cities).

Lastly, EDF Trading actively participates on commodities market in Germany, especially the intraday and gas markets.

1.4.5.3.2 Central and Eastern Europe

Russia

The EDF group is present in Russia in the energy services sector via Dalkia Rus, a subsidiary of Dalkia (see section 1.4.6.1.1 "Dalkia").

1.4.5.3.3 Southern Europe

Spain

At 31 December 2019, the EDF group held 31.48% of the capital of Elcogas, a 320MW power plant of the ICGG type (Integrated Combined-Cycle Gasification), alongside Endesa Generación (40.99%), Iberdrola Generación (12.0%) and EDF España (8.54%). As the profitability of the power plant was no longer assured, it was disconnected from the network in 2016 and its dismantling was initiated. In 2017, Elcogas agreed to sell land and facilities to Ence, a pulp manufacturer. The Shareholders' Meeting on 13 May 2019 resolved to dissolve the company and place it in liquidation. The company will retain its legal structure during liquidation.

1. The Group, its strategy and activities

Description of the Group's activities

The Group is also present on the Spanish market through the local subsidiary Fenice (EDF Fenice Ibérica, see section 1.4.5.2 "Italy") and Citelum (see section 1.4.6.1.2 "Citelum").

In 2019, Citelum optimised lighting in the capital of Asturias, Oviedo, making the city more sustainable, allowing it to achieve almost 80% power savings, and avoid emitting 84 tonnes of CO₂ per year. In La Nucia, Citelum installed new sports lighting and illumination for the facade of the Olympic Stadium at the Camilo Cano sports village, on the occasion of the 99th edition of the Spanish Athletics Championship.

EDF Trading operates in this market from its trading platform in London (see section 1.4.6.3 "Optimisation and trading: EDF Trading").

Framatome Spain is active in Spain through various engineering and maintenance contracts with firms that own nuclear reactors.

Since 2015, EDF Invest has held a minority stake in Madrileña Red de Gas, the operator of the main gas distribution network in the Madrid region.

1.4.5.3.4 North America

The EDF group operates throughout the North American continent, with a strong presence in the United States.

It has more than 9.8GW of gross installed capacity in North America. It also manages, on behalf of third parties, around 52GW of installed capacity under operation and maintenance or optimisation services contracts.

EDF's activities in North America mainly include:

- investments in nuclear generation, related to its 49.99% stake in CENG ("Constellation Energy Nuclear Group"), a joint venture with the Exelon group (leading American nuclear operator) in three nuclear power plants. CENG has installed capacity of 4GW (i.e. 2GW consolidated by EDF group). These three facilities are operated by Exelon;
- renewable energies, with a gross installed and under construction capacity of 7.1GW, mainly located in the United States through EDF Renewables North America, a wholly-owned American subsidiary of EDF Renewables. Equally, EDF Renewables Services (a wholly-owned subsidiary of EDF Renewables North America) manages close to 10GW in North America through operation and maintenance contracts on its own account or on behalf of third parties;

- trading throughout the entire value chain in North American gas and electricity markets through EDF Trading North America, and the supply of energy management products in the US and Canada through EDF Energy Services (a wholly-owned subsidiary of EDF Trading North America);
- energy services, local management of energy and energy efficiency, under the management of Dalkia and its subsidiaries, Dalkia Wastenergy, Dalkia Energy Solutions (formerly Groom Energy Solutions) and Aegis Energy Services;
- R&D and Innovation, as part of EDF Innovation Lab;
- urban road lighting, via Citelum, a wholly-owned subsidiary of EDF.

1.4.5.3.4.1 Nuclear activities in the United States

Nuclear generation: Constellation Energy Nuclear Group (CENG)

On 6 November 2009, the EDF group and CEG established CENG. Since the merger between Exelon and CEG, EDF and Exelon respectively hold 49.99% and 50.01% of CENG. EDF and Exelon signed an agreement in 2014 to transfer the operating licenses for the CENG power plants to Exelon, under which Exelon manages the operational activities of the three CENG nuclear sites (5 reactors).

As part of the agreement, CENG paid EDF \$ 400 million in exceptional dividends and EDF obtained an option to sell its CENG shares to Exelon at fair market value between 1 January 2016 and 30 June 2022. On 20 November 2019, EDF initiated the put procedure by notifying Exelon of its intention to the exercise of the put option⁽¹⁾. The disposal price of the shares will be based on the appraisal of their fair value, pursuant to the contractual provisions in the option to sell. Completion of the transaction is subject to obtaining the necessary regulatory permissions, in particular permission from the Nuclear Regulatory Commission (NRC).

CENG's governance is provided by a Board of Directors composed of ten members, five of whom are appointed by the EDF group and five others, including the President, by Exelon.

CENG's nuclear activities

CENG's nuclear business is under the control of the US Nuclear Regulatory Commission (NRC).

CENG operates five nuclear reactors, spread across three operating sites and representing a combined capacity of 4,272MW. The duration of licences for Units 1 and 2 of Calvert Cliffs, Unit 1 and 2 of Nine Mile Point and RE Ginna is 60 years.

Reactors	Capacity (in MW)	% interest	Company-owned capacity (in MW)	Output ⁽²⁾ (in TWh)	
				2019	2018
Calvert Cliffs 1	908	100	908	7.91	7.29
Calvert Cliffs 2	881	100	882	7.10	7.70
Nine Mile Point 1	620	100	620	4.57	5.31
Nine Mile Point 2 ⁽¹⁾	1,287	82	1,056	9.16	8.29
RE Ginna	576	100	576	4.99	4.70
TOTAL	4,272		4,042	33.74	33.28

(1) CENG owns 82% of this unit (i.e. 1,056MW of the unit's total capacity of 1,287MW). The 18% of Unit 2 of Nine Mile Point not owned by CENG belongs to the Long Island Power Authority (LIPA). LIPA receives 18% of the capacity and electricity generated by Nine Mile Point Unit 2, in consideration for payment to CENG of its share of the costs incurred by the unit, and is responsible for its 18% share of the costs of dismantling the unit. CENG and LIPA are each required to provide specific funding for Nine Mile Point 2.

(2) These values correspond to the sum of the exact values expressed to one decimal place after rounding.

The assets of EDF represented 2% of the US nuclear generation capacity and 0.84% of total electricity generation (2018 data). The principal competitors of CENG on this market are Entergy, AEP, Exelon, Dynegy and NRG.

Regulations of the State of New York

On 1 August 2016, the New York Public Service Commission (NYPSC) issued an order establishing a new regulation, the Clean Energy Standard (CES), of which one of the aspects is aimed at the preservation of nuclear resources in the State of New York, by the recognition of their zero-carbon electricity generation environmental characteristics. The mechanism includes the creation of a programme of zero emission credits (ZEC: Zero Emission Credit). The New York State Energy Research and Development Authority (NYSERDA) procures ZECs from the eligible power plants

via a 12-year contract, administered in six tranches of two years, with effect from 1 April 2017 until 31 March 2029. The payment of ZECs to eligible producers will be made on the basis of the number of megawatt-hour produced, subject to caps and minimum performance requirements. The price to be paid for the ZEC for each tranche will be determined administratively using a formula based on the social cost of carbon estimated by the federal government in 2016. This formula also includes downward adjustments related to price fluctuations in the energy market and capacity. For the first tranche (from 1 April 2017 to the end of March 2019), the price of a ZEC was fixed at \$17.48 per MWh generated. The updated price for the following tranche (April 2019 to the end of March 2021) has increased to \$19.59 per MWh. For the following tranches, the price will be updated every two years.

(1) See EDF's press release dated 20 November 2019: "EDF notifies the exercise of its put option on its participation in CENG".

Each electricity supplier ("Load Serving Entity") is required to purchase a ZEC volume consistent with its market share in the State of New York. Recovery of program costs from customers who benefit from regulated tariffs is included in their electricity bills.

The NYSPC has established that Ginna and Nine Mile Point nuclear facilities are eligible for the ZEC program. On 18 November 2016, agreements for the sale of ZECs for Ginna and Nine Mile Point were signed with NYSERDA. During the 2019 fiscal year, CENG recognised \$357 million for the sale of ZECs.

Environmental groups filed a petition, aimed at invalidating the ZEC program, in a New York state court on 30 November 2016. The petition was amended on 13 January 2017. This petition contends that NYSPC is not empowered to set up this program, that it violated state environmental law, and that it violated certain technical provisions of New York State law on administrative procedures (SAPA). On 15 February 2017, CENG filed a motion to have this case dismissed. On 22 January 2018, the court dismissed the environmental claims and the majority of the plaintiffs from the case but denied the motions to dismiss with respect to the remaining five plaintiffs and claims, without commenting on the merits of the case. On 8 October 2019 the New York Supreme Court issued a decision rejecting all the petitioners remaining claims. On 5 November 2019, the petitioners filed a Notice of Appeal in the New York Supreme Court Appellate Division, Third Department. The deadline for petitioners to perfect the appeal is 5 May 2020.

1.4.5.3.4.2 EDF Trading in North America

EDF Trading operates in the North American markets for electricity (including transmission rights), gas, coal and environmental products. EDF Energy Services is the commercial and industrial retail arm of EDF Trading and provides management and optimization services to large-scale energy intensive commercial and industrial customers throughout North America (see section 1.4.6.3 "Optimization and trading: EDF Trading").

1.4.5.3.4.3 EDF Renewables in North America

EDF Renewables, through its subsidiaries EDF Renewables North America, EDF Renewables Canada and EDF Renewables Mexico continued its expansion in North America, commissioning 868MW gross of wind, solar photovoltaic and biogas capacity in 2019.

EDF Renewables Services manages wind and solar projects, both for the company's own accord and on behalf of third parties.

1.4.5.3.4.4 Dalkia in North America

Dalkia, a wholly-owned subsidiary of the EDF group, is present in the North American energy services markets (local management of energy and energy efficiency) with 505 employees. Dalkia operates through its companies, Dalkia Energy Solutions (formerly Groom Energy Solutions) and Aegis Energy Services in the United States, and Dalkia Wastewater in Canada (see section 1.4.6.1.1 "Dalkia").

1.4.5.3.4.5 Research & Development

EDF has an R&D and Innovation team (EDF Innovation Lab) located in Los Altos, California, which assists EDF group with research, development and innovation as well as with its development in the United States (see section 1.6.1.4 "EDF R&D partnerships"). To this end, EDF Innovation Lab analyses new technologies and start-ups, develops products and tests solutions locally. In 2016, this team identified the Company Off Grid Electric (OGE), EDF's partner in the supply of competitive off-grid solar energy in the Ivory Coast (see section 1.4.5.3.9 "Off-grid energy").

1.4.5.3.4.6 Citelum in North America

Citelum, an EDF subsidiary in the field of urban road lighting, is also present in the United States (see section 1.4.6.1.2 "Citelum"). In 2019, Citelum has conducted the outdoor and indoor lighting inventory of 14 marinas along the East Coast from New Jersey to Florida for Safe Harbor Marinas.

1.4.5.3.4.7 Framatome in North America

Operating in nuclear energy in the United States since the 1950s, Framatome holds a large share of the market, involved in providing power to some 36 million American households. Its mission consists in ensuring the maintenance and modernisation of the American nuclear plants in operation and providing it with the fuel required and supporting the potential construction of new plants (also see section 1.4.1.3 "Framatome").

1.4.5.3.5 South America

In South America, the EDF group is present in the Brazilian and Chilean markets, and is extending its ambitions in certain countries in the region, in which it is prospecting for development opportunities.

1.4.5.3.5.1 Brazil

Since April 2014, the Group has held 100% of EDF Norte Fluminense SA (EDF NF), following the buyback of the 10% equity interest held by Petrobras in its share capital. EDF NF built and has operated, since the end of 2004, the Combined-Cycle Gas plant of Norte Fluminense, with installed capacity of 725MW, located in the region of Macaé, State of Rio de Janeiro. A 20 years Power Purchase Agreement (PPA) for 725MW is in place with Light, the distribution company for the city of Rio de Janeiro. EDF NF supplies the equivalent of almost 25% (2,5 million of clients) of the electricity energy consumed in the Rio de Janeiro metropolitan area. The power plant's generation in 2019 is 5.9TWh which represents an increase of 20% comparing with year end 2018. When Brazil's market conditions and electricity grid permit, the remaining balance is sold on the spot market.

In addition, on 11 December 2014, through its subsidiary EDF Norte Fluminense, EDF acquired a 51% stake in Sinop Energia, responsible for building, maintaining and operating the Sinop hydropower plant with an installed capacity of 402MW, supplying the equivalent of 50% of the State of Mato Grosso (1,6 million clients). Sinop Energia obtained the environmental permission to fill the reservoir on 24 January 2019. Delays on environmental licenses and difficulties with the EPC contractor have resulted in the postponement of the commercial commissioning that was eventually authorized by ANEEL (Brazil Regulatory Agency) on 17 September 2019 for the first turbine and 18 October 2019 for the second turbine.

In the first quarter of 2018, EDF NF won the call for tenders as the contractor to operate and maintain the Sinop Energia plant. These O&M activities will be remotely performed from Macaé (2,500km away from Sinop), starting from the end of 2020, thanks to innovative technologies being implemented by EDF NF.

In line with the CAP 2030 strategic plan, the EDF Renewables subsidiary is accelerating its development in Latin America and notably in Brazil with a portfolio of:

- 400MW of solar energy from Pirapora power plant (one of the largest solar power plant of Latin America located at Minas Gerais State);
- 600MW of wind energy in development in the state of Bahia.

EDF is also present in Brazil *via*:

- Edison, of which the 50%-held subsidiary Ibiritermo operates a CCGT of 226MW in the state of Minas Gerais;
- Citelum, reference company in municipal public lighting and management and connected public service. In 2019, Citelum in Brazil renewed its contracts in Sao Francisco do Conde, Caixias and Goiania, set foot in the city of Valinhos and won a new contract in Imperatriz;
- Framatome, which is cooperating with Eletronuclear and Eletrobras through an Agreement in the field of nuclear business, to promote existing and future nuclear power generation in Brazil. Part of the agreement is to contribute to the pursuit of the construction of the Angra 3 plant.

1.4.5.3.5.2 Chile

Since 2013, EDF is jointly developing with its Chilean partner Andes Mining & Energy (AME) a gas to power project combining the design, construction, and operation of a CCGT-type power plant with a power output of around 600MW, a storage infrastructure and an LNG Floating Storage Regasification Unit (FSRU). *Via* its subsidiary EDF Chile, created in 2014 for this purpose, the Group has a 50% shareholding in the two project companies (Penco-Lirquén LNG terminal and El Campesino power plant), alongside BiobioGenera (50%) of which AME is the controlling shareholder.

The project nonetheless suffered a setback when the Chilean Supreme Court, in a decision on 30 January 2017, revoked the permit for the Penco Lirquen regasification terminal. Various measures have been taken to further the Group's expansion into electricity generation in Chile, including resuming the process to obtain a permit, which was finally granted in November 2019.

In addition, in December 2017, the El Campesino power plant signed an agreement to acquire ESSA, the owner of a 750MW thermal generation asset. The closing of the operation occurred in May 2018.

EDF Renewables is also active in Chile *via* the Boléro solar plant (146MWp) in the Atacama Desert, the Santiago Solar photovoltaic project (115MWp) which is jointly held with AME and opened in January 2018, and the Cabo Leones 1 wind farms (115MW) which came online in June 2018 (see section 1.4.1.5.4 "EDF Renewables").

Lastly, Citelum, a wholly-owned subsidiary of the EDF group, is also present in the country, in the road lighting market (see section 1.4.6.1.2 "Citelum"). In 2018, Citelum replaced 95% of road lights in Independencia (Santiago Province), helped reduce the town's electricity consumption by 50% and designed various artistic lights to illuminate its most iconic sites and monuments. In Lo Barnechea, Citelum renewed and won several contracts and currently manages 23,315 road lights.

1.4.5.3.5.2 Peru

In 2018, EDF signed a Joint Development Agreement with its Peruvian partner GCZ SAC to develop the run-off-river hydroelectric projects Alto and Chontayacu Bajo for a total of 260MW, *via* its subsidiary EDF Peru SAC incorporated in December 2018.

1.4.5.3.6 Asia-Pacific

The EDF group's activities in the Asia-Pacific region are focused on China and fast developing countries. The presence in the sectors of electricity generation, networks and services constitutes an industrial challenge for the Group. In nuclear power, in addition to the EPR project in Taishan, new projects should provide the Group with access to technological innovation and enable it to exploit its industrial expertise.

EDF's objective is, thus, to maintain its competitive and technological advantages in the international arena focused on the global nuclear programme, the equipping of emerging countries, and the perspective of the French fleet renewal.

1.4.5.3.6.1 China

The EDF group has been present in China for more than 35 years through its advisory services in nuclear, thermal and hydraulic technologies. Today, it is one of China's most significant foreign investors in electricity generation, with investments in coal-fired thermal power plants that have a total installed capacity of 2,000MW⁽¹⁾. With the commissioning of the Taishan facility (two 1,750MW reactors), EDF also became an investor with a 30% stake in an electricity generation project involving an EPR-type nuclear power plant. Lastly, the EDF group has been involved in renewable electricity generation in China since 2016 and is developing partnerships with leading Chinese electric energy companies, which open up new prospects for investment in the nuclear industry, renewable energies, energy services and engineering. 41% of electricity from EDF's assets in China was CO₂-free in 2019, higher than the Chinese national average.

Nuclear power generation activities

Daya Bay, Ling Ao and Taishan EPR power plants

After having led the design, construction and commissioning in 1994 of Daya Bay (two nuclear reactors of 1,000MW each) and then assisted the Chinese group China General Nuclear Power Co. (CGN) in the construction of the Ling Ao Phase 1 power plant (two reactors of 1,000MW commissioned in 2002 and 2003), followed by Phase 2 (two additional reactors of 1,000MW commissioned in 2010 and 2011), EDF is currently providing assistance to the CGN group with the operation of its entire fleet. The performance achieved by these power plants since commissioning is one of the Group's main benchmarks in China. In addition, EDF owns a 30% shareholding in Taishan Nuclear Power Joint Venture Company Ltd., which was set up to fund, build and operate two EPR nuclear reactors in Taishan, in the province of Guangdong. Through this project, the Group represents the first foreign investor in Chinese nuclear power generation. The project's success will rest on the complementary expertise of the EDF (including Framatome) and CGN groups. Unit 1 came into commercial operation on 13 December 2018 and Unit 2 on 7 September 2019 (see section 1.4.1.2.2 "Other New Nuclear projects" and section 2.2.4 "Operational Performance", risk factor 4A Management of large and complex industrial projects [including EPR]).

Partnership agreements

EDF is developing partnerships with key players in the Chinese nuclear industry, in particular its peers CGN and CNNC, with the latter benefiting from the Group's business lines. The General Partnership Agreement between EDF and CGN was signed in 2007 and complemented in 2014 by implementation of agreements related to engineering, providers, R&D, and plant operation-maintenance. The partnership with CGN enabled the initiation of discussions concerning its participation in joint nuclear projects in Great Britain, which resulted in the signature by EDF and CGN of

the final contracts for the Hinkley Point C power plant on 29 September 2016. An agreement covering the development of the UK Hualong technology was also signed at that time. The EDF group has set up a facility based in Beijing and Shenzhen (the Group's front office for China's nuclear industry) with the aim of promoting the EDF model of an integrated architect-assembler operator while acting as a flagship for French industry and positioning itself to support the Group's projects, in partnership with the Chinese nuclear sector. Experts in this facility are working, in particular, to further promote French codes and standards, as well as the Group's nuclear safety guidelines. EDF also chairs the Partenariat France Chine Électricité (PFCE), made up of qualified suppliers of EDF which are seeking to develop in China.

In 2010, the Group concluded a partnership framework agreement with China National Nuclear Corporation (CNNC), extended in March 2014 and renewed in 2019, aimed at developing their cooperation along deeper, global lines. Lastly, in the context of the Franco-Chinese governmental declaration of June 2015, tripartite agreements (EDF and AREVA – Framatome with CGN and CNNC) were signed in 2015, providing for, *inter alia*, the participation of the Chinese industrial customers in Great Britain, as well as a partnership for the development of medium- and large-sized reactors. In addition, an agreement between AFCEN and NEA (National Energy Administration) covering cooperation as regards codes and standards was signed in November 2017. Its objective is to promote mutual recognition of nuclear codes and standards and to establish a basis for cooperation between France and China enabling both countries to operate on the international nuclear market.

The action plan for Franco-Chinese relations backed by the French and Chinese Presidents in November 2019 acclaims the cooperation between French and Chinese industrial groups on the EPR, in particular in Taishan, and calls for ongoing cooperation in China and on third-country markets, as well as continuation of the joint work on projects in the UK (Hinkley Point C, Sizewell, and Bradwell).

Framatome

Framatome, specialising in nuclear steam supply systems, the supply of instrumentation & control systems, installed base services, and fuel, all provided with high levels of performance and safety, has been operating in China for 35 years. Framatome China draws on local skills and teams as well as on its own international experts, engineers, and technicians to address the needs of its customers. It designed the EPR; units 1 and 2 of the Taishan power plants are now in commercial operation. Framatome is taking part in the assembly and installation of the Tokamak facility (TAC1) at ITER's nuclear fusion project centre, and is also supplying some equipment and technology building blocks for the Hualong project (RCP, I&C, etc.) along with the fuel. Framatome operates in China *via* joint ventures with Dongfang Electric Corporation (FDJV) and China National Nuclear Corporation (CAST) and through its wholly-owned subsidiary Framatome Nuclear Services (FNS). Framatome operates on 9 sites: Shanghai, Lianyungang, Songjiang, Haiyan, Deyang, Shenzhen, Daya Bay, and Taishan, with a representation office in Beijing.

Coal-fired thermal power generation activities

Shandong Zhonghua Power Company Ltd. (SZPC)

The EDF group holds 19.6% of SZPC, a company which owns three coal-fired power plants in the Shandong province, commissioned between 1987 and 2004, with a total capacity of 3,060MW. The other shareholders are the Guodian group (which merged with Shenhua in 2017 to form a new group, China Energy Investment Group) and the Hong Kong electricity producer CLP.

Datang Sanmenxia Power Generation Company Ltd. (DSPC)

The EDF group holds 35% of DSPC, the company that owns the Sanmenxia 2 power plant in Henan province, commissioned in 2007, with an installed capacity of 2x600MW, using a technology known as "supercritical coal". This investment was made through a joint venture with a fixed lifespan, established by the Chinese authorities, running until 2039. The other shareholders are two Chinese companies, including the Datang Group, which has a majority stake in which DSPC.

Fuzhou Power Generation Company (FZPC)

The EDF group holds 49% of FPC, a joint-venture created in 2014 with a subsidiary of the Datang group to build and operate an "ultra-supercritical" power plant (2x1,000MW) in the Jiangxi province. The first unit was commissioned in December 2015, the second in April 2016. Fuzhou is thus the first power plant of the "ultra-supercritical" type (in other words, having increased output and a limited environmental impact) in which the EDF group has a stake. This technology makes it possible to reach high levels of temperature and pressure in the boiler, assuring a better output (close to 44% for Fuzhou) than a traditional power plant, while decreasing fuel consumption and CO₂ per kilowatt-hour generated.

(1) Share in the capacity corresponding to EDF's stake.

Renewable energies

The EDF group owns a stake in 5 operating wind farms with gross total installed power of 219.3MW through the Chinese subsidiary of EDF Renewables (with EDF's stake corresponding to 102.6MW), as well as a pipeline of projects under development for several hundred megawatts. In 2018, EDF Renewables diversified its business into distributed solar power with the creation of a joint venture with ACC, aimed at developing rooftop solar power solutions for industrial customers (109.8MW is in operation or under construction to date, with EDF's stake corresponding to 87.75MW, plus a pipeline for several dozen megawatts). EDF Renewables also set up a joint venture with Qilu Transportation to install ground-mounted solar panels along highways operated by Qilu in Shandong province.

In the sphere of offshore wind power, on the occasion of the official visit of the Chinese President to France in March 2019, EDF concluded an agreement with the China Energy Investment electricity company for the construction of two projects (Dongtai IV and Dongtai V) off the shore of Jiangsu province, subject to approval of the final agreements by the Chinese authorities. The two partners will build and operate these wind farms, with total capacity of 500MW, together; they will be commissioned progressively between now and 2021 (see section 1.4.1.5.4 "EDF Renewables").

Research & Development (R&D) activities

Eight years after its creation, EDF's R&D centre in China has stepped up support to EDF China's Divisions and is deploying its expertise on priority thematic areas for EDF's development in China. The Centre's activities involve the generation and storage of low-carbon electricity, innovative electricity grids, local multi-energy systems, energy engineering, electric mobility and open innovation. Benefiting from the highly dynamic and innovative Chinese ecosystem, EDF's R&D centre in China is working on applications of digital technology and artificial intelligence to energy business lines.

Energy services

In the city of Sanmenxia (Henan province), EDF set up a joint venture (of which 65% is held by EDF) for the construction and operation of an urban heating network using the recovery of unavoidable heat emitted by thermal power plants of its partner Datang. The concession agreement, for a period of 30 years, was signed on 9 August 2016 and the network entered into commercial operation on 15 November 2016. After the success of the first heating season, the municipality of Sanmenxia decided on 29 August 2017 to extend the concession area granted to the joint venture and to reduce CO₂ emissions by 200,000 to 240,000 tonnes per year starting from 2021.

In the city of Lingbao (Henan province), EDF set up on 13 November 2017 a joint venture (of which 65% is held by EDF) with the municipal investment company to build and operate a heating network powered by a 35MW biomass cogeneration power plant. The 30-year concession agreement was subscribed on 9 January 2018 as part of the French President's state visit to China. This project aims to provide additional income to local farmers and to allow for the controlled elimination of agricultural waste and the avoidance of 150,000 tonnes of CO₂ per year.

In the city of Sanya (Hainan province), EDF and its partner Changfeng Energy were chosen on 8 August 2017 by the municipal government to complete a network of multi-energy plants in the city's tourist areas under a 30-year concession agreement. This initiative will make it possible to supply cooling (air conditioning) and sanitary hot water to hotels, shopping centres and hospitals. The joint venture (of which 30% is held by EDF) was set up on 6 November 2017 and the concession agreement was signed on 9 January 2018 in the presence of the French and Chinese Presidents. The first cold production plant is due to commence commercial operations in 2020. This project should enable the avoidance of 20,000 to 70,000 tonnes of CO₂ per year.

In the field of energy services, the agreement entered into with Dongfeng Peugeot Citroën Automobile in Caidian district, Wuhan in 2013 for lighting was extended to the whole of the site in 2014 and 2015, covering 65,000 lights. EDF is also working with the district of Caidian for the planning, development and operation of energy services in the Franco-Chinese eco-district.

In November 2019, EDF and Huadian concluded an agreement to create a joint venture (EDF's stake being 49%) for the operation of an existing heat network in the centre of Wuhan city. Powered by waste heat from a CCGT in Huadian, the network will benefit from digital tools installed by EDF at Sanmenxia.

The Group also provides innovative solutions for industry and eco-neighbourhoods, drawing on EDF's skills in Europe, in particular in the field of smart grids, cogeneration, waste heat recovery, decentralised renewable energy (heat pumps, urban solar heating, biomass, and geothermal energy) and digital tools developed on site with the China R&D centre.

Engineering services

EDF is looking at ways to support investments in new engineering-based business models, for example "incremental" distribution networks and the sale of electricity. EDF also offers on-demand engineering services to its Chinese partners to foster long-term partnerships and access Chinese technology such as supercritical carbon dioxide and concentrated solar power (CSP).

Other EDF group activities in China

Citelum subsidiary is also present in this country for public lighting, through the contract signed with Kunming city (100,000 road lights). In 2019, Citelum provided and installed 288 lights free of charge in the village of Qixingtian, near Kunming, where there was no road lighting.

1.4.5.3.6.2 Southeast and Southern Asia

The EDF group's activities in Southeast and Southern Asia are focused on the development of the electricity sector, particularly through involvement in projects for the design, construction and operation of new thermal gas and hydraulic generation plants in countries offering Independent Power Plant (IPP) type opportunities, as well as in the field of renewable energies, nuclear, smart cities, micro-grids and innovation.

Vietnam

At 31 December 2019, EDF owned 56.25% of Mekong Energy Company Ltd. (MECO), the company owning Phu My 2.2, a combined cycle gas power plant with a capacity of 715MW. The other shareholders are TEPCO (JERA) and SGM2 (Sumitomo). This is the first IPP project financed exclusively by foreign investors in Vietnam. The BOT (Build, Operate, Transfer) contract has a term of 20 years. In 2005, EDF provided "turnkey" delivery of the power plant, and operations are now managed by MECO.

New milestones in the building of the Son My 1 thermal power plant in Vietnam were reached in 2019. Once built, the high-efficiency and environmentally-optimised CCGT plant with a capacity of 2,250MW in Binh Thuan province, situated north-east of Saigon will be operated by EDF for a period of 20 years. It forms part of Vietnam's efforts to diversify its sources of energy and will help satisfy the country's growing hunger for electricity while reducing the share of coal in its energy mix (38% in 2018) in favour of gas and renewable energy. The EDF group was chosen to head the consortium tasked with studying the project alongside local partner Pacific Corporation and Japanese partners Sojitz Corporation and Kyushu Electric Power Co. with stakes of 37.5%, 25%, 18.75% and 18.75% respectively. A memorandum of understanding setting out the general terms of the project was signed with Vietnam's Ministry of Industry and Trade (MOIT) on 2 November 2018. 2019 was devoted to negotiations, followed by completion of the investment feasibility study. The working schedule for 2020 will consist in obtaining final approval for this feasibility study from MOIT and moving forward in the negotiation of a concession agreement and other contractual documents required for commissioning of the first unit by the end of 2024.

Laos

At 31 December 2019, the EDF group held a 40% stake in Nam Theun 2 Power Company (NTPC), which owns the hydropower complex Nam Theun 2 with an installed capacity of 1,070MW, built by the EDF group under a "turnkey" contract, commissioned in 2010 and which represents approximately 17% of the installed capacity of the country. The other shareholders are a Thai company, EGCO (Electricity Generating Public Company Limited), which holds 35%, and a Lao State company, LHSE (Lao Holding State Enterprise), which holds 25%. NTPC company operates the power plant on a 25-year concession agreement concluded with the government of Laos.

1. The Group, its strategy and activities

Description of the Group's activities

In 2018, EDF acquired the minority stake held by EDF International in NTPC. In 2019, EDF Invest's provisions to dedicated assets were finalised.

2019 business focused on the operational management of installations in a difficult hydrological climate in Laos, whilst also continuing with social and environmental support missions in the region of Nam Theun 2.

A project to develop a floating solar farm with capacity of 240MWp on the Nam Theun 2 hydroelectric dam reservoir was launched in 2019. This project forms part of the Laos government's strategy to diversify its energy mix.

India

As regards nuclear power, following the MOU covering the planned construction of six EPR reactors in Jaitapur agreed in January 2016, Indian national electricity firm Nuclear Power Corp. of India Ltd. (NPCIL) continued their discussions in 2017 with a view to a more specific definition of the framework for cooperation. On 10 March 2018, this resulted in an industrial agreement being entered into, pursuant to which EDF is acting in the capacity of EPR technology supplier, with particular responsibility for structuring the industry relating to the project (see also section 1.4.1.2.2 "Other New Nuclear Projects").

EDF continued developing its smart meters and smart grid business. After winning a contract in 2016 to supply 75,000 smart meters to the New Delhi Municipality Council, in Sep-Nov 2018 the Group won a call for tenders issued by Energy Efficient Services Limited (EESL), an Indian energy services company (ESCO), to install nearly 5 million smart meters in five Indian states, under the French-Indian Cooperation Plan. The EESL3 was officially launched on 14 March 2019; the test phase is currently underway, prior to massive deployment. The EDF International Networks subsidiary was established in India during 2019, and is coordinating implementation of the EESL3 project.

EDF Renewables continued growing its solar and wind power businesses in India, the latter established in 2016 (see section 1.4.1.5.4 "EDF Renewables").

The Citelum subsidiary is also present in India, where it manages almost 178,000 lights in the city of Ahmedabad and is renovating 74,000 lights in Noida for Tata Projects Ltd.

Burma

The Shweli 3 project to develop a hydroelectric dam on the river Shweli in Shan state, North-East Myanmar, achieved further milestones in 2019. The project relates to the construction and 20-year operation of a 671MW hydroelectric dam. The EDF group has been appointed lead contractor of the consortium (with a 32.5% stake), responsible for developing the project alongside two private-sector partners, one from Myanmar (Birman Ayeyar Hinthar Holdings Co. Ltd, 10%) plus a Japanese partner (Marubeni Corporation, 32.5%), together with the Ministry of Electricity and Energy (MOEE, 25%), a Burmese state entity. The goal of continuing negotiations during 2020 is to conclude a Power Purchase Agreement and a licensing agreement, for planned commissioning in 2025. The dam is subject to the same strict standards observed by the Group in all its projects in terms of corporate and social responsibility. It will supply responsibly-sourced, low-carbon electricity to a country in dire need of power for economic development, where nearly 50% of the population currently has no access to electricity.

EDF is also starting to develop micro-grids in Myanmar, with the conclusion of a Memorandum of Understanding (not legally binding) on 7 October 2019, with InfraCo Asia and Solarisys, in the presence of the Burmese government's Minister for Agriculture. The aim is to develop hybrid solar and battery micro-grids in a number of villages located in the Magway region of Myanmar.

Indonesia

The EDF group is continuing its development strategy in Indonesia, favouring renewable energy projects and accelerating access to electricity for the country's remotest island locations, with the development of micro-grids.

At the same time, a Memorandum of Understanding (not legally binding) was concluded with ITB (Institut Teknologi Bandung) in November 2019 with a view to strengthening cooperation on energy mix issues and the implementation of smart energy solutions.

Research & Development

Following an agreement signed in June 2013 with the Singapore Housing and Development Board, the city's largest construction firm, with the aim of developing an innovative urban modelling tool, the EDF group, in 2014, opened a centre of excellence for sustainable cities in Asia: EDF Lab Singapore Pte. Ltd. This R&D centre dedicated to urban planning has as its mission to reinforce existing collaboration and to initiate new collaborative relationships with Singapore and other cities of the region.

In October 2018, Nanyang Technical University, EDF, and Enedis inaugurated the Microgrid for Affordable and Sustainable Electricity in Remote Areas (MASERA) demonstrator as part of Singapore International Energy Week (SIEW) and the France-Singapore Year of Innovation 2018. 2019 saw the demonstrator enter service, and a number of major milestones being achieved. The demonstrator will allow the EDF group to offer affordable and efficient microgrids for remote areas in Southeast Asia.

The Group is now well-established in Singapore to better manage its interests in Southeast Asia, strengthen its synergies with the R&D lab and embed itself in the development and innovation ecosystem of smart cities which is particularly vibrant in Singapore.

1.4.5.3.7 Africa

The Group wishes to develop on the African continent by assisting countries with high-energy demand, on a selective basis appropriate to each geographic region, and by building sustainable and multi-industry partnerships. EDF is also intensifying its action in the supply of competitive off-grid energy.

South Africa

The EDF group established a subsidiary in 2007 in Johannesburg, initially with a view to preparing the relaunching of the South African nuclear programme. The energy guideline plan for the country, promulgated in May 2011, provided for the commissioning of 9.6GW of nuclear power capacity by 2030. This programme was revised in October 2019, and now provides for approximately 20GW of additional renewable capacity by 2030, as well as 3GW of gas. With respect to nuclear power, investigations into the construction of modular nuclear power plants are to be launched. The South African subsidiary is also responsible for developing EDF's business activities in Southern Africa, particularly as regards generation projects as well as the sale of services relating to thermal engineering, hydropower, transmission and distribution.

The Group is also present in South Africa *via* the company KES (Kukhanya Energy Services), created in 2002 (see section 1.4.5.3.9 "Off-grid energy").

Mozambique

The Group has been active in Mozambique since the end of the 1980s involving the provision of engineering services and has formed preferred partnerships with EDM (Electricidade de Moçambique).

Morocco

The EDF group has been active in Morocco since the 1970s, and has formed preferred partnerships with Morocco's national electricity and water office (ONEE), electricity distribution authorities, and industrial players. To help support its development, the Group created EDF Maroc in 1997, EDF EN Maroc in 2012 as well as EDF Fenice Maroc in October 2016.

The Group and ONEE continued their cooperation, pursuant to the general agreement signed in January 2012, in the areas of renewable, thermal and hydraulic generation, as well as in networks and training.

After having been selected by ONEE through a call for tenders, the consortium led by EDF Renewables in partnership with the Japanese group, Mitsui & Co., is developing the 150MW Taza wind farm. With the acquisition of Futuren in 2017, the Group's total gross installed capacity in Morocco reached 50.4MW.

In May 2019, following an international call for tenders, the Moroccan sustainable energy agency MASEN selected a consortium bringing together EDF Renewables, Emirati firm Masdar, and Moroccan company Green of Africa to design, build, operate, and maintain the first phase of the Noor Midelt solar complex. This 800MW capacity project, located north of Midelt, is an innovative hybrid power plant combining concentrated solar power and photovoltaic solar power, a world first.

The Group is also involved in energy efficiency activities in Morocco with the Fenice subsidiary EDF Fenice Maroc (see section 1.4.5.2.3.4 "Energy services") and in public lighting with the Citelum Maghreb subsidiary.

Senegal

The Group is also present in Senegal, through the ERA company, the operator of the rural electrification concession in Kaffrine-Tambacounda-Kédougou (see also section 1.4.5.3.9 "Off-grid energy"). In 2019, EDFI acquired the 30% stake held by Matforce in ERA, thereby becoming its sole shareholder.

It is also present through a service contract involving generation with an independent power producer and several service contracts through its subsidiary EDF International Networks, responsible for implementing contracts to improve the performance and ensure the reliability of the local operator Senelec's distribution network.

Cameroon

Nachtigal Hydro Power Company (NHPC), owned by EDF (40%), IFC (20%), the Republic of Cameroon (15%), Africa50 (15%) and STOA (10%) has begun construction of the Nachtigal 420MW hydropower dam, situated on the Sanaga River, close to Yaoundé on 1 February 2019. In July 2016, Nachtigal Hydro Power Company was created to assist with the project and signed a Concession Agreement for Electricity Generation in April 2017. The Nachtigal financial closing was completed on 24 December 2018. The first loan drawdown took place in January 2019.

The Nachtigal hydroelectric power plant is a sizeable project for the country and will, on commissioning, be the most important generation resource in Cameroon. It aims at providing around one third of the electricity needs and generating numerous economic benefits for the local economy.

Republic of the Congo

EDF International Networks, a wholly-owned subsidiary of the EDF group, opened a branch in September 2017 to further develop its activities in the country in support of SNE.

Egypt

The EDF group entered into the renewable energy generation market in Egypt. In August 2019 EDF Renewables, in a 50/50 partnership with the Egyptian company Elsewedy, financed, built, and commissioned two 65MWp photovoltaic plants, both in Benban, near Aswan. These projects will benefit from a Power Purchase Agreement (PPA) for a period of 25 years (see section 1.4.1.5.4 "EDF Renewables").

In 2019, EDF Renewables took out a strategic stake in Karm Solar, a major player on the emerging market for privately-produced solar power in Egypt. Karm Solar has a portfolio of 170MW of operational solar power plants and plants under construction or development (see also section 1.4.1.5.4 "EDF Renewables").

EDF provides consultancy services for EETC on the extension of the Egyptian transmission network; performance of two consultancy calls for tender won in 2017 is ongoing, one with Egyptian Electricity Transmission Company (EETC) for engineering and supervising construction of the dispatcher in the Delta, the other with Egyptian Electricity Holding Company (EEHC) to manage the deployment of 53,000 smart meters, implemented by subsidiary EDF International Networks in a consortium led by French industrial company Sagemcom and including the Egyptian company Globaltronics. In June 2019, EETC awarded EDF an OTC agreement for the supervision of engineering and construction of the new national dispatcher, which will be located in the new administrative capital of Egypt.

Since the mid-1990s, the EDF group has been present in Egypt in Exploration and Production (E&P) of oil & gas through its subsidiary Edison. A process to dispose of Edison E&P is in progress (see also section 1.4.5.2.3.2 "Gas - Italy – Activities in the gas sector").

Côte d'Ivoire

EDF group is developing the "Biovéa" project for a biomass electricity power plant with two 23MW units in partnership with SIFCA, an Ivorian agro-industrial group in West Africa, and Meridiam, an investment firm which joined the project in January 2018. This project is already included in Côte d'Ivoire's development master plan. An agreement on the selling price for electricity was entered into with the State of Côte d'Ivoire on 30 November 2017; the concession agreement with the State was signed on 9 December 2019. The final investment decision is targeted for March 2020.

In August 2016, the Group created a local subsidiary to support its development strategy in Côte d'Ivoire.

In October 2016, EDF created the ZECI company, a joint-venture with the US company Off Grid Electric (OGE), now known as "Zola Electric", for the deployment of an off grid energy project for rural and peri-urban populations (see also section 1.4.5.3.9 "Off-grid energy").

Ghana

In October 2017, the EDF group opened a local branch to support its development strategy in this country. It is also present in Ghana through the ZEGHA company (see also section 1.4.5.3.9 "Off-grid energy").

1.4.5.3.8 Middle East

The EDF group engages in development and project monitoring activities in the Middle East, and has a regional office based in the United Arab Emirates covering business in the region.

In addition, the Group has offices in Qatar (Doha), Saudi Arabia (Riyadh), Lebanon (Beirut), Bahrain and the United Arab Emirates (Abu Dhabi and Dubai).

These offices manage the commercial activities and projects in these various countries.

The area's major projects are in the UAE with the customer DEWA (responsible for water and electricity in the city of Dubai):

- a development project for a 800MW solar photovoltaic power plant. EDF, through its subsidiary EDF Renewables, is developing this project alongside Masdar, an Abu Dhabi-based company belonging to the Mubadala group and the customer DEWA. This power plant, for which the first two 200 + 300MW phases have been commissioned and the third 300MW phase is under construction, will be one of the largest solar power plants in the world (see section 1.4.1.5.4 "EDF Renewables");
- an assistance project for the management of a 250MW dam pumping station, planned for the Hatta mountains in the Emirate of Dubai, for the customer DEWA.

The EDF group has sought to establish a long-term relationship with Nawah, the operator of the Barakah nuclear plant in the UAE. On 21 November 2018, EDF and Nawah signed a long-term master agreement under which EDF will assist the Emirates Nuclear Energy Corporation (ENEC) subsidiary with the operation and maintenance of the Barakah plant through various services such as safety, radiation protection, fuel cycle management and environmental monitoring.

Another major engineering consultancy project for customers Kahramaa (water and electricity in Qatar) is currently being conducted in Doha, along with the construction of substations and high-voltage power line networks (this project being part of "phase 13").

In 2014, in Saudi Arabia, the EDF group signed a partnership agreement with the Saudi Electricity Company (SEC), the country's benchmark electricity operator, enabling a broad cooperation between the two groups, including training initiatives. In the extension of this agreement, the two GOC "Generation, Optimisation Center" contracts signed in 2016 and 2019 provide for support by EDF for the implementation of regional generation optimisation centres.

In addition, via its subsidiary EDF Renewables in partnership with Masdar, EDF won a 2019 call for tender for the financing, construction, and operation of the first wind power project in Saudi Arabia, with installed power of 400MW, at Dumat Al Jandal (see section 1.4.1.5.4 "EDF Renewables").

Israel

The EDF group has been present in Israel since 2010 through its subsidiary EDF Renewables, which operates photovoltaic power projects connected to the grid with gross installed capacity of 295MW, and launched in 2018 the construction of an additional 87MW. EDF Renewables Israel won four State calls for tender in 2019 for over 170MWp, to be constructed by 2021 (see section 1.4.1.5.4 "EDF Renewables").

Furthermore, EDF Hydro's Hydraulic engineering centre supplies services to the first Israeli project for the storage of electricity through pumping, on Mount Gilboa.

1.4.5.3.9 Off-grid energy

The EDF group has 15 years' experience in off-grid power area in Africa via companies created for that purpose based on territorial concessions. Since 2017, the EDF group has joined forces with innovative start-ups to supply power and services to customers in rural areas and on urban outskirts in line with their income and needs. Solutions include supplying power to central grids, installing minigrids and providing solar power kits.

Such services enable thousands of people in South Africa, Ivory Coast, Ghana, Senegal and Togo to light and power their low-consumption household appliances such as a television or a radio, or to recharge their mobile phones. Customers in Kenya can buy solar-powered water pumps and thereby significantly improve their crop yields.

The EDF group, via EDF Pulse Croissance Holding with a 17% stake, teamed up with investment firm Meridiam to create NEoT Offgrid Africa with the aim of contributing to financing our energy supply and services solutions.

Togo – BBOXX

EDF bought a 50% stake in BBOXX Togo from BBOXX UK in November 2018 to undertake the sale, installation and maintenance of solar kits for rural households in Togo.

South Africa – KES

In South Africa, the KES (Kukhanya Energy Services) company, created in 2002, is 50% owned by EDF, 15% by the local operator, Calulo, and 35% by Total. It initially developed its business through photovoltaic kits in Kwazulu-Natal, and then extended its activities into the Eastern Cape region (see also section 1.4.5.3.7 "Africa").

Senegal – ERA

In Senegal, as of 31 December 2019, EDF group held all of the shares in ERA. Since 2014, ERA has been the operator of the rural electrification concession of Kaffrine-Tambacounda-Kédougou (25% of Senegal's surface area). Having received a grant from the French Development Agency, with a third and last tranche expected to be released soon, ERA is developing the electricity grid, installing photovoltaic panels in rural areas and currently provides electricity to around 6,000 customers (see also section 1.4.5.3.7 "Africa").

Kenya – SunCulture

On 18 July 2018, the EDF group took a stake in SunCulture, a Kenyan firm, to undertake the sale, installation and maintenance of solar-powered water pumps for rural households in Kenya and expand into other African countries.

Ivory Coast – ZECl

The EDF group and Off Grid Electric (OGE), now known as "Zola Electric" – an American company involved in the distribution of solar energy in Africa, in which Electranova Capital, EDF's cleantech venture capital investment fund, holds a shareholding – created in October 2016 a joint company in the Ivory Coast, ZECl, for the supply of competitive off-grid solar energy in Africa.

Within the framework of this joint venture, the EDF group and Zola Electric assume the cost of the installation and maintenance of solar kits intended for households in rural areas and on urban outskirts (see also section 1.4.5.3.7 "Africa").

Ghana – ZEGHA

Off Grid Electric, now known as "Zola Electric", the Ghanaian company CH group and EDF decided to create ZEGHA and launched the pilot phase in December 2017 on the Ivorian model (see also section 1.4.5.3.7 "Africa").

1.4.6 Energy services and other activities

1.4.6.1 Energy services

In a legislative, technological, and social environment focused on fighting global warming and the quest for performance, EDF group aims to achieve significant growth in energy services in order to provide innovative, effective solutions for its customers.

These solutions draw on the Group's expertise, in particular in R&D, and are implemented through its various subsidiaries. In June 2017, they were brought together beneath the single banner of the "EDF Solutions énergétiques" brand, placing the latter in a position to assist its customers in taking up the challenges of energy transition and economic efficiency. In addition, in 2017, EDF group created "EDF Pulse Croissance", a new organisation designed to be EDF's start-up incubator, with the role of exploring ecological and digital transition, providing its clients with innovative and competitive offers and services.

The energy services developed by the Group are designed to meet the needs expressed by local authorities, firms, and private individuals in a wide range of areas including distributed power production, low-carbon heating networks, smart lighting, waste recovery, electric mobility, hydrogen, battery storage, domestic services, smart building management, and production resources. The range of solutions offered is

both complementary and innovative, and meets customers' emerging requirements, notably reducing carbon emissions and improving energy performance.

In 2018, EDF focused on electric mobility to help lower carbon emissions in the transport industry, which accounts for 20% of greenhouse gas emissions in Europe. To that end the Electric Mobility Plan announced by EDF on 10 October 2018 outlines the Group's goal of becoming the energy industry's leading electric mobility service provider in Europe by 2022. This approach was boosted in 2019 by the creation of Dreev and the launch of the EV100 project.

In 2019, EDF engaged in local services with the acquisition of Hello Casa, now known as Izi Solutions. This new activity is aimed at improving home comfort and energy performance.

EDF is also expanding its presence in electrical engineering, with the acquisition in 2019 of three electrical engineering companies brought together under the EDF ELECTROTECHNICS brand. This manages all the components, and covers all the aspects, required to provide low, medium, and high voltage design, installation, maintenance, and emergency repair work for business customers nationwide.

Lastly, in April 2019 EDF created Hynamics, a subsidiary dedicated to the production and marketing of low-carbon hydrogen from electrolysis, aimed at addressing the needs of industry and heavy-duty mobility.

1.4.6.1.1 Dalkia

The EDF group has held a 99.94% equity interest since July 2014 in Dalkia, a leading player in the European energy services market with a full range of services and an excellent sales network in France, that contribute to developing renewable energy and energy recovery, reducing energy consumption and improving the performance of the installations.

Dalkia's operations

Against the backdrop of climate change, volatile prices, and rare resources, Dalkia provides its customers with expertise to develop, produce, and manage more environmentally-friendly and economical energy systems.

Accelerating customers' energy transition.

Dalkia is active throughout the energy chain, from decentralised production to demand management via distribution optimisation, accelerating energy transition for its customers.

Commitments

Thanks to its nearly 80 years of experience in managing heating and cooling networks, optimising industrial utilities, improving the energy performance of buildings, or using alternative and renewable energies, Dalkia offers its customers tailor-made solutions to reduce their energy consumption and to improve the environmental and economic performance of their installations.

Dalkia (including its subsidiaries) manages over 80,000 energy installations in France and abroad, achieving 6.7TWh of energy savings in 2019, as well as enabling its customers to avoid the emission of 4.3 million tonnes of CO₂.

Dalkia and the development of renewable energy

Dalkia's first business is to make the most of local energy sources. In other words, Dalkia uses local sources of energy to provide its customers – both businesses and local authorities – with sustainable energy solutions:

- the development of renewable energy is a focus of Dalkia's priorities, particularly through the use of renewable and recovered energy: biomass, biogas, geothermal and recovered energy;
- a pioneer in energy transition, Dalkia encourages the production of energy from non-recyclable waste. Energy recovery also contributes to reducing greenhouse gases, limits the use of fossil fuels, and contributes to Dalkia's low-carbon goals.

Dalkia and energy savings

Dalkia's second business line is energy savings: the most efficient energy is energy that is not used in the first place.

- Dalkia is innovating on a daily basis to achieve energy savings, through connected buildings that consume less and less, and energy renovation works to make buildings more efficient;
- Dalkia also optimises its customers' consumption by processing all their data using "Descs": energy performance management centres that combine digital and human intelligence.

Main subsidiaries of Dalkia in France

Dalkia Smart Building

Dalkia Smart Building, a wholly-owned subsidiary of Dalkia, specialises in designing and implementing solutions to help its customers adapt to the energy shift and digital transition in France. Complementing Dalkia's regional scope, Dalkia Smart Building designs and implements solutions to upgrade existing school, government, indoor pool and office facilities and build new buildings and neighbourhoods (smart buildings, smart thermal and electric grids, green data centres, smart pools).

Dalkia Wastenergy

Dalkia Wastenergy, a wholly-owned subsidiary of Dalkia since 29 March 2018, specialises in waste recovery serving local authorities and industrial customers:

- waste recovery *via* incineration, anaerobic digestion and boilers running on solid recovered fuel (SRF) able to generate steam, electricity or biogas;
- materials recovery *via* compost, the sorting and packaging of recyclable materials and solid recovered fuel generation.

Dalkia Wastenergy designs, builds and currently operates facilities located in France, Great Britain and Canada.

Dalkia Froid Solutions

Dalkia Froid Solutions, a wholly-owned subsidiary of the Dalkia Group, specialises in industrial and commercial refrigeration and HVAC. Its aim is to supply all its customers, everywhere, with controlled temperatures, optimising energy consumption and protecting the environment thanks to innovative end-to-end management of the process encompassing consultancy, design, installation, and maintenance. Temperature control has a great many applications, as a result of which Dalkia Froid Solutions has gained experience in many different sectors over the years.

Dalkia Biogaz

Dalkia Biogaz, a wholly-owned subsidiary of Dalkia, is a company specialising in biogas generation, treatment and recovery. It has been committed for several years to the development of anaerobic digestion, with the biogas produced used both in cogeneration and for direct injection into the natural gas distribution network.

Dalkia Air Solutions

Dalkia Air Solutions, a wholly-owned subsidiary of the Dalkia Group, provides a complete offering of auditing, design, installation and maintenance for compressed air, nitrogen, and breathing air systems aimed at all sectors of industry. Compressed air is an energy flow that has a high electricity component, and thus offers potential for energy savings.

Main subsidiaries of Dalkia abroad

Matex Controls, rebranded Dalkia Polska Solutions

Dalkia Polska Solutions, based in Poland, designs, builds and maintains technical facilities (ventilation, heating, air conditioning, fire protection, etc.) for commercial buildings and industrial customers. It also provides innovative solutions for the building's energy performance management, including VEMS[®] (Virtual Energy Management System).

ZEC, rebranded Dalkia Polska Energia

Dalkia Polska Energia is mainly specialised in the generation and distribution of heat in the region of Katowice in Poland (Upper Silesia). It has recognised expertise in the energy recovery of mine gas as an alternative to coal to be used by heating networks and electricity distribution facilities.

Fenice Rus, rebranded Dalkia Rus

Specialised in energy efficiency for industrial customers, Dalkia Rus is one of the pioneers in the energy services sector in Russia.

Imtech

Imtech, jointly owned by Dalkia and EDF Energy, specialises in major HVAC and electrical engineering works, technical facilities maintenance, and data acquisition and control systems integration, in the United Kingdom and Ireland. Imtech provides its services to the construction, industry and tertiary sectors and public authorities.

In late 2019, Dalkia and EDF Energy bought out UK energy performance specialists Breathe, *via* Imtech. Breathe develops bespoke solutions to reduce energy

consumption and carbon footprints, modernise heat and cold production and distribution facilities, and improve building efficiency.

Groom Energy Solutions, rebranded Dalkia Energy Solutions

Based in Massachusetts, Dalkia Energy Solutions provides companies and industrial customers with a comprehensive approach to consultancy, project management and the performance of energy efficiency work, with nationwide coverage in the United States.

Aegis Energy Services

Bought out in August 2018, Aegis Energy Services LLC, a company based in Holyoke, Massachusetts, specialises in small gas cogeneration plants, which it designs, produces and commissions, and maintains. The firm has installed just under 1,000 cogeneration plants since it was founded in 1985.

1.4.6.1.2 Citelum

Citelum is the subsidiary of the EDF group dedicated to smart lighting and connected services, and one of the leading players in the field in France and throughout the world.

With 500 employees in France, Citelum employs 2,500 people, mainly in Europe (including France, Italy, Spain and Denmark) and in America (including Mexico, Brazil and Chile), which enables it to manage the services of leading cities throughout the world (Mexico City, Copenhagen, Barcelona, Rome, etc.). At the end of 2019, Citelum managed over 3 million road lights all over the world, lighting the way for 30 million residents.

The technological changes in lighting equipment currently enable it to make use of an existing connected infrastructure, thereby facilitating energy savings, remote management of installations and improvements to security as well as showcasing cultural heritage. In addition, this lighting equipment, connected to other devices (sensors, cameras, etc.), offers new value-added services in the areas of the prevention of pollution, video-monitoring of the territory, information to users or the management of urban mobility and parking.

Citelum operates on the following three value chains:

- increasing attractiveness for customers through the optimisation of lighting, while limiting energy expenditure;
- improving perceived security by optimising the use of the allocated resources;
- creating more fluid mobility and parking, promoting an increase in receipts from customers.

Citelum marks out its difference through its capacity to assist in all phases of a project, from design and completion of the works to operation and maintenance, by incorporating into its service offer: financing solutions, innovation with its Citigestion subsidiary's digital urban space management platform, MUSE[®], and strong skills in contractual engineering.

Sustainable development is a key concern for Citelum. The solutions provided by Citelum, notably smart lighting, are developed to save energy in cities, minimise light pollution, and preserve biodiversity. The LuWa consortium comprises Citelum, Luminus, CFE, and DIF. Its "Light Plan 4.0" provides for the new motorway lighting in the Walloon region to adjust in line with the night-time habits of neighbouring flora and fauna.

In 2019, Dijon Métropole inaugurated and commissioned its connected control unit (PPC), designed as part of the tender won by Bouygues Énergies et Services and Citelum with Suez. Based on Citigestion's MUSE[®] platform, the PCC connects the street furniture in all of the city's 23 municipalities. This will allow Dijon Métropole to manage day-to-day incidents and exceptional events from a single facility, providing citizens with high-quality public service, enhanced security, and a better living environment.

In Belgium, in the Walloon region, the consortium LuWa (consisting of Citelum (lead contractor), Luminus, CFE, and DIF) has begun maintenance and renovation works on the road and motorway lighting network. SOFICO's twenty-year Light Plan 4.0 calls for LED replacement of 100,000 lights and energy savings of 76%, thus avoiding 166,000 tonnes of CO₂ emissions.

1. The Group, its strategy and activities

Description of the Group's activities

In Brazil, Citelum has won a new contract in Imperatriz in the State of Maranhão to manage 24,375 lights for a five-year period.

In Chile, Citelum has embarked on LED replacement of 8,238 lights in Los Andes, with the aim of achieving 40% energy savings. Maintenance of the lighting fleet will be provided for 10 years, with the help of the MUSE® CMMS.

In Denmark, Citelum is now responsible for managing lighting in 7 municipalities, and has diversified its business in Copenhagen, lighting high-traffic squares and buildings, as well as installing external lighting for the new Cityringen metro line.

In Spain, Palma de Majorca has extended its agreement with the Citelum and Comsa Service consortium to benefit from new connected services, including noise sensors in lights; these flash when a threshold value is reached. There are also electric vehicle charging outlets connected directly to road lighting.

In India, Citelum manages 180,000 lights in Ahmedabad, including 6,000 smart lights on a "bus rapid transit" corridor. Citelum is also upgrading 74,000 lights in the city of Noida for Tata Projects Ltd.

In Italy, Citelum manages over 200 towns and cities, and has equipped the town of L'Aquila with the first system in Europe to adjust lighting in line with circadian rhythms. This solution will help bring down the town's energy use, reduce its CO₂ emissions, and improve quality of life for local residents.

Citelum is also continuing to expand its industrial customer portfolio, and has started work to optimise lighting on a Renault industrial site in Novo Mesto, Slovenia.

1.4.6.1.3 EDF Pulse Croissance

Innovation has always been at the core of EDF's strategy. In June 2017, in order to broaden the scope of its activities, the EDF group created a new structure called EDF New Business to act as EDF's start-up incubator.

In October 2018 EDF New Business was renamed EDF Pulse Croissance to bring it under the Group's innovation arm (EDF Pulse) and raise its profile.

The purpose of EDF Pulse Croissance is to look into the energy and digital transition and create new growth drivers for the Group by providing innovative and competitive products and services to households, businesses and local authorities.

EDF Pulse Croissance is a corporate venture entity and an intrapreneurial project incubator, with financing capacity of some €60 million (excluding exceptional transactions) in 2019.

Four areas will be prioritised:

- industrial efficiency for our business customers;
- residential services;
- sustainable town and country planning;
- decentralised energy systems.

EDF Pulse Croissance boasts a tight-knit team that works closely with EDF's R&D and functional Divisions as well as all of the Group's resources committed to open innovation and partnerships with start-ups.

Incubator

As an intrapreneurship incubator, EDF Pulse Croissance draws on the ideas and expertise of the Group's employees and is in a position to provide them dedicated support to assist them in developing their project as part of an entrepreneurial approach benefiting the Group and its employee entrepreneurs.

Investor and partner

To succeed in developing new business activities and innovative solutions in new technologies, EDF Pulse Croissance can invest directly in fledgling start-ups or put them in contact with the Group's ecosystem – particularly dedicated funds such as Electranova Capital in which EDF Pulse Croissance has a stake.

The objective of investing in venture capital funds is to strengthen our position in the innovation ecosystem, reduce EDF's financial exposure and develop skills and synergies within the Group. This investment strategy is adapted to the Group's challenges and focuses on generalist or multi-sector funds, such as smart city or clean tech, chosen for their reputation in an active and relevant geographical area for EDF, and on specialist or seed funds in new technologies to better integrate complementary technological building blocks (particularly in cyber security) with those notably supported by R&D. This strategy has led the Group to invest in 14 thematic funds, mainly in France but also in Europe, North America and China. The investments and collaborations will generate financial income, deal flows and collaboration opportunities with start-ups, and investment opportunities in new businesses.

The entity may also create joint ventures with start-ups capable of exploring new business models and conquering new markets in France and internationally. For the most part, the investment is conceived as part of a global industrial and commercial partnership.

The start-ups supported by EDF Pulse Croissance operate in various sectors related to energy and digital transformation. Examples include Metroscope's artificial intelligence solution to improve the performance of industrial facilities; financing of innovative energy efficiency projects with Perfesco; the sale of industrial cyber security solutions with Seclab; energy management systems for local electrical systems through energy storage and forecasting with EDF Store & Forecast; the aggregator for renewable energy production and consumption flexibility with Agregio, and finally stationary electricity storage systems using batteries based on Zinium's zinc-air technology. Since it was set up, EDF Pulse Croissance has invested in 19 start-ups and built up stakes in 14 investment funds.

In 2019, EDF Pulse Croissance invested in particular in two start ups and helped creating 3 subsidiaries that emerged from intrapreneurial projects:

Hynamics

Created in April 2019, Hynamics⁽¹⁾ a wholly-owned subsidiary devoted to the production and marketing of low-carbon hydrogen produced by water electrolysis. It is directed at industrial markets and heavy-duty mobility. Hynamics installs, operates, and maintains hydrogen production plant, investing in the infrastructures required for industrial customers that use hydrogen as a raw material, such as refineries, glassworks, the food and chemicals industries, etc. For players in public and professional mobility, Hynamics is helping to build a network of hydrogen recharging stations for fleets of heavy-duty electric vehicles such as trains, buses, refuse collection trucks, commercial vehicles, and river vessels.

DREEV

Launched in February 2019, DREEV⁽²⁾ is a joint venture set up by EDF Pulse Croissance and Californian start-up NUVVE. It develops smart charging control solutions that are cost-effective for customers (V1G), as well as Vehicle-to-Grid (V2G) solutions. The latter is the most innovative aspect of smart charging, and the most promising: electric vehicle charging and even discharging can be optimised by managing electric vehicle charging power efficiently, flexibly, and economically. DREEV provides companies and local authorities with turnkey solutions comprising consultancy, installation, and operation of terminals and digital services for their vehicle fleets.

Energy2Market⁽³⁾

In June 2019, EDF Pulse Croissance acquired German firm energy2market (e2m), an experienced aggregator of renewable production and local flexibility, and one of the leading market players in Germany. e2m provides short-term flexibility management products and services, markets renewable energy production, and markets its own VPP (Virtual Power Plant) platform on an SaaS (Software as a Service) basis. e2m has 2,000 customers, most of them in Germany; it manages and operates 4,500 connected, decentralised energy production and flexibility sites (wind farms, solar farms, biomass, etc.) with total installed capacity of 3GW.

(1) See EDF's press release of 2 April 2019: "EDF launches Hynamics, a subsidiary to produce and market low-carbon hydrogen".

(2) See EDF's press release of 20 May 2019: "EDF launches DREEV, its new subsidiary to turn innovative smart charging solutions into a reality".

(3) See EDF's press release of 13 June 2019: "EDF acquires energy2market (e2m), strengthening its position in decentralised energy management in Europe".

MyBus

This start-up offers a mobile application that provides electronic tickets for passengers on urban and suburban public transport networks. Passengers can find out details of bus timetables in real time and do their own route planning. In July 2019, EDF Pulse Croissance joined forces with Banque des Territoires in a round of fundraising for MyBus⁽¹⁾. Facilitating multi-modal travel is a way of developing sustainable cities and achieving energy transition.

Exaion

Launched in late 2019, Exaion is the result of an intrapreneurial project co-incubated by EDF Pulse Croissance and EDF's Transformation and Operational Efficiency Department. Exaion provides a 100% French, low-carbon blockchain that preserves the sovereignty of shared data. Exaion offers three services to its customers: distributed cloud computing, backed by the EDF group's supercomputers; a Blockchain As A Service solution; and third-party datacenter hosting in secure containers.

Start-up funding

EDF Pulse Croissance organises requests for proposals designed to promote start-ups, VSBs, and SMEs that are already established or maturing, working in innovative technologies, products, tools, and sets of solutions, and likely to contribute to the development of a new business line or sales offer. Selected in liaison with the Group's business lines and third-party experts, the winners receive support from the Group and its partners to develop the innovative solution in question.

Since it was first set up, EDF Pulse Croissance has launched four requests for proposals. In 2017, a request for proposals concerning international nuclear decommissioning put together with the Deconstruction and Waste Project Department (DP2D) identified a number of promising solutions, including Cyclife Digital Solutions, now a subsidiary of EDF group. In 2018, two requests for proposals were organised with EDF's Domestic Customer Marketing Department in the field of support for elderly domestic customers (the silver economy) and home services. The winner of this request for projects, start-up Zenpark, received investment from EDF Pulse Croissance in late 2018. In 2019, EDF Pulse Croissance launched a further request for proposals, this time in the realm of e-health, in partnership with AG2R La Mondiale, to identify innovative solutions in support of prevention, screening, and assistance with chronic diseases in the various living environments of the patients. In December 2019, ExactCure and Pheal, two innovative start-ups working in e-health applications for chronic diseases, were selected as winning proposals.

1.4.6.1.4 Other service activities of the EDF group

Other subsidiaries within the EDF group complete the range of energy services that EDF offers. These focus on specific areas, targeting different categories of customers (residential, professionals, businesses and local authorities) and cover a wide range of activities including research, construction, equipment maintenance, investment financing and assistance with obtaining permits and subsidies.

Energy management

To help customers manage their energy and fluid consumption, the EDF group provides facility monitoring and management solutions. Its subsidiaries Netseenergy and Edelia are active in this strategic area.

Netseenergy

A wholly-owned subsidiary of the EDF group specialising in energy intelligence for buildings and industrial processes, Netseenergy supports companies and local authorities in energy transition by providing technological and human resources throughout the energy management value chain in a variety of ways:

- recovering multi-fluid consumption data (electricity, gas, water, etc.): instrumentation, metering, remote readings, invoice flow, etc.;
- formatting retrieved data using iBoard, the online interface for tracking, analysing, and controlling B2B energy efficiency: Data Analytics (indicators, charts, aggregation), Reporting, Algorithms;
- assistance with energy efficiency, with human support from a dedicated Energy Manager: ISO 50001, regulatory audit (NF EN 16247), French "service sector" Decree.

Netseenergy processes almost 9 million items of data daily for a total of 20,000 sites, using bespoke solutions tailored to the needs of its customers: energy performance control, innovative energy audits, and more. A specialist in the IoT, collecting data from 60,000 connected objects every day, Netseenergy provides energy management for total space of over 120 million square metres.

Edelia (EDEV Téléservices)

Edelia is a wholly-owned subsidiary of EDF that designs and implements solutions for individuals and businesses to monitor and control their energy consumption. Its online platform provides a range of innovative digital services to 12 million EDF group customers. Edelia also offers modular tools based on the IoT (Internet of Things) that can be adapted to users' own ecosystems, thus getting the most out of connected objects in smart homes and enhancing digital customer tools.

Connected home

A wholly-owned subsidiary of EDF set up in 2016, Soweé is the only energy market player to combine energy sales with a Connected Station, allowing the Group's offer for domestic customers to be expanded. The Connected Station provides both comfort and energy savings by remotely controlling domestic gas and electric heating, and simulating energy budgets on the basis of temperatures and day-to-day use. Daily routines are facilitated by the integration of Amazon Alexa in the Connected Station's speaker base and the display of practical information such as indoor air quality, weather, journey times, and so on.

For its business and local authorities customers, the Group continues to expand its range of offers related to remote monitoring and analysis of consumption through to managing energy use.

Electric mobility

The EDF group launched the Electric Mobility Plan in October 2018, with the goal of becoming the leading electricity company in electric mobility by 2022 on its four largest European markets: France, the UK, Italy, and Belgium. This energy transition plan confirms its ambitions in CO₂-free electricity production and the development of new electric applications.

The EDF group's Electric Mobility Plan is accelerating, with specific goals for its four major European markets:

- becoming the leading supplier of electricity for electric vehicles by 2022;
- being the leading electric terminal network operator: the EDF group intends to be the leading operator of public and private charging infrastructure in its four core countries in Europe. Through its subsidiary IZIVIA, the Group will deploy 75,000 terminals and provide its European customers with access to 250,000 interoperable terminals by 2022;
- becoming the European leader in smart charging. Electric mobility will transform electricity systems: electric vehicles are also batteries, which can be made available to networks and help to balance them during consumption spikes. As part of its Electric Mobility plan, the Group is aiming to become the leader in smart charging in Europe, with the goal of operating 4,000 "smart" terminals by 2020.

IZIVIA (formerly Sodetrel)

Izivia, a benchmark player in France, is one of the network's leading operators, with over 8,000 private and public charging points in operation in 2019. To facilitate electric car travel throughout Europe, Izivia makes 100,000 charging terminals available on an interoperable basis to holders of its Izivia Pass. In September 2019, Izivia also launched a new application to support roaming charging for its customers, with geolocation of charging points, simplified payment, use tracking, and so on. Meanwhile, the European Commission has expressed renewed confidence in the firm, providing financial support for the rollout of 300 fast charging terminals, in addition to the 217 existing Corri-Door terminals operated by Izivia⁽²⁾. Ranging from 50kW to 100kW, these terminals will be located in some 60 2-8 place charging stations to provide additional capacity. Commercial success already offers proof of the Group's commitment to electric mobility. Izivia and Demeter won a Request for Proposals from Lyon Métropole for the creation of a network of public charging points. Deployment of 631 charging points across the Grand Lyon city district commenced in 2019. This partnership between Izivia and an investment fund is one of the most ambitious projects to roll out charging points across an entire area in France to date. In October 2019, Izivia launched a trial with Europcar Mobility Group designed to provide an electric vehicle charging solution for Europcar customers in France.

Electrical engineering

HTMS, a wholly-owned subsidiary of EDF, has acquired three companies working in electrical engineering, brought together under the EDF ELECTROTECHNICS brand. HTMS has thus become a unique player in the field of electrical engineering, covering all requirements and all the components of medium voltage (HTA), high voltage (HTB), and low voltage (BT) solutions.

(1) See the MyBus press release: "EDF and Banque des territoires invest in MyBus, the rising star in smart mobility".

(2) On 7 February 2020, IZIVIA made 189 of the 217 terminals in the Corri-Door network unavailable following the appearance of 2 technical incidents generating security risks.

1. The Group, its strategy and activities

Description of the Group's activities

EDF ELECTROTECHNICS specialised in the manufacture of HTA substations, carrying out design, integration, installation, equipment, repair, sales, and rentals. It is involved in the operation and maintenance of high-voltage and medium-voltage equipment and substations, the supply and replacement of circuit breakers and transformers, troubleshooting, project management support and training.

Heating: CHAM

CHAM is a wholly-owned subsidiary of the EDF group, specialising in the installation, maintenance, and repair of small and medium-sized thermal equipment: boilers, heat pumps, air conditioners, thermodynamic tanks, etc.

With more than 950 employees across France, CHAM completes upwards of 800,000 tasks a year, meeting the needs of homeowners, private and public collective housing, and businesses.

It develops innovative online maintenance solutions and offers connected home management services.

In its relentless pursuit of growth CHAM is positioning itself as a specialist energy services provider based on three key strengths: professional staff, network expertise and strong local markets.

IZI by EDF

On 7 February 2019, EDF launched the "IZI by EDF" brand, a multiservice interface for private individuals and small businesses. EDF is thus expanding into proximity services, with the aim of becoming the benchmark brand and a one-stop shop for home services and professional premises.

Since 2019, IZI by EDF has offered a broad range of services, spanning emergency repairs, minor works, indoor renovations, boiler maintenance, solar power repair, charging point installation, and connected remote monitoring services. Through IZI by EDF, EDF is positioned as a general contractor for customers, providing a strong commitment to the quality of work and customer relations, using carefully selected contractors.

IZI by EDF is also a multi-service interface where offers from the Group's subsidiaries (EDF ENR, CHAM, and IZIVIA) are proposed alongside those of chosen strategic partners (AXA, EPS, etc.).

Ultimately, in December 2019, EDF acquired mychauffage.com, a benchmark interface for the online sale of boilers and heat pumps.

IZI by EDF is thus committed to providing peace of mind and sustainable comfort for French consumers.

1.4.6.2 Gas activities

In Europe, the EDF group uses over 250TWh of gas. As such, EDF has developed a gas strategy to ensure the security of gas supply for its more than 5.2 million customers ⁽¹⁾, its cogeneration plants and its gas power plants.

The Group is active in the natural gas market in France and Europe *via* its subsidiaries EDF Energy and Luminus and more particularly in Italy *via* its subsidiary Edison. The latter on 1 August 2017 became EDF's gas platform by virtue of a service contract to manage its assets and develop its upstream activities (see section 1.4.5.2.2 "Edison strategy"). It also relies on EDF Trading for its short-term operations relating to transactions on the continental and United Kingdom wholesale markets, as well as on Dalkia (for cogeneration plants).

Lastly, the Group is present outside Europe, especially in the United States, where EDF Energy Services is an important natural gas supplier of major industrial customers and distributors.

In 2019, EDF Trading Limited and JERA Co. Inc. entered into an agreement to set up a joint venture under the name JERA Global Markets in which EDF Trading has a 33.33% stake and JERA Trading International Pte Ltd, itself a wholly-owned

subsidiary of JERA Co. Inc. has a 66.67% stake. JERA Global Markets is the sole entity in charge of managing the short and medium-term performance of EDF's and JERA's LNG assets.

1.4.6.2.1 Natural gas end-market

In Europe, on 31 December 2019, the downstream customer portfolios were as follows:

- in France (EDF and ÉS): around 1.7 million customers (retail and key accounts) and about 32TWh in 2019;
- in Italy (Edison): around 0.9 million customers, and about 86TWh gas consumption;
- in the UK (EDF Energy) ⁽²⁾: around 2 million customers and about 29TWh;
- in Belgium (Luminus): around 600,000 customers and about 13TWh.

1.4.6.2.2 Gas assets and projects

1.4.6.2.2.1 Supply sources

In Europe, the Group's gas and LNG supply comes from short- and long-term gas markets and from a diversified portfolio of short-term and long-term contracts, originating from Qatar, Russia, the North Sea and North Africa.

In the United States, the majority of the supplies originates from the gas markets.

In the rest of the world, specific contracts have been concluded to ensure the supply of the Group's gas power plants.

In order to continue being able to supply its customers, the Group aims to strengthen and diversify its medium and long-term sources of gas. In particular, in LNG, EDF has taken out medium and long-term contracts, one of the aims of which is to enhance the regasification capacity of the Dunkirk LNG terminal.

1.4.6.2.2.2 Infrastructures

Gas pipelines

Apart from its various rights to transport capacity in the European network, the EDF group participates, through its Edison subsidiary, in infrastructure projects for gas importation (see section 1.4.5.2.3.2 "Gas").

LNG regasification terminals

In line with the Group's gas strategy, EDF is the main shipper using the Dunkirk LNG terminal in the long term.

EDF retains the right to use 80% of the Rovigo offshore terminal's regasification capacity, *i.e.* 6.4Gm³ a year, through Edison (see section 1.4.5.2.3.2 "Gas").

The Group also holds regasification capacities in the terminal of Zeebrugge (Belgium).

Small Scale LNG supply chain

Since 2018, Edison is building a Small Scale LNG supply chain to sell LNG in Italy comprising an onshore depot and a small scale LNG terminal in order to help develop a low-carbon sustainable fuel for transport by road and sea (see section 1.4.5.2.3.2 "Gas").

Storage

In Germany, the EDF group has storage for natural gas in salt cavities situated in Etzel. The aboveground facilities are operated through a 50/50 joint venture with EnBW. EDF has around 190 million cubic metres of volume capacity in this salt cavity storage.

With respect to storage activities of the Group in Italy and in the United Kingdom, see respectively, sections 1.4.5.2.3.5 "Regulated activities" and 1.4.5.1.2.2 "Thermal generation and gas storage".

The Group also holds storage rights in the Netherlands, Belgium and France.

(1) Customers are broken down by number of delivery points at end 2019.

(2) Excluding Northern Ireland.

1.4.6.2.2.3 Exploration and Production (E&P)

Following a strategic repositioning, in 2019 Edison announced the sale of upstream business in oil & gas exploration and production (see section 1.4.5.2.2 "Edison strategy").

1.4.6.3 Optimisation and trading: EDF Trading

EDF Trading (EDFT) is the EDF group's exclusive interface with the wholesale energy markets providing market, optimisation and risk management services to the EDF group as well as third parties. The company operates across Europe, North America and Asia in the wholesale markets for electricity, natural gas, and LPG, environmental products and coal and freight (through its partnership with JERA Global Markets). EDF Trading is one of the largest wholesale energy market traders in Europe and in North America. Through its North American subsidiary, it is also one of the main service providers to electricity producers and energy suppliers for access to wholesale markets, and one of the five leading electricity suppliers for major-account customers in sales and industry.

EDF Trading's registered office is located in London. The company has around 820 employees and is governed by the UK's financial market regulator, the Financial Conduct Authority.

Among other things, EDF is responsible for accessing wholesale markets on behalf of DOAAT (see section 1.4.3 "Optimisation activities for EDF in France").

European Electricity market

EDF Trading is a leading participant in the European electricity wholesale market trading over 2,000TWh annually. The company provides a full range of risk management services to EDF group's asset operators and to third parties. It has an extensive geographic footprint and scale of activity which makes it able to adapt quickly to changes in the market and to develop new business where appropriate. In 2019, EDF group signed a number of long-term supply deals which were supported by EDF Trading through financial hedging services. The subsidiary also provided services to help the Group manage its exposure to ARENH.

European Gas

EDF Trading is also a leading participant in the European gas wholesale market trading over 605Gm³ annually. It optimises EDF group entities' gas assets including production, transmission rights, long-term supply contracts and re-gasification and storage capacities. This enables it to support the EDF group and third party customers with complete gas wholesale market solutions. In 2019, EDF Trading did more business with the Group's French customers. The subsidiary also handled a significant number of LNG cargoes shipped to Dunkirk.

North American wholesale markets

EDF Trading North America is a leader on wholesale energy markets in North America, where it benefits from broad geographical coverage, offering solutions to customers across the entire North American energy value chain. It provides energy management solutions, natural gas supply, and real-time services for electricity producers in the USA. As one of the leading suppliers of production services for electric power plants in the USA, the subsidiary manages over 31GW for 89 electric power plants. For retail energy aggregators, it provides supply services on the wholesale market, as well as services to interface with Independent System Operators (ISOs).

Retail sales operations in North America

Ranked in the top five electricity suppliers to commercial and industrial customers in North America, the retail supply and services team offer natural gas, electricity, and environmental products to a portfolio of commercial and industrial customers,

managing a portfolio of 2.1GW of customer demand response. Some of these customers are also active in Europe, allowing EDF to address their needs on a worldwide basis. In 2019, a new product was made available to customers in collaboration with Dalkia, allowing them to invest in energy efficiency projects and incorporate the related costs in their electricity bill.

Environmental products

EDF Trading is committed to the environmental products marketplace and, as subsidiary of a leading renewable generator, offers a broad range of multi-commodity hedging solutions that help the EDF group and third party customers around the world. EDFT is active in the compliance and voluntary carbon markets, guarantees of origin certificates in Europe, Renewable Energy Certificates in the US, and International Renewable Energy Certificates in the rest of the world. In addition, it is a recognised leader and provider of risk management products in the European weather market. In 2019, the business framework was adjusted to the marketing of guarantees of origin, thereby capturing the value of EDF's carbon-free asset portfolio.

International markets

In April 2017, EDF Trading concluded the sale of its coal and freight business to JERA. EDFT now holds a 33% financial stake of JERA Global Markets, one of the largest coal traders globally.

In April 2019, EDF Trading expanded its joint venture with JERA to include LNG optimisation and trading. JERA Global Markets is now the LNG optimiser for JERA and the EDF group, managing LNG optimisation in the short and medium term. The Company continued to develop its global LPG activities. EDF Trading thus offers a complete range of LNG and LPG services including supply, delivery and nominations into the appropriate network.

1.4.6.4 Equity interests

1.4.6.4.1 EDF Trading Logistics

With a fuel oil supply volume of approximately 1 million tonnes and 0.5 million tonnes of coal delivered in 2019, EDF Trading Logistics acts as EDF's vehicle for fuel oil purchases. It organises fuel oil and coal supply logistics operations for all of the EDF group's thermal plants in mainland France, Corsica and France's overseas departments, in close collaboration with JERA Global Market, and controls the coal terminals in the ports of Le Havre and Saint Nazaire.

In addition, EDF Trading Logistics provides the Group its expertise in regard to managing risks relating to the transport of fuel oil (hazardous materials), an activity that has received ISO 14001 certification which was renewed on 31 October 2019, and in the management of environmental crises arising from this activity.

1.4.6.4.2 Other equity interests

As well as interests in local distribution companies or LDCs (SMEG, Enercal, Électricité de Mayotte, EDSB), the EDF group has industrial subsidiaries and holdings. These companies contribute, within their specific field of activities (generation, fuel, engineering) to the Group's missions, and more specifically, to those of generation and engineering: namely to ensure the short- and medium-term performance of EDF's portfolio of generation assets in France.

These companies include SAE, which specialises in fuel transport and trading operations on behalf of the EDF group; SHEMA, which specialises in hydropower generation by small power plants; and Cyclife France, a wholly-owned subsidiary of EDF specialising in the treatment and packaging of very low- and intermediate-level radioactive waste.

For recent changes in the dedicated asset portfolio, see section 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio".

1.5 Legislative and regulatory environment

EDF group entities are subject to a considerable array of regulations in the performance of their business activities. In particular, EDF is subject to the European legislation on the electricity and gas markets, which has been transposed into French law, as well as to the applicable environmental, nuclear power, health and safety regulations.

The following review of legal and regulatory provisions is not designed to be an exhaustive description of all such provisions that are applicable to the EDF group.

1.5.1 EDF: a public undertaking with a public service mission

1.5.1.1 EDF as a public undertaking

Pursuant to the Article L. 111-67 of the French Energy Code, the state must remain the owner of at least 70% of its capital. Furthermore, as an undertaking in which the French State holds a majority share, EDF is subject to the provisions of Order no. 2014-948 of 20 August 2014 on the governance and equity transactions of companies with a public shareholding and its Application Decree no. 2014-949 of the same date.

In accordance with the legislation that applies to all undertakings of which the State is a majority shareholder, EDF may have to undergo certain State audit procedures, in particular through an economic and financial evaluation assignment, pursuant to Decree no. 55-733 of 26 May 1955 on State economic and financial evaluation and Decree no. 53-707 of 9 August 1953 on State evaluation of national public undertakings and certain organisations, the purpose of which has an economic or social component.

EDF also has to undergo the audit procedures performed by the French General Accounting Office (*Cour des Comptes*) and Parliament. Thus, in addition to the control performed by the Statutory Auditors, the Company's accounts and management and, where applicable, those of its directly-held majority subsidiaries, fall under the control of the French General Accounting Office, in accordance with Articles L. 111-4, L. 133-1 and L. 133-2 of the French Code of Financial Jurisdictions.

Moreover, the Legislative Decree of 30 October 1935 laying out the State's control over firms, consortia and organisations or companies of any kind calling on State financial aid allows the Minister for the Economy to have EDF audited by the General Finance Inspection Office.

Lastly, the disposal of EDF shares by the State, or the dilution of the State's stake in EDF's capital, is subject to a specific procedure under Order no. 2014-948 of 20 August 2014 on the governance and equity transactions of companies with a public shareholding.

Directive no. 2014/24/EU on Public Procurement and Directive no. 2014/25/EU on Procurement by Entities Operating in the Water, Energy, Transport and Postal Services Sectors, to which EDF is subject as a purchaser, have been transposed into French domestic law by:

- order no. 2015-899 of 23 July 2015 on public procurement contracts, which unified the various competitive tendering procedures that previously existed in the French Public Procurement Code and Order no. 2005-649 of 6 June 2005;
- decree no. 2016-260 of 25 March 2016 that implemented the Order of 23 July 2015.

These texts entered into force on 1 April 2016.

1.5.1.2 Public service in France

Statutory definition of public service in France

Articles L. 121-1 *et seq.* of the French Energy Code outline the framework for the public electricity service (see section 1.5.2.1.2 "French legislation: the Energy Code" below for a description of this regulation).

Public service missions

Articles L. 121-1 *et seq.* of the French Energy Code state that the public electricity service must develop a balanced supply of electricity, develop and operate public electricity networks and supply electricity at regulated sales tariffs.

Balanced development of electricity supply mission

The purpose of developing a balanced supply of electricity, which is defined in Article L. 121-3 of the French Energy Code, is to achieve the objectives defined in the multi-year energy programme (PPE). The PPE was defined by decree, and sets out priority courses of action for the public authorities for the management of all forms of energy in continental metropolitan France. It must be compatible with the greenhouse gas emission reduction targets set in the carbon budget and the low-carbon strategy, which are defined by Decree no. 2015-1491 of 18 November 2015.

The PPE contains sections on (i) the security of supply, (ii) improving energy efficiency and reducing primary energy consumption, in particular fossil fuel, (iii) developing the utilisation of renewable energies and energy recovery, (iv) the balanced development of energy networks, storage and conversion, and managing the demand for energy, (v) the preservation of consumer purchasing power and the competitiveness of energy prices, in particular for undertakings that are exposed to international competition, (vi) the evaluation of the needs for professional skills in the field of energy and how training courses can be adapted to these needs, and (vii) the strategy for developing clean mobility.

It defines the quantitative objectives for the plan and the maximum indicative budget for the public funds that the State and its public institutions will mobilise in order to attain them. It may be broken down by objective and by industry sector.

The first PPE must cover an initial period of three years (2016-2018), then a second period of five years (2018-2023). Subsequent PPEs will be drawn up for two successive five-year periods.

The first PPE was defined by Decree no. 2016-1442 of 27 October 2016 on the multi-year energy programme. Pursuant to the law, on 6 April 2017, EDF prepared a Corporate Strategy Plan (PSE) presenting the actions that the Company commits to implementing in order to meet the security of supply and electricity generation diversification objectives defined in the first period of the PPE. The PSE was submitted for approval by the Minister for Energy who, after reviewing its compatibility with the PPE, asked EDF to develop a new plan.

Between 19 March and 30 June 2018 the public was invited to comment on the draft PPE covering the 2019-2023 and 2024-2028 periods.

On 25 January 2019 France's environment Ministry published the full text of the draft PPE which will form the basis of the country's energy future in the coming years. The draft PPE was debated by various bodies that issued an opinion in 2019 (the *Autorité environnementale*, *Conseil national de la transition écologique*, *Conseil supérieur de la construction et de l'efficacité énergétique*, *Comité de gestion des charges de service public de l'électricité*, *Conseil supérieur de l'énergie* and *Comité du système de distribution publique d'électricité*). The public will be invited to give further comments online on the PPE in light of the opinion issued by the *Autorité environnementale* (national environmental authority). Neighbouring states will also be invited to comment.

The PPE report, its summary and the corresponding draft decree have been made available to the public by the Ministry of Ecological and Solidarity Transition for public comments from 20 January to 19 February 2020 on <http://www.consultations-publiques.developpement-durable.gouv.fr>. A review of the consultation will be produced by the Ministry of Ecological and Solidarity Transition. The PPE is expected to be adopted and the corresponding decree issued in 2020.

The balanced development of electricity supply mission also involves guaranteeing the supply of areas that are not interconnected to continental metropolitan France (Corsica, and the overseas departments and territories), as well as some islands in Brittany. Corsica, Guadeloupe, Guyana, Martinique, Mayotte, La Réunion, and Saint-Pierre-et-Miquelon will each have their own specific PPE. Other areas that are not interconnected with the continental metropolitan network, except for Saint Martin and Saint Barthélemy, will be subject to a section appended to the PPE for continental metropolitan France.

As a power producer, EDF, along with the other producers, contributes to the performance of this mission.

Mission to develop and operate public transmission and distribution networks

The mission to develop and operate the public electricity transmission and distribution networks, which is defined in Article L. 121-4 of the French Energy Code, involves ensuring:

- a rational electricity distribution service in France through the public transmission and distribution networks, in a way that is environmentally friendly, the interconnection with neighbouring countries;
- connection and access to the public transmission and distribution networks, under non-discriminatory conditions.

Public network operators are designated by law to carry out this duty: RTE for transport, Enedis and Local Distribution Companies (*entreprises locales de distribution*, or LDCs) for distribution, EDF in zones that are not interconnected to the continental metropolitan network.

Mission to supply electricity

The public service mission to supply electricity, which is defined in Article L. 121-5 of the French Energy Code, involves ensuring the supply of electricity throughout France to customers who benefit from regulated electricity sales tariffs.

By law, this mission has been entrusted to EDF and to the LDCs.

The conditions under which customers can benefit from regulated electricity sales tariffs are defined in Articles L. 337-7 *et seq.* of the French Energy Code.

Since 1 January 2018, the special “basic necessity” rate (TPN), a public service mission assigned to all electricity suppliers, has been replaced by the “energy voucher” scheme. These vouchers are a special means of payment that allow households that are experiencing financial difficulties to cover part of their energy consumption expenses (electricity, gas, fuel oil, etc.) or their expenditure on improving the energy efficiency of their home.

The mission to supply electricity also includes supplying emergency power to customers connected to public networks, if their supplier is unable to supply power or has had its licence withdrawn or suspended. Emergency suppliers are appointed by the Minister for Energy following a call for applications organised with the support of the French Commission de régulation de l'énergie (Energy Regulation Commission – CRE). As the implementing regulations had not yet been adopted on the date of this Universal Registration Document, this provision has still not entered into force.

Social cohesion

Article L. 121-5 of the French Energy Code provides that the supply of electricity at regulated tariffs must contribute to social cohesion, in particular through the national equalisation of regulated electricity sale tariffs and tariff entitlement.

Article L. 115-3 of the French Social Action and Families Code prohibits electricity suppliers from cutting off electricity supplies to the primary residences of individuals or families during the winter period (from 1 November to 31 March) due to unpaid bills, including through contract termination. Electricity suppliers may, nevertheless, in certain cases, reduce the power supplied, except with regard to customers who benefit from “energy vouchers”.

In its capacity as an electricity supplier, EDF is required to maintain electricity supplies under the conditions laid down by said Article and by Decree no. 2008-780 of

13 August 2008 on the procedure that is applicable in the event of unpaid electricity, gas, heating and water bills, implemented in its amended form pursuant to Decree no. 2014-274 of 27 February 2014.

Public Service Contract

On 24 October 2005, a Public Service Contract was signed by the State and EDF pursuant to Article L. 121-46 of the French Energy Code. This contract, which details the commitments made by EDF and the State and specifies the rules governing the financial compensation for service commitments, will remain in force until a new contract is signed, as provided for in the contract itself.

Commitments by EDF (excluding network managers)

EDF's public service commitments include:

- access to the public electricity service and the supply of electricity to customers who choose to remain at regulated tariffs;
- production and sales. These areas include the implementation of the energy policy and maintaining secure power generation that is environmentally friendly;
- contributing to the safety of the electricity network. In this regard, EDF undertakes to enter into several contracts with RTE, in particular concerning the optimisation of work on generation facilities and the availability of the resources required to maintain network balance.

Commitments by network managers

In the Public Service Contract, the Enedis and RTE network managers made commitments concerning the management of the public networks for the transmission and distribution of electricity and the safety of the electricity system. These commitments are financed by the Tariff for Using the Public Electricity Transmission and Distribution Networks (TURPE).

These commitments concern, above all, network safety, supply quality, third party safety and the preservation of the environment – four areas where customers' and local authorities' expectations are especially high.

More accessible services

On 28 September 2010, the State and EDF, as well as eight other major public service operators, signed a partnership agreement entitled “+ de services au public” (“more services to the public”), which aims to develop access to a set of services intended for rural populations in France (information on bill payment, general information, travel ticket sales, etc.).

Reception staff and internet access points are some of the many resources made available to users through shared facilities such as Multiservice Conciliation and Information Points (PIMMS), Public Service Relays (RSP) and other structures such as town halls. Following the experimental phase, during which these services were deployed in twenty-two French departments, in July 2013, the Inter-Ministerial Committee for the Modernisation of Public Action (CIMAP) decided to extend this initiative throughout France.

1.5.1.3 Concession contracts for the distribution and supply of electricity in France

French legal system applicable to concessions

In accordance with Articles L. 121-4 *et seq.* and L. 322-1 *et seq.* of the French Energy Code, and Article L. 2224-31 of the French Local Authorities Code, the public distribution of electricity is operated under a system of public service concessions. Pursuant to this body of law, the contracting authorities organise the public electricity distribution service through concession agreements and general specifications that set forth the respective rights and obligations of the contracting authority and the operator. Currently, the contracting authorities are most often public institutions formed by associations of several municipalities cooperating together, however contracting authorities at department level are becoming more common.

The separation of supply and network activities imposed by Community Directives has led to the identification of a public service with two distinct missions: on the one hand, the regulated tariff supply mission entrusted to EDF and the LDCs in their exclusive service areas and, on the other hand, the development and operation of the public electricity distribution networks, entrusted to Enedis and the LDCs in their service areas, and EDF for areas not interconnected to the continental metropolitan network.

1. The Group, its strategy and activities

Legislative and regulatory environment

Article L. 334-3 of the French Energy Code provides that the signature of new concession agreements and amendments, as well as renewals of existing concession agreements, must be executed by three parties: the contracting authority, the distribution network manager (for the provisions relating to management of the public distribution network) and by EDF (or the LDC that has the authority in the geographic area) for supply at regulated tariffs. The other current concession agreements in force are deemed to have been signed jointly by these three entities.

In accordance with Order no. 2016-65 of 29 January 2016 on concession contracts and its implementing Decree no. 2016-86 of 1 February 2016, which transposed Directive 2014/23/EU of the European Parliament and of the Council of 26 February 2014 into French domestic law, concession contracts for the operation of the public network for the distribution and supply of electricity at regulated tariffs are awarded directly, *i.e.* without a contract notice or competitive tendering procedure.

The ELAN Housing bill adds chapter 5 about rising mains to the section of the French Energy Code on accessing and connecting to electricity networks. Rising mains put into service after the law is published will belong to the public distribution network. Those put into service before the law is published must be integrated into the public distribution network within two years as from 24 November 2018. Owners and joint owners can apply to have their rising mains integrated ahead of time. They can also choose to retain ownership of the mains.

Rights of the contracting authorities

The rights of the contracting authorities are set out in section 1.4.4.2.2 ("Distribution activities") of this Universal Registration Document.

1.5.2 Energy markets

1.5.2.1 Electricity markets

1.5.2.1.1 European legislation

Since 1996, three European Directives have been issued to set out the common rules for the generation, transmission, distribution and supply of electricity. Directive 96/92/EC of 19 December 1996 laid the foundation for opening up the electricity market to competition.

Directive 2003/54/EC of 26 June 2003 reiterated the major principles and took an additional step on the path to opening up the market, by progressively expanding eligibility to all customers.

Directive 2009/72/EC of 13 July 2009, known as the "Third Directive", was adopted as part of the third "Energy Package". This Directive primarily strengthens the guarantees of the independence of transmission system operators and increases the power of the national regulatory authorities. These provisions have now been incorporated into the French Energy Code.

These texts have been reformed by regulation 2019/943 on the internal market for electricity and Directive 2019/944 of 5 June 2019 on common rules for the internal market for electricity. Although they restate the main principles governing the operation of the market for electricity defined in the previous legislation, they do strengthen the role of the consumer and take into account new forms of generation and consumption (storage, self-consumption, etc.).

Moreover, the rules that govern the conditions for access to the network for cross-border exchanges in electricity are currently defined by regulation (EC) no. 714/2009 of the European Parliament and of the Council of 13 July 2009, which is part of the third Energy Package. This regulation, *inter alia*, provides for a compensation mechanism between transmission system operators for the costs incurred by hosting cross-border flows of electricity on their networks. This compensation is paid by the operators of the national transmission systems from which cross-border flows originate and the systems where those flows end.

Finally, the "Security of Electricity Supply" Directive 2005/89/EC, which was adopted on 18 January 2006, is designed to provide a better definition of the responsibilities of the various operators, ensure that minimum operational standards are respected, maintain balance between demand and supply, and channel investments toward the systems. The objectives of this Directive have been taken into account in various French laws and regulations.

These regulations concern the organisation of the wholesale and retail markets for electricity, and are designed to give increased importance to consumer-centred measures. They are also an opportunity to confirm or propose new European targets

for 2030 in terms of energy efficiency (30%) and renewable energy (32%). A new regulation is proposed for security of supply, and a revised regulation is proposed concerning the Agency for the Cooperation of Energy Regulators (ACER). All these regulations are intended to create a more cohesive organisational framework for the electricity markets, for the benefit of the European energy and climate policies, as part of the planned European Energy Union. The regulation on the Governance of the Energy Union completes the package and specifies the method for monitoring the achievement of targets by the Member States.

1.5.2.1.2 French legislation: the Energy Code

The various pieces of legislation on energy law⁽¹⁾ were incorporated into the French Energy Code by Order no. 2011-504 of 9 May 2011, with the exception of the majority of the provisions on nuclear energy, which were incorporated into the French Environment Code, pursuant to Order no. 2012-6 of 5 January 2012. Moreover, Decree no. 2015-1823 of 30 December 2015 organised the regulatory section of the French Energy Code. Consequently, around one hundred decrees on energy law have been repealed.

The Law of 17 August 2015 on Energy Transition for Green Growth amended numerous provisions of the French Energy Code, and in particular the objectives of the energy policy, which are now focused on the emergence of a competitive economy that creates an abundance of jobs through the mobilisation of all the industrial sectors (in particular the green growth sectors), security of supply and the reduction of reliance on imports, competitive and attractive energy prices, the preservation of human and environmental health, social and territorial cohesion, the fight against fuel poverty, and contributing to the implementation of a European Energy Union.

The Energy and Climate Law no. 2019-1147 of 8 November 2019 transposes into French law some of the measures enacted in the documents making up the "Clean Energy for all Europeans" package and updates the targets of the energy policy to reflect the Climate Plan adopted in 2017, the National Low-Carbon Strategy (SNBC) and the multi-year energy programme (PPE). The new targets are as follows:

- carbon neutrality by 2050: 40% reduction in fossil fuel use compared to 2012 by 2030 (up from the previous target of 30%);
- target of reaching a 50% nuclear share in the electricity mix postponed to 2035 (from 2025) (closure of 14 reactors).

The law also introduces a Haut Conseil pour le climat (High Council for Climate). Its role is to assess the government's climate action. It is tasked to analyse, once a year, the implementation and effectiveness of the measures adopted to reduce greenhouse gas emissions, develop carbon sinks and reduce the carbon footprint, including budgetary and fiscal provisions with an impact on the climate.

The law also sets up a mechanism to limit greenhouse gas emissions from the electricity generation sector from 1 January 2022. The working life of the most polluting power plants is capped.

Generation facilities

Anyone can operate an electricity generation facility provided that, above a certain power threshold determined by decree, an operating licence issued pursuant to Article L. 311-5 of the French Energy Code is obtained. The powers and responsibilities of local authorities with regard to electricity generation are defined in Articles L. 2,224-32 and L. 2,224-33 of the French Local Authorities Code, and in Article 88 of Law no. 2010-788 of 12 July 2010 on the national commitment to the environment.

Regulated Access to Electricity from the Existing Nuclear Fleet (ARENH)

The rules governing Regulated Access to Electricity from the Existing Nuclear Fleet ("ARENH"), provided for in Articles L. 336-1 *et seq.* of the French Energy Code, have been implemented since 1 July 2011. See section 1.4.3.3 "Regulated access to historic nuclear power (*accès régulé à l'énergie nucléaire historique*, or ARENH)" on this point.

The Energy and Climate Law revised the ARENH mechanism by (i) specifying that it contributes to price stability for the end consumer, and (ii) increasing the upper limit of the ARENH maximum overall volume to 150TWh. Article L. 337-16 also specifies that changes in the consumer price index and the maximum overall volume that can be sold from the existing nuclear fleet may be taken into account to revise the ARENH price. However, there is no direct link between price increases and increases in the maximum overall volume.

(1) Law of 15 June 1906, law no. 46-628 of 8 April 1946, law no. 2000-108 of 10 February 2000, law no. 2003-8 of 3 January 2003, law no. 2004-803 of 9 August 2004, law no. 2006-1537 of 7 December 2006, law no. 2010-1488 of 7 December 2010.

That provision was referred to the Constitutional Council, which ruled that it was constitutional provided that, when setting the ARENH price, Ministers take sufficient account of the economic conditions of electricity generation by nuclear power plants.

Choice of electricity supplier

All customers, without exception, have been eligible since 1 July 2007, *i.e.* they may freely sign a contract for the purchase of electricity with a producer or supplier of their choice that is established on the territory of the European Union or on the territory of a State that is party to an international agreement with France (Article L. 331-1 of the French Energy Code).

Customers can choose to benefit from regulated electricity sales tariffs under the conditions set out in Articles L. 337-7 *et seq.* of the French Energy Code.

These provisions were amended by the Energy and Climate Law of 8 November 2019 to take into account the decision of the Council of State of 18 May 2018 and transpose into French law Directive 2019/944 of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU maintaining regulated sales tariffs for household customers and microenterprise customers by way of derogation. Pursuant to these provisions:

- household end consumers, including single owners and condominium associations of a single residential building, and non-household end consumers employing fewer than ten persons and whose annual turnover, revenue or balance sheet total does not exceed €2 million (microenterprise definition) may continue to benefit from the regulated sales tariff ;
- non-household consumers whose power demand is less than or equal to 36kVA but do not meet the definition of a microenterprise cease to be entitled to regulated sales tariffs. Regulated sales tariffs for those consumers are phased out from 1 January 2020 and abolished on 1 January 2021. Customers with regulated sales tariffs on 31 December 2020 will automatically switch to the market-based prices of the incumbent supplier.

Article L. 111-84 of the French Energy Code requires internal accounts to be kept that make it possible to distinguish between supply to customers who exercised their right to eligibility and supply to customers at regulated tariffs. The State and the CRE have a right of access to the electricity companies' accounts.

Third-party access to networks

Article L. 111-91 of the French Energy Code provides that network managers must guarantee access to the public transmission and distribution networks in order to:

- perform the public service missions to supply electricity at regulated electricity sales tariffs and at basic necessity special rates;
- perform electricity procurement contracts;
- perform electricity export agreements signed by a producer or by a supplier who is located on French national territory.

Disputes concerning third-party access to networks are heard by the Settlement of Disputes and Sanctions Committee (CoRDIS), which is part of the Energy Regulation Commission (CRE).

The tariffs for using the Public Electricity Transmission and Distribution Networks (TURPE) referred to in Articles L. 341-2 *et seq.* of the French Energy Code entered into force on 1 August 2017. They have been defined, with regards to transmission (TURPE 5 HVB) through a decision of the CRE of 17 November 2016 and a decision of the same date concerning distribution (TURPE 5 HVA/LV). Through its decision on 26 October 2017, the CRE added to its decision of 17 November 2016 on TURPE five distribution of a decision determining the conditions for covering the costs associated with customer management ("supplier commissioning").

Subsidy mechanisms for certain production sectors

EDF is subject to electricity purchase obligations that result in contracts being signed with facility operators. The purchase obligation system, which was created by Law no. 2000-108 of 10 February 2000 on the modernisation and development of the public electricity service, was amended by Law no. 2015-992 of 17 August 2015 on energy transition for green growth, which clarified some aspects of this system and created a new form of subsidy in the guise of additional remuneration. The subsidy mechanism for certain production sectors that results from the aforementioned Law of 17 August 2015 now has three separate systems.

Firstly, the purchase obligation regime provided for by Articles L. 314-1 *et seq.* of the French Energy Code. These articles provide that EDF (as well as the LDCs that are

responsible for supply in their service area) must sign purchase contracts, at the request of producers, for the electricity generated by technology sectors, the development of which the public authorities wish to support, either because they use sources of renewable energies, or because they have a specific form of energy efficiency (e.g. cogeneration). The eligible facilities are listed in Article D. 314-15 of the French Energy Code.

Article R. 314-2 of the French Energy Code provides that producers who benefit from the purchase obligation must sell all of their production to EDF under agreements entered into on the basis of indicative models approved by the Minister for Energy. Purchasing terms and conditions, specifically the electricity purchase prices, are set by order of the Ministers for Energy and the Economy.

Secondly, the additional remuneration regime, which was introduced by Law no. 2015-992 of 17 August 2015 on energy transition for green growth and is governed by Articles L. 314-18 *et seq.* of the French Energy Code. The additional remuneration takes the form of a premium that is paid to producers as a complement to their income from selling the electricity they produce on the market, as well as the assignment of their capacity certificates. In this respect, EDF is obliged to enter into an additional remuneration contract with eligible producers who request one and with certain producers who currently benefit from a purchase obligation and who wish to benefit from an additional remuneration agreement for the remainder of the term of their initial purchase contract. The facilities that are eligible for the additional remuneration are listed in Article D. 314-23 of the French Energy Code.

Thirdly, the tendering procedure which, pursuant to Articles L. 311-10 *et seq.* of the French Energy Code, may be launched by the Minister for Energy when production capacities do not meet the targets of the multi-year energy programme. EDF is then required, outside the areas served by LDCs, to enter into an electricity purchase contract or a contract that provides for additional remuneration with the selected bidder(s) (this is a memorandum of understanding in the event that it is EDF itself in the capacity of "producer" that is chosen following the call for tenders).

The additional costs for EDF and the LDCs that result from contracts signed pursuant to the obligation to purchase energy are compensated by the State and financed, in particular, by the "Energy Transition" special purpose account, created by the Amending 2015 Finance Law. For 2018, Article 50 of Law no. 2017-1837 of 30 December 2017 (the Finance Act for 2018) substitutes these TICC and TICPE percentages with an amount in order to overcome the return forecast uncertainties of these taxes as well as the revenue expansion of the CAS which will incorporate the income generated by the auctioning of the guaranteed sources provided for in Article L. 314-14-1 of the French Energy Code. Likewise, the 2019 Finance Act stipulates a slight increase in the TICPE share from €7,166.3 million to €7,246.4 million in line with spending levels budgeted for 2019.

Mechanism for compensating the additional costs of public service

Compensation of Public Electricity Service costs (CSPE)

Article L. 121-6 of the French Energy Code lays down the principle that the State must compensate in full the costs that are attributable to the public service duty to generate and supply power (electricity and gas) assigned to EDF in particular, to other power producers and to the LDCs.

For electricity generation, the expenses defined by Article L. 121-7 of the French Energy Code include:

- the additional costs that result both from electricity purchase agreements entered into by EDF and the LDCs after tendering procedures (Articles L. 311-10 *et seq.* of the French Energy Code) and from purchase obligation agreements signed within the framework of Articles L. 314-1 *et seq.* of the French Energy Code, as well as additional remuneration agreements that are entered into pursuant to Articles L. 314-18 *et seq.* of the French Energy Code;
- in areas that are not interconnected to mainland France:
 - additional generation costs that are not covered by the generation portion in regulated sales tariffs, the costs of storage facilities managed by the electricity system manager, within the limits of the additional generation costs they help to avoid,
 - additional electricity procurement costs (other than those, mentioned above, linked to the purchase obligation) that are not covered by the generation portion in regulated sales tariffs, within the limit of the additional generation costs they help to avoid,

1. The Group, its strategy and activities

Legislative and regulatory environment

- the costs paid by electricity suppliers in respect of energy demand control initiatives, less any income received through these initiatives, within the limit of the additional generation costs they help to avoid,
- the costs of studies paid by a producer or supplier with a view to implementing electricity supply projects that are identified in the Decree on the multi-year energy programme; and
- since the Amended Budget Act for 2016, the direct costs for EDF and the LDCs triggered by signing and managing purchase contracts, contracts for additional remuneration and contracts signed following tendering procedures, within the limit of the costs that an average undertaking that is properly managed and adequately equipped with the necessary resources, would have incurred.

For the supply of electricity, the costs defined in Article L. 121-8 of the French Energy Code include:

- revenue losses and additional costs incurred by suppliers due to the implementation of "energy vouchers";
- costs incurred by suppliers as a result of their participation in the smart meter display plan established for low-income persons.

Moreover, in accordance with the provisions of Article L. 121-8-1 of the French Energy Code, the purpose of the CSPE is to finance the costs incurred by operators of public electricity transmission networks in respect of the calls for tender they may initiate if the load shedding capacities do not meet the targets stipulated in the multi-year energy programme.

The system for compensating public service costs, which is governed by Articles L. 121-9 *et seq.* of the French Energy Code, underwent a reform, which has been in effect since 1 January 2016, pursuant to Law no. 2015-1786 of 29 December 2015 (the Amended Budget Act for 2015), which aims to secure the financing of the costs of the public electricity service.

The public electricity (and gas) service costs are now financed in full, as follows:

- the costs linked to energy transition, which correspond to the subsidy mechanisms for renewable energies, as well as the reimbursement of the "long-term" compensation deficit incurred by EDF as it stands on 31 December 2015, are registered in a special purpose account (CAS) for "energy transition" that was created by the Amended Finance Act for 2015. Since early 2017 the CAS has been funded by a percentage of the revenue from the TICPE and to a lesser extent by the TICC. Fossil fuels are thus helping to pay for the energy shift;
- the other public service costs – excluding the costs associated with the subsidy mechanisms for renewable energies – (fuel poverty, tariff equalisation in areas not interconnected to metropolitan France, cogeneration, and the budget for the energy conciliator, etc.) are entered directly in the general budget under "Public Electricity Sector";
- revenue from the domestic tax on the final consumption of electricity (TICPE), which was renamed the "Contribution to Public Electricity Service" (CSPE), is directly affected to the general budget. The CSPE is collected directly from final consumers of electricity in the form of an additional levy on the electricity sale price or directly from electricity producers that produce electricity for their own uses. Before 1 January 2017 it had been used to fund renewable energy and cogeneration plants, offset cost overruns in island territories and subsidise welfare policies.

The amount of the CSPE was set at €22.50/MWh as from 1 January 2016. This amount has been maintained for 2017, 2018 and 2019. As an exception, for electro-intensive and hyper-electro-intensive undertakings and distribution companies, reduced tariffs of between €0.50/MWh and €12/MWh have been defined.

The decree no. 2016-158 of 18 February 2016 specifies the rules for determining the costs that can be attributed to public service energy missions, the procedure for determining the amount of the costs to be compensated for each operator, and the transactions for paying the compensations to the operators who bear the expenses.

Each year, the CRE records the amount of the costs that can be attributed, in respect of the previous year, to public service energy missions that are the responsibility of the operators and assesses, for the following year, the provisional amount of the same costs, and updates its cost forecast for the current year. It thus distinguishes between the costs that are allocated to the "energy transition" special purpose account and those financed directly by the general budget.

Each year, before 15 July, the CRE sends the Minister for Energy its assessment of the amount of these costs.

The massive expansion of facilities that generate electricity using renewable energy sources (mainly wind power and photovoltaic facilities) and that benefit from the purchase obligation, for several years, has led to a significant increase in the costs to be compensated. Yet, since 2007, the amount of the CSPE that is actually applied to consumers has not made it possible to cover these costs, thus leading to an offsetting shortfall, for which EDF alone pays and that adversely impacts the Group's indebtedness. It therefore became necessary to design a new mechanism that is balanced (*i.e.* that avoids a new structural deficit being created), the financing of which is not based exclusively on electricity consumers alone (electricity is by far the least carbon-heavy energy and yet an imbalanced tax situation penalises its ability to compete with other energy forms, which is in contradiction with the CO₂ emissions reduction targets of the "Energy Transition" Law). Accordingly, since 1 January 2017 a share of TICPE revenue has been allocated to the "Energy Transition" CAS while the CSPE is allocated directly and solely to the general budget.

EDF and the public authorities have reached an agreement for the repayment of the debt formed by the offset deficit as it stands on 31 December 2015 *i.e.* €5,779.8 million. Under the new mechanism that has been in force since 1 January 2016, this debt shall be paid off by 31 December 2020, according to a progressive repayment schedule that was defined by an Order of 13 May 2016, which was amended on 2 December 2016.

On 22 December 2016, EDF sold part (26.40%) of this debt to a pool of investors comprised of a bank and a dedicated Special Purpose Entity (SPE). The proceeds of this sale without recourse totalled €1.542 billion. The debt sold includes a component which is not classified as dedicated assets. The sale of this component has led to an improvement of the Net Indebtedness of approximately €645 million. The remainder corresponds to the portion of the debt that was allocated to Dedicated Assets. It will be reinvested in these assets.

Compensation for additional distribution costs

The purpose of the Electricity Equalisation Fund (FPE), the accounting management of which is entrusted to EDF under Article L. 121-29 of the French Energy Code, is to distribute the charges incurred as a result of public service missions assigned for managing the electricity distribution networks among the operators concerned, in particular those linked to the specificities of the networks operated and that will not be covered by the portion relating to the use of those networks in the regulated tariffs or by the tariffs for using the public electricity distribution networks. The costs linked to involvement in the development of areas with particular geographical, economic or social difficulties, as defined by Article 42 of Law no. 95-115 of 4 February 1995, are also concerned. Note 4.3 to the consolidated financial statements at 31 December 2019 (section 6.1) describes the financial impact on the Group of the law's application.

Capacity guarantees

Articles L. 335-1 *et seq.* of the French Energy Code, which are taken from the NOME Act (New Organisation of the Electricity Market – Nouvelle Organisation du Marché de l'Électricité), obligate each electricity supplier to contribute to the security of electricity supply in continental metropolitan France, in light of its customers' power and energy consumption patterns. Each supplier must therefore provide annually, under penalty of an administrative sanction, an amount of capacity guarantees according to its customers' consumption at peak periods. Suppliers will obtain these capacity guarantees from generation or load operators, which must first have their capacities certified by the public distribution network manager.

The aims of this mechanism are:

- to make it possible to maintain or develop generation or load shedding capacities that ensure the level of security of supply set by the public authorities;
- to improve the remuneration of these capacities;
- to share the expense of this security of supply among all suppliers.

The "capacity mechanism rules" proposed by RTE were approved by a ministerial order of 22 January 2015 after consulting the CRE. Following the publication of Decree no 2018-997 of 15 November 2018 on the required capacity mechanism in the electricity sector, RTE sought consultation on a new draft set of rules.

The Law of 17 August 2015 on Energy Transition for Green Growth has adapted the capacity mechanism to small players allowing LDCs to transfer their capacity obligations, no longer just to other LDCs but “to any other supplier” and allowing electricity suppliers to transfer their capacity obligations to a final consumer for its consumption or to a public network operator for its losses (Article L. 335-5 of the French Energy Code).

Moreover, Article L. 335-3 of the French Energy Code introduced the possibility for all capacity operators to transfer to a third party their liability for discrepancies between effective capacity and certified capacity, and the payment of the penalties in respect of said discrepancies.

On 13 November 2015, the European Commission opened an in-depth investigation in light of European rules on State aids, with respect to the planned French capacity mechanism.

On 8 November 2016, the European Commission approved French plans for a capacity mechanism. During the investigation, France agreed to amend the mechanism as follows: introduction of long-term contracts (7 years) for new capacities, taking into account foreign capacities and measures to prevent any manipulation of the market.

Revisions made for the improvement of market transparency and surveillance led to the publication of the Order of 29 November 2016 amended by the Order of 12 October 2018. This made it possible for the mechanism to enter into force on 1 January 2017.

Over-the-counter transactions remain possible.

The implementation of the commitments concerning the opening of the mechanism to foreign capacity providers and long-term contracts requires a revision of the 2012 Decree, adopted in 2012 by the Council of State after reviewing the opinions delivered by the Higher Energy Council, the National Council for Standards Assessment, the Energy Regulation Commission and the Competition Authority. Decree no. 2018-997 of 15 November 2018 on the required capacity mechanism in the electricity sector provides for the explicit inclusion of some cross-border contributions to France’s security of supply of electricity as well as the setting up of a multi-year contractual system for new capacity.

Electricity load shedding

The Law of 17 August 2015 on Energy Transition for Green Growth amended the legal rules on load shedding and, in particular, Articles L. 271-1 *et seq.* of the French Energy Code on this subject.

These provisions amend the previous legal rules and stipulate, in particular:

- that load shedding is defined as “the action to reduce temporarily the effective withdrawal level of electricity from the public electricity supply and distribution networks by one or more consumption sites, compared to a forward-looking consumption plan or an estimated consumption, when an *ad hoc* request is sent to one or more final consumers by a load manager or an electricity supplier”;
- that there is the possibility for consumers to monetise each of their demand responses, either *vis-à-vis* their supplier as part of a demand response offer that is inseparable from the supply, or *via* the intermediary of load managers;
- that the Government will organise calls for tenders if the load management capacities do not meet the targets of the multi-year energy programme (this mechanism replaces that of the load shedding premium);
- finally, for load shedding that leads to significant energy savings, the law provides that the administrative authority may require the payment to the supplier as provided for in Article L. 271-3 of the French Energy Code to be shared between the load manager and RTE.

The terms and conditions for applying these provisions are specified in Articles R. 271-1 *et seq.* of the French Energy Code, last completed by Decree no. 2017-437 of 29 March 2017 and by the latest rules for valuing the demand response on the wholesale energy markets (known as the “NEBEF 3.2” rules) approved by the CRE on 24 July 2019 and effective as of 1 September 2019 and the rules concerning scheduling, the balancing mechanism and the recovery of balancing charges, in their version approved by a decision of the CRE of 24 July 2019 and effective as of 1 September 2019.

Self-consumption of electricity

Article 119 of Law no. 2015-992 of 17 August 2015 on Energy Transition for Green Growth authorised the Government to take, by way of an order, the necessary measures to ensure the controlled and secure development of facilities intended to consume all or some their own electrical output.

Following Order no. 2016-1019 of 27 July 2016 on the self-consumption of electricity came the publication of Articles L. 315-1 to L. 315-8 of the French Energy Code on 28 July 2016, which were ratified and completed by the Law of 24 February 2017 and distinguish between individual and collective self-consumption and in particular:

- require network operators to facilitate self-consumption operations, to implement the necessary technical and contractual arrangements, particularly with regards to the metering of electricity and to enable the realisation of self-consumption operations under transparent and non-discriminatory conditions;
- provide that the CRE establish special tariffs for public distribution networks for consumers participating in self-consumption operations when the installed capacity of generation facilities supplying them is less than 100 kilowatts.

The provisions of Decree no. 2017-676 of 28 April 2017 amending the French Energy Code specify the conditions for applying these provisions, particularly with regards to collective self-consumption (no measurement used to qualify self-consumption, procedures for assessing the 100kW threshold provided for by law for the eligibility of TURPE “self-consumption” facilities to be defined by the CRE, general principles of distributing generation between each consumer participating in a collective self-consumption operation, link between the legal entity responsible for a collective self-consumption operation and the public distribution network managers, maximum capacity of the generation facilities eligible for derogation from the obligation to be attached to a balance group, which is set in the decree at 3kW).

On 15 February 2018 the CRE gave its decision presenting its recommendations and opinion on matters relating to self-consumption.

In its decision of 7 June 2018, the CRE set the TURPE (Tariff for using the public transmission network) for collective self-consumption.

The “Pacte” business reform law no. 2019-486 of 22 May 2019 has modified the scope of collective self-consumption for a 5-year experimental phase. The scope is now defined according to criteria, particularly geographical criteria, defined in an order published after consulting the CRE. However, the continued application of these experimental provisions could be undermined by the provisions of Article 40 of the Energy and Climate Law no. 2019-1147 of 8 November 2019, codified in Article L. 315-2 of the French Energy Code, which further modifies the definition of collective self-consumption and limits its scope to operations located “in the same building, including residential buildings”, while qualifying as “extended” collective self-consumption operations that were previously included in the definition under the Pacte law. The Energy and Climate Law does not reproduce the experimental nature of those “extended” operations provided for in the Pacte law.

Renewable energy communities

Transposing into French law Directive 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources, Article 40 of the Law introduces the concept of a “renewable energy community” (“REC”) into the French Energy Code in Articles L. 211-3-2 and L. 211-3-3. A renewable energy community is an autonomous legal entity:

- which is based on open and voluntary participation;
- which is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity. Its shareholders or members are natural persons, SMEs or local authorities, or their groupings;
- the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.

The Law also specifies that renewable energy communities are authorised to:

- generate, consume, store and sell renewable energy, including through renewables power purchase agreements;
- share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community;
- access all suitable energy markets both directly or through aggregation.

1. The Group, its strategy and activities

Legislative and regulatory environment

In their current version, the REC provisions fail to make a clear distinction between RECs and collective self-consumption operations, but this confusion should be resolved by the decree to be issued following consultation of the Council of State provided for in the provisions.

Closed distribution networks

Article 167 of Law no. 2015-992 of 17 August 2015 on Energy Transition for Green Growth authorised the Government to take any measure, by way of an order, arising from the law in order to add a section on closed distribution networks to the French Energy Code to provide a framework for a practice made possible by Article 28 of Directive 2009/72/EC.

Following Order no. 2016-1725 of 15 December 2016 on closed distribution networks, Articles L. 344-1 *et seq.* of the French Energy Code specify the definition of the closed distribution networks, their legal regime, missions assigned to the manager of the closed distribution network and the sanctions applicable if these provisions are not adhered to.

Article L. 344-13 of the French Energy Code provides that the terms and conditions for applying these provisions are defined by decree of the Council of State. To date, this decree has not been adopted.

A draft law to ratify the order was registered in the French Senate on 15 February 2017.

Domestic networks

Law no. 2017-1839 of 30 December 2017 ending the exploration and use of conventional and non-conventional hydrocarbons and introducing various provisions relating to energy and the environment has defined and authorises the creation and operation of domestic building networks which constitute a new category of networks alongside public electricity distribution or transmission networks, and closed electricity distribution networks.

Pursuant to Articles L. 345-1 *et seq.* of the French Energy Code, domestic networks can now only be legally created if four criteria are met: the domestic building from which the network will be created must i) stand alone, ii) belong to a single owner, iii) be used primarily for offices, iv) not contain any dwellings.

Decree no. 2018-402 of 29 May 2018 on domestic building networks sets out the conditions under which these networks may exist as well as the rights and duties of office building owners and managers, network users and electricity public distribution networks managers.

Electricity sector regulation

The Energy Regulation Commission (CRE)

The Energy Regulation Commission ("CRE") is an independent administrative authority created by Article 28 of the Law of 10 February 2000.

Articles L. 131-1 *et seq.* of the French Energy Code give a general definition of the remit of the CRE, which is tasked with contributing to the correct functioning of the electricity and natural gas markets for the benefit of final consumers. In this respect, the CRE ensures, in particular, that the conditions for access to electricity and natural gas transmission and distribution networks do not impede the development of competition.

The CRE has significant powers: the power to make proposals, advisory powers and decision-making powers (approval power and regulatory power).

The CRE makes proposals, in particular, to the Ministers for the Economy and for Energy regarding the amount of the costs that are attributable to the public service missions assigned to power producers, and the net amount of the related contributions. Once the Decree has been published that specifies the methods for identifying and recognising the costs that are taken into account for the calculation of the ARENH price, the CRE will also propose the ARENH price. Moreover, since 7 December 2015, it has been the CRE's responsibility to send its reasoned proposals for changes in the regulated sales and transfer tariffs for electricity (on which it previously could only issue an opinion) to the Ministers for the Economy and Energy. The decision is deemed to have been made in the absence of any objections by one of the Ministers within the three months following the receipt of these proposals.

The CRE now has significant decision-making power to set the Tariffs for Using the Public Transmission and Distribution Networks (TURPE): it sends its reasoned decision to the administrative authority, which can only ask the CRE for a new decision in the event of non-compliance with energy policy guidelines. Under its residual regulatory power, the CRE also takes network connection decisions, as well as decisions to define the rules for calculating and adjusting the rights of suppliers to the ARENH.

The CRE is also vested with very broad powers that enable it to obtain any information that it may deem useful for the fulfilment of its remit, as well as authority

to settle disputes and to apply penalties, through the Settlement of Disputes and Sanctions Committee (CoRDIS).

The Law on Energy Transition for Green Growth also gives the CRE the possibility of having the information it obtains through its remits audited, at the expense of the audited undertakings.

Organic Law no. 2017-54 of 20 January 2017 on Independent Administrative Authorities and Independent Public Authorities and Law no. 2017-55 of 20 January 2017 on the General Statute of Independent Administrative Authorities and Independent Public Authorities, provided these authorities, including the CRE, with a common legal status. These laws mainly lay down the rules relating to the mandate of members, the ethics of members, the operation and organisation of these authorities and parliamentary control.

The Energy and Climate Law of 8 November 2019 modifies the composition of the CRE council.

Regulatory framework

Tariff for Using the Public Transmission and Distribution Networks (TURPE)

Pursuant to Article L. 341-3 of the French Energy Code, the tariff for using the public electricity transmission network is set by way of a reasoned decision by the CRE. The tariff for using the public transmission network (TURPE 5 HVB) entered into force on 1 August 2017 for a period of four years.

This tariff was set by the decision of the CRE of 17 November 2016 and was published in the *Journal officiel* on 28 January 2017. This decision sets up an initial increase of 6.76% on 1 August 2017, followed by an inflation-based change on 1 August of each year (apart from corrections arising from the income and expense regularisation account). On 1 August 2019 the tariff was raised by +2.16%.

The financial remuneration of RTE's assets is derived from the product of the regulated asset base (RAB), estimated on 1 January 2020 at €14,440 million, by a fixed remuneration rate. This remuneration rate corresponds to a nominal rate before tax of 6.125% for the current tariff period.

Concerning the transmission and distribution of natural gas (Law no. 2003-08 dated 3 January 2003), see section 1.5.2.2.2 "French legislation: the Energy Code".

Tariff for using the public electricity distribution networks (distribution TURPE)

Over 90% of Enedis' sales are made up of revenues made from electricity transmission. The tariff for using the public electricity network (TURPE), in terms of levels and structure, is set by the CRE in a transparent and non-discriminatory manner, in order to cover all the costs borne by the efficient network operators.

On 28 June 2018, the CRE adopted TURPE 5 bis HVA/LV (medium voltage – low voltage).

This tariff came into effect on 1 August 2018 for a period of approximately three years. It involves an inflation-linked change on 1 August 2019 and 2020 (apart from corrections arising from the income and expense regularisation account).

In the context of TURPE 5 bis HVA/LV, Enedis' financial remuneration is derived from the sum of the remuneration on managed assets (RAB paid at 2.5%) and the remuneration of regulated shareholders' equity (remunerated at 4.0%).

In a decision dated 25 June 2019, the CRE set the average increase in the tariff on 1 August 2019 at +3.04%, in accordance with the annual adjustment formulas.

Linky regulation

The Linky project, led by Enedis, is subject to a specific regulatory framework regarding meters operating life (20 years), with a dedicated regulated asset basis (RAB) for the meters installed between 2015 and 2021 and the associated system.

The CRE's decision dated 17 July 2014 thus set a nominal return rate before tax of 7.25% and a 3% additional premium in return for an incentive regulation to better meet costs and system performance, targets as well as deadlines bringing the return on the RAB to 10.25%. The incentive regulation can also trigger penalties potentially lowering the return, although not below a floor of 5.25%. As provided for in the decision dated 17 July 2014, the incentive regulation of the system's performance for 2020 and 2021 was set by the CRE in a decision dated 19 December 2019.

In addition, the implementation of a postponed tariff, set up to guarantee a neutral impact of Linky on the tariff for customers, means that payments for the 2014-2022 period will be made during the 2023-2030 period. This postponed tariff, which is attached a 4.6% compensation covering the cost of financial carry, will be totally paid by 2030.

At 31 December 2019, the deferred amount is +€1,297 million (this represents a receivable from Enedis in relation to their network users, which is not recognised on the Group's balance sheet at 31 December 2019, pursuant to the accounting standards in force on this date).

Energy efficiency

Energy Efficiency Directive

On 25 October 2012, the European Union adopted a Directive on energy efficiency (2012/27/EU). The purpose of this Directive is to enable the European Union to reach its energy savings target of 20% by 2020. With this aim in mind, the Directive enhances the provisions of European legislation on energy efficiency services (2006/32/EC) and cogeneration (2004/8/EC).

The Directive of 25 October 2012 contains several provisions that are liable to impact the activities of the EDF group, first and foremost of which is the obligation for Member States to reach an energy savings target each year that is equivalent to an aggregate annual reduction in energy sales of 1.5% over the period 2014-2020, which can take the form of an obligation for energy distributors and/or suppliers to reduce sales. The Directive also contains provisions on providing customers with information on their consumption, the promotion of energy services, taking into account energy efficiency in heat and cold production, and in the transmission and distribution of energy.

Published in the Official Journal of the European Union on 19 June 2018, Directive (EU) 2018/844 of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency strengthens current provisions and simplifies some of their aspects under the EU Commission's "Clean Energy Package". The Directive must be transposed by member states no later than 10 March 2020.

Energy audits

Articles L. 233-1 *et seq.* of the French Energy Code (derived from Law no. 2013-619 of 16 July 2013, which transposed Article 8-4 of the Directive into French law, and recently amended by Law no. 2018-670 on protection of business secrecy), require large companies to conduct an energy audit on their business activities in France by 5 December 2015 at the latest, then every four years. The thresholds above which companies are concerned, the scope of the audit and the conditions to be met by the energy auditors are laid down in Articles R. 233-1 and R. 233-2 and D. 233-3 to D. 223-9 of the French Energy Code, completed by the Order of 24 November 2014 on the terms and conditions of application of the energy audit. Undertakings that use a certified energy management system that is ISO 50001 compliant may, under certain conditions, be exempted from this obligation. In accordance with regulations, EDF has sent an audit report to the administration.

Energy savings certificates

At the national level, the energy savings certificates (CEE) mechanism, which is provided for in Articles L. 221-1 *et seq.* of the French Energy Code, places energy suppliers under the obligation to save energy. This mechanism defines a three-year objective that is shared between persons subject to an obligation to achieve energy savings (the "obligors") based on their sales volumes. At the end of the relevant period and under penalty of sanctions, the obligors must produce energy savings certificates that correspond to the amount of the energy savings they are under the obligation to achieve, which are obtained either by carrying out (directly or indirectly) energy savings actions or by purchasing credits from the other obligors or "eligible" economic players through a National Register of Certificates (the Emmy Register).

The mechanism's third period started on 1 January 2015 and ended on 31 December 2017.

The Law of 17 August 2015 on Energy Transition for Green Growth amended the CEE system for the third period, by adding an additional system to the obligation that was already provided for, concerning the energy savings made for the benefit of households that are in a precarious situation in terms of energy.

The fourth period started on 1 January 2018 and will end on 31 December 2021, following the one-year extension provided for in the Energy and Climate Law of 8 November 2019.

Decree no. 2017-690 of 2 May 2017 on energy savings certificates (codified in Articles R. 221-1 *et seq.* of the French Energy Code) sets forth the implementation methods for energy savings certificates for the fourth period. The text sets the total level of obligations for the 2018-2020 periods at 1,200TWhp of classic shares and an

extra 400TWhp to be achieved for households in a situation of energy poverty. It involves a doubling of obligations compared with the third period.

Decree no. 2017-1848 of 29 December 2017 (codified in Articles R. 221-1 *et seq.* of the French Energy Code) sets the ceiling for the assistance programmes at 200 billion kWh of updated combined end use electricity.

The Pacte business reform law no. 2019-486 of 22 May 2019 amends Article L. 221-7 of the French Energy Code. Energy savings certificates (white certificates) may now be issued for energy saving actions carried out at the facilities classified for the protection of the environment (ICPEs) referred to in Article L. 229-5 of the French Environment Code.

Decree no. 2019-975 of 20 September 2019 relating to the application of the energy savings certificates scheme for facilities subject to greenhouse gas emission allowances sets out the terms on which energy savings certificates may be issued for energy saving actions carried out at facilities subject to greenhouse gas emission allowances.

The Energy and Climate Law no. 2019-1147 of 8 November 2019 extends the length of the fourth period and also includes a chapter relating, in particular, to preventing certificate fraud. The Law aims to strengthen the effectiveness of controls and sanctions.

1.5.2.1.3 Italian law: the new capacity market

Outline

A capacity mechanism was launched in Italy in 2019: it was validated as state aid by the European Commission on 14/06/2019 (State Aid number SA.53821) until the end of 2028; an implementing decree was issued for this mechanism by the Minister for Economic Development on 28/06/2019. Terna, the Transmission Network Manager, defined the rules after consultation with stakeholders, and the first auctions took place in November 2019 for the 2022 and 2023 delivery years.

The capacity mechanism implemented in Italy is a "Market Wide" mechanism (remunerating all capacity required to meet security of supply criteria), with centralised "pay as clear" auctions, price zones in case of potential congestion and carbon emission limits. Capacity availability is primarily encouraged through the "reliability option" system specified below.

Fixed Premium

Selected capacity is remunerated by a fixed annual premium stated in Euros/MW/year (paid monthly during the delivery year). Prices are established by cross-referencing a demand curve produced by Terna with a supply curve (bids at auctions).

A bid cap for existing capacity is set within a range of between €25,000/MW/year and €45,000/MW/year (€33,000/MW/year for the 2022 and 2023 delivery years).

A bid cap for new capacity is set within a range of between €75,000/MW/year and €95,000/MW/year (€75,000/MW/year for the 2022 and 2023 delivery years).

Incentives for capacity availability

The "reliability option" scheme adopted by Italy involves a "repayment obligation": the selected counterparty must pay Terna the positive difference between a reference price and a predetermined strike price, whether or not the capacity is available at that time.

The reference price is based on the day-ahead market price and the balancing (adjustment) price of the price zone where the capacity is located. The strike price is set at the level of the standard hourly variable cost of the technology with the highest variable costs (*i.e.* the peak technology). The peak technology chosen by the Authority for 2022 and 2023 is the OCGT (open-cycle gas turbine), with a variable production cost of €125/MWh in 2017.

Carbon emission limits

New and refurbished capacity is only eligible for the capacity mechanism if it does not emit more than 550g of fossil-fuel carbon emissions per kWh of electricity. Existing capacity is only eligible for the capacity mechanism if it does not emit more than 550g of fossil-fuel carbon emissions per kWh of electricity. If this limit is not respected, existing capacity may still be eligible if it commits not to emit more than 350kg of fossil-fuel carbon emissions on average per installed kW for a given delivery year.

1.5.2.1.4 English law: the new capacity market

See section 1.4.5.1.1 "United Kingdom – Strategy".

1.5.2.2 Gas market legislation

1.5.2.2.1 European legislation

Directive 98/30/EC of 22 June 1998 and Directive 2003/55/EC of 26 June 2003 were the major steps towards opening up the gas market to competition.

New rules aimed at improving the functioning of the internal natural gas market were defined in Directive 2009/73/EC of 13 July 2009, and by regulation (EC) no. 715/2009 of 13 July 2009 on conditions for access to the natural gas transmission networks.

Pursuant to this legislation, the network codes for capacity allocation mechanisms (CAM) and balancing rules officially entered into force on 1 November and 1 October 2015 respectively. The first requires the capacities at interconnection points between transmission networks to be commercialised by bundling the output capacity of the first network with the input capacity of the second network, and by selling these interconnection capacities *via* auction. This first code has been replaced by a new code from regulation (EU) 2017/459 of 16 March 2017. The purpose of the second is to harmonise the balancing rules on transmission networks.

These codes have been completed by a network code on the standardisation of tariff structures for the transmission of gas from regulation (EU) 2017/460 of 16 March 2017.

1.5.2.2.2 French legislation: the Energy Code

Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 was transposed into French law by Order no. 2011-504 of 9 May 2011, which organised the legislative section of the French Energy Code. The French Energy Code entered into force on 1 June 2011.

Access to natural gas networks

The French Energy Code provides that customers, suppliers and their agents have a right to access natural gas transmission and distribution infrastructures, as well as LNG facilities, under the terms and conditions set forth in an agreement with the operators that run them.

Natural gas network operators must refrain from discriminating between users or categories of users in any way.

Customers

Since 1 July 2007, all customers can freely choose their supplier.

Through a decision of 19 July 2017, the Council of State annulled the Decree of 16 May 2013 on regulated natural gas sales tariffs on the grounds that maintaining such tariffs is contrary to European Union law. Indeed, regulated natural gas sales tariffs do not fulfil the conditions laid down in Directive 2009/73/EC and, in particular, do not pursue any objective of general economic interest. However, that decision only annulled the disputed decree and not the regulatory provisions of the Energy Code relating to regulated natural gas sales tariffs in force since 1 January 2016. As such, regulated natural gas sales tariffs remain as long as the Prime Minister does not repeal these provisions.

The Energy and Climate Law of 8 November 2019 phases out regulated natural gas sales tariffs.

Regulated natural gas sales tariffs are abolished for all consumers at the following times:

- for non-household customers: one year after the publication of the law;
- for household customers, the single owners of a residential building and condominium associations: 30 June 2023.

The Energy and Climate Law also bans the marketing of regulated natural gas sales tariffs for new sites, one month after the publication of the Energy and Climate Law. The incumbent supplier, Engie, has announced that it will cease marketing regulated tariffs from 20 November 2019.

Customers supplied under regulated natural gas sales tariffs when they are phased out will automatically switch to the market-based prices of the incumbent supplier.

The Energy and Climate Law also includes a mechanism to provide a supply of last resort to household consumers without a natural gas supplier and to provide an emergency supply in replacement of a supplier incapable of or barred from doing business in order to ensure continuity of supply to end consumers.

Accordingly, until the end date of regulated sales tariffs, household and non-household customers using less than 30,000kWh per year may benefit from regulated tariffs, at their request and without having to meet any conditions. After that date, new sites will cease to be eligible for regulated sales tariffs and any regulated contracts in force will be terminated at the dates set out in the Energy and Climate Law (see above).

Non-household end consumers using more than 30,000kWh per year have already ceased to be eligible for these tariffs:

- for non-household consumers who are connected to the transmission network, since 18 June 2014;
- for non-household consumers whose consumption level exceeds 200,000kWh per year, since 31 December 2014;
- for non-household consumers whose consumption level exceeds 30,000kWh per year, since 31 December 2015.

Suppliers

Article L. 443-4 of the French Energy Code defines suppliers as persons who (i) are established on the territory of a Member State of the European Union or on the territory of another State pursuant to international agreements, and (ii) hold a licence issued by the Minister for Energy.

EDF is authorised to supply natural gas to non-household customers that do not provide services in the public interest, pursuant to an Order of the Deputy Minister of Industry of 14 September 2004, and, pursuant to an Order of 9 August 2005, to non-household customers that provide services in the public interest, as well as to natural gas distributors and suppliers, and, pursuant to an Order of 15 June 2007, to household customers.

EDF only supplies its customers at market-based prices. Regulated sales tariffs can only be proposed by Engie and LDCs responsible for gas supply.

Underground storage and third-party access to natural gas storage facilities

Law no. 2017-1839 of 30 December 2017 ending the research and use conventional and non-conventional hydrocarbons and introducing various provisions relating to energy and the environment, published in the *Journal officiel* of 30 December 2017 has amended the rules for accessing underground natural gas storage facilities necessary for the security of supply, to establish a regulated access framework, guaranteeing the coverage of the costs borne by the operators of these facilities through the natural gas transmission network access tariffs. Suppliers will be able to subscribe to storage capacities *via* an auction system, the terms of which will be defined by the CRE. Obligations for suppliers to hold natural gas stocks by suppliers provided for in Article L. 421-4 of the French Energy Code have therefore been abolished.

Decree no. 2018-221 of 30 March 2018 on building additional natural gas stores, mentioned in Article L. 421-6 of the French Energy Code, and Decree no. 2018-276 of 18 April 2018 amending various provisions of the regulatory section of the French Energy Code on the natural gas sector, amended the regulatory section of the French Energy Code on access to natural gas underground storage to take legislative changes introduced by Law no. 2017-1839 of 30 December 2017 into account.

The Order of 9 May 2018 on taking storage capacity rented from another member state of the European Union into account when applying Article D. 421-12 of the French Energy Code repealed the decree of 31 July 2017.

Lastly, the CRE implemented the reform of natural gas storage by means of three decisions issued on 22 February 2018 pertaining to (i) the tariff for using natural gas underground storage infrastructure, (ii) the terms under which storage capacity may be sold, and (iii) the introduction of a storage tariff payment in the tariff for using GRTgaz's and TIGF's transmission networks, to which was added, after the storage capacity auction, the CRE's decision on 27 March 2018 to set the amount of the storage tariff payment in the tariff for using natural gas transmission networks.

Control and penalties

The French Energy Code grants the Minister for the Economy, the Minister for Energy and the CRE, power to oversee the gas market. The Minister for Energy may also levy a fine, or withdraw or suspend an authorisation to supply natural gas. The CRE can carry out investigations into whether offences that breach the provisions of the French Energy Code have been committed (Article L. 135-13 of the French Energy Code).

1.5.2.3 Regulations on the wholesale energy markets

Inspired by the rules contained in Directive no. 2003/6/EC on Market Abuse applicable to financial markets (see section 4.1 "Corporate Governance Code"), regulation (EU) no. 1227/2011, known as the "REMIT" regulation, on wholesale energy market integrity and transparency came into force on 28 December 2011. This regulation is aimed at preventing market abuse and manipulation on wholesale energy markets and strengthening the confidence of market participants and consumers.

Strengthening wholesale energy market integrity and transparency must foster open and fair competition on these markets, in particular so that prices set on these markets reflect a fair and competitive interplay between supply and demand. The regulation prohibits insider trading and market manipulation, and establishes an obligation to publish inside information as defined in the REMIT.

The European Agency for the Cooperation of Energy Regulators (ACER) is primarily responsible for monitoring wholesale trades in energy products, in order to detect and prevent transactions based on inside information and market manipulations.

ACER also collects the data needed to assess and monitor markets. The regulation provides that market participants, or a person authorised to do so on their behalf, provide ACER with a detailed statement of the transactions in the wholesale energy market.

Lastly, market participants that perform transactions for which a declaration to ACER is mandatory must register with the national regulatory authority of the Member State in which they are established (the CRE in France) or, if they are not established in the European Union, that of a Member State in which they do business.

1.5.3 Regulations applicable to EDF group facilities and activities

EDF's business in France, as well as in other countries where EDF operates, is subject to regulations that are applicable to the environment, nuclear power, health, hygiene and safety. Compliance with these increasingly strict and continuously changing regulations exposes the Group to significant costs in order to ensure it does business compliantly.

1.5.3.1 Regulations applicable to fossil fuel-fired facilities in France

1.5.3.1.1 Regulations applicable to fossil fuel-fired energy generation

The EDF group's fossil fuel-fired energy generation business is subject in France to the regulations that are applicable to ICPEs (see section 1.5.3.1.2 "Regulations applicable to facilities classified for the protection of the environment (ICPEs)"). EDF's fossil fuel-fired facilities must also comply with specific regulations on air quality, adopted mainly as a result of European Directive 2001/81/EC of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (the NEC Directive) and Directive 2010/75/EU of 24 November 2010 on Industrial Emissions (the IED). These Directives were transposed into French law by several orders, in particular the Order of 26 August 2013 (itself repealed on 20 December 2018) on combustion facilities with a power rating of 20MW or more, which as type 2910 and 2931 plants must be approved. Decree no. 2018-704 of 3 August 2018 amended the designations of type 2910 (Combustion) and 2770 & 2771 (Incineration) plants and lowered the approval and application thresholds from 2MW to 1MW. It modifies the application requirements for combustion facilities. From 20 December 2018, type 2781-1, 2910, 2931 & 3110 combustion plants will fall under the relevant stipulations set by the five Orders of 3 August 2018.

Exemptions from obligations concerning emissions into the air were possible until 31 December 2015. As of that time, the ceilings and the exemptions originating from the IED Directive mentioned above will apply, with, in particular, specific issues concerning production facilities in the overseas departments and emergency systems, for which the pollution levels require negotiating adapted provisions. Fossil fuel-fired energy production is also subject to the provisions of the Seveso 3 Directive and to the obligation to lodge financial guarantees (see section 1.5.3.1.2 "Regulations applicable to facilities classified for the protection of the environment (ICPEs)").

Directive no. 2015/2193/EU of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants that was to be transposed into French law by 19 December 2017 was transposed by Decree no. 2018-704 of 3 August 2018 amending the classification of categorised facilities and some provisions of the French Environment Code. It lays down rules designed to limit the air pollution caused by sulphur dioxide (SO₂), nitrogen oxides (NO_x) and dust from medium combustion plants, and to reduce the airborne emissions and their potential risks for human and environmental health. The facilities concerned are combustion plants with a rated thermal input of 1MW or more and less than 50MW, regardless of the type of fuel they use. Five orders amending the regulations applicable to combustion facilities falling under environmental protection regulations governing categorised facilities in order to transpose Directive 2015/2193/EU were adopted on 3 August 2018.

The Energy and Climate Law no. 2019-1147 of 8 November 2019 regulates the phasing out of fossil fuels by discontinuing coal-fired power generation by 2022. The Law amends Article L. 311-5-3 of the French Energy Code, to allow the administrative authority to set an emissions cap applicable, as of 1 January 2022, to fossil fuel-fired electricity generation facilities located in continental metropolitan France.

1.5.3.1.2 Regulations applicable to facilities classified for the protection of the environment (ICPEs)

Facilities concerned and main obligations

Certain facilities operated in France by the EDF group, in particular fossil fuel-fired power plants, are subject to legislation on facilities that are classified for the protection of the environment (ICPEs), which is organised in the French Environment Code. These facilities are subject to a prior declaration, simplified authorisation (known as "registration") or to an authorisation depending on the magnitude of danger or adverse effects they may cause to the environment or public health. Since 1 March 2017, for projects subject to authorisation under ICPE or facilities, structures, works and activities (IOTA) subject to water legislation, the two procedures have been merged into the environmental authorisation. This new scheme incorporates, within book I of the French Environment Code, a new chapter VIII entitled "Administrative Procedures" comprising a separate section entitled "Environmental Authorisation" and is composed of Articles L. 181-1 to L. 181-31 and R. 181-1 to R. 181-56.

The ICPE regulation requires that the site be restored when a facility is taken out of service, depending on the expected future use of the land. Under Article L. 516-1 of the French Environment Code, lodging financial guarantees is also required for certain ICPE facilities that are subject to authorisation (including Seveso facilities) and registration. The basis and amount of the financial guarantees vary depending on the facility. These financial guarantees are designed to provide collateral for the financing of the measures that must be adopted in the event of an accident before or after closure, as well as the surveillance, safety works and restoration operations after closure. These guarantees do not cover compensation owed by the operator to third parties who may suffer loss or harm in connection with the activity carried out.

The EDF group operates facilities that are concerned by these new requirements. The Decree no. 2015-1250 of 7 October 2015 increased the threshold above which guarantees are required from €75,000 to €100,000 (Article R. 516-1 of the French Environment Code). It also provides for additional financial guarantees to be lodged with the Caisse des dépôts, as well as the amendment of the rules governing how guarantees are triggered, in particular by allowing them to be implemented as soon as court-ordered liquidation proceedings are initiated.

1. The Group, its strategy and activities

Legislative and regulatory environment

Seveso facilities

Since 1 June 2015, "Seveso" facilities have been governed by the provisions of the Seveso 3 Directive (2012/18 of 4 July 2012). The entry into force of the Seveso 3 Directive resulted in the use of dangerous products (under the CLP regulation of 16 December 2008) being incorporated into the scope of the Seveso regulations.

The Seveso 3 Directive also contains stricter provisions concerning access by the public to information related to safety, public participation in the decision-making process and access to justice, as well as improvements in the way information is collected, managed, made available and shared. The Seveso 3 Directive also introduced stricter standards for facility inspections. These provisions have been incorporated into the French Environment Code, in Article L. 515-15 *et seq.* These provisions, which are complemented by two Decrees (no. 2014-285 and no. 2014-284) of 3 March 2014 and by an Order of 26 May 2014, entered into force on 1 June 2015.

Decree no. 2015-1250 of 7 October 2015 amended the rules governing how the financial guarantees that are applicable to Seveso ICPEs are lodged, in particular by allowing operators of multiple facilities to pool these guarantees. The Order of 24 September 2018 "determining the rules for calculating and conditions for lodging the financial guarantees provided for in Article R. 516-2-I of the French Environment Code" sets out the terms for lodging financial guarantees and the methodology for calculating pooled guarantees from 1 January 2019.

Facilities that are subject to the "IED" Directive

Directive 2010/75/EU of 24 November 2010 on industrial emissions (known as the "IED" Directive) revised and recast several existing Directives into a single piece of legislation, including the IPPC, LCP, Waste Incineration and VOC Directives, among others.

Chapter 3 of this Directive affects EDF as it regulates the combustion plants that are found in fossil fuel-fired plants, in particular. The applicable requirement levels depend on the rated thermal input of the combustion plants concerned and on the fuel used. This Directive, which was partially transposed into French law *via* Order no. 2012-7 of 5 January 2012 (and incorporated into the French Environment Code in Articles L. 515-28 to L. 515-31), has the effect of broadening the application of the IPPC Directive to include new activities, enhancing the scope of the best available techniques (BAT) on which the fixed emission limit values will be based, causing a periodic reconsideration of operating conditions in order to take into account changes in BAT and, in certain cases, requiring a "baseline report" on the state of soil.

As of 20 December 2018, type 2781-1, 2910, 2931 & 3110 combustion plants will fall under the relevant stipulations set by the five Orders of 3 August 2018. Finally, Decree no. 2017-849 of 9 May 2017 "amending the regulatory provisions of the French Environment Code on facilities mentioned in Annex I of Directive 2010/75/EU of the European Parliament and Council of 24 November 2010 on industrial emissions" has streamlined administrative procedures (including the content of the review file) and made the implementation of the IED Directive more operational.

1.5.3.1.3 Greenhouse gases (GHG)

Allowance trading scheme

Some of the EDF group's activities fall within the scope of European Directive 2003/87/EC of 13 October 2003 as last amended by Directive 2018-410 of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 (the "ETS Directive").

In France, this Directive was transposed and integrated into Articles L. 229-5, R. 229-5 *et seq.* of the French Environment Code. The Group has an annual obligation to surrender allowances equal to the level of CO₂ emitted by its facilities. In order to comply with this obligation, under certain conditions, the Group may use credits issued under eligible projects for the project mechanisms provided for under Articles 6 and 12 of the Kyoto Protocol (joint implementation and clean development mechanism).

Under the ETS Directive, the third period for the greenhouse gas ("GHG") emission allowance trading scheme started on 1 January 2013. The rule for the electricity sector is the auctioning of quotas, in accordance with the rules defined by regulation (EU) No 1031/2010/CE of 12 November 2010. Since that date, EDF has to purchase 100% of its allowances. Order no. 2019-1034 and Decree no. 2019-1035 of 9 October 2019 on the greenhouse gas emissions allowance trading system (2021-2030) transposed the aforementioned Directive 2018-410 into French law. This legislation overhauls the greenhouse gas emissions allowance trading system, particularly with regard to the facilities covered by the system, the procedures for calculating emissions and monitoring and controlling allowances, and also with

regard to the required administrative permits. It should be noted that emergency units in basic nuclear facilities are no longer exempt.

In order to support the price of GHG allowances on the European market, in Decision (EU) 2015/1814 of 6 October 2015 as amended by the aforementioned Directive 2018-410, the European Parliament and the Council decided to create a market "stability reserve" that makes it possible to remove surplus allowances from the market. This mechanism entered into force on 1 January 2019.

GHG reporting

Pursuant to Articles L. 229-25 and R. 229-46 *et seq.* of the French Environment Code (respectively amended by Order no. 2015-1737, Law no. 2016-1087 of 8 August 2016 and Decree no. 2015-1738 of 24 December 2015), companies with over 500 employees must provide an annual report on their greenhouse gas emissions and a summary of the actions they plan to take to reduce such emissions. Article R. 229-46, as amended by the aforementioned Decree of 24 December 2015, specifies that "the groups defined in Article L. 2331-1 of the French Labour Code may draw up a consolidated report on greenhouse gas emissions for all their companies that have the same level 2 nomenclature code for French activities" and that employ more than 500 persons. The information disclosed is made public and must be updated every four years.

1.5.3.2 Specific regulations applicable to basic nuclear facilities

1.5.3.2.1 Basic nuclear facilities in France

Creation of basic nuclear facilities (BNFs)

The construction of a BNF is authorised, following a public debate and a public enquiry based on the operator's application, by a decree issued by the Prime Minister after consulting the Autorité de sûreté nucléaire (Nuclear Safety Authority – NSA) and on the basis of a report produced by the Minister for Nuclear Safety. The authorisation to commission a BNF is issued by the NSA after consulting the public.

The conditions applicable to pumping water, discharging liquid and gaseous wastes – whether radioactive or not – and the related limit values, arising from the decree authorising the facility, are decided by the NSA. The decision setting the limit values for discharges by facilities into the environment also requires the approval of the Minister for Nuclear Safety.

The NSA also issues regulations pursuant to the decree that authorises the facility to be set up, in order to prevent or limit the effects of any accidents or incidents, to define measures to protect residents on an individual and collective basis, limit noise pollution and manage the waste generated by and stored at the facilities.

Rules on nuclear safety and the inspection of basic nuclear facilities

EDF, Framatome and Cyclife France are subject in France to the provisions relating to basic nuclear facilities (BNF) governed by Articles L. 593-1 and R. 593-1 (recently introduced by the Decree of 14 March 2019) *et seq.* of the French Environment Code. These provisions are supplemented by the Order of 7 February 2012 as amended, setting out the general rules governing basic nuclear facilities (the "BNF Order") and by regulatory decisions of a technical nature issued by the NSA, which require the approval of the relevant ministers.

The general regulations applicable to basic nuclear facilities make the protection of public safety, health and sanitation, nature and the environment (the "protected interests") a priority.

During operation, operators are required to conduct a periodic review under Article L. 593-18 of the French Environment Code, as part of which they must implement an in-depth examination, every ten years, of the compliance of their facilities to ensure that they comply with the applicable standards, correct any discrepancies detected, improve the level of compliance and implement an in-depth examination of the effects of ageing equipment. Operators are required to send a report to the NSA and the Minister for Nuclear Safety setting out the findings of the review required under Article L. 593-18. A public enquiry must be held for the review-related provisions proposed by operators after the thirty-fifth year of operation of a nuclear power reactor.

The NSA is an independent administrative authority and one of its main tasks is to control BNFs. It has set up a Sanctions Committee for that purpose, comprising Council of State and Supreme Court judges, which can impose administrative fines of up to €10 million. The Committee will start to operate once its members have been appointed.

Moreover, criminal law penalties have been established to punish BNF operators who do not comply with their legal and regulatory obligations, such as a three-year prison sentence and a €150,000 fine if a BNF is operated without authorisation, or a one-year prison sentence and a €30,000 fine if radioactive substances are transported without authorisation or approval.

Nuclear transparency

The provisions of the French Environment Code concerning BNF have also introduced mechanisms for informing the authorities and the public. In this respect, all accidents and incidents that occur as a result of the operation of a BNF and that could potentially cause significant harm to the health of the population or to the environment, must be declared as soon as possible by the operator to the ASN and to the relevant administrative authority.

Bodies have also been set up to inform the public, for example the Haut Comité pour la transparence et l'information sur la sécurité nucléaire (High Committee for Transparency and Information on Nuclear Safety) and any member of the public may now contact operators directly for information on the risks associated with exposure to ionising radiation and on the safety and radiation protection measures adopted to prevent or reduce these risks. Finally, Local Information Committees have been set up at each nuclear power plant to monitor, inform and consult on nuclear safety, radiation protection and the impact of nuclear activities on people and the environment.

Decommissioning of nuclear facilities and radioactive waste management

The decommissioning of a BNF is prescribed by a Decree that is issued after a public enquiry and an opinion by the NSA. The Decree specifies the decommissioning operations and stages and how long they will last along with the intended final status. Once the decommissioning has been completed, the operator must send a delicensing request to the NSA, describing the post-decommissioning condition of the site and the soil, following which the facilities will cease to have BNF status, if decided by the NSA and approved by the relevant Minister. Article L. 593-25 of the French Environment Code, introduced by the Energy Transition for Green Growth Law of 17 August 2015, gave legislative value to the principle implemented since the early 2000s by EDF according to which decommissioning must take place within a timeframe that is "as short as possible" after final shutdown, under conditions that are economically acceptable and in compliance with the principles set out in Article L. 1333-2 of the French Public Health Code and section II of Article L. 110-1 of the French Environment Code.

The management and financing of decommissioning and radioactive waste and EDF's business is subject to French regulations on the sustainable management of radioactive waste. EDF is liable for the radioactive waste generated from its operations, as the producer of the waste. In France, radioactive waste is managed by the National Agency for Radioactive Waste Management (ANDRA), a public institution of industrial and commercial nature created by Law no. 91-1381 of 30 December 1991 on research into the management of radioactive waste.

The method used to manage radioactive waste in France depends on the level of radioactivity and on the radioactivity lifespan of the waste (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). The management of radioactive and non-radioactive waste is governed by Article L. 541-1 *et seq.* of the French Environment Code; specific provisions relating to the sustainable management of radioactive material and waste are also set out in Article L. 542-1 *et seq.* of the same code. Operators of BNFs are also subject to the provisions of the Order of 7 February 2012, known as the "BNF" Order, establishing "potential nuclear waste production areas" for which special procedures must be used to manage the waste, and the regulatory requirements associated with the national plan for the management of radioactive material and radioactive waste (PNGMDR), which is revised every three years. Financial provisions are set out in Article L. 594-1 *et seq.* of the French Environment Code, defining the arrangements for assessing and covering the costs of decommissioning BNFs, managing spent fuel and radioactive waste and off-site transportation costs. In particular, the assets allocated to cover provisions cannot be used for any other purpose by the operator, and separate accounting procedures for these assets must be used. The implementation of these provisions is overseen by the administrative authority, *i.e.* the Ministry in charge of energy, which is itself subject to a National Commission to Assess the Financing of the Charges related to the Decommissioning of BNFs and the Management of Spent Fuel and Radioactive Waste

Decree no. 2007-243 of 23 February 2007 on securing the financing of costs in the nuclear industry sets forth the terms and conditions for implementing Article L. 594-1 *et seq.* of the French Environment Code.

A report is filed with the administrative authorities and the ASN every three years and a copy sent to the Statutory Auditors. This report includes, in particular, a valuation of the costs, the methods used for the calculation of provisions, and the decisions made regarding composition and management of the assets. The administrative authorities may require any additional supporting documents, have an outside organisation conduct a study, or require an expert valuation of the assets at the operator's expense.

Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, transposed into French law by Order no. 2016-128 of 10 February 2016 laying down various provisions on nuclear matters, constitutes a set of fundamental rules for the management of radioactive waste and spent fuel for the member states of the European Union, based in particular on the principles of minimisation of the volume and harmfulness of the radioactive waste produced and protection of human health, safety and the environment. This text presents, in particular, deep geological disposal as the safest and most sustainable option to manage Long-Lived, High-Level Waste and considers the possibility of creating disposal facilities shared between several Member States, on a voluntary basis.

Regulations on radiation protection

In France, nuclear activities that present a risk of exposing persons to ionising radiation are regulated by two separate sets of rules, depending on the category of persons to be protected. Regulations on the basic protection of the population against such radiation, which are governed by the French Public Health Code, are primarily based on all nuclear activities being subject to a declaration, registration or authorisation. Authorisations granted to establish a Basic Nuclear Facility serve as the authorisation required under the French Public Health Code. Article R. 1333-11 of the French Public Health Code sets the maximum exposure level of the general public at 1mSv per year.

French regulations on the protection of workers against the dangers of ionising radiation, which are governed by the French Labour Code, lay down various obligations for employers of workers who are likely to be exposed and, in particular, set a limit on exposure of workers to ionising radiation at 20mSv over a period of twelve consecutive months.

The French Health Code contains the provisions applicable to controlling high-level sealed radioactive sources and orphan sources.

The radiation protection regulations are the transposition into French law of Directive 2013/59/Euratom of 5 December 2013 in the above-mentioned Order no. 2016-128 of 10 February 2016, in two decrees of 4 June 2018 and their implementing orders, some of which have yet to be published.

Civil liability of nuclear facility operators

Several international conventions govern the civil liability of nuclear facility operators, in particular the Paris Convention of 29 July 1960 on Third-Party Liability in the Field of Nuclear Energy and the Brussels Convention of 31 January 1963, which supplements the Paris Convention. These two conventions are applicable in the signatory countries that have ratified them, including France and the United Kingdom (see also section 2.1.2.6 "Insurance - Specific insurance for nuclear facility operations"). France is also a Party to the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention, which establishes a link between the Paris Convention, which covers countries in Western Europe, and the Vienna Convention of 21 May 1963 on Civil Liability for Nuclear Damage, which covers (among others) countries in Eastern Europe.

The Paris Convention introduced a special liability system for nuclear damage to persons and property, which is strict (even in the absence of fault), limited in terms of the amount and duration, and is exclusively focused on the operator of the nuclear facility.

In France, the operator's liability was set to €700 million per nuclear accident at a facility and to €70 million per nuclear accident during transport. Over and above the maximum amount for which the operator is liable, the State in which the incident occurred is responsible for compensating victims up to a maximum of €217.4 million (provided that said State is a Contracting State of the Brussels Convention); over and above this amount, Member States that have ratified the Brussels Convention (including France) contribute collectively to compensation up to a limit of €372.6 million.

The Convention also provides that the operator has an obligation to take out insurance or lodge a financial guarantee for the liability amounts established in order to guarantee the availability of funds. The Minister for the Economy monitors French operators' compliance with this obligation. EDF complies with the current coverage requirements (see section 2.1.2.6 "Insurance").

1. The Group, its strategy and activities

Legislative and regulatory environment

Protocols to amend the Paris and Brussels Conventions were signed on 12 February 2004 but have still not entered into force. They require higher amounts of compensation than the original conventions, in order to cover a greater number of victims and types of damage that are eligible for indemnification. The State in which the nuclear facility of the operator that is liable for causing the damage is located is liable for amounts above the €700 million for which the operator is liable, up to €1,200 million (provided that said State is a Contracting State of the Brussels Convention). Over and above this amount, the Contracting States of the Brussels Convention are liable up to a maximum amount of €1.5 billion. In addition, for personal injury only, the time limit to claim compensation has changed from 10 years to 30 years from the date of the incident. The definition of "nuclear damage" is evolving and includes economic losses, the cost of protective measures, the cost of measures to rehabilitate damaged environments, and certain other losses resulting from damage to the environment.

Protection of facilities that house nuclear materials

The purpose of the regulations on the protection and control of nuclear material governed by Article L. 1333-1 of the French Defence Code is to detect and prevent the loss, theft or misappropriation of nuclear material that is stored at facilities or being transported, or any attempts to alter, damage or disperse such material.

For nuclear power plants, the Order of 10 June 2011 on the physical protection of facilities that house nuclear materials, which can only be held with an authorisation, is based on in-depth defence of targets, namely the nuclear material, equipment or functions, which, in the event of default or damage by a malicious act, are liable to have radiological consequences. Accordingly, the operator must set up several lines of protection in the form of six zones (e.g. access control areas, a vital area, an internal area, etc.). Following an amendment by an Order of 15 September 2015, the Order of 10 June 2011 now makes it possible to set up safety devices in dangerous areas if the assessment of the contents of the safety study provided for in Article R. 1333-4 of the French Defence Code reveal that the means implemented to meet the safety objectives appear to be insufficient.

Law no. 2015-588 of 2 June 2015 on the improvement of the protection of civilian facilities that house nuclear materials, which is now incorporated into the French Defence Code, created a specific criminal misdemeanour of trespassing in these facilities. For the implementation of these rules, Decree no. 2015-1255 of 8 October 2015 created restricted access nuclear areas ("ZNR") that must be delineated within each facility. Trespassing in a ZNR constitutes a criminal misdemeanour that carries a one-year prison sentence and a €15,000 fine. These penalties are increased in the event of aggravating circumstances (to a three-year prison sentence and a €45,000 fine, in particular when the offence is committed in a group, and to a seven-year prison sentence and a €100,000 fine, in particular if the offence is committed with the use or threat of a weapon). All of the orders that define the ZNR for each nuclear power plant have been published.

1.5.3.2.2 Basic nuclear facilities in the United Kingdom

In the United Kingdom, EDF Energy is required, under the Nuclear Installations Act 1965 ("NIA 1965"), to hold a nuclear site licence for its existing nuclear power plants and comply with a certain number of licence conditions. Licence condition 35 concerns decommissioning and requires EDF Energy to make a decommissioning plan and to decommission its nuclear power plants/manage its waste in accordance with its plan. Part 3 of the Energy Act 2013 and the corresponding implementing order set up the Office for Nuclear Regulation ("ONR") as the UK's nuclear safety and security regulator. The decommissioning plan must be approved by the ONR, which may order operators to commence or cease decommissioning at any time. The ONR and the Environment Agency/SEPA are responsible for the safety, security, environment and emergency planning regulations that apply to the UK's nuclear sites.

For new nuclear constructions in the United Kingdom, a nuclear site licence must be obtained under the Nuclear Installations Act 1965 at an early stage of development and is required for commissioning, operation and decommissioning. The ONR, in collaboration with the Environment Agency, also conducts non-site-specific safety assessments on potential nuclear power plant designs, which is a key element of the licensing process. This is called generic design assessment.

The Planning Act 2008 ("PA 2008") regulates the planning process for major infrastructure projects, including new nuclear power plants. The PA 2008 introduced the concept of Development Consent Orders ("DCOs"), which are the authorisations required to build a new nuclear power plant in the UK. The DCO application process involves conducting an environmental impact assessment, implementing environmental mitigation measures and holding a certain number of public consultations.

Under section 45 of the Energy Act 2008 ("EA 2008"), operators applying for a licence for a new nuclear power plant in the United Kingdom are required to give written notice, to prepare and to submit a funded decommissioning programme ("FDP") to the Secretary of State. The FDP is designed to ensure that operators have secure financing arrangements in place to cover all decommissioning costs and their total share of waste management and disposal costs.

Rules on nuclear safety and the inspection of basic nuclear facilities

The United Kingdom implemented Directive 2014/87/Euratom on 15 August 2017 by amending the ONR's Technical Assessment Guides and Technical Inspection Guides and submitting a Directive under section 92(1) of the Energy Act 2013.

In the United Kingdom, the ONR is responsible for the regulation and inspection of nuclear facilities and the following laws are overseen by the ONR:

- (1) The Health and Safety at Work Act 1974 ("HSWA 1974"), which defines EDF's liability for the safety of workers and the public;
- (2) The NIA 1965, under which operators of nuclear power plants need to obtain a nuclear site licence and comply with 36 licence conditions;
- (3) the ionising radiation regulations 1999 ("IRR 1999"), which are based on the Basic Safety Standards Directive and provide for the protection of workers against ionising radiation.

When assessing the measures that may be required to reduce risks in accordance with the HSWA 1974, the ONR requires risks to be reduced as low as reasonably practicable.

Safety is ensured through all of the ONR's duties and its approach to the regulation of nuclear facilities. It begins with a detailed review and assessment of the safety of the design and continues throughout the operation and decommissioning of the facilities.

The ONR uses the powers granted to it under the NIA 1965, the conditions for licensing sites and the HSWA 1974 as the basis for its monitoring and enforcement regime. The ONR has extensive inspection powers allowing it to inspect nuclear facilities, request documents and conduct investigations.

Under the NIA 1965, the ONR is authorised to grant licences to applicants and to impose licence conditions which may be varied or revoked. In particular, the ONR can prohibit certain nuclear operations or revoke the licence of a nuclear site. More commonly, the ONR may agree to specific actions, approve arrangements or require changes/variations to operations. The maximum penalty for non-compliance with safety legislation is an unlimited fine or imprisonment for a term not exceeding two years for directors.

Decommissioning of nuclear facilities

In the United Kingdom, EDF is subject to licence condition 35 which forms the basis for the detailed decommissioning plans and programmes required by the ONR, but its requirements must be taken into account with other legal provisions such as the nuclear reactors (environmental impact assessment for decommissioning) regulations 1999 which require an assessment of the environmental impact of decommissioning and mitigation measures to reduce the environmental impact.

Decommissioning is usually carried out in stages, with a separate licence required to move on to the next stage. The ONR may order operators to start or cease decommissioning at any time and must approve decommissioning plans for each stage of the decommissioning process.

Radioactive waste

In the United Kingdom, EDF is required, under licence condition 34, to ensure, so far as is reasonably practicable, that radioactive material and radioactive waste cannot leak or escape.

The Environment Agency regulates the disposal of radioactive waste from licensed nuclear sites under the environmental permitting regulations 2010.

The Committee on Radioactive Waste Management (CoRWM) published its recommendations for the long-term management of higher activity waste in 2006. In response, the UK government decided to prefer the use of deep geological disposal facilities for the storage of higher activity waste in England. It set the framework for the management of long-term storage through geological storage, combined with a safe and secure interim storage.

Financing of decommissioning and radioactive waste management

In the United Kingdom, the costs associated with decommissioning and managing spent fuel are, with limited exceptions, guaranteed by the UK government for existing nuclear plants. The decommissioning costs of the eight plants are covered by the Nuclear Liabilities Fund (NLF) in accordance with the Nuclear Liabilities Funding Agreement. EDF Energy Nuclear Generation Ltd. is required to make quarterly payments to the NLF under the terms of a contribution agreement.

Prospective operators of nuclear power plants are required to submit in their FDP a Decommissioning and Waste Management Plan ("DWMP"), setting out the operator's costed plans for meeting its decommissioning and waste management and disposal obligations, and a Funding Arrangements Plan ("FAP"), explaining how the operator will make financial provision for its obligations. Chapter 1 of Part 3 of the EA 2008 sets out the rules governing the decommissioning and clean-up of nuclear sites, along with detailed provisions on FDPs.

Regulations on radiation protection

In the United Kingdom, the ionising radiation regulations 2017 ("IRR 2017"), which transposed Directive 2013/59/Euratom into UK law on 1 January 2018, are based on basic safety standards and are designed to protect workers and the public from ionising radiation. Under the IRR 2017, EDF Energy has a legal obligation to take all necessary measures to limit, as far as possible, the exposure of workers and other persons to ionising radiation for any work involving ionising radiation.

Civil liability of nuclear facility operators

In the United Kingdom, liability to third parties for nuclear damage is governed by the Nuclear Installations Act 1965 (the "NIA"). It transposes the Paris Convention and the Brussels Supplementary Convention into UK law.

Operators are liable under the NIA 1965 for the following heads of damage:

- personal injury to any person;
- damage to any property.

Liability under the channelling principle is covered by mandatory nuclear insurance up to the prescribed financial limits.

The Nuclear Installations (Liability for Damage) Order 2016 is due to come into force when the protocols amending the Paris and Brussels Conventions are ratified. Once it has come into force, it will amend the NIA to make operators liable for a higher level of compensation, for a wider category of claimants and for a wider range of damage than at present. It will include:

- **Increase in the amount of compensation:** There is currently a £140 million cap on liability for any one incident for nuclear power plants. This liability cap will be increased to €700 million, plus a further €100 million per year, to reach €1.2 billion.
- **Wider category of claimants:** The rules currently only apply in countries that are parties to the Paris Convention. The geographical scope of the Paris Convention has been extended to include all "qualifying territories", which includes non-nuclear countries (e.g. Ireland) and countries with equivalent and reciprocal liability arrangements (e.g. the United States). However, this will not prevent claims from the countries of origin and will not eliminate the risk that the US courts could accept jurisdiction in a case brought against a US contractor.
- **Wider range of damage:** The current rules only apply to personal injury and property damage. The amendments provide for three new categories of damage:

- (i) costs of measures of reinstatement of the impaired environment; (ii) loss of income deriving from a direct economic interest in any use or enjoyment of the environment; and (iii) costs of preventive measures and further loss or damage caused by such measures.

It is common practice in the UK nuclear industry for operators to indemnify certain suppliers against nuclear liability risks, including where the liability is the fault of the supplier. This indemnification is required by suppliers due to gaps in the protection provided under the nuclear third party liability regime. This liability is not covered by the NIA and is not insurable (potentially unlimited).

Protection of facilities that house nuclear materials

The ONR is the UK's nuclear safety regulator. In the United Kingdom, comprehensive safety rules are set out in various regulations and administered by the ONR. The main regulations dealing with nuclear security issues in the United Kingdom are the nuclear industries security regulations 2003, as amended by the nuclear industries security (amendment) regulations 2013.

The United Kingdom takes into account the nuclear security recommendations made by the International Atomic Energy Agency ("IAEA"). The United Kingdom promotes effective and proportionate security and seeks to meet or even exceed the IAEA's physical protection objectives, in particular:

- (1) Protection against the unauthorised removal of nuclear material;
- (2) Location and recovery of nuclear material; and
- (3) Protection from nuclear material and facilities.

Brexit's impact on the Euratom Treaty

By leaving the European Union, the United Kingdom will no longer be a party to the Euratom Treaty. The consequences of this situation and the measures taken to deal with it are described in section 1.4.5.1.1 "United Kingdom – Strategy".

1.5.3.3 Regulations applicable to hydropower facilities and other renewable energy facilities

1.5.3.3.1 Regulations applicable to hydropower facilities in France

In France, hydropower facilities are subject to the provisions contained in Articles L. 511-1 *et seq.* of the French Energy Code. They require concession agreements granted by the State (for facilities generating over 4.5MW), or an authorisation from the Prefecture (for facilities under 4.5MW), (see section 1.4.1.5.1.4 "Hydropower generation issues") concerning hydropower concessions.

EDF's hydropower generation business is subject to the substantive provisions of water regulations. Such regulations mainly cover control over variations in water levels and flow rates, the safety of areas in the vicinity and downstream of hydropower facilities and, in general, maintaining a balanced management of water resources (see section 1.5.3 "Regulations applicable to EDF group facilities and activities").

Competitive tendering for hydropower concession contracts

Under the French Energy Code, the granting of a hydropower concession is preceded by public notice and competitive tendering in accordance with the terms and conditions set out in Part III of the French Public Procurement Code, subject to the provisions of the French Energy Code. The Law of 17 August 2015 on Energy Transition for Green Growth has completed the legal framework for hydropower concession contracts by giving the State the possibility:

- of combining concession contracts that form a "series of facilities that are hydraulically linked", by setting a new deadline for all the concession contracts concerned (Articles L. 521-16-1 and L. 521-16-2 of the French Energy Code);
- of creating semi-public hydroelectric companies (SEM) made up of private-sector operators and a public Division (State, local authorities, etc.), each of which holds at least 34% of the shares (Articles L. 521-18 *et seq.* of the French Energy Code);
- of extending certain concession contracts in return for investments by operators where these investments are necessary in order to reach national energy policy targets (Article L. 521-16-3 of the French Energy Code).

1. The Group, its strategy and activities

Legislative and regulatory environment

The purpose of the Decree of 27 April 2016 on hydropower concession contracts, now incorporated into the French Energy Code, is to implement the provisions of the aforementioned Law of 17 August 2015 and to modernise the regulatory framework for hydropower concession contracts (in particular by clarifying certain aspects of the procedure for awarding hydropower concession contracts by approving a new model for general terms and conditions).

Under the Energy and Climate Law of 8 November 2019, a declaration procedure may now be used for a power increase, subject to compliance with several conditions, including acceptance by the administrative authority.

Annual concession fee

In accordance with Article L. 523-2 of the French Energy Code, when a hydropower concession contract is renewed or extended under the conditions provided for by Articles L. 521-16-2 or L. 521-16-3 of the French Energy Code, an annual concession fee that is proportional to the revenues generated by the concession contract is levied, which is paid in part to the French State and in part to the French departments and municipalities through which the waterways used flow. A limit is set by the contracting authority on a case-by-case basis for each new or renewed concession contract. Article 69 of Law no. 2015-1785 of 29 December 2015 (the Budget Act for 2016) expressly confirmed that this type of concession fee excludes the application of the concession fees provided for by Article L. 523-1 of said Code, which apply to concession contracts that were renewed before 2006. Moreover, Law no. 2018-1317 of 28 December 2018 (the Budget Act for 2019) levies a fee on any "rolling delay" concession extended in accordance with Article L. 521-16 of the French Energy Code, starting on 1 January 2019. Decree no. 2019-664 of 28 June 2019 relating to the proportional fee for a hydropower concession contract extended under Article L. 521-16 of the French Energy Code (Article R. 523-5 of the French Energy Code) sets the base of that fee and its rate: 40%.

Safety and security of facilities

Articles R. 214-112 *et seq.* of the French Environment Code contain provisions that are applicable to the safety and security of hydropower facilities that are authorised and operated under concession contracts. Dams are divided into three classes (A, B and C) according to their characteristics, in particular their height and the volume of the floodwaters. According to this classification and the legal rules applicable to the facility, the regulations require the operator or concession contract holder to fulfil a certain number of obligations in order to guarantee the safety and security thereof (in particular by carrying out and updating hazard studies – see section 1.4.1.5.1.2 "Hydropower safety"). The aforementioned Decree of 27 April 2016 on hydropower energy concession contracts contains provisions that are designed to unify the regulations, regardless of the legal rules that are applicable to the facility. The Decree of 6 August 2018 setting the technical requirements for dam safety applicable to facilities approved for construction and to those in operation lays down basic safety requirements applicable to dams. The provisions will gradually come into force for existing dams between 31 December 2025 and 31 December 2035 depending on the type of dam.

Balanced management of water resources

The Water Framework Directive of 23 October 2000 is the foundation of Community water policy. It defines a framework for the management and protection of water, for each major river basin, and sets targets for maintaining and restoring the status of surface waters, in particular to ensure the correct ecological and/or chemical status of water by 2015.

In France, the Directive was primarily transposed into law through the Water and Aquatic Environments Act of 30 December 2006, which stipulates the measures that are designed to ensure that the Directive's targets are attained. These targets are determined for each river basin in the master plans for water development and management (SDAGEs). All EDF's activities that could impact water and aquatic environments must be compatible with the targets set in the SDAGEs.

The Water Act also requires the various uses of water to be reconciled. The requisite balanced, sustainable management of water resources therefore has consequences for the operating rights of hydropower plants, and indirectly for all EDF's activities that affect aquatic environments.

The EU Water Framework Directive makes provision for its re-examination by the EU Commission no later than 19 years after its entry into force *i.e.* by 2019. It was the subject of a consultation in the first quarter of 2019 and it may now be revised.

1.5.3.3.2 Regulations applicable to other renewable energy facilities in France

1.5.3.3.2.1 Regulations applicable to renewable energy generation

The "Climate Package" (known as the "2020 Energy-Climate Package") is the source of a set of measures aimed at ensuring that, by 2020, the EU will achieve the objectives of a 20% reduction of greenhouse gas (GHG) emissions, a 20% improvement in energy efficiency and a 20% portion of renewable energy (REN) in energy consumption. The "2030 Energy-Climate Package", which was adopted on 24 October 2014, set new targets for 2030: a 40% reduction in GHG emissions compared to 1990, 27% of renewable energies in the energy mix and a 27% improvement in energy savings. The "Clean Energy for all Europeans" package, adopted by the European Commission on 30 November 2016, raised these targets by setting a target of a 32% share of renewable energies in the energy mix by 2030.

Following on from Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources introduced as part of the "2020 Climate & Energy Package", Directive 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources pursues the objective of maintaining the European Union's position as a world leader in renewable energies and meeting its GHG reduction commitments under the Paris Agreement.

In this respect, pursuant to regulation 2018/1999 of 11 December 2018 on the governance of the energy union and climate action, also part of the "Clean Energy for all Europeans" package, each member state is required to draw up a ten-year national energy and climate plan for 2021-2030 setting out the actions to be implemented to achieve the new 2030 targets for renewable energy and energy efficiency. On the basis of the multi-year energy programme and the National Low-Carbon Strategy, France published its draft integrated national energy and climate plan in February 2019.

In domestic law, the Law of 17 August 2015 on Energy Transition for Green Growth also provides for a target of 32% of renewable energies in energy consumption by 2030. Furthermore, the Grenelle 2 Law created land planning instruments with a view to enabling balanced development between the various renewable energy sectors, which include:

- regional climate, air and energy schemes (SRCAEs), for which the legal framework is laid down in Articles L. 222-1 to L. 222-3 and R. 222-1 to R. 222-7 of the French Environment Code. As of 1 May 2014, all regions had adopted their SRCAE;
- regional schemes for connection to renewable energy networks (S3RERs), of which Articles D. 321-10 to D. 321-21 and D. 342-22 to D. 342-25 of the French Energy Code specify the content, approval rules, host capacity management and financial conditions for the connection of electricity producers.

In addition, an Order of 14 September 2011 (ratified by Law no. 2013-619 of 16 July 2013) amended the legal rules on the guarantees of origin of the electricity produced using renewable sources or by cogeneration, laid down in Articles L. 314-14 *et seq.* of the French Energy Code. The terms and conditions to implement this new scheme and the rules for appointing the organisation in charge of managing guarantees of origin (issuing, transfer, cancellation) are stipulated in Articles R. 314-24 to R. 314-41 of the French Energy Code. As producer and mandatory purchaser of electricity produced using renewable energy sources, the EDF group is concerned by these provisions.

Lastly, Order no. 2016-1059 of 3 August 2016 relating to electricity generation from renewable energies, codified in Article L. 314-1 *et seq.* of the French Energy Code, amended the provisions applicable to facilities generating electricity from renewable sources in order to ensure a better integration into the electricity market and to provide the technical provisions necessary for a better integration into the electricity system of electricity generation facilities connected to a public distribution network, particularly facilities generating electricity from renewable sources.

The Grenelle 2 Law also contains exceptional provisions designed to encourage the development of sea-based energies, which were enhanced by the Law of 17 August 2015 on Energy Transition for Green Growth.

In addition, Article 18 of Law no. 2014-1545 of 20 December 2014 on the simplification of corporate life empowers the Government to set up a dedicated, comprehensive authorisation system for sea-based facilities that produce renewable energy and that are located in the maritime public domain, and for the connection structures for these facilities. Moreover, Decree no. 2016-9 of 8 January 2016 simplified the legal procedures that are applicable to sea-based renewable energy projects that win competitive tendering procedures.

Furthermore, the Law of 17 August 2015 on Energy Transition for Green Growth provides an exceptional appeal timeframe for the benefit of "facilities that produce energy from renewable sources" of four months in which to contest an authorisation, as from, respectively, either the publication of the authorisation, or its notification.

1.5.3.3.2 Regulations applicable to wind power generation

Pursuant to Articles R. 421-1 and R. 421-2 of the French Urban Planning Code, a building permit must be obtained for land-based wind farms with a height equal to or greater than 12 metres. However, the environmental authorisation granted for the completion of an onshore wind farm project is exempted from the requirement for a building permit, in accordance with Article R. 425-29-2 of the French Urban Planning Code. For its part, the construction of wind farms on the public maritime domain is exempted from the requirement for a building permit, in accordance with Article R. 421-8-1 of the French Urban Planning Code.

In addition, the Grenelle 2 Law provides that onshore wind farms are now subject to the nomenclature applicable to ICPEs with the legal system of authorisation or declaration (see section 1.5.3.2.1 "Regulations applicable to facilities classified for the protection of the environment (ICPEs)") under section 2980 "Terrestrial facilities for the generation of electricity using mechanical wind energy with one or more wind-power generators". In connection with the application for a building permit, an impact study must be performed for wind farms that are subject to authorisation and submitted with the building permit file.

The Law of 17 August 2015 on Energy Transition for Green Growth amended the rules on the distance required between wind farms and housing: the minimum distance of 500 metres is maintained, but may be increased in light of the impact study, which is part of the authorisation application. It also inserted provisions into Article L. 146-4.1 of the French Urban Planning Code that are designed to facilitate the location of land-based wind farms in municipalities concerned by the "Coastline" Law. A decree is also expected to clarify the rules on wind farm location with regard to military facilities and sectors, weather monitoring equipment and air navigation equipment.

The operator of a wind farm, or in the event of default, the parent company, is responsible for decommissioning the farm and site restoration, as soon as operation is terminated for any reason (Articles L. 553-3 and R. 553-1 of the French Environment Code). For this purpose, the operator is required to lodge financial guarantees as of the start-up of generation and for subsequent depreciation periods.

The authorisations relating to the generation and transmission works necessary for the development of offshore wind farm projects are subject to a specific litigation framework, laid down by Decree No. 2016-9 of 8 January 2016. Decree no. 2018-1054 of 29 November 2018 relating to onshore wind turbines and the environmental authorisation and introducing various provisions simplifying and clarifying environmental law simplifies, in particular, the law governing onshore wind turbine disputes.

1.5.3.4 Networks in France

Exposure to Electromagnetic Fields (EMF)

Pursuant to the Grenelle 2 Law, Decree no. 2011-1697 of 1 December 2011, now incorporated into the French Energy Code, requires managers of public electricity transmission networks to perform regular verifications of the EMF caused by electric lines that transmit electricity.

Law no. 2015-136 of 9 February 2015 on simplicity, transparency, information and consultation regarding wave exposure introduced an obligation to provide information for persons who install equipment that emits electromagnetic fields on residential premises. In due course, this obligation may concern some entities of the EDF group.

1.6 Research & development, patents and licences

EDF group's Research & Development (R&D) activities are carried out by the Research and Development Department – EDF R&D, as well as by certain Group subsidiaries. These activities are complementary and are in line with the Group's CAP 2030 strategy.

EDF group's R&D is both integrated and cross-disciplinary, in order to facilitate synergies and method transfers between the different Divisions within the Group. It employs over 2,700 ⁽¹⁾ persons worldwide.

Skills cover all the Group's field of activities: renewable energies and storage, networks, nuclear generation, thermal, hydropower, energy management, trade and services, IT systems, environment. They are specific to particular disciplines, business lines and projects, and also come together for work on major systems.

EDF R&D is currently organised on a multi-site basis, with several sites located in France and abroad, mainly in Germany, the UK, China, the United States, Singapore and Italy.

EDF R&D's main centre is located in Palaiseau on the Paris-Saclay campus where it opened in 2016. At end 2019 EDF's R&D employed 1,868 people in France representing 29 nationalities.

The main missions of the EDF group's Research and Development Division (R&D) are firstly, to support the Group's Divisions and subsidiaries on a day to day basis, by providing them with its top-level expertise and high performance practices, and secondly, to contribute to build the Group's future by anticipating the developments and major challenges with which it is confronted.

With the goal of carbon neutrality by 2050, and with electricity anticipated to be a major factor in the decarbonisation of the French economy, the role that R&D will play will be crucial to achieving this objective. Its avenues of research are structured around three broad topics:

- electric transition;
- climate transition;
- digital and societal transition.

In 2019, EDF group's total R&D budget was €713 million. It comprises EDF's R&D budget of €523 million, as well as the research carried out by certain wholly-owned subsidiaries, mainly Framatome, EDF Energy and Edison. This is one of the largest R&D budgets of any major electricity company.

Moreover, in 2019, approximately 18% of this budget was devoted to protecting the environment. In particular, expenditures covered research into energy efficiency, uses of electricity as a substitute for fossil fuels, renewable energies and their insertion into the grid, energy storage, carbon-free hydrogen and its applications for decarbonising the economy, sustainable cities, the local impacts of climate change and other environmental issues such as biodiversity, water quality, and the mitigation of disturbances.

1.6.1 R&D priorities

EDF R&D's work serves all the Group's business lines. For each of them, it offers technological solutions or innovative business and economic models designed to improve their performance, and prepare the Group's future in the longer term by means of medium and long-term anticipation initiatives. It is one of the factors in EDF becoming a global industrial group providing low-carbon electricity systems.

Its research focuses on three main areas, in line with the CAP 2030 project:

- electric transition: electricity, especially if generated using low-CO₂ emission facilities, will play a major role in decarbonising the end uses of energy. Among these uses, electric mobility and innovative heat production methods are important development drivers for EDF;
- climate transition: this focus includes issues in relation to EDF's electricity generation facilities. EDF group, a champion of carbon-free energies, endeavours to ensure that its facilities emit as little CO₂ as possible and, therefore, to make a major contribution to the COP21 and COP22 climate goals;
- digital and societal transition: this focus recognises the advent of connected objects and digital tools, which have been developing exponentially in the domestic and business worlds in recent years. This transition is inseparable from

the very significant changes in our lifestyles and actions with respect to energy use.

The research work on grids on behalf of Enedis is carried out under a services contract, which defines obligations that guarantee the protection of commercially sensitive information and compliance with the principle of the independent management of the distributor. In addition, Enedis also has its own independent R&D programme. This work is described in section 1.6.1.5.

1.6.1.1 Electric transition

The development of energy efficiency and distributed renewable energies, regulatory and technological changes (digitisation) as well as market deregulation, have all led to profound changes in the relationship between energy firms and their clients. They allow customers to be actively involved in their consumption and production of energy, on an individual or regional scale.

Shifts in European and French legislation and regulation, exemplified by the EU's Clean energy for all Europeans Package and France's National Low-Carbon Strategy (SNBC) and multiyear energy programme (PPE), as well as various tax incentives to replace fossil fuels with clean electricity (batteries vs combustion engines, heat pumps vs oil-fired boilers) are shaping the future energy landscape.

In this context, the challenges for the EDF group's marketers and specialised subsidiaries are many, and its CAP 2030 goals aim high in terms of energy services:

- changes in the range of price offers for both electricity and gas;
- the development of smart technologies, e.g. the deployment of smart meters;
- changes in client relations, which are becoming increasingly digital, with more demanding client expectations accompanied by changing behaviours;
- the emergence of demand among customers to become stakeholders in their own electricity generation through private energy generation and consumption.

Work on new uses for electricity were carried out, in particular by the EDF Energy subsidiary, which develops activities in the electric mobility field.

2019 also saw new customer interfaces, using techniques linked to artificial intelligence and augmented reality, being marketed.

The dynamics of the energy transition are creating new uses of electricity and new expectations. For example, energy communities are emerging: cities have expressed enthusiasm for optimising infrastructures and their management (transport, waste treatment, buildings, energy generation, grids) and aim to become smart cities or "sustainable cities".

For electric mobility, which offers the prospect of a profound transformation of modes of transport, the issue of battery storage is key. R&D research in this respect consists, firstly, in characterising battery safety and performance in the lab, and secondly, in innovating in the realm of breakthrough technologies with the potential to deliver significant improvements in battery life and/or cost. R&D is also studying non mobile applications for the reuse of batteries that were originally used in electric vehicles (combining them with renewable energies, system services, etc.). In the longer term, R&D will adopt a similar approach for the hydrogen technologies that are used for mobility, including electrolysers and charging stations, as well as fuel cells for heavy transport and light vehicles.

Energy transition towards a low-carbon economy in Europe also involves reducing the carbon footprint of electricity systems. This will require taking on new challenges:

- managing the intermittence of production sources that use renewable energies and pushing back the limits of their inclusion in electrical systems;
- integrating new uses of electricity by optimising the production mix and grid requirements;
- developing network transmission infrastructures and optimising electricity traffic in Europe;
- optimising decentralised energy systems (demand-side management, decentralised generation and storage, etc.) by integrating them into larger scale energy management systems;
- adapting the coordination of electricity systems in order to address a reduction in inertia of the electricity system in a context of increasing use of power electronics in order to factor in patterns of use and new production sources;

⁽¹⁾ Calculated as full-time FTEs.

The trend towards more intelligent electricity systems, also known as smart grids, is one of the pivotal points in transitioning towards a low-carbon energy economy in Europe. It raises not only technical, economic and regulatory issues, but over and above the integration of renewable energies and new uses, issues relating to the management of information for the various users of the grid and the need to control costs.

R&D's work can be divided into three main categories:

- the first category of work aims to anticipate the impacts of energy transitions and the emergence of decentralised energy systems on the development and management of electricity systems;
- the second category of work aims to improve the performance of electricity grids;
- the third category of work aims to manage the transition of the electricity system to smart grids through the integration of intermittent renewable energies and new distributed resources such as energy storage and electric vehicle charging infrastructure.

1.6.1.2 Climate transition

In the field of nuclear, hydro and fossil-fired power generation, EDF R&D is developing tools and methods to improve the safety of production resources, optimise their operational lifespan, and increase their performance in terms of output and environmental impact. There are three key priority goals: ensuring the Group maintains its advantage in terms of nuclear power over the long term, developing renewable energies while reducing their cost and increasing the extent to which they are used in electricity systems, while improving the environmental acceptability of our generation facilities.

1) To secure the Group's advantage in nuclear power generation in the long term

a. EDF

R&D is working to protect EDF's assets through actions in line with its policy to improve the safety of facilities, particularly with regard to enhanced performance and extended operating lifespan.

More broadly, the EDF group (EDF and Framatome) works on R&D with the CEA as part of the Institut Tripartite (which also includes AREVA). In 2017 the three partners launched the Nuclear Plan of Tomorrow Initiative comprising technological building blocks for existing plants and nuclear new build. The aim of several of these technological building blocks is to gain actionable knowledge of the ageing mechanisms of components having an impact on the operating lifespan of the EDF group's nuclear units.

To support these programmes, R&D is developing digital simulation tools and experimental test resources, as well as tools that are capable of handling the fresh challenges raised by the increase in large sets of digital data, IT security, and new information and communication technologies. In 2017, EDF launched ConnexLab in Saclay to test new concepts of operation and maintenance. ConnexLab is part of the nuclear sector's digital transition initiative bringing together EDF and its subsidiary Framatome, the CEA, equipment manufacturers, maintenance companies and digital model suppliers.

Furthermore, R&D contributes to the preliminary design of the Small Modular Reactor (SMR) reactor called Nuward.

b. Framatome

In connection with its nuclear steam supply systems business, in 2019, Framatome's R&D activities focused, in particular, on:

- upgrading reactor justification software and methods used to prepare safety reports, in line with developments in the international state of the art and the most recent requests from safety authorities. Examples include neutron

calculations of core power and analyses of thermal-hydraulic behaviour in the event of accidents (e.g. loss of coolant). Highlights of 2019 included progress on the validation by Framatome's teams of the new CATHARE 3 accident thermal-hydraulics software, as well as new milestones achieved by the advanced neutron simulation chain project ("ODYSSEE") carried out in partnership with EDF (delivery of the core thermal-hydraulics code, first version of the multi-physics coupling code). This chain, which is more precise and productive, will be operational in 2022 to carry out studies in support of the EPR2 safety file and, thereafter, the 10-yearly safety reassessments of French nuclear power plants. Significant progress was also made in computational fluid dynamics (CFD) thermal-hydraulic calculation methods, particularly in the field of two-phase studies (modelling of quenching phenomena, critical flows, etc.) and aerodynamics (thermal environment, fire, etc.), using calculation acceleration solutions (use of metamodels);

- the development and continuous improvement of reactor components: vessel, internal structures, steam generators, primary pumps. This R&D made advances in the areas of compliance with new regulatory requirements and the ability to justify the behaviour of equipment beyond its nominal lifetime (up to 60 years). For example, advanced methods of fracture mechanics justification have been developed. The assistance provided to plants for the design of the new technology forgings required for EPR2 production has also begun to yield concrete results;
- productivity gains in engineering studies, by optimising study processes, or in certain services or equipment, and the use of advanced digital techniques (deployment of virtual reality, use of metamodels or learning methods, etc.);
- a contribution to advanced model development activities;
- optimisation of power plant maintenance.

2) Support the development of renewable energies

The second priority is support for the development of renewable energies in France and abroad. These are playing an increasingly important role in the European and global energy landscape, as confirmed, in particular, by Dalkia's main R&D programmes, which focus on developing the share of renewable and recovered energies in the energy mix, particularly in heating networks. Suitability studies are underway on the development of absorption machines, solar thermal energy, and offers using renewable gas. The work begun in 2018 on high-temperature heat pumps with EDF's R&D Department is continuing, as is the work on heat recovery in decentralised data centres located at our customers' sites.

For renewable energies, storage and hydrogen, the goal of R&D is to identify technological breakthroughs that offer a significant competitive advantage, and to help the most promising technologies emerge industrially, working in partnership with academia, industry and startups. EDF is investigating a wide range of renewable energies and storage solutions: hydropower, photovoltaics, onshore and offshore wind power, solar thermodynamic power, biomass, marine energies, geothermal power, electrochemical batteries, flywheels, flow cells, supercapacitors, electrolysers, fuel cells (hydrogen) and thermal energy storage (heat and ice).

For example, in the photovoltaic solar power field, EDF Renewables has launched innovative power plants that are currently undergoing experimental prototyping, such as agri-photovoltaic, floating photovoltaic or bifacial photovoltaic power plants. Tools for dimensioning and calculating specific photovoltaic production are generally developed in parallel. In addition, laboratory experiments allow us to understand the failure and degradation modes of photovoltaic modules, whose technologies evolve regularly.

R&D is also working to develop tools and methods to enhance operational performance and optimise the cost of the EDF group's electricity generation system projects that are based on renewable energies and storage:

3) Environmental acceptability of facilities

The third priority is to improve the environmental acceptability of our production facilities. Climate change, the marked decline in biodiversity and Earth's limited resources make EDF a legitimate choice for a low-carbon energy mix. The aim of the R&D Division's initiatives is:

- through its scientific and technical expertise, to contribute to the way in which the regulatory environment is implemented;
- to provide justification for our production facilities being on par with the best available techniques, at an economically acceptable cost, and to leverage these best available techniques in new projects;
- to acknowledge and manage our impact on terrestrial and aquatic environments, enhance the value of our improvement initiatives, limit and enhance the value of our sub-products;
- to know how to anticipate and address new developments in climate change, for example by becoming more familiar with the robustness of the heat sinks for power plants in light of future climate change; As well as to study how water resource availability may change in the future as a result of changes in climate and physical geography;
- to contribute to leveraging our positive actions with regard to local stakeholders.

Therefore, for many years, EDF has set up research teams dedicated to biodiversity issues. In 2018, an ambitious research programme was launched to develop efficient tools to assess and control its impacts on biodiversity.

1.6.1.3 Digital and societal transition

Digital transition impacts the entire electric power system and is a key driver of the electric and climate transitions described above. The information technology research programme focuses on:

- firstly, understanding and anticipating the impacts on the Group's businesses and the possible disruptions that may be caused by technologies such as artificial intelligence, the internet of things, 5G telephony, cyber security, blockchains, quantum computing, virtual reality; etc.
- secondly, maintaining and developing a cross-disciplinary ecosystem of scientific computing to support the studies conducted by R&D and engineering.

This digital transition is also synonymous with progress: the use of advanced digital techniques (deployment of virtual reality, use of metamodels or learning methods, etc.) has, in particular, enabled the Framatome subsidiary to increase the productivity of its engineering studies.

In addition, a digital platform, based on cloud technology, is currently being deployed at EDF Renewables. It is designed to utilise EDF Renewables' production data, from assets in all its territories, in the same "data lake". The ultimate goal is to improve asset production and reduce operating and maintenance costs.

Artificial intelligence is one of R&D's research priorities, both its digital and semantic aspects. R&D has been instrumental in the dissemination of its methods within the businesses through its contributions to the adoption of data lakes, the launch of common platforms for data analytics and the Group AI Task Force. AI is a key aspect for the Group's businesses:

- for power generation, AI makes it possible to mine decades of industrial data to review maintenance strategies, build diagnostic tools that capitalise on the history of unforeseeable events, and develop functional digital twins to facilitate the management of installations;
- for energy management, AI serves the increasingly complex optimisation and forecasting needs required by the upsurge in renewable energies, electric mobility, local energy systems and electricity trading;
- for distribution networks, AI facilitates maintenance planning, modelling and resilience to natural hazards and smart grid management;
- for customer relations, artificial intelligence is used to improve the customer experience, operational efficiency, and business performance. For example, stemming from its work to digitise performance studies for its industrial customers, Dalkia launched its "Dalkia Analytics powered by Metron" offer. This offer analyses energy flows and their interactions with customers' processes in order to offer them high value-added solutions to improve performance. Dalkia has also developed the BIM Exploitation offer, which proposes Ready-to-Service buildings.

Blockchains offer another example of R&D's significant contribution to the incubation of a new digital technology. Two years after R&D launched this project, the Group has various experiments in progress, including several pilot projects. Under the impetus of the Group Blockchains Task Force, a "Blockchain Lab" provides "end-to-end" expertise, from consulting to the operation of blockchain applications integrated into the information system, as well as an industrial policy and partnerships adapted to the challenges and level of maturity of these technologies.

To support digital transition, R&D invests in powerful supercomputers that are essential for physics simulation studies and artificial intelligence machine learning models.

More than ever, the various types of energy are also at the core of the challenges facing modern societies, with issues raised about its availability, its climatic, environmental, economic and geopolitical impacts, the resilience of energy systems, and access to energy for all. The goal to achieve energy transition by 2050 will require rapid shifts over the next 30 years in terms of uses, technical and industrial changes, and changes in lifestyles and consumption patterns. The challenge of carbon neutrality may cause unprecedented changes in the major systems that structure our lives. It is therefore essential to anticipate the societal and social consequences of these developments, in relation to the independent dynamics at work in society today. R&D develops specific tools to understand these societal issues and employs researchers in human and social sciences who work to understand these developments:

- the trends laboratory is an exploratory, multidisciplinary and collaborative system that focuses on societal trends and identifies areas to be monitored and issues that are the subject of debate for EDF group. Finally, it explores certain emerging or fundamental topics in greater depth;
- the Design Lab places the user experience at the core of its approach. It engages in various types of design (industrial, information, service, strategic) to develop industrial proposals and solutions;
- lastly, the close relationships that have been forged with the innovation ecosystem (start-ups, fab lab, etc.) make it possible to envision new joint innovation practices.

1.6.1.4 EDF's R&D partnerships

To conduct its research and development programmes, EDF R&D develops a large number of partnerships worldwide, the purpose of which is to maintain its expertise at the highest global level in the disciplines central to EDF's concerns, and to supplement its internal reservoir of skills.

R&D's partnership policy is embodied in a variety of ways, both nationally and internationally.

In France, R&D has entered into framework agreements with major public research organisations. In 2019, the framework agreement with the National Scientific Research Centre (CNRS), the leading R&D partner both in terms of number and volume of contracts, was renewed for a term of five years. Over the past few years, R&D has also set up about fifteen laboratories on a joint basis with academic partners and technical or industrial centres. With them, it is participating in collaborative research projects funded by several national or European desks. Each shared laboratory offers an opportunity to establish a combined team in order to focus on a common scientific and technical problem, with a view to creating value, expertise and knowledge for all partners; this constitutes a major asset when taking part in cooperative projects. R&D also supports a few specially targeted teaching and research chairs.

In the field of nuclear R&D, a three-way agreement between CEA, EDF and Framatome was renewed in 2017. This collaboration takes place within a Tripartite Institute, which aims to increase the coordination of R&D programmes between the partners and to structure programmes that are defined with reference to objectives, particularly industrial objectives, and that are carried out applying the technological building blocks of the Nuclear Plant of the Future.

R&D is also active within the Energy Transition Institutes (ITE), which have been set up pursuant to the Future Investments Programme, such as the Île-de-France Photovoltaic Institute (IPVF), France Énergies Marines, which focuses on marine energies and offshore wind power, and Vedecom, which works on electric mobility.

EDF group is also the driving force behind ConnexITy, an R&D programme aimed at connecting, through digital technology, players in the nuclear sector in order to simplify power plant operation, site preparation and design.

EDF is also a founding member of several European associations recognised at the EU level, such as Nugenia for nuclear power and EASE for storage.

In addition, several partnerships are active in the Paris-Saclay Campus ecosystem, such as SEIDO, a joint research laboratory between EDF and Telecom ParisTech that focuses on the internet of things and cyber security for electrical systems, the Finance and Energy Markets joint laboratory operated with educational institutions such as Dauphine, ENSAE and École Polytechnique, etc.

EDF's R&D has also set up the Materials Ageing Institute (MAI), an international research centre on materials ageing that brings together, alongside EDF, most of the world's major nuclear operators.

Internationally, since the early 2000s, EDF has had a research centre in Germany, EIFER, in collaboration with the Karlsruhe Institute of Technology (KIT). This centre is chiefly devoted to decentralised production (fuel cells, hydrogen), sustainable cities and territories, geothermal energy, and biofuels.

EDF Energy UK consolidates the Group's positions in the British research eco-system, particularly through Strathclyde University in the field of renewables, as well as with Manchester University, Imperial College, the National Nuclear Laboratory (NNL) and the University of Bristol in the field of nuclear energy. The centre provides direct support to the activities of EDF Energy business units whether in the existing nuclear field (extension of AGR reactor lifespans, decommissioning), or in new projects with the installation of an antenna in Bristol to support the HPC project and help solve its environmental problems. The centre is also fully mobilised, in digital solutions for clients and offshore wind farm projects for which it is the reference centre for all the Group's projects in France and abroad.

The Beijing centre is an asset in terms of participating in large-scale Chinese smart grid demonstration projects for smart grids, or nuclear facilities (see section 1.4.5.3.6.1 "China"). The centre was reorganised in 2019 to provide significant support for the ambitions defined in the 2025 strategic plan of EDF China and its business units. It thus focuses on areas such as sustainable cities and, more broadly, local multi-energy projects combining electricity, biomass and heating and cooling networks. It also provides support to the new renewable energy development entity established in China.

The United States R&D and innovation sector is one of the largest and most buoyant in the world. EDF group has had an R&D and Innovation centre in Silicon Valley for several years, which supports its development in the USA and contributes to innovation in the Group. This laboratory's research areas include the analysis of technological and digital trends, market design and the assessment of new business models for the Group in the USA.

Singapore's R&D centre mainly focuses on supporting the promotion and implementation of the Group's know-how concerning sustainable cities and marketing the various solutions of the Group. Throughout 2019, Lab Singapore received feedback from its cost-competitive, renewable energy micro-grids demonstrator on Semakau Island off the coast of Singapore,

1.6.1.5 Enedis' R&D

Enedis' R&D and innovation programme aims to meet the main challenges facing the distribution system operators. It contributes to developing a long-term vision and identifying technological breakthroughs and new services expected and, at the same time, designs concrete industrial solutions within rigorously observed time frames. It concentrates on two main issues: improving industrial performance and facilitating energy transition.

The work carried out to improve industrial performance focuses on the following areas:

- innovating to ensure the long-term performance of an industrial asset that is essential to all;
- developing network intelligence;
- inventing the technician 3.0;
- adapting customer relations to the digital revolution.

The portion of the programme that aims to facilitate energy transition focuses on the following areas:

- facilitating the integration of renewable energies and new uses, while ensuring the safety of the electric power system;
- facilitating the development of electric mobility;
- preparing data management solutions;
- supporting "smart territories" projects.

1.6.2 Intellectual property

Intellectual property plays a major role in protecting the EDF group's technologies and know-how from competition, and in leveraging these assets through licensing agreements.

EDF is keen to strengthen its industrial property portfolio in order to make the most of its capacity for innovation and technological expertise. The portfolio is comprised of patents, registered software and formalised expertise.

Patents

At the end of 2019, EDF's portfolio (including Enedis' portfolio) comprised 682 patented innovations, protected by 1933 property titles in France and abroad.

Strengthening the patent portfolio is a priority. It aims to facilitate R&D cooperation, protect the development of EDF's activities, to contribute to the Group's external image, to boost researcher motivation and to further enhance the value of inventions.

In 2019, EDF filed 61 patent applications ⁽¹⁾ (59 in 2018).

Trademarks

"EDF" is a registered trademark in over 90 countries. The Group's name is a vital component of its image and its assets: the EDF brand, Internet domain names and logos are therefore constantly monitored, in order to protect them against any fraudulent use likely to jeopardise the Group's image. Moreover, following the work to enhance the status of the "EDF" brand, the Company has entered into brand licensing agreements with those of its subsidiaries that use the "EDF" brand.

The Group has also registered a large number of other trademarks, in particular those relating to the business of its various subsidiaries.

At the end of 2019, the EDF group's brand portfolio comprised some 548 names, protected by over 1,384 property titles, excluding the subsidiaries own portfolio.

(1) Enedis filed four patent applications.

1. The Group, its strategy and activities



2.

Risk factors and control framework

CONTENTS

2.1. Risk management and control of activities	104	2.2 Risks to which the Group is exposed	110
2.1.1 Control environment	104	2.2.1 Market regulation, political and legal risks	112
2.1.2 Focus on the 2nd line of control: cross-functional control systems	105	2.2.2 Financial and market risks	115
2.1.3 Focus on the 3rd line of control: the Group's audit unit	110	2.2.3 Group transformation and strategic risks	117
2.1.4 External controls	110	2.2.4 Operational performance	118
		2.2.5 Risks specific to nuclear activities	122
		2.2.6 Impacts of the coronavirus on risk factors	127

Section 2.1 “Risk management and control of activities” describes the risk and activity control systems that apply to the entire Group.

Section 2.2 “Risks to which the Group is exposed” describes the most significant risks the Group believes it is exposed to, bearing in mind the Group’s specific characteristics.

2.1. Risk management and control of activities

This section presents the business control (internal control) and risk management systems applicable to the entire Group, highlighting the latest developments for 2019. These systems are part of the framework established by the Group’s policies. They also comply with the general principles set out in the AMF risk management and internal control reference framework (published on 22 July 2010). They are also based on developments in the main international reference frameworks, in particular COSO-2013.

- the smooth running of processes and projects;
- the reliability of financial and non-financial information;
- compliance with Group policies;
- the control of risks and activities of any kind.

2.1.1 Control environment

Framework: Group policy corpus

Since 2017, the EDF group has organised the control of activities and risks around the Group policies, validated and signed by the Executive Committee. This corpus defines all of the sustainable and cross-functional requirements to be implemented in all of the Group’s entities and subsidiaries. It deals with all cross-cutting themes common to the entire Group. Regular updates make it possible to adapt requirements to regulatory changes and strategic orientations.

Control system objectives

The system for controlling the risks and activities of the Group, defined in the “Functioning principles/Risk management and internal control” policy aims to:

- identify and periodically reassess the significant risks and opportunities likely to impact the targets of the Group, in order to ensure the existence and control of relevant and effective action plans;
- constantly ensure:
 - compliance with laws and regulations;

Principles of execution

The fundamental principles of execution are based on the three lines of control model:

- 1st line of control: each manager at all levels is responsible for: identifying and controlling the main risks related to their activities, ensuring this control for the missions that they themselves have entrusted to their employees, to ensure that the control systems are appropriate and proportionate to the risks identified, and reporting on them formally and regularly to their own manager through self-assessments;
- 2nd control line: the support functions define common requirements for the Group and supervise their control. Their contribution to the control of the Group’s activities is set out in section 2.1.2. Amongst them, the risk and internal-control functions organise the overall control measures and prepare reports intended for the Group’s governing bodies;
- 3rd control line: the independent audit system can check the appropriateness and effectiveness of the measures for managing the risks and activities of the Group’s entities, check management of the main cross-functional processes and major projects of the Group, and more generally, check the level of control of the Group’s risks (see section 2.1.3).

All of these measures based on the three control lines provide the managers and governing bodies of the Group with “reasonable assurance” concerning the identification and coverage of the main risks.

1st line	Operating entities	<ul style="list-style-type: none"> • Comply with Group policy requirements • Implement 1st level controls adapted to their risks and issues • Carry out risk mapping and annual self-assessments of their control system • Implement progress and risk treatment action plans
2nd line	Functional Support Departments	<ul style="list-style-type: none"> • Define and update the Group's cross-functional policies • Implement 2nd level controls organised within their functions • Analyse the reliability of entity self-assessments • Coordinate the progress and risk management action plans of their function
3rd line	Internal Audit	<ul style="list-style-type: none"> • Independently assess the entire system • Make recommendations to be incorporated by entities in their internal control plans • Provide the governance bodies with reasonable assurance that the system as a whole is effective (incorporating in particular the 1st and 2nd lines)

Scope

With regards to the other subsidiaries of the Group (subsidiaries that are operators of regulated infrastructure and significant shareholdings), EDF representatives within the governing bodies make sure, for each subsidiary, that a system for controlling activities and risks is put in place. They provide regular information on the map of risks and internal control and audit activities (programme and main results). They can also check the effectiveness and appropriateness of each of these measures through a periodic audit of the respective entities. The applicable principles are adapted for the operators of regulated infrastructure to ensure compliance with obligations related to their management independence.

The management bodies

The organisation of the Executive Management of EDF is described in section 4.3.1. "Members of the Executive Committee". Each member of the Executive Committee is responsible for implementing all actions necessary to controlling the risks within their scope.

Risk Committee

The Executive Committee meets at least twice a year as a Risk Committee, during which it examines in particular the mapping of Group risks, the assessment of internal control activities and audit activities (annual programme, results). It identifies the priority risks for the Group, shares their strategy for mitigation and designates the members of the Executive Committee who are its sponsors.

The Group Executive Committee Commitments Committee

To strengthen the appraisal and monitoring of projects, the Group Executive Committee Commitments Committee⁽¹⁾ (CECEG) thoroughly examines the most significant projects in terms of the extent of the commitments and/or the risks incurred before decisions are made by the Executive Committee (see section 2.1.2.3 "Approval of commitments").

2.1.2 Focus on the 2nd line of control: cross-functional control systems

The second line comprises all the Group's support functions (Purchasing, Communication, Sustainable Development, Ethics and Compliance, Finance, Real Estate, Legal, Human Resources, Risks, Asset Security, General Services, Information Systems, Data Management). In particular, these support functions are responsible for organising and coordinating the implementation of Group policies.

Please note: aspects relating to the Group's human resources, including in particular the control of risks relating to the health and safety of employees and service providers, are set out in detail in section 3.3.3 of the Universal Registration Document.

2.1.2.1 Risk mapping and the report on the control of activities and risks

Report on the control of the activities and risks of the entities

Each Group entity (53 entities in 2019 covering the scope of EDF and controlled subsidiaries) prepares an annual report on the control of its activities and risks based on a self-assessment, including a description of its improvement actions. Each report gives rise to a commitment signed by the Director of the entity on the level of control achieved and the actions undertaken.

The report includes internal control, the report on the safeguarding of assets and the ethics and compliance report.

The ethics and compliance section meets the requirements of the Group Ethics and Compliance policy, including: the ethics alert system, prevention of the risk of corruption (monitoring the integrity of business relations, managing gifts and invitations); financial ethics (prevention of the risk of money laundering and financing of terrorism), prevention of market abuse, and compliance with the EMIR regulation⁽²⁾; prevention of breaches of competition law; prevention of conflicts of interest; compliance with personal data protection rules; combating fraud; combating harassment and discrimination; due diligence; compliance with sector-specific regulations (REMIT regulation⁽³⁾ on integrity and transparency of energy markets, regulations on dual-use goods); compliance with international sanctions programmes.

The part relating to security of assets fulfils the requirements of the Security of Assets against Malicious Acts Group policy, including: the safety of individuals during international travel, the security of material assets and the security of intangible assets (identification, classification and protection of sensitive information).

In addition to these topics, self-assessments more generally report on the control of all their "business line" activities and all the requirements of the other cross-functional areas identified in Group policies, in line with their risk mapping. Within the Group, 90% of the entities subject to a "risk and control of activities" self-assessment report indicate that they have an ICP (internal control plan) defining a set of controls to be implemented annually.

Finally, the self-assessments report on the control of the requirements relating to accounting and financial internal control, in line with the AMF framework (see section 2.1.2.4 "Reliability of financial information - internal accounting and financial controls").

Entity risk mapping

The entities produce an annual risk map based on a methodology common to the entire Group. The process of constructing the risk map for the entities is based on:

- the principle of management accountability discussed in section 2.1.1 "Control Environment";
- a typology of risks, including internal or external risks and operational or strategic risks, as well as opportunities;
- a qualitative evaluation method of the impact, the probability and the level of control of each risk;
- the description of action plans for dealing with risks and the evaluation of their effectiveness.

Numerous discussions have taken place between the Group Risk Division and the entities, with the aim of querying the relevance of risks and the soundness of the control actions undertaken.

Methods and tools: Several methodological documents and tools are made available to the entities to support risk and internal control approaches:

- a risk analysis methodological guide and a software package (SIGR) to support entity risk maps;
- an internal control guide, a detailed self-assessment framework and a digital platform for sharing and summarising self-assessments.

Group risk mapping

On the basis of these reports, supplemented by a cross review with the Internal Audit Department, the EDF group Risk Department draws up the consolidated mapping of its major risks, including the overall assessment of internal control and providing Management and governance bodies with a consolidated and regularly updated view of the major risks and their level of control⁽⁴⁾. These documents are validated by the Risk Committee and are presented to the Board of Directors after examination by the Audit Committee.

The Risk Committee identifies within the Group risk mapping, a smaller set of "priority risks" selected as a result of their operational or strategic importance.

(1) The composition of the Group Executive Committee Commitments Committee is the same as that of the Executive Committee.

(2) European Market Infrastructure regulation (EMIR): European regulation on market infrastructures.

(3) Regulation on Wholesale Energy Market Integrity and Transparency (REMIT).

(4) Group risk mapping notably includes environmental risks and risks related to climate change (physical risks and transition risks). These risks are described in section 2.2 "Specific risks to which the Group is exposed"; the strategic response to the challenges of climate change is described in section 3.3.2 "EDF, a responsible company with regard to the environment".

2.1.2.2 The Group Ethics and Compliance program

The Group Ethics and Compliance Department implements the Group Ethics and Compliance programme on the basis of the following reference frameworks (see section 3.1 "EDF, a responsible company"):

- the Group Ethics and Compliance Policy (PECG), validated by the Executive Committee on 17 May 2016, which compiles the main rules that Managers must know, respect and ensure compliance within their entities, in strict accordance with the risks of these entities. The Group Ethics and Compliance Policy (PECG) is backed up by instruction notes and support guides designed to assist its deployment, including in particular monitoring the integrity of business relations, financial ethics, protection of personal data, the fight against fraud, the management of gifts and invitations and the prevention of conflicts of interest. The PECG is the supra-reference to the Group Ethics Charter and the ethics and compliance code of conduct, which can be updated according to new applicable regulations and is subject to audit;
- the Group Ethics Charter built around the Group's three values (Respect, Solidarity, Responsibility), which defines the requirements that should guide the actions and conduct of the Group employees on a daily basis. An updated version of the Charter, which dates from 2013, has been rolled out throughout the Group as of March 2019;
- the Code of Ethical Conduct and Compliance published on 1 June 2017 and set out in the internal regulations of the entities, which constitutes the Universal Registration Document for the prevention of corruption and applies to all employees (requirements of the Sapin II Law);
- the EDF group ethics and compliance whistleblowing system, which allows employees and external collaborators (temporary staff, employees of a service provider, etc.) or occasional employees (fixed-term contracts, apprentices, trainees, etc.) of the Group, to make a report in accordance with the "Sapin II" Law of 9 December 2016, relating to transparency, the fight against corruption and the modernisation of economic life. The same alert system is also made available to third parties for issues covered by the "Due Diligence" Act of 27 March 2017 relating to the due diligence obligations of parent companies and ordering companies;
- training and awareness-raising actions for executives, managers, employees, staff who are exposed to the risk of corruption and support for the network of Ethics and Compliance Officers (EOC) to carry out their missions.

2.1.2.3 Approval of commitments

The EDF group's Commitments policy sets the framework for commitment decisions in terms of steering, governance and control. This policy applies to all commitment projects, regardless of their amount, for all EDF entities and subsidiaries, excluding regulated subsidiaries while respecting the governance of listed companies.

Before each commitment decision, the proposed projects undergo a risk analysis according to a methodological reference framework made available to the entire Group. Strategic projects (beyond the thresholds defined in the Commitments policy) are reviewed by the Group Executive Committee Commitments Committee (CECEG).

Draft commitments are reviewed, where appropriate, by the Board of Directors as described in sections 4.2.2.3 "Powers and duties of the Board of Directors" and 4.2.2.8 "Activity of the Board of Directors in 2019".

Strategic disposal projects are investigated separately and supervised by the Disposals Committee to preserve confidentiality and responsiveness.

2.1.2.4 Reliability of financial information – internal accounting and financial controls

Organisation of financial risk management

The EDF group has organised its financial risk management around the following functions:

- **Performance Management, reporting:**
 - contributing to the management of the performance of the Group's entities by helping define the Group's performance plans and by challenging the measures implemented by the entities and business lines. For this purpose, the Finance Department implements a set of management indicators adapted to the economic model of each of the Group's activities;

- contributing to budget monitoring through general performance reviews in the departments and controlled subsidiaries;
- conducting portfolio reviews and economic and financial optimisation analyses;
- developing and disseminating financial management methods and processes, contributing to the dissemination of management culture within the Group;
- managing the management cycle processes, summarising them and suggesting decisions to management and subsidiaries;
- developing medium- and long-term financial trajectories.

- **Accountancy:**

- preparing EDF's financial statements and the Group's consolidated financial statements;
- ensuring accounting compliance through Group reference frameworks based on accounting standards and the chart of accounts;
- coordinating the Group's internal accounting and financial control system, in accordance with the system presented below.

- **Taxation:**

- ensuring the consistency of tax practices, the requirements of which are listed in the Group's Tax policy. The precise provisions in this area are discussed in section 3.3.1.2.3 "Tax transparency" of this document;
- ensuring the proper implementation of legal and declarative obligations, notably by monitoring the subject;
- ensuring the accounting follow-up of the deferred tax position and the periodic justification of the accounts;
- identifying and controlling the Group's tax risks.

- **Finance and Investments:**

- coordinating all the actions inherent in the Group's balance sheet and financial result, with the aim in particular of controlling the exposure of the Group's hedging assets, debt and the Group's overall balance sheet to financial risks;
- managing the investments and acquisitions and disposals as well as the listed or unlisted dedicated assets, The Group Risk Department prepares an annual risk mandate and specific working frameworks which define the principles for managing risks and the risk limits that are acceptable for this portfolio;
- appraising the investment projects presented to the Group Executive Committee Commitments Committee meetings to anticipate impacts and improve the reliability of the financial trajectories on the Group's balance sheet and profit and loss accounts, as defined by the Commitments policy;
- ensuring that the Group is financed in accordance with the Financing, Treasury and Financial Risk Management policy; verifying the proper application of the policy's principles (drafting of frameworks, methodology, monitoring of exposures, regular calculation of risk indicators and checking that risk limits are complied with). The positions of the trading room in charge of cash management are monitored by the Group Risk Management Department.

The policy on Financing, Treasury and Financial Risk Management requires all entities of the Group to continuously and systematically identify financial risks (in particular, liquidity, interest rates, foreign exchange and counterparty). The Group Risk Department exercises 2nd level control of these risks *via*:

- verification that the principles of the policy have been properly applied (preparing work management frameworks, methodology, monitoring exposures, regular calculation of risk indicators and checking compliance with risk limits);
- the control of positions in the trading room in charge of cash management. For these activities, a system of indicators and risk limits checked on a daily and a weekly basis is in place. The Markets Committee (a body that brings together the Finance and Investment Department and the Group Risk Department) checks and reviews on a quarterly basis, where necessary, requests for exemptions to the work management framework and requests for investment in new financial products.

The policy on the constitution, management and control of the financial risks involving Dedicated Assets of EDF SA applies to the portfolio of dedicated assets which are managed by the Financial Department. The Group Risk Department prepares an annual risk mandate and specific working frameworks which define the principles for managing risks and the risk limits that are acceptable for this portfolio.

Reference frameworks

The accounting standards used by the EDF group (the scope of the Group's consolidated financial statements are included in the appendix to the consolidated financial statements [see section 6 "Financial statements"]) comply with the international standards published by the International Accounting Standards Board ("IASB") approved by the European Union and applicable as at 31 December 2019. These international standards include the IAS (International Accounting Standards), IFRS (International Financial Reporting Standards) and the SIC and IFRIC interpretations. The accounting rules and methods are specified in the Group's accounting principles manual and summarised in the notes to the consolidated financial statements.

The principles applicable to the preparation and reporting to the Group's Finance Department are defined in the Accounting and Financial Reporting policy. The specific internal control provisions are described in the Group guideline entitled "Accounting and Financial Internal Control", and the control objectives to be implemented in the entities are specified and updated each year in the Group's Internal Control Guide. The Finance Management Directors of the Departments of the Business Lines and Subsidiaries sit on the Management Committee of the entities to which they belong. With the exception of the operators of regulated infrastructure, they are appointed and evaluated jointly by operational management and the management of the Management Control function. A network of correspondents from the operational Departments and subsidiaries facilitates dissemination of the instructions and harmonised implementation throughout the various Group entities.

Each EDF operational and functional Director makes a commitment each year with regard to the quality of the Internal Control system in the Accounting and Financial areas, the improvement goals for the coming period and the truthfulness and exhaustiveness of the accounting information for which they are responsible by preparing a commitment letter sent to the Group Accounting and Tax Director. In return, each Director receives a letter of appreciation of accounting and tax quality from the Group's Accounting and Tax Director based on the various elements of assessment (results of internal controls, indicators of the accounting quality dashboard, letter certifying the compliance of the CSP2C accounts, specific actions) to highlight the progress made and determine the improvement actions to be undertaken or continued. An indicator reference framework is used within EDF. It makes it possible to measure areas of conformity of the accounting information for each process. With regard to subsidiaries, each legal entity is responsible for the implementation of the Group's Accounting and Financial Internal Control Directive.

Procedures for preparing and controlling the consolidated financial statements

The consolidated financial statements are prepared by the Consolidation Department of the Consolidation Accounting Division on the basis of data entered locally by each entity (parent company entities and subsidiaries) in accordance with Group standards and closing instructions, following a single chart of accounts. The scope of consolidation is closed after noting all companies of significance that are controlled, jointly-controlled or under significant influence. The non-significant nature of entities for which EDF holds an interest and which might fall within the scope of consolidation is examined regularly and submitted annually for the assessment of the Statutory Auditors.

The half-year consolidated financial statements are presented to the Audit Committee and then approved by the Board of Directors. The annual consolidated financial statements are reviewed by the Audit Committee, then closed at 31 December of the fiscal year by the Board of Directors and lastly approved by the Shareholders' Meeting.

Each half-yearly and annual closing gives rise to the preparation of instructions specifying the main deliverables expected from each party involved in the publication of the financial statements as well as the preparation of the management report and the Universal Registration Document (URD) for the annual financial statements. Meetings with EDF departments and the subsidiaries facilitate the preparation of these financial statements and make it possible to anticipate changes with regard to certain treatments thereby increasing the reliability of the accounting and financial information published. An analysis of the conditions of preparation (compliance with deadlines, quality of information, etc.) after the event allows for regular improvement of the consolidated financial statements preparation and analysis process.

Monthly reporting of information on the balance sheet accounts and the income statement can anticipate the processing of complex operations and contribute to making the results more reliable.

Forecasts and management acts are implemented using a single reference framework and tools shared between accounting and management. This system contributes to

the coherence of Group management and facilitates dialogue at all levels of the organisation and helps promote exchange of information between actors and the quality of the information produced.

Procedures for preparing and auditing the corporate financial statements

The corporate financial statements are prepared annually and semi-annually by the Parent Company Financial Statements Department of the Accounting Consolidation Division. The annual corporate financial statements are closed on 31 December of the fiscal year, approved by the Board of Directors of EDF and then approved by the Shareholders' Meeting.

The condensed half-year corporate financial statements are closed on 30 June of the fiscal year by the Board of Directors. EDF's transactional accounting (excluding the Nuclear Fuel Division, the Insular Energy Systems Division, the Decommissioning and Waste Projects Division and the Executive Talents Training Managers Department for the payroll accounting aspect) is entrusted to the Shared Accounting and Consulting Services Center (CSP2C) of the Tertiary Services Department, which also handles the transactional accounting for certain French subsidiaries. The processing of transactional accounting is organised by process. "Governance pacts" set the respective responsibilities of the Operational and Functional Departments, of the shared "Accounting" services centre or, where applicable, the accounting operators in the operational business lines and the Accounting Consolidation Division.

Meetings are organised on a quarterly basis with the EDF departments to prepare the financial statements and anticipate changes with regard to certain treatments to increase the reliability of the accounting and financial information published.

2.1.2.5 Crisis management and business continuity

Natural disasters (floods, landslides, earthquakes, etc.), significant climatic variations (droughts, etc.) or any other event the scope of which is difficult to predict (pandemic, major industrial accident in the world, etc.) could affect the Group's activities; this was the case with the storms Klaus (2009), Xynthia (2010), Amelie (2019) in metropolitan France, or Irma (2017) in the West Indies, or with episodes of extreme cold (winter 2017) or heat waves (summer 2019). In the event of an exceptional incident, the measures adopted may generate costs beyond those of repairing the damage caused by the disaster and the loss of earnings from the interruption of the goods and services provided by the Group. For example, the coronavirus epidemic that appeared in China in December 2019 might affect the health of employees and service providers, the Group's operations and projects, as well as its financial position (see section 2.2.6 below).

To meet this risk, EDF has defined a crisis management policy that takes into account the Group's territorial presence and the importance of the Group's electricity business in the economy. This crisis-management and business-continuity policy defines the organisation principles and specifies the entire system necessary to its implementation. This policy consists in particular of:

- making sure of the existence of organisations for crisis management and permanent systems for raising alerts;
- checking the existence and regular update of relevant crisis-management procedures, with regard to the risks involved;
- defining, for periods of crisis, coordination procedures with all stakeholders;
- ensuring feedback from crises and crisis exercises is systematically applied in order to avoid or reduce the consequences of similar crises;
- checking the existence of business continuity plans within each entity;
- checking the implementation of professional development actions for all players in the crisis.

A crisis exercise programme allows these mechanisms to be tested in terms of their effectiveness and overall consistency. In 2019, the crisis management organisation was strengthened on the cyber crisis side, notably with the creation of an EDF CERT and the setting up of a specific cyber crisis unit.

2.1.2.6 Insurance

In order to protect its assets and limit the impact of certain events on its financial position, the EDF group has dedicated insurance programmes that cover its major risks in terms of property damage, civil liability and insurance of persons. Nuclear risks are subject to the specific civil liability regime described below.

Organisation

The Group Insurance Division is responsible, while respecting the management independence of the regulated infrastructure operators, for preparing the insurance policy of the EDF group and organising its implementation throughout the Group, in order to continuously optimise the overall costs of its insurable risks ⁽¹⁾.

Its duties are to:

- continuously analyse cover for the EDF group's risks in conjunction with the Group Risk Department: analysis by business line, entity and project;
- establish rules for the Group's entire scope that enable covering all risks that can and must be covered, as well as optimising the total cost thereof and managing volatility;
- promote and apply these rules to all Group entities, using appropriate means and in compliance with governance rules;
- develop and monitor the tools necessary to perform the above tasks, including within the subsidiaries reporting to the Insurance Division: EDF Assurances and the Group's captive insurance companies.

The Insurance Managers of entities and controlled subsidiaries that join the Group's programmes are responsible for:

- ensuring that all risks are insured;
- scheduling prevention inspections and overseeing implementation of the resulting recommendations;
- reviewing cover strategies and amounts declared (risk quantification);
- analysing losses and participating in claims handling.

This work, carried out in close collaboration with the Group Insurance Division, makes it possible to continuously improve the quality of information on insurable risks as programmes are renewed and prevention visits are carried out (assessment of maximum possible claims, "SMP"). In connection with prevention actions, the Insurance Division establishes and oversees implementation of the site inspections programmes.

Framatome's inclusion into the Group's insurance programmes continues with a view to improving the coverage offered and achieving financial synergies. This integration concerns in particular General Liability and Civil Liability insurance for Corporate Officers, Damage insurance (excluding nuclear property), and Cyber risk insurance. Integration into the Nuclear Operator's Civil Liability and associated transport group programme will take effect at the next renewal of the contract on 18 February 2020.

Group Insurance Policies

Purpose: the Insurance policy, validated by the Executive Committee in January 2017, specifies the risks that the Group decides to transfer to the market and the general principles for optimising these transfers: mass purchasing through the implementation of Group insurance programmes, sharing between traditional markets and other types of cover (specialised mutual insurance companies, transfer to the financial markets, etc.), individual and Group deductibles (generally, only large-scale risks are transferred) and optimisation of intermediation expenses.

Implementation methods: since 2004, an update on the situation and costs of covering EDF's risks through insurance or the transfer of risks to the financial markets has been presented to the Audit Committee. The Audit Committee therefore receives regular updates on insurance and a review of the insurability of Group risks.

Since 2011, a Strategic Insurance Policy Committee ("COSA"), currently chaired by the Finance and Investments Director, provides an opportunity for the business lines and the Finance Department to reflect on changes to and procedures for implementing the Insurance policy, in particular the main characteristics of the programmes.

The Group Insurance Division and the Group Risk Department produce an annual analysis of the risk mapping at Group level, supplemented by the insurance coverage system in place. Based on this shared view, EDF is in a position to improve, and, where necessary, extend the coverage of insurable risks in accordance with the principles established by the Group in this area.

The goal of the Group's insurance programmes is to integrate the controlled subsidiaries as broadly as possible, in order to homogenise risk coverage and

streamline its management, on the one hand, and to control the corresponding insurance costs, on the other hand.

In accordance with the principle of independence of management of the regulated subsidiaries, RTE is not included in the Group's insurance programmes.⁽²⁾

Insurance contracts, according to market practice, include exclusions, limits and sub-limits.

Use of captive insurance companies and mutual insurance companies

Like all major French and international groups, EDF uses captive insurance companies and mutual insurance companies to supplement coverage provided by the traditional insurance markets.

The EDF's captive insurance companies are:

- Wagram Insurance Company DAC, an insurance company founded in 2003 in Dublin, which is involved in the majority of the Group's insurance programmes;
- Océane Re, a reinsurance company established in 2003 in Luxembourg, to reinsure EDF's nuclear civil liability.

It should be noted that Framatome has had a reinsurance company (Tereco) in Luxembourg since 21 December 2018.

Furthermore, EDF is a member of the Oil Insurance Limited (OIL) mutual insurance company in order to deal with the risks of damage (excluding overhead networks) to the property owned by the Group or under concession (EDF and its consolidated subsidiaries). OIL is an insurance mutual company which provides its members with cover for property damage. The scope covered includes inter alia nuclear power plants (the conventional portion), fossil fuel-fired power plants, hydropower facilities, network substations and exploration and production assets.

The Group's damage insurance programmes combine this cover provided by OIL and covers provided by market insurers.

The EDF group is also a member of the European Liability Insurance for the Nuclear Industry (ELINI), the European Mutual Association for Nuclear Insurance (EMANI), the Nuclear Industry Reinsurance Association (NIRA) and Blue Re, which are mutual insurance companies that manage cover in this field for European nuclear power operators.

The captive and mutual insurance companies enable EDF to reduce the total amount of premiums paid and, more generally, the cost of its insurance schemes.

Civil liability insurance (not including nuclear civil liability)

EDF has taken out a general civil liability insurance program covering EDF, Enedis and their controlled subsidiaries against the financial consequences of civil liability, excluding nuclear damage, that may be incurred by the entities in the course of their activities due to damage caused to third parties. In particular, this programme covers the risks of civil liability associated with the operation of structures (hydroelectric dams, fossil fuel-fired power plants, substations and other network facilities), risks associated with development of the Group's renewable energy activities (wind, solar, etc.), as well as risks associated with environmental damage (emissions of solid, liquid or gaseous substances).

This cover is purchased to the extent of available capacity under acceptable financial terms on the insurance and reinsurance markets. Maximum cover is €1 billion. Under this programme, the share of risk retained by the Group with regard to an insurable accident ("retention"), including the share of Wagram Insurance company DAC and Océane Re, does not exceed €10 million per insurable accident. Subsidiaries generally opt for lower deductibles that are more consistent with their financial capacity.

Civil liability insurance for corporate officers

EDF holds civil liability insurance covering corporate officers and directors of EDF, Enedis and their controlled subsidiaries against the financial consequences of their civil liability incurred in performing their management functions.

(1) Risks that can be transferred to the insurance markets and the alternative markets.

(2) Exit effective since 31/03/2015.

Damage insurance (excluding nuclear assets)

Conventional damage programme

The scope of the conventional damage programme includes almost all subsidiaries of EDF, notably Enedis, EDF Energy, Edison and Dalkia.

Wagram Insurance Company DAC, the Group's captive insurance company, together with other insurers and reinsurers, provide extensions of cover (property damage and business interruption) in addition to the covers provided by OIL, bringing the maximum up to €1 billion.

Under this conventional damage programme, the Group's retention per claim, including the deductible (which varies by subsidiary) and the share of the risk retained by Wagram Insurance Company DAC and by Océane Re, does not exceed €15 million.

This programme provides cover for business interruption for most subsidiaries in the event of property damage, but not for EDF, which does not benefit from this cover. The actions and measures implemented to prevent industrial and environmental risks and limit their effects are described in particular in section 2.1.2 "Focus on the 2nd line of control: cross-functional control systems".

Cover for "construction" risks

EDF has taken out insurance policies covering specific construction risks (construction all-risk and erection/testing all-risk policies). These policies are not included in any Group programme but are purchased on an *ad hoc* basis for major construction projects such as the EPRs of Flamanville and Hinkley Point C, the construction of combined cycle power plants, dams, etc.

These covers are specifically monitored and are renegotiated if unforeseen events occur during the construction projects.

Storm coverage

In connection with the renewal of the storm insurance coverage, Enedis signed with Swiss Re on 27 June 2016 a parametric insurance contract covering the aerial transmission network against the consequences of exceptional storms.

With a term of five years and total cover of €275 million, this innovative insurance contract triggers, in the event of a claim, parametric compensation based on a composite index for wind speeds recorded by Météo-France stations weighted by the vulnerability of the distribution network in each region of the Enedis concession area.

The overhead networks of the Island Energy Systems, for their part, do not benefit from "property damage" coverage, except within a radius of 1000 m around the production units. Damage to these networks could have an adverse impact on the Group's financial position in the absence of insurance cover or if cover is inadequate. In addition, renewing or taking out these specific covers may be difficult or costlier due to the impact, frequency and magnitude of natural disasters experienced in recent years.

Cyber risk cover

Since 1 July 2017, cyber risk cover has been put in place. The €100 million coverage policy underwritten for two years covers all EDF SA entities and the subsidiaries of the Group. This coverage was renewed on 1 July 2019.

Its purpose is to cover the expenses incurred to handle major disruptions caused by a cyber-attack against the Group's information systems.

Specific insurance for nuclear facility operations

Civil liability of nuclear facility operators

In France, EDF's current insurance policies are in compliance with French Act no. 68-943 of 30 October 1968, Act no. 90-488 of 16 June 1990, and Act no. 2006-686 of 13 June 2006 (known as the "TSN" Act), now codified in the French Environmental Code and which codified the civil liability obligations imposed on nuclear facility operators by the Paris Convention (see section 1.5.3.2 "Specific regulations applicable to basic nuclear facilities").

The French Law on Energy Transition for Green Growth enacted on 17 August 2015 subsequently amended the provisions of Articles L. 597-28 and L. 597-32 of the French Environmental Code and, in particular, the limits on the civil liability of nuclear operators which, since 18 February 2016, were brought to €700 million for nuclear installations (€70 million for low-risk installations) and €80 million for risks during transport.

In order to comply with the new statutory ceilings, EDF issued a tender notice on 10 August 2015 entitled "EDF SA Nuclear Liability Insurance Programme" to obtain

and set up appropriate insurance coverage for nuclear civil liability and related claims management.

The insurance coverage obtained following this invitation to tender allows the Group to meet the new obligations while controlling their financial impact. The insurance is shared between the nuclear insurance market (AXA, reinsured by the French nuclear pool Assuratome), the Group's captive insurance companies, and the nuclear mutual insurance company ELINI.

This coverage, which took effect on 18 February 2016, was renewed for a period of three years on 18 February 2019. In view of the likely evolution of the obligations imposed on the operator during the period (notably the entry into force of the Protocols amending the Paris and Brussels Conventions) (see section 1.5.3.2 "Specific regulations applicable to basic nuclear facilities"), clauses allowing an exit from the contract have been included.

On 18 February 2019, all the operations and tools for claims management were entrusted to EQUAD, a company with a high-performance IT tool as well as the necessary human resources and network.

In the United Kingdom, where EDF Energy operates nuclear power plants, the nuclear operator's civil liability rules are similar to French rules. The UK Parliament approved on 4 May 2016 the "Nuclear Installations Order" (order transposing the above-mentioned amending Protocols of February 2004), which makes substantially the same changes as the French TSN Act in 2006 but which, for the most part, shall enter into force only in conjunction with the Protocols.

This Order will raise the British operators' obligations from the current limit of £140 million to the equivalent of €700 million, and they will be progressively increased over a five-year period to reach a cap of €1.2 billion.

EDF Energy is currently insured by ELINI and Wagram Insurance Company DAC. The reinsurance company Océane Re shares in this risk under the reinsurance contract it issues for the benefit of Wagram Insurance Company DAC.

For further information on the legislation concerning nuclear operators' civil liability, see section 1.5.3.2 "Specific regulations applicable to basic nuclear facilities".

Civil liability for transport of nuclear substances

Under the Paris Convention, the operator that is the "shipper" is civilly liable for transport of nuclear substances (unless stipulated otherwise). Since 18 February 2016, the liability ceiling has been set at €80 million with an unchanged scope of damage (see section 1.5.3.2 "Specific regulations applicable to basic nuclear installations"), and will subsequently be extended to a broader scope of damage admissible for compensation when the revised Paris Convention comes into force. This liability is as of now covered by the aforementioned nuclear operator civil liability policy.

Damage to nuclear facilities

The cover obtained through EDF's membership in the OIL mutual insurance company provides protection against material damage in cold areas, excluding the consequences of a nuclear accident, of 60% of \$400 million in excess of a deductible of \$15 million, both in France and the United Kingdom.

Until 30 September 2018, in addition to that coverage, physical damage (including following a nuclear accident) to EDF's nuclear plants in France and EDF Energy's nuclear plants in the United Kingdom, and nuclear decontamination costs, were covered by a common insurance policy principally involving the British atomic pool National Risk Insurers (NRI), Axa and Allianz (reinsured by the French nuclear pool Assuratome), and the European Mutual Association for Nuclear Insurance (EMANI), for a total capacity of €1,760 million above an amount of €240 million.

As from 1 October 2018:

- in France, the protection provided by OIL is supplemented, for the consequences of a nuclear accident, including the cost of decontaminating the site, by an insurance coverage of €90 million in excess of a deductible of €10 million using the EMANI nuclear mutual insurance company, Axa and Allianz (reinsured by Assuratome), and Wagram Insurance Company DAC (reinsured by Océane Re);
- in the United Kingdom, protection is supplemented for the consequences of a nuclear accident, including site decontamination costs, by an insurance programme with a total capacity of €1,510 million, exceeding an amount of €240 million provided by the EMANI nuclear mutual insurance company, the British nuclear pool NRI and Northcourt, which includes specialised British insurers.

2. Risk factors and control framework

Risks to which the Group is exposed

Furthermore, EDF Inc. is a member of NEIL (Nuclear Electric Insurance Limited) – a mutual nuclear insurance company in the United States, so as to cover the activities of CENG (Constellation Energy Nuclear Group) in the United States.

Premiums

The total amount of Group insurance premiums for all types of cover was €236 million in 2019.

2.1.3 Focus on the 3rd line of control: the Group's audit unit

The Group's audit unit is composed of all of the audit resources of the Group exercising an internal audit activity. Pursuant to a decision of the Chairman and CEO this function is supervised by the Group Audit Director. It includes the Internal Audit Department ("IAD" reporting to the General Secretary) and audit teams specific to each of the main French and foreign subsidiaries. The relationship between the IAD and the various audit teams and their respective prerogatives take into account whether the teams belong to EDF or Enedis, for which the relationships are adapted to ensure compliance with the principle of management independence. The IAD carries out functional supervision of the business line (co-appointment and peer assessment of Audit Directors of the subsidiaries by the IAD – excluding Enedis –, exchanging best practices, training, sharing tools and methods, etc.). At the end of 2019, the Group audit unit consisted of 70 FTE ⁽¹⁾.

Operating standards for EDF and controlled subsidiaries

The IAD applies the international standards defined by the Institute of Internal Auditors and monitors their compliance.

The missions, powers and responsibilities of the auditors as well as the rights and duties of the audited parties are defined in a charter that was issued in July 2019. It sets out the fundamental principles governing audits, the procedures for drawing up the programme, the types of assurance assignments entrusted to it, and the duties of the audited parties and auditors. It includes a code of ethics applicable to the entire sector. This Code is intended to promote a culture of ethics and serves to reiterate that the auditor must comply with and apply certain basic principles relevant to the profession and the conducting of internal audits.

The Internal Audit Department has direct access to the Chairman and Chief Executive Officer; it reports on assignments to the Audit Committee, which gives an opinion on the risk-based internal audit universe, reviews the performance of audits and verifies the adequacy of the workload and resources dedicated to internal audits.

Auditors are trained in the same methodology, in line with international standards and are evaluated at the end of each mission.

The IAD's processes for all activities (from the definition of the audit programme to the monitoring of action plans) are outlined and steered.

The audit unit regularly submits voluntarily to evaluation by IFACI ⁽²⁾. The last evaluation of 2018 stated, as previously, that the audit practices were compliant with the international standards of the profession.

Functioning procedures

The Group's audit unit conducts audits of the entities and controlled subsidiaries, Business Units, projects and cross-functional functions. These audits include a review of the robustness of internal control and are carried out every three to five years depending on their level of significance. The IAD conducts corporate cross-functional audits, whereas the Audit Departments of the subsidiaries only conduct audits within their scope. The IAD is the only entity competent to carry out audits of BUs/projects involving a corporate level risk.

The audit program is drawn up on the basis of the Group's priority risk universe; all Group BUs, projects and processes must be audited on a regular basis.

All audits give rise to recommendations which, once validated by the audited parties and their management, become the subject of action plans drafted by the aforementioned management and audited parties. These action plans are sent for opinion to the IAD, which subsequently monitors them, starting no later than six months after the audit report is circulated.

A half-yearly summary report recaps the main findings of the corporate audit and the follow-up of action plans. The half-yearly report also presents the results of the audit programme, the satisfaction of the audited parties, the activity of the sector as well as an assessment of skills and the budget. Furthermore, it identifies any recurring or generic problems observed in several audits and which merit special attention. Finally, it provides an audit-based view of the Group's level of risk control. This report is presented to the Chairman and Chief Executive Officer, the Executive Committee, and then to the Audit Committee and the Board of Directors.

2.1.4 External controls

Like all listed companies, the EDF group is subject to review by the AMF. As a company majority owned by the French State, EDF is also subject to control by the *Cour des Comptes* (French Court of Auditors), State Controllers, the Inspectorate of Finance, Economic Affairs Committees or *ad hoc* Committees of inquiry of the French National Assembly and Senate.

According to law, the Statutory Auditors certify the annual financial statements (statutory and consolidated financial statements) and perform a limited review of the Group's half-yearly condensed consolidated financial statements. Their report includes the verifications on the information on corporate governance required by the Articles L. 225-237-3 *et seq.* of the French Commercial Code (*Code de commerce*).

In the light of its activity, EDF is also subject to control, in France, by the Energy Regulation Commission (CRE) and the French Nuclear Safety Authority (ASN).

2.2 Risks to which the Group is exposed

The Group operates in a fast-changing environment that entails numerous risks of various kinds: they may be strategic or operational; some are exogenous, others are endogenous and inherent to the Group's business lines. Their consequences may be manifold and may affect the Group's operating results, the Group's financial position and its ability to finance its strategy or development, affect its internal or external stakeholders or environment, or impact its reputation.

The Group describes hereinafter the specific risks to which it considers itself exposed. The principle of specificity leads us to describe in this section only those risks for which the specificity of the EDF group is a key factor. For risks that are not specific to the Group, the absence of a risk description in this section does not exclude the Group from taking the risk into account.

Risks are divided into five categories, described in sections 2.2.1 to 2.2.5 respectively.

Section 2.2.1 "Market regulation, political and legal risks" describes the risks related to changes in public policy and regulation in the countries and territories where the Group operates, as well as the legal risks to which the Group is exposed.

Section 2.2.2 "Financial and market risks" describes the risks arising from exposure to the energy markets in which the Group operates, as well as risks related to changes in the financial markets and the reliability of related information.

Section 2.2.3 "Group transformation and strategic risks" describes the risks related to the Group's ability to adapt, particularly in terms of strategy and skills, in response to the needs for transformation brought about by climate change, new competition, and technological and societal changes.

(1) Full-Time Equivalent.

(2) Institut français de l'audit et du contrôle interne (French Institute of Audit and Internal Control).

Section 2.2.4 "Operating performance" describes the risks related to the control of the Group's operating activities across its various industrial activities and projects, including EPR, services and sales.

Section 2.2.5 "Risks specific to nuclear activities" supplements section 2.2.4 for the Group's nuclear-related activities, which entails additional risk factors and special provisions, particularly in view of the primary requirements of nuclear safety and the very long-term capital-intensive nature of nuclear activity.

The risks are outlined in detail in each of the relevant sections for their respective category. They are numbered to make it easier to connect the table with the graph and the detailed descriptions that follow.

In addition to the risks specific to the EDF group listed below, the impacts of the Coronavirus crisis are described in section 2.2.6.

All the risks identified in this document have been selected because they are significant in terms of the materiality of their estimated impact on the Group. In addition, they are prioritised based on a qualitative assessment of their criticality, taking into account simultaneously the significance of the potential impact for the Group, the probability of their occurrence and the level of control, in light of the

actions undertaken. This prioritisation produces a three-level scale for all risks: the criticality can be considered strong, intermediate or moderate. The categories are not ranked among themselves.

As a general rule, the scope of exposure is France, Belgium, Italy, the United Kingdom and all countries in which the Group is present. Where the scope of exposure is more restrictive, it is specified in the table and in the risk description.

Exposure to risk may vary according to duration. The potential impact of these risks may produce effects at very different time horizons, ranging from very short term (less than a year), to medium term (up to a few years) to very long term (up to several decades or more, given the nature of the relevant industrial activities which may span centuries).

In order to control risks, measures have been put in place. Some measures apply to all risks: internal control, commitment approval process (see section 2.1); others are specific to each risk.

Additional provisions for taking into account certain risks related to Corporate Social Responsibility are set out in chapter 3. Cross-references shall, where appropriate, be specified in the risk description.

EDF GROUP'S SPECIFIC RISKS

1.	Market regulation, political and legal risks	2.	Financial and market risks	4.	Operational performance
<ul style="list-style-type: none"> • 1A – Public policy developments in France and Europe • 1B – Evolution of the regulatory framework (ARENH, TRV, environmental regulations and SNBC) • 1C – Evolution of the regulatory framework for hydraulic concessions *** 		<ul style="list-style-type: none"> • 2A – Interest rate risk 		<ul style="list-style-type: none"> • 4A – Management of large and complex industrial projects (including EPR projects) 	
<ul style="list-style-type: none"> • 1D – Evolution of the regulatory framework for electricity distribution concessions *** 		<ul style="list-style-type: none"> • 2B – Financial markets risk • 2C – Energy market risk 		<ul style="list-style-type: none"> • 4B – Hydraulic safety risks • 4C – Occupational health or safety violations (employees and service providers) • 4D – Attacks against assets, including cyberattacks • 4E – Operational continuity of supply chains and contractual relationships 	
<ul style="list-style-type: none"> • 1E – Ethics or Compliance Violations • 1F – Legal Litigation Risk • 1G – Increased cost caused by energy savings certificates * • 1H – Insufficient compensation for missions of general interest * 		3.		4F – Blackout risk	
		Group transformation and strategic risks		4G – Industrial safety and impact on environmental assets, including biodiversity	
		<ul style="list-style-type: none"> • 3A – Transformation capacity in the face of disruptions • 3B – Adaptation to climate change: physical and transition risks 		5.	
		<ul style="list-style-type: none"> • 3C – Adaptation of employees' skills • 3D – Ability to ensure long-term social commitments 		Specific risks related to nuclear activities	
Criticality				<ul style="list-style-type: none"> • 5A – Failure to comply with the operating objectives and/or in terms of extending the operating life of nuclear power plants (France and United Kingdom) ** • 5B – Control of radioactive waste treatment and decommissioning of nuclear facilities, and ability to meet related commitments ** 	
<ul style="list-style-type: none"> • Strong 				<ul style="list-style-type: none"> • 5C – Nuclear safety risks during operation resulting from nuclear civil liability ** • 5D – Control of the fuel cycle ** 	
<ul style="list-style-type: none"> • Intermediary 					
<ul style="list-style-type: none"> • Moderate 					

Main exhibition perimeter, France, Europe and International, with specific mentions.

* France

** France and United Kingdom

*** France and Italy

2. Risk factors and control framework

Risks to which the Group is exposed

2.2.1 Market regulation, political and legal risks

1A: Public policy developments in France and Europe.

Changes in public energy policies and the political framework of market regulation in the countries where the Group operates, such as the energy-climate act or the Multi-year Energy Programme (PPE) in France, or the "green deal" in Europe, are likely to lead to profound changes in the Group's governance or business portfolio. These could hinder the Group's development in relation to its competitors or undermine its ability to meet its commitment to climate protection.

Criticality in view of the control actions undertaken: Strong.

On 25 January 2019, the French Government presented a draft Multi-year Energy Programme (PPE) which sets out the trajectory for the next 10 years in terms of energy policy, and therefore ecological transition (see section 1.5.1.2 "Public service in France").

In particular, in this context:

- the French Government has confirmed the objective of diversifying the electricity mix and reducing nuclear power to 50% of electricity production in France by 2035: to reduce nuclear power to 50% of the energy mix, 14 reactors could be shut down by 2035 (including the two at Fessenheim). This would represent a quarter of the reactors currently operating in France. The final version of the Multi-year Energy Programme (PPE) will indicate the criteria for identifying the sites of the reactors to be closed, which will serve as a basis for EDF's proposal. It will ultimately be up to the government to identify which sites have priority;
- it could therefore be decided to shut down one or more reactors in the EDF fleet prematurely, not as a result of an industrial choice but as a result of the application of the Multi-year Energy Programme (PPE). Such decisions should lead to EDF being compensated for the harm suffered, as reiterated by the French Constitutional Council in a decision of 13 August 2015;
- in this respect, with regard to the Fessenheim nuclear power plant, on 30 September 2019, EDF sent the Minister responsible for ecological and solidarity transition and the Nuclear Safety Authority a request for the repeal of the operation and the declaration of permanent shutdown of the two reactors of the Fessenheim nuclear power plant, providing for the shutdown of reactor no. 1 on 22 February 2020 and reactor no. 2 on 30 June of the same year. The submission of this request and declaration follows the signing, on 27 September 2019, by the French State and EDF, of the protocol governing the State's indemnification of EDF for the early closure of the Fessenheim power plant.

The energy-climate act was enacted on 8 November 2019. The act specifies the key points of the energy and ecological transition policy in France and updates the objectives set by the energy transition act for green growth (see section 1.5.1.2 "Public service in France").

In particular:

- in terms of energy mix, the law ratifies the postponement to 2035 of the deadline for reducing the share of nuclear power in electricity production to 50%, thus providing a legal framework for the Multi-year Energy Programme (PPE) project mentioned above. The act also calls for a 40% reduction in fossil energy consumption compared to 2012 by 2030 (compared to 30% previously), as well as carbon neutrality in 2050, by dividing emissions by a factor of more than 6;
- it sets up a scheme to limit from 1 January 2022 the level of CO₂ emissions from installations generating electricity from fossil fuels, with the aim of closing down coal-fired power stations by 2022;
- it introduces a revision of the Arenh system allowing the French government to increase by decree the maximum overall volume of electricity that EDF can assign to alternative suppliers from 100 to 150TWh ("ARENH ceiling") as of 1 January 2020. The Act also authorises the French government to revise the price of Arenh, without establishing a direct link between price increases and increases in the ceiling. However, the French government had not implemented these possibilities by the end of 2019;
- it also specifies the procedure concerning the Strategic Business Plan (PSE), which will have to cover both periods of the Multi-year Energy Programme (PPE), be made public (with the exception of information relating to business secrecy), and present the accompanying measures put in place for employees as a result of the closure of nuclear or thermal power stations. In the event that the Strategic

Business Plan (PSE) is incompatible with the Multi-year Energy Programme (PPE), the act provides for a formal notice followed, if necessary, by sanctions.

The European legal framework, which notably organises the liberalisation of the energy sector and climate and energy policies, underwent significant changes in 2019 with the finalisation of the Clean Energy Package and is likely to evolve in the future, in particular through the "Green deal", a flagship mechanism of the new European Commission likely to include key provisions for the energy sector in general and the EDF group in particular.

The Green Deal, according to the presentation made by the President of the European Commission to the European Parliament in December 2019, sets out the climate neutrality target for the EU by 2050, and includes measures such as:

- the revision of the EU Emissions Trading Scheme (EU-ETS) within the EU and a carbon floor price to bring about a meaningful and predictable price for CO₂;
- the introduction of a "carbon tax" (carbon inclusion mechanism) along the borders of the EU;
- the revision of the Energy Taxation Directive, which should lead to preferential tax treatment for low-carbon solutions such as CO₂-free electricity or hydrogen.

Developments relating to the European taxonomy for Sustainable Finance should also be taken into account. A key element in guiding investments is their consistency with the objective of long-term carbon neutrality. There is a risk that nuclear power could be excluded from the taxonomy, which would be detrimental to the fight against climate change.

These developments could be unfavourable to the Group and could adversely affect its ability to meet its commitment to climate protection.

In particular, they could result in additional costs, not be in line with the Group's development objectives, change the competitive environment in which the Group operates, change the level of regulated tariffs or affect the profitability of current or future production units or any of the Group's other activities. In general, the legislative and regulatory framework put in place in France, in Europe or in the countries where EDF is present is likely to have a significant impact on the Group's results or its business model.

Moreover, in terms of the governance or delimitation of its scope of activity that may be enforced, EDF could be affected by a limitation or loss of control of certain strategic and operational decisions that could have a negative impact on the outlook and profitability of its various activities (see section 1.5 "Legislative and regulatory environment"). At the same time, EDF may continue, in its capacity as shareholder, to bear certain risks, potential liabilities towards third parties and factors that may affect the profitability of assets. Finally, the competent authorities or certain States could, in order to preserve or promote competition on certain energy markets, take decisions that are contrary to the Group's economic or financial interests or that impact its integrated operator model.

Finally, in the renewable energies field, EDF relies primarily on its EDF Renewables subsidiary (see section 1.4.1.5.4 "EDF Renewables"), which does business in numerous countries. The profitability of these developments often depends on the support and tendering policies implemented in the different countries. The Group cannot guarantee that these policies will not change in some of these countries in ways that will be detrimental to the profitability of investments.

1B: Evolution of the regulatory framework (ARENH, TRV, environmental regulations and SNBC).

A significant portion of the Group's revenues comes from regulated activities. Thus, any change in regulated sales tariffs, the ARENH or the Tariffs for Using the Public Transmission and Distribution Networks (TURPE), or any change in the regulation of greenhouse gas emissions, would be likely to affect the Group's profitability and its ability to meet the challenges of energy transition by developing low-carbon energy solutions for the protection of the climate.

Criticality in view of the control actions undertaken: Strong.

In France, a significant portion of the EDF group's revenues is based on regulated tariffs set by public authorities or regulatory authorities (Regulated Sales Tariffs – TRVE, Tariffs for Using the Public Transmission and Distribution Networks – TURPE). The law on the New Organisation of the Electricity Market (NOME law or *nouvelle organisation du marché de l'électricité*) has also introduced the Regulated Access to Electricity from the Existing Nuclear Fleet (ARENH), for the benefit of EDF's competing electricity suppliers (See section 1.5 "Legislative and regulatory environment").

Within the framework of the Energy and Climate Act, several provisions have been taken concerning regulated sales tariffs or the ARENH:

- the provisions concerning the ARENH: they are described in §1A above (Developments in public policies in France and Europe);
- the reduced scope of sites eligible for the Regulated Sales Tariffs (TRVE): as of 1 January 2021, only domestic end consumers, including sole proprietors and co-owners' associations of a single residential building; and non-domestic end consumers employing fewer than ten people and having annual sales, revenue or balance sheet total not exceeding €2 million may benefit from the TRVE for their sites with a subscribed power less than or equal to 36kVA.

In addition, the Multi-Year Energy Programme (PPE) stipulates that "the government will propose the terms of a new regulation for existing nuclear power that will make it possible to guarantee consumer protection against market price increases beyond 2025 by giving them the competitive advantage linked to the investment made in the historic nuclear fleet, while giving EDF the financial capacity to ensure the economic sustainability of the generation facilities to meet the needs of the Multi-Year Energy Programme in low price scenarios".

In order to achieve this objective, the French government plans to introduce economic regulation requiring EDF to provide a general economic interest service (SGE) covering consumer and climate protection for the benefit of all French consumers in a transparent and non-discriminatory manner. With this in mind, in January 2020, the government launched a call for contributions from market players and stakeholders on the fundamental findings that led to this economic regulation project, as well as on its proposed construction and operating principles.

Any modification of the ARENH system (volume ceiling, prices) or its replacement by a new system is the responsibility of the French government or the legislator and requires prior in-depth discussions with the European Commission, which means that there is a great deal of uncertainty about what changes will ultimately be implemented and the associated deadlines.

In this context, the risks are as follows:

- with regard to the existing ARENH system:
 - Risk of an increase in the ARENH volume without sufficient changes in price;
 - In addition, the optional nature of the mechanism gives suppliers opportunities for arbitrage between the ARENH mechanism and the markets to the detriment of EDF, and exposes EDF to major uncertainties that have a negative impact on the effectiveness of its energy market risk management (see section 2.2.2C "Energy market risks") with no corresponding consideration since the option is free of charge.
- with regard to the mechanism envisaged to replace the ARENH: risk that the price level will be insufficient to ensure a fair return on EDF's nuclear generation assets in France;
- risk of disputes by stakeholders concerning Regulated Sales Tariffs (TRVE).

More generally, in France as in other countries, the Group cannot guarantee that the ARENH, regulated sales tariffs, Tariffs for Using the Public Transmission and Distribution Networks (TURPE) or local tariff regulations will be set at levels that enable it to preserve its short-, medium- and long-term investment capacity and its proprietary interest, by ensuring a fair return on the capital invested by the Group in its generation, service, transmission and distribution assets.

There is also a risk, which could be brought about by inadequate regulation, that CO₂ prices may be too low and not allow sufficient development of low-carbon energy solutions, at the expense of an effective transition in favour of the fight against climate change. This may represent a loss of opportunity to promote the Group's low-carbon energy solutions and call into question the Group's ability to achieve corporate responsibility objective no.1, committed to climate action (see section 3.2.1.1.1 "EDF group's ambition").

1C: Evolution of the regulatory framework for hydraulic concessions.

The Group sometimes carries out its hydropower generation activities under public service concessions and does not always own the assets it operates. Changes in the regulatory framework, particularly with respect to the renewal of concessions, changes in the specifications of concessions and the conditions of implementation could have an impact on the Group's results.

Criticality in view of the control actions undertaken: Strong.

In France, hydropower facilities are operated under concessions granted by the French State for facilities with a capacity of 4.5MW or more and under authorisations by the Prefecture for facilities of less than 4.5MW (see Section 1.5.3.3 "Regulations applicable to hydropower and other renewable energy facilities"). The challenges associated with the renewal of hydraulic concessions in France are specified in section 1.4.1.5.1.4 "Hydropower generation issues".

The EDF group cannot guarantee that each of the concessions that it currently operates will be renewed, or that any concession will be renewed under the same financial terms and conditions as the initial concession. Furthermore, the Group cannot guarantee that the compensation paid by the government in the event of early termination of a concession's operation will fully compensate the Group's consequent loss of revenue, or that future regulations regarding the limitation of fees will not change in a way that could negatively affect the Group. These factors could have an adverse impact on its activities and financial position.

The Group also operates under hydroelectric power generation concessions in other countries where it operates, notably in Italy. Depending on the conditions in each country, these concessions may not be continued or may not be renewed in its favour with changes to the financial terms and conditions of the concession specifications, which would have an adverse impact on the Group's activities and financial position.

1D: Evolution of the regulatory framework for electricity distribution concessions.

The Group conducts its distribution activities under public service concessions and does not own most of the assets it operates. Changes in the regulatory framework, in concession specifications and implementation conditions could have an impact on the Group's results.

Criticality in view of the control actions undertaken: Intermediate.

In France, Enedis does not own all the assets that make up the distribution network, which by law (with the exception of the source stations) is owned by the local authorities. This is why Enedis must also enter into public electricity distribution concession contracts with these local authorities (see section 1.4.4.2.2 "Distribution activities"), which grant it, within the limits of contractual stipulations, the exclusive right to carry out the tasks of developing and operating the public electricity distribution system. These public electricity distribution concession agreements, generally concluded for a period of between 25 and 30 years, are tripartite contracts between the licensing authority, the distribution system operator and the supplier at the regulated rates. Under the law, only Enedis and Local Distribution Companies (LDC) in their service areas (and EDF for areas not connected to the continental metropolitan network) may be appointed to operate the public energy distribution networks and only EDF and LDCs in their service areas may be appointed to provide the supply at the regulated rates. Therefore, at this time, when a concession agreement is renewed, Enedis and EDF do not compete with other operators. This is the legal basis for the current process of renewing concession contracts with all of the authorities in charge of organising electricity distribution, based on a new contract template drawn up in December 2017 by the FNCCR (Fédération nationale des collectivités concédantes et régies – National Federation of Licensing Authorities), France Urbaine, EDF and Enedis. However, the Group cannot guarantee that such provisions will not be modified in the future by legislation (see section 1.5.1.3 "Concession contracts for the distribution and supply of electricity in France"). Furthermore, the Group may not obtain the renewal of these contracts under the same financial terms and conditions.

1E: Ethics or Compliance Violations.

The EDF group has implemented a robust Ethics and Compliance program to address the risks of prohibited and unethical practices in the conduct of business by employees or third parties.

Criticality in view of the control actions undertaken: Moderate.

The globalisation of the Group's activities and the strengthening of regulatory frameworks repressing unethical practices especially in the conduct of business could expose the Group, its employees, or third parties acting on the Group's behalf to criminal and civil sanctions that could adversely affect EDF's reputation.

In France, Act no. 2016-1691 of 9 December 2016 on transparency, the fight against corruption and the modernisation of economic life requires companies to take measures to prevent and identify acts of corruption or trading in influence, under the control of a French Anti-Corruption Agency established under the Act and under penalty of administrative or criminal penalties. This law includes a system to protect whistleblowers from possible criminal or disciplinary proceedings and provides, for companies, an internal warning system (see section 1.5.3 "Regulations applicable to EDF group facilities and activities"). These regulations could increase compliance costs. Moreover, any failure to comply in any way with these regulations could lead to prosecutions being brought against EDF, which could have a negative impact on the Group's result and reputation.

The Group has thus implemented all the necessary measures to ensure that its practices comply with the regulations in force. Reporting to the General Secretariat, the Group Ethics and Compliance Department (DECG) is responsible for disseminating knowledge of, and compliance with, the Group's ethical values, as well as the main regulations to which the Group is subject by virtue of its activity and geographical locations, in order to prevent the risk of sanctions. It federates and controls the Group compliance activities and aims to defend and promote the Group's culture of integrity, for the benefit of its image and reputation. It reports to the Executive Committee and the Governance and Corporate Responsibility Committee of the Board of Directors.

1F: Legal Litigation Risk.

Proceedings or litigation could have a significant financial or reputational impact on the Group.

Criticality in view of the control actions undertaken: Moderate.

In the course of its day to day activities, the EDF group is involved in litigation, whose development or outcome could have a material adverse effect on EDF's results or financial position.

In particular, due to its position in certain markets, the EDF group is subject, in France, to proceedings initiated by its competitors or by administrative authorities. The claims made against EDF may be significant and could lead to the payment of compensation or fine or even the issuance of injunctions that could have an impact on some of its activities. For example, in proceedings before the competition authorities in France or the European Commission, fines can amount to up to 10% of the consolidated revenues of the company concerned (or of the group to which it belongs, as the case may be). The EDF group may also be involved in litigation proceedings relating to commercial disputes with significant stakes, the outcome of which is by nature unpredictable.

The EDF group believes that it complies in general and in all countries where it carries on its activities with all specific regulations in force, and in particular those relating to the conditions for carrying on its nuclear activities, but it cannot prejudge on this point the assessment of the supervisory, administrative or judicial authorities to which the matter is referred. These risks are the subject of particular vigilance and the implementation of prevention policies (contractual policies, compliance policies, etc.). A procedure is in place for reporting to the Group's Legal Department on significant actual or potential disputes or other litigation and investigations.

The main procedures in which EDF is involved are described in note 50 of the appendix to the consolidated financial statements and in section 7.1.5 "Litigation".

1G: Increased cost caused by energy savings certificates.

Changes to regulations concerning energy savings certificates (ESC) could impose additional obligations on EDF and generate costs in relation thereto.

Criticality in view of the control actions undertaken: Moderate.

In France, the energy savings certificates (ESC) measure, which is set out in Articles L. 221-1 *et seq.* of the French Energy Code, imposes energy savings obligations on energy sellers. It sets a multi-year savings target and financial penalties for non-compliance. The Energy Transition for Green Growth Act of 17 August 2015 amended the ESC scheme as from the third period (2015-2017) of the scheme by adding to the original obligation a supplementary scheme for energy savings for households in situations of fuel poverty. Decree no. 2017-690 of 2 May 2017 set the overall level of obligations for the fourth period (2018-2020), with a doubling of objectives compared to the third period. On 9 October 2019, the French government announced the implementation of the extension of the fourth period until 2021, at the same annual bond rate, as confirmed by Decree no. 2019-1320 of 9 December 2019 (see section 1.5.3 "Regulations applicable to EDF group facilities and activities").

The doubling of the bond, in a market where the activation of new energy-saving deposits generating Energy Saving Certificates takes time and is subject to increased competition between obligors, has led to considerable pressure, resulting in particular in a significant increase in the price paid for trading Energy Saving Certificates over-the-counter. The latter has levelled off relatively well since the beginning of 2019 under the combined effect of the Government's "stimulus package" and the one-year extension of the fourth period. However, as these operations have yet to be completed, there is still a risk that the objective will not be achieved by the end of the period, which may therefore lead to deterioration in the Group's financial position. Such deficit situations would also be likely to call into question the climate protection commitment set out in corporate responsibility objective no. 1 (and the ambition to ensure that each customer consumes more responsibly set out in corporate responsibility, objective no. 4 (ORE 1 and ORE 4 see section 3.2.1.1 "EDF, a company committed to climate issues (CSR Goal (CSRG) no. 1)" and section 3.2.2 "EDF, a company standing shoulder to shoulder its customers (CSR goal (CSRG) no. 4)").

1H: Insufficient compensation for missions of general interest.

EDF is responsible for certain general interest missions, in particular public service missions, the costs of which are covered by mechanisms that might not fully compensate for the additional costs incurred in connection with these obligations, or which might be called into question.

Criticality in view of the control actions undertaken: Moderate.

The public service contract entered into by the French government and EDF on 24 October 2005 specifies the objectives and terms for performing the public service obligations that EDF is appointed to perform under law (in particular Articles L. 121-1 *et seq.* of the French Energy Code), and also sets out the mechanisms under which EDF is compensated for the performance of these obligations (see section 1.5.1.2 "Public service in France" and section 1.5.2.1.2 "French legislation: Energy Code – Contribution to the Public Electricity Service (CSPE)"). The forecast amount of energy public service charges to be offset in France in 2020 for EDF amounts to €7,793.6 million, according to the decision of the French Energy Regulatory Commission (Commission de régulation de l'énergie) of 11 July 2019 concerning the assessment of energy public service charges for 2020 (€6,875.4 million in charges excluding financial expenses and before schedule; -€19.1 million in financial expenses and €937.4 million adjustment under the recovery schedule). The amounts of public service charges are set out in the Finance Act of 28 December 2019 for 2020.

The development of renewable energies connected directly to the distribution network may, in certain regions, saturate the reception capacities of the source substations and networks. This situation may possibly generate local imbalances, or disputes if Enedis must disconnect certain producers or connect them with significant delays. New investments may be required in these regions, with the risk that the costs associated therewith may not be taken into account.

More generally, EDF cannot ensure that the compensation mechanisms provided for by the legal and regulatory provisions applicable to it in connection with the performance of these public service missions will fully compensate for the associated additional costs incurred. Furthermore, EDF cannot guarantee that these compensation mechanisms will never be subject to change or that existing mechanisms will fully cover potential additional costs that may be incurred in relation with new duties imposed on EDF in connection with its public service obligations, in particular when a new public service contract is negotiated.

The occurrence of any of these events may have an adverse impact on EDF's activities and financial position. Such situations could also call into question the Group's ability to meet its ambition to help fragile populations set out in corporate responsibility objective no. 3 (see section 3.3.1.1.3 "Energy poverty (CSRG no. 3)").

2.2.2 Financial and market risks

The EDF group, through its varied activities, is exposed to numerous financial and market risks. This section describes these various risks by addressing interest rate risk, financial market risk, energy market risk, foreign exchange risk, counterparty risk and liquidity risk. All of these risks could affect the Group's ability to finance its investments. Financial and market risks are also discussed in the activity report (section 5) and the appendices to the financial statements.

2A – Interest rate risk.

The Group is exposed to risks related to changes in interest rates in the various countries in which it operates. These rates depend partly on the decisions of the central banks.

Criticality in view of the control actions undertaken: Strong.

I. Risk of falling interest rates

Lower interest rate fluctuations could affect the Group's economic indebtedness, due to changes in the value of the Group's fixed-rate financial assets and liabilities, as well as its discounted liabilities. The discount rates for pension and other specific employee benefit commitments (see note 34 of the appendix to the consolidated financial statements for the year ended 31 December 2019) and the Group's long-term nuclear commitments (see note 32 of the appendix to the consolidated financial statements for the year ended 31 December 2019) are directly or indirectly linked to interest rates over different time horizons.

For the specific case of nuclear provisions in France, given the decline in rates over the past few years, the discount rate could be reduced over the next few years by applying the method used by the Group, in accordance with regulation on the ceiling discount rate. The magnitude of this decline will depend on future interest rate and regulatory developments. An increase in nuclear provisions due to a decrease of the discount rate may require allocations to the dedicated assets and may result in an adverse effect on the Group's results, cash flow generation and net debt.

With regards to the regulations on the ceiling discount rate, the order dated 29 December 2017 establishes the statutory discount rate ceiling.

As the case may be, this increase in provisions, including those covered by dedicated assets, does not mean however a mechanical impact on the amount to be allocated to dedicated assets as of the considered dates, as the former depends on:

- the return on dedicated assets and the resulting hedge rate;
- the period within which the allocation is made, as applicable rules provide for the option to set a maximum time period to proceed with the allocation, subject to approval by the Supervisory Authority.

In a letter dated 12 February 2020, the French Minister for Energy and the French Minister for the Economy informed EDF that they had decided to amend certain regulatory provisions regarding the securing of the financing of nuclear expenses.

- the regulatory ceiling of the discount rate will be expressed in real value and formulated as the ultimate forward rate applicable on the date in question (Ultimate Forward Rate) and published by the European Insurance and Occupational Pensions Authority, increased by one hundred and fifty basis points.

This change will take place gradually and linearly over 5 years from 1 January 2020, starting from a real rate value of 2.3%;

- the obligation to endow assets between 100 and 110% coverage rate to offset the impact of changes in assumptions on provisions will be eliminated, and the threshold above which withdrawals can be made will be raised from 110% to 120%. The current obligation under the financial statements at 31 December 2018 (€797 million) will nevertheless continue to apply. No allocation is expected for the year 2019;
- the time-limit for the administrative authority to take the necessary measures in the event of insufficient coverage will be extended from 3 to 5 years as from the accounting date on which the insufficient coverage is booked.

As a reminder, changes in estimates of nuclear provisions resulting from a change in the discount rate are booked (see note 1.3 and note 32.1 to the consolidated financial statements for the year ended 31 December 2019 in chapter 6 of this Universal Registration Document):

- as an increase or decrease of the corresponding assets, within the limit of their net book value, when the counterparty to the provision has been initially recorded as an asset;
- as financial income for the period in other cases.

Therefore, any change of the discount rate therefore has a punctual impact on the financial results of the year during which the discount rate change occurred, without equivalence for the following years.

The fall in interest rates since 2014 has had a negative impact on the Group's financial position due to the obligation to allocate to dedicated hedging assets in order to offset, under certain conditions, the effects of the fall in the discount rate on nuclear provisions. Without the decrease in interest rates and the associated discount rate, allocations to hedging assets between 2014 and the end of 2019 would have been reduced by €2,021 million, all other things being equal.

Overall, a 1% decrease in interest rates would have the following impacts:

- (i) An impact on pre-tax income of approximately -€580 million for nuclear liabilities, as a result of the impact of this rate cut on the corresponding nuclear discount rate;
- (ii) An impact on pre-tax income of approximately -€180 million for provisions for employee benefits in France, as a result of the impact of this rate cut on the corresponding discount rate.

In total, the sensitivity of pre-tax income is approximately -€760 million for a 1% drop in interest rates.

II. Risk of higher interest rates

Upward variations in interest rates could affect the Group's ability to obtain financing on optimal terms, or even its ability to refinance itself if the markets were very strained, this being the risk related to changes in flows linked to variable-rate financial assets and liabilities. Financial securities and derivatives held by the Group, as well as debts issued, may pay or receive coupons directly indexed to variable interest rates.

Thus, a 1% increase in interest rates would have an effect of approximately -€180 million, due to the increase in coupons linked to the debt issued by the Group.

These unfavorable impacts related to a rise in interest rates are in principle more than offset by the favorable impacts related to a rise in interest rates in connection with long-term commitments (see previous point), so that the net sensitivity of pre-tax income is approximately +€580 million for a 1% rise in interest rates.

2B – Financial markets risk.

As a result of its activities, the EDF group is exposed to risks related to the financial markets, in particular equity risk.

Criticality in view of the control actions undertaken: Intermediate.

The Group is exposed to equity risk on securities held primarily as dedicated assets constituted to cover the cost of long-term commitments in relation with the nuclear business, in connection with outsourced pension funds and, to a lesser extent, in connection with its cash assets and investments held directly by the Group (see section 5.1.6.1.5 "Management of equity risks" and 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio").

2. Risk factors and control framework

Risks to which the Group is exposed

2C – Energy market risk.

In order to sell its output, the Group is exposed, directly or indirectly, to the prices of the European wholesale energy markets and capacity markets, the levels of which impact its financial position.

Criticality in view of the control actions undertaken: Intermediate.

In conducting its production and marketing activities, the Group does business in energy markets, primarily in Europe. As such, the Group is exposed to changes in wholesale market prices: electricity – energy prices and prices of capacity guarantees for the countries concerned -, gas, coal, petroleum products, CO₂ emission quotas (see section 5.1.2 “Economic factors” for information on recent changes in these prices). A connexion exists between these markets: a fall in the prices of gas, coal, oil products or CO₂ leads to a fall in electricity prices. In view of the dominant position of nuclear generation in the EDF fleet, which requires neither gas nor coal and does not emit CO₂, the fall in the price of these commodities therefore has a very limited positive impact for the Group compared to the negative impact of the resulting drop in electricity prices.

Various factors, over which the Group has no control, influence these price levels: commodity prices on world markets, the balance between supply and demand, but also pricing and tax policies or subsidies allocated to certain means of production. As a result, these markets can experience significant and unpredictable price increases and decreases, as well as liquidity crises.

This exposure thus impacts the Group’s revenue and all of its financial indicators. In particular, persistently low electricity prices may affect the profitability of the Group’s generating units and, more broadly, the value of its assets, as well as the conditions for their maintenance, their life expectancy and any renewal projects.

In France, the degree of exposure to market prices for electricity depends on the level of sales under the ARENH system currently applicable until the end of 2025, which in turn depends on the level of market prices and potential regulatory changes:

- this means that exposure is at its maximum when no optional ARENH volume is subscribed and is then estimated at around 75% of EDF’s generation under the terms of the ARENH mechanism in force at the beginning of 2020: As a result, EDF is highly exposed to falls in wholesale electricity market prices when their total level (energy + capacity) is below the ARENH price (currently €42/MWh) for the year of delivery in question;
- conversely, the positive impact of wholesale electricity market price increases is limited when their total level (energy + capacity) is above the ARENH price (currently 42 €/MWh) and the ARENH subscription is maximum;
- in addition, the energy-climate act, passed in 2019, provides that the French government may, by decree, raise the “ARENH ceiling”, currently set at 100TWh, to 150TWh (see risk 1A – Public policy developments in France and Europe). If this development were implemented, with or without an increase in the price of the ARENH, it would further reduce EDF’s ability to benefit from wholesale market prices for electricity when their total level (energy + capacity) is above the ARENH price.

The risks related to possible changes in the ARENH system are described in Risk 1B (Changes in the regulatory framework). The Group manages its exposure to energy markets through a specific energy market risk policy, which is essentially aimed at gradually reducing uncertainties regarding the level of its financial results in the coming years (see section 5.1.6.2 “Management and control of energy market risks” for more detailed information on the associated principles and organisations). This policy serves to mitigate the impact of price changes but cannot be used to negate them: the Group remains subject to the structural trends of upward or downward movements in these markets (see note 43 “Market and counterparty risk management” of the appendix to the consolidated financial statements for the year ended 31 December 2019).

In addition, a Group REMIT Directive defines the expectations for ensuring that Group entities comply with the European regulation on the transparency and integrity of wholesale energy markets (see section 1.5.2.3 “Regulation on wholesale energy markets”).

2D – Exchange rate risk.

Due to the diversity of its activities and their geographical distribution, the Group is exposed to the risks of fluctuations in foreign exchange rates, which may impact currency translation adjustments, balance sheet items and the Group’s financial expenses, equity and financial position.

Criticality in view of the control actions undertaken: Moderate.

As the Group is involved in long-term contracts, an unfavourable currency fluctuation could have consequences on project profitability. In the absence of hedging, currency fluctuations between the euro and the currencies of the various international markets in which the Group operates can therefore significantly affect the Group’s results and make it difficult to compare performance levels from year to year. If the euro appreciates (or depreciates) against another currency, the euro value of the assets, liabilities, income and expenses initially recognised in that other currency will decline (or increase). Moreover, insofar as the Group is likely to incur expenses in a currency other than that in which the corresponding sales are made, fluctuations in exchange rates could result in an increase in expenses, expressed as a percentage of turnover, which could affect the Group’s profitability and income (see section 5.1.6.1.3 “Management of foreign exchange risk”).

An adverse fluctuation of 10% in exchange rates related to currencies in which the EDF group’s debts are denominated (USD, GBP, other currencies) would have an impact amounting to around 2% on the EDF group’s indebtedness after hedging instruments.

2E- Counterparty risk.

Like all economic operators, the Group is exposed to possible default by certain counterparties (partners, subcontractors, service providers, suppliers or customers).

Criticality in view of the control actions undertaken: Moderate.

A default by these counterparties may impact the Group financially (loss of receivables, additional costs, in particular if EDF is required to find satisfactory alternatives or take over the relevant activities or pay contractual penalties). The risk may be hedged by the use of margin calls.

2F – Access to liquidity risk.

The Group must at all times have sufficient financial resources to finance its day-to-day business activities, the investments necessary for its expansion and the appropriations to the dedicated portfolio of assets covering long-term nuclear commitments, as well as to deal with any exceptional events that may arise.

Criticality in view of the control actions undertaken: Moderate.

The Group’s ability to raise new debt, refinance its existing indebtedness or, more generally, raise funds in financial markets, and the conditions that can be negotiated to this effect, depend on numerous factors including the rating of the Group’s entities by rating agencies. The Group’s debt is periodically rated by independent rating agencies (see section 5.1.6.1 “Management and control of financial risks”). Any downgrading of EDF’s debt rating could increase the cost of refinancing existing loans and have a negative impact on the Group’s ability to obtain financing. To meet liquidity needs, the Group has a significant cash reserve. Hybrid emissions may be considered, and could lead to a change in the Group’s financial statements, particularly in the event of changes in accounting standards.

2.2.3 Group transformation and strategic risks

3A – Transformation capacity in the face of disruptions.

The Group's development strategy, changes in the scope of activities and synergies within the integrated Group, risk not being implemented in accordance with the objectives defined by the Group, even though it faces increased competition on European energy markets, particularly on the French electricity market, which is its main market.

Criticality in view of the control actions undertaken: Strong.

In France, since 1 July 2007, the electricity market has been totally open to competition. All EDF customers can select their electricity supplier (see section 1.4.2.1 "Presentation of the market in France"). In a context of escalating competitive intensity (new customer expectations, new regulations, emergence of new players, mergers between existing operators, changes in market prices, etc.), these changes, at constant consumption and price levels, have had and may have in the future a negative impact on the Group's sales in France. EDF must therefore adjust its marketing expenses; insufficient adjustment could have a negative impact on its profitability.

Elsewhere in Europe, the Group faces different situations, depending on the local competitive conditions (totally or partially open markets, position of competitors, regulations, etc.). The type of competition faced by the Group, the evolution over time of such competition and its effect on the Group's activities and results vary from one country to another. These factors depend in particular on the market depth and its regulations in the country in question and on other factors over which the Group has no control.

In this context, particularly following the development of low-carbon electricity uses and energy services and energy efficiency, the Group may not be able to defend its market share or gain market shares as expected, or it may see its margins decrease, which would have an adverse effect on its activities, its strategy and its financial position.

In addition, the Group, in line with corporate responsibility objective no. 1 aimed at protecting the climate, (see section 3.2.1.1 "EDF, a company committed to climate issues (CSRG no. 1)"), and objective no. 4, (see section 3.2.2 "EDF, a company standing shoulder to shoulder its customers (CSRG no. 4)") intends to continue its development as a high-performance and responsible electricity company, championing low-carbon growth in France, in its core countries in Europe (United Kingdom, Italy, Belgium) and in the other countries where the Group operates in accordance with the CAP2030 strategy. This strategy combines the search for growth drivers with the promotion of existing assets. The strategy and drivers of the Group's transformation are described in section 1.3 "Group Strategy".

Weak synergy in the deployment of the Group's integrated model, particularly upstream/downstream or in the enhancement of the complementarity of the divisions and the diversity of the solutions deployed by the Group, (see section 1.4 "Description of the Group's activities"), could lead to an increase in risks related to physical and market contingencies, and to a loss of gross margin, to the detriment of customers, subsidiaries and the Group's performance. In addition, insufficient emphasis on geographic diversification, or on the diversification and complementarity of the low-carbon industrial solutions offered by the Group, or a reduction in the cross-functional synergies deployed within the integrated Group could lead to a reduction in the Group's ability to deal with the seasonal nature of the electricity generation and sales business, the diversity of local expectations and the proximity of its customers and stakeholders, and the efficiency and therefore the competitiveness of the low-carbon industrial solutions implemented.

The Group is implementing development, adaptation and reorganisation programmes and performance plans in order to give itself the means to carry out its strategy. These programmes may be complemented by a strategic analysis of assets which may itself lead to a requirement for additional financial agility, giving rise to disposals or acquisitions.

Focused primarily on its customers and stakeholders, the Group intends to develop and consolidate its offer of integrated service solutions, in particular energy efficiency services, its offer of low-carbon and decentralised power generation solutions, and its offer of diffuse storage solutions, in a sustainable development approach and in close

proximity to customers and local communities. This transformation may not be sufficient or rapid enough in the face of technological and societal changes and strong competition.

The Solar Plan, the Electric Storage Plan and the Electric Mobility Plan are three major levers for developing and expanding the range of low-carbon energy solutions offered by the Group in addition to the industrial solutions already widely available within the Group, particularly wind, hydro and nuclear power.

Even in the event of protective contractual arrangements, the Group cannot guarantee that these various projects relating to its offer or to the various low-carbon industrial solutions deployed to meet them can be implemented according to the forecast schedules and under satisfactory economic, financial, regulatory, partnership or legal conditions or that they will ensure a long-term response to the needs expressed by our customers and stakeholders and the expected profitability at the outset, which could have a negative impact on the Group's financial position, its commitment to the fight against climate change, and its reputation.

Nuclear costs and changes in these costs (new nuclear projects, major "Grand carénage" refurbishment projects, etc.) and the Group's ability to finance them could force the Group to reconsider the rate at which it deploys its strategy.

To achieve its strategic transformation objectives, the adaptation programs implemented by the Group rely largely on individual and collective employee mobilisation. However, this mobilisation may not be sufficient due to an industrial relations environment which has deteriorated as a result of the changes linked to these adaptations affecting in particular the Group's organisation, or linked to more general developments (pension reforms in particular).

3B – Adaptation to climate change: physical and transition risks.

The Group is exposed to physical effects of climate change that could have consequences on its own industrial and tertiary facilities and more generally on the Group's financial position. The societal, technological and economic context may not be favourable to the Group's low-carbon solutions for the transition to address climate change challenges.

Criticality in view of the control actions undertaken: Strong.

Physical risks

EDF group facilities are closely linked to water, wind and solar resources; the overall reliability of the power system depends on the resilience to climatic conditions of generation facilities and distribution and transmission network infrastructures. As a result of this sensitivity to climatic conditions, the EDF group's activities are likely to be significantly affected by the physical effects of climate change, both in terms of chronic effects and an increase in the frequency and intensity of extreme climatic events. To address these risks, the Group's operating entities must regularly update their climate change adaptation plans, based whenever possible on IPCC scenarios, in order to review the measures taken and to be taken. In addition, periodic reviews are carried out on nuclear and hydraulic installations, incorporating both feedback and climate change projections; this is a key cornerstone of the robustness of the installations. Since the 1990s, the EDF group has been building up specific R&D expertise on climate change issues, invested in collaborative research projects to support these actions.

However, the effects of climate change present many uncertainties. Despite the actions taken by the EDF group, they could adversely affect the continuity of the Group's business, its operating results, its cash flows and more generally its operating performance.

Transition risks

The CAP 2030 strategic project reflects the Group's goal of being the "champion of low-carbon growth". Most of the Group's investments are oriented towards this low-carbon strategy. This strategy reinforces corporate responsibility objective no. 1 in favour of the climate (see section 3.2.1.1 "EDF, a company committed to climate issues (CSRG no. 1)"). In 2018, the Group had already made a commitment to significantly reduce its carbon dioxide emissions, with a target of 30 million tonnes in 2030 instead of 51 million tonnes in 2017 (40% reduction). EDF also confirms this goal in 2020 with the "Business Ambition for 1.5 degrees" initiative. EDF keeps stating its ambition of becoming carbon neutral by 2050 and makes new commitments in this regard to reduce its direct emissions by 50% by 2030 (scope 1) and to reduce its indirect emissions (scope 3).

2. Risk factors and control framework

Risks to which the Group is exposed

Achieving the objective of reducing emissions and, more generally, ensuring the success of the Group's low-carbon strategy depend primarily on the continued acceptance of nuclear energy by the public, the successful shutdown or adaptation of fossil fuel power plants and the accelerated development of renewable generation resources to complement nuclear and hydroelectric generation. The Group has been particularly active in the development of solar energy in France, electric storage and low-carbon electric mobility, which will make it possible to develop and promote the Group's low-carbon energy solutions, particularly for the transport sector, which still emits a very high level of carbon dioxide in France and Europe.

Thus, the EDF group's strategy and energy mix are fully in line with the public low-carbon transition policies, which give EDF the opportunity to enhance the value of all its investments and activities. Nevertheless, this opportunity could be stalled by the external, societal, competitive, social, economic, or industrial context. Nuclear energy may not be recognised at the societal level as a key factor in enabling the low-carbon transition. For example:

- the standards or taxonomies currently being set up to recognise carbon-free energy could include criteria that would effectively exclude nuclear energy. See in particular risk no. 1A above "Changes in public policies in France and Europe";
- In connection with the preparation of the 2019-2028 Multi-Year Energy Programme, the French government wished to review several scenarios between 2030 and 2050, "ranging from a 100% renewable scenario to one in which nuclear power remains a sustainable source of electricity generation integrated into the mix for reasons of production management and competitiveness".

In addition, new low-carbon energy solutions may induce new societal questions (new intrusive technologies, land rights-of-way, new conflicts related to the use of water or scarce resources, etc.). New legislative or regulatory changes brought about by climate change could also have a negative impact on EDF's business and lead to new legal or compliance risks. The Group may also have to deal with the emergence of new technologies or disruptive solutions that are part of the efforts to meet the transition objectives.

Such situations could make it more difficult to carry out these transformations and achieve the desired objectives. They could directly or indirectly affect the Group's business volumes, margins, asset value, financial position, reputation or prospects.

Risk summaries and mapping

In 2019, a summary on climate change and its impacts on EDF was presented to EDF's Scientific Council (see section 3.1.2.2.1). In addition, a Group-wide climate risk mapping of all physical and transition risks following the recommendations of the TCFD (Task Force for Climate Financial Disclosures, see section 3.2.1.1.6). Climate risks have been identified and assessed using the Group's general risk mapping method. This mapping of climate risks, based in particular on the adaptation plans of the operating entities and on the report to the Scientific Council, has led to an action plan mobilising the Group at both corporate and entity levels. It was examined by the Audit Committee. A detailed description of this risk mapping is given in the appendix to chapter 3.

3C – Adaptation of employees' skills.

Skill adaptation and development may be insufficient in view of the Group's transformation, business line requirements and new organisational and working methods.

Criticality in view of the control actions undertaken: Intermediate.

Human development represents corporate responsibility objective no.2 (see section 3.3.3.1 "EDF, a company with a responsible attitude to its employees"). The Group's scope of activity is evolving in a rapidly changing environment and context of energy and digital transition and, consequently, many new business lines are emerging and new working methods are being adopted (extended company, project platform operation, teleworking, etc.). The historical business lines are themselves undergoing dramatic change yet retaining their very high level of technicality, always with a similarly high requirement for a culture of safety and security, particularly in the hydropower and nuclear power sectors as well as for electricity networks. The human and socio-organisational dimension is a key factor in the Group's performance. The anticipation of emerging needs and requirements related to new business lines, the necessary functional and geographical adjustments required to facilitate the evolution of the scope of activity, induce adaptation and constant development of skills and

organisations. (see section 3.3.3.1.1 "Employee employability and enhancement of the internal social elevator" and section 3.3.3.1 "EDF, a company with a responsible attitude to its employees"). Obtaining qualifications or authorisations may require several years and sufficient coverage for the transfer of knowledge and experience. The rapid evolution of technology and, therefore, of the business lines, requires flexibility and an increased ability to adapt on both an individual and organisational level, as well as in terms of working methods and acquiring and transmitting individual and collective skills.

The EDF group considers the dynamic matching of skills to needs over time to be a major challenge and therefore implements the appropriate measures to facilitate change. However, it cannot guarantee that the measures taken will always be sufficient, timely or on satisfactory terms, which could have an impact on its business, financial position and reputation as an employer.

3D – Ability to ensure long-term social commitments.

The Group may be required to meet significant commitments related to pensions and other employee benefits.

Criticality in view of the control actions undertaken: Intermediate.

The pension plans applicable in the various countries in which the Group operates involve long-term commitments to pay benefits to the Group's employees (see note 34 of the appendix to the consolidated financial statements for the financial year ended 31 December 2019). In France, in addition to these pension commitments, the Group also owes obligations for post-employment benefits and long-term benefits for employees currently in service. The ongoing pension reform in France may have an impact on the Group's commitments.

To cover these commitments, the Group has set up outsourced funds or pension funds. At the end of 2019, depending on the case, assets only partially covered these commitments, although, for the Group, the maturity dates of the obligations are relatively smoothed over time. At 31 December 2019, the average duration of employee benefits commitments was 19.7 years in France and 19.5 years in the United Kingdom.

The amounts of these commitments, the provisions booked, the outsourced funds or pension funds set up and the additional contributions required to make up insufficient funding are calculated based on certain actuarial assumptions, including a discount rate subject to adjustment depending on market conditions and, in the event of any employee-related commitments in France, on the rules governing retirement benefits paid out by the general retirement scheme, and amounts owed by the Group. These assumptions and rules may be adjusted in the future, which could increase the Group's current commitments for pensions and other employee benefits and, therefore, require a corresponding increase in provisions.

Furthermore, if the value of outsourced funds or pension funds proves insufficient to meet the corresponding commitments, in particular in the United Kingdom or France, primarily due to calculation assumptions or developments in the financial markets, the Group may be obliged to make additional contributions to the relevant funds, which may have an adverse impact on its financial position.

2.2.4 Operational performance

The Group implements programmes aimed at continuously improving its operational performance, which determines its financial performance as well as the direct or indirect achievement of the corporate responsibility objectives defined in sections 3.2 and 3.3. The Group's ability to transform also depends on the achievement of operating results, and its reputation.

However, the Group cannot guarantee that the programmes it implements will have the expected results or that such results will be obtained within the planned timetable, nor that they will be sufficient to deal with technical or industrial contingencies or regulatory and economic developments.

Failure to achieve the expected operating results may therefore lead to a direct deterioration in the Group's financial position, reputation and ability to transform.

This section sets out the most significant risks likely to affect the control of the Group's operations and projects.

4A – Management of large and complex industrial projects (including EPR projects)

The Group carries out very large-scale projects. These projects represent a major risk for the Group in terms of the potential financial impact on its shareholders' equity and implications for its development strategy. In particular, the success of EPR projects depends on specific industrial, regulatory and financial factors.

Criticality in view of the control actions undertaken: Strong.

As part of its activity and in its capacity as project owner or prime contractor, the Group is called upon to carry out projects that are inherently complex, require significant investments and lengthy procedures for construction and regulatory approvals. A very large number of stakeholders can be involved. The implementation of certain projects may lead EDF to set up industrial and/or financial partnerships. Projects may also need to be connected to local development projects or may encounter difficulties with respect to local approval. The control of these projects falls within the scope of corporate responsibility goal no. 5, which consists of developing a worldwide process of dialogue and consultation for projects (see section 3.3.1.2.5 "Dialogue and consultation for projects (CSRG no. 5)"). In order to improve this control, the Group has embarked on an overhaul of its project management and has defined a "Commitments" policy that requires an analysis to be carried out of the risks and associated security issues.

Such projects may involve, in France or internationally, offshore facilities for new energies (off-shore wind power in France), the installation of new meters (Linky in France, handled by Enedis) on an entire distribution network concerning tens of millions of customers, in France or the United Kingdom, the implementation of hydraulic projects, or the implementation of large-scale nuclear investments over decades ("Grand Carénage", EPR projects and decommissioning projects, in particular).

These projects are large-scale and long-duration projects; they involve numerous industrial partners and significant investments, for which the financing and pricing conditions may still be subject to confirmation. Given the economic or institutional climate, obtaining such funding may be delayed.

The implementation of these projects may give rise to numerous technical, industrial, operational, economic, regulatory, environmental or acceptability risks that could jeopardize project schedules, associated costs or profitability. There may also be difficulties in terms of relationships with the partners involved with EDF in these projects. Trade tensions between the United States and China could have an impact on the conduct of some of these projects given the technologies and partnerships implemented.

In this regard, in October 2018, the US Department of Energy ("US DoE") issued a decision on civil nuclear cooperation with China which deals in particular with the transfer of US goods and technology, or goods and technology of US origin, to CGN, its subsidiaries and related entities. This decision concerns technologies relating to equipment within or directly attached to the vessel, core power control equipment and equipment that contains or is in direct contact with the primary fluid. On 14 August 2019, the United States Department of Commerce ("US DoC") issued a ruling placing four CGN Group entities on the list of entities subject to restrictions ("Entity List") concerning any transfer of goods and technology, in particular US dual-use goods and technology, or dual-use goods and technology of US origin (or including a certain percentage of US content) subject to the jurisdiction of the US DoC (export administration regulations: covering all goods and technology, in particular dual-use commercial goods and technology, other than those subject to the jurisdiction of the US DoE and the Nuclear Regulatory Agency). As a result of these decisions, the transfer of goods and technology to the entities in question for the technical scope covering them under the decisions, must be specifically authorised in advance by the competent US courts, with the presumption that such authorisation will be refused.

In addition, these projects require administrative authorisations, licenses or permits which may be subject to disputes, withdrawals or delays in obtaining them.

Such situations could, in particular in the event of non-compliance with the Group's contractual commitments or the Group's potential exposure in the event of major contingencies arising from the completion of these projects or the operation of these reactors, have a major impact on the Group's business, results, asset value, financial position, reputation and outlook.

The success of EPR projects determines the performance and reputation of the nuclear industrial sector, and through it, those of the Group.

The Flamanville 3 project is a major industrial, regulatory and financial challenge for the Group. In particular, meeting the timetable and cost objectives is still dependent on:

- implementing the action plan on the 53 welding seams to be reworked on the main secondary circuit piping, as well as those of the 8 crossings for which ASN has requested immediate repair. For these 8 welding seams, the preferred option of reworking by remotely-operated robots could run into difficulties, particularly in view of the innovative nature of this option;
- successfully completing the start-up tests still to be carried out and the transfer to the operator;
- obtaining the various authorisations which have yet to be issued by the ASN. In this context, as a precautionary measure, EDF submitted an application to amend the decree authorising its creation to the French Ministry for Ecological and Solidarity Transition on 11 March 2019 in order to extend the deadline for commissioning the reactor to April 2024;
- the emergence of any other risks or failures.

In view of these considerations, the provisional timetable for implementing the preferred option for the reworking of crossing weld seams would lead, if the objective of ASN validation is met, to a fuel loading date at the end of 2022 and to re-estimating the construction cost at €12.4 billion, *i.e.* an increase of €1.5 billion. However, the Group could face other potentially significant additional costs and delays, in particular if the preferred option could not be implemented and the fallback scenario studied by EDF and based on extraction and refurbishment in the auxiliary back-up buildings (see section 1.4.1.2.1 "Flamanville 3 EPR project") had to be used.

The construction cost to completion of €12.4 billion is expressed in 2015 euros and does not include interim financial interest. As this is a construction cost, it also does not include other elements necessary for the project such as spare parts for the subsequent operation of the plant.

The financial statements as at 31 December 2019 show in this respect (note 25.1 of the appendix to the consolidated financial statements as at 31/12/2019 – section 6.1 "Financial statements") that:

- the amount of interim interest amounts to €3,028 million;
- the spare parts inventory, pre-operating costs and other tangible assets related to the project amount to €1,033 million.

Furthermore, these amounts correspond to costs incurred as of 31 December 2019, and not to costs anticipated to be incurred as at the fuel loading date scheduled for the end of 2022.

Studies for the EPR 2 Project are underway in order to propose a competitive reactor with a view to renewing the existing nuclear fleet. Failure to meet the competitiveness target, the absence of an appropriate regulatory framework, the failure to obtain or delays in obtaining, the necessary permits to continue the reactor's development could have an impact on the Group's financial position (see section 1.4.1.2 "New Nuclear projects – EPR 2"). On 25 January 2019, the French government published the main guidelines of the Multi-year Energy Programme. In accordance with these guidelines, the government has asked EDF to prepare a file with the nuclear industry by mid-2021 relating to a programme of renewal of nuclear facilities in France.

In China, the Group has a 30% stake in TNPJVC (Taishan Nuclear Power Joint Venture Company Limited) alongside its Chinese partner CGN. Taishan 1 was the first EPR reactor to be coupled to the grid on 29 June 2018. It was commissioned on 13 December 2018. The Taishan 2 reactor became commercially operational on 7 September 2019. The feed-in tariff for the electricity generated by Taishan has been set at RMB 435/MWh (approximately €56/MWh) for up to 7,500 operating hours per year per reactor, with any surplus being sold at market price. This tariff, which is below EDF's expectations, will remain in force until the end of 2021. Efforts are still under way with the relevant Chinese authorities to determine its future development.

In the United Kingdom, control of the design and bringing the manufacturing and the major milestones of the construction site under control will determine the profitability of the Hinkley C project and the financing of any future projects in the United Kingdom. The Group has a 66.5% stake in the Hinkley Point C Project, alongside its Chinese partner CGN with 33.5% (see sections 1.4.1.2.2 "Other – New Nuclear projects" and section 1.4.5.1.2.4 "United Kingdom – Nuclear New Build Business"). In June 2019, the HPC project achieved milestone J-0 (completion of the unit 1 nuclear island common raft) as planned. Following this major milestone, a review of the costs, schedule and organisation of the HPC project concluded that the risk of delaying the delivery of units 1 and 2 as previously announced (15 and 9 months respectively) had increased, and that the construction cost to complete the project is

2. Risk factors and control framework

Risks to which the Group is exposed

now estimated between £₂₀₁₅21.5 billion and £₂₀₁₅22.5 billion, an increase of £₂₀₁₅1.9 billion to £₂₀₁₅2.9 billion compared to the previous estimate. The range depends on the effectiveness of action plans to be delivered in partnership with contractors. The additional costs are mainly the result of difficult soil conditions, which made the earthworks more expensive than expected, the revision of the objectives of the operational action plans, and the additional costs related to the implementation of the functional design of a "first of a kind" plant adapted to the British regulatory context.

Given the new cost to completion induced by these changes, the project's financing requirement will exceed the contractual commitment of the shareholders, which could lead to financing difficulties in the event of a shift in the shareholders' alignment. Due to its size and complexity, this project, like all similar projects, carries multiple risks of delays and additional costs.

The project's IRR is sensitive to the exchange rate and could decrease in the event of a significant fall in the pound sterling against the euro, notably as a result of Brexit. The way in which Brexit is implemented may have a more general impact on the conditions under which the project is carried out, in particular on customs duties, the movement of persons and trade in goods and services. Finally, the governance of the project could also be affected in the event of misalignment between shareholders. Changes to these different factors could have a significant impact on the Group's financial position.

EDF has also signed two other agreements with CGN relating to two nuclear construction projects in the United Kingdom: Sizewell C and Bradwell B (see section 1.4.5.1.2.4 "United Kingdom – Nuclear New Build Division"). EDF's ability to make a final investment decision on Sizewell C and to participate in the financing of this project beyond the development phase could depend on the operational control of the Hinkley Point C project, on the existence of an appropriate regulatory and financing framework, and on the availability of sufficient investors and financiers; such criteria are not met to date. With regard to the Bradwell B project, the assessment by the Office for Nuclear Regulation of the generic design of the UK HPR1000 (UK Hualong) reactor model is underway and the development of this technology at the Bradwell B site in the UK may be impacted by this process. The new environment created by Brexit may lead to a change in the profitability conditions of projects and to reassessing or even discouraging investors associated with the Group's future projects in the United Kingdom or Europe.

On 10 March 2018, the Chairman and Chief Executive Officer of EDF and the Chairman and Chief Executive Officer of NPCIL (Nuclear Power Corporation of India Limited), which already operates 22 reactors in India, signed an Industrial Way Forward Agreement for the construction of six EPR-type reactors at the Jaitapur site in India. Jaitapur is set to be the biggest nuclear project in the world, with a total power capacity of around 10GW. EDF submitted a non-binding offer on 14 December 2018. As part of this offer, EDF, in association with GE and its subsidiary Framatome, will be the engineering contractor for the entire project and supplier of the EPR technology. EDF will undertake all engineering studies and all component procurement activities for the first two reactors (see section 1.4.1.2.2 "Other New Nuclear projects" and section 1.4.5.3.6.2 "South-East and South Asia"). Discussions in view of the submission of a binding offer are being held with NPCIL on this basis.

A fundamental element for the success of an EPR project and for the operating safety of EPR reactors in which the Group is involved is accounting for the needs of the final operator, who is responsible for operating safety, from the beginning of the design phase and throughout the design and implementation of the EPR project.

Framatome is now a Group subsidiary and as such can expose the Group through its activities for other nuclear operators or customers in France and abroad. Exposure may be financial or involve the Group's reputation. Framatome's industrial performance remains strategic for EDF Nuclear Operator in France and the United Kingdom. The successful completion of an EPR project depends on quality and compliance with contractual clauses in Framatome's production of studies, components or services for each EPR Project.

The success and value creation resulting from Framatome's integration into the EDF group implies a converging framework for nuclear projects, and the development of resulting synergies. Failure to achieve these objectives could jeopardise the competitiveness of the nuclear sector in France and that of the Group in its international development, and the success of all EPR Projects.

Other issues and risks specific to nuclear activities, whether in terms of nuclear safety, control of operation and maintenance operations, long-term commitments or the fuel cycle, are specified in section 2.2.5 "Risks specific to nuclear activities".

4B – Hydraulic safety risks.

The hydroelectric facilities operated by the Group present risks with potentially serious consequences for people, property and the environment that could have a financial and reputational impact on the Group.

Criticality in view of the control actions undertaken: Intermediate.

The Group's hydraulic structures present specific risks with potentially very serious consequences: breakage, overflow during floods, operating manoeuvres. Hydropower safety comprises all the measures taken when designing and operating plants to reduce risks and hazards to people and property associated with water and the presence or operation of facilities. Hydropower safety is the major and permanent concern of the producer. It involves three main activities:

- measures to address the major risk associated with dam or reservoir failures, through the regular monitoring and maintenance of facilities under the supervision of public authorities, mainly the French regional environment, land use and housing authorities (*directions régionales de l'environnement, de l'aménagement et du logement* – DREAL). Of the largest dams, 67 of them are subject to a special administrative procedure implemented by the competent prefect;
- the management of facilities during periods of exceptionally high water levels, in order to ensure safety at the facilities and for the surrounding communities;
- control of operational risks: changes in the level of the water bodies or the flow of watercourses downstream of the works.

EDF regularly monitors and maintains its dams, including through continuous monitoring. The real-time readings and analysis, at each site, of multiple data (settlement, pressure, leakage measurements, combined with the visual inspection of the concrete and an inspection of the mechanical parts, etc.) enable EDF to conduct a regular assessment on the state of its dams. In Grenoble and Toulouse, EDF teams can analyse the largest dams or those dams that are the hardest to access, remotely and in real time, using a series of sensors.

Furthermore, a danger study including a complete technical examination is carried out for each of the large dams every ten years. This examination requires draining or an inspection of the submerged parts with sub-aquatic equipment. These operations are carried out under the supervision of public authorities (the DREAL office at the regional level as well as the Service technique de l'énergie électrique des grands barrages et de l'hydraulique – STEEGBH, the central French government agency specifically responsible for large dams and hydropower facilities).

At the organisational level, the Hydropower Safety Inspector prepares an annual report for the Chairman and CEO of EDF, to which he or she reports directly, as well as to those involved in hydropower safety (see section 1.4.1.5.1.2). Issued after analyses, inspections and assessments carried out by the Hydropower Safety Inspector, this report aims to give an opinion on the level of hydropower safety of the Group's installations and provide a basis for reflection and progress to ensure its improvement and consolidation. This report is made public on the Group's website.

4C – Occupational health or safety violations (employees and service providers).

The Group is exposed to health and safety risks in the workplace, both in terms of its employees and those of its service providers.

Criticality in view of the control actions undertaken: Intermediate..

Human resources and their related skills are a major challenge for the Group and its service providers. The industrial nature and diversity of the Group's activities reinforce the crucial importance of complying with the rules and taking into account the various risks that may affect people working in the Group's industrial facilities in order to protect health and safety in the workplace.

The risk of work-related accidents or occupational illnesses cannot be excluded in all of the Group's areas of activity. The occurrence of such events may lead to lawsuits against the Group and may result in the payment of damages, which could be significant.

To address this risk, the Group has for many years taken the steps necessary to comply with the health and safety laws and regulations in the various countries in which it operates, and considers that it has taken the measures required to ensure the health and safety of its employees and that of its subcontractors'.

Each Group entity has action plans aimed at continuously improving health and safety at work. Actions are also carried out at the level of the Group as a whole: defining and promoting vital rules, the day-long shutdown on 3 October 2019 to jointly discuss the persistence of fatal accidents (see section 3.3.3 "EDF, a company with a responsible attitude with regard to its employees and service providers").

4D – Attacks against assets, including cyberattacks

The Group faces the risk of malicious acts against its tangible or intangible assets, particularly its information system.

Criticality in view of the control actions undertaken: Intermediate.

The facilities or assets operated by the Group or its employees may be the target of external attacks or malicious acts of any kind. An attack or malicious act committed on these facilities could have consequences such as injury to persons and/or damage to property, the Group being held liable on the grounds of measures judged to be inadequate and interruptions to operations. The Group would also be forced to make additional investments or incur additional costs if laws and regulations relating to the protection of sensitive sites and critical infrastructures became more stringent.

The Group operates multiple, interconnected and complex information systems (databases, servers, networks, applications, etc.) that are essential to the conduct of its commercial and industrial activity, the preservation of its human, industrial and commercial assets, and the protection of personal data (of customers and employees) which must adapt to a rapidly changing context (digital transition, development of teleworking, new ways to share work in extended companies with suppliers, changes in regulations, etc.).

The frequency and sophistication of information system hacking and data corruption incidents are increasing worldwide. A malicious attack may have a negative impact on the Group's operational activity, its financial, legal or property position or its reputation.

The EDF group has defined an Asset Security policy in the face of malicious acts and an Information System Security policy to prevent this risk and limit its impact in the event of an attack. These policies are supplemented by guidelines on the protection of personal data. However, the Group cannot rule out an attack on its information systems that would have consequences on the Group's operational activity, its finances, its legal position, in particular with regard to the integrity of personal data, or its reputation.

A charter for the use of IT resources is annexed to the Company's internal regulations. IT security training courses adapted to different profiles (users, project managers, IS security managers, etc.) are offered to employees. The Audit Committee of the Board of Directors receives reports on cyber security risk management. Several dozen security audits are carried out each year by external PASSI qualified IS security audit companies (IS security audit providers) by the ANSSI (French National Agency for Information Systems Security), both on IT infrastructures and on business information systems. In addition, the EDF group SOC (Security Operational Center) reports on IS security incidents on a monthly basis.

In 2019, the main actions deployed in the field of cyber security and protection of intangible assets were as follows:

- notifying cyber security objectives to the Directors of the main Group Entities;
- defining a security reference framework based on the rules of the French National Agency for Information Systems Security (ANSIS);
- carrying out six campaigns to raise awareness regarding the protection of information at the Group level, and a large number of campaigns led by local management and adapted to the specific nature of the businesses run by the Entities;
- conducting two crisis exercises on EDF's Datacentres;
- carrying out a cyber security crisis exercise at Group level enabling EDF to test its ability to withstand cyberattacks;
- updating the policy to combat malicious acts targeting intangible assets in order to address new cyber and behavioural risks;
- creating a Group-level incident response function (CERT).

4E – Operational continuity of supply chains and contractual relationships.

The Group is exposed to the operational continuity of supply chains and contractual relationships with its suppliers as well as to fluctuations in the price and availability of materials, equipments or services it purchases in the course of its business activities.

Criticality in view of the control actions undertaken: Intermediate.

The Group's needs can arise in markets with limited surface area or increasing tensions, in particular due to the structure and evolution of the industrial offer or the increase in competition from new uses in particular between the growing needs of information systems and the needs of energy players. Climate change-related transition may also introduce new tensions in supply chains. Certain materials, equipment or services could also be subject to increased demand relative to the available industrial supply, which could have an impact on their cost and availability. These market pressures may increase the cost of supplying certain critical products or services and lead to a reduction in supply by some suppliers in response to a contraction in their margins. Fluctuations in the price and availability of certain raw materials or products that play a key role in setting the price of electricity and energy services may affect the Group's supply capacity and results.

The Group uses technologies, mainly in the fields of nuclear, hydraulic or renewable energy generation, electrical storage or mobility, that require materials or elements that may be highly sensitive in terms of access ⁽¹⁾. The scarcity or conditions of access to certain raw materials may be critical for the Group due to geological, geopolitical, industrial, regulatory or competitive limitations, particularly in a context of energy transition. The development of uses, particularly related to storage, the growth of renewable energies and the penetration of low-carbon electricity, could pose problems of access to certain materials: Lithium for batteries, ferromagnetic rare earths for wind power, Indium or Selenium for solar energy... These difficulties could limit the Group's ability to achieve its development objectives. In addition, control of the conditions under which raw or semi-finished materials are extracted, processed, packaged or made available for the Group's needs may be subject to provisions calling for greater control of regulatory requirements and a duty of vigilance.

Moreover, the Group currently depends on a limited number of industrial players with specific skills and the required experience. This situation reduces competition in markets where EDF is a buyer and exposes the Group to the default risk of one or more of these specialised suppliers or service providers. This is particularly the case for Orano (which accounts for more than 34% of EDF's purchases of all types of fuel in 2019), Westinghouse and GE. Changes to the shareholding or governance of these various providers may also have an impact on the cost, the operational continuity of ongoing contracts and the cost of services provided or delivered products. Regular monitoring of the situation of these suppliers is carried out through specific reviews.

The Group's performance is also based on the contracts signed with suppliers of equipment or services. Improved management of contracts entered into by EDF is a major issue in controlling operations, deadlines and associated costs. It is the role of the Contract Management function which aims to improve the management of risks and create opportunities in the management of contracts. This function calls upon Contract Managers positioned in the business lines throughout the contractual process. It is an additional line of defence in the management of contracts, in relation to corporate and the divisions. The Contract Management Department, which reports to the General Secretary, is responsible for structuring this function, leading the Contract Management process, measuring its performance and professionalising the players.

(1) The topic of Uranium supply is not considered here. It is dealt with in Risk 5D Control of the fuel cycle.

2. Risk factors and control framework

Risks to which the Group is exposed

4F – Blackout risk.

Repeated customer power supply interruptions, or a black out, or a widespread power grid incident, in a territory served by the Group could have consequences for the Group's activities, financial position and reputation, particularly if they were partly attributable to the Group.

Criticality in view of the control actions undertaken: Moderate.

The Group may be faced with repeated power outages or even a black-out, a widespread network incident of considerable scale, or be involved in it, even if the triggering incident occurred on a network not operated by EDF or was attributable to another player.

The causes of power outages can be diverse: local or regional imbalance between electricity generation and consumption, accidental power supply or transmission failure, cascade failures, interconnection problems, delays in investment and the necessary network conversions to meet the needs of energy and ecological transition, difficulty in coordinating players, particularly in a market with insufficient or evolving regulation.

The initial impact of such power failures could be repair costs incurred to re-establish power or restore the network. Power failures may also generate capital expenditures if it were decided, for example, to install additional generation or network capacity. This could also cause a decline in the Group's turnover. Finally, they could have a negative impact on the Group's financial position or reputation with its customers and all its stakeholders, particularly if the power outage were to be partly attributable to it.

4G – Industrial safety and impact on environmental assets, including biodiversity.

The Group operates facilities for which accidents could, in the event of a failure in industrial safety, have serious consequences on the human or natural environment, particularly in terms of biodiversity and environmental capital.

Criticality in view of the control actions undertaken: Moderate.

The Group operates or has operated facilities which, as part of their day-to-day operations, can, may or may have been the cause of industrial accidents or environmental and health impacts. The Group's facilities may be located in industrial areas where other activities subject to similar risks exist, which means that the Group's own facilities may be impacted by accidents occurring at neighbouring facilities owned by other operators and not under the Group's control.

Biodiversity issues concern all the Group's facilities and projects, particularly in France where EDF is a landowner and a manager of natural resources of great importance. This issue is all the more important as energy transition introduces new or reinforced requirements. The Group is committed to biodiversity through its corporate responsibility objective no. 6 (see section 3.3.2.1 "EDF, a company that is responsible with regard to biodiversity (CSRG no. 6)").

Measures taken for industrial safety and the control of these risks may not be fully effective, which could have consequences for people, property and business continuity. Protective measures may be taken on similar facilities. The Group may be held liable.

Insurance policies for civil liability and damages taken out by the Group could prove to be significantly inadequate, and the Group cannot guarantee that it will always be able to maintain a level of cover at least equal to current cover levels and at the same cost.

Risks specific to nuclear facilities are further developed in section 2.2.5 "Risks specific to nuclear activities". Risks specific to hydraulic facilities are set out in 4B above.

The impact of an industrial safety failure may have a negative impact on the Group's operational activity, its financial, legal or property position or its reputation, and may affect the Group's ability to achieve Corporate Responsibility Objective no. 6 with respect to biodiversity.

The Group owns 40 facilities classified as Seveso under the European Directive for the prevention and management of major industrial risks. These are essentially storage or warehousing facilities for oil, gas or chemicals. The regulatory requirements applicable to this type of facility are implemented at all relevant Group sites. In addition, the Group's French Seveso sites have all responded to requests from prefects following the fire that occurred on 26 September 2019 at the Lubrizol plant, a Seveso classified site in Rouen.

(1) Source: www.iaea.org/pris.

2.2.5 Risks specific to nuclear activities

The EDF group is the world's leading nuclear operator in terms of the number of reactors in operation (73 reactors for which the EDF group is the nuclear operator, out of 447 power reactors in operation in the world on 01/01/2020)⁽¹⁾.

The Group has basic nuclear fuel cycle facilities and carries out activities in research, equipment manufacture and the supply of services to other nuclear operators, since the integration of the Framatome subsidiary, within the scope of the Group in 2018.

In addition, the Group holds minority stakes in nuclear power plants in operation in China, the United States and in Belgium, which it does not operate.

The Group is investing in new reactor projects in France, the United Kingdom and China and carries out its nuclear industrial activity in other countries, notably India and the United Arab Emirates, countries in which nuclear operators signed agreements with the Group.

The share of nuclear energy, as a low-carbon form of energy and a part of the Group's electricity mix, thus represents a significant industrial asset for the competitiveness and development of the Group.

Given the low impact of fossil carbon dioxide emissions from the nuclear industry over the entire industrial lifecycle, the performance and control of nuclear activities contribute directly to the achievement of Corporate Responsibility Objectives in support of the Climate (see CSRG no. 1), fostering human development (see CSRG no. 2), supporting vulnerable populations (see CSRG no. 3), in particular with regard to the fight against fuel poverty and access to clean, low-carbon and competitive energy, including for the most disadvantaged populations, committing to ensuring that each customer consumes more responsibly (see CSRG no. 4), fostering dialogue and consultation (see CSRG no. 5), and supporting biodiversity (see CSRG no. 6). (see sections 3.2 and 3.3). The control and performance of nuclear activities are at the heart of EDF's sustainable development policy.

The nuclear activities of EDF are associated with the following issues:

- as with any nuclear operator, the latter's obligations means giving ongoing priority to nuclear safety, based on technical and organisational provisions in order to guard against a nuclear accident and, in the hypothetical event of an accident occurring, to limit the consequences of such an accident. The nuclear business is carried out under the control of nuclear safety authorities in countries where the Group exercises nuclear operator responsibility. Failure to take nuclear safety into account as the number one priority could have a significant, even vital impact on the Group;
- the Group's nuclear activity is subject to detailed and demanding regulations with, particularly in France, a system in place that monitors and periodically re-examines basic nuclear facilities, which focuses, firstly on nuclear safety, protection of the environment and public health, but also on security considerations regarding malicious acts. These regulations may be significantly tightened by national or European authorities (see section 1.5.3.2 "Specific regulations applicable to basic nuclear facilities"). Furthermore, stricter regulations or possible non-compliance with current or future regulations could result in the temporary or permanent shutdown of one or more of the Group's plants or financial penalties as stated in Article L.596-4 of the French Environmental Code. Cases of non-compliance with regulations or non-compliance with commitments undertaken, may also be used by third parties against EDF and brought before the courts. The increased number of requests emanating from the French Nuclear Safety Authority (NSA) and enhanced controls may increase EDF's compliance costs and risks;
- although the nuclear business can contribute effectively to the security of energy supply and to combating the greenhouse effect, it must also demonstrate its competitiveness and its acceptance over the different time scales in which it operates. Nuclear activity by its very nature requires substantial and long-term investments, sometimes spanning decades. The robustness and efficiency over time of maintenance and upgrading programmes for the operating fleet, new reactor projects, and the respect of very long-term commitments are inevitably subject to extreme vigilance, with industrial cycles that span a century or even beyond;

- the nuclear fuel cycle is part of this long-term industrial outlook. EDF has a specific responsibility to develop a long-term strategy with the various stakeholders;
- the nuclear business is an industrial activity that brings together a large number of industrial partners in France, Europe and throughout the world. In France, EDF was assigned the role of lead company in the nuclear sector by the public authorities, with the integration of the Framatome subsidiary, which involves specific risks associated with the exercise of this responsibility and the activities of Framatome.

In light of the fact that EDF is the world's largest nuclear operator, exploiting global feedback and making comparisons with best practices internationally⁽¹⁾ represents an ongoing challenge to ensure that the EDF group is well positioned to be able to sustainably manage the risks associated with being the world leader;

5A – Failure to comply with the objectives (i) in terms of operation and/or (ii) in terms of extending the operating life of nuclear power plants (France and United Kingdom).

The Group may not meet its nuclear power plants' operating objectives in terms of safety and availability. It may also not be able to obtain approval to continue operating its reactors beyond the current planned expiry date, or even be authorised to operate them until that date in both France and the United Kingdom. In addition, the Group may not be able to control costs and deadlines for upgrading its operating fleet ("Grand Carénage" refurbishment projects in France).

Criticality in view of the control actions undertaken: Strong.

The fleet of nuclear reactors that the Group currently operates in France is highly standardised (see section 1.4.1.1.1 "EDF's nuclear fleet in France"). This enables the Group, in particular, to achieve economies of scale, to apply improvements made to its newest reactors to all reactors and, in the event of a reactor malfunction, to anticipate the measures to be taken in other reactors. But this standardisation has a potential parallel risk of the dysfunction being common to several reactors or to a generation or series of reactors (see section 1.4.1.1.2 "Operation and technical performance of the nuclear fleet").

The Group cannot guarantee that it will not be required to make significant or costly repairs or modifications to all or some of its plants, or that events will not occur that may have an impact on the operation of its plants or their output or cause a temporary or permanent shutdown of all or some of its plants. Thus, the deviation related to a steam generator (SG) weld stress relief process which was detected and reported to the Safety Authority in the summer of 2019 concerned SGs installed on 6 reactors of the nuclear fleet in operation in France and the Flamanville 3 EPR. Framatome is expanding the investigation to include other stress relieving processes.

During the periodic reviews carried out during the ten-yearly inspections and following the Fukushima accident in Japan, the Group drew up a major work programme, called "Grand carénage", the principle of which was approved by the Board of Directors (See section 1.4.1.1.2). The potential risks of the latter include a possible delay in the appraisal of the authorisations required to start operations, in particular as regards the authorisations expected from the French Nuclear Safety Authority (ASN). Such uncertainties may also concern the manufacture and delivery on site of new equipment or work carried out on-site in a situation where a large number of industrial operations are being carried out at the same time.

The ASN decides on the measures taken by the operator and may give additional instructions for each reactor and for each authorisation stage. Solutions are being studied to demonstrate the capacity of non-replaceable equipment such as the containment building and reactor vessels, to ensure their operation up to 60 years. These studies, which are based on data available in France but also internationally⁽²⁾ make it possible to confirm the safety margins available for the operating periods under investigation but may also lead to the need to adopt additional protective measures, if necessary, to be taken on the existing fleet, which could have consequences on its performance.

In order to postpone the construction of new units and related investments, and to continue to benefit from low-carbon generation and cash flows from its existing fleet, the Group has been aiming for several years to extend the operating life of its nuclear fleet in France beyond 40 years, a period already exceeded in France for six reactors. The fourth ten-yearly inspection of the 900MWe reactor series (VD4-900), like the previous ones, includes, on the one hand, a verification of the compliance of the facilities with the current reference design and, on the other hand, a safety

reassessment. This makes it possible to increase the level of safety by taking into account, on the one hand, international best practices and, on the other hand, the condition of the facilities, the experience acquired during operation and the evolution of the knowledge and rules applicable to similar facilities. As part of this process, the ASN could prescribe significant additional amendments.

Concerning the fourth review of the 900 series, the Permanent Group (GP) regarding the V4 closing is scheduled for September 2020. The ASN will present its generic opinion, in particular on the adequacy of the amendments initiated by EDF. Starting in March 2020, EDF is expected to have initial discussions with the ASN on its future opinion. The formal ASN post-Permanent Group opinion is expected in 2021; consultations will be held with the College of Commissioners and the public beforehand. The ASN shall issue authorisations for continued operation on a reactor-by-reactor basis, following the examination of a periodic review report, taking into account the results of the inspections and requalification tests. For Tricastin 1, the VD4 (pilot plant) started on 1 June 2019 and ended with re-coupling on 23 December 2019, after the ASN had given its authorisation to restart. The periodic review report is scheduled for February 2020 and the public inquiry will take place in 2021, after the generic DSA notice on the VD4 has been issued. The ASN opinion on the TN1 periodic review report is expected to be issued in late 2021 or early 2022. It cannot be ruled out that the ASN's generic opinion on the 900MW PWR series includes additional requests that could lead to additional costs and delays.

In 2016, the Board of Directors considered that all the technical, economic and governance conditions necessary to align the depreciation period of the French nuclear fleet with the Group's industrial strategy were met (see notes 1.3.2 "Judgments and estimates of the Group's management" and 1.3.2.1 "Depreciation period for nuclear power plants in France" of the appendix to the financial statements). It therefore approved the extension in the consolidated financial statements of the depreciation period for 900MW PWR plants outside Fessenheim from 40 years to 50 years, without anticipating the decisions of the ASN on whether or not to grant a licence to continue operation on a reactor-by-reactor basis after each 10-year inspection. With regard to the Fessenheim nuclear power plant, EDF has sent to the French Minister for Ecological Transition and Solidarity and to the ASN the request to repeal the operating licence and the declaration of permanent shutdown of the two reactors, providing for the shutdown of Reactor no. 1 on 22 February 2020 and Reactor no. 2 on 30 June of the same year.

The accounting period of the other series of France's nuclear fleet (1,300MW and 1,450MW), which are more recent, currently remains at 40 years. The subsequent extension of the depreciation period of these series nevertheless remains an industrial objective for the Group. This objective may not be achieved as the conditions are not in place at this stage.

In the United Kingdom, the ongoing analysis of graphite ageing in the RAG (Advanced Gas Reactor) reactor may lead to prolonged unavailability of the most sensitive reactors. The cracking of graphite subjected to irradiation must be carefully monitored, with inspections carried out regularly, and controlled by the office for nuclear regulation ("ONR"), to ensure that there is sufficient knowledge of the core to justify continued operation. Following this process, the two Hunterston B reactors (R3 and R4 reactors) were shut down for inspections in March and October 2018, respectively. Following further unfavourable findings, the shutdown of Hunterston B R3 had to be extended in order to prepare the grounds for continued operation, which were submitted to the UK regulator (ONR) in June 2019. The ONR approved the restart of R4 at the end of August 2019 for a short period ending in December 2019. The safety case for the R3 reactor is under review by the ONR; approval is expected in early 2020. This approval will affect the restart of Hunterston's R3 and R4 reactors and may also impact the safety case for the operation of Hunterston's twin Hinkley Point B reactors. Such approval may also not be obtained or may lead to early abandonment in the event of an unfavourable ONR decision.

The current planned operating period for the reactors in EDF Energy's existing nuclear fleet ranges from 41 to 47 calendar years for advanced gas reactors (AGRs) and is 40 years for the Sizewell pressurised water reactor (PWR). Since EDF Energy acquired them, the operating lifespan of the AGR power plants has been extended by 10 years on average and the objective is to increase the operating life of the PWR power plant by 20 years after the currently planned 40 years (see section 1.4.5.1.2.1 "Nuclear generation"). Nevertheless, given the nuclear safety rules applicable in the United Kingdom and RAG reactor technology in particular, the Group cannot guarantee that EDF Energy will obtain the necessary authorisations from the ONR when the time comes to operate its existing nuclear reactors until the currently planned end of

(1) Exploitation of standards and feedback from the International Atomic Energy Agency and the World Association of Nuclear Operators (WANO).

(2) Six reactors in the US are being investigated for an extended operating life of 80 years: the Nuclear Regulatory Commission (NRC) staff has defined subsequent license renewal (SLR) to be the period of extended operation from 60 years to 80 years. <https://www.nrc.gov/reactors/operating/licensing/renewal/subsequent-license-renewal.html>.

2. Risk factors and control framework

Risks to which the Group is exposed

operation date, or that such authorisations will not be obtained under conditions involving significant expenditure or investment by the Group.

For nuclear reactors where EDF is not in charge of operation but has financial interests (United States, Belgium, China), the Group is financially exposed to the same risks. The Group may need to contribute up to the amount of its share to costly repairs or modifications to be carried out on these units or to events that may have an impact on their operating lifespan, production or availability. As in France and the United Kingdom, the nuclear safety authorities in these countries may take decisions that require additional works or controls, in particular as regards exploiting feedback from international experience and anticipating potentially precursory events.

Furthermore, despite the quality of operations and the changes made by the Group to its nuclear facilities, it cannot be ruled out that some of these facilities will be subject to special operating conditions to reinforce the operating safety margins at the initiative of the nuclear operator responsible for nuclear safety or at the request of the Nuclear Safety Agency.

Finally, a potential serious nuclear accident not involving the Group but with widespread consequences worldwide could lead the Safety Authorities to require new reactor upgrades applicable to the Group's reactors, and to those in which the Group has a stake.

The Group cannot guarantee that it will receive the expected operating lifespan extension from the competent authorities. Furthermore, such extensions could also be obtained under certain conditions, the financial impact of which, in particular in terms of investments, could affect the Group's strategy with respect to extending the operating life of its reactors or the Group's ability to pursue its global investment strategy. These events could have a significant negative impact on the Group's financial position.

5B – Control of radioactive waste treatment and decommissioning of nuclear facilities, and ability to meet related commitments.

The provisions set aside by the Group for the decommissioning of nuclear facilities and for the treatment and ultimate disposal of radioactive waste, including long-lived waste from spent fuel treatment and decommissioning, may prove to be insufficient. In particular, decommissioning existing nuclear facilities may present currently unforeseen difficulties or be much costlier than anticipated.

The amount of dedicated assets in France allocated by the Group to cover the costs of its long-term nuclear business commitments (radioactive waste and decommissioning) might need to be revised upwards or require additional expenditures.

Criticality in view of the control actions undertaken: Strong.

Decommissioning

The decommissioning operations underway in France (see section 1.4.1.1.6 "Decommissioning of nuclear power plants") concern plants that were built and operated before the current nuclear fleet, including the Superphenix plant ("first generation" plants). These operations cover four different reactor technologies: heavy water reactor (Brennilis), sodium-cooled fast reactor (Superphenix at Creys-Malville), graphite-moderated and gas-cooled reactor (UNGG reactors at Chinon, Saint Laurent and Bugey) and the "PWR" at Chooz. Each of them is a first for EDF, and apart from the PWR, they concern reactor technologies for which there is little or no international

experience. They therefore require development of new methods and technologies that are riskier than technologies for which feedback already exists. The decommissioning of the PWR at Chooz A does benefit from some feedback (essentially American and of a limited nature) but it has the innovative specific feature of being located in a cave, which also makes it an unusual operation for which experience is not immediately transferable and which includes specific risks.

The Chooz A PWR decommissioning operations are continuing with the cutting and removal of the vessel internals according to schedule, after the reactor pool was filled with water in 2018 and the vessel was opened in March 2017.

The feedback from the PWR at Chooz will enable consolidation, as far as possible, of the studies and estimates on the future costs of decommissioning the nuclear fleet currently in operation ("second generation" power plants). The first reactor of the Fessenheim power plant was definitively shut down on 22 February. The shutdown of the second reactor is scheduled for 30 June 2020, making these two reactors the first of the nuclear fleet currently in operation to benefit from this feedback for their decommissioning. Nevertheless, neither EDF, nor any other operator, has yet undertaken a decommissioning programme on a scale comparable to that of the Group's current PWR fleet and the estimates therefore involve risks that are associated in particular with this scale effect.

The timing and cost of the work is also dependent on administrative authorisations and the availability, at the necessary time, of radioactive waste storage centres or other facilities necessary for the conditioning, treatment or storage of waste containers.

In addition to these technical and industrial sensitivity factors, the amount of provisions currently set aside may change in the coming years. Indeed, the assessment of the need for these provisions is sensitive to the assumptions used for costs, planning, inflation rates and long-term discount rates, and to any change in the regulations, in particular those relating to the scope of expenses to be covered. The amount of these provisions, in accordance with the French Environmental Code, is subject to control by the administrative authority, which verifies in particular the adequacy of the provisioned expenses and imposes a cap on the discount rate for the provisions.

Given these sensitivity factors, changes in certain parameters may require significant adjustments of the provisions booked and, therefore, the Group cannot guarantee that the provisions booked will equal the costs actually incurred at the relevant time, which would have an adverse impact on the Group's financial position (see note 32 of the appendix to the consolidated financial statements for the financial year ended 31 December 2019). The Group regularly conducts an update of the key assumptions underlying the provisions (see note 32 of the appendix to the consolidated financial statements for the financial year ended 31 December 2019).

With regard to the provision for decommissioning of nuclear power generation facilities in France, the amount of expenses under economic conditions at the end of 2019 is estimated at €27,562 million, the corresponding provision is €16,937 million. As for the last core provision, costs based on year-end economic conditions are estimated at €4,331 million and provision at present value amounts are valued €2,624 million, as the discounting effect is very significant due to distant waste storage maturities. Note 32 "Analyses of sensitivity to macro-economic assumptions" of the appendix to the consolidated financial statements for the fiscal year ended on 31 December 2019 indicates the analyses of sensitivity of provisions and Group's results to a discount rate change, for the different types of provisions.

The provisions of Framatome and Cyclife France (formerly SOCODEI) relating to basic nuclear facilities in France amounted to €83 million and €61 million respectively (see note 33 "Other provisions for decommissioning" of the appendix to the consolidated financial statements for the year ended 31 December 2019).

In the United Kingdom, under the agreements concluded in connection with the restructuring of British Energy, the costs of decommissioning EDF Energy Nuclear Generation Group Ltd.'s existing nuclear power plants will be paid by the Nuclear Liabilities Fund. If the assets of this Fund prove insufficient, these costs will be borne by the UK Government (see section 1.4.5.1.2.1 "Nuclear Generation"). In 2019, EDF Energy and the UK Government (BEIS) began discussions with a view to clarifying the conditions for implementing the above-mentioned agreements, in particular as regards determining the decommissioning costs to be recovered by EDF Energy from the Nuclear Liabilities Fund and the conditions under which the UK authorities may exercise their option to acquire the nuclear power plants at the end of the fuel unloading phase. A set of principles was agreed in 2019 as a result of these discussions, which are continuing with a view to achieving comprehensive binding agreements.

For nuclear power plants which EDF does not operate, but has financial interests in (China, United States, Belgium), the Group is exposed financially in proportion to its contribution to future decommissioning costs.

Failure to control the costs, the time-frame for completion and the associated provisions with respect to the decommissioning of nuclear facilities for which the Group is liable would have a negative impact on the Group's financial position and reputation.

Waste Management

As a nuclear operator or producer of radioactive waste, within the meaning of the legislation applicable to waste, the Group could be held liable, in particular in the event of an accident involving damage to third parties or to the environment in connection with spent fuel or waste. The Group may be held liable even if these products are handled, transported, held, stored or warehoused by parties other than the Group, in particular, in France, the Orano Group and the French National Agency for Radioactive Waste Management (ANDRA), particularly in the event of any failure by any of the latter.

In France, EDF is liable for all radioactive waste produced during:

- the operation of the nuclear facilities operated by the Group;
- processing operations for spent fuel from reactors operated by EDF;
- decommissioning operations at the nuclear facilities operated by the Group. (See section 1.4.1.1.4 "The nuclear fuel cycle and related issues" – Storing conditioned ultimate waste).

The long-term management of radioactive waste has been the subject of various studies under programme laws no. 91-1381 of 30 December 1991 on research on radioactive waste management and no. 2006-739 of 28 June 2006 on the sustainable management of radioactive materials and waste. All of the Group's Long-Lived High-Level and Intermediate-Level waste may not constitute "ultimate radioactive waste" within the meaning of Article L. 542-1-1 of the French Environmental Code. In this case, it may not be possible to store this waste directly in a deep geological repository, especially since the Nuclear Order of 10 February 2016 issued pursuant to

Act no. 2015-992 relating to the energy transition for green growth allows for the reclassification of radioactive materials as radioactive waste and vice-versa by the administrative authority. Moreover, the Group has no control over the time taken by the public authorities to issue permits for such ultimate storage, nor over the technical guidelines that are set forth. This is likely to create uncertainties regarding the fate of the waste, the liability and the resulting costs for EDF.

EDF has allocated provisions for the long-term management of waste, assessed on the assumption of geological storage, which is the international solution of reference for the ultimate storage of long-lived high-level radioactive waste and on the basis of a reasonable version of the work carried out in 2006 by a working group comprising ANDRA, the public authorities and radioactive waste producers (see note 32 of the appendix to the consolidated financial statements for the year ended 31 December 2019). Following new calculations of the costs of deep storage under the supervision of the DGEC in conjunction with EDF, the Minister of Ecology, Sustainable Development and Energy, in an order of 15 January 2016, set the new reference cost at €25 billion under the economic conditions of 31 December 2011. This cost was taken into account in the Group's financial statements at the end of 2015 (see note 32 of the appendix to the consolidated financial statements for the year ended 31 December 2019). The current estimate is based on the preliminary design assumptions and will be regularly revised based on the progress of the project, as stated in the Ministerial order. Opinion no. 2018-AV-0300 from the French Nuclear Safety Authority dated 11 January 2018 relative to the safety options file presented by Andra for the Cigeo project to store radioactive waste in a deep geological layer specifies that the project has achieved satisfactory overall technological maturity at the stage of the safety options file. The reservations that remain and the supplementary investigation being carried out for Andra to obtain approval for the construction of the geological storage area starting in 2022 could lead to a revision of the provisions for long-term radioactive waste management.

Act no. 2006-739 dated 28 June 2006 provided for a dedicated storage centre for Low-Level Long-Life waste (FAVL), such as graphite. ANDRA submitted a progress report in July 2015 under the national plan for the management of radioactive materials and radioactive waste (PNGMDR). This report assesses several storage concepts and allows for the possibility of storage of graphite waste on the Soulaines site. The overall industrial scheme for the management of all LLW-LL is being defined within the framework of the PNGMDR (see section 1.4.1.1.4 "The nuclear fuel cycle and associated issues"). Provisions may have to be adjusted accordingly.

In the United Kingdom, when British Energy was restructured, agreements were entered into with the authorities concerning the management of certain radioactive waste from existing nuclear power plants (see section 1.4.5.1.2.1 "Nuclear generation"). Under the terms of these agreements, the liability and certain costs associated with the management of certain radioactive waste are transferred to the British government. However, EDF Energy Nuclear Generation Ltd. remains financially, technically and legally liable for the management, storage and processing of waste that does not come within the scope of the aforementioned agreements.

For nuclear power plants which EDF does not operate, but in which it has financial interests (United States, Belgium, China), the Group is exposed financially in proportion to its shareholding to contributing to future expenditures related to the management of spent fuel and waste.

2. Risk factors and control framework

Risks to which the Group is exposed

In addition to these sensitive technical and industrial factors, the amount of provisions currently recorded could also change in the coming years depending on the assumptions used in terms of costs, inflation rate, long-term discount rate and disbursement schedules, as well as to any change in the regulations. The amount of these provisions, in accordance with the French Environmental Code, is subject in France to control by the administrative authority, composed jointly of the ministers in charge of the economy and energy, with said control verifying in particular the adequacy of the amounts provided for and imposing a ceiling on the discount rate of the provisions. Given these sensitivity factors, changes in certain parameters may require significant adjustments of the provisions booked. In such case, any insufficiency of provisions for long-term nuclear commitments may have a material adverse impact on the Group's financial position (see note 32 of the appendix to the consolidated financial statements for the financial year ended 31 December 2019).

Note 32 "Analyses of sensitivity to macro-economic assumptions" of note 32 "Nuclear provisions in France" of the appendix to the consolidated financial statements as of 31 December 2019 shows the connection between "costs based on year-end economic conditions", which represent estimated amounts as at 31 December 2019, and provisions made at present value. Concerning the long-term management of waste and the recovery and packaging of waste, the expenses at year-end economic conditions are evaluated at €33,615 million and the corresponding provision is €11,336 million, as the discounting effect is very significant due to distant waste storage maturities. Note 32 "Analyses of sensitivity to macro-economic assumptions" indicates the analyses of sensitivity of provisions and Group's results to a discount rate change, for the different types of provisions.

Failure to control the costs and time-frames for completion with respect to the solutions for the treatment and ultimate storage of waste for which the Group is liable would have a negative impact on the Group's financial position and reputation.

Dedicated asset management

In France, the market value of EDF's portfolio of dedicated assets to cover the costs of long-term nuclear commitments (radioactive waste and decommissioning), amounted to €31.6 billion as of 31 December 2019, compared to €27.7 billion as of 31 December 2018 (see sections 1.4.1.1.7 "Assets available to cover long-term nuclear commitment (outside the operating cycle)" and 1.5.3.2 "Specific regulations applicable to basic nuclear facilities" and note 48.3 of the appendix to the consolidated financial statements for the year ended 31 December 2019).

In the event of a significant change in the provisions determining the reference base of the dedicated assets, it might prove necessary to make additional allocations to adjust the value of these assets, which could have a material adverse impact on EDF's financial position. Moreover, stricter regulations at the national level, in particular those that impact the base for determining the dedicated assets to be constituted by EDF⁽¹⁾ or European level may lead to more stringent requirements regarding the constitution of dedicated assets and have a significant impact on EDF's financial position.

Lastly, although these assets are constituted and managed in accordance with strict prudential rules, the Group cannot guarantee that price fluctuations in the financial markets or changes in valuation will not have a material adverse impact on the value of these assets (see section 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio" for a sensitivity analysis), which could require EDF to allocate additional amounts to restore the value of these assets; such events could have a material adverse effect on the Group's financial position.

In the United Kingdom, the funds for nuclear liabilities are managed by a body independent of EDF set up by the British government (Nuclear Liabilities Fund – NLF) for the existing nuclear fleet. For HPC-related liabilities, the funds will be managed by FundCo, a body (Trust) independent of HPC's shareholders (EDF Energy and CGN) and the UK government. Operators therefore have no assets to manage for this purpose (see section 1.4.5.1.2.1 "Nuclear generation").

The unavailability or insufficient amount of the dedicated assets to hedge the expenditure schedules of the Group's long-term commitments could have a negative impact on the Group's financial position and reputation.

5C – Nuclear safety risks during operation resulting from nuclear civil liability.

In addition to the control of industrial performance, and given the place of nuclear generation within the EDF group and with nuclear safety as the number one priority, our responsibility as a nuclear operator determines the Group's overall performance. As a result of its nuclear activities, the Group is exposed to nuclear civil liability risks.

Criticality in view of the control actions undertaken: Intermediate.

The primary responsibility for nuclear safety lies with the nuclear operator throughout the operating cycle of nuclear reactors. This principle along with the principle of control are reaffirmed in the EDF group's nuclear safety policy. The Chairman and CEO delegate this nuclear operator liability to the Group Executive Director for the Nuclear and Thermal Fleet Department and the Group Executive Director for the New Nuclear Engineering and Projects Department, who then sub-delegate it to the Directors of the Divisions involved, who in turn sub-delegate it to unit managers.

The no. 1 priority given to nuclear safety drives the industrial performance of the nuclear activity as a whole. Nuclear safety takes into account the design by the nuclear operator and the operation by the designer. Failure to control operating safety could have major or even vital consequences on the value of the Group's industrial assets, its financial position and its development outlook or even on the continuation of its industrial activity.

Any serious event related to the Group's nuclear activities, with a potential or proven impact on the population or on a territory, could lead to a significant increase in the operating constraints of the Group's industrial sites, or even the partial or total interruption of the Group's nuclear activities. Such an event could have a significant negative impact on the Group's activities, financial position, strategy and reputation.

The nuclear civil liability scheme that applies to nuclear facility operators of States parties to the Paris Convention, and the insurance applicable thereto, are described in section 1.5.3.2 ("Regulations applicable to basic nuclear facilities") and section 2.1.2.6 ("Insurance"). This scheme is based on the principle of the operator's strict liability. Accordingly, if an event occurs that causes nuclear damage, the Group would be automatically liable up to a monetary maximum set by the law applicable in the country, regardless of the source of the event that caused the damage and any safety measures that may have been taken.

The Group cannot guarantee that in countries where it operates nuclear facilities the maximum liability set by law will not be increased or cancelled. For example, the protocols amending the Paris Convention and the Brussels Convention, not yet in force (see section 1.5.3.2 "Specific regulations applicable to basic nuclear facilities"), provide for these maximum amounts to be increased and a substantial expansion of the damage to be covered. With regard to the new amounts, act no. 2015-992 of 17 August 2015 on the energy transition for green growth made them applicable as from 18 February 2016. The operator's liability in France now amounts to €700 million in the event of a nuclear accident in a facility and €70 million in the event of a nuclear accident during transport. The entry into force of the other changes laid out in these protocols is likely to increase yet again the cost of insurance and the Group cannot guarantee that insurance covering this liability will always be available or that it will always be able to maintain such insurance. Insurance coverage for the Group's nuclear operator's civil liability and for the transport of nuclear substances is described in section 2.1.2.6 "Insurance".

Property damage to EDF's nuclear facilities is covered by insurance programmes (see section 2.1.2.6 "Insurance"). Despite this cover, any event that may cause significant damage to a nuclear facility of the Group could have an adverse impact on the Group's business and financial position.

Lastly, the Group cannot guarantee that the insurers that cover both its liability as a nuclear plant operator and property damage to its facilities will always have available capacity or that the costs of cover will not significantly increase, particularly in light of the impacts on the insurance market of events such as the nuclear accident in Japan that occurred in March 2011.

In view of these risks, and in application of Group policy, each Group company operating nuclear facilities acts within the framework of legal and regulatory requirements specific to the country in which it operates and is obliged to comply with them. Each one ensures the nuclear safety of its facilities and constantly improves the level, based on its methods, skills and values. The Group develops common principles aiming to obtain the best level of prevention of incidents and protection of workers, the public and the environment. These principles apply to all stages of the activity,

(1) The French Cour des Comptes' report on the decommissioning and dismantling of nuclear power plants, published on 4 March 2020, recommends that the costs of all decommissioning preparation operations, post-operational expenses and the cost of taxes, levies and insurance premiums directly attributable to decommissioning sites should gradually be included in the long-term expense categories.

both for new projects and for the existing fleets. The Group closely involves its industrial partners with the achievement of these objectives.

Each company is responsible for the proper conduct of its nuclear activities and sets the appropriate delegations at each decision and action level. The Group guarantees the allocation of the necessary resources for nuclear safety.

An internal entity in charge of an independent safety evaluation is put in place at the level of each site, each company and of the Group. Each one reports to the manager concerned, independently of other managerial functions; furthermore, each one has the duty to alert the superior hierarchical level if the reaction of the level directly involved is not what is expected.

The Group's nuclear operating companies regularly receive international evaluation teams (WANO Peer Review ⁽¹⁾ and OSART from the IAEA ⁽²⁾).

Clear and honest communication on the events and their possible impacts are promoted within the Group. This high-quality dialogue is sought and maintained with the salaried personnel and its representatives, subcontractors, the supervisory authorities (Nuclear Safety Authority in France, Office for Nuclear Regulation in the United Kingdom), local communities and all other stakeholders in nuclear safety.

The Nuclear Safety Council, which the Chairman and CEO of EDF chairs, meets several times a year and, periodically reviews the annual assessment of nuclear safety for the EDF group. A General Inspector for nuclear safety and radiation protection (IGSNR) is appointed by the Chairman and CEO to whom he/she reports. He/she carries out inspection missions on all of the nuclear activities of the EDF group. Each year, it gives an opinion on safety within EDF. Its report is presented and debated in the Nuclear Safety Council. It is then made public (see section 1.4.1.1.3).

5D – Control of the fuel cycle.

In addition to the control of nuclear safety (risk 5C), the operation of existing nuclear facilities (risk 5A) and new nuclear projects (risk 4A), the Group is exposed, in the context of nuclear activities, to the control of the nuclear fuel cycle.

Criticality in view of the control actions undertaken: Intermediate.

The Group's operating costs include nuclear fuel purchases.

EDF is supplied with uranium, conversion and enrichment services, fuel assembly supplies and spent fuel reprocessing operations for its nuclear fleet in France and the United Kingdom.

Prices and volumes are subject to fluctuations that depend on factors beyond the Group's control, including political and economic factors (in particular, profitability outlook for mining investments, supply/demand imbalance or tension on the supply side, associated, for example, with the occurrence of an operating incident in a uranium mine or cycle plant, a delay in the commissioning of a new mine or an event leading to institutional instability in a producing country, or restrictions/sanctions/embargos).

The storage and transport of new or spent nuclear fuel is an industrial activity that requires specific safety and security measures. These requirements could become more stringent, generating additional difficulties and costs for the Group.

In the event of the collapse of this industrial logistics system, the Group could reduce or even interrupt all or part of the electricity generation at the affected sites, either due to the non-delivery of new assemblies or to the saturation of intermediate storage facilities, which could have a negative impact on the Group's financial position (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues").

Despite the project to build a large-capacity spent fuel storage pool (see section 1.4.1.1.4 "The nuclear fuel cycle and associated issues"), the risk of the impossibility, in the long term, of implementing multi-recycling in its 3rd generation pressurised water reactors or recycling in fourth generation reactors known as "GEN IV" (abandonment of the ASTRID fast neutron reactor project), could call into question the fuel cycle, with consequences both in terms of operation and in financial terms.

In France, EDF has booked provisions for spent nuclear fuel management operations (transport, processing, conditioning for recycling) (see note 32 of the appendix to the consolidated financial statements for the financial year ended 31 December 2019) based on the price and volume conditions of the master agreement signed with Orano in December 2008 and broken down in the successive implementation agreements. The implementation agreement for the period from 2016-2023 was signed in February 2016 (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). The amount of provisions currently booked to cover the period not covered by the current agreement should be reassessed if the terms under which this agreement is renewed prove more onerous than those currently applicable.

Note 32 "Analyses of sensitivity to macro-economic assumptions" and note 32 "Nuclear provisions in France" of the appendix to the consolidated financial statements as of 31 December 2019 shows the connection between "costs based on year-end economic conditions", which represent estimated amounts as at 31 December 2019, and "provisions made at present value". As regards spent fuel management, the costs based on year-end economic conditions are estimated at €18,737 million and the corresponding provision is €10,823 million.

However, the Group cannot guarantee that its contracts, in France and abroad, will completely protect it from sudden or significant price increases. The Group cannot guarantee that when these long-term contracts expire, it will be able to renew them, in particular at an equivalent price. This could have an adverse impact on the Group's financial position.

2.2.6 Impacts of the coronavirus on risk factors

The coronavirus epidemic that appeared in China in December 2019 is likely to affect the health of employees and service providers, the Group's operations and projects, as well as its financial position. Even if the impacts are difficult to quantify at this stage, the main risk factors of this epidemic have been identified. Without being exhaustive, they are as follows: - disruption of industrial supply chains for products or equipment from countries affected by the epidemic (risk 4E); - health impacts on the activity of the Group's employees and service providers (risk 4C); - disruption of the running of the Group's operations, construction sites and major projects in the event of restrictions likely to affect business continuity (risk 4A) and possibly the level of production, particularly in the event of an impact on nuclear unit shutdowns (risk 5A) – impact of a possible slowdown in economic activity with regard to the price of raw materials and electricity on the wholesale markets, as well as on the level of demand for electricity or counterparty risks (risks 2C and 2E); - impact of a disruption in the financial markets through a decrease in the valuation of the portfolio of dedicated assets or pension assets affecting the Group's financial results and the coverage rate of nuclear provisions, and impact of a decrease in interest rates on the calculation of the amount of nuclear provisions and provisions for employee benefits (risks mentioned in chapter 2.2.2).

(1) WANO: World Association of Nuclear Operators.

(2) OSART: Operational Safety Analysis Review Team, International Atomic Energy Agency (IAEA).



3.

Non-financial performance

CONTENTS

3.1 EDF, a responsible company	130	3.5 Non-financial rating	186
3.1.1 Identification of CSR issues	130	3.6 Appendices, concordance tables and report from Statutory Auditors	187
3.1.2 Management of CSR issues	132	3.6.1 Vigilance plan	187
3.2 EDF, a company committed to the energy transition	136	3.6.2 Description of key stakes in the materiality matrix	192
3.2.1 EDF, a leader in low-carbon energy	136	3.6.3 Summary of EDF group climate risks	194
3.2.2 EDF, a company standing shoulder to shoulder with its customers	142	3.6.4 TCFD recommendations	195
3.3 EDF, a company committed to a just and fair transition	146	3.6.5 Sustainable Development Goals	196
3.3.1 EDF, a company with a responsible attitude to people and communities	146	3.6.6 Stakeholder mapping	197
3.3.2 EDF, an environmentally-friendly company	157	3.6.7 Details of income tax paid in all the countries where the Group has subsidiaries	198
3.3.3 EDF, a company with a responsible attitude to its employees and service providers	166	3.6.8 Ecological knowledge of land sites	199
3.4 Indicators and methodology	179	3.6.9 Report by one of the Statutory Auditors, appointed as independent third party, on the consolidated non-financial performance statement included in the management report	200
3.4.1 Indicators	179		
3.4.2 Methodology	182		

3. Non-financial performance

EDF, a responsible company committed to a just and fair energy transition.

EDF, a responsible company committed to a just and fair energy transition.

Order 2017-1180 of 19 July 2017 and Decree 2017-1265 of 9 August 2017 transposed European Directive 2014/95/EU amending Article 225 of the Commercial Code, which requires companies falling within its scope to publish labour, environmental and social information in their management report. EDF falls within the scope of application of this regulation aiming to draw up a non-financial performance report for the year 2019.

EDF presents its business model in chapter 1 of this document and the analysis of its principal risk factors in chapter 2, of which the high-priority CSR risks⁽¹⁾ are detailed in chapter 3, particularly via the Group materiality matrix that takes account of 18 major issues (see sections 3.1.1.2 and 3.6.2). EDF describes how these issues are covered by reasonable due diligence policies and procedures, and mentions key performance indicators when it is relevant.

Chapter 3 shows how EDF, as a responsible company (section 3.1), is committed to the energy transition (section 3.2) and a just and fair transition (section 3.3)⁽²⁾. This is demonstrated not only by its six Corporate Social Responsibility Goals (CSRG), but also through its policies and all the action it takes on environmental, social or societal issues.

The EDF vigilance plan, presented by virtue of the French law of 27 March 2017 relating to the duty of care ("devoir de vigilance") of parent companies and ordering companies, is developed in section 3.6.1.

Each section of this chapter identifies whether the theme is a materiality matrix issue, if it features a key performance indicator⁽³⁾, if it involves a Group Corporate Social Responsibility Goal (CSRG), and how EDF's action in this field contributes to the UN's Sustainable Development Goals.

3.1 EDF, a responsible company

3.1.1 Identification of CSR⁽⁴⁾ issues

3.1.1.1 Understanding stakeholders and the environment

3.1.1.1.1 Listening practices

In 2019, EDF launched the first edition of ObsCop, the Observatoire Climat & Opinions Publiques (i.e. French climate and public opinion monitoring survey), which is a unique poll organised by IPSOS in 30 countries based on a representative sample of 24,000 people. Its aim is to produce an international overview of opinions, knowledge, expectations and levels of engagement regarding climate change in order to provide food for thought and contribute to the constructive identification of solutions for the future. The full results are available as open data to allow anyone, particularly researchers, to use them⁽⁵⁾.

Other surveys are also repeated year on year, including the poll of local residents living near nuclear generation, classic thermal, and hydropower facilities⁽⁶⁾ which, since 2009, has aimed to measure the perception of local residents of facilities and energy, or even the internal environmental survey (Baromètre interne des perceptions de l'environnement – BIPE), for which a sample of EDF and Enedis employees⁽⁷⁾ answer questions on these same themes⁽⁸⁾.

Between June 2019 and November 2019, the Group met with and hosted talks by representatives of Manifeste pour un réveil écologique (i.e. "manifesto for an ecological awakening"⁽⁹⁾), including a seminar for environmental experts featuring 200 participants from around forty Group entities and units. This gave them the opportunity to present the work of this organisation and attract the attention of the

Group's management by demonstrating their determination to work only for businesses that genuinely understand the scale of environmental issues. In October, Edison organised a focus group at Bocconi University in Italy with Millennials and members of generation Z.

EDF also has access to the most advanced discussions and research on sustainable development through think tanks, partnerships⁽¹⁰⁾ and various research institutes. The objective is to exchange about the best practices and also to enrich the quality of discussions for public decision-makers during events such as negotiations on climate change or biodiversity (COP⁽¹¹⁾).

3.1.1.1.2 Stakeholder panels

For over 20 years, the EDF group has relied on different external stakeholder councils, at the corporate, country and subsidiary level. Several panels of experts provide Group managers with their view on the major topics of interest to EDF.

The Sustainable Development Council is made up of external specialists who represent various major environmental, social and societal issues affecting the EDF group. It challenges EDF managers and experts as early as possible about the Company's proposed actions regarding sustainable development. In 2019, the panel met twice, focusing firstly on the participant's guide submitted by EDF for the public debate on the French national radioactive materials and waste management plan (PGMDR), then on revision of the Group's materiality matrix. The EDF Scientific Council, chaired by Sébastien Candé, Chairman of the Academy of Sciences, met three times in 2019 to discuss the impact of climate change on EDF, the impact of climate change, and the IoT (Internet of things). EDF's Medical Council is a body for reflection and advice on a number of current health topics connected to EDF's

(1) See section 2.2 "Risks to which the Group is exposed", particularly risks more specifically linked to environmental, social and societal aspects liable to impact its corporate responsibility.

(2) In line with the objectives of the European Green Deal presented by Ursula von der Leyen to the European Parliament on 11 December 2019.

(3) Also summarised in the non-financial performance statement concordance table included in section 8.5.4.

(4) Corporate Social Responsibility.

(5) The results are also available at www.edf.fr/observatoire.

(6) Nineteen nuclear generation sites, 6 fossil thermal sites, 14 hydropower sites and 2 nuclear sites being decommissioned (Creys-Malville and Brennilis) were the focus of this survey in 2018.

(7) Enedis is an independently managed subsidiary.

(8) There are plenty of other customer-focused schemes. Examples include regular dialogue between consumer associations and the Trading Division, Citelum or SEI; "Ma Rivière et Moi" (i.e. "My River & Me"), a multi-service digital information and data sharing platform developed by EDF Hydro.

(9) This was a wake-up call for businesses and public authorities on the urgency of environmental issues, signed by more than 30,000 students.

(10) See section 3.1.2.4.5 "Expertise from sustainable development partnerships".

(11) Conference of Parties.

activities. In 2019, it examined issues including the distributor Enedis' Linky⁽¹⁾ meter and the reconversion of coal-fired power plants to biomass.

The panel of SDGs@Edison stakeholders examined not only the ties between sustainable finance and the energy transition, but also diversity and integration as a competitiveness factor. The Enedis Stakeholder Council looked into proximity and work-study programmes, the Linky meter, and smart grids. The Nuclear & Thermal Fleet Division (DPNT), in conjunction with the Renewable Energy Division, launched "Cercle" (i.e. "circle"), a think tank set up to address new societal expectations about energy autonomy, self-consumption, and decentralised generation. This group, which includes non-profits, academics, journalists and economists, produced an initial analysis, focusing on the current electricity system built around notions of solidarity, interconnection, and power supply security. In 2019, assisted by a "follow-up group" featuring the Company's managers involved throughout the work process, it produced recommendations to be implemented via the follow-up group. In 2017, EDF and Usbek & Rica magazine created an EDF Council of Future Generations, with the aim of innovating in terms of dialogue with civil society to tackle the sensitive issues at the heart of the energy transition and business transformations. In 2019, the Council's work was refocused on themes linked to the UN's Sustainable Development Goals (SDG) with the aim of subsequently facilitating the switch from theory to practice. The Council's membership was expanded to include new stakeholders committed to CSR: businesses (AtoS, Crédit

Agricole, Daher, LVMH, M6, RATP, Veepee, etc.), politicians, and young people (Usbek & Rica readers). 20+ personalities committed to CSR (researchers; non-profits and NGOs; sociologists; experts; start-ups; etc.) contributed to the Council, which held two sessions in 2019: "Is the ecological transition possible?" and "What inclusive mobility is compatible with the climate emergency? "

3.1.1.2 EDF group materiality analysis

A materiality analysis consists of defining what may have a significant impact on a company, its activities and its ability to create value for itself and its stakeholders. The analysis identifies the important and pertinent issues likely to have an impact on the Company's performance, and ranks them according to their potential impact on the Company and its environment. The methodology governing the materiality analysis are the AA1000 standard regarding the involvement of stakeholders in identifying, understanding and responding to problems and concerns relating to sustainable development, and the GRI 101 standard which covers the quality and content of reporting, in order to respond to stakeholders' expectations⁽²⁾.

The 2017 analysis was updated for the 2019 URD with help from the Sustainable Development Council and round tables featuring Group managers and experts⁽³⁾. The list of issues was reduced from 35 to 18 "material" issues falling within the scope of CSR. Each of the issues identified is precisely described in section 3.6.2.

		<ul style="list-style-type: none"> • Management of radioactive waste and plant decommissioning • Action to support energy efficiency • Creating of value shared with stakeholders to benefit territories and employment • Sustainable cities, innovation and diversification of solutions 	<ul style="list-style-type: none"> • Nuclear safety and safety of industrial infrastructures and data • Renewal, extension and performance of the energy mix aimed at decarbonisation • Performance of end customer offers (B2B and B2C) • Quality of key project management and responsible investment
		<ul style="list-style-type: none"> • Listening, communication, transparency and dialogue • The circular economy and conservation of biodiversity, water, air, soils and rare resources 	<ul style="list-style-type: none"> • Adaptation of infrastructure and activities to climate change • Ethics and the duty of care • Company's attractiveness
	<ul style="list-style-type: none"> • Energy poverty and access to energy in developing countries • Equal opportunities 		
<ul style="list-style-type: none"> • Existence and effectiveness of company internal whistleblowing systems 		<ul style="list-style-type: none"> • Social Dialogue 	<ul style="list-style-type: none"> • Health and safety of employees and stakeholders

(1) Led by Enedis.

(2) ISO 26000 and the work of the International Reporting Council (IRC) follow the same lines.

(3) Following these round tables, the project was presented to the CSR Strategy Committee to take account of observations by members of the Executive Committee and subsidiary managers. The project was then submitted to the Board of Directors Corporate Responsibility Committee, before being approved by the Senior Executive Vice-President, Innovation, Strategy, and Corporate Responsibility.

3.1.2 Management of CSR issues

3.1.2.1 Corporate Social Responsibility Goals (CSRG)

The six Corporate Social Responsibility Goals announced during the Shareholders' Meeting of 12 May 2016 translate the Group's commitment to its strategic transformation taking into account the UN's 17 Sustainable Development Goals, which, while not directly targeted at companies are not attainable without their active contribution.

These ambitious CSR goals lay down a roadmap for the Group's businesses and subsidiaries for success with the CAP 2030 strategy. Six major themes have been adopted. Three of them are related to the environment and natural resources: climate, biodiversity and energy efficiency. Three others serve to confirm EDF's long-term social and societal commitment: support for the most vulnerable communities and access to electricity, the systematic implementation of consultation mechanisms for new projects, human development to ensure the safety and equal treatment of all our staff. These goals are integrated into the Group's sustainable development policy, which is intended to stipulate all the Group's sustainable development requirements.

CSRG Goal (CSRG) no. 1: EDF, a company committed to climate issues (see section 3.2.1)

CSRG Goal (CSRG) no. 2: EDF, a company with a responsible attitude to its employees (see section 3.3.3.1)

CSRG Goal (CSRG) no. 3: EDF, a company with a responsible attitude to people – Energy poverty (see section 3.3.1.1.3),

CSRG Goal (CSRG) no. 4: EDF, a company standing shoulder to shoulder its customers (see section 3.2.2)

CSRG Goal (CSRG) no. 5: EDF, a company with a responsible attitude to communities – Dialogue and consultation about our projects (see section 3.3.1.2.5)

CSRG Goal (CSRG) no. 6: EDF, a company committed to biodiversity (see section 3.3.2.1)

3.1.2.2 Group policies

3.1.2.2.1 Sustainable Development policy

The EDF group Sustainable Development (SD) policy as revised in June 2018 includes the Group's carbon plan ⁽¹⁾ and more specifically CSRGs.

Its implementation is based on the principle of subsidiarity. The Group's performance will consist of the positive contributions reported by the Group's various business lines and subsidiaries in the areas in which they are concerned. The Group Sustainable Development Policy sets out the common principles and the means of achieving consistency.

The requirements of the Sustainable Development Policy meet three priorities: regulatory compliance, the means of implementing the Corporate Social Responsibility Goals, and the control and coverage of other major Sustainable Development issues such as air and water quality. It also includes some recommendations associated with the anticipation of and preparation for the future (for example, the practical integration of the principles of the circular economy). The requirements of the policy are divided into four broad areas: responding to the challenges of climate change; optimising the use of natural resources and conserving the environment; paying particular attention to people; and, dialogue with stakeholders and reporting on our activities. They apply to all Group entities and subsidiaries as well as to projects and investments submitted to decision-making bodies (see section 3.1.2.4.1 "Integration of Corporate Social Responsibility Goals into the Group's strategic process and project screening").

3.1.2.2.2 Other CSR policies

In addition to the Sustainable Development policy, other Group policies focus on other specific aspects of corporate responsibility (HR policies, Procurement policies, Ethics & Compliance policy, Nuclear Safety policy, etc.). Corporate responsibility policy is progressively being implemented in all the Group's fields of business. For example, the Company recently committed to the new FAiRe programme set up by Union des Marques (UDM), making EDF one of the thirty pioneering businesses in the field of responsible communication ⁽²⁾.

3.1.2.3 Governance of corporate responsibility

3.1.2.3.1 Board of Directors

The Board of Directors sets the strategies for the Company's activities and oversees their implementation, acting in its corporate interest, while taking into consideration the social and environmental issues of its activities. The Board also regularly examines, in connection with the strategy that it defines, opportunities and risks such as financial, legal, operational, social and environmental risks, as well as the measures taken as a consequence. Within this framework, it particularly examines risks and opportunities relating to climate change and their impact on the Group's strategy and its activities. It ensures the implementation by the Company of a programme to prevent and detect corruption and influence-peddling and a policy to promote non-discrimination and diversity, particularly in terms of balanced representation of women and men on the Company's governing bodies.

The Corporate Responsibility Committee ⁽³⁾, as one of the Board of Directors committees, examines, in connection with the Group's strategy, the Group's commitments and policies, as well as their implementation, in terms of ethics, compliance, and corporate responsibility. It examines the way in which the Company takes account of issues relating to climate change. It makes sure, in conjunction with the Audit Committee, of the existence of programmes to identify and manage the main risks in these fields and comply with legal and regulatory provisions. In the line of its duties, it particularly examines, in conjunction with the Audit Committee, information regarding the declaration of extra-financial performance included in the management report in accordance with the French Commercial Code (*Code de commerce*), the annual ethics and compliance report, and the EDF mediator's annual report. It submits an opinion to the Board on the way in which the Company implements a non-discrimination and diversity policy, particularly in terms of balanced representation of women and men on governing bodies. It can submit any opinions, proposals and recommendations to the Board of Directors in fields falling within its remit. This Committee's role is to prepare the work of the Board of Directors and endeavour to guarantee the quality of its discussions; it does not replace the Board, which has sole decision-making authority (see section 4.2 "Members and functioning of the Board of Directors"). In 2019, among other issues, it examined socially-responsible sub-contracting, EDF's relations with service providers in the nuclear industry, the Group's diversity aims, changes to EDF's non-financial rating, and revision of the materiality matrix.

3.1.2.3.2 CSR Strategy Committee

The Corporate Social Responsibility Strategy Committee was set up in order to better coordinate all the CSR issues of the various Group entities and to ensure strategic management. This Committee is composed in particular of the Executive Director for Human Resources, the Executive Director for Finance and the Group Secretary General, and is chaired by the Executive Director for Innovation, Corporate Responsibility and Strategy. The CSR Strategy Committee met three times during the year, and particularly examined at each meeting the stages of the development of the Group's main mission, how to take account of Corporate Social Responsibility Goals in the management cycle, particularly including climate commitments, revision of the materiality matrix, the impact of non-financial performance on financing, the Group's CSR Agreement and implementation of the CSR policy by major subsidiaries, and regionally to purchasing processes, payment term action plans, and finally litigation issues regarding the duty of care. The minutes of these meetings are submitted to the Board of Directors.

(1) See section 3.2.1.1 "EDF, a company committed to climate issues".

(2) EDF's commitment was confirmed by the publication of an "EDF responsible communication code", written in collaboration with internal and external stakeholders, that includes 50 commitments, covering 12 chapters including: respect for human dignity and its audiences; clear and responsible communication; respectful environmental communication; relationships with responsible suppliers engaged in CSR initiatives; communication focused on listening and discussion; and, impeccable digital communication. In 2019, to support and manage the implementation of the 50 commitments in activities and projects, 20 responsible communication performance indicators were put in place. Mandatory "Responsible communication" training courses were deployed internally for the communication and management function. For example, EDF neither publicly retaliates following the publication of articles particularly critical of the Company, nor does it use certain indirect communication techniques.

(3) Internal rules of procedure of 8 October 2019.

3.1.2.3.3 The Sustainable Development Department

It reports to the Innovation, Corporate Social Responsibility and Strategy Director, a member of the Executive Committee.

It contributes to the Group's strategic transformation by accompanying business lines and projects in specifically taking into account environmental and social issues (opportunities and risks) in their business decisions and conduct, the integration of the six Corporate Social Responsibility Goals into the strategic screening of operating entities and process of screening new projects from the point of view of sustainable development ⁽¹⁾. It is particularly responsible for monitoring the Group's target for reducing direct "scope 1" ⁽²⁾ GHG emissions.

Its aim is to make the Group's performance as a responsible company a USP that creates value for all stakeholders (employees, shareholders, customers). It coordinates sustainable development in the Group: corporate coordination of the business lines and subsidiaries through the SDC (Sustainable Development Committee) ⁽³⁾, coordination of the dedicated internal networks such as the EMS and the predictive watch networks, coordination of relations and dialogue with external partners. It brings together and coordinates the expertise necessary for taking into account sustainable development issues, particularly the implementation of the CSRGs.

3.1.2.4 Transformation drivers

3.1.2.4.1 Integration of the Corporate Social Responsibility Goals into the Group's strategic process and project screening

The six CSRGs reflect long-term commitments (2030). The requirements for their implementation are set out in guidelines specifying the contribution of each of the Group's entities and subsidiaries to the achievement of the common objective. The system for monitoring these commitments is integrated into the Group's strategic planning loop. Annual performance reviews allow entities and subsidiaries to monitor and control their actual performance.

Similarly, projects and investments subject to the approval of the Group's various Commitments Committees, and particularly those of the Group Executive Committee ⁽⁴⁾ (CECEG) and the International Business Development Committee (CBDI) that are the subject of a specific opinion of the Sustainable Development Department based on a screening grid that translates the issues of the six CSRGs into operational terms. Where necessary, the Sustainable Development Department organises due diligence specific to these issues.

3.1.2.4.2 The environmental management system (EMS)

In order to implement the goals and actions based on its sustainable development commitments and policy, the EDF group has set up a Group-wide environmental management mechanism using an environmental management system (EMS). This system is ISO 14001: 2015 certified by the Afnor certification external expert, for a scope representing almost all the consolidated revenue of EDF and its subsidiaries (excluding Enedis) and shareholdings. All (100%) of industrial sites are covered by an EMS and, for all thermal, nuclear and hydropower generation sites in Europe, this system is certified. The environmental actions adopted are deployed at all entities and subsidiaries *via* implementation of the Group's Sustainable Development policy goals.

3.1.2.4.3 Predictive watch

EDF anticipates changes to environmental and energy policies in order to take appropriate measures to guarantee regulatory compliance and manage business integration or reputational risk issues. To this end, the Sustainable Development Division coordinates a predictive watch system that mobilises and coordinates the Group's experts. This process is based on the work of thematic groups known as "watch networks": water, waste and soil, air, biodiversity, industrial risks, energy efficiency, energy poverty, health and climate change, sustainable finance. Each of these network comprises fifteen members from different Group businesses that meet every quarter to share an overall vision. Each network works closely with the Legal, Public Affairs and European Affairs Divisions. The managers of each network meet every month as a Sustainable Development Agency which monitors the transversality of approaches and ensures that the Group's challenges are optimally taken into consideration with an overall, long-term view. In 2019, EDF was considered by the InfluenceMap think tank to be one of the 17 businesses most actively supporting regulation in accordance with the Paris Agreements ⁽⁵⁾.

3.1.2.4.4 Management of environmental risks

Environmental risks, including those associated with climate change, are fully integrated into the Group's EMS and internal control system in coordination with the Group risk management function. They are subject to action plans resulting from strategic priorities in the Group's sustainable development policy.

Identifying the environmental risks

The 2019 risk mapping ⁽⁶⁾ update reconfirmed the risk analysis and did not highlight new environmental risks. At the end of 2019, the Group has eight high-threshold SEVESO sites and 32 low-threshold sites ⁽⁷⁾.

In 2019, as in previous years, the most significant factors in terms of the economic and financial challenges related to environmental risks pertain to the following subjects: climate change and GHG emissions; the roll-out of energy efficiency initiatives; the impacts of EDF's activities on the air, water and soil and the production of waste; protection of biodiversity and services provided by ecosystems and the management of water resources. The main change concerns the observation of the effects of climate change with higher temperatures and droughts increasing the pressure on both environments and some of the Group's business lines.

Managing the environmental risks

In order to control risks of industrial incidents or accidents that could harm the natural environment or public health, EDF has implemented a Group environmental management system; an active investment policy and an industrial asset decommissioning programme for assets no longer in operation, which includes decontamination operations where necessary; an employee training and awareness-raising programme for all stakeholders, including feedback from crises experienced and drills; inspections and audits at the generation sites; a crisis management policy which requires the regular testing of crisis systems through an annual programme of crisis response drills (see section 2.1.2.5 "Crisis management and business continuity"). Specific internal feedback from the industrial incident at LUBRIZOL's SEVESO site in France (non-EDF) will be provided, allowing identification of any potential areas for improvement.

(1) See section 3.1.2.2 "Integration of the Corporate Social Responsibility Goals into the Group's strategic process and project screening".

(2) See section 3.4.2 "Methodology".

(3) In 2018, the SDC met five times. It reviewed the carbon trajectory, the biodiversity agenda, the organisation of non-financial reporting and the Group's Environmental Management System.

(4) This undertaking concerns new projects involving investments of more than €50 million, entailing a significant impact on regions and the environment. The Group plans to lower this investment threshold to €30 million by 2030.

(5) How companies really impact progress on climate, 2019, [influencemap.org/climate-lobbying](https://www.influencemap.org/climate-lobbying).

(6) See section "2.1.2.1 Risk mapping and the report on the control of activities and risks".

(7) Upper and lower threshold: industrial establishments are "Seveso" classified according to their technological risk depending on the quantities and types of hazardous products they handle. There are two different thresholds which classify establishments as "Seveso low-threshold" or "Seveso high-threshold". The requirements vary significantly between these two types; they are very restrictive for the high-threshold, particularly with regard to the safety management system, informing the public and the prevention plan, etc.

3. Non-financial performance

EDF, a responsible company

In France, a comprehensive “environment – sustainable development” training programme features both business line and cross-disciplinary training focusing on themes of environmental management, standards and regulations, and environmental analysis. In 2019, 2,760 employees received training representing 21,752 hours⁽¹⁾. The “environmental skills development” network contributes to forecasting and managing both skills in this field and experts’ career paths.

Locally, each of the Group’s operational units and companies identify events that could have an environmental impact, manage emergency situations that could result from them, conduct corresponding crisis response drills, implement monitoring and communicate on environmental events under its responsibility.

High-stake environmental event

There were no high-stakes environmental events during 2019⁽²⁾. A single noteworthy event occurred at the start of the filling of the SINOP dam in Brazil, causing two incidents of fish mortality in February and March, and resulting in the death of several dozens of tonnes of fish. The main cause identified was gas oversaturation (frequent in Brazil and in major rivers), due to the use of spillways during this phase. Sinop Energia (51%-owned by EDF Norte Fluminense, a 100% EDF-owned subsidiary) committed to putting in place prevention and monitoring programmes as well as to paying BRL 4 million (approx. €0.9 million) in financial compensation for the environmental impacts.

Certain operations may result in litigation arising from complaints filed by NGOs or non-profits or formal warnings from national regulatory authorities (the French Nuclear Safety Authority (ASN), the Prefecture, etc.) or disputes relating to land transactions. In 2019, EDF was ordered to pay total penalties amounting to €28,000, covering 6 penalties all of less than €10,000, and including 4 fines (concerning 3 nuclear sites and Edison) and 2 criminal settlements (hydropower and nuclear) regarding waste management, water quality, or BNF (basic nuclear facility) regulations.

Reduction of chemical risk

When it is technically feasible, in order to reduce the pollution risks, the Group’s entities have also implemented a programme to eliminate or substitute certain chemical substances with more environmentally-friendly products. This work focuses as a priority on CMR (carcinogenic, mutagenic, or toxic for reproduction) substances or those considered extremely worrying. Substitute products are often environmentally certified, e.g. cleaning products (regarding our subsidiaries Citelum, Électricité de Strasbourg (ÉS) and data centres). Following on from the studies of previous years, substitutions are implemented: environmentally acceptable oils for hydraulic production, fluids for thermal and nuclear power plant turbines in France and the United Kingdom, varnishes and paints (Industrial Division, Property Management and Citelum). As part of an R&D project, activities aim to identify and evaluate mature and innovative liquid effluent treatment technologies. Furthermore, EDF, Hydro, Property Management, Enedis and ÉS are continuing with their programmes to decontaminate equipment containing PCBs⁽³⁾ and PCTs⁽⁴⁾ of more than 50 ppm. These action plans continued in 2019 are on target. Complete disposal is set for the end of 2025. EDF R&D, EDF IES, EDF PEI, Cyclife France, Dalkia and the thermal and nuclear generation sites no longer have any equipment exceeding the threshold.

3.1.2.4.5 Expertise from sustainable development partnerships



Partnerships are an important lever for implementing Corporate Social Responsibility Goals, particularly in four areas: biodiversity, energy transition, vulnerable populations and fuel poverty, dialogue and consultation.

In France, in terms of biodiversity, the Group relies on domestic partnerships built over time with major players in the sector (see section 3.3.2.1.1 “EDF’s commitment in favour of biodiversity”). Regarding climate and the fair ecological transition in the broad sense, the partnership forged with the Sustainable Development and International Relations Institute (Iddri) allows EDF to engage in discussions on issues, develop expertise and identify emerging issues. Assisting vulnerable sections of the population in the energy transition constitutes one of EDF’s partnership areas, especially with the social and fair economy and social entrepreneurship sector. EDF therefore entered into a partnership with ASHOKA France, one of the pioneers and major players in social entrepreneurship (see section 3.3.1.1.3 “Energy poverty (CSRG no. 3)”). In terms of dialogue carried out in the regions of France, partnerships continue with the French coastal protection agency (Conservatoire du Littoral) on “support for local communities” and with the National School of Landscape Architecture (ENSP) so that the operational divisions of EDF increasingly address the landscape dimension in their activities. The regional dimension is also extended to the national level with the non-profit Remarkable Sites and Cities for supporting the development of our industrial heritage. Lastly, many local partnerships are being created as part of the regional dialogue with regional players.

3.1.2.4.6 R&D resources for corporate responsibility

The EDF group’s Research & Development (R&D) activities are handled on the one hand by the Research & Development Division – EDF R&D and on the other by certain Group subsidiaries. These activities are complementary and in line with the Group’s CAP 2030 strategy. To achieve the aim of carbon neutrality by 2050, a process in which electricity will be a major factor to make the French economy carbon-free, R&D has a crucial role to play. Its areas of research focus on three main themes: the electrical transition; the climate transition; and the digital and societal transition. In 2019, the EDF group’s total R&D budget was €713 million. This was divided into €523 million for R&D by EDF and independent R&D by certain subsidiaries, mainly Framatome, EDF Energy and Edison. In particular, expenditures covered research into energy efficiency, uses of electricity as a substitute for fossil fuels, renewable energies and their insertion into the grid, energy storage, carbon-free hydrogen and its applications for decarbonising the economy, sustainable cities, the local impacts of climate change and other environmental issues such as biodiversity, water quality, and the mitigation of disturbances (See section 1.6 “Research & development, patents and licences”).

For a range of illustrations of EDF’s R&D commitment on material issues, see sections 3.3.2 and 3.3.3.

(1) Within the scope of EDF SA.

(2) High-stake environmental event: an event causing serious environmental damage (areas, resources and natural environments, sites and landscapes, air quality, animal and plant species, biological diversity and balance) combined with extensive media coverage or a financial impact of more than €3 million. An event causing environmental damage and likely to affect human health falls within the scope of a high-stake environmental event for the EDF group.

(3) PCB: Polychlorobiphenyls.

(4) PCT: Polychloroterphenyls.

3.1.2.4.7 Sustainable Development Training and Awareness Raising



EDF focuses its sustainable development training and awareness raising actions on the visibility of EDF's contribution to a just and fair energy transition. It also aims to boost understanding of the related transformation of the Group's business lines.

Employee training

In 2019, the EDF group University launched a "Strategic energy business" course for 70 Group executives; it particularly focuses on the impact of climate change on the energy industry, as well as the different processes to achieve carbon-free energy by 2050. 70 Group directors also completed a "Business and sustainable development" module, and for managers, a 100%-digital "management and sustainable development" course was released on the e-campusmanagers training platform.

The document setting the corporate training aims for EDF SA now includes a chapter focused on EDF's contribution to the energy transition. Both the "business" process and the integration of new employees maintain and develop skills relating to low-carbon electricity generation, the safety of facilities, energy efficiency and the integration of renewable and decentralised energy into the energy mix. The Company is bolstering its skills regarding management of environmental risks, and responsibility to employees and suppliers, as well as people and communities. EDF developed a "dialogue and regional involvement" training programme for projects managers and senior staff designed to develop knowledge of stakeholders, understanding of the issues involved, and expertise regarding dialogue and consultation practices. New courses on public participation in projects and regional involvement were made available to DP2D project stakeholders and 5 videos ("Dialogue in under 6 minutes") were released to all employees and managers on the e-campus online platform. Overall, nearly 500 employees completed listening and dialogue training, including 230 "dialoguers" for the "Let's Talk Energy" programme.

Raising employee awareness

In 2019, EDF launched "Combating CO₂, it starts with us", which encourages employees to manage their energy consumption and reduce their carbon footprint. This programme is part of the CAP 2030 strategy, and meets an expectation highlighted by staff in "Let's Talk Energy". Currently targeting all Group employees in France, it promotes environmentally-friendly practices and provides access to preferential terms for the low-carbon sales offerings available from EDF and its subsidiaries. For electric mobility, they have access to a framework contract with motor vehicle suppliers selected for the "EV100" commitment on the EDF vehicle fleet (see section 3.2.2.2.1 "Electric mobility"), as well as virtuous recharging solutions provided by EDF subsidiaries.

In 2018, the 101,000 employees of EDF and its subsidiaries in France (excluding Enedis) were invited for dialogue on the Company's strategic vision ("Let's Talk Energy"). The resulting 20 challenges are currently being implemented, including the appointment of employee ambassadors to encourage adoption of the solutions⁽¹⁾. In 2019, Let's Talk Energy gave employees the chance to share their thoughts on the implementation of the multi-year energy programme law and to consider the Company's main mission. More than 1,400 proposals were put forward.

Awareness Raising among external stakeholders

This campaign targets the general public, opinion leaders, and young people. It prioritises CSRGs, and more specifically the fight against climate change and biodiversity.

To target the general public, EDF supports the "Energies for Climate" programme headed up by Makesense, an international community of citizens, non-profits, and entrepreneurs. The community created for this programme features more than 7,000 contributors and 400 ambassadors in 43 countries. By organising more than 100 forums and meeting/debates in 2019, Energies for Climate helped to raise awareness among some 100,000 people regarding climate change issues and

impacts. The aim of the programme is to get everybody to put theory into practice by setting up or supporting projects that will transform modes of generation, consumption of and access to energy, through which nearly 800 innovative businesses have been identified and already 50 start-ups and entrepreneurs promoted or supported.

Faced with the environmental emergency, which has become a major cause for concern in France, EDF is supporting Make.org's key campaign "Agissons pour l'environnement" (Let's take action for the environment), a coalition of more than 70 institutions, non-profits, media organisations, grass-roots movements and partner businesses. Via a digital platform that provides tools to improve understanding of climate and biodiversity issues, a large-scale call for grass-roots solutions in order to take collective action in favour of environmental preservation was launched in November 2019. In year two, workshops will be organised to make the step from proposals to action plans. The first phase of the programme will focus on managing five to ten chosen projects, and assessing their impact. At the end of 2019, more than 366,000 people had already participated in the programme, submitting more than 13,700 proposals.

In France, EDF has been a partner of "Fête de la Nature" (i.e. "Nature Festival"), a government-funded project, since 2008, particularly via the French Biodiversity Agency (AFB), the French Ministry for the Ecological & Inclusive Transition, and IUCN⁽²⁾. Every year, EDF's divisions and entities in mainland France and its overseas regions and departments work to provide visibility on the issue of biodiversity, by raising awareness among the general public, and employees, of the practical measures put in place by the Company's business lines to preserve our planet. These joint sessions offer the opportunity to highlight the links between biodiversity and climate change. The organisation of these events by business lines contributes to one of the commitments made in act4nature ("mobilising all the Group's entities"). In 2019, for the 13th edition focused on "Nature in motion", EDF's business lines organised 77 events and received nearly 5,500 visitors. Since 2008, more than 60,000 visitors have been welcomed to EDF sites. Finally, special focus was placed on communication regarding solidarity, particularly in terms of the fight against poverty, with several campaigns aimed at the general public, explaining to them about programmes designed to help them consume less and better, which were recognised by the AFNOR "Engagé RSE" (i.e. "committed to CSR") certification scheme.

Focusing on opinion leaders, the Group continued the cycle of its "Energy Climate Encounters" started during COP21, where experts share their approach towards climate issues and energy transition with targeted audiences (major companies, local authorities, government representatives, NGOs, etc.). Accordingly, in 2019 EDF organised a conference with the Chair of the CNDP (French National Public Debate Commission), Chantal Jouanno, on the theme of "Projects, public participation issues". In the French context of the "yellow vests" crisis, which has further underlined the need to take account of the dependency of consumers on fossil fuels and to find ways to make the climate policies currently being put in place acceptable to the most vulnerable communities, EDF organised, as part of its partnership with the Théâtre du Rond-Point, a day of discussions on "The fair energy transition: a debate on the acceptability of public policies", with the participation of the Abbé Pierre Foundation, FONDEM (Fondation énergies pour le monde, i.e. Energies for the World Foundation), European Political Strategy Centre (EPSC), Climate Finance Pact, and Ademe (French Environment & Energy Management Agency). In 2019, Group R&D organised two major events: in partnership with EPRI, an "Electrification Europe Summit" on the theme of "Practical solutions for the electrification of practices and decarbonisation of society", for French and European businesses (nearly 800 participants); a "Climate: look before you leap" day, with the aim of providing and sharing information, and joining forces to tackle issues of climate change.

For young people, EDF offers primary, secondary and high schools free conferences on electricity and sustainable development⁽³⁾. In 2019, EDF totally overhauled these conferences, which are now focused on the theme of "Energies & Climate" and based on a new educational approach: workshops that increase interaction and make students play an active role in their own learning by throwing them into an "real-life" situations (developing an energy strategy to reduce GHG emissions; transforming a city into a smart city, etc.). More than 52,800 students attended these workshops.

(1) This initiative received the participation and consultation trophy on 19 November 2018, organised by the Gazette des Communes and the Décider Ensemble association under the auspices of the Ministry of Ecological and Solidarity Transition, the National Public Debate Commission and the Commissioner-General for Sustainable Development.

(2) IUCN: International Union for Conservation of Nature.

(3) In partnership with the French Ministry for National Education under the terms of an agreement signed in 2002.

3. Non-financial performance

EDF, a company committed to the energy transition

3.2 EDF, a company committed to the energy transition

Subject to approval by the Shareholders' General Meeting on 7 May 2020, EDF's *raison d'être* is "to build a net zero energy future with electricity and innovative solutions and services, to help save the planet and drive wellbeing and economic development".

This underscores EDF's aim, both in France and internationally, of developing solutions that allow everyone to play an active role in energy transition.

EDF is by far the largest contributor to carbon-free energy in Europe and the leading investor in energy transition.

3.2.1 EDF, a leader in low-carbon energy

As a world leader in low-carbon energy, EDF group has developed a diversified production mix, based mainly on nuclear power and renewable energy. To address the climate emergency, EDF group is implementing an ambitious strategy combining low-carbon transition, adaptation, and transformation, helping to achieve Sustainable Development Goals 13 (combating climate change) and 7 (access to clean energy).

3.2.1.1 EDF, a company committed to climate issues (CSR Goal (CSRG) no. 1)



3.2.1.1.1 EDF group's ambition

EDF group is aware of both the impact of its operations on climate change, and the impact of climate change on its operations. In response to the climate emergency, and to address stakeholder expectations, in 2016, EDF group made doing better than the 2°C trajectory requirements established by the Paris Agreement its first "CSR Goal" (CSRG No. 1), significantly cutting its CO₂ emissions.

In 2018, EDF group committed to cutting its direct greenhouse gas emissions to 30 million tonnes by 2030, and the goal of becoming carbon neutral by 2050. This commitment has been incorporated into the Group's Sustainable Development policy.

The 2030 goal of 30 million tonnes corresponds to a 40% reduction in EDF group's direct emissions compared to 2017; this goal was raised to 50% at the beginning of 2020. The goal was set using the method developed as part of the Science Based Targets initiative for the electricity industry, taking 2015, the year in which the Paris Agreement was signed and in which EDF group's 2030 strategy was launched, as the baseline. In addition to its carbon commitment for 2030, EDF group has also set itself a half-way target of 35 million tonnes by 2023⁽¹⁾.

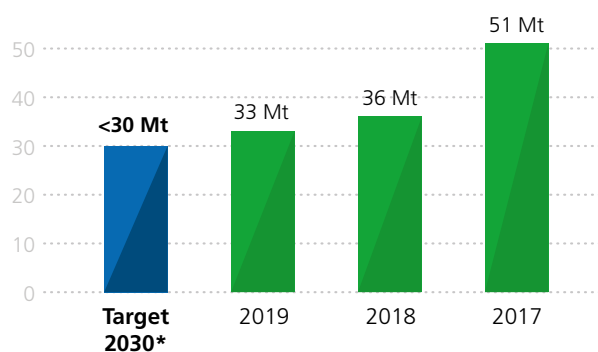
This is an ambitious commitment: in addition to being one of the world's leading electricity firms in terms of net capacity and output, EDF group already has one of the lowest carbon intensities amongst electricity firms, such that it has already significantly reduced the European electricity sector's carbon footprint.

Enabling EDF group to adhere to its carbon commitment has entailed the Group's main subsidiaries also setting themselves ambitious goals: in the UK, EDF Energy is aiming to cut its carbon intensity and achieve carbon neutrality before 2050. In Italy, Edison aims to cut its carbon intensity to less than 260g/kWh by 2030.

The following chart shows the progress of EDF group's Scope 1 direct greenhouse gas emissions:

→ EDF, a leader in low-carbon energy

EDF group direct greenhouse gas emissions (scope 1) (Mt CO₂eq)



Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). Direct GHG emissions, excluding life-cycle analysis (LCA) of fuel and production resources. For the scope and method used for this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 2 "Renewal, extension and performance of the energy mix aimed at decarbonisation" described in section 3.6.2 "Description of key stake in the materiality matrix".

2019 indicator subject to reasonable assurance check by KPMG S.A.
*Figure being adjusted to take into account the SBTi initiative.

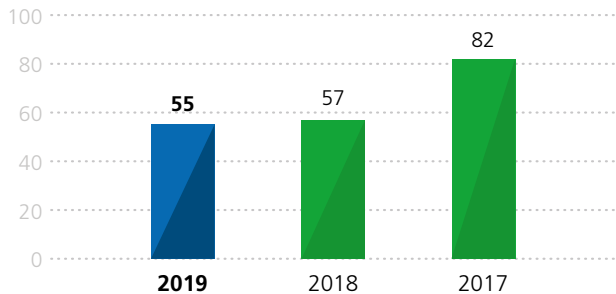
EDF group's direct greenhouse gas emissions continued to fall in 2019 (7% down on 2018). This decrease in EDF group's direct emissions in 2019 was due mainly to a sharp drop in the use of coal to produce electricity and heat within the Group (60% less than in 2018), with it being partially replaced by natural gas, which generates far fewer emissions (an additional 7%). Part of GHG reduction recognised between 2017 and 2018 was due to EDF Polska's assets being transferred to the Polish public undertaking PGE.

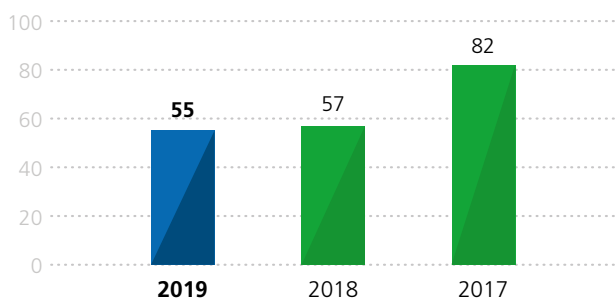
EDF group is aware that disposing of carbon assets does not constitute a strategic response to the global climate emergency, and is therefore aiming to shut down all of its high-emissions power plants: in the years 2017-2019, these included Porcheville, Cordemais 2 and Cordemais 3 (the last remaining oil-fired unit) in France, and the coal-fired power plant in Cottam, UK.


(1) Figure being adjusted to take into account the SBTi initiative.

The following chart shows the progress of the “electricity and heat kWh carbon intensity” performance indicator for EDF group:

→ EDF, a leader in low-carbon energy

Carbon intensity: CO₂ emissions due to heat and electricity generation (gCO₂/kWh) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). Direct CO₂ emissions, excluding life-cycle analysis (LCA) of fuel and production resources. For the scope and method used for this indicator, see section 3.4 “Indicators and methodology”. This indicator refers to key stake no. 2 “Renewal, extension and performance of the energy mix aimed at decarbonisation” described in section 3.6.2 “Description of key stakes in the materiality matrix”.

EDF group’s carbon intensity has continued to decrease, down to 55gCO₂/kWh in 2019. This level is more than five times lower than the European electricity sector’s average of 294g/kWh, and over eight times lower than the worldwide electricity sector average of 485g/kWh⁽¹⁾, thus confirming EDF group’s position as the low-carbon leader within the electricity sector.

Towards fresh commitments

EDF group aims to become carbon neutral by 2050. In 2018, the Group had already committed to cutting its Scope 1 direct greenhouse gas emissions by 40% between 2017 and 2030, with a mid-point emissions goal of 35 million tonnes in 2023⁽²⁾.

Each year since 2016, EDF group has published a detailed greenhouse gas emissions report for the whole of its value chain, subject to third-party verification covering all significant emissions; this anticipates legal requirements in the field by several years.

Being fully persuaded that achieving carbon neutrality requires a strategy to cut all its emissions, including those of its customers, in early 2020 EDF group signed up to the “Business Ambition for 1.5 degrees” commitment alongside 200 other global companies, setting itself greenhouse gas reduction targets aimed at restricting any temperature increase to 1.5 degrees. The Group has also committed to obtaining Science Based Target Initiative certification, and in doing so has now revised the target for decreasing the Group’s direct emissions by 2030 upwards from, 40% to 50% – and, for the first time, has committed to cutting Scope 3 indirect emissions (validation in progress).

3.2.1.1.2 EDF climate strategy governance

EDF group’s climate strategy governance forms part of its sustainable development governance (see section 3.1.2.3.3 “The Sustainable Development Department”), and is managed at the highest level of the Group.

The Executive Committee establishes the Group’s climate strategy. Within the Executive Committee, the Innovation, Corporate Social Responsibility and Strategy Director (DIRES) is in charge of climate issues. Each year, the Executive Committee

examines and validates the Group’s low-carbon trajectory. Where necessary, alternative options are put forward as part of the Medium Term Plan (MTP) process during validation of the strategic and financial guidelines for the EDF group’s different entities in May-June.

The Board of Directors establishes the Group’s strategic, economic, financial, and technology orientations, taking climate issues into consideration. To do so, it regularly examines climate change-related risks and opportunities and gives its opinion on the Group’s climate strategy. In November 2018, EDF group’s carbon commitment governance was presented to the Board of Directors’ Governance and Corporate Responsibility Committee (CGRE). In October 2019, a specific brief on climate risks was presented to the Board of Directors’ Audit Committee.

Any investment projects brought before the Group’s decision-making bodies that are likely to cause significant direct or indirect greenhouse gas emissions include a verification of their consistency with the Group’s low-carbon trajectory and with the energy transition dynamic in the countries in question.

Set up in 2018, the Corporate Social Responsibility Strategy Committee is in charge of managing EDF group’s climate strategy. This includes monitoring the Group’s carbon commitment, as well as monitoring the progress of Scope 3 indirect emissions and the adjustment strategies engaged to cope with the course of climate change-related risks and opportunities. The CSR Strategy Committee meets at least twice a year, and reports on its activities at least once a year to the Group’s Executive Committee and the Board of Directors’ Governance and Corporate Responsibility (CGRE) Committee.

The Sustainable Development Department (DDD) is responsible for operational monitoring of EDF group’s climate change-related actions and indicators for implementation of the Group’s sustainable development policy. It works in liaison with the corporate departments and subsidiaries concerned, backed by the Group’s Environmental Management System (EMS) and the Sustainable Development Committee (SDC), which serves as the Group’s Environment Board. Actions to implement the Group’s sustainable development policy are the responsibility of the Group’s various business units and entities.

The Group Risk Department (DRG) ensures that all entities examine climate risks (physical and transition risks) in their risk map, which is updated annually. The DRG coordinates the updating of EDF group’s policies and, in collaboration with the DDD, ensures that each update includes a specific analysis to verify its consistency with the Group’s climate strategy.

The Sustainable Development Board, whose members are third parties representing the different issues facing EDF group, is an avenue for civil society to communicate its expectations in terms of combating climate change.

The Scientific Council is regularly approached to inform the Company’s climate strategy, presenting the progress of scientific knowledge in the field (in particular from the IPCC⁽³⁾) and suggesting strategic orientations for EDF group’s R&D. The Scientific Council was approached in 2019 to produce a report on “Climate change and its impact on EDF group”; this was used in the climate risk brief presented to the Group’s Executive Committee and Audit Committee.

3.2.1.1.3 Practical initiatives to reduce EDF group emissions

To maintain its position as low-carbon leader and achieve its emissions reduction goal, EDF group has three main sources of leverage: ensuring long-term performance of the Group’s nuclear fleet; doubling renewable energy capacity by 2030⁽⁴⁾; reducing CO₂ emissions within its production asset portfolio (see also section 1.4.1.4.2 “Issues relating to thermal generation”).

Shutdown of coal-fired plants

Between 2010 and the end of 2019, EDF group permanently shut down over 4,500MWe of coal-fired plants in France (10 units) and the United Kingdom (2 units). These closures were accompanied by employee redeployment measures and initiatives to develop new local economic activities. The most recent plant to be shut down was Cottam, operated by EDF Energy, in September 2019.

(1) CO₂ Emission Factors, International Energy Agency, 2019 (2017 figures).

(2) Figures are still being adjusted to take into account the SBT initiative.

(3) Intergovernmental Panel on Climate Change.

(4) See section 1.3.3.3 “Very low carbon generation: nuclear and renewable energies”.

3. Non-financial performance

EDF, a company committed to the energy transition

Since 2017, EDF group has been engaged in the Powering Past Coal Alliance, which promotes the phasing out of coal in EU countries by 2030 and in the rest of the world by 2050 in the wake of the Paris Agreement. In 2020, EDF has committed to stop coal power generation by 2030 in all geographical areas.

The situation for the last remaining coal units operated by the Group is as follows: the Le Havre power plant will be shut down in spring 2021; the Cordemais power plant is planning to convert to biomass (the ECOCOMBUST project) from 2022 onwards, enabling a reduction in direct greenhouse gas emissions from the facility by a factor of 5, for operation at peak times using pellets, until 2026. The Cottam power plant (United Kingdom) closed in 2019 after 50 years of operation.

In 2019, coal-fired heat and electricity generation accounted for less than 1% of EDF group's total output. It should be noted that between 2010 and 2018, EDF also closed all its high-power oil-fired boilers, corresponding to installed capacity of 5,200MWe.

Improvement of performance and R&D

Countries and companies will not be able to become carbon neutral without using new technology. By way of an example, EDF group has been developing skills in CO₂ capture for over 10 years, becoming involved in international research projects as well as building and operating a pilot capture unit on the Le Havre site. This €22 million demonstrator (25% co-funded by French research agency ADEME) has captured 1,900 tonnes of CO₂ and enabled the technical and economic feasibility of several processes to be described. EDF group also actively monitors technologies that could result in a breakthrough in this field.

In addition, EDF group is working on how to optimise the energy and environmental performance of its fossil fuel-fired fleet in order to reduce its CO₂ emissions, as well as to provide more services to the electricity system as the latter is called on to incorporate an ever-higher quantity of intermittent renewable energy that cannot be managed ahead of time.

Ambitious energy transition for island territories

France has set itself ambitious low-carbon and energy independence goals for island territories, forming part of their PPEs (energy autonomy of French overseas territories by 2030, and Corsica by 2050). Fossil fuel-fired facilities (mainly generators) currently play a major role in these non-interconnected zones. EDF SEI and EDF PEI are fully committed to these energy transition goals, notably through the following initiatives:

- voluntary implementation of an energy management system (ISO 50001 certification) on 7 SEI fossil fuel-fired generation sites and output optimisation work on PEI facilities;
- project to replace fuel oil with biofuels for the SEI micro-network generators (with tests lasting over a month on the Island of Molène, in Brittany) and PEI generators;
- shutdown of the oldest oil-fired combustion turbines (TAC) and generators as and when new generation resources with lower emissions become available.

Greener heating networks

Dalkia, a subsidiary of EDF group specialising in energy services, has set itself the goal of achieving 50% of renewable and recovered energy in its energy mix by 2022, and achieved a figure of 40% in 2019. This commitment has led to the development of the use of biomass (wood energy, biodegradable household refuse, and biogas), the recovery of waste heat, and geothermal energy, backed by specialist subsidiaries Dalkia Wastenergy and Dalkia Biogaz. Dalkia has also enabled its customers to make 6.7TWh worth of energy savings, thus avoiding the emission of the equivalent of 4.3 million tonnes of CO₂.

Controlling other greenhouse gas emissions

In addition to CO₂, the other greenhouse gases taken into account in EDF group's emissions report are methane (CH₄), nitrogen dioxide (N₂O), and sulphur hexafluoride (SF₆). Other, residual greenhouse gas emissions account for approximately 1.6% of the Scope 1 total for the Group (see § 3.4 note on Methods for more details).

Wherever technologically and economically possible, EDF group uses alternative technologies to SF₆. For instance, in 2019, SEI replaced two GIS substations (*postes électriques sous enveloppe métallique*, PSEM) containing SF₆ with Modular Indoor Substations (*postes intérieur modulaire*, PIM), free from SF₆; EDF Hydro has volunteered to carry out experiments on a production site with a dry air insulated vacuum circuit breaker (also free from SF₆). The same type of air insulation technology has been adopted for the EPR2 project's Energy Removal Platform. Network distribution manager Enedis has also developed a new technical series of vacuum breaker cells for primary medium and high-voltage substations, the first of which will be installed in 2020.

In 2004, EDF signed a voluntary commitment to cut SF₆ emissions arising from leakage from all of its high and medium-voltage electrical equipment. These actions are monitored by the Group's Environmental Management System (EMS). Distribution network manager Enedis has thus set itself the goal of stabilising its SF₆ emissions at 330kg per year. By engaging in a proactive policy, the Nuclear Generation Division (NGD) cut its SF₆ emissions by 84% between 2008 and 2017. SF₆ leaks increased by 34% in 2018, leading the NGD to implement a specific action plan targeting 5 sites, designed to restore all installations to their design standard: leaks totalling no more than 1% per year.

All EDF group business lines are working to cut the carbon impact of the refrigerating fluids they use. For instance, the Dalkia Froid Solutions subsidiary uses "green" fluids (CO₂ and ammonia) in over one-third of its businesses, cutting the average carbon impact of its refrigerating fluids from 2.5tCO₂eq/kg in 2017 to 1.25tCO₂eq/kg in 2019.

Initiatives to improve scientific understanding of the carbon impact of dams in tropical areas are underway on the Petit Saut dam in French Guiana. Indeed, artificial reservoirs may emit greenhouse gases in the form of methane and CO₂, in particular in the years after they are first filled, due to decomposition of submerged biomass (trees and humus).

3.2.1.4 Investments that take the climate into account 97% low-carbon investments

To maintain its position as a leader in very low-carbon growth, the EDF group is intensifying the development of renewable energy and services while continuing its nuclear and grid investments. These investments in existing low-carbon resources and resources that allow more renewable energy to be incorporated came to almost €13.5 billion in 2019, approximately 97% of the Group's net investments (excluding disposal plans). EDF R&D plays a major role in the development of low-carbon solutions (switchover to electric uses, electric mobility, new nuclear power, renewable energy, and storage), whilst also improving the performance and safety of existing installations.

Taking carbon pricing into account

As part of its investment policy, EDF group's financial commitments are analysed in the light of the CAP 2030 strategy and the Group's carbon commitment. Investment profitability is assessed on the basis of medium to long-term scenarios that take into account carbon prices in regions subject to greenhouse gas emissions markets, such as the EU's ETS in Europe. Scenarios involving a high carbon price direct Group investments towards low-carbon assets. The description of the scenarios used and their consequences are currently confidential, but EDF group is working towards being able to make some aspects public, in line with TCFD (Task force on Climate-related Financial Disclosures) recommendations.

Use of Green Bonds

EDF group has been a pioneer in so-called "sustainable" finance, with a first Green Bond issue in 2013. Since then, the Group has carried out three other issues, raising a total of €4.5 billion and making EDF one of the largest corporate green bond issuers in Europe. EDF has committed to allocating the funds raised to new investments in photovoltaic and wind power projects, in renovating and modernising its hydropower fleet in mainland France and internationally, in projects relating to energy efficiency and conservation of biodiversity.

Credit facilities indexed to EDF's corporate responsibility commitments

As part of its commitment to corporate social responsibility (CSR), EDF group promotes closer ties between the Group's non-financial performance and its funding strategy through the use of new sustainable finance instruments.

Following the syndication of three lines of credit indexed to environmental, social, and governance (ESG) criteria in 2017 and 2018, EDF group agreed in 2019 to 3 new bilateral revolving credit facilities, each worth €300 million. These credit facilities incorporate a cost adjustment mechanism that takes into account reductions in the Group's direct CO₂ emissions, as well as EDF customers' use of online consumption tracking software (used as an indicator of EDF's success in making its French domestic customers play an active role in their energy use) and electrification of EDF's light vehicle fleet. EDF group's credit facilities indexed to ESG criteria now amount to over €5 billion, 48% of EDF group's total credit facilities.

EDF Pulse Croissance incubator and corporate venture

The energy transition involves exploring innovative solutions and using start-ups. In 2017, EDF group launched the EDF Pulse Croissance incubator and corporate venture, with the aim of investing in start-ups and projects to encourage the emergence of new activities and future business lines for the Group, in France and internationally (see section 1.4.6.1.3 "EDF Pulse Croissance").

3.2.1.1.5 Responsible management of indirect emissions

Carbon accounting over and above legal requirements

Since an attenuation strategy is impossible without an accurate knowledge of direct and indirect emissions, EDF group has implemented carbon accounting that goes well beyond the legal requirements. Every year, EDF group publishes a GHG report covering all the Kyoto Protocol greenhouse gases (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆, and NF₃) and all the significant items listed in the GHG Protocol (Scope 1, 2 and 3), ranging from fuel manufacture to quality of life for office employees. Emissions are divided into three "Scopes": Scope 1, which covers the direct emissions generated by EDF's assets (power plants, vehicles, etc.), Scope 2, which covers indirect emissions relating to the purchase of energy (electricity, heat, etc.) for EDF's own needs, and lastly, Scope 3, which covers other indirect emissions generated by EDF's suppliers (upstream fuel), customers (combustion of gas sold), and non-consolidated investments.

EDF group's GHG report is subject to third-party verification, covering all significant emissions. Today, EDF group provides one of the most detailed GHG reports for its entire value chain of any leading European electricity company.

EDF's GHG report

EDF group's full GHG report is published on the EDF website⁽¹⁾, separately from its non-financial performance statement. The full GHG report for 2019 is not yet available; it will be published in May 2020. The following table presents trends in the Group's GHG reports between 2017 and 2018.

EDF group's greenhouse gas report (million tCO _{2eq})	2018	2017
Scope 1 emissions	36	51
Scope 2 emissions	0.5	0.5
Scope 3 emissions	111	110

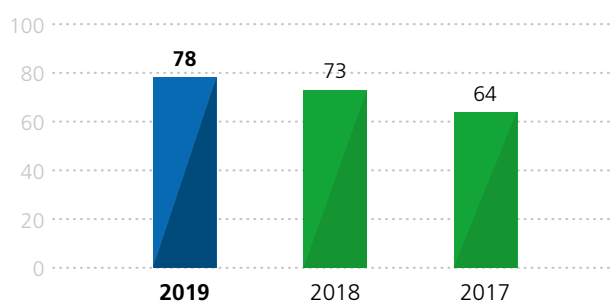
Significant indirect emissions

EDF group's significant indirect emissions cover the following greenhouse gas emissions: emissions due to the combustion of gas sold to end customers and emissions due to the production of electricity that has been purchased to be sold to end customers. Other categories of EDF group's indirect emissions are detailed in the Group's full GHG report.

The following chart presents trends in EDF group's significant indirect emissions since 2017.

→ EDF group's significant emissions

Significant indirect emissions due to gas sold and electricity purchased to be sold to end customers (MtCO₂e)



There was a slight increase in significant indirect emissions in 2019, due to the increase in sales of gas to end customers.

Initiatives to manage changes to EDF group's Scope 3

EDF group aims to achieve carbon neutrality by 2050. Due to its energy mix being largely low-carbon, the indirect emissions in EDF group's value chain are however considerably greater than its direct emissions.

In view of this, in 2019 EDF group launched a policy to manage development of the Group's gas business with a view to contributing to local authorities' energy transition. A similar "responsible" approach lies behind EDF group's aim of supporting all its customers in reducing their own carbon footprint by using energy more effectively and using less of it (see section 3.2.2.1 "EDF, a company committed to better energy use by each customer").

(1) <https://www.edf.fr/nos-engagements/indicateurs-de-developpement-durable/environnemental#bilan-des-emissions-de-gaz-a-effet-de-serre-du-groupe-edf>.

3. Non-financial performance

EDF, a company committed to the energy transition

3.2.1.1.6 Greater transparency on climate issues ⁽¹⁾

Implementation of Task Force on Climate-related Financial Disclosures (TCFD) recommendations

The TCFD is a G20 Financial Stability Board (FSB) working Group set up after the 2015 COP 21 conference with a view to improving companies' financial transparency in climate-related matters. EDF was one of the first organisations in the world to support the TCFD recommendations published in June 2017. These recommendations set out the climate reporting components companies are expected to provide in their reference documents, for four broad areas: governance, strategy, risk management, and indicators. Since 2018, EDF group's non-financial performance statement includes a concordance table that provides an exhaustive list of how the Group is addressing the TCFD recommendations. EDF group is also committed to a continuous improvement process, of which the ultimate aim is to achieve full alignment of its reporting with TCFD recommendations.

Responding to the CDP questionnaire

CDP (formerly the Carbon Disclosure Project) is an independent, non-profit body set up in 2000 supported by over 800 investors. It encourages listed companies worldwide to supply information about their strategies to combat climate change in order to rate these and facilitate information to stakeholders, including companies, investors, and politicians. EDF's response to the CDP questionnaire is public ⁽²⁾.

3.2.1.1.7 Identifying climate change risks and opportunities ⁽³⁾

Energy production today accounts for about 60% of global anthropogenic greenhouse gas emissions, 40% of which ⁽⁴⁾ is related to the production of electricity and heat. The electricity and heat production sector alone produces 25% of anthropogenic CO₂ emissions (IPCC, AR5). In France, the EDF group's carbon performance gives it an advantage ⁽⁵⁾, even if, due to its size, the Group remains a carbon emitter in terms of Scope 1 emissions and significant indirect emissions of Scope 3. The decarbonisation of electricity production is recognised as an effective vector for reducing CO₂ emissions; at the same time, a consensus has been reached on the prospects for very strong growth in global electricity demand (almost 80% by 2050).

EDF group identified climate risk as a priority risk in 2018, addressing it in a report from the Group's Scientific Council in March 2019, as well as in detailed analysis presented to EDF group's Executive Committee and the Board of Directors Audit Committee in October 2019. section 3.6.3 gives a detailed description of the risks and opportunities identified in this analysis, as well as their potential impact on the Group's business; these risks are also listed in section 2.2.3 "Group transformation and strategic risks – 3B Adaptation to climate change: physical and transition risks". In its analysis of climate risks, EDF group has adopted the classification put forward by TCFD, which draws a distinction between physical risks and transition risks.

EDF group's exposure to climate risks and, more especially, political risks, is atypical. With an electricity production mix that is 90% decarbonised worldwide ⁽⁶⁾, the proportion of EDF's electricity production that is directly exposed to EU ETS carbon prices is well under 10%. As a result, contrary to many other electricity and energy firms, the fact that policy objectives are increasingly being informed by the climate emergency, together with the increase in carbon prices, particularly in the EU ETS, actually deliver excellent opportunities to play to the Group's strengths.

3.2.1.1.8 Climate change adaptation strategies

From a climate incident plan to an overall corporate climate change resilience strategy

By 1999, Storms Lothar and Martin had already led EDF to work on mitigating the physical impact of climate change on its activities. EDF group went on to develop a climate incident plan in 2004, followed by an initial climate change adaptation strategy in 2010. This document lays out the foundations of the Group's commitments in terms of adaptation, and identifies actions to be implemented across all business lines: evaluating the impacts of climate change on future and existing activities; adapting existing installations to make them less sensitive to climatic conditions and more resilient to extreme weather events; incorporating climate change scenarios in the design of new installations; and adapting the Group's offers, internal operations, and expertise to encompass climate change.

In this initial adaptation strategy, physical risks relating to climate change were the priority, in particular production infrastructures with a lifespan of over 40 years, such as nuclear power plants and hydropower dams. Wind and solar farms, being less cumbersome, easier to decommission, and with a typical lifespan of less than 20 years, were seen as being less exposed to climate risks.

Following the publication of the TCFD recommendations in 2017 (see section 3.2.1.1.6) and the "climate risks" brief presented to the Board of Directors (see section 3.2.1.1.7), EDF group has undertaken to update its climate change adaptation strategy in 2020, adopting a holistic method covering not only physical risks, but also risks relating to transition. This national strategy goes hand in hand with adaptation plans developed by each of the Group's entities, to be updated at least once every five years.

A skills pool unrivalled by any other major electricity company

Immediately after publication of the IPCC's first report in 1990, EDF group resolved to develop internal skills focusing on climate issues. Unlike any other major electricity company, EDF group now has a team of some fifteen permanent researchers investigating the consequences of climate change on its existing and future production fleets for nuclear, hydro, wind, and solar power, etc., changes in production potential from renewable energy, and trends in energy demand.

EDF R&D's Climate Department was set up in 2014. It acts as an interface between constantly-changing scientific knowledge about the climate and EDF group's business lines. It provides EDF group's different business lines with climate data that can immediately be used to quantify climate-change-related risks and develop appropriate adaptation plans. EDF systematically takes the IPCC's worst-case scenario (currently, RCP 8.5) into account in its impact and design studies.

EDF group has also developed an operational unit to monitor meteorological phenomena and forecast their impact on water catchment sources: groundwater, rivers, and the sea. Located in Grenoble, this unit provides 24/7 monitoring of hydro-meteorological phenomena that represent a risk to EDF's production fleet.

Adaptation of nuclear power plants

Resilience to extreme natural phenomena has always been taken into account in the safety rules imposed by the Nuclear Safety Authority (ASN) for France's Basic Nuclear Facilities (*installations nucléaires de base*, INB). The aim of the adaptation actions launched by EDF, in particular since France's 2003 heatwave, has been to increase the safety margin and maintain production levels during such periods; in 2003, some power plants had to reduce output so as not to further heat river water, leading to a production loss of 5.5TWh, equivalent to 1% of EDF's production that year.

The "Grands Chauds" ("Heatwaves") plan launched in 2008 resulted in EDF making improvements to cold water source cooling efficiency for some of its power plants, and hardening reactor building electronics so that they can withstand temperatures in excess of 50°C.

⁽¹⁾ See section 3.6.4 "TCFD recommendations" and section 3.5 "Non-financial rating".

⁽²⁾ For detailed results, see section 3.5 "Non-financial rating".

⁽³⁾ See chapter 2 "Risk factors and management".

⁽⁴⁾ CO₂ Emissions from Fuel Combustion, International Energy Agency, 2018 (chiffres 2016).

⁽⁵⁾ See section 3.2.1.1.1 "EDF group's ambition".

⁽⁶⁾ See section 1.1 "Key Figures".

All EDF group power plants currently under construction (including Hinkley Point C and Flamanville 3) have been designed taking into account the most recent climate scenarios; in particular, this has involved revising the rise in sea levels upwards in these projects.

Météo-France ranked 2019 as the third warmest year in France since the start of the twentieth century, with two exceptionally severe (but relatively short) heatwaves in the summer (at the end of June and July). These heatwaves resulted in operating losses of 1.4TWh in the nuclear fleet (compared to 2.7TWh in 2018) as a result of having to comply with legislation covering river temperatures and low water levels in these rivers. For the first time, a coastal power plant was also briefly halted to comply with the maximum threshold temperature for cooling water discharged into the sea.

Adaptation of hydropower infrastructures

To increase resilience to extreme weather events and the risks relating to a huge influx of water into reservoirs, EDF group has developed and installed innovative technology known as the Piano Key Weir (PKWeir) on nine of its hydropower infrastructures. This technology allows much more water to be released without increasing the size of the dam. EDF received an award recognising this innovation in the field of adaptation to climate change at the COP 21 United Nations Climate Change Conference in Paris.

In 2019 EDF carried out spillway recalibration works on the La Palisse sur la Loire dams (Ardèche), raising the abutments and reinforcing downstream scour protection, as well as works on the Sainte-Marguerite dam on the Chassezac (Lozère and Ardèche), installing active truss rods to reinforce the dam against high water levels.

Another example of how EDF group is adapting its hydropower fleet to climate change is the work done in 2006 to raise the Les Bois reservoir water intake in the Mont Blanc massif by several metres, thus taking into account and anticipating the shrinkage of France's largest glacier, the Mer de Glace.

Adjustment of distribution networks

In the aftermath of the 1999 storms, distribution network manager Enedis set up the Electricity Rapid Intervention Force (Force d'intervention rapide électricité, FIRE) enabling resources and staff to be redeployed nationwide to restore power as quickly as possible. FIRE is one of EDF group's key measures to respond to extreme weather risks. FIRE currently has 2,500 technicians trained for crisis situations and 11 logistics storage facilities across the country, allowing the deployment of 2,000 generators.

2019 saw a large number of extreme weather incidents in France, including a succession of storms, in particular Storm Amélie, and torrential rainfall at the end of the year, resulting in a number of waterways in spate and flooding. FIRE was deployed seven times in 2019. FIRE intervened on seven occasions. Distribution network manager Enedis is also working on reducing the vulnerability of its 1.4 million kilometres of networks. This mainly consists in putting high-voltage overhead lines underground to avoid risks of falling trees, wind, snow and frost, beginning with the most exposed facilities. In 2019, 3,422km of high voltage overhead lines and 5,972km of low voltage overhead lines were removed. In the island regions, 95% of the new networks are built underground.

3.2.1.1.9 EDF group, committed to ambitious climate policies ⁽¹⁾

EDF group promotes public policies that encourage actual carbon reduction in the economy. Some examples of the recent positions taken publicly by the Group are listed below.

France

During the 2018 public debate on the multi-year energy programme (PPE), EDF's stakeholder brief ⁽²⁾ clearly positioned combating climate change as a priority in its strategy. In August 2019, EDF joined French bosses' union MEDEF's "French businesses' climate engagement" ⁽³⁾ initiative, reasserting the need for a collective change of direction, with the acceleration of innovation and R&D through investment in low-carbon solutions.

The EU

EDF group is particularly active in the EU, both in its own name (through its permanent office in Brussels) and through Eurelectric, the association representing the common interests of the electricity industry in Europe. EDF group's commitment to a robust EU greenhouse gas trading system (EU ETS) and the Commission's ambitious long-term climate and energy strategy (LTS) is recognised by all stakeholders, including NGOs such as InfluenceMap which, in 2019, ranked EDF as one of the companies most actively promoting climate issues in EU negotiations ⁽⁴⁾.

In 2018 the CEOs of EDF and EDISON signed the Eurelectric "Vision of the European electric industry" ⁽⁵⁾ declaration, in which the European electricity industry undertakes to pursue its efforts to become carbon-neutral well before 2050. This commitment was reasserted and supplemented in November 2019 by the Electrification Alliance coalition's declaration "Powering a climate neutral, competitive and secure Europe" ⁽⁶⁾ (signed by EDF, EDF Energy and Luminus), of which the aim is to see electricity enabling the entire EU economy to become carbon neutral by 2050.

The EDF group has given its full support to the EU "Green Deal" presented by the European Commission in December 2019, aimed at revising the EU target for reducing greenhouse gases by 2030 upwards to "at least 50%, or even 55%" (compared to 1990 levels), and at having the goal of being climate neutral by 2050 included in EU law.

Worldwide

EDF supports the Carbon Pricing Leadership Group initiative: this brings together businesses, governments, academics, and NGOs to promote carbon pricing as a means of achieving a low-carbon world economy. At the Climate Action Summit organised by the Secretary General of the United Nations in September 2019, EDF group signed the CPLC's appeal ⁽⁷⁾ recommending a price per tonne of carbon of \$40-\$80 by 2020 and \$50-\$100 by 2030, in line with the 2017 Stern-Stiglitz report, in order to enable countries to abide by the Paris Agreement.

Acting in a consistent manner with external stakeholders

EDF group has implemented specific governance to ensure that positions taken by the Group in formal consultations (e.g. with the European Commission) and during contributions to talks, expert appraisals, and French and EU thinktanks are consistent. EDF group's major positions on climate strategy (revising the EU ETS, PPEs, etc.) are validated by an Steering Committee on relations with the public authorities chaired by the General Secretary and the Innovation, Corporate Social Responsibility and Strategy Director (DIRES). The three entities in charge of defending EDF group's interests (its Public Affairs Department, European Affairs Department, and Regulation Department) are represented on this Committee. EDF group's positions on climate strategy are drawn up in collaboration with the climate change anticipatory monitoring network, which brings together all of EDF group's business units and entities (including EDF Energy, EDISON, and Luminus). This network is part of EDF group's Sustainable Development anticipatory monitoring scheme.

(1) See section 3.2.1.1.1 "EDF group's ambitions" and section 3.3.1.1.1 "Ethics and compliance".

(2) <https://ppe.debatpublic.fr/cahier-dacteur-ndeg43-edf>.

(3) <https://www.medef.com/fr/communique-de-presse/article/french-business-climate-pledge-les-entreprises-francaises-engagees-pour-le-climat>.

(4) https://influencemap.org/site/data/000/391/IM_EUTradeGroups_May2019.pdf.

(5) <https://www.eurelectric.org/media/2189/vision-of-the-european-electricity-industry-02-08-2018.pdf>.

(6) <https://www.eurelectric.org/electrification-alliance/>.

(7) <https://www.carbonpricingleadership.org/news/2019/9/19/business-leaders-call-for-long-term-stable-carbon-pricing-policies>.

3. Non-financial performance

EDF, a company committed to the energy transition

3.2.1.1.10 Involving employees and directors in the fight against climate change

The fight against climate change is part and parcel of EDF group's identity as a low-carbon energy leader. To pursue this goal with all its employees and managers, EDF group organises initiatives in three areas: pay, training⁽¹⁾, and innovation.

Pay

For employee pay, the profit-sharing agreement entered into by EDF in 2016 for the 2017-2019 period includes a carbon footprint-reducing criterion, accounting for 20% of each employee's profit-sharing, with two targets: cutting hardcopy print-outs by 15% per year and increasing remote meetings by 30% per year. In 2019, the hardcopy print-out target was exceeded, with a drop of 18.2% compared to the previous year, while the increased Lync meeting target was almost achieved (28% more than in the previous year).

As regards managers⁽²⁾, 10% of the variable part of their remuneration (which represents up to 40% of their salary) is indexed to the availability of the nuclear fleet, and therefore to the carbon content of the electricity produced, which does not generate direct CO₂ emissions. A criterion directly linked to carbon and applying to all executives should be introduced in 2020.

Training

EDF group encourages all its employees, at all levels, to receive training on climate and energy issues. The "New energy world" and "Energy strategic business" courses provide training for high-potential executives and Group senior managers relating to the major climate issues and their implications for the electricity industry (70 managers trained in 2019). Learning expeditions are organised for the Group's senior managers (approximately 80 managers per year) to discuss approaches to climate and resource management issues with other managers and members of civil society.

Innovation and collective intelligence

EDF group undertakes to enable each employee to become active in the fight against climate change and contribute to defining the Group's broad orientations in this area.

The internal "Let's talk Energy" dialogues organised since 2017 have brought together 25,000 employees in workshops devoted to climate change, low-carbon energy, and the energy transition. "Let's talk Energy" led to a "Combating CO₂" programme, offering all employees in France the opportunity to become ambassadors for the energy transition by committing to better control of their domestic energy use and reducing their carbon footprint.

The "Y project" involves 30 employees aged under 35 each year. Their goal is to accelerate EDF's transformation, using digital technology as leverage, to challenge traditional practices. Employees enjoy extensive freedom to implement practical initiatives. In 2019, employees were able to help define the Group's mission statement. The climate, protecting the environment, and the general interest were all widely-mentioned topics. Each year, the "EDF Pulse Interne" Prize, first launched in 2014, identifies and rewards innovative projects conducted by teams of employees in the Group based on topics such as low-carbon production and the transformation of the Group.

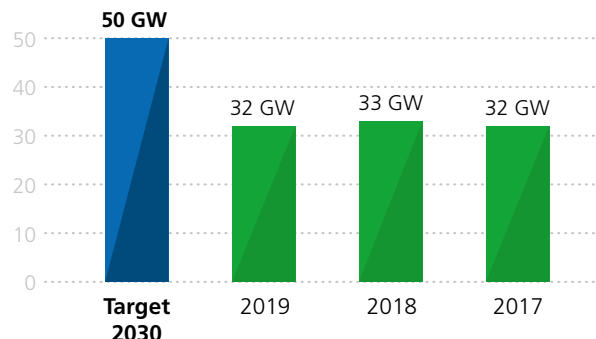
3.2.1.2 EDF, a company committed to the development of renewable energy



EDF is firmly committed to the development of renewable energy. A recent study by EI New Energy ranks EDF as one of the top 10 "green" players in the world and one of the five most dynamic European players in renewable energy development.⁽³⁾ For details of this development, see section 1.3.3.3 "Very low-carbon production: nuclear and renewable energies".

→ EDF, a leader in low-carbon energy

Net installed renewable electrical generation capacities (GW)



Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and method used for this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 2 "Renewal, extension and performance of the energy mix aimed at decarbonisation" described in section 3.6.2 "Description of key stakes in the materiality matrix".

3.2.2 EDF, a company standing shoulder to shoulder with its customers (CSRG no. 4)



EDF's commitment (CSRG no. 4) aims to support the energy transition of our customers with offers that are adapted to various markets (residential, business, cities and regions) and more broadly that of all energy consumers by developing electric mobility and by implementing storage solutions and intelligent networks. The digital revolution opens up new prospects in this area, offering customers the possibility of being more actively involved in their consumption and indeed the production of energy, controlling their energy consumption, and limiting their CO₂ emissions. The increasing use of electricity fosters the development of new, more effective offerings, most notably smart meters allowing more accurate and detailed analysis of consumption. This trend seems bound to intensify as technology continues to evolve.

The indicator used for CSRG no. 4 concerns customer visits on digital consumption monitoring platforms, which stood at over 47 million in France in 2019.

3.2.2.1 EDF, a company committed to better energy use by each customer

The quality of customer relations is a priority for EDF. While digital solutions offer simplicity and seamlessness, human contact is clearly vital at certain key times in the customer experience. With this in mind, 100% of customer advisers are based in France, in some 50 call centres located throughout the country.

(1) See section 3.1.3.3.5 "Sustainable Development Training and Awareness-Raising".

(2) These are the generation managers in France (EDF SA) and the United Kingdom (EDF Energy).

(3) Energy Intelligence, Green utilities report, 2019.

3.2.2.1.1 The domestic market

EDF supplies energy to over 30 million domestic customers, most of them in France, the UK, Belgium, and Italy; EDF develops innovative digital offerings directed at customers, helping them manage their energy use and supporting them in their energy savings projects.

Monitoring and understanding energy use

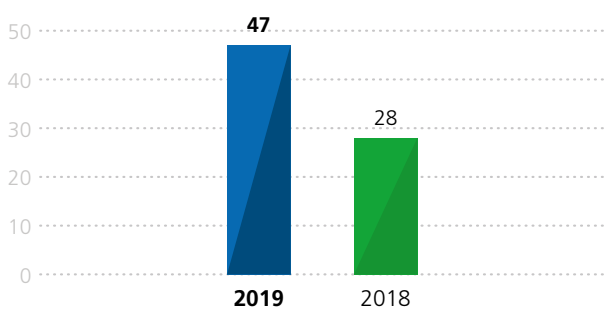
In France⁽¹⁾, EDF provides its customers with a digital energy use tracking solution, accessible *via* their customer space on the website and the EDF&Moi app. Customers can monitor their energy use in kWh and in euros, identify their main sources of energy and/or gas use, compare their use to that of similar households, and benefit from personalised advice about making energy savings, for instance by setting an annual energy use goal accompanied by email or text message alerts if they go off target. For customers equipped with a Linky⁽²⁾ smart meter who have given their consent, energy use data is available (in euros and in kWh) in daily or 30-minute increments. Customers who consult this energy use tracking solution more than two or three times a month achieve savings of up to 12% on their bills.

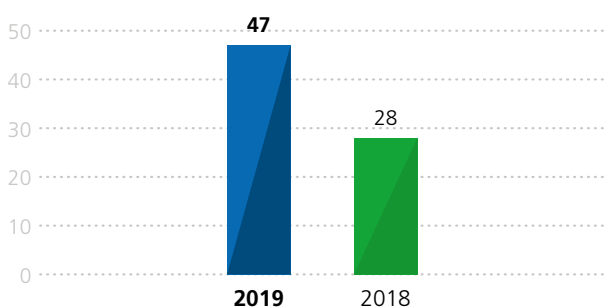
Customers equipped with a Linky smart meter who have given their consent also have access to "Fil d'Actu", a dedicated news feed, *via* the EDF&Moi app. This timeline gives them daily news to help them understand their energy use and make energy savings, covering topics such as the impact of weather, similar households, the proportion of energy used in heating, appropriate environmentally-friendly practices, and so on.


Over 47 million visits were recorded in 2019.

In the same spirit, in Italy, Edison continued developing its platform "Edison World" to make it more easily accessible for customers. Energy Control Light, hosted online on Edison's website, which helps customers understand their consumption pattern better and advises them on reducing related costs, based on actual data. Sowe markets a connected station compatible with gas-fired boilers and individual electric heating, which allows better control over their energy budget and comfort. Customers who use the station can achieve energy savings of up to 25% without changing their installation⁽³⁾.

➔ EDF, a company standing shoulder to shoulder with its customers

Number of customer visits on digital consumption monitoring platforms (millions) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and method used for this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 3 "Action to support energy efficiency" and no. 6 "Performance of end customer offers (B2B and B2C)" described in section 3.6.2 "Description of key stakes in the materiality matrix".

(1) The e.quilibre solution was deployed in the French islands in 2018.

(2) Led by Enedis.

(3) R&D EDF internal study: savings estimated on the basis of dynamic heat models, using a home permanently heated to 20°C, not fitted with a central heating timer or open window detector, and without real-time energy use tracking, as a baseline. Depending on where the home is located and lifestyle habits, the connected Station can help achieve energy savings of up to 25% for domestic electric heating and up to 20% for domestic gas heating.

(4) Subject to using one of EDF's 3,000 Energy Savings Partners and to examination and acceptance by EDF's financial partners Domofinance.

(5) EDF Énergies Nouvelles Réparties (New Distributed Energies).

Achieving energy savings

Customers seeking to achieve energy savings benefit from appropriate advice and resources made available by EDF: energy performance diagnosis, advice on heating systems, installation of high-performance equipment, and so on.

Online diagnosis and advice

In France, EDF helps its customers achieve energy savings. In addition to the digital energy use monitoring solutions described above, EDF offers a range of services:

- assisting customers seeking eco-friendly household appliances by means of attractive marketing campaigns: in 2019, two marketing campaigns were conducted between July and October, in partnership with Samsung;
- simulators to estimate homes' energy labels, assess the cost of any renovation works, and identify any potential financial aid available;
- EDF can put customers seeking to carry out energy savings works such as renovation, insulation, or changing their type of heating in touch with trusted professionals (EDF's *Partenaires solution habitat* network, known as EDF *Partenaires économies d'énergies* (Energy Savings Partners) since 1 January 2020), offering them the benefit of financial bonuses to help pay for the works in question if they qualify for these (accessible *via* the prime-energie-edf.fr website). Preferential financial terms for works are also offered by EDF's financial partner Domofinance.

Promoting low-carbon practices

The "Mon chauffage Durable" ("My sustainable heating") offer allows customers to replace a fossil fuel-fired boiler with a heat pump, or convector heaters with eco-friendly radiators. This offer is part of the *Coup de pouce chauffage* initiative launched by the French government in January 2019. For heat pumps, EDF goes further than the state scheme, offering additional bonuses. Homes may also benefit from preferential rate financing provided *via* EDF, covering the entire cost of their project.⁽⁴⁾ EDF has also innovated with new supply offers for domestic customers keen to be part involved in the energy transition, with its "Vert électrique" range and its "Avantage Gaz Durable" offering. EDF ENR⁽⁵⁾ markets the self-consumption offer "Mon Soleil & Moi", increasing household self-consumption rates and covering a greater share of energy bills. In 2019, EDF ENF carried out some 5,000 installations of solar panels for domestic customers in France. IZI by EDF is EDF's new online interface for access to everyday services, allowing users to carry out installation and renovation projects.

3.2.2.1.2 The business market

Assisting customers with their economic and environmental performance

EDF group offers customised services to companies and professionals that wish to optimise their energy flows to improve their economic performance and reduce their environmental footprint. Services provided by EDF and its subsidiaries to make the best use of energy include energy audits, monitoring and management of energy use (also using digital platforms), energy savings investments, calculating the profitability of these investments, etc. EDF commitments in this respect take the form of specific performance plans and energy productivity plans. EDF can assure optimisation of all the flows – electricity, gas, water, steam – of a company and handles the complete energy management of industrial sites. EDF guarantees certified "green" renewable electricity supply to companies, who so wish. EDF can also help a company choose the solution that is most suitable to its own energy generation (heat pump, photovoltaic panel, solar hot water, small wind turbine) and set it up;

In France, EDF Entreprises offers a personalised supply contract, specially adapted to the additional power requirements of individual self-consumer customers. The offer provides customers with more accurate forecasts of their electricity budget and use. They can choose peak and off-peak hours synchronised with their solar production, enabling them to maximise and organise their savings. Dalkia established the DESC (Dalkia Energy Savings Centre), an interactive platform to monitor building energy consumption. Dalkia also offers a practical outworking of its digitisation work to industrial customers in the form of its "Dalkia Analytics

3. Non-financial performance

EDF, a company committed to the energy transition

powered by METRON” offer. Based on machine learning and artificial intelligence models, this analyses energy flows and their interactions with customers’ processes to offer high added value solutions for improved performance.

Innovation geared to customer needs

Agregio is a subsidiary of the Group directed at renewable electricity producers and companies with load balancing capacity, enabling them to trade this capacity on electricity markets. For electricity producers, Agregio has bespoke offers allowing them to optimise and sell their power on the markets. Agregio is also aimed at industrial and tertiary consumers, who are willing to reduce or shift their consumption in exchange for compensation, according to the needs of the electricity system.

EDF ENR enables customers to use the energy generated by their own solar panels and store some of it for use when needed. The offer enables customers to maximise their self-consumption rate, monitor their use online in real time, and thus control their energy spending.

EDF Store & Forecast, develops and markets a software solution for energy optimisation of local electricity systems through energy forecasting and storage. EDF adapts its Energy Management System to its customers’ facilities for smart and independent management: management of the variability of renewable energy, services to the electricity system, economic optimisation of the demand/supply balance, maximisation of self-consumption and reduction of energy bills.

3.2.2.1.3 Fostering the energy transition in towns and communities

The EDF group is committed to the energy transition of towns and communities, which play a vital role in combating climate change. EDF develops tailor-made solutions to assist local authorities in their energy-related projects. EDF’s support focuses on strategic energy planning and advice, energy generation from local resources, the energy and environmental performance of buildings and facilities, street lighting and mobility.

This support is carried out for example through EDF’s participation in projects which include individual and collective self-consumption projects, or local energy management at the level of a building, an island or a district. Examples include the Ydeal Confluence project in Lyon, featuring collective solar self-consumption and operation of a stationary battery; the Niwa project in Vanves, a community digital tool for monitoring different fluids and coaching in consumption control; the So Mel project in Lille (urban digital dashboard and flexibility monitoring); and the H2020 project in Dijon (development of urban “positive energy blocks” in an existing social housing neighbourhood through renovation, the development of local production, local energy management on different scales, and storage solutions). In 2019, Dalkia signed a DSP ⁽¹⁾ for a heating and cooling network at La Grande Motte, for which 66% of the power supply for the network will be SWAC, and inaugurated a new heating and cooling network in Perpignan for which 90% of the power supply comes from heat recovered from an energy-from-waste plant ⁽²⁾ operated by Dalkia Wastenergy producing 100,000MWh per year. In addition, 54 secondary schools and 4 administrative buildings in Indre et Loire, as well as 45 high schools in the Nouvelle Aquitaine region, benefitted from an Energy Performance Contract (CPE) ⁽³⁾.

Citelum monitors and reduces energy consumption of the public lighting networks, and sets up systems that quickly remedy the problems observed by operators or reported by residents. These systems were set up, for example, in Dijon, but also in Italy, India, Brazil, Mexico and Chile. In 2019 the LuWa consortium, including

Citelum and Luminus, won the tender for the design, upgrading, financing, management, and maintenance of road lighting equipment for the main roads in Belgium’s Walloon region. The 20-year “Light Plan 4.0” will take the form of a public-private partnership. The contract specifies gradual commissioning of the new lighting and renovation of the network infrastructure with LEDs, for a total of around 100,000 lights, over the first four years.

In partnership with CSTB ⁽⁴⁾ and 17 social landlords, EDF R&D is seeking to identify the innovative technical renovation solutions best suited to social housing with electric heating, and evaluate them as to their energy, environmental, economic, and social aspects. In 2019, EDF R&D assisted Luminus in Ghent, with the integration of a high temperature heat pump in a heating network, thus helping to make the network greener.

3.2.2.2 EDF, a company committed to leveraging the energy transition

Mobility, storage, and smart grids form three essential pillars of the energy transition.

3.2.2.2.1 Electric mobility

The Electric Mobility Plan

EDF group launched the Electric Mobility Plan in October 2018, thereby announcing its aim of becoming the leading energy provider in electric mobility by 2022 on its four major European markets.

The Electric Mobility Plan focuses on three practical goals: becoming the leading supplier of electricity for electric vehicles by 2022, with the aim of powering 600,000 vehicles (a 30% market share); becoming the leading operator of charging stations, with the aim of rolling out 75,000 charging stations and providing its customers in Europe with access to 250,000 charging stations *via* interoperability by 2022, through its subsidiary Izivia; becoming the European leader in smart charging ⁽⁵⁾, with the aim of operating 4,000 smart charging stations by 2020.

Izivia, a key player in France, is one of the leading network operators, with over 8,000 public and private charging stations operated in 2019. In order to facilitate electric car journeys across Europe, Izivia also provides customers holding an Izivia Pass with access to 100,000 charging stations *via* interoperability.

Smart charging achievements in 2019 include: the creation of DREEV, a joint venture between EDF and Nuvve (a California start-up specialising in V2G) to develop smart charging solutions; a cooperation agreement signed with Nissan aimed at accelerating the rollout of electric mobility, in particular using smart charging for electric vehicles; the acquisition of Powerflex, a pioneering company in the field of electric vehicle charging technology based in California, to create a unique decentralised energy ecosystem combining smart charging solutions, solar power, and storage; the development of a range of service offers aimed at all customer segments.

EDF’s commitment for its vehicle fleet

The EDF group was the first French Group to sign the “EV100” undertaking, which aims at having a fleet of 100% electric light vehicles by 2030. Of its fleet of light vehicles, currently more than 40,000 vehicles worldwide (mainly in Europe), more than 8% (over 3,500 Electric Vehicles, 800 more vehicles than by end 2018) is already electric. This Group Project includes both the vehicles and charging infrastructure (more than 1,500 sites to be equipped across the world by 2030).

(1) DSP: délégation de service public, public-service contract

(2) A waste incineration unit that can produce electricity or heat to supply a network.

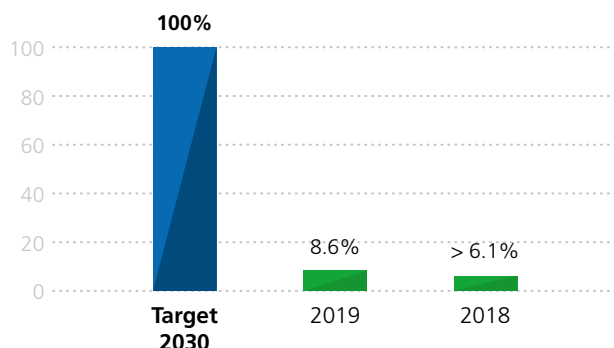
(3) A CPE is “an agreement between a contracting authority and an energy efficiency service provider aimed at ensuring improved energy performance for a building or set of buildings with respect to a contractual baseline, verified and measured over time, by means of investment in works, supplies, or services”.

(4) Building Scientific and Technical Centre (CSTB).

(5) Electric mobility will result in the transformation of electricity systems because an electric vehicle can also serve as a battery, made available to networks and contributing to network balancing during peak periods of energy use.

→ **EDF, a company standing shoulder to shoulder with its customers**

EDF group's Electric Vehicles rate in the fleet of light vehicles (%) ↗



↗ Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and method used for this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 5 "Innovation, sustainable cities, and diversification of energy production methods" described in section 3.6.2 "Description of key stakes in the materiality matrix".

3.2.2.2.2 Storage solutions and smart grids

EDF's storage plan

In a changing energy landscape, EDF is speeding up the development of electricity storage to become the European leader in the sector. A pioneer in the field, the Group was already present in the main areas of application of storage technologies, in particular batteries and Pumped Storage Hydropower Plants (PSHP).

EDF aims to develop 10GW of new storage facilities across the world by 2035 in addition to the 5GW already operated by the Group. EDF's goals cover all electricity storage markets in order to ensure the proper functioning of the balance between the electricity system, private and business customers and regions. The Group aims, particularly, to be the leader in France and Europe in the individual customer market with its range of self-consumption offers integrating batteries. The African continent is also a priority market for the Group, which aims to develop a portfolio of 1.2 million "off-grid" customers (without access to electricity) by 2035. EDF has also invested in a number of Off Grid electrification companies, particularly in Côte d'Ivoire, Ghana, Kenya, and Togo. These companies are operational and at the stage of building up their customer portfolio.

The portfolio of storage projects that have been constructed or decided already amounts to 0.5GW. The main aim of the projects developed is to offer services that support the electricity system and mesh with renewable energy production to defer renewable energy dispatch onto the grid. EDF also strengthened its R&D capacity, doubling storage research investment to €70 million over the 2018-2020 period.

Smart networks and on-demand management

The energy transition and digital revolution deeply transform the management of the electricity distribution network. Distribution network manager Enedis has a new roadmap setting out the priority work sites and transformation required to help make it the go-to distributor in France and Europe.

EDF has acquired E2M in Germany, an aggregator of renewable energy production and local flexibility that is active mainly on the German market. It has also taken over technical coordination of the EU project Eu-SysFlex, the aim of which is to determine a flexibility roadmap to incorporate 50% of renewable energy into European electricity grids by 2030. In the UK, EDF has launched the CommUNITY project, allowing social housing residents access to renewable energy sources through a peer-to-peer blockchain trading platform; in Singapore, EDF has launched the first French microgrid demonstrator, enabling the Group to roll out an offer of affordable, high-performance microgrids for remote areas in South-East Asia.

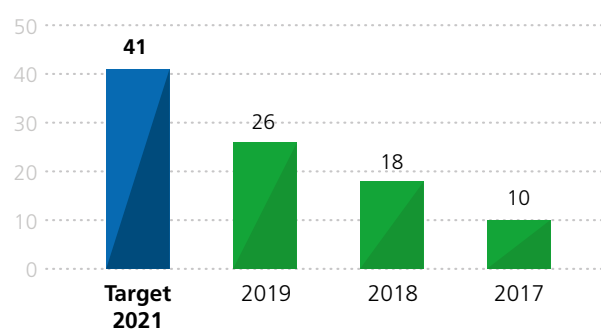
Together with a major real estate project partner, Dalkia has launched the first dual heating and electricity smart grid in France in the Nanterre Cœur Université eco-district: the smart grid is able to pool five sources of renewable and recovered energy (EnR&R) to supply homes, offices, and shops in the district with heating, hot water, and air conditioning. With at least 60% EnR&R used, this smart grid allows 100% self-consumption of the electricity generated, which will be adjusted in real time.

Distribution network manager Enedis published its Local Flexibility roadmap in October 2019. Innovative, flexibility-oriented technical solutions include sending an electronic instruction from management agencies to customers, so they can temporarily limit their energy use; load shedding at the request of Enedis during a cold spike; the use of charging stations or a storage system to modulate power and improve network resilience; and the forthcoming launch of an inventory of local flexibility sources that may offer an alternative to traditional solutions.

Smart meters are an essential link in smart networks. They provide all players – distributors, suppliers, customers and local authorities – with wide range of benefits. EDF group has set itself the goal of installing at least 41 million such meters by 2021, mainly in France, the UK, and India. At end-2019, over 26 million meters were installed.

→ **EDF, a company standing shoulder to shoulder with its customers**

Number of smart meters installed (millions) ↗



↗ Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and method used for this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 3 "Action to support energy efficiency" and no. 6 "Performance of end customer offers (B2B and B2C)" described in section 3.6.2 "Description of key stakes in the materiality matrix".

3. Non-financial performance

EDF, a company committed to a just and fair transition

3.3 EDF, a company committed to a just and fair transition

3.3.1 EDF, a company with a responsible attitude to people and communities

The attention the EDF group pays to people covers the stakeholders identified in its mapping (see section 3.6.6 "Stakeholder mapping").

3.3.1.1 EDF, a company with a responsible attitude to people

3.3.1.1.1 Ethics and compliance



The EDF group promotes a culture of integrity and applies a zero tolerance policy towards fraud and corruption. Ethical conduct in accordance with the law is the absolute rule for all Group employees, at all levels of the organisation, and without exception.

Organisation of ethics and compliance at the EDF group Governance

The EDF Executive Committee (Excom) is responsible for determining the orientations and priorities of the ethics and compliance programme, allocating the necessary resources and ensuring the monitoring and control of its implementation. The Board of Directors of EDF, through its Corporate Governance and Social Responsibility Committee, oversees the Company's incorporation of ethical and compliance considerations into its works. Every year, the Executive Committee and the Governance & Corporate Responsibility Committee also receive an activity report drawn up by the Group Ethics & Compliance Division.

In December 2019, the Group held its first Ethics & Compliance Day. This is a key event for the EDF group in its role as a responsible company.

The Group Ethics & Compliance Division and its ethics & compliance network

Reporting to the General Secretary, the Group Ethics & Compliance Division manages and coordinates, in liaison with the divisions concerned, the implementation of the Group's ethics & compliance programme. This programme is created to meet the requirements of national and international regulatory authorities and local practices. The programme places all EDF executive directors and, more generally, all employees at the heart of the compliance system.

A network of around 50 Ethics & Compliance Officers within the French entities and internationally share and deploy the Group's Ethics & Compliance Policy.

The Ethics & Compliance Officers take part in Management Committee meetings and report directly to the directors of the entities on ethics & compliance matters and on the associated action plans. EDF is a member of several anti-corruption groups and non-profits. In 2016, it joined Transparency International France, in which it participates in the Forum of Engaged Companies (Forum des entreprises engagées or FEE) composed of companies looking to adopt the highest standards of transparency and integrity.

EDF group Ethics Charter and values

The Group Ethics Charter sets out the values shared by all EDF staff, places ethical requirements at the heart of corporate responsibility and, in accordance with the Chairman's commitment, promotes ethical behaviour in all professional activities. Updated in 2019, the Group Ethics Charter now focuses on the Group's three values "Respect, Solidarity and Responsibility", each featuring 4 requirements. It is available in French and English on the EDF group website and in eleven other languages in which the Group works.

Group Ethics & Compliance Policy

In 2016, the Executive Committee adopted the Group Ethics & Compliance Policy (PECG), which comprises the Company's compliance programmes as well as the main rules that executive directors must know, observe and enforce within their entities, which are strictly aligned with the risks of these entities. The PECG was updated in January 2020 and now includes thirteen compliance programmes:

- preventing the risk of corruption and influence peddling;
- preventing conflicts of interest;
- the fight against fraud;
- compliance with international sanctions programmes;
- prevention of harassment and discrimination;
- prevention of market abuse;
- prevention of the risk of money laundering and financing of terrorism;
- compliance with the EMIR regulation;
- compliance with the REMIT regulation;
- preventing breaches of competition law;
- personal data protection;
- export control (dual-use goods);
- and duty of care.

The anti-corruption programme

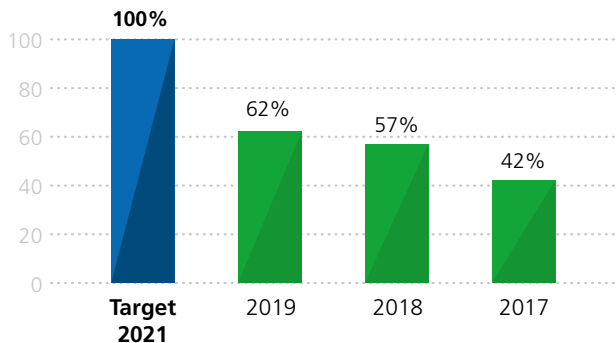
In accordance with the French law of 9 December 2016 on transparency, the fight against corruption and the modernisation of the economy, known as the "Sapin 2" Law, EDF set up an anti-corruption compliance programme taking account of legal requirements:

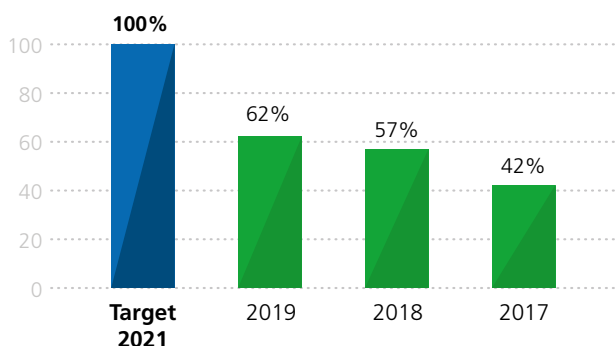
- **an ethics & compliance code of conduct included with the internal rules of procedure and a disciplinary mechanism.** This code of conduct defines and illustrates, through practical cases, the different types of behaviour employees are likely to face as a result of the Company's business activities and organisation, and which should be prohibited given that they may constitute acts of corruption or influence peddling. It sets rules for all the themes identified during the risk mapping process. It prohibits facilitating payments, and restricts gifts and invitations. Breach of any of its rules may result in disciplinary sanctions. It can be viewed by third parties on EDF's site in French and English ⁽¹⁾;
- **a whistleblowing system** (described below);
- **risk mapping:** Ethics & compliance risk mapping is part of the Group Risk Division's annual internal control self-assessment process. Based on this, the entities draw up action plans appropriate to their operational contexts to prevent and mitigate these risks. Since 2018, a specific "corruption" risk map was prepared, which identifies and prioritises, by business sector and country, risks of exposure to corruption;


(1) <https://www.edf.fr/sites/default/files/contrib/content/engagement%20ethique%20et%20confirmit%20groupe/page%203/code-de-conduite-fr.pdf>.

- **accounting controls:** Control procedures have been established for the Company's different processes. Following a technical analysis, any anomalies likely to be characterised as fraud are, where applicable, forwarded to the entity's Ethics and Compliance Officer;
- **training schemes:** The Group Ethics & Compliance Division is developing prevention measures and training for all employees. It has a dedicated community on the Group intranet that provides a range of training materials. It organises standard in-class training courses, particularly for members of the ethics & compliance network, subsidiary directors, and contract managers. The Group Ethics & Compliance Division has introduced a "Preventing the risk of corruption" e-learning module for executives. As of 31 December 2019, 62% of executives had completed the module. The target is for 100% of executives to have been trained by 31 December 2021.

→ EDF, a company with a responsible attitude to people and communities

Proportion of executives who have completed the anti-corruption training programme (%) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 8 "Ethics and the duty of care" described in section 3.6.2 "Description of key stakes in the materiality matrix".

In 2019, it also released an interactive training tool, in French and English, to increase and test staff knowledge of the ethics & compliance code of conduct.

The Group Legal Affairs Department also provides a "Preventing corruption" e-learning module, for staff to learn about how best to behave in situations relating to business relations, conflicts of interest and gifts. As of 31 December 2019, 8,313 employees had completed this module:

- **internal control and evaluation system:** To ensure the appropriateness and effectiveness of measures to prevent and detect misconduct, a system allowing entities to evaluate the level of implementation and meeting of each key requirement has been put in place. It enables identification of improvement actions to be taken;
- **a system to prevent conflicts of interest:** The entities have put in place a system designed to prevent conflicts of interest and raise employee awareness of high-risk situations, provide a system for employees to declare their links to organisations in which they have a personal interest, and require managers to resolve conflicts of interest with respect for individual freedoms;
- **fight against fraud:** In accordance with the "Fight against fraud" memorandum of instructions, executives are tasked with setting up systems within their entities to raise awareness among their staff, put in place checks to detect potential cases of fraud, investigate incidents, report proven cases and sanction those responsible;

- **international sanctions:** The Group Ethics & Compliance Policy requires the executive directors of the relevant Group entities to implement a system to prevent the risks of international sanctions within their entities, particularly providing for integrity checks to be carried out to ensure the absence of risks of exposure to international sanctions as well as the insertion of a clause into each contract entitling EDF to terminate a business relationship with immediate effect in the event of failure to adhere to an international sanctions programme;
- **regulation of interest representatives:** EDF is an interest representative within the meaning of the Sapin II law. In this respect, it is registered on the list of interest representatives managed by the HATVP (French High Authority for Transparency in Public Life). The network managers RTE, Enedis, and Dalkia are also registered: they each declare interest representation actions carried out during the year. The list of persons in charge of an interest representation identified in the register will be updated regularly. EDF also files with the HATVP ⁽¹⁾ an annual declaration relating to interest representation actions carried out that mentions actions aimed at influencing a public decision, with national public officials identified by the legislator.

At the European level, EDF is listed in the Transparency Register of the European Parliament and the European Commission, and applies the related code of conduct. EDF presents its positions publicly *via* this transparency register ⁽²⁾, and *via* associations of which it is a member ⁽³⁾. The estimated annual cost of the activities covered by the European Transparency Register since 2016 is around €2 million, with a downward trend;

- **regulation of financing of political parties:** The EDF group complies with the laws and regulations in force concerning the financing of political parties. Such financing may take place only in countries that allow it, and only with due regard to the principle of neutrality. In accordance with the legislation in force in France, EDF makes no payments to political parties. The Group's Italian and UK subsidiaries have written directly into their codes of conduct the prohibition of financing political parties. In countries where it is allowed (such as the United States), EDF group companies may determine whether they wish to provide financial support. Every year, the Group companies concerned must report any financing to their parent company. In 2019, only EDF Renewables made payments in the United States, consisting of US\$26,300 in the form of Political Action Committee contributions and US\$184,900 in the form of Corporate contributions.

Other compliance programmes

Prevention of harassment and discrimination

Banning all harassment or discrimination, and preventing and dealing with any physical or psychological violence, intolerance or injustice in the workplace is one of the requirements of the Group Ethics Charter. This commitment is part of the regulatory and judicial context which, in many countries, incriminates not only the actions and behaviours themselves, but also employers who fail to implement sufficient preventive measures. More specifically, directors must take all necessary measures to prevent discrimination, harassment and physical and emotional violence within their entities by striving to make employees aware of the risks of harassment and discrimination, raise awareness among managers on ways of preventing and fighting harassment and discrimination, communicate regularly on the Group whistleblowing system and apply the appropriate sanctions in the event of proven wrongdoings.

Two Reference guides to prevent and handle bullying and sexual harassment were released in the first half of 2019. They are intended for management and the HR Department, as well as for Ethics and Compliance Managers of entities.

Financial ethics (Prevention of market abuse and the risk of money laundering, plus compliance with the EMIR regulation)

The Ethics and Compliance Policy sets out the requirements to be followed to prevent market abuse, the risk of money laundering and the financing of terrorism. An Ethical Code for Trading in Securities, updated in 2019, complements this Policy. The Group Ethics & Compliance Policy also sets out the requirements concerning compliance with the European EMIR regulation. The practical implementation of this EMIR regulation by the EDF group, the implications for entities as well as the related processes and controls are described in the EDF group EMIR Policy Paper support guide.

(1) hatvp.fr/fiche-organisation/?organisation=552081317.

(2) ec.europa.eu/transparencyregister/public/consultation/displaylobbyist.do?id=39966101835-69.

(3) avere.org/wp-content/uploads/2019/02/the_electrification_alliance_-_declaration-2017-030-0453-01-e.pdf (The Electrification Alliance Electricity for an Efficient and Decarbonised Europe).

3. Non-financial performance

EDF, a company committed to a just and fair transition

Compliance with the REMIT regulation ⁽¹⁾

In accordance with the Group Ethics & Compliance Policy, entities concerned must put in place a European REMIT regulation compliance programme. A "Group Compliance Officer" was appointed in September 2017 and was tasked with preventing risks of non-compliance, by developing an appropriate control environment. The practical implementation of this REMIT regulation by the EDF group, the implications for entities as well as the related processes and controls are described in a memorandum of instructions.

An online staff training tool has been set up. It is freely available on VEOL, the EDF group intranet.

Preventing breaches of competition law

EDF group has made awareness of and adherence to competition law a major priority for its employees. With this in mind, the Group has implemented a Competition Law Compliance Programme since 2010. The programme, which is binding on all employees, aims to ensure that all operations of subsidiaries and entities of the Group in France and worldwide comply with competition law. After rolling out an e-learning module between 2010 and 2015 which trained over 5,400 employees, in France and abroad, since 2016 a more non-specialised Serious Game called: "Cap Antitrust" is accessible to all employees on the Group's internal training portal, in multiple languages (French, English and Italian).

Personal data protection

EDF, which appointed a Personal Data Officer (PDO) in France as early as 2006, appointed its Data Protection Officer (DPO), pursuant to EU regulation 2016/679 of 27 April 2016 known as the general data protection regulation (GDPR). The DPO is the Lead Manager for the Group. The DPO is responsible for ensuring compliance with regulations relating to the protection of personal data within the Company, whether with regard to the personal data of its customers, employees, service providers or partners. The work carried out to bring the Group in line with the requirements of the GDPR notably led to the appointment of around twenty DPOs at subsidiaries across France and Europe.

Export control (dual-use goods)

In the course of its activities, particularly in the nuclear field, EDF and its subsidiaries carry out a range of operations to meet their own needs or the needs of third parties, requiring the use of goods and technologies including dual-use goods and technologies ("DUG") that can expose it to certain risks inherent in French, European and/or foreign regulations, some of which have extraterritorial scope and can require, subject to exceptions, the issuing by the competent authorities of a license/authorisation prior to any transfer, export, re-export, brokerage, and/or transit of such goods and technologies.

A Group Export Control & International Sanctions Director was appointed in August 2019. The Group Ethics & Compliance Policy describes compliance procedures to be implemented regarding export control of dual-use goods and technologies.

The Duty of Care programme

The EDF Duty of Care plan drawn up in accordance with French law no. 2017-399 of 27 March 2017 relating to the duty of care of parent companies and ordering companies, is implemented in practice via a "Duty of Care programme", which is stipulated in the Group Ethics & Compliance Policy and which Executives must implement within their entities. The operational requirements of this programme as well as the related processes and controls are described in a "duty of care" memorandum of application.

A Duty of Care (DoC) Compliance Officer is tasked with managing and coordinating the duty of care plan and reporting on its effective implementation based on feedback from the entities, in conjunction with the Legal Affairs Division, Group Ethics & Compliance Division, and Group Risk Division. A Duty of Care Officer appointed at each entity is tasked with coordinating the implementation of the entity's Duty of Care Programme and reporting on its effective implementation. The DoC Compliance Officer manages this network of Officers.

A mandatory self-assessment form on this theme has been added to the internal control guide.

Whistleblowing system

In 2018, the EDF Executive Committee decided to upgrade its system to secure the handling of alerts and increase personal data confidentiality and security. It decided to set up a single alert system for all alerts under the Sapin II Law and the law on "duty of care" ("devoir de vigilance"), as well as alerts from employees alleging harassment and discrimination. The Group Ethics & Compliance Division is the system's contact for the Group. This Group system benefits all Group entities, except for the subsidiaries in the regulated sector, Enedis and RTE ⁽²⁾, which have their own whistleblowing system to respect their managerial independence.

The Group's Ethics & Compliance Whistleblowing System is accessible at all times on the EDF group website, its interface is available in several languages (French, English, Italian, Portuguese, Dutch and Mandarin) in France and abroad, and whistleblowers can submit their alerts in the language of their choosing ⁽³⁾.

The EDF group Ethics & Compliance Whistleblowing System allows Group employees and external staff (temporary workers, service provider employees, etc.) or occasional employees (fixed-term contracts, apprentices, trainees, etc.), as well as third parties, to report actions of which EDF group or its employees are the culprits or victims. Once the report has been submitted, the whistleblower receives confirmation within 72 hours informing them that the admissibility assessment has begun. Whistleblowers can submit reports anonymously in countries where this is authorised. Alerts can be reported anonymously, as long as the severity of the reported facts is established and the factual elements are provided in precise and sufficient detail, so as to provide evidence for the reality of the reported facts.

The Group Ethics & Compliance Division assesses the admissibility of an alert, which depends on this scope of application and the whistleblower's relationship with the Company. This admissibility is independent of whether the alleged facts are well-founded or not, which can only be determined through an alert handling process. Once a ruling has been made on admissibility, the whistleblower is informed of the protective measures from which they benefit (protection under the Sapin II law, French Labour Code, etc.). These vary according to their status (victim or witness, individual or corporation, etc.), their relationship with the Company (employee, external service provider, third party, etc.) and the themes involved (fraud, harassment, serious environmental damage, etc.).

Each alert that is deemed admissible is handled. The Group Ethics & Compliance Division appoints a case manager and, if necessary, is assisted by Ethics & Compliance Officers and other experts to handle alerts. When the investigations have been completed, a report is drawn up by the case manager. If the allegations in the alert are proven or partially proven, an action plan is implemented. The Group Ethics & Compliance Division monitors the progress of this action plan and ensures it has been fully implemented before the alert is closed.

Alert results are consolidated and included in the annual ethics & compliance report submitted to the Executive Committee and presented to the EDF Board of Directors' Governance & Corporate Responsibility Committee.

In 2019, this Division recorded 53 admissible alerts; 81% came from Group employees; 44 alerts were about incidents occurring in France and 9 abroad; 39 related to EDF and 14 to Group subsidiaries. Most whistleblowing alerts (59%) related to harassment/discrimination. In 2019, more than 2/3 of alerts handled were sufficiently circumstantiated to result in corrective actions or disciplinary sanctions. The average handling time for these alerts was 112 days.

(1) Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency.

(2) Distribution network operator Enedis and transmission operator RTE are managed independently.

(3) www.edf.fr/edf/alerte-ethique.

3.3.1.1.2 Human rights



One of the EDF group's fundamental goals is to endeavour to respect and ensure respect for human rights in all its activities and wherever it operates. Human rights include social components (e.g. labour or health and safety rights), societal aspects (e.g. community rights or safe services), and ethical matters (e.g. respect for people, and the fight against discrimination and corruption). As a consequence, human rights risks are covered in detail in several chapters of the URD, and certain issues examined in this section refer to other sections.

EDF promotes international human rights law by recognising the ILO's fundamental conventions, which guarantee fundamental labour principles and rights, and the fight against discrimination. EDF has been committed to the United Nations Global Compact since 2001 and has published a Communication On Progress (COP) at "Advanced" level every year since 2012. The Group complies with the UN guiding principles on human rights as well as the OECD Guidelines for Multinational Enterprises. Since 2001, EDF has adhered to the UN Global Compact, a programme that requires companies to adopt a socially-responsible attitude. The Group also complies with the Declaration of the Rights of the Child, the Convention on the Elimination of All Forms of Discrimination Against Women, the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions, and the United Nations Convention against Corruption.

In 2018, EDF signed a new global agreement on the Group's corporate social responsibility with two international trade union federations (IndustriAll and ISP) and the EDF group's own trade unions. This agreement automatically applies to all the Group's employees and effectively reflects its commitment to "make upholding human rights a prerequisite to all its business activities, and not to tolerate any violation of these rights whatsoever, whether during the course of its business, or by its suppliers, subcontractors and partners". It confirms that, in the event of conflicting standards with applicable laws in countries in which it operates, the EDF group undertakes to apply the most protective human rights provisions. A collective bargaining agreement was signed in China with the EDF Trade Union Committee elected in China with the aim of improving working conditions and terms of employment, as well as social dialogue. The EDF group and the signatories to the global agreement are committed to promoting all of the legal texts to which the agreement refers amongst its subcontractors and suppliers. By virtue of the ILO conventions, the agreement particularly affirms that the EDF group is committed to:

- guaranteeing freedom of association and the principles of collective bargaining (Conv. 87 and 98);
- abolishing forced and compulsory labour (Conv. 29 and 105);
- prohibiting child labour and the exploitation of children (Conv. 138 and 182);
- fighting against discrimination (Conv. 100, 111 and 135).

In June 2019, EDF's Chairman signed a call to action urging businesses to respect human rights alongside 35 other CEOs in the CEO Guide to Human Rights published by the World Business Council for Sustainable Development (WBCSD). In this guide, he states: "As a group with strong and global international operations, EDF group has the willingness and the responsibility to preserve human dignity and make offering decent jobs the norm."

The Sustainable Development policy states that the Group endeavours to "make upholding human rights a prerequisite to all its business activities, and not to tolerate any violation of these rights whatsoever, whether during the course of its business, or by its suppliers". It also states that special attention must be paid to social dialogue and respect for fundamental freedoms, vulnerable groups (children, indigenous peoples), training of security forces and compliance with EDF group commitments by suppliers, sub-contractors and partners, particularly in industrial projects.

At the Corporate level, the "human rights" aspect is systematically taken into account in screening of projects presented to the Group Commitments Committee, as well as to the International Division's Commitments Committees, by identifying project risks (local communities, working conditions, security forces, foreign workers).

In terms of non-fuel purchases in 2019, within the scope covered by the Group Purchasing Division, 1,700 suppliers with a volume of business of more than €400,000 received a self-assessment questionnaire on themes of corporate responsibility; 815 of them were checked and assessed. In addition, 35 external audits were carried out, with a specific focus on human rights issues; The Group Purchasing Division's CSR risk mapping was reworked to take account of the feedback from 2018. It now includes a "human rights" risk assessment per purchasing segment. Regarding fuels, the supply of coal is covered by the Bettercoal⁽¹⁾ code of conduct, that of uranium is the subject of mine audits and that of gas and oil for plants in France's overseas departments was the subject of human rights risk mapping, as part of the vigilance plan;

The "human rights in business" e-learning module developed with the association "Entreprises pour les droits de l'homme" (i.e. businesses for human rights), of which EDF is a founding member, has been updated to include the duty of care and is available to all employees. This e-learning module was completed by 78 employees in 2019; a second e-learning module targeting the supply chain "human rights" risk, more specifically focused on purchasers, was released at the end of 2019.

Performance indicators are monitored at the Group level, based on Cap 2030, via the Health & Safety Policy (LTIR see sections 3.4.1 and 3.3.1.4), CSRG no. 2, social climate analyses (Let's Talk Energy programme, employee commitment surveys) and supplier relations (evaluations, supplier focus survey).

3.3.1.1.3 Energy poverty (CSRG no. 3)



EDF's commitment

EDF's commitment consists in providing 100% of vulnerable populations with information and support solutions in terms of energy consumption and access to rights (CSRG no. 3).

Various problems due to access to energy are complex and keeps intensifying in most developed countries, in terms of the number of households concerned or the severity of the impacts encountered. Vulnerability varies according to geographical location, income, and size and type of accommodation, as well as the type of energy used. The aim of the European Energy Poverty Observatory, set up by the EC, is to collect data, facilitate sharing of good practice, and establish dialogue. In these very different national contexts in regulatory, economic, political, and competitive terms, the EDF group is committed to the fight against energy poverty alongside public and social organisations and associations.

In France, the French National Energy Poverty Observatory, of which EDF is a partner, published its indicator⁽²⁾, revealing that 3.3 million households were in a situation of energy poverty. In the United Kingdom, the indicator published by the public authorities⁽³⁾ showed the country had 2.5 households in a situation of energy poverty. In Italy, there is currently neither a definition nor an indicator relating to energy poverty. A study financed by the Italian government⁽⁴⁾ published in 2019 proposed an energy poverty measurement methodology. In Belgium, there is no definition of energy poverty. However, the authorities are paying close attention to the issue, and special measures, which vary from region to region, have been taken to support people with a low income.

Above all, the Group acts to ensure that an electricity bill is not an additional aggravating factor for its most vulnerable customers and gives priority to supporting them. EDF's action includes research programmes, innovation and the implementation of practical solutions, consisting of enhanced support for public measures and EDF group-specific actions.

(1) On Bettercoal, see section 3.3.3.2.2 "Responsible purchasing", uranium and coal supply chain; The Bettercoal code of conduct is available on <https://bettercoal.org/>.

(2) French National Energy Poverty Observatory 2019 dashboard (Energy poverty quantification indicators).

(3) National Statistics Fuel poverty detailed tables 2019.

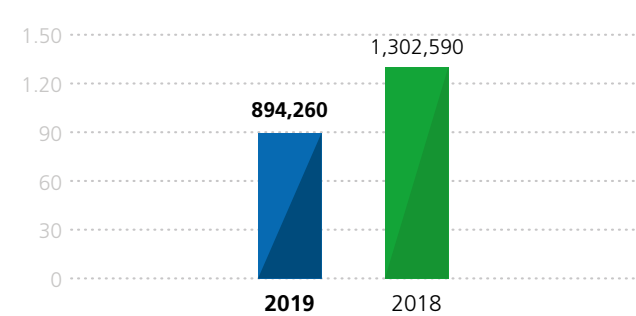
(4) "The socio-demographic and geographical dimensions of fuel poverty in Italy", RSE S.p.A and the Ministry of Economic Development.

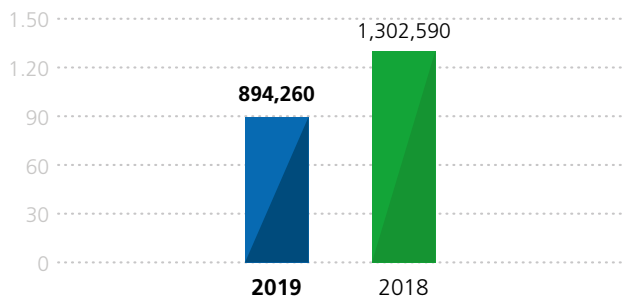
3. Non-financial performance


EDF, a company committed to a just and fair transition

The indicator used for CSRG no. 3 concerns the “number of energy supports”. In France, it is a system deployed by telephone by 5,000 customer service representatives, intended for any customer experiencing a difficulty and designed to analyse the situation and propose the most appropriate solutions. In 2019, 894,260 people received energy support, down on 2018, particularly due to changes in the customer portfolio.

→ EDF, a company with a responsible attitude to people and communities

Number of energy support 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 “Indicators and methodology”. This indicator refers to key stake no. 14 “Energy poverty and access to energy in developing countries” described in section 3.6.2 “Description of key stakes in the materiality matrix”.

Implementation of operational solutions

Public schemes strongly supported by the EDF group to boost their accessibility and effectiveness

EDF implements public schemes by adding its own strong support systems for vulnerable populations. In terms of prevention, EDF is heavily involved in thermal renovations of homes occupied by people with very low incomes, particularly by participating in the French nationwide *Habiter Mieux* (Better Living) programme but also via the “*Toits d’Abord*” (i.e. “A Roof First”) programme with the Abbé Pierre Foundation. EDF voluntarily contributes a maximum of €57 million to the Guarantee Fund for Energy Renovation. This fund, available to all EU member states, makes it easier for households to obtain a loan from banks to finance the remaining cost of work. It must make it possible to guarantee approx. 35,000 individual eco-loans for low-income households as well as collective loans for more than 6,500 condominiums per year by 31 December 2020. The Fund is managed by SGFGAS (i.e. social ownership access financing & guarantee management company).

For the 4th period of the Energy Savings Certificate programme, EDF is under an obligation due to the scheme relating to energy savings for households in a situation of energy poverty. In terms of payment assistance, 2,373,216 customers benefited from the “Energy cheque” programme in 2019. EDF’s action was broadly bolstered with a multichannel relations programme, particularly during the cheque send-out period and before the “winter truce” with a targeted reminder campaign. EDF’s aims to increase access to the cheque through a high level of digitisation. EDF is continuing its active involvement in the implementation of payment assistance. EDF, EDF Systèmes Energétiques Insulaires and Électricité de Strasbourg voluntarily contributed to the Housing Solidarity Fund (FSL) to the tune of more than €20 million in 2019.

In the UK, the Energy Carbon Obligation ECO, implemented by EDF Energy, encompasses in its third phase both measures for reducing carbon emissions and fighting against fuel poverty through the improvement of energy efficiency which contributes fundamentally to finding new solutions. ECO3 began on 1 October 2018 and will continue until 31 March 2022. Unlike earlier obligations, ECO3 is

entirely aimed at vulnerable customers in a situation of energy poverty. EDF Energy is one of the rare energy companies to have an ECO channel for its own customers and works hard to target eligible customers. In Italy, Edison is rolling out the “social bonus” scheme. This public scheme takes the form of a reduction applied to electricity bills, based on levels of income. In Belgium, Luminus developed all the public schemes that are very specific to Flanders, Wallonia and the Brussels Capital Region.

Specific and voluntary EDF group schemes

In France, EDF has developed human and digital support to help customers manage their consumption and make sure they can easily exercise their rights. There are multiple digital solutions available to customers, such as e.équilibre, EDF & MOI, Electriscore (see section 3.2.2.1 “EDF, a company committed to better energy use by each customer”). The Prime Energie website offers financial assistance to households in situations of fuel poverty to carry out work to save energy. With this scheme, EDF committed to the “Coup de Pouce” (i.e. “A Helping Hand”) campaign. EDF’s 5,000 advisers based in France are trained and mobilised to provide customers experiencing difficulties with flexible and suitable solutions, whether or not they are supported by leading social organisations. In addition, close to 300 “dedicated solidarity experts” work directly with social workers to best support the most vulnerable customers. EDF is continuing its partnership with UNCCAS (i.e. French National Union of Municipal Centres for Social Action). EDF and EDF SEI are deploying the PASS (Portal for Access to Solidarity Service), which makes exchanges with social workers more fluid. The solidarity teams proactively contact customers experiencing payment difficulties to offer them solutions and, where necessary, refer them to the relevant social services. At the same time, EDF is implementing various alert and monitoring methods (mailing, text campaigns, phone calls) of vulnerable customers who are disconnected or whose power was reduced at the beginning of winter, so that each of them could benefit from restoration of power before winter. EDF partners with more than 200 conciliation points (including PIMMS: Multiservice Conciliation and Information Points) and charities (Secours Catholique, Secours Populaire, French Red Cross, nearly 450 active partnerships). EDF is developing its modelling capacities to map energy poverty zones and propose solutions to local authorities. EDF, EDF SEI (Island Energy Systems) and ÉS (Électricité de Strasbourg) distribute Demand Side Management (DSM) kits.

For EDF subsidiaries in France, the distribution network manager Enedis, which is managed completely independently, is developing actions for some sites with Maison de Service Au Public- and Maison France Services-certified PIMMS (EDF has been chair of the PIMMS National Union since 2019). They participate in the information and support of vulnerable populations in the areas of eco-friendly practices and access to rights and services. Enedis action also complements measures taken by electricity suppliers regarding their unpaid bill procedures, and the Company systematically contacts customers before cutting off their electricity supply or restricting wattage. ÉS, via its solidarity officer, organises events for customers focused on bills and environmentally-friendly practices on the premises of social stakeholders, associations, etc. The ÉS Solidarity team works with social workers to simplify the setup of payment schedules or terms. A personalised support initiative is in place and each customer experiencing difficulty benefits, in particular, from continuation of their power supply at the subscribed-to level and the time to take the necessary steps with the social services. The Sowe subsidiary handles the energy vouchers and enables better monitoring of customer budgets, by also providing tips for demand-side management on its website.

In Corsica and the French overseas departments & territories, EDF SEI is continuing its actions to finance energy demand management for customers and social-housing lessors (LEDs, solar water heaters with the region on Réunion Island, heat insulation programmes, etc.). EDF SEI develops other types of specific actions, for example: electrification of remote areas (inland municipalities) in Guyana, specific application for new customers in remote areas of Maripasoula using digital meters with the setup of smartphone monitoring, overconsumption alert texting with assistance from energy advisers who grew up in the area; Local Energy Management Services on Réunion Island, i.e. detection and support programmes coordinated by the local authorities for households in a situation of energy poverty; the WATTY schools programme raising awareness of electricity savings.

Internationally, EDF Energy is strengthening its partnerships, for example with Plymouth Citizens Advice (featuring a live chat function for customers), Income Max and the EDF Energy Trust fund, to provide appropriate support and information for customers struggling with debt. Relations with Macmillan have been developed, with a good number of cases of cancer patients where EDF Energy was able to provide practical support, such as price changes, energy advice, and/or payment schedules. EDF Energy collaborated with the charity MIND for mental health, and also is continuing a programme to educate staff that would be in contact with vulnerable customers suffering from mental health problems. Prepaid meter subscriptions are also available. Luminus proposes the My Luminus tool, which helps customers to consume less. To help customers potentially experiencing difficulties, Luminus alerts customers when their consumption is higher than usual or when their annual bill could be a nasty surprise, and, when appropriate, proposes payment schedules. It participates in the energy poverty platform launched by the Roi Baudouin Foundation. The platform has played an active role with the legislator, and is now focusing on issues of payment default.

Social innovation

EDF R&D runs an "Energy poverty: understand-innovate" programme to anticipate changes in energy poverty and public policies, and to design and develop innovations allowing to fight against energy poverty more efficiently. Contextual studies and prospective reflections of researchers allow this multidisciplinary team (sociology, engineering, economics, computer science, design, ergonomics, statistics) to nurture the three areas of actions (payment assistance, support, prevention) of EDF's solidarity policy. In France, EDF was involved in the work of the National Fuel Poverty Monitoring Centre.

Beyond monitoring and research, innovation, and particularly social innovation, may take the form of partnerships. In 2019, EDF continued its partnership with ASHOKA France (social entrepreneurship) and a network of 7 social innovation accelerators. In this context, EDF was a partner in a second call for solutions on the "Energy and Solidarity Transition". It focused on heads of projects developing innovative solutions and projects responding to vulnerabilities in the regions. Following this call, EDF decided to provide support for six projects on the following themes: connected homes for people with reduced mobility, remobilising inhabitants to successfully renovate run-down condominiums, cost-effective passive houses, renovation using environmentally-friendly materials, inclusive and shared housing, and environmental health. EDF is developing "Don d'énergie" (i.e. "Energy gift"), a social and digital innovation, in partnership with the Abbé Pierre Foundation. Since the beginning of 2019, hundreds of EDF's customers with the EDF & MOI application have already made a donation to help vulnerable households pay their electricity bill, irrespective of their electricity supplier. The allocation of these donations is entrusted to the Abbé Pierre Foundation, as part of its mission to support the most vulnerable households. EDF matches this tax-free donation. In conjunction with various partners (for example, the Community Workshop in Toulouse, or the Energy Wall in Hem), EDF R&D experiments with new ways of reaching out and raising awareness among vulnerable populations.

3.3.1.1.4 Consumer health and safety



The EDF group's low-carbon generation has a positive impact on air quality. The electricity generated offers consumers comfort that contributes to solving major public health challenges (cold chain, lighting, indoor air, indoor circulation, etc.). In terms of the precautions to be taken with electricity, EDF has deployed a full range of systems to share information and raise awareness for several years already ⁽¹⁾.

- (1) Various schemes have been set up in all relevant Group structures in France, Italy, the United Kingdom, etc. For example, EDF systematically sends a safety instruction booklet to all customers who take out a natural gas subscription. These instructions can be accessed on the edf.fr web site. Enedis also develops partnerships with organisations representing the main high-risk groups to raise awareness of the risks of fishing near power lines, or to boost cooperation in the prevention of risks relating to firefighting work near power grids. Overseas, EDF Energy in Great Britain informs its customers of the potential dangers of electricity in newsletters or on the back of bills; EDF Energy also offers a toll-free number to inform its customers about safety practices. Specific action is taken regarding the most vulnerable customers to promote their health, particularly during the winter period.
- (2) Other specific dedicated offers are also available: Sérénis Bloc OP: offer dedicated to healthcare facilities with controlled-environment zones, such as operating blocks. SeniorSolution: an offer developed to help nursing homes achieve energy and economic efficiency.

Risk management

EDF assesses the impacts of its generation facilities on people and ecosystems, and sets up annual programmes to prevent occupational risks and improve working conditions. In 2019, the Purchasing Division's CSR risk mapping was significantly reworked and now includes a personal health and safety risk assessment per purchasing segment.

More specifically regarding acoustic risks, the Group endeavours to manage impacts in terms of noise pollution. EDF Renewables arranges acoustic studies for every wind farm project to assess impacts and minimise them from the design stage of project development. The noise levels of turbines are part of the selection criteria for the procurement of machinery. These preventive measures are particularly carried out at international subsidiaries such as in Belgium (Luminus), the United Kingdom (EDF Energy) or Italy (Edison).

Sales offerings

Health sales offerings include advice, work, support for facility management and targeted offers. In terms of advice, the site edf.fr provides a wide range of information to improve occupants' thermal comfort and well-being. EDF facilitates work designed to enhance comfort by establishing relations with qualified partners (EDF's Solutions Habitat partners) and helping to finance the work. In terms of targeted offerings, the Trading Division recently began testing a new service to help seniors who live alone to remain in their homes ("Mon Parent & Moi"). In terms of facility management, Sowee offers domestic customers a connected system capable of controlling their heating, analysing air quality, weather, traffic and pollution. Dalkia has deployed SERENIS, an offer dedicated to healthcare facilities (heating, air-conditioning, etc.), ensuring both facilities' regulatory compliance and the implementation of health risk management procedures ⁽²⁾.

3.3.1.1.5 A data-responsible company



Information is a critically important asset for the EDF group, particularly in digital form in our information systems. These systems must be perfectly protected, contributing to data confidentiality and integrity, business process continuity, and respect for applicable laws and regulations. The digital transformation of businesses and new business practices (collaborative, mobility, Cloud, Big Data, Internet of Things, etc.) generate both opportunities and risks in terms of information systems security. An information systems breach, whether malicious or accidental, that causes the unavailability, leakage, theft, destruction or alteration of certain information and business processes can cause significant damage to the EDF group: harm to its image, financial losses, loss of competitiveness, civil and criminal sanctions, and damage to production facilities.

The Group has redefined three complementary policies: an "Information Systems Security" policy, a "Security of Assets against Malicious Acts" policy, and a "Data management" policy.

The Information Systems Security Policy aims to guarantee the protection of information systems, which are essential to the management of the Company's assets, as well as enabling business lines to reach out and seize Digital opportunities. So, by enabling EDF to function as an "extended company", this policy is a factor in the success of the Group's industrial projects. This policy sets out the security requirements, responsibilities and reference documents required to effectively protect the Group's Information Systems. Management at each EDF group entity is responsible for ensuring the deployment of this policy throughout its organisation, with means appropriate to the challenges and risks of its business lines. The EDF group CIO, seconded by the information systems security manager, and in conjunction with the business line CIOs and entity representatives, assists the entities with the policy's implementation. They report on the security status of EDF group information systems to IS security risk sponsors via the EXCOM.

3. Non-financial performance

EDF, a company committed to a just and fair transition

The Security of Assets against Malicious Acts Group policy sets out the principles, rules and organisation designed to detect threats, prevent risks of malicious acts liable to damage the Group's assets and limit their consequences. This policy is based on a comprehensive approach that aims to protect people and the Group's tangible assets but also, and with increasingly high stakes, its intangible assets. With the aim of making people accountable as near the ground as possible, each Group entity deploys this policy with assistance from the Security and Economic Intelligence Division, which is particularly tasked with identifying reference documents, managing "Security" activities, and making sure that measures put in place are effective and shared.

A data management policy backs up the scheme to create value; it is more focused on the availability and profitable use of data, and aims to promote sharing, cross-disciplinarity, and reconciliation of data to generate new knowledge. A 2017 instruction establishes the framework of applicable requirements in terms of personal data processing, the necessary measures to meet these requirements, the procedures to check compliance with these requirements, and the procedures introduced to manage the Group's subsidiaries.

In terms of the Group's digital transformation, note should be taken of EDF's stand-out performance in the 2019 "eCAC 40"⁽¹⁾, a leading annual ranking measuring the level of progress by groups on the index, plus other big French businesses, in terms of their digital transformation. EDF improved its score (16.61/20) and rose to second in these rankings. This level of performance is driven by excellent results in categories covering the Company's digital culture, management models, and level of technological expertise⁽²⁾.

3.3.1.2 EDF, a company with a responsible attitude to communities

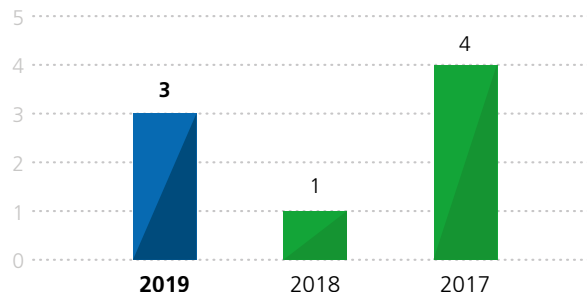
3.3.1.2.1 Nuclear safety



The operational safety of nuclear facilities is taken into consideration from the initial design stage, and is regularly monitored, together with the implementation of an employee motivation policy and large-scale investment programmes. The Group's nuclear safety policy is incorporated into training for both EDF employees and subcontractors. Nuclear safety is subject to internal controls (annual reviews, internal control plans and nuclear inspection audits in France) and external controls (peer reviews between corporate members of WANO⁽³⁾ and OSART⁽⁴⁾ audits conducted by experts from the IAEA). In France, the safety of nuclear facilities is controlled by the ASN (i.e. Nuclear Safety Authority). In the UK, the Office for Nuclear Regulation (ONR) is the independent safety regulator in the civil nuclear sector. It monitors compliance with safety rules, including for the transport of radioactive materials. The "EDF group Nuclear Safety" policy was redefined in 2017⁽⁵⁾.

EDF, a company with a responsible attitude to people and communities

Nuclear safety: Number of significant level 2 events on the INES scale



Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 1 "Nuclear safety and safety of industrial infrastructures and data" described in section 3.6.2 "Description of key stakes in the materiality matrix".

3.3.1.2.2 Hydropower Safety



EDF operates 432⁽⁶⁾ hydropower plants and manages 239 dams⁽⁷⁾ in France. The average age of the French hydropower fleet is 75 years⁽⁸⁾. Hydropower safety aims to limit risks of structural failure, risks relating to the operation of facilities during times of flooding, as well as watercourse flow variations during operation. Like the nuclear safety policy, the hydropower safety policy aims for a high level of safety and continuous improvement (see section 1.4.1.5.1.2 "Hydropower safety").

3.3.1.2.3 Tax transparency



EDF has implemented a Group tax policy to define the applicable principles, in terms of taxation, to all of the Group's relations with its financial or business partners and the government or tax authorities. The tax policy is applied by the Group Executive Director responsible for the Group's Financial Management. It was approved in 2017 by the Executive Committee.

At the end of 2019, as in 2018, the Group uploaded its country-by-country report (of data for fiscal year 2018) to the French tax authorities, in accordance with the provisions of Article 223 (5) c) of the French General Tax Code which follows the OECD's recommendations.

(1) Les Échos Executives, 13 December 2019, "EDF: acteur de premier plan en matière de transformation digitale" (i.e. EDF: leading light in the world of digital transformation).

(2) See section 3.5 "Non-financial rating".

(3) World Association of Nuclear Operators.

(4) Operational Safety Review Team.

(5) See section 1.4.1.1.3 "Environment, nuclear safety, radiation protection" in France and 1.4.5.1.2.1 in the United Kingdom.

(6) EDF Hydro i.e. Continental France on EDF SA excl. subsidiaries.

(7) 239 class-A or -B dams according to French regulations.

(8) Arithmetic mean.

Group tax policy

A wide scope

The policy covers all the Group's taxes: direct and indirect taxes, duties, contributions, any tax or customs deductions which are ultimately the responsibility of the Company or its customers (when EDF merely acts as a collector on behalf of third parties).

This policy must be applied throughout the Group, by all controlled entities regardless of their nature or geographical location, with the exception of regulated infrastructure managers, for whom it constitutes a guide. All Group staff must comply with this policy which aims to protect the Group's reputation and to reduce any tax risks to which it may be exposed through its activities. The policy follows the following guidelines:

- strengthen the tax performance of the Group in strict compliance with national and international tax laws and regulations;
- control tax risks through continued, systematic improvement, in all Group entities, of the identification and management of fiscal risks;
- implement the tools, reporting and actions necessary for the continued, optimum, forward-looking management of tax cash flows ⁽¹⁾, as well as attentive and proactive monitoring of the Group's effective tax rate;
- ensure the conditions necessary for obtaining constructive relations with the tax and government authorities of all kinds by maintaining a transparent, professional relationship with them.

Ethical principles

In the context of the allocation between countries of operating margins internal to the Group, EDF strives to apply a transfer price policy in accordance with the principles of the OECD to justify the resulting revenues. EDF has no legal implantation (company, branch or office of representation) in a territory listed as a non-cooperative state or territory as defined by French and international legislation which is not determined by economic activity reasons and under no circumstances purely by tax reasons. Similarly, cash flow *via* these countries is prohibited where it is for tax reasons only.

Presence in Luxembourg and Ireland

Like all major French and international groups, EDF relies on captive and mutual insurance companies to supplement the cover provided by traditional insurance markets. Captive insurance companies and mutual insurance funds enable EDF to reduce the cost of its insurance schemes and the amount of premiums paid to the insurance market. EDF has three captive insurance companies, based in Ireland and Luxembourg:

- Wagram Insurance Company DAC. (wholly owned by EDF), an insurance company founded in 2003 in Dublin which is involved in the majority of the Group's insurance schemes;
- Océane Ré (wholly owned by EDF), a reinsurance company founded in 2003 in Luxembourg to reinsure EDF's nuclear civil liability risk;
- Tereco (wholly owned by Framatome), a reinsurance company within the Framatome consolidation scope located in Luxembourg, to reinsure a portfolio of risks including that of Framatome's nuclear civil liability.

Taxes paid by the Group

In 2019, the EDF group's tax expense ⁽²⁾ was €3,798 million, a 2.9% increase (€108 million) compared to 2018 (up +3.3% in organic terms).

The EDF group contributes to the development of the French regions through an annual payment of more than €1.8 billion in local taxes to local authorities.

The income tax expense amounted to (€1,581) million in 2019, corresponding to an effective tax rate of 24.71% ⁽³⁾ (compared to an expense of €(178) million in 2018, corresponding to an effective tax rate of 27.13%). The €1,759 million increase in the income tax expense between 2019 and 2018 was mainly due to the rise in pre-tax income of €5,743 million, generating an additional income tax expense of €1,977 million *via* the application of a corporate income tax rate of 34.43% in France.

(1) Tax cash: tax actually paid or recovered.

(2) See note 11 Taxes and Duties in the notes to the Consolidated Financial Statements.

(3) See note 17.2 Reconciliation of the theoretical and effective tax expenses (tax proof) in the notes to the consolidated financial statements.

(4) This information was restated based on the IFRS 5 impacts of the discontinued E&P activity.

(5) FAPE: fape-edf.fr.

Adjusted for the non-recurring items, the effective tax rate in 2019 was 19.1%, down from 22.6% in 2018.

Income taxes paid by the Group amounted to €922 million in 2019 (€309 million in 2018 ⁽⁴⁾): the €613 million increase in corporate tax paid was essentially due to the significant increase in taxable profits in France.

Income tax paid in all the countries where the Group has subsidiaries is detailed in an appendix, in section 3.6.7.

3.3.1.2.4 Sponsorship



For more than 30 years, EDF group and its Foundation have supported public interest actions. Their corporate sponsorship policy is based on the values of respect, solidarity and responsibility. Endowed with a budget of €10 million per year, the EDF group Foundation has worked with several Group subsidiaries represented on its Board of Directors to promote a Group approach to corporate sponsorship. Philanthropic actions are carried out either by the Foundation, or directly managed by EDF's parent company and the Group's subsidiaries.

To prepare for the coming term (the current one expired on 31 December 2019), the Foundation consulted all its stakeholders, both internally and externally, on possible areas of intervention and expected impact on civil society. Following this consultation, the EDF group Foundation's Board of Directors decided to refocus its areas of intervention for the next 4 years (2020-2023) on the environment, education and inclusion.

Areas of intervention

Solidarity is the basis for the EDF group Foundation's action which can be divided into the following categories:

- fight against precarious work, social integration of young people and education;
- access to culture, the Foundation runs a cultural space and offers a free programme of cultural mediation, exhibitions and meetings. In 2019, with the "Light matters" and "Coup de Foudre" exhibitions, it received more than 60,000 visitors;
- The social and fair economy, *via* the EDF Fonds Agir Pour l'Emploi (*i.e.* act for employment) foundation ⁽⁵⁾, which helps to get the long-term unemployed back to work.

Given that scientific and technological progress ultimately contributes to human progress, the EDF group Foundation is committed to supporting access to scientific knowledge in order to develop promoting science and innovation amongst young people, medical research, digital progress, using the digital revolution as a lever for renewing social cohesion.

In 2019, the Foundation dedicated over €7.1 million overall to financing initiatives directly relating to solidarity and progress in France.

Means of action

Working with associations, the Foundation not only provides organisations with financial support to enable the implementation of public interest projects, but also loans out employees *via* skills sponsorship and volunteer work, and offers assistance, particularly IT support. For instance, for the Telethon, in addition to the funding provided by the Foundation for genetic disease research, hundreds of EDF group employees are taking action through various initiatives (donating their time, cultural events, sports challenges, etc.); and a contribution by the Foundation to the financing of a digital platform designed to collect all the financial donations in real time. Similarly, EDF R&D research engineers offer their technological expertise to institutes that work for the public interest, through skills-based sponsorship. This is how a technology originally developed for nuclear power plant maintenance was re-tooled to improve accessibility to parts of Musée de Cluny previously not open to wheelchair users.

3. Non-financial performance

EDF, a company committed to a just and fair transition

The Foundation abroad

Internationally, the Foundation supports projects run by non-profits for which electricity aids in access to water, health, education and development, by providing them with a combination of funding and technical expertise from the Group's employees. In 2019, it supported about 51 projects that resulted in 50 technical assignments by 67 employees in 20 different countries, amounting to €2.3 million. Among the 32 associations supported, Electricians Without Borders holds a special place as a historical partner of the Group: 12 projects supported in 2020 and financial support for the humanitarian crisis in Mozambique.

In the UK, EDF Energy focuses its corporate sponsorship policy on sustainable development and support for local communities. The educational programme Pod aims at teaching 2.5 million children about the principles of sustainable energy use. EDF Energy also grants employees two days per year for volunteering. Finally, employees are encouraged to raise funds for partner charity Breast Cancer Now, which contributes to cancer research, raising the awareness about prevention of the disease and support for employees who suffer from it.

In Italy, Edison's sponsorship activities are part of a corporate responsibility strategy to involve employees in volunteering actions. Edison has chosen to focus particularly on the younger generation to promote a sustainable development and consumption culture, thanks to cooperation with consumer organisations. Finally, Edison is developing several projects on the inclusion of women in scientific culture, through schools activities organised by women working at Edison.

3.3.1.2.5 Dialogue and consultation about our projects (CSRG no. 5)



EDF's commitment

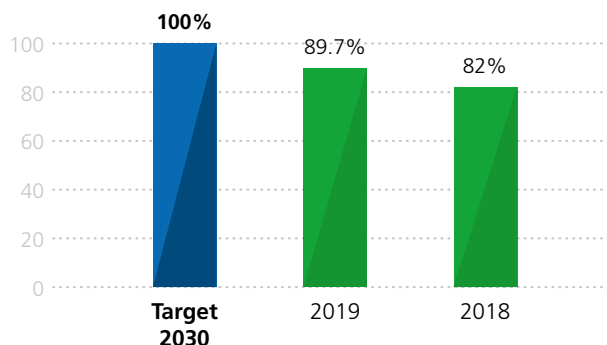
Wherever EDF operates, civil society expects more dialogue and vigilance with regard to projects likely to alter the environment. The EDF group systematically consults stakeholders but the way in which this is done depends on countries, regulations and projects.

The Group is striving to organise a global initiative of dialogue and consultation which is transparent and open for each new project (CSRG no. 5). Any new project of more than €50 million and having a significant impact on the regions or the environment, for which an investment decision is taken after 1 January 2017 (thus subject to review by the Group Executive Committee's Commitments Committee⁽¹⁾) is concerned. The EDF group is committed to implementing the rules governing dialogue, according to international standards on stakeholder participation, and to ensuring that such consultations are publicly reported. More precisely, the following procedures will be applied: identify stakeholders; launch consultation as far upstream as possible; provide transparent and clear information to stakeholders on the project; gather stakeholders opinions on the project and address them; set up a system for dealing with suggestions and complaints; ensure that local populations are able to participate in the consultation process; ensure that consultations are publicly reported. For 2030, the goal is for there to be dialogue or consultation on 100% of projects worth more than €50 million in accordance with the Equator Principles⁽²⁾.

In 2019, projects falling within the defined criteria accounted for the review of 29 files by the CECEG; 89.7% of these were the subject of a consultation. This goal is presented every year to the Board of Directors' Corporate Responsibility Committee, and the CSR Strategy Committee chaired by the Innovation, Corporate Social Responsibility & Strategy Director, who is a member of the Executive Committee (see section 3.1.2.3.3 "The Sustainable Development Division").

EDF, a company with a responsible attitude to people and communities

Percentage of projects on which there was consultation in accordance with the Equator Principles



Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 10 "Listening, communication, transparency and dialogue" described in section 3.6.2 "Description of key stakes in the materiality matrix".

In accordance with French regulations, stakeholders have access to environmental (EIA) and social (SIA) impact assessment results for ICPE facilities (*i.e.* facilities classified for environmental protection), for example at Dalkia or EDF R or on local community sites internationally. EDF releases documentation on projects, such as these EIA and SIA, which are required to be published⁽³⁾ on prefectural sites; the documentation also include the opinions of the French Environmental Authority or the investigating commissioner⁽⁴⁾ to be submitted to debate or a public inquiry where appropriate.

Some illustrative examples

Locally

EDF Renewables was also recognised for its continuous dialogue and the quality of joint development work with the local authorities on its Beaujolais Vert wind farm project⁽⁵⁾ (Rhône) taking account of stakeholders' expectations. EDF SEI⁽⁶⁾ and TERNA⁽⁷⁾ organised three-way consultation on the plan to strengthen the existing "SACOJ"⁽⁸⁾ link between Sardinia, Corsica and Italy. This project, called SACOI 3, was added in 2015 to the Multi-Year Corsican Energy Programme, and certified as a "Public Interest Public: PIP"⁽⁹⁾ by the European Union in November 2017. It aims to increase the link's electricity transit capacity to secure both Sardinia's power supply and Corsica's electrical system, as well as encourage the inclusion of REN in

(1) CECEG: The Group Executive Committee Commitments Committee.

(2) This is a reference framework in the financial sector aimed at determining, assessing and managing environmental and social risks on projects. It features 10 principles: equator-principles.com.

(3) aude.gouv.fr/IMG/pdf/b1cpv11_fendaille_ei.compressed.pdf.

(4) See for example haute-loire.gouv.fr.

(5) parc-eolien-beaujolais-vert.fr/.

(6) Island Energy Systems.

(7) TERNA is the main operator of the Italian high-voltage and very-high-voltage electricity transmission network. Its mission is to secure electricity transmission across the whole of Italy, including islands, particularly Sicily and Sardinia. In Italy, TERNA operates 73,000km of lines and 25 links with its neighbouring countries and islands.

(8) SACOI: SArdinia COrsica Italy.

(9) To qualify for PIP status, the project must produce significant advantages for at least 2 EU Member States, contribute to market integration and increased competition, improve energy supply safety, and contribute to reducing CO2 emissions. On 23 November 2017, the EU recognised the SACOI3 project as a Public Interest Project (PIP).

the Corsican electricity mix. A first "Fontaine⁽¹⁾" consultation under the aegis of the Prefect serves to "define the characteristics of the project as well as the project's environmental insertion measures with elected representatives and associations representing relevant groups", and "provide quality information to groups affected by the project" to share the study location proposed by the project managers and determine the route with the least impact. A 2nd voluntary preliminary consultation with 2 guarantors appointed by the CNDP⁽²⁾ helped to get the entire population fully involved in the scheme. This consultation was held from 30 September to 22 November 2019, including eight public meetings, two workshops, seven individual meetings with stakeholders, a website, etc. The guarantors expressed a positive opinion on this consultation, both in terms of the efforts made for the consultation and the quality of the discussions, at the end of December. Finally, a 3rd consultation will be organised for the project's certification as a "Public Interest Project". The measures set out in the preliminary consultation mean the European commission's main requirements can be met. In early 2020, the line's preferred route will be approved by the prefect and dialogue with both the public and stakeholders will continue alongside the authorisation application process.

Internationally, Edison worked with the local communities of Valchiavenna (Northern Italy), close to a hydropower plant. A Traccolino tourist route that served only the dam and the plant was transferred to the community. In addition, an educational programme to develop the entrepreneurial spirit was created with the objective of developing the region using new technologies. All the major work carried out by the International Division includes stakeholder engagement programmes, according to IFC standards, including a system to record and handle complaints. In 2019, EDF continued to use the Request & Complaint Management System both on the Nachtigal project⁽³⁾ (Cameroon) and SINOP project⁽⁴⁾ (Brazil). In India and Mexico, Citelum sets up regular meetings with stakeholders interested in its projects, connects with customers to follow their needs and invites subcontractors to the main events (safety week, inauguration of the training centre). In French-speaking Belgium, each wind farm project is discussed in advance with the municipal and regional authorities, in order to agree on the best location for the wind farms, as well as the type of compensatory measures, if any, meeting stakeholder expectations. Proposals by locals have been taken into account in the design and follow-up of the project (e.g.: monitoring of nesting of protected species like eagle owls and creation of marked paths around the Lierneux wind farm, which is located in a forest management zone).

Following studies on the design of HPC and work with specialist stakeholders, EDF Energy wants to modify the 2013 operating order issued by the UK government to remove the obligation to install a means of acoustic dissuasion for fish on HPC, which was deemed less effective. EDF Energy proposed a series of measures to protect fish from the plant's cooling water system and accordingly reduce the number of fish entering water intakes.

A consultation on the modification of the order for the development of Hinkley Point C was held from 2 April to 4 June 2019 and based on these constructive opinions, HPC will propose this more favourable (for fish) modification of this order to the Secretary of State in 2020.

Nationally

The provisions proposed by EDF to improve the safety level of its 900MW nuclear reactors as part of their fourth periodic review were the subject of an unprecedented consultation: under the aegis of a High Committee for Transparency and Nuclear Information (HCTISN), it was a matter of associating the public with the challenges and objectives of this programme and making it possible to shed light on subsequent decisions. All the main institutional players in the safety of nuclear power plants in France are involved: the National Association of Committees and Local Information Commissions (ANCCLI), the Nuclear Safety

Authority (ASN) and the Institute for Radiation Protection and Nuclear Safety (IRSN). Eight nuclear power plants are involved: Blayais, Bugey, Chinon, Cruas-Meyse, Dampierre-en-Burly, Gravelines, Saint-Laurent-des-eaux and Tricastin. This is a first phase of exchange with the public, in the run-up to the public inquiries that will take place reactor by reactor. A digital platform was created and meetings are scheduled by the local information commissions; This consultation, overseen by two CNDP guarantors, involved the organisation of local meetings from September 2018 to 31 March 2019, i.e. 16 public events organised all over France with the support of Local Information Committees (10 public meetings, 3 themed workshops, 3 student mirror group meetings) and public drop-in centres; 1,300 meeting participants; 4,000 connections to the platform; 1,600 contributions and questions asked.

Participation in the public debate is also an opportunity for all stakeholders to have their voices heard regarding projects whose scale or sensitivity justified the setup of a debate in this form. In 2019, this was the case with the PNGMDR (French national radioactive materials and waste management plan). The French State had committed to revising this plan and EDF participated in the preparatory work and various public meetings organised by the CNDP (French National Public Debate Committee). Taking account of the recommendations made by the French Sustainable Development Council, EDF published a first participant's guide, which presents the EDF group's stance, with two proposals: construction of a pool to store already-recycled used fuel, and post-treatment recovery of so-called "very low activity" metal waste (see section 3.3.2.2.5 "Radioactive waste").

Following many questions regarding the deployment of smart meters, distribution network operator Enedis engaged in consultation at the request of the local authorities and various stakeholders (social-housing lessors, etc.). The task force composed of two people, dedicated to this consultation, carried out 374 interventions in two and a half years; this does not include everything done directly by the regional departments (interventions before municipal teams, permanent office in the town hall, public meetings, etc.).

3.3.1.2.6 Creation of value in the regions



The EDF group contributes to the sustainable development of the regions where it operates, participates in economic development and employment and provides tax revenue to the territories

Contribution to economic development

Local procurement

The Group's Procurement Department continues to interact with suppliers – including SMEs, ISEs, VSEs and start-ups – with the operational implementation of a process adapted for innovative purchasing and to make it easier for SMEs to access EDF's markets. This entails the acceptance of simplified general terms and conditions of purchase and created special terms and conditions for "small orders" (online on the Provider portal); a simplified capacity questionnaire for new suppliers, for tenders with amounts below the thresholds of European Directive 2014/25/EU; a tailored purchasing process and standard agreements for innovative start-ups and SMEs (40 tests, €45,000 average budget, 100 potential new deals each year); a dedicated space on the edf.fr institutional site (single point of access).

In terms of purchases from SMEs located in France, the target range is between 22% and 26% of purchases by EDF and the distribution network manager, Enedis⁽⁵⁾.

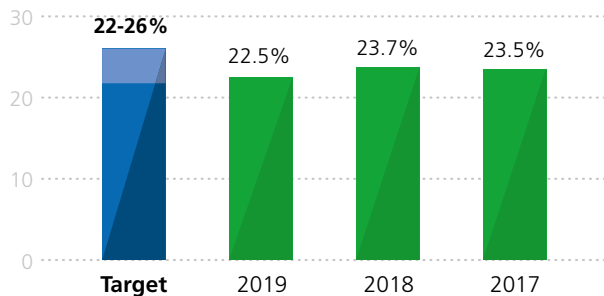
(1) The Fontaine circular (circular of 9 September 2002 by Nicole FONTAINE, French Minister of Industry) concerns the development of the public electricity distribution network with voltage greater than or equal to 63,000 volts.
 (2) Commission Nationale du Débat Public, i.e. French National Public Debate Committee.
 (3) nachtigal-hpp.com/index.php/gestion-des-requetes-et-des-plaintes.html.
 (4) sinopenergia.com.br/show.aspx?idCanal=4f0Af5gdJaBxAqHrYGYMyw.
 (5) Enedis is an independently managed subsidiary.


3. Non-financial performance

EDF, a company committed to a just and fair transition

→ EDF, a company with a responsible attitude to people and communities

Annual rate of procurement from SMEs (%) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 7 "Creation of value shared with stakeholders, to benefit territories and employment" described in section 3.6.2 "Description of key stakes in the materiality matrix".

In 2019, as part of the consultation process, the Purchasing Division added clauses encouraging tier-1 suppliers to employ local suppliers meeting the requirements of European Directive 2014/25/UE, for work or service contracts on electricity generation sites. The economic flows from the Nuclear and Thermal Fleet Department and the New Nuclear Projects and Engineering Department injected into the French economy in 2019 represented €2,864 million in direct purchases.

The EDF Hydro "future project" strategy, which aims to maximise value creation for both the operator and the region, was implemented on major projects such as La Coche (Alps) or Sabart (Pyrenées). It contributes to increasing cooperation with local businesses and integration, when suitable with support from "One river, one region" agencies, by adding appropriate clauses and continuously working with regional employment stakeholders. The La Coche project, worth a total of €150 million, illustrates this with €88 million spent on businesses from the Auvergne Rhône-Alps region and nearly €30 million on companies based in the Savoy area, i.e. a total of 500 local jobs, including 11 integration jobs. For the Sabart plant hydroelectric penstock replacement project, 80% of the project's spending is on south-western businesses (out of the 158 businesses working on the project). In 2019, this meant more than €3 million spent on businesses from the Ariège, €12 million on Occitan businesses and the injection of an extra €215,000 into the local economy via spending on accommodation and catering, benefiting 80% of professionals in the industry in the Tarascon-sur-Ariège area.

The policy for EDF Energy's HPC project is to utilise local and regional suppliers whenever possible. Currently, more than 4,000 of these businesses are registered on the HPC supplier portal. Local suppliers sign contracts directly with HPC or with its tier-1 suppliers. Since the start of the project, HPC has spent approximately £380 million on purchases, including £106 million on consortium companies set up specifically by local businesses to work with HPC, accounting for around 800 subcontracting jobs. In Vietnam, MECO has CSR programmes in the south of the country, developing concrete actions in favour of local communities: renovating toilet blocks and bathrooms; building new classrooms and libraries for students; assisting disadvantaged children from minority backgrounds, people with disabilities, and orphans, all actions aiming to eradicate illiteracy and help new communities to settle and grow.

Through the creation or protection of jobs

All organisations have an economic impact on the local region: they hire employees, make purchases from other businesses, and pay taxes and duties. This all has an

economic knock-on effect: i.e. "employment footprint", which is divided into direct impacts (EDF employees), indirect impacts (impact of EDF purchasing on its entire supply chain), and spin-off impacts (impact of employee spending: both EDF employees and employees of companies in EDF's purchasing supply chain spend a share of their salary in the region, as well as paying taxes and duties).

The data collected for 2019 concerns the following scopes: France excl. Corsica and French overseas departments and territories; the Nuclear & Thermal Fleet Department (DPNT) and New Nuclear Projects & Engineering Department (incl. EDVANCE purchases) and the Thermal Expertise & Multi-Sector Industrial Support Division (DTEAM); non-fuel purchases. The results revealed 38,095 direct EDF employee jobs (incl. work-study trainees); 60,610 indirect employee jobs, incl. 34,767 at tier-1 suppliers and 25,843 at tier-2+ suppliers; 114,061 spin-off employee jobs, incl. 46,002 due to household expenditure and 68,059 as a result of public administrative spending. One direct EDF job contributes to supporting 4.6 indirect and spin-off jobs.

Outside the study's scope of calculation, the Group has a range of positive impacts on jobs through all its business activities both in France and internationally. EDF Hydro generated 5,727 direct jobs, including 5,431 open-ended contracts and 293 work-study contracts, as well as 3,276 indirect jobs across the region. Through its biomass boilers and heating networks, Dalkia generates non-transferable local jobs, up to approximately 2,100 jobs in France. Since 2018, the Trading Division has been committed to the Energy Savings Certificate ⁽¹⁾ TEPCV ⁽²⁾ programme. 60 regions have benefited from support since 2019. With the ACTEE programme, EDF and FNCCR (French National Federation of Licensing Authorities) participated in the renovation of local authority buildings, providing €12.5 million in funding. An ACTEE website, simulator and tools have been set up, and Calls for Expressions of Interest jointly promoted.

Internationally, Citelum has set up new lighting projects in India and created 480 direct and indirect jobs. In Laos, the Nam Theun 2 Development Fund was launched to finance livelihood, health, education, and capacity-building projects, selected and implemented by communities with technical support, contributing to the creation of 200 local jobs with sub-contractors.

In Brazil, Norte Fluminense supports a range of social and environmental programmes such as the scheme headed up by the association Mico Leão Dourado, which provides agroforestry and agroecology training in the Mata Atlantica region. Norte Fluminense's sub-contractors sign commitments to the SA 8000 ⁽³⁾ standard, which sets out the standard's 9 "employment & social responsibility" requirements.

EDF Renewables enabled the creation of 55 local jobs for the construction of its projects in Canada, in addition to 85 existing jobs. In South Africa, EDF Renewables created a database of small businesses in the local community located near construction projects for contractors and sub-contractors to include in calls for tender.

Contribution to local tax revenue

See section 3.3.1.2.3 "Tax transparency: Taxes paid by the Group".

3.3.1.2.7 Access to energy



Access to electricity is a vector for progress and development, including in the areas of health, education and security. This has been clearly reaffirmed in the United Nations sustainable development objectives. Today, even though the global electrification rate increased by 6 points between 2010 and 2017 (89%), 840 million people worldwide have no access to electricity, and around 50% of them are located in Sub-Saharan Africa.

EDF is continuing its efforts in this area, and has updated its models beyond its scope of action. Technological advances, the cost of equipment and local economic models open up new possibilities for action and mass implementation. EDF is developing new business models that combine its traditional know-how with technological and financial innovation.

(1) TEPCV: territoire à énergie positive et croissance verte, i.e. positive energy and green growth regions.

(2) sgsgroup.fr/fr-fr/sustainability/social-sustainability/audit-certification-and-verification/sa-8000-certification-social-accountability.

(3) GRI indicator: G4 EN12 – Disclosure 304-2.

EDF is developing off-grid projects designed to provide domestic customers and very small enterprises, mainly in Africa, with electrical services, including ZECI in Ivory Coast, ZEGHA in Ghana, BBETO in Togo, Sun Culture (solar-powered pumping) in Kenya, and KES in South Africa. EDF today makes it possible to supply energy (8 to 10MW of installed capacity) to more than 500,000 people and aims to multiply this figure by 4 over the next 3 years. This energy is supplied along with "low-energy" equipment (lamps, radios, fans, televisions) enabling lower energy use. New products are also being developed to meet the needs of local populations, particularly solar-powered pumps (meaning people can stop using diesel-powered pumps), solar kiosks and even mini-grids (see section 1.4.5.3.9 "Off-grid energy").

Again in Africa, EDF set up the EDF Pulse Africa Awards to support entrepreneurial activity by identifying potential new partners for the development of energy projects and stimulating the development of innovative solutions to the continent's energy issues. In 2019, to ensure optimal project sourcing, a nationwide pre-selection campaign, the EDF Pulse Africa Tour, was organised in 7 African countries (South Africa, Cameroon, Ivory Coast, Ghana, Morocco, Senegal and Togo). In the end, EDF Pulse Africa 2019 attracted 536 projects from 26 African countries. The five winners received a financial grant, operational and financial advice, project development partnerships with incubators based in African countries, and access to EDF's innovation ecosystem, including R&D, EDF's in-house creativity labs, and EDF Pulse Croissance (EDF incubator and corporate venture dedicated to start-ups).

Furthermore, most major EDF projects, especially those in Africa and Asia, are designed to improve access to electricity on a local, regional and national scale. Preparatory work on the construction of the Nachtigal hydroelectric facility in Cameroon began in 2019. This hydroelectric dam project meets the country's growing demand for electricity with a sustainable low-carbon solution, and a very competitive electricity generation cost. Nachtigal is a national priority for securing Cameroon's electricity system. In Myanmar, an in-depth environmental, social and societal impact and risk assessment is ongoing on the Shwe Li 3 project. The issue of access to energy is decisive in the EDF group's positioning on this project. In French Guiana, EDF supports the electrification programme in Haut-Maroni, with the construction of hybrid generating plants combining a photovoltaic system, storage batteries and diesel engines (except for Pidima which does not have a diesel engine). Planned performance aims for an annual renewable energy coverage goal of 70% (see section 1.4.4.3 "Island energy systems").

3.3.2 EDF, an environmentally-friendly company

3.3.2.1 EDF, committed to biodiversity (CSRG no. 6)



Because most of its industrial facilities are located in or near protected areas, the Group has made biodiversity a major commitment for several decades. Therefore, EDF is a landowner and a manager of natural resources of great importance. Improving our knowledge of this heritage, reducing the impacts of our activities, and enriching local biodiversity are part of the performance goals for these industrial sites. The importance of the issue explains why the Group committed to biodiversity as early as the 1970s, with for example, the creation of a national laboratory on hydro-ecological issues in France, and the drawing up of a Biodiversity policy in 2006.

The pressures of the Company's activities on biodiversity mainly concern ⁽¹⁾ water and aquatic biodiversity: hydraulic generation structures (power plants, dams and

water intakes), which bring about modifications of the biodiversity upstream of the structures in the event of flood defence, and downstream, due to the fragmentation of areas and flow limitations or variations. The impact of thermal structures, to a lesser extent, concerns the degradation and fragmentation of natural terrestrial habitats, due to the land occupied by the existing sites or projects, overhead transmission systems, wind turbines and street lights, which pose a threat to birds and bats.

In order to better assess the threats and opportunities related to the impacts and dependency of the Company's activity on ecosystems, EDF is testing the Ecosystem Services Review (ESR) method. ⁽²⁾ This process of continuous improvement ⁽³⁾ has earned several Group companies recognition for their initiatives: in Mexico, Citelum has been recognised by the COEBIO (Council that distinguishes companies responsible for bioethics); in the UK, EDF Energy is one of the five companies to have met the Wildlife Trusts' Biodiversity Benchmark on multiple sites; in France, EDF has been recognised for its commitment to the National Strategy for Biodiversity (SNB) by the Ministry of Ecology for the 2014-2017 period. Developed with its partners, this commitment has resulted in a major focus and concrete actions implemented in favour of biodiversity.

3.3.2.1.1 EDF's commitment in favour of biodiversity

EDF's long-term commitment consists of generating positive impacts on biodiversity, without limiting itself solely to knowledge. This goal, which is binding upon the whole Group, concerns the entire lifecycle of installations, from the project study stage, to construction and operation through to the end of the life of installations. It spans the whole length of the value chain, including procurement policies and relationships with suppliers and subcontractors.

The Group intends to develop a positive approach to biodiversity, by improving its practices and by avoiding as much as possible irreversible damage to the natural environment. This is why EDF does not solely focus on reducing the impacts of its industrial operations on ecosystems. In 2018, the Group's commitment to the act4nature initiative specified the modalities for rolling out this CSRG, which is broken down into five main objectives: mobilising the Group's entities, understanding biodiversity issues and implementing concrete actions, innovating for biodiversity, engaging in a participatory and open process, and contributing to public policies.

3.3.2.1.2 Mobilise all the entities of the Group

EDF's commitment in favour of biodiversity mobilises the entire Company, its business lines, employees, activities and its projects. Management in favour of biodiversity is certified *via* the EMS (see section 3.1.2.4.2 "The environmental management system (EMS)").

Training and awareness raising

Each company manages its own training and internal awareness courses for biodiversity. Training is often carried out with the help of non-profit naturalist partners. In France, eight business guides have been published, written in a manner which very closely addresses the biodiversity issues and challenges specific to each operational activity. Training is organised both at the national level and within the entities.

Avoid, Reduce, Compensate ⁽⁴⁾

The Group applies the principles of the mitigation hierarchy ⁽⁵⁾ or the *ad hoc* regulations of the country where it is located, which are sometimes more demanding (particularly in Europe): thus, in France, the Group companies apply the mitigation hierarchy (Avoid, Reduce, Compensate) doctrine for all projects and facilities in operation. The Company's practices in this area were challenged by the international recommendations promoted by the BBOP ⁽⁶⁾. The French biodiversity law of 2016 requires the implementation of "offsetting measures designed to avoid a net loss, and, preferably, even make a net gain in biodiversity". This is what the EDF group does in France. In the UK, EDF Energy set the goal of having a positive net impact before 2030.

(1) Method developed by the World Resource Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

(2) GRI indicator: G4 – EU 13.

(3) Action on biodiversity is certified via the Environmental Management System (EMS), see section 3.1.2.4.2.

(4) IFC Guidance Note 6: Performance Standard 6 of the International Finance Corporation (a World Bank organisation) dedicated to Biodiversity Conservation and Sustainable Management of Living Natural Resources.

(5) This is a biodiversity risk management support tool.

(6) Business and biodiversity offsets programme (BBOP): The Business and Biodiversity Programme is an initiative that lasted from 2004 to 2018. It promoted standardised best practices through the coordination of a network and publication of various documents.

3. Non-financial performance

EDF, a company committed to a just and fair transition

Environmental issues, including biodiversity, are integrated throughout the engineering and operational process, from the beginning and design phases of the projects to promoting prevention and reduction. For new projects, EDF reduces its site coverage as much as possible and, in case of decommissioning of its facilities, works to restore the natural environment. Similar processes are also carried out at facilities in operation. Their impacts on the environment and biodiversity are the subject of monitoring conducted by public bodies (in France: Ifremer, IRSN, Irstea, AFB/Onema). The results are published and are accessible. In addition, EDF assesses the risks in investment projects. 100% of projects presented to the Commitments Committee are screened for biodiversity issues.

In mainland France, in the Belledonne en Isère mountain range, the Company conducted an experiment on the offsetting proposals with the Initiative Biodiversité Combe-Madame non-profit organisation and the key community players. It is aimed at restoring sub-alpine environments and enabling the return of remarkable fauna and flora species (such as the black grouse). This experiment is part of the action initiated by the Ministry of Ecological and Solidarity Transition, to test the relevance and feasibility of the offsetting proposals. The project started in 2015; in 2016, the assessment of the initial condition of the site was completed and preliminary work for reopening the environments started; in 2017, actions were also carried out with the Fédération des Alpagnes de l'Isère, LPO Isère, ONCFS and Irstea to reconcile economic and tourism uses with the biodiversity of the site. In 2018, the site did not apply for approval from the Ministry to propose offsetting units through the offer due to weak local demand. However, actions in favour of biodiversity are continuing with local partners and the results of this trial (one of four in France) will be published in 2020.

In the areas operated by the distribution network operator Enedis, new HV lines were completed 98% underground and 100% underground or unobtrusively for LV. Overall, 48% of all HV and LV networks are underground.

As part of the offsetting measures, EDF carries out actions on Réunion Island for the protection and conservation of the "Papangues" (an endemic endangered species) in partnership with SEOR: acquisition of data on the flight corridors of these birds by fitting transceivers. EDF is involved in the financing of the project and with fitting equipment on our networks (receivers).

EDF's R&D Department also carries out research on the assessment of ecological equivalence. Thus, EDF recently financed a thesis defended in 2018 with Irstea and the Natural History Museum concerning the preparation of a method to verify the achievement of ecological equivalence. This involves measuring, using indicators, the losses related to the impacts and comparing the losses resulting from a development and gains resulting from the offsetting measure.

In the UK, as part of the offshore wind farm demonstrator project in Blyth, EDF Renewables UK reduces its impacts using the GBF (gravity based foundation) technique. The technique avoids digging foundations in the ocean floor. This is done in partnership with the University of Newcastle, which monitors the presence of marine mammals around the site;

In Cameroon, a first E&S study was conducted on the Nachtigal project in 2006, then updated in 2011. Additional biodiversity studies were conducted in 2014 and 2015 to complete these impact studies and enable the drafting of an in-depth operational E&S Management Plan and a biodiversity action plan in 2016, with specific areas of action relating to offsetting measures (fishes) and support (endemic aquatic flora species). A support programme for the conservation of the Mpem and Djim National Park was launched (over €350k/year for 8 years).

In Laos, NTPC is maintaining its policy of protecting biodiversity in the river basin in conjunction with the WMPA, the authority managing it, with the specific aim of Nakai Nam Theun national park being added to the IUCN green list of protected areas. NTPC's CEO is a member of the WMPA Board of Directors and is preparing to set up a Scientific Board, which will facilitate the preparation of WMPA's action plans.

3.3.2.1.3 Knowing biodiversity issues and acting concretely

Knowing the ecological quality of land

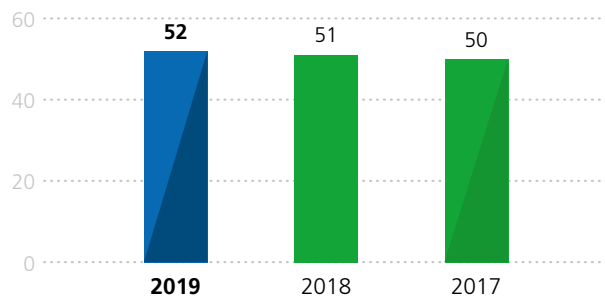
The vast majority of EDF's production sites are located close to protected sites (in France, 80% of hydropower sites are situated in or near a Natura 2000 site). These preserved sites, located close to waterways, bring together several factors that are conducive to biodiversity. The ecological management implemented on these sites aims to foster biodiversity.

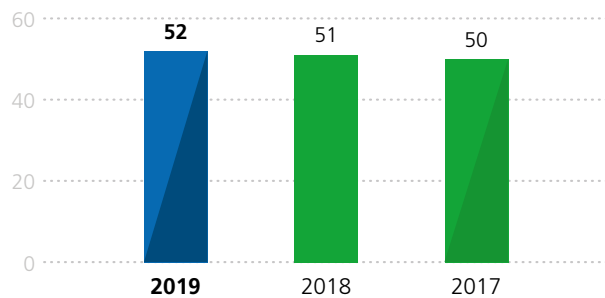
EDF carries out an assessment of the biodiversity issues on its industrial sites and their immediate surroundings. Mandated by the Company, UNEP – WCMC (World Conservation Monitoring Centre) carried out a vast study to assess the ecological sensitivity of places where the Group's industrial sites are located⁽¹⁾, representing approximately 1,000 sites. Certain sites of the Group present bigger challenges in terms of biodiversity, either due to the proximity of a protected area, or due to the species they host (see section 3.6.8 "Ecological knowledge of land sites"). Thanks to the evaluation of the ecological value of its land, the Company integrates biodiversity as one decision-making criterion in its industrial choices⁽²⁾.


In 2019, EDF reviewed the indicator calculation methodology to take account of the latest changes to its geographical information system and better reflect the sites where a detailed ecological survey has been completed. At EDF Hydro, flood zones and areas of sites that could not be fully surveyed for topographical reasons or due to land fragmentation were reclassified.

Launched several years ago, the EDF ecological site survey programme has now been completed at several entities, which have surveyed all their sites. However, at EDF Hydro, where the survey programme is still ongoing, progress in the number of sites surveyed is structurally limited by the fragmentation, remoteness and inaccessibility of a good proportion of hydroelectric facility sites. The current programme, which should be completed in 2021, will have enabled EDF to survey the most interesting and most sensitive hydraulic sites, accordingly achieving the programme's qualitative objectives, as quantitative objectives are of limited relevancy here.

EDF, an environmentally-friendly company

Level of awareness of the ecological value of the land (%) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 9 "The circular economy and conservation of biodiversity, water, air, soils and rare resources" described in section 3.6.2 "Description of key stakes in the materiality matrix".

(1) Analysis carried out in September 2018 by the WCMC for EDF, EDF Renewables, EDF Energy, Edison, EDF China and the International Division (Luminus, MECO, Nachtigal, EDF Norte Fluminense, NTPC, SLOE, and SINOP).

(2) See section 3.1.2.4.1.

Acting through a positive approach to biodiversity

Ecological continuity in an aquatic environment ⁽¹⁾

In France, for the implementation of ecological continuity (action 39b of the French national biodiversity plan):

- for hydroelectric activities: between 2013 and end-2017, almost 120 fish and/or sediment diagnostic projects were conducted to identify ecological continuity challenges site by site. With regard to fish, between 2013 and 2019, 48 fish passes or ladders were implemented on the sites at risk (waterways ranked List 2 in the classification and Rhine). 218 fish passes (upstream/downstream migration) are now functional at EDF Hydro;
- in 2018, the Prefect of Haute Loire signed the addendum to the concession on the emblematic site of Poutès, after a renewed consultation process. Structural reconfiguration work began in 2019. The optimised project will make output equivalent to the initial project possible while minimising investment and offering a significant ecological advantage, with access to 60% of the spawning grounds of the Allier salmon, a unique genetic branch of Atlantic salmon;
- EDF is carrying out studies in preparation for the upcoming controlled levelling of the Roche qui Boit dam on the Sélune river in the department of Manche. After the levelling of the Vezins dam by the French government in 2019, this work should contribute to the full restoration of the river's natural functions, opening it up to the return of diadromous migratory fish (salmon, eels, shad, lamprey).

Luminus has started an ambitious programme aiming to measure and reduce the mortality of migratory fish due to hydropower turbines. Supported by the European Commission thanks to €2 million in funding as part of the European Life Programme and with an overall budget of €5 million, the objective of the Life4Fish programme is to model migratory routes, putting in place repelling systems such as electrical barriers or bubble curtains and specially-adapted systems to make fish passage easier. At the same time, the programme plans to install a new, very low impact turbine for migrating fish on the Monsin hydropower facility, whose renovation started in 2019.

Ecological continuity in a terrestrial environment ⁽²⁾

The hydraulic generation sites at Kembs and Romanche-Gavet have undergone major ecological restoration operations that have contributed to the reconstruction and reinforcement of terrestrial ecological continuities, in keeping with nearby natural habitats (e.g.: Alsatian Petite Camargue); EDF's R&D Department, which has been interested in the subject for several years, has tested various tools for numerical modelling of ecological continuities on site. The results were shared with the French Natural History Museum (MNHN). A study of the Île-de-France region is currently under way in order to develop a territorial approach characterising the integration, in particular, of sites with regard to green belts.

Green corridors used by nocturnal species ⁽³⁾

On Réunion Island, EDF, in partnership with the SEOR and the National Park, is continuing the night-without-light experiment (25 nights) during the petrel breeding season (modification of the spectra and direction of the lights from the East Port power station and public buildings of the neighbouring municipalities, planned outages at night, etc.).

Environmental preservation and restoration ⁽⁴⁾

The Company manages natural sites belonging to the land it owns in partnership with local associations; they resort to agro-environmental practices such as late mowing or eco-grazing; part of the land owned is allocated to areas dedicated to the protection or reconstitution of biodiversity, through management plans, with objectives adapted to the site's challenges.

In Kembs, in the heart of the Petite Camargue Alsacienne national nature reserve, on an old agricultural corn monoculture plot (100ha), EDF carried out large-scale ecological rehabilitation work over a 5-year period (including one year of earthworks): restoration of a river arm over more than 7 kilometres, i.e. creating a new river in Alsace, and reconstitution of a set of wet and dry natural environments, which increased populations and paved the way for the return of

several species of insects, amphibians, birds and mammals. The monitoring of nature and management actions, in particular for the limitation of invasive alien species, are carried out and form part of a management plan managed by the Nature Reserve of Petite Camargue. A full ecological review of this exceptional restoration project is currently being finalised. As part of the Romanche Gavet project, the temporary rights-of-way for the construction of the dam over 10 hectares have been renovated by ecological engineering techniques using local plants, with support from partners such as CBNA and Irstea. This ecological restoration experiment is set to be rolled out to similar operations.

Invasive alien species

Invasive alien species are systematically detected in thermal and nuclear sites. This issue is therefore integrated into the projects, through actions with partners at the local level (local authorities, river contracts, etc.). EDF is a partner of the "Local vegetation" programme organised by the Federation of French Botanical Conservation Bodies. The aim of this programme is to promote the systematic use of local wild plants in development work, the re-naturation of areas, the upkeep of green spaces, etc. The use of local species creates a natural barrier which protects these spaces from invasive alien species and increases the ecological functionalities of the local environment. In 2018, EDF made a promotional video of the "local vegetation" initiative available on the Internet. At the Aramon solar park, EDF and EDF Renewables are testing the reintroduction of local seeds as part of a planting project. For phytosanitary products, see section 3.3.2.2.3 "Soils".

3.3.2.1.4 Innovating for biodiversity

For over 30 years, EDF has equipped itself with a dedicated R&D Department working on the environment, in partnership with external bodies. The biodiversity research programme has mobilised €21 million, 25 researchers and technicians, and a number of partners. Their work helps improving the Company's practices for biodiversity and contributes to scientific knowledge (publication of theses, 25 scientific articles published since 2018).

3.3.2.1.5 Engaging in a participatory and open process

EDF group seeks to understand and meet the expectations of its stakeholders and is involved in local biodiversity governing bodies, such as: River Basin Committees, River Committees and Regional Biodiversity Committees in France. EDF has developed a policy of cooperation with scientific and institutional partner associations, with strong regional involvement and expertise in biodiversity. For example, EDF has regular discussions with think tanks like OREE, EPE, CILB and the Business & Biodiversity Offsets Programme (BBOP) and also participates in the B4B+ working group of CDC Biodiversité for the definition of the global biodiversity score. In the UK, for more than 20 years, EDF Energy has worked in partnership with the Suffolk Wildlife Trust at Sizewell and the Natural England Wildlife Trust in Dungeness. In France, the Company's historic partners are given priority with major players in the sector in France: National Natural History Museum (MNHN), League for the Protection of Birds (LPO), Nature Reserves of France (RNF), French Committee of the International Union for Nature Conservation (IUCN), Federation of National Botanical Conservation Bodies (FCBN), Federation of Natural Site Conservation Bodies (FCEN), Society for the study and protection of mammals (SFPEM), Coastal Conservation Agency. In total, EDF has forged over 100 partnerships with non-profit organisations or research organisations such as the National Institute for Scientific and Technological Research for the Environment and Agriculture (Irstea) and Ifremer (French Research Institute for Exploitation of the Sea). Locally, numerous partnerships aim to help sites in their approach conducted in favour of biodiversity. The partnership with the National Federation of Fishing in France (FNPF) continues through the financing and management of actions in favour of aquatic environments (one framework agreement and nearly 50 local agreements with departmental federations). These partners meet regularly in seminars in order to maintain collective momentum in favour of EDF's biodiversity approach. In 2018, the partners participated in drawing up EDF's biodiversity road map during a two-day seminar bringing together around 50 people.

(1) In France, this is known as the "blue belt".

(2) In France, this is known as the "green belt".

(3) In France, this is known as the "black belt".

(4) GRI G4 EN 13 – disclosure 304-4.

3.3.2.1.6 Contribute towards the implementation of public policies

Protected areas or endangered species ⁽¹⁾

In Europe, several EDF sites contribute to achieving the preservation objectives in the Natura 2000 areas and to implementing the Natura 2000 contracts. The Group participates in Life+ programmes, in particular EDF for the Pyrenean Desman (2014-2019), EDF Luminus for migratory fish, or the distribution network operator Enedis with Life Gyconnect 2015-2021.

In France, the Group contributes to a number of national action plans for the Bearded Vulture, the Zingel Asper and Bonelli's Eagle, and takes part in the regional variants of these plans, such as the European otter project in the Centre region, Angelica Heterocarpa, or the one for Odonata, which was the topic of a thesis defended in 2018.

For raising awareness among the general public

In addition to the Fête de la nature (*i.e.* "Nature Festival") initiative ⁽²⁾, the Group is implementing other voluntary action levers, as part of political sponsorship initiatives. In Brazil, EDF Norte Fluminense is continuing its work which has been underway for ten years with the Mico Leao Dourado non-profit organisation to preserve an Atlantic rainforest: reforestation of the watershed, *Leontopithecus rosalia* habitat (golden lion tamarin). In 2019, the Company extended its partnership to take action on agroforestry. Since the start of the project, nearly 10 hectares of forest and agroforestry systems have been reforested with the direct support of EDF Norte Fluminense. EDF supports the "red list" of endangered species in France prepared by UICN France and the French Natural History Museum. In Guadeloupe, EDF is contributing to the project to create an educational marine area in the Montal basin in the city of Moule.

3.3.2.2 EDF, a company with a responsible attitude to environmental capital

3.3.2.2.1 Water



Global demand for energy and water is increasing against a backdrop of climate change, which increases the mutual dependence of both processes. Water is essential to producing most forms of energy. It is an issue identified in the materiality matrix as a significant issue. As a manager and major user of water, EDF must protect, manage and share water throughout the regions in which it operates by fully integrating the highly local dimension of water management. The EDF group has included "water" risk in its risk management policy and in particular in its investment decisions.

3.3.2.2.1.1 Responsible water use

Water reservoirs held by EDF's large dams in France enable the storage of more than 7 billion cubic metres of water. At the Group level, around 50 billion cubic metres of water (including sea water) are used for cooling thermal power facilities, of which 99% is returned to the natural environment and can be reused instantaneously. As such, EDF is a significant user, but negligible consumer, of water.

The Group Sustainable Development policy includes a water requirement: "Managing water in an integrated, inclusive and sustainable manner" and results in a specific indicator: "Each energy generation site shall plan, evaluate and report the sustainability of its water use using an internal EDF method (pending a recognised international method)". The Group mobilised a working group internally to define a range of indicators on the sustainability of water uses to feed the

dialogue with local stakeholders. These indicators, can, depending on the context, reflect the relation to water of a development level or a set of developments in a river basin. Every year, a significant amount (several million €) is spent on water-related R&D, which led in 2019 to the launch of the Visi'Eau project, covering various areas of research from water as a cold source to hydrological river basin modelling, lasting 4 years and costing €9 million.

EDF is also directly involved, as UFE representative to Eurelectric, in European Commission working groups on the Water Framework Directive, as well as a range of international associations or working groups on water (IHA Board of Directors, Board of Directors of the Partenariat Français de l'Eau (French Water Partnership), member of the World Water Council, etc.). This allows it to observe and anticipate global and regional trends in terms of water-related issues.

Management of water withdrawals and consumption

Exposure of the Group's generation resources to water stress has been assessed using a range of tools (Baseline water stress, Aware, etc.), and remains limited ⁽³⁾.

Most of the water withdrawal from its facilities is carried out in France (81%) and the UK (17%) in areas where there is no permanent water stress; the nuclear and thermal facilities are mainly established in coastal locations (and therefore do not use fresh water). In situations where a specific, potential risk has been identified, suitable measures have been taken either during design or operation. Therefore, the Lunax reservoir was constructed from the outset upstream of the Golfech nuclear plant to prevent a possible shortage of water from the Garonne used for cooling in periods of severe drought. In 2019, Golfech was shut down for several days during a heat wave, not due to flow issues, but rather high river temperatures (regulatory limits reached). Particular attention is paid to water stress when screening any new project presented to the Group Executive Committee's Commitments Committee (CECEG). In terms of hydropower generation, some reservoirs are located upstream from basins experiencing water stress, meaning they are regularly required to provide back-up in case of lower water levels. Every 5 years, EDF Hydro reassesses its sites' generation, taking account of changing hydrology and temperatures due to climate change.

Worldwide, 66% of the water withdrawn for cooling purposes by the Group comes from marine or estuary environments, where resource availability is not an issue. This percentage is almost 60% in France, over 99% in the United Kingdom and close to 91% in Italy.

Water withdrawals are slightly lower (7%) than in the three previous years but freshwater withdrawals remained stable. The quantity of freshwater sourced from groundwater is marginal and amounts to 2hm³, about 0.01% of the freshwater surface. Likewise, mains water is used only for various forms of process water but not for cooling systems and its use is therefore negligible (<0.1%).

Almost 99% of water withdrawn is returned to the environment. In accordance with local intake and discharge regulations, the Group's companies take the necessary measures, as part of their EMS, to comply with water quantity and quality requirements. They have implemented, in tandem with stakeholders, measures tailored to exceptional weather conditions. EDF monitors the indicator parameters for the quality of the terrestrial and aquatic ecosystems (pH, temperature, conductance, O₂, etc..) around the sites, including subterranean groundwater. The results of this monitoring are provided to local authorities and used in documents or other media available to the public. There were no significant water-related environmental events in 2019.

The volume of evaporated water ⁽⁴⁾ in absolute terms (486hm³) was down by 3%, and, as for withdrawals, this fall was mainly due to the energy mix used (4% fall in nuclear generation), and France (95.7%) and the United Kingdom (2.1%) accounted for most of this volume. Specific consumption of evaporated water per kilowatt hour of electricity generated, also called water intensity, was stable, equalling 0.87l/kWh in 2019 compared to 0.86 in 2018.


(1) These initiatives are carried out on species identified according to their status and dependence or proximity to our facilities.

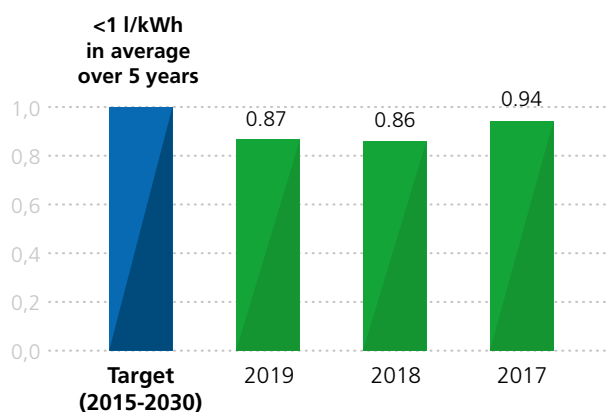
(2) See section 3.1.2.4.7 "Sustainable Development (SD) Training and Awareness Raising", awareness of external audiences.


(3) Only 3 fossil-fired thermal sites are located in a water stress zone (drought-related prefectural by-laws are enacted practically every year) where appropriate water saving measures have been taken without having an impact on generation.

(4) Of which 99.5% fresh water.

→ EDF, an environmentally-friendly company

Water intensity: water consumed / electrical production of fleet (l/kWh) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 9 "The circular economy and conservation of biodiversity, water, air, soils and rare resources" described in section 3.6.2 "Description of key stakes in the materiality matrix".

Taking account of the expected variation in generation resources and the different actions taken to optimise water, total Group-wide fresh water withdrawal and consumption should fall in the coming years. The stated aim is to progressively reduce specific water consumption by 2030 from the 2015 level (0.96l/kWh), and not exceed the target of 1l/kWh on average over 5 consecutive years. This threshold, which is much lower than the industry average, particularly in the US ⁽¹⁾, serves to put an exceptional climatic year, which will significantly increase or decrease the annual indicator, into perspective. 2015-2019 average water intensity was 0.91l/kWh.

The optimisation of water used in EDF's generation activities is vital to ensuring management of water resources and to honouring the Group's commitment to guarantee multi-purpose water resources (drinking water, water for irrigation, tourism, etc.) and the needs of local authorities. The EDF group works in a number of ways to optimise its water usage and to reduce pressure on the environment:

Water consumption reduction and withdrawal limitation measures

In French overseas departments, where EDF is investing in new thermal power stations in order to balance demand and supply, R&D teams have designed dry air cooling systems for engine cooling, which reduce water withdrawal by 700,000 cubic metres per year per power plant. Now, EDF PEI's power plants are no longer cooled with saltwater. In 2019, the Golfech nuclear power plant began a trial with a local EMS to reduce its water withdrawals from the Garonne river, as well as use of chemicals to produce demineralised water (300,000m³/year). In Chile, following a long drought that caused the water table to fall by 1m in less than a year, specific measures were taken for the combined cycle power plant in Nueva Renca, enabling halving of process water, which plummeted from 12t/h in 2018 to 6t/h in 2019. In Brazil, a plan for a second combined cycle power plant after Norte Fluminense is under consideration, featuring an air- rather than water-based cooling system from the design phase.

Reuse and recycle water

The recycling of process and cooling water is growing throughout the Group, where appropriate. In China, the Ultra-supercritical power plant of Fuzhou reuses all its process water sequentially and depending on the quality of water (from cooling to watering ash to gardens). In Dalkia's large biomass combustion facilities, process wastewater is used to cool bottom ash to limit the volume of liquid effluent to be treated. In France, EDF's thermal power plants in Cordemais and Martigues recover rainwater or recycle their effluents so as to reduce their consumption of tap water by half. In the UK, rainwater is recovered and reused on the Hinkley Point C construction site to eliminate site dust. The new R&D centre in Saclay uses rainwater recovery to supply 50% of toilet water of the site.

In some cases, the supply of part of the water from the heated cooling circuit of certain nuclear power plants for different uses (agricultural, industrial, etc.) is authorised within the framework of specific regulatory requirements.

Desalinating water

EDF has several desalination unit trials on its sites: a desalination unit has been in operation since 2016 at Flamanville 3 to produce demineralised water for processes as well as for other existing reactor units. In southern Corsica, EDF has designed the cold water source for a thermal power plant by installing a sea water inlet, which reduces the consumption of fresh water significantly. In Guadeloupe, the TAC power plant in Jarry Sud also has a sea water desalination facility, which has made it possible to stop using tap water and save around 50,000m³ of fresh water per year. Since the end of 2016, Edison has had one CCG plant (Simeri Cricchi) in Italy with sea water desalination systems to replace freshwater withdrawals.

A pilot test of a new technology is ongoing on the combined cycle power plant site in Martigues. If it proves a success, this technology could be used to produce process water from seawater on several sites. The principle, called AquaOmnes, consists of extracting sodium chloride salts (NaCl) from seawater using liquid resins. The liquid resin is heat-regenerated. The purpose of the process is to produce desalinated water (for process water) at a low cost, due to the abundant availability of seawater.

3.3.2.2.1.2 Sharing water

2019 was the hottest year ever worldwide and there were also an increase in the number of extreme events. In Laos, the dry season was longer and more intense, causing a reduction in generation at Nam Theun 2 between May and August. The rainy season was late and intense, featuring two typhons in two weeks (late August) that filled the reservoir more quickly than normal: 240hm³ had to be discharged *via* the overfall. In France, 2019 was an unusual climatic year with more than nine very dry months and two heat waves in one month, which were exceptionally intense but short-lived, followed by record rain over the last two months. Absolute air temperature records and major thermal impacts on water temperatures were seen on some sites. This situation led to severely low water levels on many waterways and rivers from summer to autumn. To cope with these unusual and even exceptional climatic conditions on certain rivers like the Meuse or the Moselle, various levers were therefore activated within EDF to optimise production ⁽²⁾ and meet the expectations of the stakeholders. Special restrictions were introduced at six dams from June to August and water was released multiple times to provide external back-up in 2019, with a record of 725 billion m³ removed from storage to meet water users' different needs under the terms of hydroelectric concession specifications or water-sharing agreements. Two dams were requisitioned in accordance with prefectural by-laws to provide additional back-up when water levels were low. Overall, EDF met its commitments to stakeholders in terms of low-water replenishment and agricultural support, as well those concerning flow rate restitution and observance of water levels for tourist-related purposes. Only the Serre-Poncon tourist water level could not be maintained in the final fortnight of August.

Despite particularly dry and hot summer conditions, the loss of nuclear generation in France (ratio of lost-to-produced net energy) related to temperatures and/or river flow rates was limited to 0.35% (*i.e.* 1.4TWh), down by nearly 50% on 2018 (which was also a particularly hot year).

(1) Intensity ranging between 1.43 and 3.54l/kWh, see "Regional water consumption for hydro and thermal electricity generation in the United States" – Applied Energy journal – May 2017.

(2) These are river-side power plants using fresh water; seaside power plants are not concerned by the issues of temperature rise and flow rates.

3. Non-financial performance

EDF, a company committed to a just and fair transition

Wherever it operates, EDF strictly manages water on each site, and is part of a water management system for each river basin. In France, EDF is represented at meetings of each of the river basin water authorities. EDF's actions are fully in line with the new master plans for water development and management (SDAGEs) for the 2016-2021 period. Since 2003, EDF has had an internal water coordination body, chaired by the Group Senior Executive Vice-President, Renewable Energies. In 2019, negotiations with stakeholders in the Rhône Mediterranean Corsica basin came to a successful conclusion, confirming the minimum flow rate of the Rhône in Bugey to be 150m³/s. In 2019, EDF Norte Fluminense (Brazil) officially became a member of the Macae River Basin Committee, as was previously the case of Luminus in Belgium for the Meuse river (2017). The operational management of water is ensured at the national level by the Water Management Group (GGE) responsible for ensuring the regular, weekly or daily monitoring, if necessary, of water stocks in order to coordinate various production constraints and the management of the multiple uses of water. In 2019, very low flow rates on the Meuse and Moselle rivers resulted in the introduction of evaporation restrictions agreed in international conventions signed with Belgium and Luxembourg: these provisions in favour of downstream uses of frontier nuclear power plants were fully complied with, causing minor generation losses.

3.3.2.2.2 Air



Improving air quality by transforming the generation fleet ⁽¹⁾

EDF is changing its fossil generation fleet, in its ambition to "Reduce air emissions of SO₂, NO_x and dust from the Group's fossil-fired thermal fleet by 50% between 2005 and 2020." ⁽²⁾

After the closing of the 700MW oil-fired reactor units in France, EDF announced its plan to close the Le Havre coal-fired reactor unit in 2021. Regarding island systems, the oldest thermal generation resources will be decommissioned as and when new, lower-emission facilities are commissioned. In parallel, EDF is continuing its process of modernising and improving the environmental performance of its thermal fleet, until it meets European Best Available Techniques requirements. Regarding island systems, actions are taken to reduce NO_x on a case-by-case basis: optimising exhaust gas processing ⁽³⁾, or reducing the number of hours of operation for certain turbines. Internationally, the emission levels of a Combined Gas Cycle power plant, like the one in Norte Fluminense, are below its NO_x limit of 25ppm. Using its future exhaust gas processing system, the Edison CGC project, Marghera Levante (780MW with 63% efficiency), which should be commissioned in 2022 to replace two old facilities, will emit a quantity of NO_x equivalent to 30% of the current

facility's limit. EDF is testing biofuels to replace fossil fuels, liquid biomass to power a motor in Molène, as well as developing an alternative fuel made from wood waste and woody residues to fuel boilers in Cordemais ⁽⁴⁾. At the same time, in the island systems, EDF is developing, non-NO_x and SO₂ emitting technologies, isolated 100% renewable energy systems in addition to the initiatives for controlling Energy Demand and saving energy.

Improving air quality by supporting public initiatives in this area

EDF ⁽⁵⁾ has historical know-how on the understanding and modelling of atmospheric emissions and air-conditioning systems of buildings. With CEREAs ⁽⁶⁾, EDF R&D participates in the scientific effort by developing open source models ⁽⁷⁾. This expertise is provided to the scientific community and local authorities. In Paris, Lille and the department of Haute Savoie, the distribution network operator Enedis' vehicles are equipped with a network of air quality sensors called Pollutrack. This is the first company fleet to contribute to improving air quality by detecting and measuring pollution caused by the finest particles which are the most dangerous for health. Citelum works with partners like AirParif to identify innovative air quality improvement solutions. Trials are currently ongoing in the Île-de-France region, installing cameras and sensors on urban infrastructure to measure mobility flows and atmospheric variations in real time. By comparing data from connected devices, sources of air pollution can be identified and necessary corrective actions proposed to both make mobility flow and minimise its impact. This scheme, tested via AIRLAB ⁽⁸⁾, could subsequently be reproduced in other cities. EDF contributes to preventive and research initiatives on the health impact of air pollution engaging in the Association for Prevention of Air Pollution (APPA) and the Inter-professional Technical Centre for Studies on Air Pollution (CITEPA), and being an active member of the SFSE (French Society for Health and the Environment).

EDF also proposes solutions designed to improve indoor air quality. The city of Villiers-sur-Marne is setting up a global benchmark demonstrator of indoor and outdoor air quality supported by EDF's scientific expertise. ⁽⁹⁾ This is an innovative approach, targeting everything "from the street to the living room", using digital modelling ⁽¹⁰⁾ to create a sizing support tool. Dalkia is assisting not only healthcare facilities with operating blocks to comply with indoor air quality regulations, but also operators of public buildings. To develop solutions takes innovation and team work. Dalkia developed NemoPool with the start-up ETHERA to make both swimmers and pool staff more comfortable. This tool, which regulates the level of trichloramines by controlling ventilation systems, is a world first. Finally, to help residential customers maintain their well-being at home, the Sowee connected station features indoor air quality measurement and information on the level of outdoor air pollution.

In 2019, these actions resulted in emissions of 18kt of SO₂, 36kt of NO_x and 3kt of dust at the Group level.

SO ₂ , NO _x and dust emissions due to heat and electricity generation (kt)	2019			2018			2017		
	SO ₂	NO _x	Dust	SO ₂	NO _x	Dust	SO ₂	NO _x	Dust
EDF group	18	36	3	21	45	3	31	63	4
EDF	4	10	0.4	4	16	0.2	6	18	0.3

⁽¹⁾ Furthermore, and beyond its generation fleet, EDF is gearing up to convert its vehicle fleet to electric as part of the EV programme (see section 3.2.2.2.1 "Electric mobility") reducing its NO_x and dust emissions at the same time.

⁽²⁾ Target in paragraph 2.3 from the EDF group's SD policy In 2005, emissions were 236 kt, 209 kt and 14 kt respectively.

⁽³⁾ To achieve in 2020, a 12% reduction in the concentration of NO_x for motors and 25% for turbines.

⁽⁴⁾ As part of the EcoCombust project.

⁽⁵⁾ More specifically, it involves the MFEE Department of EDF R&D.

⁽⁶⁾ Atmospheric Environment Education and Research Centre, a joint laboratory at EDF R&D and the École nationale des ponts et chaussées.

⁽⁷⁾ Free access to source code.

⁽⁸⁾ Airparif's laboratory of innovative air quality solutions.

⁽⁹⁾ EDF R&D as part of a research programme led by CEREAs.

⁽¹⁰⁾ CEREAs/ENPC/EDF R&D.

3.3.2.2.3 Soils



Pollution of soil and underground water is one of the potential environmental impacts of the Group's industrial activities. The Group owns, or uses under concession, large land assets. The environmental policies of the Group entities aim to optimise the use of land and protect these environment against any impacts. Soil use is monitored as part of the actions related to biodiversity (see section 3.3.2.1 "EDF, committed to biodiversity (CSRg no.6)").

Preventing impacts

The prevention of impacts is based on an "in-depth defence" approach and protection methods in place at all industrial sites: maintaining the integrity of means of protection to provide a barrier between chemical substances and the environment; control of effluents management operations; maintaining and inspecting ultimate structures such as retention systems; ensuring that the soil surface remains free from radiological and chemical contamination at industrial sites; monitoring the physico-chemical and radiological properties of groundwater directly beneath sites; building retention tanks at storage sites; reinforcing safeguards when transporting fuel or waste; ensuring the availability of emergency kits in the event of spillages and carrying out the corresponding drills; developing operational procedures and high levels of awareness among operators and service providers through suitable training.

These preventive measures are based on facility hazard studies and are enriched at the time of periodic reviews.

Optimising soil use

The action plans in place to manage situations across all of the Group's sites consist of four stages: site surveys; identification of potential pollution; soil analysis; monitoring of sources of pollution and drawing up a management plan and considering possible remediation depending on future use and regulatory requirements.

In 2019, basic reports were drawn up in accordance with the European IED Directive on the SEI and Luminus sites (Seraing and Angleur) without revealing any major pollution. Soil management plans have been drawn up for Belleville and Chinon and the post-operation of sites being decommissioned, particularly in Dessel (Framatome). Decontamination work has been carried out in Le Havre, Flamanville, Hinkley Point (pre-existing issues) and decommissioning work has begun in Sarmato (Edison). EDF Hydro has carried out actions for the agricultural use of sediment for soil reconstitution.

Action plans are under way to limit the use of phytosanitary products. The distribution network manager, Enedis, has the goal of achieving "zero phytosanitary products" by 2020 to maintain green spaces adjoining service sites and from 2024 for industrial sites (source substations). EDF's Real Estate Department has set a target of "zero phytosanitary products" by 2020 for its 123 service sites. 119 sites hit this target in 2019. Other entities no longer use these products⁽¹⁾. The action plans are based on alternatives to the use of chemical herbicides (mechanical, thermal or other), vegetation management protocols for EDF Renewables and EDF R&D (differentiated management of vegetation, sheep, etc.) as well as on rules relating to companies in charge of maintaining the green spaces. They are accompanied by a training and awareness-raising programme.

(1) Cyclife, Edison, Luminus, EDF Norte Fluminense, Enedis, EDF Hydro; ES no longer uses any glyphosate-based products.

(2) Net electrical generation takes account of this self-consumption.

3.3.2.2.4 Resources



Fuels

The Group uses raw materials for electricity generation and to provide energy services to its customers. A significant portion of these are comprised of fuels: uranium, coal, gas, fuel-oil and biomass. Electricity consumption essentially for generation resource auxiliaries (approx. 20TWh/year) is mainly self-consumption⁽²⁾. Its sustainable development policy aims to preserve natural resources and optimise its consumption of raw materials, while guaranteeing energy supply to its customers. The Group has chosen to focus on several factors:

- variation in its generation mix with the development of renewable energies, declassification of thermal power plants, commissioning of high-efficiency combined gas cycle power plants (Edison's Maghera Levante project is targeting the European efficiency record of 63%), use of biomass by Dalkia, modernisation of the island systems' thermal fleet, and replacement of power plant motors in French overseas departments and territories;
- the optimisation of existing facilities: improving energy efficiency or output (IES, Dalkia, EDF Energy, MECO) through maintenance measures, modifications, fuel quality rules and more rigorous monitoring of efficiency levels or cogeneration (e-monitoring);
- the real-time selection of the best performing means of generation depending on the load curve and energy performance. These optimisation measures have been further reinforced with the ISO 50001 certification of thermal sites (Saint-Pierre & Miquelon in 2019). Dalkia uses an energy management tool to optimise energy facility fuel use and is increasing its renewable energy use rate, replacing fossil fuels;
- the implementation of a natural uranium savings strategy: EDF's control of each stage of the fuel cycle, the design of high-efficiency fuel and suitable management of that fuel within nuclear units all contribute to optimising natural uranium needs (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). Recycling spent fuel enables savings of 10% of natural uranium;
- the Group's business model, based on managing its facilities' full lifecycle, allows for efficient feedback as well as the implementation of eco-design initiatives developed at engineering centres, such as the EPR 2 project (extension of the lifespan of core instrumentation cables). As part of its supplier qualification system, EDF Renewables, whose raw material use is related to equipment manufacture, asks turbine and panel manufacturers to provide lifecycle analyses of their products. In parallel, lifecycle assessments are carried out on wind farms to optimise material use;
- the Group is also developing industrial ecology initiatives among its various entities and initiatives supporting local authorities through a service based on the RECYTER tool, developed by EDF R&D, for the regional diagnosis of material and energy flows.

Globally, consumption of different fossil fuels continued to fall in 2019: coal (-60%), heavy fuel oil (-4%), and gas (+7%). Coal consumption continued on the downward trend seen in 2018 following power plant closures. Gas consumption rose slightly, offsetting decreased nuclear generation and lower water levels at the start of the year. It is worth noting that there was a strong increase in the use of biomass (+36%) to 3 billion tonnes and wood (+70%) to 2.1 billion tonnes, due to the development of renewable energies in Dalkia's mix.

3. Non-financial performance

EDF, a company committed to a just and fair transition

In commercial activities, all actions in favour of energy management contribute to preserving resources. The use of recycled materials (aggregates, earth, concrete, etc.) is encouraged during major projects related to networks (ÉS, Enedis) and hydraulic, nuclear and thermal investments and the materials used are recovered (see section 3.3.2.2.6 "Conventional waste and the circular economy"). R&D is currently developing programmes to reduce the use of raw materials, such as Zinium, the Group's spin-off company which is working on zinc-air batteries. This technology uses easily accessible and non-polluting materials.

Regarding tertiary uses, a wide-ranging travel limitation programme has been implemented by many Group entities (EDF, Edison, Citelum, NTPC, etc.) with extensive use of video-conferencing and teleworking. For EDF, the total time users spent on the LYNC tool rose from 82 million minutes to around 130 million in 2019.

The issue of the potential scarcity of certain resources is monitored for each business line concerned, which implement measures suited to each particular situation. The review focused on these themes, which is submitted to the Executive Committee, is used as a reference for prospective studies on the Group's future activities.

Internal consumption

EDF SA is aiming to reduce electricity consumption on all service sites by 2% per year between 2018 and 2021 by reducing consumption from 152.5kWh/m² in 2018 to 146kWh/m² in 2021, *i.e.* an estimated saving of 58GWh over the period. A range of measures have been put in place to achieve this ambitious goal: increased building density, major renovation work, improved building management (LED lighting, clocks, etc.), fleet renovation by abandoning old sites and leasing high-efficiency sites. Starting with the ratio per m² meant fleet renovation could be taken into account to calculate the savings made and, by extrapolation, the savings generated by the floor areas freed up. In 2019, results were on target to hit the goal with consumption of 149.1kWh/m² (*i.e.* -2.2%).

Group-wide actions (videos, in-house social network posts) to raise awareness of the saving of resources (energy, water, plastic, including distribution of water bottles to employees to avoid the use of single-use plastic bottles) are regularly organised.

Paper

Since 2012, EDF has implemented a policy with two types of measures to reduce paper consumption:

Development of e-billing for domestic customers, replacing paper bills: this development is boosted by the adoption of the French Pacte law, which allows energy suppliers to offer customers e-billing by default (with an opt out), in May 2019.

Setting of an office paper purchasing reduction goal: in four years, EDF's annual printout volume was halved, falling from 400 million pages in 2015 to 200 million in 2019. The 2017-2019 profit-sharing agreement included a sustainable development and digital criterion based on the criterion, which was worth 10% of the overall eligibility score, of a 15% fall in the annual percentage of the number of printouts on all connected printers. A number of measures were implemented to encourage staff to reduce paper printing: fewer printers, removal of individual printers, default double-sided printing, generalisation of secure print with password and, finally, on some sites, targeted and encrypted campaigns are carried out. The target was exceeded first in 2017 (-19%), then in 2018 (-15.4%), and again in 2019 (-18%). In addition, 100% of the paper used is FSC (recyclable and carbon neutral) paper that carries the EU Ecolabel.

3.3.2.5 Radioactive waste



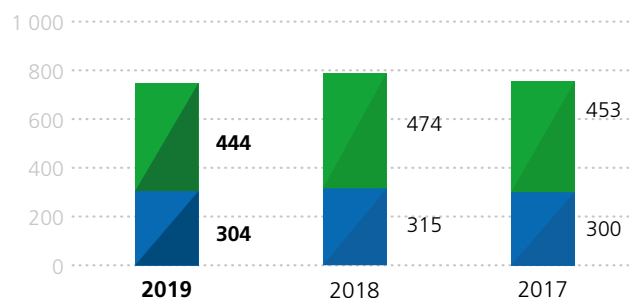
France has a strict legislative and regulatory framework that regulates the industrial management of radioactive waste and materials, stipulates any necessary add-ons and improvements, and secures financing of all these measures. The PNGMDR (French national radioactive materials and waste management plan) is a key part of this programme. Coordinated by the DGEC (French General Directorate for Energy & Climate) and the ASN (French Nuclear Safety Authority), the PNGMDR publishes guidelines on the management of radioactive materials and waste in France, and identifies any studies, actions and development work required on units or facilities. Stakeholders (including associations) are involved in this work.

For the first time, a public debate was held in 2019 to examine the 19-21 PNGMDR (5th edition) ⁽¹⁾.

EDF, which plays an active role in managing its waste, has set up an industrial operational waste and dismantling management programme, which already enables secure management of all waste from nuclear electrical generation, respecting both the environment and the health of local populations and staff alike. EDF is continuing to work to improve this programme to optimise this management. In particular, EDF endeavours to reduce the quantities and harmfulness of waste produced "at the source" through waste zoning design, optimisation and adjustment, defining and optimising soil and structural decontamination operations in accordance with ASN guides, and developing and promoting good operating practices, taking advantage of the PWR reactor unit fleet effect. In addition, Centraco's fusion and incineration facilities help to further reduce stored waste volumes.

Regarding metal materials with activity well below safety thresholds, EDF is in favour of the alignment of French regulations with the European regulatory framework ("release" thresholds) to authorise, after processing and checking at a dedicated facility, conventional recycling of a significant proportion of metal materials from decommissioning operations. Currently, in France, all waste from a "potential nuclear waste generation zone", irrespective of its level of activity, is considered as radioactive waste and cannot be recycled outside the nuclear industry.

EDF, an environmentally-friendly business



- United Kingdom: volume of low level radioactive waste generated (m³)
- France: volume of long-lived high and intermediate level solid radioactive waste (m³)

Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). For the scope and methodology of this indicator, see section 3.4 "Indicators and methodology". This indicator refers to key stake no. 4 "Management of radioactive waste and plant decommissioning" described in section 3.6.2 "Description of key stake in the materiality matrix".

For a detailed description, see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"; see also section 3.4.1 "Indicators".

(1) See section 1.4.1.1.4 "The nuclear fuel cycle and related issues".

3.3.2.2.6 Conventional waste and the circular economy



Circular economy

In accordance with the energy transition, the Group makes the optimum use of natural resources consumed through its value chain a central element of its corporate responsibility and has included this area in its sustainable development policy. Electricity is a means of transforming economies through the development of new patterns of use which provide improved comfort while reducing the use of natural resources (electric mobility, new energy services). The principles of the circular economy guide the Company's management, involving many areas well beyond waste management alone⁽¹⁾, particularly energy, the Group's core business, the necessary raw materials (see section 3.3.2.2.4 "Resources"), soils (see section 3.3.2.2.3 "Soils"), and water (see section 3.3.2.2.1 "Water").

Practical actions are taken in the field, particularly *via* recovery of energy from our own and our customers' processes but also by promoting the reuse of our materials and equipment on our generation fleet construction and decommissioning projects. The design of facilities by engineering entities is based on an eco-design approach taking account of their environmental footprint throughout their entire lifecycle. EDF Renewables, which studies the impacts of wind and solar power technologies (from the extraction of raw materials to decommissioning of the facilities) has a special focus on the end-of-life of equipment and its recyclability.

Recovery of combustion products and materials

The Group has implemented the circular economy for some years, with ethical systems in place for the recycling and reuse of thermal plant products and materials used during construction works. Combustion fly ash and gypsum produced by desulphurisation are recovered in full by all thermal generation plants in Europe (France, United Kingdom) and in China. Overall, several hundred thousand tonnes of ash are used in building roads and in the cement industry. In France, EDF's fossil-fuel thermal plants produced 31,340 tonnes of ashes in 2019 and 113,971 were recycled in the cement and concrete sector (depletion of old inventory).

Dalkia is developing the use of waste as fuel, which uses a fraction of biomass waste that has not been used previously (forest cutting residues). The materials involved in construction work are, to a great extent, reused, as in the following examples: post-Fukushima projects of nuclear sites, burial sites (ÉS).

In order to find other levers for recovery of these materials in France, the Group has undertaken research into better recovery of ash, sediment and sludge and is an active participant in the work of the non-profit RECORD to develop methods and tools together with other industrial groups.⁽²⁾ With the association OREE, ADEME and the Ministry of Ecological Transition, EDF participated in writing the decommissioning guide. Tests in previous years on hydraulic generation to recover sediment for use as soil resulted in high levels of recovery in 2019. Dalkia Wastenergy is actively participating in the research project TERRACOTA for the recovery of solid recovered fuel (SRF) supported by ADEME.

The EDF sustainable development policy has set an objective to recover 90% of all waste for the entire Group by 2021. Results remain at high levels.

Conventional waste management and recovery (EDF group)	2019	2018	2017
Volume of conventional industrial waste transported for recovery (<i>in tonnes</i>)	631,367	414,627	518,591
Waste recovery rate (%) – EDF group	92.4	87.1	85.0
Waste recovery rate (%) – EDF	96.9	92.4	93.0
Waste recovery rate (%) – EDF UK	78.5	95.7	96.8

Conventional waste

So-called conventional waste includes waste passed on to a subsidiary during the year. Waste stored on-site, waste awaiting removal, materials reused on-site (e.g. earth and rubble) and equipment that could be reused (sold or gifted) are not taken into account. They do not include radioactive waste (see section 3.3.2.2.5 "Radioactive waste"). Combustion fly ash and gypsum from the process are reviewed specifically⁽³⁾. Construction and decommissioning waste is included in this report, if its management falls under the responsibility of the EDF group.

Due its business model spanning design to end-of-life, the EDF group generates waste at different stages in the life cycle of its assets: site development (construction, decommissioning and heavy maintenance), operations (process and maintenance), and waste generated by service activities. As part of its sustainable development policy, the EDF group is committed to limiting waste generated by its facilities and activities. Based on its Environmental Management System (EMS), conventional waste management is carried out within the framework of the regulations in force, complies with the waste management hierarchy and prioritises reduction at the source, particularly by repairing, reusing and use of eco-designed and eco-friendly products, sorting and recycling.

Measures to reduce conventional waste

The Group's entities and companies are committed to a process of continuous improvement according to the principle that the "best waste" is waste that is not produced. They have action plans aimed at limiting the generation of waste integrated in the management systems' action programmes (EDF, ÉS, Dalkia, Luminus, EDF Energy) with associated indicators (quantity of waste prevention, savings made on waste management, quantities of equipment reused, etc.). A number of levers for action are used: internal procedures (anticipation of construction sites: organisational schemes for waste management systematically set-up prior to any major construction, decommissioning or maintenance work, sales agreements or donations for reuse), specific rules in the Company specifications, innovative technical solutions (separation of water/oil from hydrocarbon effluent, asbestos stripping), numerous awareness-raising initiatives for staff and service providers (communication, training, waste prevention guide incorporating 34 best practices, e-learning), and initiatives to reduce waste hazardousness such as limiting the use of hazardous products (see section 3.1.2.4.4 "Management of environmental risks").

A "Waste Prevention Competition", in place since 2011 and extended Group-wide in 2016, compiles good practices. In-house or external reuse activities are developing strongly in connection with the cessation of activity of (thermal) production units and the support tools.

Conventional waste management and recovery

In addition to prevention measures, the Group's environmental policy aims to improve the recovery of waste that is produced *via* the following actions: developing the recycling of parts and materials, particularly in the decommissioning phase; the efficient sorting of waste so that it may be sent to energy or materials recovery companies (e.g.: EDF Renewables PV Cycle and First Solar agreements which take panels back at the end of their useful life, rental of IT equipment to DSP); developing partnerships with recycling service providers (RECYLUM for Citelum, Ateliers du Bocage for printer cartridges); implementing on-site pre-treatment of various waste items, in order to limit the volume of hazardous waste and promote the recovery of the remaining portion (e.g.: concentration of hydrocarbons).

(1) With regard to food waste, EDF does not consider this information as being material. With respect to its materiality analysis, EDF does not consider information related to the amendments to Article L. 225-102-01 of the French Commercial Code on food shortages, respect for animal welfare and a responsible, fair and sustainable food supply as being material.

(2) There were many examples, including the free supply of warm water from the Gravelines power plant to the Aquanord fish farm, where by installing pipes to draw warm water from the drains, the fish farm collects 10m³ per second, without a water heating system (see the EDF "Circular economy and regions" guide, 2020).

(3) Taking account of the quantities produced and prospects of recovery (mainly the cement industry).

3. Non-financial performance

EDF, a company committed to a just and fair transition

In 2019, the total production of conventional waste amounted to 613,259 t in France, 19,706 t in the UK, 31,265 t in Italy, 1,319 t in Belgium. Waste that is disposed of in a landfill consists of waste that does not benefit from recovery processes: sludge from flue gas processing (de-sulphurisation) or effluent processing and containing hazardous substances (the prefectural by-laws for authorisation require burial of this waste), insulation and mineral insulation (no industrial-sector solution available), and mixed waste similar to household waste. Year-to-year changes in tonnage are strongly influenced by investments and decommissioning programmes. In 2019, cleaning work (frequency: every 10 to 15 years) on the Serre-Ponçon dam in France generated nearly 280,000 tonnes of sediment, which is considered as waste but was fully recovered by local quarriers. Elsewhere, other entities' generation levels were relatively stable due to the progress made on EDF's major projects ("Grand Carénage" nuclear fleet project, thermal power plant decommissioning in France and French overseas departments and territories).

3.3.3 EDF, a company with a responsible attitude to its employees and service providers

3.3.3.1 EDF, a company with a responsible attitude to its employees (CSRG no. 2)



The Group's actions go beyond merely integrating environmental issues into its strategy, as EDF remains a socially-responsible, committed employer and a leader in terms of the professionalism and involvement of its employees.

In 2019, the EDF group thus pursued its plan to transform and improve work organisation, setting the following goals: encouraging accountability, simplifying operating methods, and promoting innovation and the use of digital technology, with a focus on employee health and safety. Various initiatives have been developed within the Group, and helped improve organisation, working conditions and quality of life at work as well as employees' well-being. On 12 November 2019, a "sustainable mobility" agreement was signed at the Group level in France to develop methods of organising work that provide greater protection for the environment and employee health and well-being, with the aim of becoming a "low-carbon employer" (see section 3.3.3.1.1 "Employee employability and enhancement of the internal social elevator").

The Group also encourages the development of methods of organisation fostering empowerment. With the "*osons la confiance*" (dare to trust) project, it supports the approaches and initiatives of entities based on trust and confidence and empowerment within teams in order to improve both operational performance and the quality of working life.

In addition, all employees and subcontractors of the global Group are covered by the provisions of the Global Framework Agreement on the EDF group's Corporate Social Responsibility signed in 2018, which sets out the major principles to be respected in several areas: respect and integrity, people development, dialogue and consultation, support for local residents and the impact of the Company's policies on local regions. It is specifically implemented by the Group's subsidiaries as they integrate it into their strategic action plans as part of their continuous improvement approach. The local projects implemented demonstrate a willingness to promote the agreement as a vector for social dialogue, policy development (digital accessibility) and innovation (circular economy project). The agreement is

managed through a collaborative approach, as was the case for the global negotiations with all trade union organisations. A launch guide for managers has been co-written with the trade union organisations of the Social Dialogue Committee for the global agreement, tasked to monitor the agreement. A vigilance plan is being developed in liaison with the Committee monitoring the agreement (composed of employee representatives) and will result in training for the Group's trade union organisations and HR staff. The governance of this Agreement was awarded a Bronze medal on 25 November 2019 at the 7th CSR Awards Night (nuit de la RSE) in the category of "best collaborative approach with a high societal impact and/or serving stakeholders and corporate performance".

In 2020, the CSR agreement will be implemented by all relevant subsidiaries and departments, in the form of CSR action plans (development of initiatives already conducted and goals for future improvement, integration into strategy, etc.) and centralised by the Social Dialogue Department.

The members of the Committee monitoring the agreement will produce a roadmap defining improvement indicators for each article.

3.3.3.1.1 Employee employability and enhancement of the internal "social elevator"

A stable workforce in a transitional context

The EDF group's consolidated workforce totalled 164,727 employees at 31 December 2019, including five companies with a workforce of over 10,000 employees: EDF (63,962), Enedis (38,754), Framatome (14,630), Dalkia (16,563) and EDF Energy (13,190). The overall workforce dropped very slightly compared to the end of 2018 (-0.6%) against a backdrop of the energy transition, technological developments and intensifying competition in France and the UK.

80% of the workforce is French, 96% of the workforce is located in Europe (including France) and 4% outside Europe.

The Group's workforce in France

In France, Group companies employed 131,099 people at 31 December 2019, stable over the last two years, excluding the impact of changes to rules for the counting of employees at Group companies in each region⁽¹⁾. This relative stability in the workforce reflects contrasting trends among EDF group companies in France. Nuclear service and supply companies are experiencing strong growth to keep pace with the expansion of their business (for example: +8.3% for Citelum, +2.8% for Dalkia, +2.9% for Framatome and +20% for Cyclife in France [decommissioning]).

EDF remains committed to its transformation and to adapting its business model (new nuclear power, development of renewable energies, development of new commercial offers, including digital offers, electric mobility, optimisation of support functions, digitalisation of internal tertiary processes, targeted international development etc.). These adaptations have led to a gradual reduction in its workforce (-2.1% since the end of 2018). In this respect, a voluntary early redundancy plan was proposed to employees in 2019 in departments with declining activity: almost 900 employees signed up for the scheme and will leave EDF over the next 3 years. Prospective studies have been conducted at the Group level with all subsidiaries in order to anticipate the transformation of its staffing needs and certain key professions to allow it to adapt the workforce and skills in the short, medium and long term, and develop intra-group career paths.

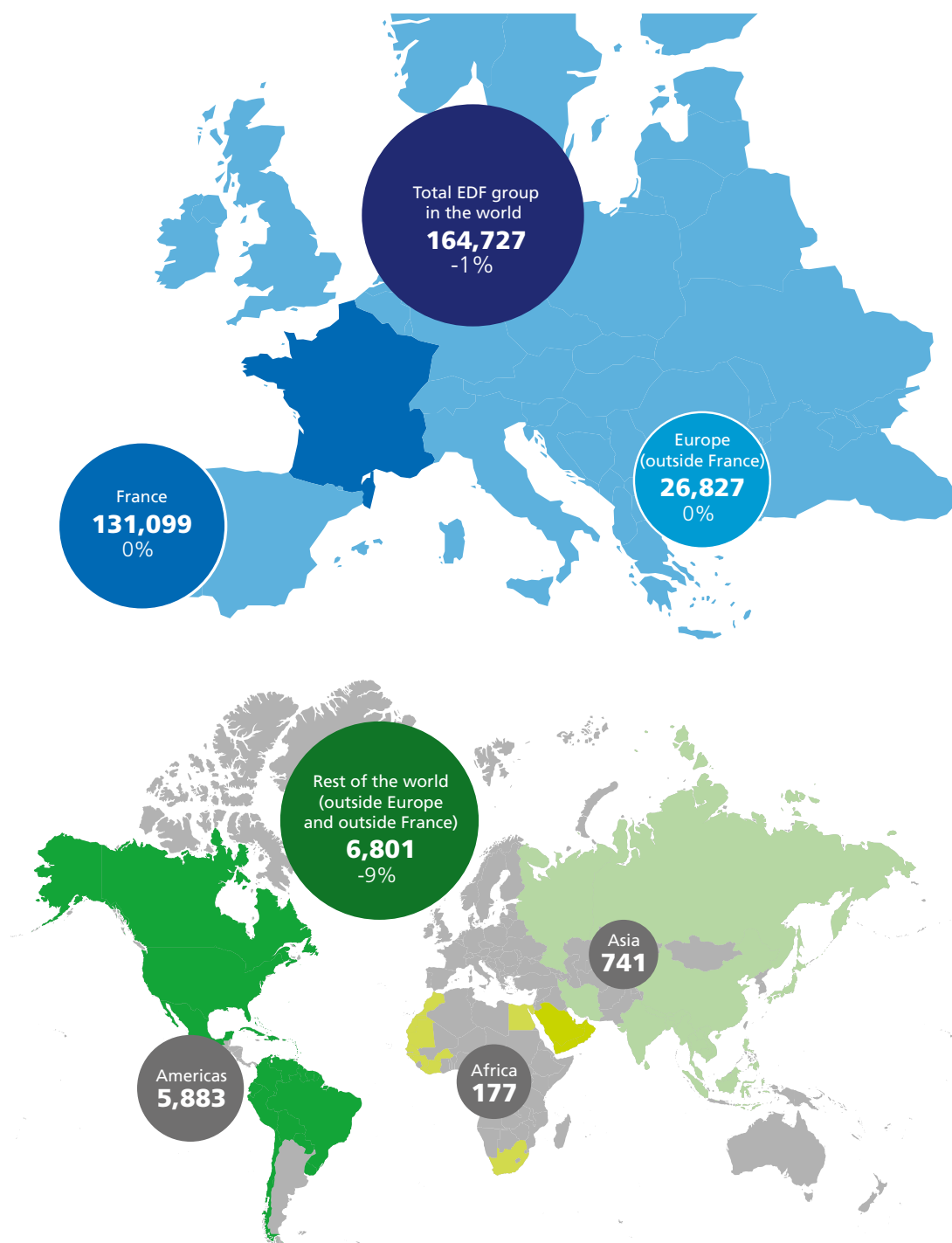
International Group workforces : 85% of the international workforce is European⁽²⁾

20% of the workforce is located outside France. It is stable and based essentially on the development of Dalkia, Citelum and Cyclife, along with the presence of EDF Energy, EDF Renewables, Framatome and Edison in Europe. The remainder of the workforce is mainly located in America (5,883), Asia (741) and to a lesser extent in Africa (177). The table below presents a breakdown of the workforce of the international subsidiaries and shareholdings included in the EDF group consolidation scope, as well as the change in headcount since 2018 year-end.

(1) As from the 2018 Registration Document, a change to the EDIFIS information system has made it possible to count employees in the country in which they operate, rather than the country where the Company's registered office is located. The figures and % change presented in the rest of the sections take into account this new employee counting method.

(2) Consolidated subsidiaries.

→ Worldwide workforce of the EDF group at 31 December 2019



The table below shows the breakdown of the Group's global workforce as at 31 December 2019:

	2019	Change
France	131,099	-0.24%
Europe (excl. France)	26,827	-0.31%
Rest of World	6,801	-8.96%
TOTAL EDF GROUP IN THE WORLD ✓	164,727	-0.64%

✓ 2019 indicator subject to reasonable assurance check by KPMG S.A.

3. Non-financial performance

EDF, a company committed to a just and fair transition

Hiring

The EDF group is one of the top industrial recruiters in France, with more than 8,135 employees hired under permanent, fixed-term and work-study contracts in 2019. EDF has made work-study programmes a key component of its skills sourcing and "human ambition", with 7,200 work-study students in 2019, meaning that more than one out of every 100 work-study students in France is trained by the EDF group. The EDF group also plays an important role in the integration of young people, with 15% of work-study students coming from deprived areas and another 15% from rural areas.

Recruitment is focused primarily on technical, hard-to-fill, rare or developing professions. The proportion of managers recruited externally remained stable at around 28% at Group level, as did the proportion of women recruited despite a decline in the attractiveness of the industrial sector.

Boosted by its employer brand, EDF, which is constantly innovating to maintain the Group's high level of attractiveness, maintains its position as the top energy company among engineering school students in all rankings (Universum, Randstad, Epoka), is considered one of the best employers in the Glassdoor ranking, and has already been awarded the top spot for gender parity in the Capital 2018 ranking. EDF came third in the Happy Trainees ranking, measuring the level of satisfaction of work-study students and trainees, in the category of companies hosting more than 1,000 young people.

The EDF group's digital image was recognised in the recruitment category by the French Human Capital Awards (Trophées du Capital Humain).

The re-insourcing of external sourcing and the use of agile methods delivered impressive results in 2019 as regards recruitment quality and a reduction in candidate selection times. The internal sourcing system was a resounding success at the entities. Operating as a genuine internal head-hunting firm, this system makes it possible to source candidates from all of the Group's departments in France (EDF and subsidiaries). This method also respects the EDF group's employment strategy, which gives priority to internal mobility and redeployment over external recruitment.

In 2019, 91% of vacancies were filled internally. This was made possible through proactive initiatives designed to boost the employability of its employees: ten "RéGlo" seminars held in each region to recruit and support Group mobility explaining the regulatory aspects of mobility within the Group, internal job forums, regional e-forums for employees and experimental schemes promoting the functional mobility of employees (reciprocal undertaking contracts, insertion contracts (contrats d'avenir) in the event of site closures). Declining departments have been supported through a specific project called *My Job*, designed to enhance the visibility of pools of qualified employees and solidarity between departments for EDF. Through this, almost 920 employees found a job in line with the Group's needs in 2019.

In order to meet its needs for specific skills by 2020, the EDF group introduced a scheme in 2019 for internal work-study programmes⁽¹⁾ for employees undergoing retraining for positions that meet the Group's future human resources needs. Several employee work-study programmes have been designed in partnership with the Paris Saclay University and Global Knowledge⁽²⁾ mainly for data analyst positions.

In order to break down the barriers to mobility, a major project involving all divisions and regions has been implemented to simplify processes, by promoting transparency and supporting employees in their efforts such as, for example, the

opportunity for employees to apply for certain jobs in faraway locations without having to relocate (*My Local Job*), or to facilitate discussions of financial issues (the before and after financial assessment). A detailed review of the way in which the Company supports mobility is also underway.

The EDF group acts responsibly to promote diversity and respect for human rights alongside its stakeholders: employees, subcontractors and employee representatives. Its work also affects the general population as a contributor to the development of the regions in which it operates.

Skills development: investing in skills development throughout an employee's career

A new policy

The EDF group has adopted a new "Group France"⁽³⁾ skills development policy focusing on investment in the changing needs for skills, in line with its CAP 2030 strategic framework, working to prepare the Group for the future. This new policy, which has now been rolled out in all Group companies in France, also aims to transform training and professionalisation practices and adapt them to the changes occurring in its divisions at an ever-increasing rate, in order to improve the long-term employability of employees, and continuously adapt them to the needs of its divisions and subsidiaries at the lowest possible cost. It commits the Group to the following goals: to secure the skills required by its divisions and prepare for the jobs of tomorrow, to ensure the employability of its employees and to treat training as an investment in human capital, as illustrated by the €594 million spent by the Group on skills development in 2019.

This policy addresses the following areas for improvement: the evaluation of training courses, to assess the transfer of knowledge and its subsequent implementation; the digitalisation of skills development resources, to meet new learning needs and improve access to certain training courses, with a confirmed educational and economic relevance; the introduction of a wide range of methods beyond so-called classical training (acquisition or development of professional skills and knowledge), to include and develop professionalisation (reinforce the skills acquired, primarily on the job) and increase the number of possible variations, combining the advantages of all available methods to produce "blended-learning" skills development, along with the need for better support for internal mobility and retraining and continued efforts in terms of work-study programmes, promotional training and support for employees changing professional categories.

Developing the employability of employees


The Group is continuing its efforts to improve the accessibility and intelligibility of the training available, by using the Group intranet and increasing the visibility of the training available through the launch of the training module of the new "MyHR" HR IS. In 2020, the internal platforms hosting e-learning modules will be combined and access procedures will be simplified. The range of training available in cross-disciplinary skills (languages, office automation, quality of written documents, oral communication, professional posture, personal development and quality) has been enhanced through special digital platforms. These efforts to improve the accessibility of training address one of the corporate social responsibility goals (see table below), and also one of the priorities of the new policy. This can be used to measure and ensure a level of harmonisation between the French subsidiaries in this "Group" commitment, and also to guide the ongoing efforts of the Company, and all its divisions, to ensure the long-term employability of its employees.

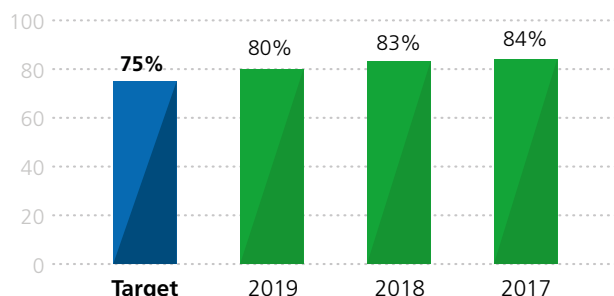
(1) Also see section 3.3.3.1.1 "Employee employability and enhancement of the internal social elevator".


(2) Global Knowledge is the largest training group in the world dedicated to IT and Methods.

(3) This affects subsidiaries whose registered office is in France, employing more than 50 employees.

→ EDF, a company with a responsible attitude to its employees

Percentage of employees who attended a training during the year 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). The scope and methodology of this indicator are set out in section 3.4 "Indicators and methodology". This indicator refers to key stake no. 11 "Company's attractiveness" described in section 3.6.2 "Description of key stakes in the materiality matrix".

In addition to the range of training courses offered and their accessibility, the Group invests in the design and dissemination of practices designed to improve learning methods and processes. Several experiments in the form of employee-manager expression groups have validated a reproducible methodology, designed to measure the effectiveness of training through the learning capacity of the organisations ("the learning company"), thus becoming the matrix for reinforcing the knowledge and skills acquired, over and above the individual benefits. The combination of training and professionalisation initiatives (transformation of acquired knowledge into proven skills, in the actual setting of the professional activity), reinforces the impact of the initiatives and the educational effectiveness.

The Group has successfully launched an internal work-study training scheme to boost internal mobility, involving re-professionalisation and retraining, called "IT Pilot", designed to train employees for emerging professions, such as data analysts in this specific case. These schemes will be further developed in 2020. Support for the management of long-term career paths is provided at various stages of an employee's career, and is enhanced, for example, by the implementation of mobility e-forums, open to all employees, which showcase regional opportunities for jobs and mobility. The number of inter-departmental transfers is on the rise and this confirms the effectiveness of the support schemes implemented: two thirds of those transfers involved a change in professional category.

In addition, under the "Sustainable Mobility" ⁽¹⁾ agreement signed on 12 November 2019: a mobility plan will be produced for all the Group's major sites, the impact on mobility will be addressed when planning changes to the location of activities, the staggering of arrival and departure times will be encouraged, the development of regular and occasional teleworking will be continued, the Welcome service will be developed, allowing employees to work at another Group site closer to their home, the development of teleconferencing will be encouraged.

Improving the "social elevator"

With regard to its career accelerator schemes, the promotional training courses continue to promote the internal "social elevator" as do the promotional training courses leading to qualifications. The most widely used scheme remains support for moving up to the next professional category, mainly the transition to management positions. The reinforced support system for employees at expert level promoted to management by managerial decision allows them to obtain RNCP (National Register of Professional Certifications) level II certification that they can apply during the course of their career. As part of its commitment to

improving occupational integration, the Group continues its efforts and commitment to work-study programmes, which is reflected in a proactive policy of hiring work-study students, providing business start-up assistance for work-study students with a project and providing systematic and revised training for work-study tutors (see also section 3.3.3.1.1).

Group talent management

The Talents policy, implemented at the level of the EDF group, describes the principles and criteria for identifying and validating employees with the potential, in the long and short term, for executive level responsibilities while respecting the management independence of network managers. Under this policy, high-potential employees should be identified at an early stage to prepare them and monitor them in the long term, with a high level of involvement from all executives at various stages. Regular assessments (junior/senior) are conducted to detect the talent and future leaders of tomorrow. These assessments are based on a single leadership model for all Group companies. Since 2018, Talents 2.0 has improved the process used to detect new talent. Employees can identify themselves directly through a series of online tests which then lead to an assessment.

GMU (Group Management University)

The GMU was created in 2010 to improve performance and support the development of EDF group managers and executives throughout their careers. Acting at the very heart of the transformations, the GMU develops managerial training schemes, prepares the "Group Talent" for executive responsibilities and ensures the professionalisation and development of the executives in office through a specially adapted curriculum. The GMU designs and provides programmes and training courses that help create and disseminate a common culture at Group level based on EDF's historical know-how and skills, and innovative practices in the field of management and leadership. The GMU is also developing partnerships with the best academic institutions worldwide, selected following tenders. The GMU's programmes combine a demand for quality and openness to change with a capacity to adapt to the Company's internal challenges. The GMU is responsible for implementing the model of leadership skills within the Company, multiplying its deployment through its programmes so as to encourage a shared, rapid appropriation of the main issues to pave the way for the future.

3.3.3.1.2 Organisation and working hours

In order to meet the needs relating to each company's business and particularly to ensure continuous operation, the Group's employees may be required to provide a continuous service 365 days-a-year or be on call outside of regular working hours. These arrangements are adapted over time according to the changing circumstances at each company, legislation and new authorised work organisation practices, particularly communications technology developments. For companies based in France, the duration of the working week in France is 35 hours with departments operating over a minimum of 5 days.

Group entities are seeking to modernise the organisation of working time to promote employee agility and empowerment. Following the implementation of agreements for a fixed number of working days a year in most of the Group's companies (EDF, Enedis, PEI, Sovee, etc.), which have been signed by almost all managers, the EDF group, as part of the CAP 2030 transformation project, has implemented work organisation policies addressing the challenges of simplification, empowerment and innovation:

- for EDF, a teleworking agreement was signed for all employees along with an agreement on the organisation of work implementing collective projects for the operation of each work team;
- EDF is also experimenting with remote working solutions, such as the Welcome Project and My Local Job, to break down the barriers to mobility and achieve a good work-life balance;
- team empowerment schemes (Opale) have been introduced to give teams the ability to show initiative and take decisions, in order to improve commitment and performance levels. 200 teams were involved in these schemes at the end of 2019.

⁽¹⁾ This agreement applies to subsidiaries having their registered office in France (excluding RTE and Enedis).

3. Non-financial performance

EDF, a company committed to a just and fair transition

3.3.3.1.3 Long-term social welfare policy

The Group's employee benefits policy is based on three main principles: a principle of accountability, a principle of balance between competitiveness and sustainability, and a principle of appropriation by beneficiaries.

A specific social welfare scheme

In France, the vast majority of the Group's workforce are employed by companies descended from "historic operators" (EDF, Enedis, PEI) which have electricity and gas industry or "EGI" status. This status carries an entitlement to a special pension and social security scheme. If employees with EGI status are unfit for work (sickness/maternity/disability), they benefit from an attractive level of cover and in terms of healthcare costs, in addition to the basic scheme, their special scheme includes an additional mandatory part, which also covers retired employees. Employees with EGI status and EGI pensioners have access to centralised social activities, financed by the companies in the professional branch and managed independently by the unions. In addition to these schemes, there is a benefit in kind historically based on a company decision which covers gas and electricity supplied by historic operators to employees and which is maintained for retired employees.

Significant changes over the last decade

EDF's IPO and the application of international accounting standards required the valuation and provisioning of commitments to retired employees. The maintaining of the industry's special pension and healthcare cost plans faced with this requirement was made possible by the overhaul of their financing: affiliation with standard mandatory plans for pensions and strengthening of affiliation between current and retired employee plans for complementary health insurance cover;

The special pension plan has also, like other public sector special pension plans, been increasingly affected by efforts to reform mandatory pension plans launched by successive governments. Except for the pension calculation method (specific rate, applied to a salary at the end of career, with a reduced base), the main parameters (retirement age, required contribution period, etc.) tend to be in line with the standard compulsory plan; a number of other less wide-ranging rules remain specific. The definition of active service, enabling earlier retirements, has also been revised and how it is taken into account significantly overhauled for newly-hired employees, via the creation of a Retirement Days Savings Account. In addition, the bill instituting a universal pension system, presented to the French Council of Ministers on 24 January 2020 and due to be examined by the National Assembly in February 2020, would apply to all employees affected by the reform, regardless of their pension scheme, including the EGI scheme.

For the EDF group, the government's proposed pension reform presents three major challenges:

- social: the special pension scheme is one of the pillars of the EGI status and is a major political and symbolic issue;
- financial: the special EGI pension scheme represents an additional financial burden of several hundred million euros per year, and some €20 billion in commitments;
- transformation: particularly with regard to the fluidity of mobility within and outside the Group (as differences between pension schemes constitute one of the main barriers).

Since the beginning of the consultation process, the Company has been keeping a close eye on the consequences of this reform for all its employees, regardless of their status. Some of the issues raised have already been addressed in the report submitted by the High Commissioner for Pension Reform, in particular with regard to the introduction of transition periods adapted to the specific nature of the EGI status for the extension of the contribution base and for employees with difficult working conditions. Unlike other historic benefits, the level of employee health, disability and life cover appeared significantly less generous than that offered by other major groups, which led from 2008 to the introduction, in agreement with the professional branch, of complementary cover in these three areas.

An agreement on family rights was signed in 2017 at the level of the EGI branch with the trade union organisations, to modernise the social system and reflect the changes to family life that have occurred since 1946 by adapting the EGI status in a concerted manner.

Other Group employees' social welfare

The Group's other employees in France are covered by several collective bargaining agreements and can have fringe benefits provided by their own employer. Each employer must therefore ensure that the benefits provided are consistent with the Group policy presented above. For Group companies outside France, even if the regulatory context specific to each country must be taken into account, each entity is required to ensure that the capital paid out in the event of a death under death benefit contracts covers one year's salary at the very least. This social protection matter is regularly discussed with the Group's Human Resources Department.

3.3.3.1.4 Health and safety of the employees of the Group and its providers: an absolutely priority

In an environment that is undergoing rapid, far-reaching changes, the human aspect is more than ever a core component of the CAP 2030 strategic plan, itself a key factor in the Group's performance. To tackle the industrial and commercial challenges it faces, EDF must remain a socially responsible and committed employer and a benchmark in terms of its employees' health, professionalism and commitment, by building their skills and fostering greater workforce diversity. EDF is committed to incorporating the best personnel development practices of industrial groups in order to maintain strong employee commitment.


Health and Safety policy: Guaranteeing the best health & safety conditions at work for all

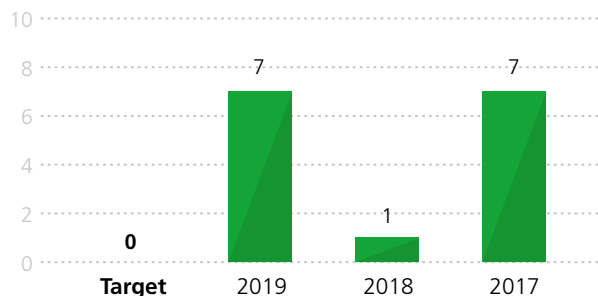
The Group's Health and Safety policy was adopted in 2018 and is based on an undertaking signed by the Chairman and all members of the Executive Committee. It defines a common, consistent framework and all policies and action plans of the Group's different subsidiaries must comply with the policy. This Group policy applies to all the companies controlled by the EDF group, in all the countries in which EDF operates, and concerns both its employees and its subcontractors' employees working on its facilities and premises. This undertaking is accompanied by a roadmap that mobilises the Group's entities to achieve the objectives set. The Executive Committee reviews health and safety figures and monitors action plans regularly.


The CAP 2030 programme's strategic health and safety objectives were defined in 2015. The Group strives to set an example in the area of Health and Safety. The main priority is to eradicate fatal accidents, then reduce the number of accidents and combat absenteeism. This ambition and these priorities for the coming years are implemented in all the companies of the Group.

Eradicating fatal accidents connected to business-specific risks

➔ EDF, a company with a responsible attitude to its employees and service providers

Number of fatal accidents linked to business risks (employees and service providers) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). The scope and methodology of this indicator are set out in section 3.4 "Indicators and methodology". This indicator refers to key stake no. 17 "Health and safety of employees and stakeholders" described in section 3.6.2 "Description of key stakes in the materiality matrix".


In 2018, continuing the initiatives started in 2015, the Group focused on 10 key rules, which were adopted following an analysis of deadly accidents in the EDF group over the last 30 years, which everyone must follow as they go about their work in order to avoid serious accidents and protect both themselves and those around them. To continue developing the safety culture and risk awareness, other initiatives are being implemented such as the collection of High Potential Events (HPE), more than half of which are near-accidents or dangerous situations and sharing at Group level of Experience Feedback on the elements resulting from the analysis of these events, in particular those related to the 10 key rules of the Group.

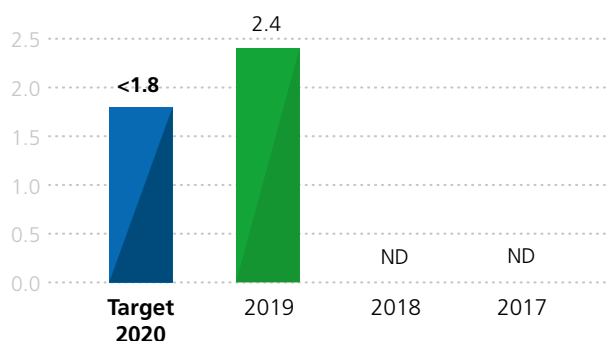
Despite the improvements witnessed in 2018, the number of fatal accidents rose in 2019, mainly during loading and unloading operations, but also during work at heights and electrical work. Accordingly, the Executive Committee decided to ask all entities to organise a "time out" on 3 October 2019 to discuss this situation in all teams and define local actions to improve the level of prevention. This initiative was led by the Group's executives but it also involved a large number of providers.


Developing a strong safety culture is key to making progress in the area of prevention. Employees are encouraged to follow e-learning courses developed by the Safety Academy. In 2019, 15,816 EDF employees completed a training module on this topic. These efforts supplemented the "Shared Vigilance" training course launched in 2018, which was taken by 26,476 employees in 2018 and 2019.

One of the main areas of focus in 2019 was the position of the employees of providers. A partnership agreement was signed with the MASE association in May 2019, during the Preventica trade fair, to encourage providers to implement a recognised, simple and operational health and safety management system.

→ **EDF, a company with a responsible attitude to its employees and service providers**

Overall LTIR (employees and service providers) 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). The scope and methodology of this indicator are set out in section 3.4 "Indicators and methodology". This indicator refers to key stake no. 17 "Health and safety of employees and stakeholders" described in section 3.6.2 "Description of key stakes in the materiality matrix".

In order to have comparable data between Group entities and measure accident rates directly related to the performance of activities, EDF uses a new "LTIR" indicator corresponding to the calculation of the frequency rate according to Anglo-Saxon standards. This indicator has been monitored since 2017 and will be

disclosed starting in 2019. The 2020 objectives of the new health and safety policy are now expressed on the basis of this new indicator (EDF LTIR below 1.4 and overall LTIR: EDF + service providers below 1.8).

→ **Combating absenteeism, preventing psycho-social risks and improving well-being at work**

	2019	2018	2017
Number of days of absence per employee per year	9.1	9.1	9.2

Among the crucial areas for improvement, prevention of anxiety- and depression-related disorders, stress and musculoskeletal disorders (MSD), the three main causes of absenteeism, are regularly targeted by prevention initiatives. An analysis of the annual My EDF group survey, completed by more than 75% of the Group's employees (see section 3.3.3.1.8: "Employees' view: My EDF group engagement survey"), is used to assess psycho-social risks according to the determinative factors of the Gollac report and identify areas of weakness and also areas of protection for working groups and therefore to take appropriate preventive action.

The development of team empowerment projects should lead to a drop in absenteeism among the employees of the teams involved (more than 500 teams involved at the end of 2019), due to the positive health impacts of the improved quality of life in the Groups and the increased levels of commitment and meaningfulness of work.

One of the main areas of focus in 2019 was the importance of back-to-work medical visits with occupational physicians and the organisation of back-to-work meetings with managers to ensure a successful return to work. EDF employees were invited, through the employee profit-sharing agreement, to take an e-learning course to find out more about the tools available in the Company. 17,886 employees took the course in 2019.

Health in the workplace and general health issues

The EDF group employs staff specialised in health at work. The Group also employs physicians who are experts in toxicology, ergonomics, epidemiology, first aid, and radiation protection. In addition to medical monitoring of employees, these healthcare workers are involved in setting up primary prevention programmes and are stakeholders on all the social dialogue bodies in the field of health at work, thus reducing absenteeism and occupational illnesses. With the support of its medical teams and the safety officers at its entities, the EDF group is also committed to public health issues such as addiction and cardiovascular risk prevention.

Health and safety in the workplace as a subject of social dialogue

In France, 2019 was marked by a far-reaching reform of social dialogue, leading to the creation of the Social and Economic Committees, a new type of representative body tasked to handle health and safety issues (see section 3.3.3.1.7 "A renewed social dialogue").

In addition to these new bodies, which have been set up under agreements signed within the various Group companies in France, there are two other levels of Group social dialogue on health in the workplace: i) at European level, as the action taken during the year is presented to the European Works Council's health & safety workgroup, and ii) at Group level in France, as the year's key issues and figures are presented to the France Group Committee. A progress report on the strategic health and safety objectives is regularly communicated to these bodies.

3. Non-financial performance

EDF, a company committed to a just and fair transition

3.3.3.1.5 Diversity & inclusion, Equal access to employment for women and men

The EDF group is committed to gender diversity and equality in the workplace, for a diverse and inclusive environment reflecting all types of differences.

Gender equality in the workplace at the heart of the Group's actions

Through the CSRGs, the global CSR agreement and its code of ethics, EDF takes concrete action, measures the progress made and sets targets for gender equality in the workplace. 2019 was marked by: the publication of the first gender equality index on 1 March 2019 (with a score of 80/100) and the continuation of the work carried out since 2015 with the Institut national d'études démographiques (National Institute for Demographic Studies or INED) to identify the sources of the gender pay gap in the Company and take action to remove them; the renewal by Bureau Veritas of the international GEEIS certification for the Group; the distribution of two sets of guidelines on how to prevent and combat sexual harassment and bullying aimed at managers and HR staff, supplemented by educational kits for all employees; the renewal of the awareness-raising and training materials to prevent and combat sexist behaviour in the workplace (sexism kits, creation of a sexism e-learning course in collaboration with Paris VIII University); the implementation of a support initiative for employees who are the victim of domestic or family violence and, in partnership with the association *FIT, une femme un toit*, training for those responsible for providing the support (HR staff, employee representatives, medical and social teams, ⁽¹⁾ etc.); and enhanced support for parents and carers (parental leave, CESU service vouchers, family allowance, family carer leave, marriage or civil partnership bonus) introduced in the agreement on the development of Family Rights in the EGI branch dated 15 December 2017.

A Group-wide goal for 2023

In 2019, the Group decided to set a goal for achieving gender diversity, through the Executive Committee, involving three major commitments designed to break the "glass ceiling" preventing female managers from sitting on Management Committees and reaching an executive level. The following targets were set: 28% of the members of the Management Committees should be female by 2023 (27.3% by the end of 2019), 28% of executives and future executives should be female by 2030 and enhanced gender parity on the boards of Directors of the Group's subsidiaries, with 40% of the Directors appointed by EDF being female (see section 4.2.1 "Members of the Board of Directors – Proportion of women on EDF group governing bodies").

Increased diversity in science, digital technology and innovation

The aim is to encourage women in our technical professions (Elles bougent, Fem'Energia, Women in energy transition, women@numerique), train female employees in the emerging digital and cyber professions, and implement internal innovation schemes (PULSE, Let's Talk Energy, the Y Project) that take into account gender diversity.

Increased diversity in the representation of the Group

The aim is to organise a gender-diverse team to speak on behalf of the Group, sign the #jamaissanselle charter, and ensure "gender-fair" communications measured externally.

Clear progress


Since 2014, the EDF group and some of its subsidiaries have decided to apply for an international certification (GEEIS certification) to assess the quality and relevance of their commitments to gender diversity and equality in the workplace. The certification was successfully renewed in 2019 and, for the very first time, it was extended to all the Group's other fields of action in terms of diversity and inclusion. In France, the implementation of a gender equality index became mandatory for all companies with more than 50 employees in 2019, and all Group subsidiaries with more than 250 employees were required to publish this index for the first time in 2019.

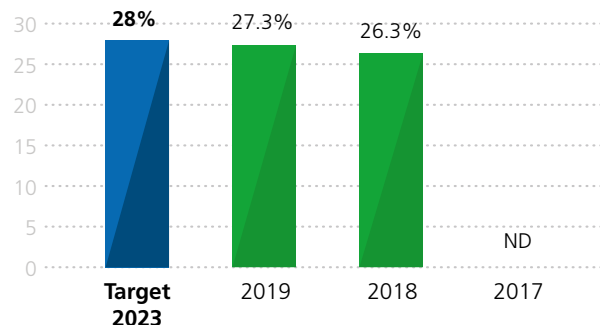
Main results of Group entities based on the gender equality index ⁽²⁾:


Entities	2019 Index Score/100
Dalkia	84
Cham	84
Framatome	74
EDF	80
EDF Renewables	81
Enedis	74
Citelum	93
Électricité de Strasbourg	68
PEI	74

The Group's goal is to ensure that all of its subsidiaries score over 75 points by 2021, regardless of when they are first required to publish their results. EDF aims to reach 90 points by 2020. 24.8% of the EDF group's workforce is currently female (30.5% at EDF), which places it in the top half of the main French industrial groups. Although the increase in this rate has slowed slightly in recent years (impact of the "15 years, 3 children" conditions, reduction in the number of new hires, now mainly needed in technical professions), it is still increasing at double the average rate recorded for French companies, for all sectors combined (DARES). Structurally, EDF is still marked by insufficient gender diversity (15% of professions are diverse) even though the number of women holding technical jobs has tripled since 2002.

➔ EDF, a company with a responsible attitude to its employees (CSRG no.2) (see 3.3.3.1)

Gender balance index : percentage of women in the Management Committees of the Group's entities 



 Key non-financial performance indicator (see concordance table with the non-financial performance statement in section 8.5.4). The scope and methodology of this indicator are set out in section 3.4 "Indicators and methodology". This indicator refers to key stake no. 13 "Equal opportunities" described in section 3.6.2 "Description of key stakes in the materiality matrix".

In order to move forward with this issue, EDF's aim, as part of the Group's goal for achieving gender diversity decided by the Executive Committee in November 2019, is that: i) each relevant entity should develop a programme to include young women in STEMs (Science, Technology, Engineering, Mathematics), ii) more and more women should be supported each year in training for digital professions, and iii) each innovation scheme set up by the Group or its entities should have a gender diversity component and provide the resources to achieve it.

(1) Gender Equality European and International Standard.

(2) Subsidiaries with fewer than 250 employees but more than 50 employees will need to publish their scores for the first time in March 2020.

EDF strives to guarantee equal access to professional and promotional training, with a view to securing comparable career paths for women and men. A specific scheme has been set up to cover additional childcare costs for parents who attend training courses away from home. Steady progress has been made in recent years with its attempts to break the “glass ceiling” effect: the number of female managers has doubled at EDF since 2002. At the end of 2018 ⁽¹⁾, more than 27% of the most senior positions (top 10%) were held by women, more than 31% of managers were female and more than 25% of the members of the Management Committees were female. The percentage of women sitting on Management Committees was below 20% in 2012. For executive positions, succession plans always include male and female candidates. In addition, schemes have been implemented (see TALENTS 2.0 in section 3.3.3.1.1. “Group Talent Management”) to better identify new talent in a more open and diverse manner.

A busy year in the prevention of sexism and violence against women:

EDF is the first company to obtain the “sexiste, pas notre genre” anti-sexism label. With the support of the “Energies de Femmes” network, which has 3,800 members among the Group’s employees, the Company is providing training and raising awareness on these subjects (sexism kits for team meetings, e-learning courses on preventing sexism on e-Campus). With its Workplace Equality Game, EDF is the first company in France to develop a learning experience on workplace equality for managers, inspired by escape games. EDF is committed to preventing and combating all forms of violence against women, both in the workplace (sexism, harassment) and also domestic and family violence (support, guidance and job retention). This commitment was recognised and emphasised by the Government at the last Grenelle Summit on Violence against Women and confirmed on 10 December 2019, by the signing of the charter against domestic violence proposed by Fondation Agir contre l’exclusion (FACE) and the Kering Foundation.

Support for female and male parents and family carers

In 2019, EDF strengthened its parenting support measures by introducing new rights for family carers, creating a parental leave scheme available to both women and men that takes into account the different types of contemporary families and giving parents the option to double their paternity and childcare leave.

The Group also promotes new ways of working and collaborating making it easier to reconcile work and family life and aiming to make employees more responsible, with the following benefits: more autonomous management of working time and the use of tools and devices that can reduce the need to travel (Skype, occasional or regular teleworking); EDF has more than 7,000 employees who work from home one or more days a week, control of connectivity, and promotion of empowerment initiatives.

Diversity and inclusion: sustainable, structured initiatives

As a signatory of the Diversity Charter (signed in 2006), the ILO’s Business and Disability Charter and the Charter produced by L’Autre Cercle, EDF is committed to preventing discrimination and promoting diversity, equal opportunity and inclusion.

Disability, a continuing commitment

A long-term disability plan

EDF was one of the first large French companies involved in the occupational and social integration of disabled people. In October 1989, EDF signed its first agreement to facilitate the occupational integration of disabled people. The 11th EDF agreement for equal rights and equal opportunity and the occupational integration of disabled people was signed on 13 December 2018 for the 2019-2022 period. In terms of sports, its goal is to encourage sports for all. In 1992, EDF became a partner of the Fédération française handisport (French Federation of Disability Sports).

Steady improvement

EDF’s commitment has not waned, as shown by the employment rates of the Group’s companies in France under approved disability agreements. Under the legislation in force at the end of 2018, the rates are: 5.09% for EDF, 6.33% for

Enedis, 7% for the ES group and 3.88% for Framatome. In total, more than 4,700 employees recognised as disabled worked within the Group in France at the end of 2019, across the Group’s wide range of activities. Under national legislation, EDF is also committed to promoting this commitment for Group companies located outside France, as shown by its participation in the ILO’s “Business and Disability” charter and the presence of more than 5,600 disabled employees worldwide.

Support for employees (guides, aid committee, adaptation of jobs)

EDF pays close attention to the integration of disabled employees throughout their careers. EDF has implemented a range of tools to support, roll out and facilitate this policy: two guides presenting the agreement, one for the relevant employees and the other for managers, and two other guides explaining the interview process are now available. Training is also available for the interested parties (disability officers, managers). In addition to adapting workstations to meet the specific needs of employees, several Group companies in France have introduced schemes, as part of their disability agreements, to provide them with occasional, back-up aid to offset the challenges they face in the workplace. Applications for aid are examined anonymously, in a multidisciplinary framework.

Hardship caused by disabilities

As part of their approved agreements, several Group companies in France have introduced measures to facilitate the continued employment of disabled employees during the second half or at the end of their careers.

Continuing challenges

The Group’s commitment to the occupational integration of disabled people is a long-term commitment, but the issues to be addressed are constantly changing, as affected by the maturity of the organisations in this area and the challenges they themselves face and general factors. A good example of this last point is the essential role now played by information and digital technology in the workplace. Digital accessibility is one of the priorities under EDF’s most recent disability agreements. As part of this, EDF has supported the development of an e-learning platform, as part of an inter-company partnership. It is now available to all employees on its online training site. Offsetting the effects of mental disability in the workplace is also an issue and, more generally, the “tools” used to keep the relevant employees in their jobs. In this area, EDF Energy recently ran a series of campaigns to raise awareness of mental health and suicide prevention. It also relies on the support of the “Disability & Carers” and “Mental Health Support” networks, which can provide personal support and enhance the awareness and understanding of these issues.

A clear framework for preventing discrimination

Preventing, supporting and guaranteeing respect for different sexual orientations in the workplace

The Group has adopted a code of ethics based on three main values: respect, solidarity and responsibility. Through these values, all employees should feel at ease in the workplace, regardless of their sexual orientation. Specifically, all employees must be able to exercise their rights without having to worry about a coming out or fear the effects of a coming out. As the diverse sexual orientations in society gradually lose their taboo status, they are becoming more and more visible in the workplace. This new exposure can sometimes lead to a revival of prejudices that need to be overcome to allow teams to operate smoothly and employees to live and work together in a harmonious manner. It is the role of the management team to prevent any situation that violates the law (any homophobic discrimination, harassment, comments or demonstrations). In that spirit, EDF provided its HR staff and managers with guidelines in 2015 on “Respect for sexual orientations in the workplace”, which was also one of the first guides in France to be directly inspired by situations in the workplace (case studies). EDF is a partner of L’Autre Cercle ⁽²⁾ and has been a signatory of the LGBT charter since 2015. It has also partnered and supported the Energay association ⁽³⁾ since 2010. EDF has also designed, in partnership with Energay, a process to accompany and support transitioning employees within the Group. “Supporting transitioning employees at EDF – Respect for gender identity” guidelines were published in 2019, aimed at managers and HR staff.

(1) The 2019 figures were not available on the date of this document.

(2) L’Autre Cercle is an LGBT (Lesbian Gay Bi and Trans) association combating discrimination in the workplace. www.autrecercle.org.

(3) Energay is the LGBT association for the electric and gas industries and their friends. www.energay.org.

3. Non-financial performance

EDF, a company committed to a just and fair transition

Religion in the workplace, a shared framework

EDF is convinced that it will perform better if its employees feel respected, including respect for their personal beliefs, as this will allow them to fully commit to their work teams. The EDF group has been committed to respecting religion in the workplace since 2008, and published a first set of guidelines in 2010 (updated in 2016), setting out guidelines for managers and HR officers to help them understand, analyse and act in compliance with the law. All of these guidelines are designed to prevent discrimination and facilitate the creation of a respectful working environment, that improves team cohesion and the Group's performance. The guidelines produced now refer to and are directly inspired by situations in the workplace (case studies).

Freely available materials

To support and implement these policies of inclusion and equal opportunity, EDF has gradually produced educational and training materials for its entire workforce, whilst still providing managers and HR staff with more targeted materials. For example, in 2018, Enedis (distribution network manager) published a set of guidelines called "Deciding without discrimination" aimed at its managers and HR staff. To raise employee awareness of diversity and encourage new inclusive practices and methods of organisation, the Group has launched a digital training programme called "Together in Diversity" based on a serious game mechanism. EDF aims to use that programme to train all its managers between 2017 and 2020. It also trains everyone involved in its recruitment process, using a digital training course that includes a specific module on how to "recruit without discrimination". EDF also provides awareness-raising materials in short, fun formats to allow employees to take action to create a caring, respectful and inclusive environment. For example: "Sexism, not our thing" anti-sexism kits to be used as part of the systematic Health and Safety ritual at the beginning of each team meeting; three Serious Games, developed in partnership with the Conservatoire National des Arts et Métiers Pays de la Loire covering intergenerational issues, gender equality in the workplace and cultural diversity.

3.3.3.1.6 Compensation: an attractive employer

Total compensation

Total compensation is a key component in recognising the contribution of every staff member to the Group's performance. It contributes to employee engagement, increases the loyalty of talent and adds to the Group's attractiveness. Accordingly, the Group is committed to offering its employees fair and competitive compensation, while paying great attention to the quality and level of social welfare it proposes, particularly in terms of cover against the major risks of life. The Group accordingly formally introduced a total compensation and fringe benefits policy. It covers all employees of the main companies controlled by the Group.

The Group's main foreign companies' compensation and social welfare systems have been reviewed based on this policy. The total compensation policy is based on four main principles: competitiveness in the external market; internal consistency and fairness; financial sustainability; and communication.

It is based on fixed compensation and individual and/or collective variable compensation which serves to recognise the achievement of objectives, connected to the companies' economic results. There is a direct and visible link between the employee's contribution and the related compensation. The Group's companies guarantee the meeting of the minimum legal or professional requirements in each country and the absence of discrimination. Since 2018, EDF has used the Transforming Recognition project to reaffirm its priorities in terms of recognition and update its policies by improving the integration of recognition into its managerial practices and processes, strengthening the link between personal contribution (performance, ability to adapt and take the initiative) and financial recognition and developing variable compensation schemes, linked to the Company's financial performance, to recognise through differentiation. Lastly, to meet the challenges of employee and manager recognition, a project was launched in 2019 to modernise the pay classification system for the Electricity and Gas Industries branch.

Variable compensation plans to boost performance

Within the Group, most employees have individual or collective performance-based variable compensation. The terms and conditions of this variable compensation differ from one Group company to another, based on historical agreements and the applicable regulations.

At EDF, all employees may receive performance-related variable compensation. For managers, the variable share is based on both individual and collective targets whose weighting increases with the position within the Company.

EDF and Enedis pay special attention to the professional training of their managers on issues of compensation. In France, EDF and Enedis employees benefit from a profit-sharing scheme, introduced more than 20 years ago in the case of EDF and for Enedis when it became a subsidiary. Most of the Group's European subsidiaries have similar schemes. EDF and Enedis employees can choose either to receive payment and/or to invest it into either the Group Corporate Savings Plan or the Group Collective Retirement Saving Plan. In a restrictive economic environment, the policy of an employer contribution for sums invested has been maintained.

The EDF and Enedis profit-sharing agreements are three-yearly and require the profit-sharing amount payable to be set based on the meeting of national objectives reflecting the different components of the companies' performances (economic, business lines, social and environmental).

A successful comprehensive employee savings policy

It is open to employees of EDF and of the Group's French companies in which EDF owns directly or indirectly at least 40% of the share capital and which have signed up for the Group Corporate Savings Plan.

The Group corporate savings plan (PEG)

A full range of diversified mutual funds is available for subscription, including conservative funds mainly invested in bonds and money market investments, balanced funds and dynamic funds, mainly invested in shares, including shareholding funds invested in EDF shares. The EDF group's corporate savings plan totalled €5 billion at the end of 2019. Profit-sharing, as well as individual payments and transfers from the Time Savings Accounts, are matched by the Company under conditions negotiated within each company.

Collective Retirement Savings Plan (PERCO)

The EDF group's Collective Retirement Savings Plan is made up of two FCPE (Employee Mutual Investment Funds) profit-sharing funds with a total of eight investment vehicles: one solidarity fund and one set-maturity fund. The plan may be managed independently, in which case it may be invested in any sub-fund regardless of the retirement date, or by the fund manager, in which case the level of risk will be automatically reduced as the maturity date approaches (retirement, projects etc.). Profit-sharing, as well as individual payments and transfers from the Time Savings Accounts, are matched by the Company under conditions negotiated within each company.

The EDF group's Collective Retirement Savings Plan totalled approximately €927 million at the end of 2019.

Employee shareholding

In 2019, a share ownership transaction reserved for employees (ORS) was carried out: 7.7 million shares were proposed to 220,000 eligible employees through a transfer of shares held by the French state. The reference price was €12.26 and the price offered to employees (including a 20% discount) was set at €9.81. The transaction was a success, as employees reserved almost six times the number of available shares.

3.3.3.1.7 A renewed social dialogue

EDF's 2019 social agenda

Through an organisational decision of the Group HRD "Overseeing collective bargaining at EDF SA" of 1 October 2018, an oversight procedure was introduced for the implementation of collective bargaining agreements to assess the effects of the negotiated agreements along with a consolidated agenda for the committees monitoring the collective bargaining agreements (including the Global Framework Agreement on the EDF group's Corporate Social Responsibility). This oversight is now presented once a year at the Group HRD Management Committee.

All of the items listed in the 2019 social agenda were successfully negotiated. The collective negotiations were particularly productive at EDF in 2019 as 12 agreements and supplemental agreements were signed.

The “2020 Social Dialogue” project launched in May 2018, structured through a method agreement signed on 4 October 2018, focused on a reform of social dialogue at EDF as a whole in 2019 (new employee representative bodies, the role of collective bargaining at the Company, site and professional branch level, informal and contractual social dialogue, professionalisation and management of the skills of those involved in social dialogue and trade union rights). Six company-level collective bargaining agreements have been signed as part of the “2020 Social Dialogue” project in the field of social dialogue:

- collective bargaining agreement setting up the site-level Social and Economic Committees and the Local Representatives within EDF;
- collective bargaining agreement setting up the EDF Central Social and Economic Committee and agreeing the arrangements for social dialogue through that Committee;
- agreement relating to the implementation of trade union representatives and the exercise of trade union rights within EDF;
- the pre-electoral memorandum for the election of employee representatives to sit on the site-level Social and Economic Committees;
- collective bargaining agreement authorising the use of electronic voting for the election of members of the site-level Social and Economic Committees;
- collective bargaining agreement relating to the appointment of employee representatives to sit on the EDF Central Social and Economic Committee dated 11 December 2019.

Furthermore, in 2019, several agreements and supplemental agreements were signed in the following areas of HR:

- employee savings plans: Supplemental agreement no. 18 to the agreement dated 29 November 2015 setting out the EDF group’s Savings Plan regulations;
- compensation: Agreement relating to individual salary measures for 2019 at EDF, collective bargaining agreement on EDF contributions to the Collective Retirement Savings Plan (PERCO) and Corporate Savings Plan (PEG) in 2020, supplemental agreement no. 2 relating to the EDF 2017-2019 profit-sharing agreement;
- jobs and training: Supplemental agreement no. 1 to the collective bargaining agreement on Skills at EDF;
- mobility: EDF group’s collective bargaining agreement on sustainable mobility.

Company Consultation and Coordination Body (Instance de Concertation et de Coordination de l’Entreprise or “ICCE”)

The ICCE is a forum for social dialogue, exchange and/or consultation with EDF’s representative trade union organisations, led by the Group Social Dialogue Director. Its role is to present and discuss societal and development issues that do not fall within the remit of employee representative bodies or emerging issues, decisions or policy orientations.

In 2019: Five meetings were arranged and three or four topics were presented at each meeting (the social agenda of the Company, Group and professional branch, CSR in purchasing, electric mobility, progress made with the My HR project, Skills policy, new variable component schemes etc.). A “Latest News” sequence has been set up and the topics have been adjusted, mainly to improve the coverage given to “training” and the Company’s industrial projects.

Employee Representative Bodies

France

At the beginning of 2019, there were 56 Works Councils, one Central Works Council, one France Group Committee, 97 Employee Representative Councils and 205 Health, Safety & Working Conditions Committees (CHSCT). Through the collective bargaining agreements signed on the 2020 Social Dialogue in the summer of 2019, the structure of the Employee Representative Bodies has been reformed and now includes 47 site-level Social and Economic Committees, one Central Social and Economic Committee and one France Group Committee. They were set up following the employee elections held on 14 November 2019.

Central Works Council, now called Central Social and Economic Committee

2019 saw a continuation of the discussions with elected representatives on the Company’s industrial and transformation projects:

- information on the progress made with engineering projects (Flamanville, Hinkley Point C, India project, EPR 2 project) and on the winter period by the Upstream/Downstream Optimisation & Trading Department;
- *ad hoc* consultations on restructuring projects at the Transformation and Operational Efficiency Department, at EDF Hydro and at the Services, Customers

and Regional Action (CSAR) Department, also within the framework of the multi-year energy programme, the closure of unit 4 of the Le Havre power plant scheduled for 1 April 2021;

- recurring “Rebsamen” consultations were organised in 2019 on Corporate Social Policy in April and June and on the Economic and Financial Position of the Company in May.

Twelve sessions were held in 2019, one of which lasted for two days. The handover to the Central Social and Economic Committee took place on 19 December 2019 and the former members of the Central Works Council spent time with the newly elected members of the Central Social and Economic Committee.

France Group Committee

The France Group Committee is a forum for dialogue at the Group level in France, comprising 28 elected representatives of the Group’s subsidiaries (EDF, Dalkia, EDF Renewables, Framatome, Enedis CHAM and RTE etc.). It met three times in 2019 in accordance with the corresponding collective bargaining agreement to discuss recurring issues and topical Group issues: presentation of the Group’s outlook, the economic and financial position, and the Group’s employment and training policies and reviews. At these meetings, the Enedis and Citelum subsidiaries were presented and the My HR project and the Group’s Ethics and Compliance Policy were discussed. The elected representatives also visited the Dalkia facilities at the Purpan hospital in Toulouse.

Outside France

European Works Council

The EWC, comprising 38 representatives of the French, German, British, Italian, Belgian, Polish and Slovakian subsidiaries, met twice in 2019 in accordance with the corresponding collective bargaining agreement. It discussed the current issues affecting the Group with the Chairman of EDF, the Group’s strategy through the presentation of the solar energy plan, the storage plan and the electric mobility plan, along with current European issues, the presentation of the Group’s 2018 consolidated financial statements and the restructuring proposals and their impact on employees, such as the disposal of Edison’s E&P activities.

Through the five Working Groups set up, the EWC members take action at the European level in relation to the health and safety policy, equal opportunity and diversity and the consolidated financial statements in support of the annual audit. It should be noted that in 2019, the working group on collective safeguards was renamed the working group on safeguards for production site closures.

3.3.3.1.8 Employees’ view: My EDF group engagement survey

Since the first “My EDF group” internal engagement survey conducted in November 2012 involving all Group employees, a plan to report results to employees are systematically implemented. The companies are drawing up action plans to increase or introduce improvement measures based on the results observed within their scope. It is available in all the Group’s languages, including English. The results that can be exploited at the level of each company can be explained using various social and demographic criteria (gender, seniority, professional category, etc.).

The 8th edition of the survey was taken from 24 September 2019 to 22 October 2019. A major internal communication campaign was organised to encourage employees to express their opinion (videos, posters and communication kit). The questionnaire was simplified 2 years ago (streamlined from 97 to 44 questions) and can now be completed from a smartphone:

- employee engagement remains at 64% at the Group level, 1 point higher compared to 2018. 70% of employees would recommend their company as an employer, 2 points higher compared to 2018. The survey demonstrates that confidence in local management remains a real strong point (69% of respondents are confident about the management’s decisions) as well as employee implication (68%, *i.e.* 2 points higher compared to 2018);
- content of work remains at a satisfactory level of 70%, increasing by 5 points. However, the perception of the effectiveness of collective operations fell 2 points to 47%. Specific action plans have been implemented for career paths (47% satisfaction) and are starting to pay off (+4pts);
- finally, for 85% of employees (+1pt) safety is a concern shared by everyone.

Employee participation (75% and nearly 99,500 respondents), a marked increase from the first year (63%), demonstrates the interest of Group employees in this survey over time and guarantees reliable results, as shown by the concrete and noticeable actions taken on the basis of the results.

3. Non-financial performance

EDF, a company committed to a just and fair transition

3.3.3.2 EDF, a company with a responsible attitude to its providers

3.3.3.2.1 Responsible subcontracting



EDF's subcontracting policy focuses on three main themes: providing providers with visibility and ensuring long-term supply partners; helping the Group improve its subcontracting practices by defining criteria to support decision-making in terms of strategy, economics, skills and social impact; developing socially-responsible subcontracting practices, particularly via the new Global Framework Agreement on the EDF group's Corporate Social Responsibility (Article 4) signed on 19 June 2018 and the agreement signed on 19 October 2006 on socially-responsible subcontracting at EDF.

Group CSR agreement commitments

The Group may be required to use subcontractors with employees under contracts drawn up in a country other than the one in which it operates. In this case, particular attention is paid to human rights, working conditions, housing conditions and employee health and safety.

EDF group implements a compliance plan, including a map of the risks identified in relation to its suppliers and subcontractors, a risk assessment, and the risk mitigation measures taken.

At EDF, subcontracting is mainly used for industrial and commercial activities, and for information systems.

2019 was consistent with the trends seen in 2018 in terms of the types of business activities that were outsourced, with the exception of real estate management activities, for which the Company has adapted its business model. It now uses Property Managers for tertiary sites and Pilot Facility Management for tertiary buildings on industrial sites (Dalkia EN subsidiary).

In the industrial field

The improvement measures launched in 2015, reflected in the Progress Charter signed in June 2016 between EDF and the Professional Organisations representing the Group's subcontractors, continued in 2019. Specifically, support for subcontractors, in place since 2017, will continue at the Flamanville 3 work site, with a view to reducing the workload. Support for subcontractors at sites being closed down is organised with local stakeholders. Personalised support was given to Fessenheim subcontractors in 2019.

In the field of Information Systems

In 2019, the Company continued to implement its industrial strategy in the IT field which determines the subcontracted share. This is particularly demonstrated by the proactive decision in favour of "Open Source" – unrestricted and free – software as well as the implementation of a fast-track contracting procedure with start-ups, which are vectors for innovation. Vigilance regarding training conditions and service provider turnover has been maintained, particularly as the total number of suppliers in the IT field continued to increase.

In the commercial field

In an increasingly competitive context, the Sales Division continued to use outsourcing to deal with variations in workload and cover extended hours, with value-creating tasks being directed towards internal consultants. EDF's customer relations centres are located in mainland France, whether operated internally or externally, and are certified for customer relations and business development activities. Its in-house centres have chosen the "Afnor CSR Commitment" label.

3.3.3.2.2 Responsible purchasing



Procurement strategy

EDF works with around 12,800 suppliers each year.

The Group Purchasing Department manages EDF's purchases, excluding fuel purchases and a portion of tertiary, IT and telecommunications purchases for certain subsidiaries. This totalled more than €8 billion in orders in 2019 (compared to 7 billion in 2018), excluding suppliers belonging to the EDF group, broken down as follows: €4.7 billion in engineering and production purchases, €2.2 billion in tertiary and services purchases and €1 billion in IT and telecom purchases.

In 2019, EDF's top five suppliers accounted for 11.3% of the total amount ordered by EDF (excluding fuel purchases), and the top ten accounted for 18.1% of that amount. They are listed below, in alphabetical order: Alstom Power Service, Assystem Engineering and Operations, Capgemini Technology Services, CWT France, Endel SAS, Onet Technologies TI, Orano Démantèlement et Services, Sopra Steria Group, SPIE Nucléaire and Westinghouse Électrique France SAS. Suppliers are considered strategic based on a criterion of non-substitutability and the purchasing volume. EDF implements suitable monitoring actions.

In 2019, 95.23% of its purchases were made in France, 0.84% in the Netherlands, 0.7% in Germany, 0.6% in Switzerland, 0.44% in Singapore, 0.34% in the United Kingdom, 0.24% in Spain, 0.23% in Portugal, 0.22% in the United States, 0.21% in the Czech Republic, 0.17% in Belgium, 0.16% in Italy, 0.13% in Lebanon, 0.11% in Japan, 0.11% in Morocco and 0.27% in more than 50 other countries in Europe and worldwide.

Responsible purchasing practices

EDF's policy

EDF's responsible purchasing policy is at the heart of the Group's social and environmental responsibility practices in its supply chain. It is structured by the Group Purchasing Department, which sets the general framework and manages the Purchasing function while respecting the management independence of network managers.

Under the Group Purchasing policy, as updated in 2019, its suppliers are required to comply with the Group's values and all contracts must include environmental, social and human rights clauses. Suppliers may not take part in any tendering procedures unless they have signed a compliance undertaking⁽¹⁾, relating to bribery and corruption, money laundering, terrorist financing and conflicts of interest. The "Sustainable Development Charter between EDF and its suppliers"⁽²⁾ forms one of the contract documents making up each contract and is binding on all suppliers and their own value chain. Even when these mechanisms are not directly applied, the major subsidiaries use equivalent methods of commitment adapted to their specific industrial or geographic characteristics. For example, all of EDF Renewables qualified suppliers have signed its sustainable development charter.

The Group Purchasing policy encourages local sourcing and value creation in the regions⁽³⁾. More than 95% of purchases are made in France. Through this policy, it has a long track record of giving preference to relationships with SMEs and using the sheltered worker sector and structures for integration through economic activity. EDF makes full use of the new possibilities offered under Directive 2014/25/EU, allowing certain purchases to be reserved for sheltered programmes. In 2019, EDF's purchases from the solidarity sector amounted to €11.3 million.

(1) https://www.edf.fr/sites/default/files/Lot%203/FOURNISSEURS/HOMEPAGE/Nos-processus/20190501_edf-declaration-et-engagement-de-conformite.pdf.

(2) <https://www.edf.fr/sites/default/files/Lot%203/FOURNISSEURS/ACHAT%20RESPONSABLE/charteddeddfournisseursv2042014.pdf>.

(3) See section 3.3.1.2.6 "Creation of value in the regions".

The voluntary development of industrial synergies between EDF entities reinforces the Group's coherence in its relations with suppliers and service providers. This is the case, for example, for purchases of wind turbines (for which Luminus and EDF Renewables cooperate) and also for hydro, nuclear, thermal and HVB power and tertiary and IT purchases, for which nearly all of the European subsidisers benefit from EDF framework agreements.

When implementing purchasing contracts, the Group Purchasing Department ensures that financial balance is maintained with respect to suppliers, in particular through compliance with payment deadlines and pricing actions. Each buyer shall

Collaborative reverse factoring

	2019	2018	2015
No. of beneficiary suppliers	588	623	423
Amounts (in millions of euros)	1,074	744	522

Responsible, balanced supplier relations

In 2019, a follow-up audit reaffirmed the "Supplier Relations and Responsible Procurement" (RF&AR) Label conferred on EDF in 2015 by the Ministry for the Economy, Company Mediation and the French Procurement Board (Conseil National des Achats). It rewards companies that have sustainable and balanced relationships with their suppliers⁽²⁾. In March 2019, Enedis, the distribution network manager, signed the Responsible Supplier Relations Charter and began the process of obtaining the "Supplier Relations and Responsible Procurement" label.

An online service reserved for suppliers is available on EDF's website. It helps suppliers promote themselves, access to "one-stop shop" spaces dedicated to nuclear and hydraulic service providers and for SMEs to have a single point of access where they can publish their product and service offerings; This service provides access to the Group Purchasing platform, a discussion tool for authorised suppliers, and to all reference tools and documents (such as the general terms and conditions of purchase for "small" and "simplified orders" and the GDPR conditions that apply to EDF) for all suppliers. In addition, a toll-free number (08 00

sign the mandatory ethical undertaking which lists the principles to be complied with in relationships with current and prospective suppliers.

In August 2019, EDF was sanctioned following an inspection by the DGCCRF (French Competition, Consumer Affairs and Fraud Office), as it had paid more than 10% of its invoices late in 2017 (see section 6.6.3 "Information on invoice settlement times (accounts payable and receivable) required by Article L. 441-6-1 of the French Commercial Code (*Code de commerce*)").

The EDF group offers its suppliers collaborative reverse factoring, granting them the possibility to pre-finance their invoices before the contractual due date, as soon as EDF issues the payment voucher⁽¹⁾.

97 10 79) can be used to anonymously report any difficulties that cannot be resolved during the usual monitoring of contractual relations. Finally, as is the case for all stakeholders, suppliers can use the Group's whistleblowing system, set up in accordance with the Sapin 2 and Duty of Care laws, which guarantees anonymity and is available in the Group's six languages.

In order to foster dialogue and promote local sourcing and skills development for local businesses, the entities in each country organise regular forums or specific schemes such as "CAP ENR" and the "One River, One Territory" workshops. At the same time, the Group Purchasing Department organises themed Supplier Days, organised by the main purchasing divisions (generation and engineering, IT and telecommunications, the tertiary sector and services).

The Group Purchasing Department continued its proactive programme of "Productivity Partnerships". The aim is to improve contract performance through cooperation between EDF and its suppliers, to their mutual benefit. The benefits may be financial, organisational or technical (indirect gains, such as shortened construction times or avoided costs). Results are up:

Productivity Partnerships

	2019	2018	2017
Productivity gains within the scope of EDF (in millions of euros)	134.2	96.4	56.8

Enhanced risk analysis

Supplier compliance with CSR commitments is primarily ensured by a mechanism prioritising assessments based on risk mapping covering EDF's 253 purchasing segments. On this basis, in 2019, the Group Purchasing Department enhanced the performance of its risk analysis, implemented in particular in accordance with the "Duty of Care" law. The new methodology factors in all CSR aspects (environment, working relations and working conditions, human rights, ethics and compliance), and ultimately allows it to determine the level of residual risk and identify the action to be taken with the supplier.

Inherent risks and residual risks⁽³⁾ are assessed on a scale of 1 to 4: low, material, major or critical risk. Any critical residual risk in the assessed segments can be secured using countermeasures implemented prior to contracting, the contractual clauses and contract monitoring. Major residual risks have been identified in the various sectors of purchasing, mainly concerning safety, ethics, waste, the use of rare materials and human rights. 14% of the purchasing segments analysed are

classified as having a major residual risk, 43% are classified as having a material residual risk and 43% are classified as having a low residual risk.

Supplier monitoring is mainly carried out by the Division or Contract Management, which uses Performance Assessment Sheets and Supplier Assessment Sheets. Almost 10,000 assessments are completed each year, on almost 2,000 suppliers. CSR assessments and audits are also carried out. For example, the Nuclear Generation Division conducts around 100 qualification or follow-up audits each year and the Group Purchasing Department arranges hundreds of questionnaires and around 50 audits worldwide each year:

- the Group Purchasing Department uses Afnor's Acesia online assessment and dialogue platform to send these questionnaires. The questionnaires completed by the supplier are systematically (and independently) checked by the Afnor teams. This tool makes it possible for purchasers and suppliers to share an approach of continuous improvement in corporate social responsibility;
- on-site supplier audits are conducted by external, independent providers.

(1) EDF enables its suppliers to benefit from interest rates based on its own financial risk and credit standards.

(2) EDF was one of the first signatories of the Responsible Supplier Relations Charter.

(3) Residual risks are the risks remaining after countermeasures have been adopted.

3. Non-financial performance

EDF, a company committed to a just and fair transition

At the end of 2019, 1,750 suppliers were questioned using the Acesa platform, and 815 have been controlled. The assessments were "satisfactory" for almost 40% of the questionnaires. They were "satisfactory" or "acceptable with comments" in more than 80% of all audits. Group entities that do not use the Acesa platform use their own specific assessment methods. Suppliers of the Nuclear Department must agree to comply with the Progress Charter for Exemplary and Efficient Nuclear Power and the Social Specifications of the Strategy Committee for the Nuclear Sector. Edison uses a self-assessment platform that focuses on the ten principles of the Global Compact and is shared with other companies. EDF Renewables assesses its suppliers of strategic wind and solar energy equipment in its qualification processes, comprising selection criteria in all CSR fields. A Chinese turbine supplier that qualified for the very first time was only selected for its ISO14001-certified plants.

All Group entities conduct assessment or follow-up audits in their supply chain. For example, the Dalkia teams conducted 2,718 health and safety audits on its subcontractors at worksites or customer sites operated by Dalkia. EDF Hydro audited 62 of its suppliers: one of them obtained an insufficient CSR risk control rating for a subcontractor in China. As a result, it was asked to produce an action plan and the orders placed with it were monitored closely. Luminus noted a major discrepancy with a subcontractor of one of its main suppliers: after several alerts, the entity suspended its contract until the relevant company became compliant. The Purchasing Department also conducted 35 on-site audits in Europe, 77% of which were in France. Apart from five year-end audits whose reports were still pending on the date of review, 40% had a "Satisfactory" rating, 50% an "Acceptable with Comment" rating and 10% an "Insufficient" rating, requiring supplier action plans.

The main areas for improvement identified were: the requirements arising under the duty of care law, which are still insufficiently applied by suppliers in their own supply chain; operational discrepancies in the management of liquid effluent and chemical containment and waste monitoring; the formal recording of CSR commitments, which is not automatic, in particular for waste and energy use reductions; a failure to obtain information on the recycling rate or percentage of recycled materials in incoming products; a low number of GHG assessments; insufficient consideration of biodiversity factors. Non-conformities were found in safety signage and training courses did not include preventive health actions (e.g. on addictions). Moreover, there were not many training courses on ethics or the prevention of bribery and corruption, discrimination and harassment. The development of good societal practices, such as using car-sharing and fleets of electric vehicles when employees travel within urban areas, and partnerships with start-ups, was also highlighted.

Coal and uranium supply chain

Since its coal contracts were taken over by JERA Trading (JERAT), EDF has no direct contractual relations with mining companies or the market, but remains an active promoter of the Bettercoal⁽¹⁾ responsible coal purchasing initiative that it helped to found. Bettercoal brings together energy companies, port institutions and coal terminals to promote CSR in the coal supply chain, mainly at mining sites, to ensure that fundamental rights are respected. The operational approach (audits and self-assessments) is based on a code that sets out ethical, corporate and environmental principles and provisions relevant to mining companies. It takes into account general performance requirements, including management systems, and also performance requirements concerning: ethics and transparency, human and labour rights (such as the prevention of forced and child labour, the right to a decent wage), social issues, including health and safety, and the environment. EDF has not renewed its membership but its coal supplies remain covered by Bettercoal as JERAT, its supplier, is now a member, thus increasing Bettercoal's influence in Asia.

EDF obtains its uranium supplies over the long term under diversified contracts in terms of origin and suppliers, in most of the main producing countries (Australia, United States, Canada, Kazakhstan, South Africa and Russia). The clauses authorising the completion of audits and setting out EDF's expectations in terms of enforcement of the fundamental rights and main international standards by suppliers and subcontractors have progressively been added to contracts. The uranium mine audit system used by EDF since 2011 ensures that the ore is extracted and processed in good environmental, social and societal conditions. The method was developed with the WNA (World Nuclear Association), consisting of a standardised framework recognised by all those involved in the sector. It takes into account the issues of human rights and fundamental freedoms (human rights, whistleblowing register, rights of indigenous peoples and radiation protection) and also the environment, in the broadest sense of that term (water, diversity, waste, site clean-up after extraction).

Every year, EDF carries out mine audits through internal means (2 audits in 2019). The reports present with the main strengths, recommendations and suggestions. The most common ones relate to health and safety (wearing personal protective equipment such as gloves or goggles), the display of safety instructions, monitoring accidents, performing radiological controls, monitoring CO₂ emissions and proposals relating to well-being in the workplace. Audit recommendations are included in the improvement plans.

(1) bettercoal.org/.

3.4 Indicators and methodology

3.4.1 Indicators

3.4.1.1 Performance Indicators

Performance Indicators	2019	2018	2017	Target	Scope ⁽¹⁾
EDF, A COMPANY COMMITTED TO THE ENERGY TRANSITION (see section 3.2)					
EDF, a leader in low-carbon energy (see section 3.2.1)					
EDF group direct greenhouse gas emissions (scope 1) (MtCO ₂ eq) ⁽²⁾ √	33	36	51	< 30 Mt* in 2030	Group
Carbon intensity: CO ₂ emissions ⁽³⁾ due to heat and electricity generation (g CO ₂ /kWh)	55	57	82	-	Group
Net installed renewable electrical generation capacities (GW) ⁽⁴⁾	32	33	32	50GW in 2030	Group
EDF, a company standing shoulder to shoulder with its customers (see section 3.2.2)					
Number of smart meters installed (millions)	26	18	10	41 million by 2021	Group
EDF group's Electric Vehicles rate in the fleet of light vehicles (%)	8.6	>6.1	-	100% by 2030	Group
Number of customer visits on digital consumption monitoring platforms (in millions)	47	28	-		Mainland EDF
EDF, A COMPANY COMMITTED TO A JUST AND FAIR TRANSITION (see section 3.3)					
EDF, a company with a responsible attitude to people and communities (see section 3.3.1)					
Percentage of projects on which there was consultation in accordance with the Equator Principles	89.7	82.0	-	100% by 2030	Group
Number of energy support	894,260	1,302,590	-	-	EDF and ES
Proportion of executives who have completed the anti-corruption training programme (%)	62	57	42	100% by 2021	Group
Annual rate of procurement from SMEs (%)	22.5	23.7	23.5	22% -26%	EDF and Enedis
Nuclear safety: Number of significant level 2 events on the INES scale	3	1	4	-	Group
EDF, an environmentally-friendly company (see section 3.3.2)					
Solid radioactive waste from operations					
France: volume of long-lived high and intermediate level solid radioactive waste (m ³)	304	315	300	-	Group
United Kingdom: volume of low level radioactive waste generated (m ³)	444	474	453		
Level of awareness of the ecological value of the land (%) ⁽⁵⁾	52	51	50	-	Group
Water intensity: water consumed/electrical production of fleet (l/kWh)	0.87	0.86	0.94	< 1 l/kWh in average over 5 years (2015-2030)	Group
EDF, a company with a responsible attitude to its employees and service providers (see section 3.3.3)					
Gender balance index: percentage of women in the Management Committees of the Group's entities.	27.3	26.3	-	28% by 2023	Group
Overall LTIR (employees and service providers)	2.4	-	-	< 1.8 by 2020	Group
Number of fatal accidents linked to business risks (employees and service providers)	7	1	7	0	Group
Percentage of employees who attended a training during the year	80	83	84	75%	Group

* Figure being adjusted to take into account the SBT initiative.

(1) For the methodology and scope of each performance indicator, see section 3.4.2.

(2) Excluding life cycle analysis of generation plants and fuel. 2018 figure of 35.5Mt rounded to 36Mt and 2017 figure of 51.3Mt rounded to 51Mt. 2019 indicator subject to reasonable assurance check by KPMG SA.

(3) Excluding life cycle analysis of generation plants and fuel.

(4) The 2019 figure is impacted by the sale of Alpiq (775MW renewable), a non-strategic asset sold in May 2019. For the methodology used for net data consolidation, see section 3.4.2.1.1.

(5) The 2018 and 2017 figures have been recalculated based on the new 2019 scope.

√ 2019 indicator subject to reasonable assurance check by KPMG S.A.

3. Non-financial performance

Indicators and methodology

3.4.1.2 Other indicators

SOLID RADIOACTIVE WASTE INDICATORS – GROUP IN FRANCE ⁽¹⁾

	Unit	2019	2018	2017
Decommissioning radioactive and industrial waste				
Very Low Level radioactive Waste (VLLW) ⁽²⁾	m ³	2,481	4,111	1,186
Low and Intermediate Level radioactive Waste (LLW and ILW) ⁽²⁾	m ³	785	321	410
Radioactive waste from operations				
Very Low Level solid radioactive Waste ⁽³⁾	m ³	3,101	3,289	3,536
Short Lived Low and Intermediate Level solid radioactive Waste ⁽³⁾	m ³	5,734	5,827	5,603
Long-Lived High and Intermediate Level solid radioactive Waste ⁽³⁾	m ³	304	315	300

(1) The Group's scope in France includes EDF and Framatome.

(2) From 2018, the very low-level decommissioning & industrial waste indicator figures included Framatome (1,383m³). From 2019, the low- and intermediate-level waste decommissioning & industrial waste indicator figures included Framatome (2m³).

(3) 2018 and 2017 respectively rounded up from 3,289.3 to 3,289; 3,535.9 to 3,536; 5,827.4 to 5,827; 5,603.4 to 5,603; 315.4 to 315; 300.2 to 300.

SOLID RADIOACTIVE WASTE INDICATORS – GROUP IN THE UK

	Unit	2019	2018	2017
Radioactive waste from operations				
Transported Low Level radioactive Waste	m ³	444	474	453
Generated Intermediate Level radioactive Waste	m ³	161	161	161

SOLID RADIOACTIVE WASTE INDICATORS – FRAMATOME ⁽¹⁾ IN BELGIUM AND THE USA

	Unit	2019	2018	2017
Decommissioning radioactive and industrial waste				
Class A radioactive waste – USA	m ³	235	208	-
Class A radioactive waste – Belgium	m ³	87	168	-

(1) The figures for Framatome's international activity are reported from 2019. The 2018 figures are presented retroactively.

SOCIAL INDICATORS

EDF group	Unit	2019	2018	2017	Ref. GRI
Workforce as of 31/12/2019 and breakdown					
EDF	Number	63,962	65,368	66,789	102-8
Enedis	Number	38,754	38,691	38,888	102-8
TOTAL EDF group ✓	Number	164,727	165,790	152,033	102-8
Total EDF group headcount (full-time equivalent – FTE)	Number	161,523	162,209	148,785	102-8
Employee breakdown by age					
Under 25 years old ✓	%	7%	7%	7%	102-8
From 25 to 35 years old ✓	%	29%	29%	30%	102-8
From 36 to 45 years old ✓	%	26%	26%	26%	102-8
From 46 to 55 years old ✓	%	26%	26%	26%	102-8
56 years old and older ✓	%	12%	12%	11%	102-8
Managers	Number	53,095	52,366	45,517	102-8
Percentage of women at managerial level ⁽¹⁾	%	37%	35%	32.5%	405-1
Non-management employees	Number	111,632	113,424	106,515	102-8
Workplace equality					
Male workforce ✓	Number	123,815	124,889	112,504	405-1
Female workforce ✓	Number	40,912	40,901	39,529	405-1
Male managers	Number	38,097	37,888	32,654	405-1
Female managers	Number	14,999	14,478	12,863	405-1
Percentage of women on the Management Committees ⁽²⁾	%	27.0%	26.3%	Not available	405-1

✓ 2019 indicator subject to reasonable assurance check by KPMG S.A.

EDF group	Unit	2019	2018	2017	Ref. GRI
Hires/departures					
Hires	Number	10,377	9,809	9,398	401-1
Retirement departures/inactive employees	Number	3,444	3,775	5,031	401-1
Resignations ⁽³⁾	Number	3,285	3,141	2,397	401-1
Redundancies – dismissals – people made inactive	Number	1,545	1,114	2,140	401-1
Turnover ⁽⁴⁾	%	5.6%	5.4%	6.13%	401-1
Other arrivals ⁽⁵⁾	Number	7,289	6,739	9,999	401-1
Other departures ⁽⁴⁾	Number	10,259	8,562	7,825	401-1
Compensation					
Total gross compensation	€M	See note on Staff costs			
Part-time employees	Number	10,389			102-8
Absenteeism					
Average number of days lost through illness and accidents ⁽⁶⁾	Number	9.10	9.12	9.19	403-2
Health and safety conditions					
Fatal accidents involving employees linked to business risks	Number	1	[0]	2	403-9
Accident frequency rate LTIR ⁽⁷⁾		1.8	Not available	Not available	403-2
Overall Group frequency rate LTIR		2.4	Not available	Not available	403-2
Employee workplace accidents (with at least one lost day)	Number	434	667	613	403-9
Accident severity rate ⁽⁸⁾		0.14	0.13	0.15	403-2
Occupational illnesses		63	Not available	Not available	403-10
Employee relations					
Employees covered by collective bargaining agreements	%	88%	88%	89%	102-41
Training					
Hours of training provided	Number	6,820,423	7,629,101	7,830,735	404-1
Number of employees benefiting from training	Number	131,992	138,131	129,479	404-1
% of employees having completed training ⁽⁹⁾	%	80.0%	83.0%	83.7%	404-1
Employment and integration of employees with disabilities					
Number of employees with disabilities ⁽¹⁰⁾	Number	5,682	5,640	5,279	102-8

(1) This percentage represents the number of women in managerial positions/the number of female employees.

(2) This percentage, collected since 2018, represents the number of women on Management Committees/number of people on Management Committees.

(3) The end of special contracts (including work-study employees) are counted under "Other departures", regardless of the action that may be taken. Departures during probationary periods are counted under "Other departures".

(4) Turnover is calculated as follows: entries (number of hires) + exits from the workforce (number of retirements + number of resignations + number of redundancies, dismissals, individuals placed on inactive status) divided by two and compared with the physical headcount at the end of the period multiplied by 100.

(5) Entries and exits from scope are accounted for under: "Other arrivals" and "Other departures" respectively. Work-study employees are accounted for under "Other entries".

(6) This data takes account of the fact that the data reported by Framatome is limited to employees working in France (see methodological note section 3.4.2).

(7) The frequency rate represents the number of workplace accidents involving at least one lost day for every million hours worked.

(8) The accident severity rate represents the number of days lost for every thousand hours worked.

(9) The % of employees having received training corresponds to the number of employees having received training/Physical headcount at the end of the period.

(10) In certain subsidiaries, this data is declarative.

3.4.2 Methodology

3.4.2.1 Reporting scope

3.4.2.1.1 Principles

The scope covered by the reporting process (societal, environmental and social indicators) includes the entire EDF group as defined by the financial consolidation. More precisely, this scope includes EDF and the comprehensively integrated subsidiaries (integration of 100% of the value of the indicators). Subsidiaries accounted for using the equity method are excluded from the reporting scope, except for renewable capacity data, which is also aggregated using the net consolidation method (see § Net consolidation of electrical generation fleet capacities).

The data on non-financial performance are consolidated according to financial standards (IAS-IFRS)⁽¹⁾. The entities acquired during the fiscal year are included in the scope of consolidation on the year following the date of acquisition for environmental and social data, and the year of acquisition for social data if the acquisition was made more than six months from the reporting date. Data on both staff on record and generation capacities is presented at 31 December.

The Group's renewable electrical generation capacities are consolidated in accordance with financial standards and also using the net consolidation method. This method takes account of the data of all subsidiaries in which the Company has a shareholding (i.e. shareholding in subsidiaries, associated companies, and joint ventures), and the data is consolidated to the tune of the percentage held by the entity, except for Dalkia, whose capacities are fully consolidated.

3.4.2.1.2 Changes in scopes

EDF Renewables transferred photovoltaic assets to ENR, which has been included in the scope since 1 January 2019. The Cyclife Holding now includes SOCODEI.

The reporting indicators are used on the following basis:

- the scope of consolidation established by the Financial Department;
- the aforementioned rules in terms of variation of scope;
- the criteria linked to relevance of the subsidiaries' activities in terms of environmental and social impact:
 - for the environmental and social data, data from industrial activities that are significant in terms of environmental impact is reported, therefore, some subsidiaries included in the financial scope may not appear in the report due to their activity or their small size with respect to the environmental challenges,
 - concerning social data, the selection criterion is the entity's workforce (greater than 50).

For 2019, given the criteria presented above, the differences between the reporting scopes for the social, societal and environmental indicators are as follows:

- subsidiaries taken into account in the reporting of environmental indicators and not in the reporting of social indicators: EDF Belgium (Belgium), EES (USA), C73 and C74 (subsidiaries with a wind and solar generation fleet in the USA);
- subsidiaries taken into account in the reporting of social indicators and not in the reporting of environmental indicators: Citelum, G2S, CHAM, EDF Trading and China Holding.

List of main entities included in the consolidation scope of the social, societal and environmental data as of 31/12/2019	Scope of social and environmental indicators	Scope of social indicators
Électricité de France	X	X
SEI	X	X
Enedis	X	X
EDF PEI	X	X
Électricité de Strasbourg	X	X
EDF Renewables	X	X
ENR	X	X
Dalkia	X	X
Framatome	X	X
Citelum		X
G2S		X
CHAM		X
Cyclife	X	X
EDF Trading	X*	X
EDF Energy	X	X
Edison	X	X
Luminus	X	X
EDF Belgium	X	
EDF Norte Fluminense	X	X
MECO	X	X
China Holding		X
C73	X	
C74	X	

* Only the subsidiary EES – EDF Energy Services (USA).

(1) Group reporting guidelines, chapter 6.

3.4.2.2 Further details on social, environmental and societal data

The environmental and societal data in this document are based on methodological sheets. This was the Group's standard for reporting in force in 2019. All of the indicators relating to consumption and emissions are linked to the electricity and heat generation and marketing data, and to other processes related to these activities.

If data are missing, particularly during the last days of the year, estimates are made on the basis of the best information available at that date.

Dalkia's environmental indicators in relation to energy are consolidated over a sliding year, from 1 December N-1 to 30 November N. Other indicators are reported over year N.

3.4.2.2.1 Performance Indicators

EDF group direct ⁽¹⁾ greenhouse gas emissions (scope 1)

EDF group scope 1 emissions (CO₂ equivalent) are comprised of direct emissions of CO₂, N₂O, CH₄, SF₆ and other minor emissions, estimated based on the full GHG report for year N-1, i.e. 0.57Mt of CO₂e (approx. 1.6% of scope 1) in 2018. The Global Warming Potential (GWP) coefficients were updated for 2019 based on the most recent reference from the latest IPCC report (see 5th IPCC report: www.ecoinvent.org/database). They are 30 for CH₄, 23,500 for SF₆ and 265 for N₂O. The scope covers the Group.

Carbon intensity: specific CO₂ emissions due to heat and electrical generation

The indicator is the ratio of the direct CO₂ emissions of electricity and heat generating plants to their related generation. The scope covers the Group.

Installed net renewable electricity generating capacities

The indicator takes account of net consolidated installed electricity generating capacities. The scope covers the Group.

Number of smart meters installed

The indicator takes account of the total number of smart meters installed (set up) on 31 December of the fiscal year. This total includes all meters installed since the start of the smart meter deployment programme. The Group's only entities with this activity are Enedis, SEI, EDF Energy and the International Division. For this indicator, these entities then cover the entire Group.

EDF group's electric vehicles rate in the fleet of light vehicles

The indicator is the ratio of the number of electric vehicles (according to the EV 100 initiative low-carbon criteria ⁽²⁾) to the total number of vehicles in the EDF group's registered light vehicle fleet. From 2026, light emergency service vehicles following a major climate event will, in accordance with the EV 100 initiative, be deducted from the total number of EDF group vehicles. The uncertainty of this indicator is calculated to be +/-0.5 points. This is linked to the current precision of the total Light Vehicle fleet count. However, this precision was higher in 2019 than it had been in 2018, when it was 0.7 points. The scope covers the Group.

Number of customer visits on digital consumption monitoring platforms

This indicator counts the number of customer visits on digital consumption monitoring platforms. The scope covers EDF (excluding French overseas departments and Corsica) given that the deployment of digital platforms in French overseas departments and regions has not been finalised.

Percentage of projects on which there was consultation in accordance with the Equator Principles

The indicator is the percentage of projects worth more than €50 million, with a significant impact on regions or the environment, examined at Executive Committee Commitment Committee meetings during the fiscal year, and on which there was consultation in accordance with the Equator Principles. The scope covers the Group.

Number of "energy support" initiatives

The indicator takes account of the number of cases of support provided to any customers experiencing difficulties. This support is intended to assess the situation and propose the most appropriate solutions. The scope covers France where the activity concerns two entities: EDF and ÉS.

Proportion of executives who have completed the anti-corruption training programme

The indicator is the ratio of the executives who have completed the anti-corruption training programme to the Group's total number of executives. This is cumulative data, which has been recorded since June 2016. Executives, for EDF, are staff included in categories D1, D2, and D3 as well as members of the Executive Committee and, for subsidiaries, members of general management. An executive is considered to have completed the anti-corruption training programme when they have received the certificate for this course (certifying that the full training programme has been completed). The scope covers the Group.

Annual rate of procurement from SMEs

The indicator is the ratio, expressed as a percentage, of the annual volume of procurement by EDF SA and Enedis from SMEs located in France, to the annual volume of total procurement in France by EDF SA and Enedis.

SMEs are identified based on INSEE (French National Institute of Statistics & Economic Studies) categories, stipulating that an SME (Small- and Medium-Sized Enterprise) has fewer than 250 staff and annual turnover not exceeding €50 million.

Suppliers are ranked in the SME category by a service provider that EDF tasks with analysing the supplier list, checking that these SMEs are not controlled above 25% by a Big Business or by an MMC.

The scope covers France, where the SMEs' locations are certified based on their French company registration number (SIREN).

Nuclear safety: Number of significant level 2 events on the INES scale

The indicator concerns the number of level-2 major events on the INES (International Nuclear Event Scale). The scope covers the Group.

Solid radioactive waste from operations

The indicator concerns solid waste from the active nuclear generating fleet. In France, the indicator covers long-lived high- and intermediate-level waste. In the UK, the indicator covers low-level waste (only category of radioactive waste transported off generation sites). The scope covers the Group where radioactive waste-related activities concern: EDF, Framatome and EDF Energy.

Biodiversity

The indicator on the assessment of knowledge of the ecological quality of land is the ratio of the area of sites that have been surveyed (by an inspection firm or other specialist organisation) to the total area of sites (assets under majority control in the financial sense). In 2019, the scope covers EDF, EDF Energy, PEI, Edison, Luminus, Norte Fluminense, Framatome and Cyclife. In 2020, the scope was extended to EDF Renewables's French solar parks. Regarding SEI, it is not possible to define a submerged area, because this low-height dam in a tropical environment is comprised of more or less submerged islands and islets varying from season to season, with a heavy rainy season. The 2018 and 2017 figures were recalculated based on the 2019 scope. The 2019 scope covers the Group, except for SEI and EDF Renewables.

(1) Direct CO₂ emissions, excluding life cycle analysis of generation plants and fuel.

(2) 100% electric battery-powered vehicle, rechargeable hybrid vehicle with an electrical range of at least 50km, vehicle equipped with a range extender with an electrical range of 50km, hydrogen vehicle.

3. Non-financial performance

Indicators and methodology

Water intensity: water consumed/electrical generation of fleet (l/kWh)

The indicator is the ratio of water consumed to the Group's total electrical generation. Water consumption for heat generation and other Group activities is taken into account to calculate the indicator. Their negligible quantity (< 0.1%) is not sufficient to change the indicator value. The scope covers the Group.

Rate of employees who attended a training during the year

The trainings for which supporting documentation are not received on the date of closure of the report are not taken into account.

The number of training hours includes the hours spent in class for staff on vocational training contracts. For 2019, hours spent at school by trainees on professionalisation contracts were not reported by Framatome.

The indicator is calculated by finding the ratio of the number of employees having completed training to the actual workforce at the end of the period. The scope covers the Group.

Gender balance index: percentage of women in the Management Committees of the Group's entities.

The Management Committee is a decision-making body that meets one of the following criteria:

- all members correspond to 1.5 -2% of the entity's total staff;
- the Chair is an executive manager or senior manager;
- the Chair of the Committee has a delegation of authority over capital expenditure related to the Company's objects;
- the Chair of the Management Committee has disciplinary authority over all or some of the entity's employees;
- the committees meet at least once a month.

Members of more than one Executive Committee within one subsidiary, or members of both a subsidiary's Executive Committee and an EDF group Executive Committee are only counted once.

This indicator is calculated by finding the ratio of the number of women on Executive Committees to the number of people on the Executive Committees. The scope covers the Group.

Overall LTIR (employees and service providers)

In order to have comparable data between Group entities and measure accident rates directly related to the performance of activities, in 2017 EDF set-up a new "LTIR" indicator corresponding to the calculation of the frequency rate according to Anglo-Saxon standards. This indicator will be reported starting in 2019.

The Group's overall frequency rate represents the number of work-related accidents (employees and service providers, regardless of the level of subcontracting, including co-contracting and temporary employees) having resulted in one day or more of absence over a 12-month period per million hours worked. The hours worked used for calculating the frequency rate are actual hours corresponding to the hours of "exposure to risks" according to CNAM (French national insurance body). The scope covers the Group.

Number of fatal accidents linked to business risks (employees and service providers)

The indicator takes account of the number of fatal accidents linked to business risks occurring in the year. The scope covers the Group.

3.4.2.2 Further details on the environmental and societal data

Further details on the indicators relating to water

Indicators on cooling water include water withdrawn and water returned to rivers, the sea and water tables. For nuclear power electricity plants located on coastlines and for thermal power plants, the amounts of cooling water withdrawn and water returned are calculated on the basis of the operating time and nominal debit of pumps.

The CCGT cooling circuit is open for MECO. All water is thus returned, and no significant consumption is to be reported. On this basis, no amounts have been reported by MECO from 2018 onwards.

These indicators are not collected by EDF RE, a subsidiary of EDF Renewables in the United States, or by some Edison sites (only the operating centres managed by Fenice), as their values are negligible at Group level.

Further details on air emissions

Air emissions from thermal power plants of the EDF group are measured or calculated on the basis of analyses of the fuels or based on standard emissions factors.

The Group's SF6 emissions are calculated, as a matter of priority, on the basis of a mass balance or, to a lesser extent, using an estimation method approved by Executive Management at the entity in question (for example, application of a leakage rate).

GCC power plants outside EDF do not report dust emissions, which do not have a significant impact at the Group scale. MECO does not collect emissions of N2O and SF6, also without material impact at the scale of the Group.

Scope 3 indirect emissions: Every year, EDF draws up a GHG report (scopes 1, 2 and 3) covering the Group scope calculated according to the principles of the GHG Protocol Corporate Standard. The 2018 report enabled us to identify significant information items adopted for the 2019 fiscal year. In 2018, three items accounted for more than 70% of GHG emissions: direct CO₂ emissions, indirect emissions linked to combustion of gas sold to our final customers and indirect emissions linked to generation of electricity purchased to sell to our final customers.

Further details on conventional waste

The conventional waste data were obtained on the basis of data available on the closing date for the quantities removed and the disposal channels. It should be noted that the reported data are not comprehensive concerning conventional industrial waste from EDF Renewables, as these data cannot, at this stage, be reported within the Group's reporting deadlines. Dalkia reports on the most significant facilities for year N-1 for France and for foreign subsidiaries from January N to December N, using an estimate for this final month.

Construction and decommissioning waste is included in this report, if its management falls under the responsibility of the EDF group. On the other hand, waste managed by service providers is not accounted for. Regarding distribution network operator Enedis, waste reporting is done on a rolling-year basis, from 1 November N-1 to 31 October N.

Further details on radioactive waste

EDF

Indicators pertaining to “short-lived Very Low Level radioactive Waste (VLLW) from operations and from decommissioning” take into account:

- the actual volume of the short-lived VLLW directly evacuated from the Industrial Gathering, Storing, and Stockpiling Centre (Centre industriel de regroupement, d'entreposage et de stockage – CIRES) from the production sites, which corresponds:
 - to the volume of waste produced in the year for operating sites,
 - to the volume of waste shipped in the year for sites being decommissioned;
- the actual volume of short-lived VLLW waste packages sent to CIRES from Centraco (after upgrading) connected to processing by incineration and by merging EDF metallic waste. The volume to be attributed to sites in operation and sites being decommissioned is determined in proportion to the tonnages delivered by the sites in operation and by the sites being decommissioned.

Indicators pertaining to “Short Lived Low and Intermediate Level radioactive Waste (short lived LLW and ILW) from activity and from decommissioning” take the following into account:

- the actual volume of the short-lived LLW and ILW waste directly evacuated to the Aube Storage Centre (CSA) from the production sites, which corresponds:
 - to the volume of waste produced in the year for operating sites,
 - to the volume of waste shipped in the year for sites being decommissioned;
- the actual volume of short-lived LLW and ILW waste packages sent to the CSA from Centraco (after upgrading) connected to treatment by incineration and by merging with EDF waste. The volume to be attributed to sites in operation and sites being decommissioned is determined in proportion to the tonnages delivered by the sites in operation and by the sites being decommissioned.

Since 2016, the reduction in the volume contributed by treatment before storage (by ANDRA) has also applied to short-lived VLLW and also to packages sent by Centraco, where applicable. It includes the reduction in volume resulting from treatment before storage (the case of super-compacted waste).

For the indicator “Long-Lived High- and Intermediate-Level solid radioactive Waste” (HILW-LL), the packaging of the waste is taken into account in the calculation.

Given the technical constraints linked to processing operations, the packages are produced approximately ten years after the fuel has effectively generated waste. The indicator is thus an estimate that relies on the long existence of current practices of packaging of Long-Lived waste that projects the current packaging ratio into the near future (number of packages effectively created following the processing of one tonne of fuel). This ratio essentially depends on the mixtures used to optimise the operations and is a combination:

- for waste generated directly by spent fuel: factors from the National Inventory of Radioactive Materials and Waste carried out by the National Agency for Radioactive Waste Management (ANDRA);
- for waste not generated directly from fuel (control rods, etc.) and for which an average lifespan of 10 years is assumed: on the basis of feedback.

Framatome

Radioactive waste data from Framatome in France is similar to EDF’s dismantling waste and so can be consolidated. Internationally, Class A waste (USA and Belgium) are not consolidated with French figures. Radioactive waste is shipped and handled in accordance with domestic regulations in force in each country.

EDF in the United Kingdom

The data relating to the indicator “Intermediate-Level radioactive Waste” of nuclear activities of EDF Energy, are founded on the inventory of radioactive waste produced during the year, established by the Nuclear Decommissioning Authority. This is an estimate of the annual volume of waste that will be considered and classified as Intermediate-Level radioactive Waste at the end-of-life of the nuclear generation sites. These estimates include packaging necessary to allow the transport of wastes off site. All of the Intermediate-Level radioactive Waste is temporarily stored at the nuclear generation sites while waiting for a national

decision on their final processing. The national inventory was updated in 2019 and the inventory was published on the official site of the “UK Radioactive Waste Inventory”.

“Low Level radioactive Waste” includes desiccants that are sent for processing in the form of Intermediate-Level Waste in compliance with applicable regulations.

Further details on the quantity of electricity and heat generated from renewable energies

For Dalkia, the quantity of electricity is measured. The quantity of heat generated using renewable energies is estimated through benchmark yields based on renewable fuel consumption.

3.4.2.2.3 Further details on social data

Further details on the theme of social dialogue

A KPI is currently being considered to supplement the results presented in the dedicated part § 3.3.3.1.7.

Further details on the workforce and transfers

Since 2011, the population considered in data collection is all employees who have a non-suspended employment contract with one of the Group’s companies.

For entities having left the consolidation scope during the year in question:

- the indicators calculated in aggregate since the start of the year take into account those entities for the period during which they belonged to the scope of consolidation;
- the indicators measured at 31 December represent the situation at the end of the year and do not take into account the entities which have left the scope of consolidation.

The workforce includes employees shared between EDF and ENGIE. An employee working 50% for EDF is counted for 0.5 in the published workforce.

The indicators “Other arrivals” and “Other departures” include:

- movements between companies of the Group;
- movements of workers in the electricity and gas industry, in compliance with industry-based agreement (IEG status);
- movements of certain categories of employees, in particular those with rotating shifts, doctors and personnel made available by outside entities.

These movements are thus not recognised in hires, resignations or redundancies.

Further details on calculating absenteeism

In its calculation of absenteeism, EDF includes absences for the following reasons: absences due to sickness, work and travel related injuries as well as absences due to other reasons such as unpaid leave and unjustified absences. Absences related to company and union activities, pre-retirement leave and maternity leave are not included. The number of hours worked used in the calculation of the absenteeism rate is the number of hours theoretically worked.

Absences due to part-time work on health grounds are taken into account to the tune of 50% of the contractual working time.

The data reported by Framatome in relation to the number of days of absence for illness in 2019 is limited to employees working in France, *i.e.* 9,132 out of a total workforce of 14,630.

At the Group level, the “average number of absences” is the sum of absences due to sickness, counted in days worked in proportion to time worked by employees and absences due to work-related accidents, counted in calendar days.

Further details on the number of work-related workplace accidents

As regards temporary employees and service providers, the accidents are declared by the temporary employment agency and by the service provider’s employer in accordance with applicable local labour regulations. These include accidents that occurred in the course of work performed on behalf of EDF group on its facilities, equipment, sites, networks, etc. Activities conducted by service providers on their own sites, outside EDF group’s facilities, are not taken into account.

3. Non-financial performance

Non-financial rating

For a “contracting” company, subcontracting involves entrusting a company, known as the “service provider”, with carrying out one or more projects involving studies, design, development, manufacturing, implementation or maintenance. These include any interventions carried out by subcontractors under a contract on EDF group’s facilities, equipment (sites, networks, etc.) within the scope of subcontracting as set out in paragraph 3.3.3.2. These include the number of workplace accidents declared in accordance with applicable local labour regulations, the circumstances of which demonstrate that they are work-related. Dizzy spells and accidents during team-building activities, and accidents in daily life occurring in the workplace are not taken into account.

Further details on the accident indicators

Road accidents may be taken into account when local laws consider them as work-related accidents.

Fatal accidents involving service providers linked to business risks include fatal accidents involving service providers that occurred during the course of work performed on behalf of the Company regardless of the level of subcontracting; malaises are excluded. Employee transit accidents while on work-related business are taken into account but not those occurring in transit between home and work.

Fatal accidents involving employees linked to business risks relates to the number of fatal employee workplace accidents, excluding malaises and accidents occurring in transit between home and work. Only the Company’s employees, including work-study employees and apprentices, are taken into account.

Further details on the number of hours worked

The value to take into consideration for the number of hours worked by employees is the number of hours worked and the “time an employee is exposed to risk under the orders of an employer”.

An additional hour counts as an hour worked regardless of the manner or level of remuneration.

The number of hours worked by service providers can be calculated in various ways depending on the type of contract or the nature of the service performed. When there is no way to formally ascertain the number of hours worked, the hours can be counted using time sheets from services provider employers, through time tracking tools or estimated based on a predetermined fixed hourly rate. Activities conducted by service providers on their own sites, outside EDF group’s facilities, are not taken into account. The hours worked during services involving the transport of equipment or merchandise are not taken into account.

Further details on integration of health and safety data

In 2017, the health and safety data of the IMTECH subsidiary (incorporated into the Group in 2017), 50% held by EDF Energy and 50% by Dalkia, was 100% incorporated into the Dalkia data.

Further details on counting occupational illnesses

In 2019, the number of occupational illnesses is published at Group level according to the definition shared by all the Group’s subsidiaries, *i.e.* the number of employees present on the 31 December having declared an occupational illness during the fiscal year that has not been rejected by CPAM. For 2019, the data reported by Enedis does not take account of applicable employees who had left the Company on 31 December.

Further details on the indicators on employees with disabilities

In countries in which regulations do not impose any mandatory declaration of the number of employees with disabilities, the reported data are provided on the basis of voluntary statements of employees. Certain subsidiaries do not communicate this type of data. In 2019, the subsidiaries EDF Training and MECO did not declare any employees with disabilities.

3.5 Non-financial rating

Evaluations by specialised rating agencies and managers of ethical funds indicate the Group’s CSR performance, in its benchmark sector. Assessments and rewards underscore external recognition of the Group’s sustainable development performance. In 2019, EDF’s results improved again: it maintained its position on the DJSI World index, continued to feature on the CDP Climate Change “A list”, and climbed quickly up the Sustainalytics rankings.

Dow Jones Sustainability Indexes (DJSI)

In 2019, EDF obtained a score of 80/100, while the Electric Utilities sector average sits at 45/100. For the fourth year in a row, EDF has been a member of the DJSI World index, which it first joined in 2016. EDF is one of 458 “Sustainability Leaders” amongst the 4,710 companies evaluated by RobecoSAM in 2019, and is ranked 10th out of 100 Electric Utilities companies (8th out of 91 in 2018, 5th out of 98 in 2017, and 6th out of 92 in 2016). In its 2020 annual report (Sustainability Yearbook), RobecoSAM classified the EDF group as a “Yearbook Member”, which means it is in the top 15% of the best performing companies in its sector of activity.

CDP Climate Change

In 2019, for the 3rd year, EDF featured on the “A list”, which was the case for the first time in 2016 and again in 2018. Fewer than 4% of the 273 Electric Utilities worldwide required by investors to respond to CDP achieved this maximum score: the industry-wide average score was C (and D for the new Nuclear power generation utilities group). In 2017, EDF was awarded an A- rating and Leadership Level. In 2015, EDF obtained an A- rating (B in 2014 and in 2013, on a ratings scale ranging from A to F). EDF’s response is published on CDP’s site.

CDP Water Security

EDF obtained a B rating, Management level, in 2019, thus improving from its result in 2018 (C in 2018, B in 2017, the same as in 2016 and 2015, on a ratings scale ranging from D- to A). EDF’s response is published on CDP’s site.

CDP Supply Chain

Every year, EDF makes CDP Supply Chain disclosures, in its capacity as a supplier to its French and foreign corporate accounts who request this information. It also

makes disclosures in the Climate Change and Water Security parts of the Supply Chain questionnaire.

FTSE4Good Index

In March 2012, the EDF group was admitted to the FTSE4Good Index. This admission is reviewed every six months, and EDF’s acceptability has been confirmed at every review since it first joined the index. The EDF group was once again included in the index in July 2019. In 2019, the overall rating rose to 4.7/5 (compared to 4.4 in 2018) and the EDF group was ranked 4th in the Utilities sector amongst all of the companies evaluated, obtaining a relative performance of 97/100 (compared to 95/100 in 2018).

Euronext VigeoEiris Indexes

In November 2012, Euronext and Vigeo jointly launched a range of indices identifying listed companies demonstrating the best performance in Social Responsibility. The indices are updated twice annually, in May and November.

At the end of November 2019, EDF was present in all the indices it can apply for: Euronext VigeoEiris World 120, Europe 120, Eurozone 120 and France 20. In 2018, during its last review, EDF obtained a score of 66 out of 100, an increase of 6 points compared to the previous score (60/100 in 2016 and 58/100 at the end of 2014), and achieved Advanced Level for the second time. It is ranked 5th out of 62 companies in the Electric & Gas Utilities sector. The next evaluation will take place in 2020.

Sustainalytics

In 2019, EDF obtained an excellent score of 86/100, up 3 point compared to 2018 (83/100), up 4 points compared to 2017 (82/100) and up 8 points compared to 2015 (78/100). It ranked 2nd out of the 193 companies in the Utilities sector. It is among the best 2% in the sector. For the third year running, the EDF group is the leader among its peers, *i.e.* companies of a comparable size in its sector of activity. EDF is a member of the STOXX ESG Leaders Index.

ISS-OEKOM

In 2019, EDF obtained the overall rating of C+ and, for the first time, obtained the rating of B+ in the "Social and Governance" section. The overall rating has been stable for six years (C+ in 2018, 2017, 2016, 2015 and 2014, and C in 2013, on a scale from D- to A+). Of the 121 companies in the Electric Utilities sector assessed by ISS-OEKOM in 2019, EDF ranked in the top 20% and was one of the very few companies in the sector to be awarded B+ for "Social and Governance".

Morgan Stanley Capital International (MSCI)

In 2019, EDF obtained Advanced Level, with an A rating (on a scale from CCC to AAA), the same as in 2018, 2017, 2016 and 2015.

EcoVadis

In 2019, EDF achieved the excellent score of 73/100 and Advanced Level, 2 points lower compared to 2018 (75/100) and 1 point higher than 2016 and 2015 (72/100). With a relative performance of 98/100, EDF group is ranked among the

best 5% out of the 211 companies in its sector of activity and the best 1% in all sectors. It was awarded the "Gold Recognition Level" reserved for companies with a score of more than 62/100.

Afnor Acesia Solutions Achats (Purchasing Solutions)

In 2018, as in 2017, EDF obtained a score of 98/100, an improvement of 7 points compared with 2016 (91/100) and 13 points compared with 2015 (85/100).

French Centre of Corporate Information (CFIE)

For the past 17 years, the CFIE has published a study on the quality of labour and environmental information in the annual reports of large French companies, with quality being assessed on the basis of the completeness and accuracy of the information provided. In 2019, for the 3rd consecutive year, the Group was ranked 1st out of the 22 big businesses assessed, with a score of 70.6/100: the average for the businesses assessed in 2019 was 58/100.

3.6 Appendices, concordance tables and report from Statutory Auditors

3.6.1 Vigilance plan



In accordance with French law no. 2017-399 of 27 March 2017 relating to the duty of care of parent companies and ordering companies, the EDF group published its third vigilance plan in this Universal Registration Document. This vigilance plan demonstrates that the identification, prevention and mitigation of risks related to serious violations of human rights, the environment and the health and safety of persons are systematically taken into account in all EDF group activities, including in its relations with suppliers and subcontractors and with a continuous progress approach. EDF's vigilance plan was determined within the framework of the UN Guiding Principles on Business and Human Rights.

3.6.1.1 Main characteristics of EDF as regards the "Duty of Care" law

The EDF group is an integrated energy company engaged in activities involving risks in three fields where the duty of care applies. EDF is active in all areas of the electricity industry and some areas of the gas industry: power generation using nuclear, renewable and thermal energies; electricity transmission and distribution; sales; energy services; energy trading (see section 1.4).

As a key player on the French market – both in mainland France and overseas regions and territories – EDF holds strong market positions in Europe, particularly in the United Kingdom, Italy and Belgium. EDF is the No. 1 nuclear-based electricity operator worldwide and the Group is also active in the design and production of nuclear equipment and fuels. As the top producer of renewable energies in Europe, EDF operates 80% of the hydroelectric power capacity in mainland France and is developing its skills in other renewable energy sources, including more particularly, land-based and off-shore wind power, photovoltaics and biomass sources. The Group is also an important player on the gas market generating electricity and heat using combined-cycle power plants and sells natural gas in several countries.

EDF's activities are based mainly in OECD countries. EDF's assets and projects that are managed in countries considered to be "higher-risk countries" require special care, including in terms of relations with partners. As regards the supply chain, over 95% of Tier-1 suppliers managed by the Group Procurement Division are located in France or the European Union. Suppliers of certain subsidiaries or suppliers involved in international projects require specific attention.

Because the Group's activities are mainly in the industrial field, EDF exercises upstream vigilance with regard to any risk of violation of persons' rights or risk to their health (employees, service providers, local residents, local communities and

customers) or risk to the environment prior to making investment decisions, particularly to build, operate, maintain or dismantle facilities.

3.6.1.2 Scope and methodology for developing the plan

Scope of the vigilance plan

The scope of the vigilance plan covers EDF's activities, the activities of subsidiaries it controls ⁽¹⁾, as well as the activities of its suppliers and subcontractors with which the Group has established commercial relations to the extent their activities are related to those relations.

Dalkia and Framatome subsidiaries with a headcount of over 5,000 employees are integrated in the plan, together with all French and foreign subsidiaries. RTE and Enedis, the French power transmission and distribution system operators, are independently managed subsidiaries, and therefore publish their own vigilance plans.

Methodology for developing the plan

The preparation of the plan involves all parties in the EDF group:

- The EDF corporate divisions: Sustainable Development Division, Legal Division, Risks Division, Ethics and Compliance Division and the Procurement Division
- EDF business lines and entities with international projects
- All other business divisions of EDF and Group subsidiaries
- The trade union organisations within the framework of the global agreement on the Group's social responsibility (Global CSR Agreement)

The plan is based on the Group reference documents:

- Mandatory Group policies binding on all controlled entities: risk management and internal control, governance of subsidiaries and holdings, project management, ethics and compliance, sustainable development, health and safety, procurement
- Internal documents made public: Ethics Charter, code of conduct ethics and compliance, Sustainable Development Charter for Suppliers, Global Framework Agreement on Corporate Social Responsibility (CSR)
- External sources: UN Global Compact, UN Guiding Principles on Business and Human Rights, OECD Guidelines for Multinational Enterprises, WBCSD CEO Guide to Human Rights, Conventions of the International Labour Organization guaranteeing fundamental principles and rights at work and combatting for the elimination of discrimination, Declaration on the Rights of the Child, Declaration on the Elimination of All Form of Discrimination against Women, OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions, UN Convention against corruption, Global Reporting Initiative (GRI), Supplier Relations and Responsible Procurement Label (RF&AR)

(1) Subsidiaries integrated into the scope of consolidation using the full consolidation method pursuant to Article L. 233-16 II of the French Commercial Code (in France and abroad).

3. Non-financial performance

Appendices, concordance tables and report from Statutory Auditors

In 2020, EDF is strengthening the governance of its vigilance plan. A dedicated compliance officer has been appointed to the Sustainable Development Division. This officer is in charge of supervising the plan and reporting, using feedback from entities and working in cooperation with the Duty of Care Committee together with the other relevant corporate Divisions (legal, risks, ethics and compliance, human resources). Directors appoint a Duty of Care Officer within the entity they manage, who may be either the Ethics and Compliance Officer or the Sustainable Development Officer.

3.6.1.3 Stakeholders association

The Global Framework Agreement on Corporate Social Responsibility signed by EDF in 2018 with the Group's trade unions and two international trade union federations (IndustriAll and ISP) states that EDF's vigilance plan will be "developed and set up in association with the Company stakeholders, including workers' representative organisations."

An annual meeting is organised for all of the signatories of the Agreement who sit on the Committee for Dialogue on Social Responsibility (CDSR) in order to work together on methodology for the vigilance plan. In 2020, work is scheduled with the members of the CDRS to jointly design new tools useful for operational staff and to optimize risk mapping on the duty of care. In 2019, training sessions on human rights and the law on the duty of care were organized at the ILO in Torino for all CDSR members with managers from the Social Dialogue Division (Group HRD).

Externally, EDF participated in discussions with other companies, lawyers, NGOs, and trade union federations within the framework of the "Entreprises pour les droits de l'homme" (Businesses for Human Rights) (EDH⁽¹⁾ non-profit organisation), in order to openly exchange on the expectations of all stakeholders, compare corporate practices and improve vigilance plan preparation processes.

EDF participated in the study commissioned by the ILO, which was presented in December 2019 on the implementation of vigilance plans.

3.6.1.4 Salient risk mapping

For EDF, the risks covered under the vigilance plan meet the criteria for "salient risks" in accordance with the UN Guiding Principles on Business and Human Rights.

Risk identification relies on the same methodological basis as general (global, comprehensive) risk mapping for the Group, which is of wider scope. Each Group entity maps internal and external risks under the management's responsibility using common evaluation and risk control criteria (see section 2.1.2.1).

General mapping ranks Group risks based on their degree of criticality, as determined from a comparative analysis of three criteria: impact, probability, level of expertise and control. Using this as an initial basis, the vigilance plan determines three categories of main risks which may be related to:

1. the safety and health of employees and service providers (see section 2.2.1-1C);
2. the impact of the Group's activities and supply chain on the climate (see section 2.2.4-4C and 3.2.1.1.5. presenting a comprehensive GHG report on Group level, *i.e.* including scope 1, 2 and 3);
3. industrial activities (outside of nuclear and hydropower) and their impacts on the environment and biodiversity (see section 2.2.1-1H).

Risks related to nuclear security (see section 2.2.2) and hydropower security (see section 2.2.1 -1B) are categorised as among the main risks in the Group's general risk mapping. Having a "security culture" and maintaining control of these risks constitute absolute priorities for the Group and are the watchwords of its global performance.

In terms of harm that could be caused to individuals and the environment, the Group considers that the most sensitive risks it faces are connected to its international business. These risks are analysed using mapping performed by the relevant entities based on three main criteria: contexts in host country, features of the projects themselves and their impacts, characteristics of the chain of suppliers and services providers involved.

Regarding the supply chain, risk mapping is performed by the Group Procurement Division. EDF's 253 purchasing segments involving 12,800 suppliers and subcontractors are mapped. The main risks concern:

1. health and safety at work, particularly lifting/handling/maintenance services;
2. the environment, mainly by the production of waste during operating and dismantling phases of facilities; as well as the use of rare materials, in particular with suppliers of IT and telecommunications equipment;
3. human rights, particularly in the textile industry which supplies Personal Protective Equipment for employees.

Analysing this mapping enables EDF to establish priorities for evaluations, controls and audits (see section 3.3.3.2.2).

Human Rights and Fundamental Freedoms

In the area of human rights and fundamental freedoms, the duty of care has led the EDF group to establish a reasonable diligence plan for all of its entities, which is implemented on the ground by identifying salient risks and the related measures to mitigate such risks. These risks are first assessed based on the country where the entity, its subsidiaries and its suppliers do business with a particular focus on higher risk countries. For EDF's activities and projects in Latin America, Asia, Africa and the Middle East, due to local practices and legislation which are less demanding than the standards applicable in OECD countries, the Group identifies:

1. risks of harm to communities, indigenous peoples and vulnerable groups (in particular when engaging in dialogue and concertation processes and when there are land issues or displacement of populations);
2. risks due to working conditions, including forced labour and child labour;
3. risks relating to practices of Security Departments or companies.

Environment

Mapping of environmental risks is performed based on the Group's line of industrial activities. These risks are identified, evaluated and ranked using the Group's environmental management system (EMS). The following points are given priority:

1. impact on the climate;
2. impact on various compartments of environment (water, soil, air, biodiversity);
3. waste management and the natural resources footprint;

In addition, chemical risks, due to their potential consequences, are studied in detail.

On the international level, risks of serious harm are first assessed based on the country where the entity, its subsidiaries and its suppliers do business or have their products manufactured. Points of vigilance given priority concern activities conducted by the chain of suppliers and service providers in Latin America, Asia, Africa and the Middle East and in certain cases, the European continent where local practices and legislation may be less demanding than in France or in the European Union. The main risks concern:

1. respect by the supply chain of the Group's commitment to the carbon trajectory;
2. protection of biodiversity;
3. waste management (conventional waste, solar panels, batteries, etc.).

Health & Safety

Mapping risks of harm to the Health and Safety of workers, customers and the public is performed by the Health and Safety Division within the framework of the EMS;

For Group employees, service providers, suppliers and subcontractors, the risks given priority are:

1. occupational accidents;
2. occupational illnesses (asbestos, ionising radiation);
3. musculoskeletal diseases and anxiety-depressive disorders.

(1) e-dh.org.

For the public, salient risks are related to the operation of industrial facilities. For example, the release of water from dams could endanger hikers and the acoustical impact of wind turbines may cause disturbance to nearby residents. For the customers of the Group entities supplying electricity, the main risk identified is an accident causing electrocution.

3.6.1.5 Risk prevention and mitigation initiatives

Risk prevention and mitigation are dealt with by each relevant entity by way of applying corporate and sectorial policies and using common Group methodology for risk control as a basis. This methodology provides a description of risk treatment action plans and an evaluation of their efficacy. Industrial projects are subject to a risk analysis within the scope of application of the duty of care, taking into account their nature, size, technical features and location. For this purpose, environmental and social impact assessments are based on the most demanding international standards (IFC, WB, ADB).

In addition, EDF systematically assesses the risks involved in investment projects. 100% of the projects presented to the Commitments of the Group Executive Committee are screened for risks related to human rights and fundamental freedoms, the environment (particularly the climate, biodiversity and natural resources), and the health and safety of people.

Human rights and fundamental freedoms

To prevent and mitigate the risk of serious violations of human rights, EDF first relies on its Ethics Charter which sets forth the Group's values, including Respect and Responsibility. These values are applied as fundamental requirements for doing business at EDF. The Charter refers to the ten principles of the UN Global Compact and in particular, businesses should support and respect the protection of internationally proclaimed human rights in their sphere of influence; make sure that their entities are not complicit in human rights abuses; must not tolerate any form of forced and compulsory labour or child labour. In addition to this, the Group's sustainable development policy provides that entities will "not tolerate any violation of Human rights in any of their businesses or the businesses of their suppliers". The EDF Global Framework Agreement on CSR places human rights as a "prerequisite for all its operations". As regards respect for the rights of local communities, dialogue and consultation constitute one of the six Corporate Social Responsibility Goals (CSR Goal No. 5) (see sections 3.3.1.1.2 and 3.3.1.2.1).

Environment

To prevent and mitigate risks of serious harm to the environment, EDF relies on its Ethics Charter to commit its entities to a precautionary approach, to acting responsibly and to developing technologies which respect the environment. Management of identified risks, including those associated with climate change, is fully integrated into the Group's EMS and internal control system. These risks are subject to action plans resulting from strategic priorities in the Group's sustainable development policy (see section 3.1.2.4.4).

The EMS organises Group-level management of environmental performance and is aimed, in particular, at controlling risks related to greenhouse gases, impacts on water, air, soil and the production of conventional and radioactive waste. Special attention is focused on preserving biodiversity and services rendered by ecosystems. This system is ISO 14001 2015 certified by the Afnor certification external expert, for a scope representing almost all the consolidated revenue of EDF and its controlled subsidiaries (excluding Enedis) (see section 3.1.2.4.2).

■ Climate

The EDF group is aware of both the impact of its activities on climate change and the impact of climate change on its activities, as well as familiar with stakeholders' expectations. EDF's main corporate social responsibility objective is focused on the

climate (see section 3.2.1.1 "EDF, a company committed to climate issues" [CSRG no. 1]). 97% of the Group's investments are designed to fulfil its low-carbon strategy, *i.e.*, using already decarbonated resources or allowing the addition of more renewable energy sources (see section 3.2.1.1.4).

Since 2017, the Group has been on a path to significantly decrease its direct CO₂ emissions. In the beginning of 2020, EDF joined the coalition "Business Ambition for 1.5 degrees". This has strengthened EDF's objective to reduce direct greenhouse gas emissions (for scope 1: 50% decrease in 2030 rather than 40% previously targeted in 2017) and the Group is planning to set objectives for reduction of indirect emissions (scope 3).

For this purpose, the Group relies on the advantage of having 90% of its production already decarbonated thanks to nuclear and hydropower (see section 1.1 key figures); the Group further committed itself to shut down coal-fired plants by 2022 in France and by 2024 in the United Kingdom (see section 1.3.2); EDF is searching for alternatives to thermal production still widely used in island territories (see section 3.2.1.1.3); and is investing in France and throughout the world (see section 1.3.4.2) with the aim to double EDF's installed capacities in renewable energies between 2014 and 2030.

■ Biodiversity

Protecting biodiversity is one of the six Corporate Social Responsibility Goals (CSR Goal No. 6) and relies in particular on the EMS. ISO 14001 certification testifies to the fact that biodiversity is taken into account in connection with Group activities. EDF's ambition, as illustrated through its commitment in 2018 to the act4nature initiative, consists in generating positive impacts on biodiversity in the future. This goal concerns the entire life cycle of installations and spans the whole length of the value chain, including procurement policies and relationships with suppliers and subcontractors (see section 3.3.2.1).

■ Conventional waste

The Group's entities and companies are committed to a process of continuous improvement according to the principle that the "best waste" is waste that is not produced. They have action plans aimed at limiting the generation of waste integrated in the management systems' action programmes (EDF, ÉS, Dalkia, Luminus, EDF Energy) with associated indicators (quantity of waste prevented, savings on waste management, quantities of equipment reused, etc.). A number of levers for action are used: internal procedures (anticipation of construction sites: organisational schemes for waste management systematically set up prior to any major construction, decommissioning or maintenance work, sales agreements or donations for reuse), specific rules in the Company specifications, innovative technical solutions (separation of water/oil from hydrocarbon effluent, asbestos stripping), numerous awareness-raising initiatives for staff and service providers (communication, training, waste prevention guide incorporating 34 best practices, e-learning), and initiatives to reduce waste hazardousness such as limiting the use of hazardous products (see section 3.1.2.4.4).

A "Waste Prevention Competition" has been in place since 2011 and was expanded to the entire Group in 2016 in order to identify good practices. In-house or external reuse activities are developing strongly in connection with the cessation of activity of production units and the support tools.

■ Natural resources

In accordance with the energy transition, the Group makes optimal use of natural resources consumed through its value chain a central element of its corporate responsibility and has included this area in its sustainable development policy. The principles of the circular economy guide the Company's management, involving many areas well beyond waste management alone⁽¹⁾, particularly energy, the Group's core business, the necessary raw materials (see section 3.3.2.2.4 "Resources"), soils (see section 3.3.2.2.3 "Soils"), and water (see section 3.3.2.2.1 "Water").

(1) Regarding food waste, EDF does not consider this information to be material. Based on EDF's materiality analysis, it is of the opinion that information related to the amendments to Article L. 225-102-1 of the Commercial Code on food insecurity, animal welfare and responsible, fair and sustainable food is not material.

3. Non-financial performance

Appendices, concordance tables and report from Statutory Auditors

■ Chemical risk

When it is technically feasible, in order to reduce the pollution risks, the Group's entities have also implemented a programme to eliminate or substitute certain chemical substances with more environmentally-friendly products. This work focuses as a priority on CMR (carcinogenic, mutagenic, or toxic for reproduction) substances or those considered extremely worrying (see section 3.1.2.4.4).

■ Radiological risk

Nuclear security is EDF's top priority and a permanent and major area of concern for the Group. Nuclear security is based on technical and organisational specifications aimed at preventing a nuclear accident, and in the hypothetical case of such an accident, at limiting the consequences thereof (see section 2.2.2). Regarding radioactive waste, in compliance with applicable legislation, EDF has set up an industrial waste management and reduction plan for the waste it produces through operations and dismantling which respects the environment and the health of people and relevant personnel (see section 3.3.2.2.5).

■ Hydropower risk

Hydropower safety comprises all the measures taken when designing and operating dams and plants to reduce risks and hazards to people and property associated with water and the presence or operation of facilities (see section 2.2.1 -1b). Responsible use and sharing of water are governed by EDF's sustainable development policy and the EMS (see section 3.3.2.2.1).

Health & Safety

To prevent and mitigate risks of serious harm to the health and safety of its employees, suppliers and subcontractors working on its sites, the Group relies on a Health and Safety policy further strengthened by the signed endorsement from the Chief Executive Officer and all of the Executive Committee members. This policy is supported by a roadmap and defines the framework for consistent policy and action plans in the various subsidiaries (see section 3.3.1.4).

The Health and Safety policy sets down as an absolute priority the elimination of fatal accidents (3.3.3.1.), followed by the reduction in the number of accidents, as well as absenteeism. The risks identified are used for information campaigns. The Group entities perform a self-evaluation based on the 10 "Essential Rules" specifically defined by EDF to prevent the occurrence of serious, and particularly, fatal, accidents. High Potential Events (HPE) are shared and analysed to foster experience-based feedback.

EDF promotes the concept of general health and relays public health campaigns. Regarding the health and safety of its customers and the public, the Group's entities implement customised information campaigns on electricity usage (see section 3.3.1.1.4), including in the areas surrounding EDF sites.

Purchases

The Group's Purchasing policy states that respect for contractual commitments and the requirements of sustainable development policy in favour of people and the environment "constitute the foundation of the relationship with suppliers".

A "responsible purchasing" policy led by the Group Procurement Division makes it possible to identify supplier-related risks (see section 3.3.3.2.2). This policy includes, among other initiatives, the use of CSR performance requirements in contractual clauses. Serious discrepancies identified amongst our suppliers may compromise the contractual relationship and entail termination of the contract.

Suppliers' respect for environmental and societal undertakings is mainly ensured by giving priority to supplier evaluations which are defined based on the risk mapping performed by the Procurement Division. In segments falling into the major risks category, the high-priority evaluations are carried out either by way of questionnaire in compliance with ISO 26000, which are completed by the suppliers and their subcontractors or by audits ⁽¹⁾ performed by outside service companies.

In the coal supply chain, EDF no longer has direct contractual relations with mining companies or the market, but remains an active supporter of Bettercoal ⁽²⁾ – the initiative for responsible coal purchases of which EDF is a founding member. Concerning uranium supply chain, clauses authorising the completion of audits and setting out EDF's requirements in terms of enforcement of the fundamental risks and main international standards by suppliers and subcontractors have been included to the contracts. The system implemented by EDF since 2011 to audit

uranium mines makes it possible to ensure good environmental, social and societal conditions for ore mining and treatment (see section 3.3.3.2.2).

3.6.1.6 Whistleblowing system

Since 2018, the Group's whistleblowing system has been extended to include third parties in addition to EDF employees and external or occasional employees, who all have the possibility of using the whistleblowing system to report any risk of a serious violation of human rights and fundamental freedoms, serious harm to the environment or the health and safety of people. Whistleblowers are guaranteed protection in accordance with applicable legislation.

The Ethics and Compliance Division examines the admissibility of reports recorded through the system (see section 3.3.1.1.1). The Ethics and Compliance Division assesses the reports received on the basis of the law on the duty of care (see section 3.3.1.1.1).

3.6.1.7 System for monitoring the measures implemented and evaluating their effectiveness

In order to monitor the measures implemented and evaluate their effectiveness, EDF relies on indicators established for the purposes of its non-financial reporting processes that cover the areas involved in the duty of care (see 3.4.1. "Indicators"), as well as the monitoring system for Group risks and the monitoring system for the six Corporate Responsibility Objectives which are all part of the Group's strategic loop.

As of 2020, Directors will be appointing a Duty of Care Officer in the entities they manage who may be either the Ethics and Compliance Officer or the Sustainable Development Officer.

Each year, a report on the vigilance plan is presented to the Committee for Dialogue on Social Responsibility (CDSR) as well as to the Committee for Corporate Responsibility of the Board of Directors.

3.6.1.8 Procedure for regular evaluation of the situation of subsidiaries, subcontractors and suppliers based on risk mapping

According to the internal control guide, entities and subsidiaries have the obligation to design a self-assessment sheet for the vigilance plan. The purpose of this sheet is to analyse the assessment of the risks identified (analysis of results, facts, causes and consequences), evaluate the entity's control and performance, and set out the objectives of its yearly action plan. They are asked to focus particularly on the evaluation of suppliers. Regular audits are conducted by the Group Auditing Division.

In addition, within the framework of the Responsible Purchasing plan, the Group Procurement Division, the main divisions and the subsidiaries carry out CSR evaluations on their suppliers and subcontractors using both questionnaires and audits administered directly or by independent firms (see section 3.3.3.2.2). Each year, almost 10,000 evaluations are performed, making it possible to audit roughly 2,000 suppliers. Additionally, CSR evaluations and audits are performed. Examples of this can be found at the Nuclear Power Production Division (DPN), which conducts around one hundred qualification and follow-up audits per year and with the Group Procurement Division, which administers around one-hundred questionnaires and performs roughly fifty audits worldwide.

3.6.1.9 Report on the EDF group's vigilance plan

In 2019, the EDF group continued to implement the requirements of the duty of care in all of its activities and relations with suppliers and subcontractors.

Main actions at the Group level

For new investment projects in mainland France, French overseas regions and territories and abroad, the identification of risks, discussed within the various Group Investment Committees, and particularly within the Investment Committees of the Group Executive Committee ⁽³⁾ (CECEG) and the International Business Development

(1) Auditing standards are based in particular on ISO 26000, OHSAS and SA80000.

(2) bettercoal.org/.

(3) This undertaking concerns new projects involving investments of more than €50 million, entailing a significant impact on regions and the environment.

Committee (CBDI) relies on the use of a new screening grid that take into account risks related to the duty of care.

Projects financed by Green Bonds or development banks were the subject of reporting to financiers on social and environmental matters.

More details on the actions implemented are given below.

Human rights

In June 2019, the Chairman of the EDF group was one of the co-signatories of the "CEO Guide to Human Rights" published by the WBCSD (World Business Council for Sustainable Development).

When leading international projects, the commitment of stakeholders and seeking of consent have been systematic. When applicable, the use of migrant workers at work sites and on-site security guard forces received particular attention. For example, all hydropower projects included a stakeholders' commitment plan and a local complaint management mechanism. These plans make it possible for all persons to be concerned to freely express their complaints or worries and to participate in decision making.

In the field of training, the e-learning programme "Human rights in business" developed with the Businesses for Human Rights organisation (Entreprises pour les droits de l'homme – EDH) was updated to include the duty of care and is available to all employees. A second e-learning programme covering "Human rights risks in the supply chain", more specifically dedicated to buyers, was made available at the end of 2019.

Environment

Environmental risks were identified and incorporated into the Group's environmental management system (EMS) and internal control system (see section 3.1.2.4.4.). Concerning biodiversity, a study completed in 2018 with the help of the WCMC (World Conservation Monitoring Centre) prioritises highly sensitive sites (generally bordering a high-profile protected area). In 2019, a full analysis of climate related risks was performed. Among the major European power producers, EDF is currently a player that publishes one of the most detailed annual GHG balances for its entire value chain (see section 3.2.1.1.5). For the year 2019 for the third time, the Group was on the A List published by CDP Climate Change, uniting companies with outstanding performance in the areas of transparency and objectives laid down for their carbon approach and their commitment to fighting climate change.

Health/Safety

Each Group entity promoted action plans aimed at on-going improvement of safety and health at work. At the Executive Committee's request, a shutdown was organised on 3 October 2019 for all working teams, involving employees and service providers in order to discuss, in particular, the fatal accidents the Group had been confronted with in 2019 after a reduction over the previous years, and to define actions locally to improve the level of prevention. Group employees were encouraged to use the new e-learning programme designed by the Safety Academy (14,295 EDF employees have completed this training module). The situation of service Company employees was highlighted. As regards this point, a partnership agreement was signed with the MASE association in May 2019 and an event was held during the Preventica trade fair to encourage service companies to establish health and safety management systems.

Purchases

In 2019, the Group Procurement Division strengthened the performance of its risk analysis methods in accordance with the law on the duty of care. New methodology takes into account all of the CSR topics (environment, working relations and conditions, human rights, ethics and compliance) and makes it possible to determine the level of residual risk and define the priority controls and actions to be taken with suppliers depending on their purchasing segment (see section 3.3.3.2.2).

Regular evaluation and follow-up audits are performed. For example, EDF Hydro audited 62 of its suppliers. One of them received an insufficient score for its control of CSR risks at a subcontractor's site in China and was asked to establish an action plan and step up vigilance over orders placed with them. Luminus determined that

a subcontractor of one of its main suppliers was far from the mark and after several warnings, suspended the supplier's contract until the relevant subcontractor was in compliance. In addition, the Procurement Division has performed 35 on-site audits in Europe, of which 77% in France. 10% led to an "insufficient" score, giving rise to action plans with the suppliers concerned.

Examples of actions implemented by the entities

- For the Myanmar SCHWE LI 3 hydroelectric dam project, the International Division and EDF Hydro identified the main risks: risks related to on-going conflict in the State of Shan where the project is located, risks related to displacement of populations, risks of violation of the rights of indigenous peoples, risks to the safety of workers in areas of insecurity. These risks are assessed in detail in order to design appropriate measures in connection with an environmental and social impact study, as well as a study to evaluate and manage human rights impacts (see section 3.3.1.1.2)
- In 2019, using its environmental and social management system, EDF Renewables organised site visits in India and China to analyse how to manage environmental and societal risks (relations with stakeholders, human rights, subcontractors' working conditions, biodiversity, waste management, etc.) in connection with the development and construction of wind and solar power projects and to train local teams on EDF group requirements in this area
- In Cameroon, training in human rights was rolled out for service companies ensuring the security of the Nachtigal dam
- In China, actions were taken in favour of vulnerable groups by supplying and maintaining radiators for the elderly, granting scholarships to low-income students, assistance to improve quality of life and health of children (clothing, shoes, access to hot water)
- In China, the Group decided not to commit to a wind turbine project in a redevelopment area. The production capacity was not consistent with the number of families that would have to be displaced
- In Côte d'Ivoire, for a biomass electricity generation project, the International Division commissioned an analysis of the risk of forced labour on the plantations by an independent outside consultant (ERM), which assessed the risk as low. Since 2013, audits on child labour on these plantations have been conducted and action programmes implemented (to promote schooling, in particular). Since 2018, no cases of child labour have been detected. However, efforts and due diligence are being maintained (audits, awareness and action programmes) for the subsequent phases of the project (construction and operation)
- EDF Hydro identified risks at suppliers' and subcontractors' sites which have their components (water wheels and turbines, transformers, alternators) manufactured in plants located in China, India, Brazil, Turkey and Eastern European countries. CSR audits on these suppliers were requested and the majority have been performed. These audits systematically covered respect for Human rights, safety and the environment. The audits are conducted at the headquarters of the relevant companies, in certain plants and are supplemented with audits on the EDF Hydro work sites. In one case in particular, a supplier was given an insufficient score for control of CSR risks at a subcontractor's site in China, which led it to establish an action plan and enhance vigilance for orders placed with this company
- For the DTEAM (in charge of thermal facilities), the safety of service providers is an absolute priority. When activities involve risks, the level of requirements is based on certification (MASE, OHSAS 18000) of subcontractors. Improvement programmes in the fields of guard services, road transport, maintenance and logistics have been initiated in cooperation with subcontractors
- Citelum, a subsidiary with business in a number of countries, organises risk management to fulfil its duty of care based on social, regulatory and operating conditions at each one of its sites:
 - in Italy, the entity was certified SA 8000 for all of its business lines and those of its subcontractors,
 - in Brazil, the entity published and implemented a code of conduct which focuses particularly on the respect for human rights by suppliers,
 - in Spain, the entity was certified SGE21(RSC) which guarantees that human rights-related risks have been identified, evaluated and treated.

3.6.2 Description of key stakes in the materiality matrix

The updating of the materiality analysis conducted in 2019 led to the definition of 18 key stakes presented in graphic format in section 3.1.1.2 "EDF group Materiality Analysis". Each key stake is described in detail.

No.	Key stakes	Key stakes description
1	Nuclear safety and safety of industrial infrastructures and data	Refers to: all technical, organisational and human systems aiming to prevent accidents or limit impacts for all Group industrial infrastructures, both nuclear powered and not; also refers to the prevention of the risk of blackouts and in view of rising cybercrime, the protection of facilities against the risk of hacking, including by terrorists and in particular, to the protection of: - IT systems which are indispensable for continuous commercial and industrial business; Group data, including customers' and employees' personal data (limit to data collection, non-disclosure, transparency, etc.).
2	Renewal, extension and performance of the energy mix aimed at decarbonisation	Refers to: the shift to a more and more decarbonated energy mix <i>via</i> the renewal and extension of the operating lifetime of nuclear facilities, modularity, secure fuel supply and high operating performance. Also refers to the development of renewable sources (wind, solar, biomass, hydro, etc.), as well as upgrading of thermal facilities (use of cleaner technology, such as for carbon capture and storage).
3	Action to support energy efficiency	Refers to: new offers aiming to control energy consumption (specifically using digital energy efficiency solutions) and awareness-raising initiatives carried out in order to promote moderate use of electricity with its customers and stakeholders. This priority also refers to the optimisation of grid output.
4	Management of radioactive waste and plant decommissioning	Refers to: responsible and sustainable management of radioactive waste, both during the operating phase and dismantling phase (regulatory, technical, environmental and financial aspects); also refers to support given to treatment and recycling sectors.
5	Innovation, sustainable cities and diversification of energy production methods	In a context of energy market changes (digitisation and inter-connectivity, increasing competition and new, disruptive market players), refers to: - the use of electricity instead of fossil fuels, and specifically to the development of electric mobility; - the development of new electric infrastructures and services contributing to sustainable cities, smart buildings, self-consumption practices, storage; identifying technological breakthroughs and developing new offers in all sectors.
6	Performance of end customer offers (B2B and B2C)	In a context of enhanced competition, refers to the competitiveness of electricity prices and services provided to customers.
7	Creation of value shared with stakeholders, to benefit territories and employment	Refers to: how the Group combines conservation of the planet, well-being and development to create value for all stakeholders (employees, shareholders, customers, territories). Refers in particular to the Group's capacity to provide services in the public interest and to participate in the economy of territories, to create value shared with these territories by contributing to job creation and the creation of local resources.
8	Ethics and the duty of care	Refers to: - the EDF group's duty of care throughout its value chain; - support to subcontractors and suppliers and social and environmental impacts of products and services procured (particularly with regard to respect for human rights), as well as responsible relations with subcontractors and suppliers; - the Group's capacity to effectively combat active and passive corruption, unfair competition, to ensure compliance with contracts and ethical practicing of influence; - tax transparency.
9	The circular economy and conservation of biodiversity, water, air, soils and rare resources	Refers to: - practices implemented aiming to protect and enhance biodiversity everywhere the Group does business; - management of pollution and contamination risks that could cause biological, physical or chemical changes to terrestrial or aquatic environments and their effects on health; - management of air emissions from Group facilities (SO _x , NO _x , fine particles, toxins, etc.); - conservation of rare resources (rare earths); - optimisation of waste management and circular economy practices.

No.	Key stakes	Key stakes description
10	Listening, communication, transparency and dialogue	Refers to: - systems established to listen to the Group's stakeholders at the local level and at the Group level; - due recognition of their needs and expectations through extensive dialogue; - systems established for concertation and involvement of stakeholders at each stage of a project's lifetime; - recognition of the local communities' interests for proper integration of activities and - infrastructures. Also refers to reporting and communication action and dialogue aiming to respond to questions in the public opinion or coming from certain stakeholders, particularly as regards nuclear energy.
11	Company's attractiveness	Refers to: EDF's capacity to attract and retain talented staff in the context of changing expectations among young graduates, the adaptation of skills in a changing environment, and mobility and career management.
12	Adaptation of infrastructure and activities to the consequences of climate change	Refers to: management of physical risks and transitions triggered by climate change. These are: - on the one hand, -adaptation of infrastructures to extreme weather events, climatic variations or any important event of unforeseeable scale; - on the other hand, adaptation of organisations to legal, regulatory, technological, commercial and reputational risks due to climate change.
13	Equal opportunities	Refers to: recognition of diversity and equal opportunity, in particular to combat discrimination due to disabilities, age, gender, social origin or cultural characteristics.
14	Energy poverty and access to energy in developing countries	Refers to: solidarity mechanisms of all types designed to reduce energy poverty in the various countries where the Group does business; also refers to the offer of technical and economic solutions (innovative partnerships and business models) making it possible to improve access to electricity in developing countries.
15	Quality of key project management and responsible investment	Refers to: EDF's capacity to manage key nuclear projects in compliance with quality, cost and lead-time standards. Also refers to ensuring consistency between investments made and EDF's corporate responsibility. In particular, this refers to the type of investment made (decarbonised assets, investments falling within the scope of corporate responsibility), as well as related decision-making on investments (commitment procedure), together with related financing conditions (sustainable financing).
16	Social dialogue	Refers to: the quality of social dialogue established between employee representatives and management, both at the branch and the Company level – locally, nationally and Group-wide.
17	Health and safety of employees and stakeholders	Refers to: action taken to promote the health and safety of employees, service providers, consumers and other stakeholders (local residents, etc.).
18	Existence and effectiveness of company internal whistleblowing systems	Refers to: internal whistleblowing systems established within the framework of regulations or voluntarily to report issues related to ethics, corruption or the duty of care, as well as any other sensitive issues. This refers particularly to their effectiveness, both in terms of the breadth of scope, ease of use, speed of treatment, data security and preservation of the whistleblower's identity.

3. Non-financial performance

Appendices, concordance tables and report from Statutory Auditors

3.6.3 Summary of EDF group climate risks

DESCRIPTION OF PHYSICAL RISKS

Risk category	Description	Potential impact for the EDF group
Risks related to extreme events	Increase of heatwaves and droughts	Production Drop in nuclear production due to heat sink, low water flow for dams in southern countries, accelerated wearing of materials Transmission and Distribution Drop in network capacity, fire risk All business lines Rise in the cost of insurance, deterioration of working conditions for employees and service providers.
	Increase of strong wind events, storms, tornados and floods	Production Slow-down or potential temporary halt of production facilities, impacts of higher flood waters Transmission and Distribution Power cut offs.
Risks related to chronic events	Increase of average temperatures Increase of sea levels	Production Change and drop in hydropower production, decreased yield of nuclear and thermal power facilities, risk of submersion of infrastructures on seacoasts (particularly island regions). Proliferation of organisms that plug water intake, risk of microbial growth in cooling circuits. Transmission and Distribution Diminished capacity of transmission lines Sales and marketing Drop in heating demand Increase in air-conditioning demand.

DESCRIPTION OF RISKS AND TRANSITION OPPORTUNITIES

Risk category	Description	Potential impact for the EDF group
Legal risks	Climate-related litigation	Risk of cancellation of licences, risk of litigation following exceptional climatic events, risk of litigation related to EDF group publications, particularly as regards the duty of care.
Political and regulatory risks	Tension over uses of water	Risk involved in the sharing of water resources due to multiple uses and multiple stakeholders in a context of increasing water scarcity situations.
	Tension over access to land and use of soils	Risk involved in the necessary land resources for renewable energy due to restrictive regulations (biodiversity, agricultural lands) and the legitimacy of sharing with numerous stakeholders.
	Political difficulties to achieve the objectives of the Paris Agreement	Opportunity As a low-carbon leader, the EDF group is called on to play a key role in decarbonisation of the European economy.
Customer – market risks	Change in customer expectations	Opportunity Increased demands of own consumption, energy efficiency, electric mobility, green deals and low-carbon.
	Change in uses of electricity	Opportunity Decarbonised electricity is recognised as an indispensable means to deliver decarbonisation to the economy.
Technological risks	Stability and security of electricity networks	Risk/Opportunity Risk of instability to the system in case of a high penetration rate of renewable energies, Key role of nuclear energy usable together with renewable energies to ensure stability of the network.
	Transition technologies	Risk/Opportunity Potential emergence of technologies such as CCSU, thermal solar, small modular reactors, storage or in the area of negative emissions.
Financial risks	Access to competitive financing	Risk/Opportunity Risk in case of European taxonomy having an impact technologically Opportunity to provide the EDF group with sustainable financing (Green Bonds, positive incentive loans).
	Stranded assets	Risk of stranded thermal assets after regulatory changes or carbon price increase.

The main actions implemented by the EDF group to manage climate-related risks are described in section 2 "Risk factors and control framework" and section 3.2 "EDF, a company committed to the energy transition".

3.6.4 TCFD recommendations

This section presents the URD concordance table with TCFD recommendation, as detailed in the report entitled "Implementing the Recommendations of the Task Force on Climate related Financial Disclosures", TCFD, June 2017.

Concordance table with TCFD recommendations	Relevant Sections of the URD
Governance	
a) Role of the Board of Directors in the oversight of climate-related issues in the organisation	Section 3.2.1.1.2 Sections 3.1.2.3.1, 4.2.2.3, 4.2.2.8, 4.2.3.1 and 4.2.3.4
b) Role of the Management in the oversight of climate-related issues in the organisation	Section 3.2.1.1.2 Section 3.1.2.3.3
Strategy	
a) Climate-related risks and opportunities over the short, medium, and long term	Sections 3.2.1.1.7 and appendix 3.6.3 Section 2.2.3
b) Impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning	Sections 3.2.1.1.3 to 3.2.1.1.10
c) Evaluation of the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario	Section 3.2.1.1.7
Risk management	
a) Processes for identifying and assessing climate-related risks	Section 3.2.1.1.2 Sections 2.1 and 2.2.3
b) Processes for managing climate-related risks	Section 3.2.1.1.2 Sections 2.1 and 2.2.3
c) Integration into the organisation's overall risk management processes	Section 2.1
Metrics and targets	
a) Financial and non-financial metrics used by the organisation for its climate-related strategy	Sections 3.2.1.1 and 3.4 Sections 1.1.1 and 1.4 Section 6.8
b) Reporting of Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas emissions	Sections 3.2.1.1.5 and 3.4
c) Climate-related targets used by the organisation and performance against targets	Sections 3.2.1.1.1 and 3.4 Section 1.3.2

3. Non-financial performance

Appendices, concordance tables and report from Statutory Auditors

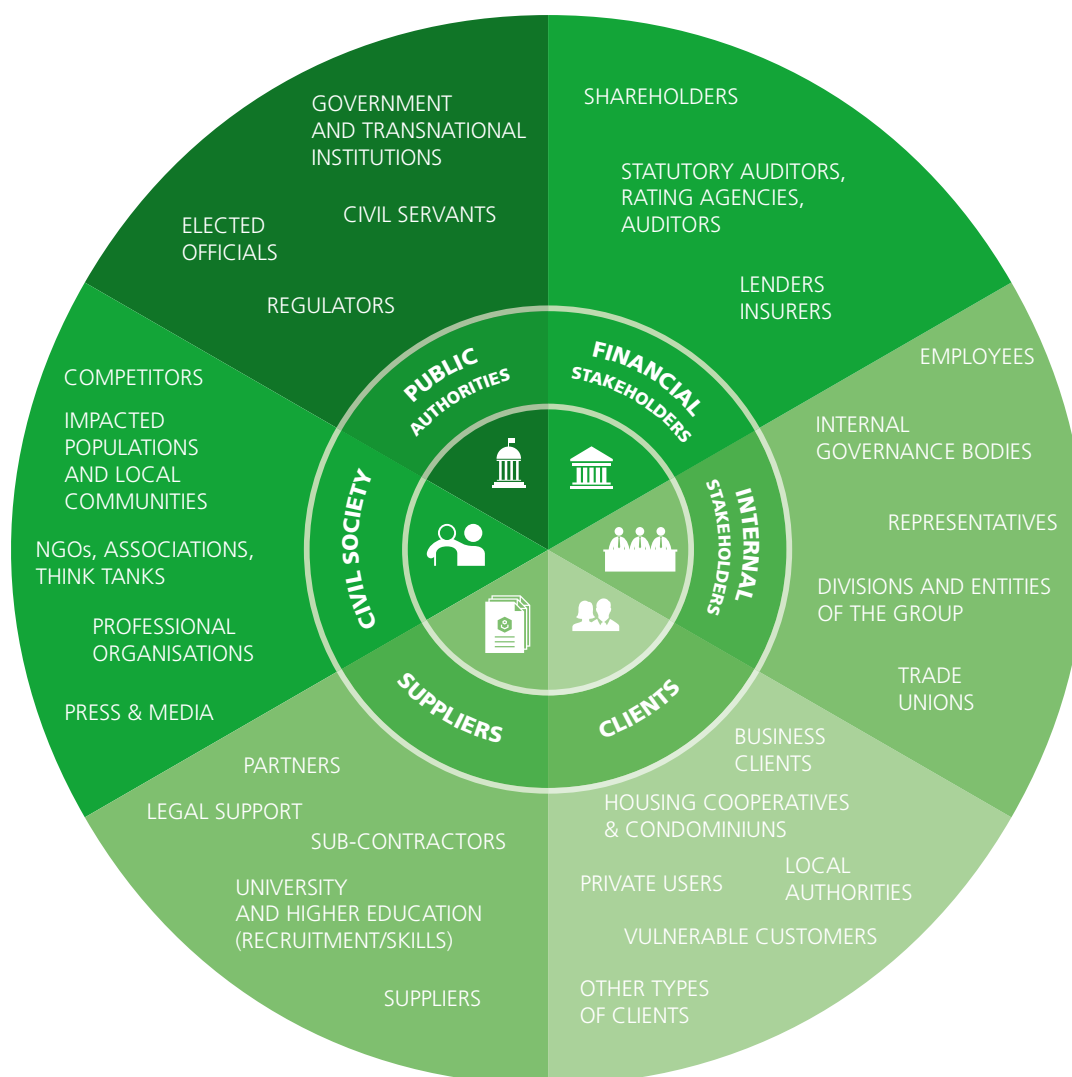
3.6.5 Sustainable Development Goals

		CSRG	Section
	Goal 1: Eradicate poverty	3	§ 3.3.1.1.3 § 3.3.1.7
	Goal 2: Food security and sustainable farming		
	Goal 3: Health and well-being	3, 6	§ 3.3.1.1.3 – § 3.3.1.1.4 § 3.3.1.2.4 – § 3.3.2.2.2 § 3.6.1
	Goal 4: Quality education	5, 6	§ 3.1.2.4.7 – § 3.3.1.2.4 § 3.3.1.2.5 – § 3.3.1.6
	Goal 5: Gender equality	2	§ 3.3.1.2.4
	Goal 6: Sustainable water management for all		§ 3.3.2.2.1
	Goal 7: Affordable and clean energy	1	§ 3.2.1.1 – § 3.2.1.2 § 3.3.2.2.1 – § 3.3.2.2.4
	Goal 8: Decent work and economic growth	4, 5	§ 3.3.1.1.2 – § 3.3.1.2.5 – § 3.3.1.6 – § 3.6.1
	Goal 9: Industry, Innovation and Infrastructure	4, 5	§ 3.2.2 – § 3.3.1.2.5 – § 3.3.1.6 – § 3.3.1.7 § 3.3.2.2.1 – § 3.3.2.2.4 – § 3.3.2.2.5 § 3.3.2.2.6
	Goal 10: Reduced inequalities	3	§ 3.3.1.1.3 – § 3.3.1.2.4 § 3.3.1.7
	Goal 11: Sustainable cities and communities		§ 3.2.2
	Goal 12: Responsible Production and Consumption	3, 5	§ 3.1.2.4.7 – § 3.2.2 – § 3.3.1.1.1 – § 3.3.1.1.2 § 3.3.1.1.3 – § 3.3.1.1.4 – § 3.3.1.1.5 – § 3.3.1.2.1 § 3.3.1.2.2 – § 3.3.1.2.5 – § 3.3.1.6 – § 3.3.2.2.5 § 3.3.2.2.6 – § 3.3.3.2.2
	Goal 13: Climate action	1	§ 3.2.1.1 – § 3.2.1.2 § 3.3.2.2.1 – § 3.6.1
	Goal 14: Life below water	6	§ 3.3.2.1 – § 3.3.2.2.1 § 3.6.1
	Goal 15: Life on land	6	§ 3.3.1.6 – § 3.3.2.1 § 3.3.2.2.2 – § 3.3.2.2.3 § 3.3.2.2.4 – § 3.3.2.2.5 § 3.3.2.2.6 – § 3.6.1
	Goal 16: Peace, justice and strong institutions	5	§ 3.3.1.1.1 – § 3.3.1.2.3 – § 3.3.1.2.5
	Goal 17: Partnerships for the Goals		§ 3.1.2.4.5

3.6.6 Stakeholder mapping

This mapping aims to help ensure proper deployment of EDF's sustainable development policy for the benefit of its performance. Dialogue with stakeholders is one of the objectives falling within the domain of the Executive Director in charge of the Department for Innovation of Corporate Social Responsibility Strategy. The stakeholder mapping was approved by the Executive Committee and relations with

local communities are included in the field of internal control. Mapping provides Group management and companies with a framework for organising dialogue⁽¹⁾. In addition, as part of ISO 9001 and 140001 V2015 certification, the Group's management and companies systematically map their stakeholders and define appropriate modes of dialogue.



(1) Accompanied by a stakeholder action guide produced in 2015 based on the guiding principles of Committee 21.

3. Non-financial performance

Appendices, concordance tables and report from Statutory Auditors

3.6.7 Details of income tax paid in all the countries where the Group has subsidiaries

Country (in millions of euros)	2019	2018*	2017
France	780	162	488
Belgium	89	87	84
Italy	38	22	13
Brazil	25	41	62
Greece	3	8	6
Germany	2	1	1
US	2	1	9
South Africa	2	n.s.	(1)
United Kingdom	2	(12)	29
Poland	1	1	18
Ireland	1	2	n.s.
Vietnam	1	1	1
Mexico	n.s.	2	13
Slovakia	n.s.	n.s.	0
China	n.s.	(14)	2
Luxembourg	n.s.	n.s.	(1)
Austria	n.s.	0	0
Russia	n.s.	n.s.	n.s.
Switzerland	n.s.	0	n.s.
Turkey	n.s.	n.s.	n.s.
Portugal	0	0	0
Egypt	0	0	76
Norway	0	0	(34)
Singapore	0	0	0
Japan	0	0	0
Hungary	0	0	0
Israel	0	0	0
The Netherlands	0	0	0
Bulgaria	0	0	0
Denmark	0	0	n.s.
Chile	(1)	1	(2)
Spain	(7)	n.s.	8
Canada	(17)	5	(2)
TOTAL	922	309	771
Laos (entity accounted for using the equity method)	9	7	6
TOTAL	931	316	778

* Data published for the 2018 fiscal year were restated in accordance with IFRS 5 for E&P activity currently being disposed of.

3.6.8 Ecological knowledge of land sites

Number of sites situated in or near a protected area or an area rich in biodiversity ⁽¹⁾

	Protected areas pursuant to international conventions			Protected areas at national level (IUCN categories)						
	Ramsar sites ⁽¹⁾	MAB sites ⁽²⁾	World Heritage Sites ⁽³⁾	Category Ia	Category Ib	Category II	Category III	Category IV	Category V	Category VI
Germany									1	
Belgium	1							41	8	19
Spain	1			1	1			1		
United States							1	4	14	
France	20	1	2	10		34	7	266	113	
Greece				1				1		
Guadeloupe*	1	2				2		7	1	
Guyana*	1							3		
India								1		
Israel								7		
Italy	6		2	2		10	7	61	22	
Laos										1
Martinique*				1				3		
The Netherlands	1							1		
Reunion*			15	7		15		13	9	
United Kingdom	13						3	46	10	
St Pierre & Miquelon*								1		
Vietnam		1								
TOTAL	44	4	19	22	1	61	18	456	178	20

* French overseas dept.

(1) The Ramsar Convention, signed in 1971, seeks to conserve wetlands of international importance.

(2) UNESCO's MAB (Man and Biosphere) programme launched in 1970.

(3) List of sites of particular importance to the common heritage of humanity (updated each year by UNESCO).

Number of threatened species in municipalities where EDF is located ⁽²⁾

	IUCN categories of threatened species					
	Global red list			Regional red list		
	CR	EN	VU	CR	EN	VU
Mainland France	12	33	82	27	109	223
Overseas Departments & French Islands	18	14	47	51	109	164

(1) GRI G4 EN 11 - Disclosure 304-1; the protected areas chosen are either domestic or subject to international conventions/agreements.

(2) GRI G4-EN14 - Disclosure 304-4; this is EDF's scope of activity for EN 14.

3. Non-financial performance

Appendices, concordance tables and report from Statutory Auditors

3.6.9 Report by one of the Statutory Auditors, appointed as independent third party, on the consolidated non-financial performance statement included in the management report

This is a free English translation of the Statutory Auditor's report issued in French and is provided solely for the convenience of English-speaking readers. This report should be read in conjunction with, and construed in accordance with, French law and professional standards applicable in France.

For the year ended 31 December 2019

To the Annual General Meeting,

In our capacity as Statutory Auditor of your company (hereinafter the "entity") appointed as independent third party, and accredited by the French Accreditation Committee (*Comité Français d'Accréditation* or COFRAC) under number 3-1049⁽¹⁾, we hereby report to you on the consolidated non-financial statement for the year ended 31 December 2019 (hereinafter the "Statement"), included in the management report pursuant to the requirements of Articles L. 225-102-1, R. 225-105 and R. 225-105-1 of the French Commercial Code (*Code de commerce*).

Responsibility of the entity

The Management Board's is responsible for preparing the Statement, including a presentation of the business model, a description of the principal non-financial risks, a presentation of the policies implemented considering those risks and the outcomes of said policies, including key performance indicators.

The Statement has been prepared in accordance with the entity's procedures (hereinafter the "Guidelines"), the main elements of which are presented in the Statement and available upon request at the entity's head office.

Independence and quality control

Our independence is defined by the requirements of Article L. 822-11-3 of the French Commercial Code and the French code of ethics (*Code de déontologie*) of our profession. In addition, we have implemented a system of quality control including documented policies and procedures regarding compliance with applicable legal and regulatory requirements, the ethical requirements and French professional guidance.

Responsibility of the Statutory Auditor appointed as independent third party

On the basis of our work, our responsibility is to provide a report expressing a limited assurance conclusion on:

- the compliance of the Statement with the requirements of Article R. 225-105 of the French Commercial Code;
- the fairness of the information provided in accordance with Article R. 225-105 I, 3° and II of the French Commercial Code, *i.e.*, the outcomes, including key performance indicators, and the measures implemented considering the principal risks (hereinafter the "Information").

Our responsibility is also to provide a report expressing, at the request of the entity and outside of the scope of accreditation, a reasonable assurance conclusion that information selected by the entity, presented in Appendix 1 and identified with the symbol ✓ in chapter 3 has been prepared, in all material respects, in accordance with the Guidelines.

However, it is not our responsibility to comment on the entity's compliance with other applicable legal and regulatory requirements, in particular the French duty of care law and anti-corruption and tax avoidance legislation nor on the compliance of products and services with the applicable regulations.

Nature and scope of our work

The work described below was performed in accordance with the provisions of Article A. 225-1 *et seq.* of the French Commercial Code, as well as with the professional guidance of the French Institute of Statutory Auditors (*Compagnie*

nationale des commissaires aux comptes or CNCC) applicable to such engagements and with ISAE 3000⁽²⁾:

- We obtained an understanding of all the consolidated entities' activities, and the description of the principal risks associated;
- We assessed the suitability of the criteria of the Guidelines with respect to their relevance, completeness, reliability, neutrality and understandability, with due consideration of industry best practices, where appropriate;
- We verified that the Statement includes each category of social and environmental information set out in Article L. 225-102-1 III as well as information regarding compliance with human rights and anti-corruption and tax avoidance legislation;
- We verified that the Statement provides the information required under Article R. 225-105 II of the French Commercial Code, where relevant with respect to the principal risks, and includes, where applicable, an explanation for the absence of the information required under Article L. 225-102-1 III, paragraph 2 of the French Commercial Code;
- We verified that the Statement presents the business model and a description of principal risks associated with all the consolidated entities' activities, including where relevant and proportionate, the risks associated with their business relationships, their products or services, as well as their policies, measures and the outcomes thereof, including key performance indicators associated to the principal risks;
- We referred to documentary sources and conducted interviews to:
 - assess the process used to identify and confirm the principal risks as well as the consistency of the outcomes, including the key performance indicators used, with respect to the principal risks and the policies presented,
 - corroborate the qualitative information (measures and outcomes) that we considered to be the most important presented in Appendix 1. Concerning certain risks⁽³⁾ our work was carried out on the consolidating entity, for the other risks, our work was carried out on the consolidating entity and on a selection of entities⁽³⁾.
- We verified that the Statement covers the scope of consolidation, *i.e.* all the consolidated entities in accordance with Article L. 233-16 of the French Commercial Code within the limitations set out in the Statement;
- We obtained an understanding of internal control and risk management procedures the entity has put in place and assessed the data collection process to ensure the completeness and fairness of the Information;
- For the key performance indicators and other quantitative outcomes that we considered to be the most important presented in Appendix 1, we implemented:
 - analytical procedures to verify the proper consolidation of the data collected and the consistency of any changes in those data,
 - tests of details, using sampling techniques, in order to verify the proper application of the definitions and procedures and reconcile the data with the supporting documents. This work was carried out on a selection of contributing entities⁽⁴⁾ and covers between 18% and 100% of the consolidated data selected for these tests;
- We assessed the overall consistency of the Statement based on our knowledge of all the consolidated entities.

(1) Accreditation scope available at www.cofrac.fr

(2) ISAE 3000: international standard on assurance engagements other than audits or reviews of historical financial information

(3) Energy poverty; Performance of end customer offers; Social dialogue; Adaptation of infrastructure and activities to the consequences of climate change; Ethics and compliance; Responsible subcontracting; Responsible investment; Human rights.

(4) The contributing entities are presented in Appendix 2.

We believe that the work carried out, based on our professional judgement, is sufficient to provide a basis for our limited assurance conclusion; a higher level of assurance would have required us to carry out more extensive procedures.

Means and resources

Our work was carried out by a team of eleven people between December 2019 and February 2020 and took a total of forty weeks.

We were assisted in our work by our specialists in sustainable development and corporate social responsibility. We conducted around forty interviews with the people responsible for preparing the Statement.

Conclusion

Based on the procedures performed, nothing has come to our attention that causes us to believe that the non-financial statement is not presented in accordance with the applicable regulatory requirements and that the Information, taken as a whole, is not presented fairly in accordance with the Guidelines, in all material respects.

Reasonable assurance report on a selection of non-financial information

Nature and scope of our work

With regard to the information selected by the entity presented in Appendix 1 and identified with the symbol √ in chapter 3, we conducted the same procedures as those described in the paragraph "Nature and scope of our work" (for the most important non-financial information). However, these procedures were more in-depth, particularly regarding the number of tests.

Consequently, the selected sample represents 50% of Workforce as of 31/12/2019 and breakdown by age and gender and 68% of EDF group direct greenhouse gas emissions (scope 1) (MtCO₂eq).

We believe that these procedures enable us to express reasonable assurance regarding the information selected by the entity and identified with the symbol √.

Conclusion

In our opinion, the information selected by the entity and identified with the symbol √ in chapter 3 has been prepared, in all material respects, in accordance with the Guidelines.

Paris-La Défense, on February 13th 2020

KPMG SA

Anne Garans	Fanny Houlliot	Michel Piette	Jean-Louis Caulier
Partner Sustainability Services	Partner Sustainability Services	Partner	Partner

3. Non-financial performance

Appendices, concordance tables and report from Statutory Auditors

Appendix 1

Qualitative information (actions and results) considered most important

Social Information

Actions implemented to improve the attractiveness of the Company
Actions to support social dialogue with internal and external stakeholders
Means adopted to promote equal opportunities
Actions to support health and safety of employees and stakeholders

Environmental Information

Commitments and actions to address climate change
Actions to fight against energy precariousness
Means adopted to support the preservation of the biodiversity
Electrical mobility plan

Societal Information

Ethics and Compliance Policy and Commitments to respect Human Rights
Functioning and results of the internal ethics and compliance whistleblowing system
Responsible investment
Responses to stakeholders' expectations on climate change
Positive impacts on the local economy, territories and employment
Nuclear safety policy

KEY PERFORMANCE INDICATORS AND OTHER QUANTITATIVE RESULTS CONSIDERED MOST IMPORTANT

Social key performance indicators and outcomes

Level of assurance

Workforce as of 31/12/2019 and breakdown by age and gender	Reasonable
Percentage of women at managerial level	Limited
Gender balance index: percentage of women in the Management Committees of the Group's entities	Limited
Hours of training provided	Limited
Number of employees benefiting from training	Limited
Percentage of employees who attended a training during the year	Limited
Average number of days lost through illness and accidents	Limited
Work related illnesses reported in the year to the Social Security	Limited
Number of fatal accidents linked to business risks (employees and service providers)	Limited
Overall LTIR (employees and service providers)	Limited
Accident severity rate (employees)	Limited

Environmental key performance indicators and outcomes

Level of assurance

EDF group direct greenhouse gas emissions (scope 1) ($MtCO_2eq$)	Reasonable
Carbon intensity: CO_2 emissions due to heat and electricity generation (gCO_2/kWh)	Limited
Indirect emissions linked to combustion of gas sold and generation of electricity purchased to sell to our final customers	Limited
Net installed renewable electrical generation capacities (GW)	Limited
EDF group's Electric Vehicles rate in the fleet of light vehicles (%)	Limited
Level of awareness of the ecological value of the land (%)	Limited
Water intensity: water consumed / electrical production of fleet (l/kWh)	Limited
Radioactive waste from operations - France: volume of long-lived high and intermediate level solid radioactive waste (m^3)	Limited
Radioactive waste from operations - UK: volume of low level radioactive waste generated (m^3)	Limited
Very Low Level radioactive Waste (VLLW) (Group in France)	Limited
Low and Intermediate Level radioactive Waste (LLW and ILW) (Group in France)	Limited
Very Low Level solid radioactive Waste (EDF)	Limited
Short Lived Low and Intermediate Level solid radioactive Waste (EDF)	Limited

Societal key performance indicators and outcomes	Level of assurance
Number of customer visits on digital consumption monitoring platforms (<i>millions</i>)	Limited
Number of smart meters installed (<i>millions</i>)	Limited
Nuclear safety: Number of significant level 2 events on the INES scale	Limited
Number of energy support	Limited
Percentage of projects on which there was consultation in accordance with the Equator Principles	Limited
Proportion of executives who have completed the anti-corruption training program (%)	Limited
Number of alerts recorded in the Group's whistleblowing system (excluding RTE and Enedis)	Limited
Annual rate of procurement from SMEs (%)	Limited

Appendix 2: List the contributing entities in the report

Sample of selected entities

Within EDF	Pôle Compétences santé au travail de Mulhouse Division Production nucléaire – Unité d'ingénierie d'exploitation Division Production nucléaire – Unité technique opérationnelle Division Ingénierie nucléaire – Direction de projets déconstruction déchets
Within Enedis	Enedis head office Direction régionale Languedoc Roussillon (RH)
Within Framatome	Fuel assembly manufacturing of Jarrie Fuel assembly manufacturing of Lingén
Within Insular Electrical Production	Site of Jarry
Within EDF Energy	Nuclear power plant of West Burton A Nuclear power plant of Hartlepool EDF Energy Crawley Headquarter (RH)
Within EDF Renewables	EDF Renewables France EDF Renewables Canada
Within Edison	Edison Group
Within Dalkia	Direction Régionale Méditerranée Direction Régionale Nord Dalkia Smart Building Wastenergy
Within Norte Fluminense	Site of Macao

3. Non-financial performance



4.

Corporate governance

CONTENTS

4.1 Corporate Governance Code	206	4.5 Shareholding by corporate officers and trading in EDF securities by corporate officers and executives	238
4.2 Members and functioning of the Board of Directors	208	4.5.1 EDF shareholding by Directors	238
4.2.1 Members of the Board of Directors	208	4.5.2 Trading in Company securities	238
4.2.2 Functioning of the Board of Directors	224	4.6. Compensation and benefits of corporate officers	239
4.2.3 Board of Directors' Committees	229	4.6.1 Compensation of corporate officers	239
4.3 Executive Management	235	4.6.2 Stock options – Bonus shares	242
4.3.1 Members of the Executive Committee	235		
4.3.2 Personal information on members of the Executive Committee	235		
4.4 Conflicts of interest and interests of corporate officers and executives	237		
4.4.1 Conflicts of interest	237		
4.4.2 Absence of conviction	237		
4.4.3 Service contracts	237		

4.1 Corporate Governance Code

EDF adheres to the AFEP-MEDEF Code ⁽¹⁾, which is the Corporate Governance Code to which the Company refers, in accordance with Article L. 225-37-4 of the French Commercial Code (*Code de commerce*), subject to the specific laws and regulations applicable to EDF.

These specific laws and regulations, in accordance with EDF's status as a French State-owned company and in particular the application to the Company of Order no. 2014-948 of 20 August 2014 and its implementing texts, and Decree no. 53-707 of 9 August 1953, are detailed in this Universal Registration Document and relate specifically to:

- the composition of the Board of Directors (see section 4.2.1 "Members of the Board of Directors");

- the terms and conditions for the appointment of the Chairman & Chief Executive Officer of EDF and the method of Executive Management (see section 4.2.2.2 "Method of Executive Management – Appointment and powers of the Chairman & Chief Executive Officer");
- the terms and conditions for the setting of the compensation of the Chairman & Chief Executive Officer (see section 4.6.1.1.1 "Terms and conditions for the setting of compensation").

In addition to the aforementioned specific laws and regulations, the table below sets out the AFEP-MEDEF Code recommendations that are not applied by the Company and the related explanations:

AFEP-MEDEF Code recommendation	Company's position	Explanation	Section of the Universal Registration Document
Succession plan of executive corporate officers Recommendation no. 17.2.2: <i>"The Appointments Committee (or an ad hoc Committee) prepares a succession plan of the executive corporate officers."</i>	The internal rules of procedure of the Board provide for the Appointments, Remuneration & Governance Committee to ensure the existence of succession plans in order to anticipate the succession, whether unforeseen or at the end of their term, of executive corporate officers. The Committee has not, to date, included the Chairman & Chief Executive Officer's succession plan into its work.	The terms and conditions of appointment of the EDF Chairman & Chief Executive Officer are subject to a specific set of rules, as in accordance with the provisions of Article 13 of the French Constitution, he or she is appointed by decree of the President of the Republic of France, on recommendation of the Board of Directors, based on the opinion of the Permanent Committees of the French National Assembly and Senate. The Chairman & Chief Executive Officer's succession shall however be included in the work of the Appointments, Remuneration & Governance Committee in 2020.	See section 4.2.2.2 "Method of Executive Management – Appointment and powers of the Chairman & Chief Executive Officer"
Holding of Company shares by direct Recommendation no. 20: <i>"...the Director should personally be a shareholder and, by virtue of the provisions in the articles of association or the internal regulations, hold a minimum number of shares that is significant in relation to the Directors' allocated attendance fees. If he or she does not hold these shares when assuming office, he or she should use his or her Directors' attendance fees to acquire them."</i>	The Company's articles of association and the Board's internal rules of procedure do not require Directors to hold a minimum number of shares that is significant in relation to the compensation they receive for their term of office.	In accordance with the law of 26 July 1983, the Directors representing the employees receive no compensation for their term of office. Furthermore, the compensation received for their term of office by Directors recommended by the French State who are civil servants is paid to the French State budget. Directors appointed on the recommendation of the French State who are not civil servants, can only receive 85% of the compensation due to them, the remainder being paid to the French State budget. Finally, the Chairman of the Board of Directors does not receive any compensation for his or her term of office as Director. Taking account of the wide range of situations, the Board has not established a unique rule on the holding of the Company's shares. Furthermore, each Director must act in the Company's best interests, irrespective of the number of Company shares they hold personally.	See sections 4.6.1.2 ("Total compensation of Directors") and 4.5 ("Shareholding by corporate officers and trading in EDF securities by corporate officers and executives").

(1) Code updated in January 2020.

AFEP-MEDEF Code recommendation	Company's position	Explanation	Section of the Universal Registration Document
<p>Requirement for corporate officers to hold shares Recommendation no. 23: <i>"The Board of Directors defines a minimum number of shares that the corporate officers must retain through to the end of their term of office. This decision is reviewed at least on each extension of their term of office. [...]</i> <i>Until this objective regarding the holding of shares has been achieved, the corporate officers will devote a proportion of exercised options or allocated performance shares to this end as determined by the Board."</i></p>	<p>The Board of Directors has not set rules for the holding by the Chairman & Chief Executive Officer of a minimum number of the Company's shares.</p>	<p>The Chairman & Chief Executive Officer does not receive any compensation for his or her term of office as Director. His or her compensation is limited in accordance with Decree no. 53-707 of 9 August 1953 modified by Decree no. 2012-915 of 26 July 2012. Finally, the Company has not put in place a stock and/or performance stock option plan in favour of the Chairman & Chief Executive Officer. Accordingly, it was decided to not implement this recommendation. Furthermore, the executive corporate officer must also act in the Company's best interests, irrespective of the number of Company shares they hold personally.</p>	<p>See sections 4.6.1.1 ("Total compensation of the Chairman & Chief Executive Officer"), 4.6.2 ("Stock options – Bonus shares").</p>
<p>Rules for the distribution of compensation paid to Directors for their term of office Recommendation no. 21.1: The method of distribution of this compensation <i>"should take into account, in such ways as it shall determine, the Directors' actual attendance at meetings of the Board and Committees, and the amount shall therefore consist primarily of a variable portion"</i>.</p>	<p>A significant but not "preponderant" share of the compensation paid to Directors for their term of office is dependent upon actual attendance by the Directors of the Board and Committee meetings.</p>	<p>Special distribution rules were adopted, which in particular take account of the level of responsibilities and the time spent by the Directors on their duties. Though the variable share of compensation paid for the term of office, that compensates the actual presence of Directors is not preponderant, the Company considers that it is nonetheless significant, insofar as it accounts for 50% of the total amount allocated and, as recommended by the AFEP-MEDEF Code, as it is appropriate to the level of responsibilities assumed by the Directors and to the time that they must spend on their duties.</p>	<p>See section 4.6.1.2 "Total compensation of Directors".</p>

4.2 Members and functioning of the Board of Directors

4.2.1 Members of the Board of Directors

In accordance with Order no. 2014-948 of 20 August 2014 regarding governance and trading in French State-owned companies, EDF is administered by a Board of Directors consisting of three to eighteen members, including members appointed by the Shareholders' Meeting, if applicable on recommendation from the French State in accordance with Article 6 of the Order, a French State Representative chosen by the Minister for the Economy from the civil service in accordance with Article 4 of the Order, and one third employee representatives elected in accordance with the provisions of the law of 26 July 1983 ⁽¹⁾.

On the date of filing of this Universal Registration Document, the Board of Directors has eighteen members:

- eleven Directors appointed by the Shareholders' Meeting, including five on recommendation from the French State;
- six Directors elected by the employees;
- one Representative of the French State.

The Government Commissioner ⁽²⁾, the Head of the French State General Economic & Financial Supervisory Mission to the Company ⁽³⁾ and the Secretary of the Central Social & Economic Committee attend the meetings of the Board of Directors, but are not entitled to vote. However, in accordance with Article L. 311-5-7 of the French Energy Code, the Government Commissioner is informed of the investment decisions and may oppose decisions, the realisation of which would be inconsistent with the objectives of the strategic plan prepared by the Company or with those of the multi-year energy programme (see section 1.5.1.2 "Public service in France").

Between 1 January 2019 and the date of filing of this Universal Registration Document, the following modifications were made to the membership of the Board of Directors:

First name, surname	Director/Category	Event	Date of Event
Ms. Anne Rigail	Director appointed by the Shareholders' Meeting on recommendation from the French State	Appointment	Shareholders' Meeting of 16 May 2019
Mr. Bruno Crémel	Director appointed by the Shareholders' Meeting	Appointment	Shareholders' Meeting of 16 May 2019
Mr. Gilles Denoyel	Director appointed by the Shareholders' Meeting on recommendation from the French State	Appointment	Shareholders' Meeting of 16 May 2019
Mr. Philippe Petitcolin	Director appointed by the Shareholders' Meeting	Appointment	Shareholders' Meeting of 16 May 2019
Mr. Maurice Gourdault-Montagne	Director appointed by the Shareholders' Meeting on recommendation from the French State	Resignation	28 June 2019
Mr. François Delattre	Director appointed by the Shareholders' Meeting on recommendation from the French State	Co-optation by the Board of Directors, replacing Mr. Gourdault-Montagne	28 June 2019
Ms. Christine Chabauty	Director elected by the employees	Expiration of the term of office	22 November 2019
Mr. Christophe Cu villiez	Director elected by the employees	Expiration of the term of office	22 November 2019
Ms. Marie-Hélène Meyling	Director elected by the employees	Expiration of the term of office	22 November 2019
Ms. Claire Bordenave	Director elected by the employees	Taking of office*	23 November 2019
Ms. Karine Granger	Director elected by the employees	Taking of office*	23 November 2019
Mr. Vincent Rodet	Director elected by the employees	Taking of office*	23 November 2019
Ms. Anne Rigail	Director appointed by the Shareholders' Meeting on recommendation from the French State	Resignation	16 December 2019
Ms. Véronique Bédague-Hamilius	Director appointed by the Shareholders' Meeting on recommendation from the French State	Co-optation by the Board of Directors, replacing Ms. Rigail	18 December 2019

* The elections of the Directors representing the employees on the Board of Directors were held from 7 to 13 June 2019, for offices taken on 23 November 2019.

(1) The employee representatives mentioned in paragraph I of Article 7 of the Order of 20 August 2014 are subject, for their election and their status, to the same provisions as those applicable to employee representatives of companies subject to the law of 26 July 1983 (sections II and III of title II of the law).

(2) Article 15 of the order of 20 August 2014.

(3) This mission exercises the French State's economic and financial supervision of EDF, in accordance with Article 8 of decree no. 55-733 of 26 May 1955. It can exercise extensive supervisory procedures.

The terms of office of Ms. Marie-Christine Lepetit, Ms. Colette Lewiner, Ms. Laurence Parisot, Ms. Michèle Rousseau, Mr. Maurice Gourdault-Montagne and Mr. Jean-Bernard Lévy were also extended at the Shareholders' Meeting of 16 May 2019 (see below the table of personal information on Directors).

The provisional appointments of Mr. François Delattre, and Ms. Véronique Bédague-Hamilius, approved by the Board of Directors in 2019, shall be submitted for ratification to the EDF Shareholders' Meeting scheduled for 7 May 2020. A recommendation shall also be submitted to the Shareholders' Meeting to extend the term of office as Director of Ms. Claire Pedini for a period of three years ending following the Shareholders' Meeting called to approve the financial statements for the fiscal year ending 31 December 2022. As an exception to the statutory term of office of Directors set to four years, it is recommended that the Shareholders' Meeting set the term of office of Ms. Pedini to three years, in accordance with Article 13.III of the articles of association, in order to maintain the rotation of Directors put in place in 2019 (see section 4.2.2.1 "Term of office of Directors – Staggered re-election of the Board").

Balanced representation of women and men – Diversity policy

Proportion of women on the Board of Directors

In accordance with Article L. 225-18-1 of the French Commercial Code (*Code de commerce*) and the order of 20 August 2014, EDF is subject to the rules relating to the balanced representation of women and men on Boards of Directors and Supervisory Boards and the Company must comply with a proportion of no less than 40% of Directors of each gender on the Board, excluding Directors representing employees.

On the date of filing of this Universal Registration Document, EDF's Board of Directors includes eight women, including two of the directors elected by employees. Women thus make up 50% of the Board members taken into consideration to calculate this percentage (*i.e.* excluding Directors representing employees), and 44.44% of the Board members as a whole.

Other diversity criteria

In accordance with the AFEF-MEDEF Code recommendations and Article L. 225-37-4 (6°) of the French Commercial Code, the Board of Directors periodically reviews the desirable balance in its membership and that of the Committees it creates, particularly in terms of the percentage of independent Directors and diversity. It defines a diversity policy applied to members of the Board as with respect to criteria such as age, gender or professional qualifications and experience.

Based on the opinion of the Committee in charge of governance issues, the Board of Directors meeting of 14 February 2019 defined a diversity policy and objectives that take into account the Group's strategy, so that the membership of the Board encourages its deployment, and also taking into account the expectations formulated by the Directors during the 2018 evaluation of the Board of Directors. In order to achieve a good balance in its membership, in connection with the Group's strategy and the missions entrusted to it, the Board considered that priority should be given to the search for skills and experience that suit its challenges and a complementarity of profiles.

The table below presents the criteria examined by the Board to define this policy, which was implemented when the candidacies for the posts of Directors submitted to the Shareholders' Meeting of 16 May 2019 were reviewed:

Criteria	Company's position	Objectives/Implementation by the Board
Directors' ages	The Directors appointed by the Shareholders' Meeting are between 54 and 74 years old, with an average age of 61 years.	The Board considered that the current average age was satisfactory and decided that the age of the candidates would not be a decisive factor in their selection to the Director's post, while remaining attentive to the limit of a third of the Directors over the age of 70 years old.* The average age of the Board fell from 63 to 61 years old following the Shareholders' Meeting of 16 May 2019.
Parity	To date, the Board has a total of 8 women, 2 of whom are Directors elected by the employees, representing 50% women (<i>i.e.</i> excluding salaried Directors).	The Board of Directors considered that the ratio of 41.7% women in February 2018 was satisfactory, without excluding the possibility of increasing the number of women in the event of changes in the membership of the Board. This ratio was increased to 50% following the Shareholders' Meeting of 16 May 2019.
Professional experience and complementarity of profiles	The Board combines various profiles and skills.	The Board noted that Directors had significant experience in fields of expertise related to EDF's activities and its strategy (particularly in the fields of energy, industry and at the international level), as well as in the financial field and in the Executive Management of large companies, and that most of the Directors appointed by the Shareholders' Meeting had held directorships in other French or foreign companies. At the end of this review, the Board considered that this complementarity of the profiles was likely to favour the deployment of the Group's strategy. The candidates whose appointments were recommended by the Board of Directors at the Shareholders' Meeting of 16 May 2019 have skills in the Executive Management of big businesses, industry, at an international level, and in the financial field.
Nationality	The Board of Directors does not have a Director of foreign nationality.	Notwithstanding EDF group's strong international presence, the Board deemed that the deployment of the CAP 2030 strategy did not require the appointment of Directors of foreign nationality in the short-term, reserving the right to review this target if necessary in case of changes to its membership. On the other hand, the Board was determined to have an adequate percentage of members with international experience. Several candidates whose appointments were recommended by the Board of Directors to the Shareholders' Meeting of 16 May 2019 have international experience.
Independence	The Board of Directors includes 5 independent Directors, <i>i.e.</i> 41.7% independent Directors out of the 12 Directors taken into consideration for this calculation (<i>i.e.</i> excluding Directors representing employees).	Considering the presence of a controlling shareholder in the Company's capital, the Board of Directors deemed the current percentage of independent Directors satisfactory, and wished to maintain this proportion within the Board and set itself the objective of at least respecting the proportion of one-third of independent Directors recommended by the AFEF-MEDEF Code. The proportion of independent Directors was maintained at 41.7% following the Shareholders' Meeting of 16 May 2019.

* Article L. 225-19 of the French Commercial Code (*Code de commerce*) provides that, in the absence of an express provision in the articles of association with regard to an age limit applicable to Directors, the number of those over the age of 70 cannot be greater than one-third.

Proportion of women on EDF group governing bodies

On the date of filing of this Universal Registration Document, the Executive Committee includes twelve members including two women, *i.e.* a proportion of 16.6% women, this ratio progressing since 2016 (see section 4.3.1 "Members of the Executive Committee").

Several actions have been implemented to increase the proportion of women on the governing bodies and the Boards of Directors of Group companies. Each member of EDF's Executive Committee mentors women managers or future women managers. Furthermore, women identified as "talents" and who might become managers in the medium-term, benefit from close individual support and specific professionalisation actions, and the related career guidance.

Special attention is paid right from the recruitment of employees (see section 3.3.3.1.5 "Diversity and inclusion, Equal access to employment for women and men").

As regards diversity results in the 10% of highest-responsibility positions (Article L. 225-37-4 (6°) of the French Commercial Code), there were, at the end of 2018 ⁽¹⁾, more than 27% women in the 10% of highest-responsibility positions, 31% women in the manager category and 25% women on the Executive Committees (compared to less than 20% in 2012) (see section 3.3.3.1.5 "Diversity and inclusion, Equal access to employment for women and men"). For executive positions, succession plans are systematically diverse.

Following on from these initiatives, the Group made several strong commitments in 2019 *via* *Ambition Mixité* (*i.e.* Destination Diversity), a plan introduced by the Executive Committee designed to eliminate the "glass ceiling" and allow women managers to gain access to Executive Committees and positions. These objectives are to achieve a proportion of 28% women on Executive Committees in 2023 (27.3% at the end of 2019), 28% women executives and future executives in 2030, and finally increase diversity on the Boards of Directors of Group subsidiaries, with an objective of 40% women Directors appointed by EDF. In 2020, the results of the *Ambition Mixité* plan will be presented to the EDF Board of Directors and the Board will re-examine the policy of gender diversity in EDF's management bodies, in accordance with Recommendation No. 7 of the AFEP-MEDEF Code.

(1) 2019 figures are not yet available at the date of this Registration Document.

Information regarding the Directors

The table below summarises the main information concerning members of the Board of Directors as of 15 January 2020.

Summary presentation of the Board of Directors

	Personal information				Experience	Situation within the Board				Attendance in the Committees
	Age	Gender	Natio- nality	Number of shares	Number of offices held in listed companies (incl. EDF)	Inde- pend- ence	Initial date of appointment	Expiry of the term of office	Seniority on the Board (years)	
Chairman & Chief Executive Officer										
Jean-Bernard Lévy	64	M	Fr ⁽¹⁾	0	2	N	23/11/2014	SM 2023 ⁽²⁾	5.15	Chairman of the Strategy Committee
Directors appointed by the Shareholders' Meeting										
Bruno Crémel	54	M	Fr	0	1	Y	16/05/2019	SM 2023	<1	Member of the Audit Committee
Colette Lewiner	74	F	Fr	1,929	5	Y	11/04/2014	SM 2021 ⁽³⁾	5.76	Chair of the Appointments, Remuneration & Governance Committee/Member of the Audit Committee/Member of the Nuclear Commitments Monitoring Committee
Laurence Parisot	60	F	Fr	137	1	Y	23/11/2014	SM 2021	5.15	Member of the Strategy Committee/Member of the Corporate Responsibility Committee
Claire Pedini	54	F	Fr	0	1	Y	12/05/2016	SM 2020 ⁽⁴⁾	3.68	Chair of the Corporate Responsibility Committee/Member of the Appointments, Remuneration & Governance Committee
Philippe Petitcolin	67	M	Fr	10	3	Y	16/05/2019	SM 2023	<1	Member of the Strategy Committee
Directors appointed by the Shareholders' Meeting on recommendation from the French State										
Véronique Bédague-Hamilius	56	F	Fr	0	1	N	18/12/2019	SM 2023	<1	
François Delattre	56	M	Fr	0	1	N	28/06/2019	SM 2021	<1	Member of the Strategy Committee
Gilles Denoyel	65	M	Fr	0	1	N	16/05/2019	SM 2023	<1	Chairman of the Nuclear Commitments Monitoring Committee
Marie-Christine Lepetit	58	F	Fr	0	1	N	07/05/2012	SM 2021	7.69	Chair of the Audit Committee/Member of the Nuclear Commitments Monitoring Committee
Michèle Rousseau	62	F	Fr	0	1	N	30/09/2016	SM 2021	3.29	Member of the Nuclear Commitments Monitoring Committee
Director – Representative of the French State										
Martin Vial	66	M	Fr	0	3	N	09/09/2015	20/11/2022	4.35	Member of the Appointments, Remuneration & Governance Committee/Member of the Strategy Committee

4.

Corporate governance

Members and functioning of the Board of Directors

	Personal information				Experience	Situation within the Board				Attendance in the Committees
	Age	Gender	Natio- nality	Number of shares	Number of offices held in listed companies (incl. EDF)	Inde- pend- ence	Initial date of appointment	Expiry of the term of office	Seniority on the Board (years)	
Directors elected by the employees										
Claire Bordenave	57	F	Fr	0	1	N	23/11/2019	22/11/2023	<1	Member of the Corporate Responsibility Committee
Jacky Chorin	60	M	Fr	294	1	N	23/11/2014	22/11/2023	5.15	Member of the Audit Committee/Member of the Strategy Committee/Member of the Corporate Responsibility Committee
Karine Granger	52	F	Fr	25	1	N	23/11/2019	22/11/2023	<1	Member of the Nuclear Commitments Monitoring Committee/Member of the Appointments, Remuneration & Governance Committee/Member of the Strategy Committee
Jean-Paul Rignac	57	M	Fr	0	1	N	01/11/2007	22/11/2023	12.21	Member of the Audit Committee
Vincent Rodet	54	M	Fr	1,873	1	N	23/11/2019	22/11/2023	<1	Member of the Audit Committee/Member of the Corporate Responsibility Committee/Member of the Nuclear Commitments Monitoring Committee/Member of the Strategy Committee
Christian Taxil	44	M	Fr	1,263	1	N	23/11/2014	22/11/2023	5.15	Member of the Audit Committee/Member of the Strategy Committee

(1) Fr: French nationality.

(2) SM 2023: Shareholders' Meeting called to approve the financial statements for the 2022 fiscal year.

(3) SM 2021: Shareholders' Meeting called to approve the financial statements for the 2020 fiscal year.

(4) SM 2020: Shareholders' Meeting called to approve the financial statements for the 2019 fiscal year.

Personal information on Directors as well as information on their terms of office can be found in the table below and are provided as at 15 January 2020, unless otherwise stated.

DIRECTORS APPOINTED BY THE SHAREHOLDERS' MEETING

Jean-Bernard LÉVY, 64 years old

Position held within the Company

Chairman & Chief Executive Officer since 27 November 2014 ⁽¹⁾

Date of appointment to the Board

23 November 2014

Last re-elected:

16 May 2019 ⁽²⁾

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2022

Other position(s)

Chairman of the Strategy Committee

Shares held

0

Nationality

French

A former student of École Polytechnique (graduating in 1973) and Telecom Paris Tech, Jean-Bernard Lévy began his career at France Télécom in 1979 as a works engineer at the Angers Division. In 1982, he became responsible for managing executive managers and HR budgets at head-office, then assistant to the head of HR. In 1986, he was appointed Technical Advisor to the office of Gérard Longuet, Minister for Postal Services and Telecommunications. From 1988 to 1993, Jean-Bernard Lévy managed the telecommunications Satellite activity of Matra Espace, now Matra Marconi Space. From 1993 to 1994, he ran the office of Gérard Longuet, Minister for Industry, Postal Services and Communications and Foreign Trade. In 1995, he was appointed Chairman & Chief Executive Officer of Matra Communication. In 1998, he joined Oddo & C^{ie} as Chief Executive Officer then Managing Partner. In summer 2002, Jean-Bernard Lévy joined Vivendi. He served as its Chief Executive Officer until April 2005 and became Chairman of its Executive Board in April 2005, until June 2012. From December 2012 to November 2014, he was Chairman & Chief Executive Officer of the Thales defence and aerospace group. Jean-Bernard Lévy has been EDF's Chairman & Chief Executive Officer since 27 November 2014.

Offices and positions held during 2019

Position held within the Company

- Chairman & Chief Executive Officer of EDF

Office/Position	Title		
Chairman & Chief Executive Officer	EDF	France	L
Chairman of the Board of Directors	Edison	Italy	G/L
Director	EDF Energy Holdings	UK	G
Director	EDF Renewables (formerly EDF Énergies Nouvelles)	France	G
Chairman of the Board of Directors	EDF Foundation	France	G
Director	Dalkia	France	G
Chairman of the Supervisory Board	Framatome	France	G
Director	Société Générale	France	L
Chairman and Director as the representative of Électricité de France	Conseil français de l'énergie (<i>i.e.</i> french energy council)	France	
Director	France Industrie	France	
Chairman	FIPA – Fondation innovations pour les apprentissages (<i>i.e.</i> Innovative Apprenticeship Foundation)	France	
Director	Global Sustainable Electricity Partnership	Canada	
Member, Representative of EDF	Haut Comité pour la transparence et l'information sur la sécurité nucléaire (<i>i.e.</i> French High Committee for Transparency and Information on Nuclear Safety)	France	

Expired offices held outside the Company over the past five years

In France

- Chairman of the Board of Directors of Institut Mines Télécom (formerly Institut Télécom)
- Director of the Institut Pasteur
- Director of Vinci

Other countries

- Chairman of the Board of Directors of Edison
- Deputy Chairman of the Board of Directors of Eurelectric
- Chairman of the Board of Directors of EDF Energy Holdings

(1) Mr. Jean-Bernard Lévy was appointed temporary Chairman & Chief Executive Officer from 23 November 2014, by ministerial decisions of 21 November 2014.

(2) Mr. Jean-Bernard Lévy was appointed EDF's temporary Chairman & Chief Executive Officer effective 16 May 2019, by ministerial decision of 16 May 2019. He was appointed as the Company's Chairman & Chief Executive Officer by decree of the President of the Republic of France of 22 May 2019.

4. Corporate governance

Members and functioning of the Board of Directors

Véronique BEDAGUE-HAMILIUS, 56 years old

Position held within the Company

Director appointed by the Shareholders' Meeting on recommendation from the French State

Date of appointment to the Board

18 December 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2022

Shares held

0

Nationality

French

A graduate from the Paris Institute of Political Studies (IEP), ESSEC business school and a former student at the French National School of Administration (ENA), Véronique Bédague-Hamilius has been Deputy Chief Executive Officer of the Nexity group, in charge of the "Enterprises and Local Authorities Client" Division since 2019. She has also been Chair & Chief Executive Officer of Nexity Immobilier d'Entreprise since March 2018. She joined Nexity group in 2017 as General Secretary and member of the Executive Committee. Before joining the Nexity group, Véronique Bédague-Hamilius had a career as a senior civil servant. This included time as an economist at the International Monetary Fund in Washington between 1994 and 1997, advisor to the French Minister for the Economy, Finance and Industry, Laurent Fabius, from 2000 to 2002, CFO of the City of Paris from 2002 to 2007, General Secretary of the City of Paris under Bertrand Delanoë from 2008 to 2014 and Chief of Staff to the Prime Minister, Manuel Valls, from 2014 to 2016.

Offices and positions held during 2019

Principal position held outside the Company

- Deputy Chief Executive Officer of the Nexity group, in charge of the "Enterprises and Local Authorities Client" Division
- Chair & Chief Executive Officer of Nexity Immobilier d'Entreprise

Office/Position ⁽¹⁾	Title	Country
Deputy Chief Executive Officer	Nexity	France
Chair & Chief Executive Officer	Nexity Immobilier d'Entreprise	France
Chair of the Board of Directors	Nexity Property Management	France
Deputy Chief Executive Officer	Villes et Projets	France
Member of the Strategy Committee	Bureaux à partager	France
Chair	Neximmo 78	France

Expired offices held outside the Company over the past five years

France

- Chief Executive Officer of Nexity Property Management
- Director of the Nexity Corporate Foundation
- Legal representative of Neximmo 78, Deputy Chief Executive Officer of Costame
- Legal representative of Neximmo 78, Deputy Chief Executive Officer of Moreau Experts
- Legal representative of Neximmo 78, Deputy Chief Executive Officer of Maestro Ingénierie

(1) Ms. Bédague-Hamilius also holds various offices within the Nexity group as legal representative of Nexity group entities. She is the legal representative of Nexity Immobilier d'Entreprise at SAS Ywood, SNC FI Développement, SCCV Lesquin Buro and SAS Tereneo, legal representative of Villes et Projets at SNC Aménagement Charras, and legal representative of Neximmo 78 at Service Personnel, Accessite, Hiptown, Nexity Solutions Digitales, Costame, Moreau Experts, Maestro Ingénierie, Nexity Contractant Général and L'Etoile Property Management.

Bruno CREMEL, 54 years old

Position held within the Company

Director appointed by the Shareholders' Meeting

Date of appointment to the Board

16 May 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2022

Other position(s)

Member of the Audit Committee

Shares held

0

Nationality

French

A graduate from the École Centrale de Paris, the Paris Institute of Political Studies (IEP), and the French National School of Administration (ENA – General Finance Inspection), Bruno Crémel started his career as a Finance Inspector, before joining the French Ministry for the Economy, Finance, and Industry as head of the Public Banks and Insurance Office, State Participations Department, where he notably coordinated the privatisation of several public banks and insurance companies. From 1998 to 2000, he was Strategic Plan Director at the Kering group as a member of the Executive Committee, then Chairman of the Management Board of PPR Interactive. From 2000 to 2002, he was Chief of Staff of Laurent Fabius, Minister for the Economy, Finance and Industry. From 2002 to 2006, Bruno Crémel was Chief Executive Officer of FNAC. From 2006 to 2012, he was General Partner and member of the Executive Committee of the LBO France investment fund, where he notably oversaw the acquisitions of Maisons du Monde and Promovacances. He was appointed Chairman & Chief Executive Officer of Darty France in 2012. He joined the Partech investment fund in May 2014 as a General Partner and Deputy Chief Executive Officer.

Offices and positions held during 2019

Principal position held outside the Company

- General Partner and Deputy Chief Executive Officer of Partech

Office/Position	Title	Country
Deputy Chief Executive Officer	Partech	France
Director	Made.com	United Kingdom
Director	Evaneos	France
Director	M-Files	Finland
Director	Exporo	Germany
Chairman of the Board of Directors	Ataris	France

Expired offices held outside the Company over the past five years

France

- Director of EcoVadis
- Director of NA-KD

François DELATTRE, 56 years old

Position held within the Company

Director appointed by the Shareholders' Meeting on recommendation from the French State

Date of appointment to the Board

28 June 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2020

Other position(s)

Member of the Strategy Committee

Shares held

0

Nationality

French

A graduate from the Paris Institute of Political Studies (IEP) and the National School of Administration (ENA), François Delattre started his career in 1989 as Second Secretary at the French Embassy in Germany. After spending two years at the Strategic Affairs & Disarmament Department of the French Ministry for Foreign Affairs from 1991 to 1993, he became a Special Advisor in Defence and European & Transatlantic Security in the office of the Minister of Foreign Affairs, Alain Juppé in 1993, before being in charge of these issues within the diplomatic team of the President of the French Republic Jacques Chirac from 1995 to 1998. He was appointed head of the Press and Communication Service at the French Embassy in Washington in 1998, Deputy Chief of Staff to the Minister of Foreign Affairs Dominique de Villepin in 2002 and then Consul General in New York in 2004. France's Ambassador to Canada from 2008 to 2011, and to the United States from 2011 to 2014, he was appointed Permanent Representative of France to the United Nations in September 2014. He has been General Secretary of the French Ministry of Europe & Foreign Affairs since 1 July 2019.

Offices and positions held during 2019

Principal position held outside the Company

- Secretary General of the French Ministry for Europe & Foreign Affairs

Office/Position	Title	Country
Director	Orano	France
Director	Agence nationale des titres sécurisés (i.e. French national agency of secure shares)	France
Director	Commission de récolement des dépôts d'œuvres d'art (i.e. French commission for the verification of the registration of works of art)	France
Director	National School of Administration (ENA)	France
Director	France Médias Monde	France
Director	Institut Français	France
Director	Office français de protection des réfugiés et apatrides (i.e. French office for the protection of refugees and stateless persons)	France
Director	Sorbonne Abou Dhabi	France
Director	Institut des hautes études de défense nationale (i.e. French high national defence study institute)	France

Expired offices held outside the Company over the past five years

France

- None.

G: EDF group company - L: listed company.

4. Corporate governance

Members and functioning of the Board of Directors

Gilles DENOYEL, 65 years old

Position held within the Company

Director appointed by the Shareholders' Meeting on recommendation from the French State

Date of appointment to the Board

16 May 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2022

Other position(s)

Chairman of the Nuclear Commitments Monitoring Committee

Shares held

0

Nationality

French

A graduate as a General Engineer from Mines ParisTech Engineering School, the Paris Institute of Political Studies (IEP) and the National School of Administration (ENA), Gilles Denoyel was appointed as a Finance Inspector at the Ministry for the Economy & Finance in 1981 before joining the Treasury Department in 1985, where he is successively responsible of the CIRI, the Financial Markets Bureau, the Insurance Sub-Directorate and, ultimately, the privatisation programme. In 1996, he joined the CCF group as Chief Financial Officer, then General Secretary in charge of Strategy & Operations, before serving as Senior Executive Vice-President in charge of Finance: in this role, he was responsible for the integration of the CCF in the HSBC group. In 2004, he is appointed Deputy Chief Executive Officer, successively in charge of central functions, he took charge of asset management, insurance activities and then all the risk and control functions and relations with regulatory authorities. From 2015 to 2017, he was HSBC's International Institutional Relations President for Europe. He was also Chairman of the group of banks under foreign control in France from 2006 to 2016 and Treasurer of the Association Française des Banques (*i.e.* French banking association) from 2004 to 2016. Gilles Denoyel has been Chairman of the Board of Directors of Dexia and Dexia Crédit Local since May 2018.

Offices and positions held during 2019

Principal position held outside the Company

- Chairman of the Board of Directors of Dexia and Dexia Crédit Local

Office/Position	Title	Country
Chairman of the Board of Directors	Dexia	Belgium
Chairman of the Board of Directors	Dexia Crédit Local	France
Director	TrustBk	France

Expired offices held outside the Company over the past five years

France

- Director of HSBC France

Marie-Christine LEPETIT, 58 years old

Position held within the Company

Director appointed by the Shareholders' Meeting on recommendation from the French State

Date of appointment to the Board

7 May 2012

Last re-elected

16 May 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2020

Other position(s)

Chair of the Audit Committee and member of the Nuclear Commitments Monitoring Committee

Shares held

0

Nationality

French

A former student of the École Polytechnique and the National School of Administration (ENA), Marie-Christine Lepetit joined the Inspectorate General of Finance in 1987, where she held auditing and advisory positions. In 1991, she was recruited by Jean Lemierre to the Directorate General for Tax in order to introduce management control. In 1995, she was in charge of synthesis work at the Tax Law Department before joining the office of the Prime Minister, Alain Juppé, as technical advisor in tax matters and macroeconomic studies then taxation and SMEs from 1995 to 1997. She continued her career at the General Directorate for Tax, working to improve service quality (pre-filled tax returns, remote procedures, and certification). She was appointed Director of Tax Law at the Ministry for the Economy and Finance in 2004 and used this role to push through tax reforms from 2004 to 2012. At the same time, she co-chaired the working group on reform of the financing of social welfare in 2006 and co-signed the report by the conference of experts on the "energy-climate contribution" chaired by Michel Rocard. She also sat on the Local Authorities Reform Committee chaired by Edouard Balladur as Executive Director and was a member of the Public Life Renewal and Ethics Commission chaired by Lionel Jospin. She has been Head of the Inspectorate General of Finance since March 2012, and now reports to the Minister for the Economy and Finance and the Minister for Public Action and Accounts.

Offices and positions held during 2019

Principal position held outside the Company

- Head of the Inspectorate General of Finance at the Ministry for the Economy and Finance and the Ministry for Public Action and Accounts

Office/Position	Title	Country
Member of the Risks & Internal Control Committee	Fondation des Apprentis d'Auteuil (<i>i.e.</i> : Auteuil Apprenticeship Foundation)	France
Director	Paris Institute of Political Studies (IEP)	France

Expired offices held outside the Company over the past five years

France

- Director of the Fondation Nationale des Sciences Politiques (FNSP) (*i.e.* the French National Foundation of Political Science)

G: EDF group company - L: listed company.

Colette LEWINER, 74 years old

Position held within the Company

Director appointed by the Shareholders' Meeting

Date of appointment to the Board

11 April 2014

Last re-elected

16 May 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2020

Other position(s)

Chair of the Appointments, Remuneration & Governance Committee, member of the Audit Committee and the Nuclear Commitments Monitoring Committee

Shares held

1,929 ⁽¹⁾

Nationality

French

A former student of the École Normale Supérieure and holder of an Agrégation degree in physics and Doctorate in science, Colette Lewiner joined Électricité de France in 1979. In 1989 she created the Development and Commercial Strategy Division, accordingly becoming the first woman appointed Executive Officer at EDF. From 1992 to 1998, she was Chair & Chief Executive Officer of SGN, a subsidiary of AREVA-Orano. In 1998, she joined Capgemini to create then manage until June 2012 the Global Energy and Utilities sector. Since July 2012, she has been, as Manager of Cowin, a Consultant in the energy field. Non-executive Chair of TDF (SAS) from 2010 to 2015, she has been a member of the Académie des Technologies (i.e. French National Academy of Technologies) since 2002. She is a Director of the Bouygues group as well as Getlink, Nexans and CGG.

Offices and positions held during 2019

Principal position held outside the Company

- Professional Director

Office/Position	Title	Country	
Director	Bouygues	France	C
Director	Nexans	France	C
Director	Getlink (formerly Eurotunnel)	France	C
Director	CGG	France	C

Expired offices held outside the Company over the past five years

France

Chair of the Board of Directors of TDF

Director of Ingenico

Other countries

- Director of Crompton Greaves (India)
- Director of TGS Nopec (Norway)

(1) Shares held directly and through the profit-sharing scheme (FCPE).

Laurence PARISOT, 60 years old

Position held within the Company

Director appointed by the Shareholders' Meeting

Date of appointment to the Board

23 November 2014

Last re-elected:

16 May 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2020

Other position(s)

Member of the Strategy Committee and member of the Corporate Responsibility Committee

Shares held

137

Nationality

French

Holder of a Master's in public law from Université Nancy II, graduate from the Paris Institute of Political Studies (IEP) and holder of an MAS in Political Studies from the IEP, Laurence Parisot joined in 1985, as survey manager, the Louis Harris Survey Institute. She became Chief Executive Officer in 1986. In 1990, she was appointed Chair & Chief Executive Officer of the IFOP (i.e. French Institute of Public Opinion), in which she gradually acquired the majority of the capital. Having sold IFOP, she led the Gradiva firm for a while, and was then appointed Chair and Managing Director of Citi bank France in 2018. Laurence Parisot was Chair of MEDEF (i.e. the French Business Confederation) from 2005 to 2013. She is also a Director of Fives and Foxintelligence, and a member of the Board of Directors of the Fondation Nationale des Sciences Politiques (FNSP) (i.e. the French National Foundation of Political Science).

Offices and positions held during 2019

Principal position held outside the Company

- Chair and Managing Director of Citi bank France

Office/Position	Title	Country
Director	Fives	France
Director	Foxintelligence	France
Director	Fondation Nationale des Sciences Politiques (FNSP) (i.e. the French National Foundation of Political Science)	France

Expired offices held outside the Company over the past five years

France

- Manager and Associate Director of Gradiva
- Deputy Chair of the Executive Board of the IFOP group
- Chair of the Scientific Committee of Fondapol
- Director of BNP Paribas
- Member of the Supervisory Board of Fives
- Member of the Supervisory Board of Michelin

G: EDF group company - L: listed company.

4. Corporate governance

Members and functioning of the Board of Directors

Claire PEDINI, 54 years old

Position held within the Company

Director appointed by the Shareholders' Meeting

Date of appointment to the Board

12 May 2016

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2019

Other position(s)

Chair of the Corporate Responsibility Committee and member of the Compensation & Governance Committee

Shares held

0

Nationality

French

Claire Pedini is a graduate of the HEC business school and holds a Master's degree in media management from the ESC Paris business school. In 1988, she joined Total as Corporate Controller. She assumed responsibility for Total's admission to trading on the New York Stock Exchange in 1991, and became Vice-President of Investor Relations in 1992, Vice-President of Media Relations in 1994 and Vice-President of New Information Technologies in 1997. In 1998, she joined Alcatel as Chief of Financial Information and Shareholder Relations, becoming successively Vice-President, Investor Relations and Public Affairs in 2001, Deputy Chief Financial Officer in 2004, Senior Vice-President, Human Resources and Corporate Communications and member of the Executive Committee in 2006, Senior Vice-President, Human Resources, Corporate Communications and Real Estate in 2007, and Executive Vice-President, Human Resources and Transformation, of Alcatel-Lucent in 2009. Claire Pedini was a director of Arkema from 2010 to 2016. Since June 2010, she has served as Senior Vice-President in charge of Human Resources for the Saint Gobain Group. She has been Senior Vice-President, Human Resources and Digital Transformation since January 2019.

Offices and positions held during 2019

Principal position held outside the Company

- Senior Vice-President Human Resources and Digital Transformation for the Saint-Gobain Group – Member of the Executive Committee of Saint-Gobain

Office/Position	Title	Country
None		

Expired offices held outside the Company over the past five years

France

- Director of Arkema

Philippe PETITCOLIN, 67 years old

Position held within the Company

Director appointed by the Shareholders' Meeting

Date of appointment to the Board

16 May 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2022

Other position(s)

Member of the Strategy Committee

Shares held

10

Nationality

French

A graduate in mathematics and from the CPA Paris business school, Philippe Petitcolin, 67 years old, began his career as export manager for Europrim, then became export zone manager for the Alcatel-Alstom subsidiary Filotex. In 1982, he was appointed aeronautical sales manager for Chester Cable in the United States. He returned to Filotex as export manager in 1984. In 1988, he joined Labinal as deputy sales manager before being named sales and marketing manager of the Aeronautical Systems Division, where he became general manager in 1995. From 1999 to 2001, he became head of Labinal's Filtrauto Division, which he combined with the role of and Head of the Friction Materials business following the takeover of Filtrauto by Valeo. In May 2001, he was named Chief Executive Officer of Labinal (now Safran Electrical & Power), and became Chairman & Chief Executive Officer in November 2004. In 2006, he was appointed Chairman & Chief Executive Officer of Snecma (now Safran Aircraft Engines). From 2011 to 2013, he was appointed Chairman & Chief Executive Officer of Safran's defence and security activities as well as Chairman & Chief Executive Officer of Safran Electronics & Defense. From July 2013 to July 2015, he was Chairman & Chief Executive Officer of Safran Identity & Security. He was appointed Director and Chief Executive Officer of Safran in April 2015. On the same date, he became a member of the Board of the "Aerospace & Defence Industries Association of Europe" (ASD). He was appointed Deputy Chairman of GIFAS (i.e. French aerospace industries association) in 2015, has been a Director of Belcan Corporation since 2015, and Director of Pernod Ricard since November 2019.

Offices and positions held during 2019

Principal position held outside the Company

- Executive Director of Safran

Office/Position	Title	Country
Executive Director	Safran	France C
Director	Safran	France C
Director	Pernod Ricard	France C
Director	Belcan Corporation	United States

Expired offices held outside the Company over the past five years

France

- Chairman of Safran Identity & Security
- Chairman of Safran Identity & Security North America
- Chairman of Morpho Detection International
- Director of Safran Identity & Security USA
- Member of the Supervisory Board of Safran Identity & Security GmbH

G: EDF group company - L: listed company.

Michèle ROUSSEAU, 62 years old**Position held within the Company**

Director appointed by the Shareholders' Meeting on recommendation from the French State

Date of appointment to the Board

30 September 2016

Last re-elected

16 May 2019

Expiry of current term of office

Shareholders' Meeting called to approve the financial statements for the fiscal year closing 31 December 2020

Other position(s)

Member of the Nuclear Commitments Monitoring Committee

Shares held

0

Nationality

French

Michèle Rousseau is graduate as a General Engineer from Mines ParisTech Engineering School. She started her career at the Nord-Pas de Calais DRIRE (i.e. Regional Directory for Industry, Research and the Environment) as Head of the Environment Division. She went on to join the Ministry of the Environment where she was responsible for waste, and later the Ministry of Industry where she held the post of Deputy Director of the Nuclear Installation Safety Directorate with responsibility for oversight of EDF's nuclear fleet. She then moved to the ANVAR (i.e. French research and innovation agency), as Deputy Director General where she conducted policies supporting innovative projects driven by SMEs, and later to the French Ministry of Economy, Finance and Industry as Director with responsibility for energy demand and markets. Here, she was tasked in particular with developing a new legislative and regulatory framework in the wake of the opening up of European electricity and gas markets and expanding energy conservation and renewable energies. Michèle Rousseau subsequently returned to the Ministry of Ecology and Sustainable Development, where she held the positions of Secretary General and, in 2008, Director, Deputy Commissioner General for Sustainable Development, with particular responsibility for implementing the Grenelle Environment initiative. In 2011, she was appointed Director General of the Seine-Normandie Water Agency before returning in 2016 to the General Council for Environment and Sustainable Development where she was Chair of the Haut-de-France Regional Environmental Authority (MRAe). Michèle Rousseau has been the Chair of the Bureau de recherches géologiques et minières (i.e. French Geological Survey institution) since March 2017, and director of the IRSTEA (i.e. French research institute on agriculture, food, and the environment) since August 2018.

Offices and positions held during 2019**Principal positions held outside the Company**

- Chair of the Board of Directors of the Bureau de recherches géologiques et minières – BRGM

Office/Position	Title	Country
Chair of the Board of Directors	Bureau de recherches géologiques et minières – BRGM	France
Director	Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture (IRSTEA)	France

Expired offices held outside the Company over the past five years**France**

- Chair of the Hauts-de-France Regional Environmental Authority (MRAe) on the French General Council for the Environment & Sustainable Development

Corporate governance

Members and functioning of the Board of Directors

DIRECTOR – REPRESENTATIVE OF THE FRENCH STATE**Martin VIAL, 66 years old***Position held within the Company*

Director – Representative of the French State

Date of appointment to the Board

9 September 2015

Last re-elected

21 November 2018

Expiry of current term of office

20 November 2022

Other position(s)

Member of the Appointments, Remuneration & Governance Committee and the Strategy Committee

Shares held

0

Nationality

French

Graduate from the ESSEC business school and the École Nationale Supérieure des Postes et Télécommunications, Martin Vial began his career as postal services and telecommunications Director at the Financial Division of the General Postal Directorate. In 1986, he joined the Treasury Division at the Ministry for the Economy and Finance. From 1988 to 1993, he was successively Technical Advisor, Deputy Director then Director of the offices of the Minister for Postal Services and Telecommunications and Space, the Minister for Equipment, Housing, Transport and Space, and finally the Minister for Postal Services and Telecommunications. In 1993, Martin Vial was appointed Chairman & Chief Executive Officer of Aéropostale, airline and joint subsidiary of Air France, La Poste and TAT, and he was elected Chairman of the Chambre Syndicale du Transport Aérien (*i.e.* French air transport union) and Fédération Nationale de l'Aviation Marchande (*i.e.* French national commercial aviation union). At the end of 1997, he became Chief Executive Officer of La Poste group. In September 2000, he was appointed Chairman of La Poste group and at the same time Deputy Chairman of the Caisse Nationale de Prévoyance (CNP). Martin Vial joined the French National Audit Office in September 2002 as Chief Advisor. From 2003 to 2014, he was Chief Executive Officer of the Europ Assistance group, world leader on the assistance market and Director and Chief Executive Officer of Europ Assistance Holding. He also chairs several Boards of Directors of this group's companies. In January 2015, he founded Premium Care, a company which provides assistance to the elderly. Commissioner of the French State Shareholdings since August 2015, Martin Vial is a Director of Renault, Bpifrance and Air France.

Offices and positions held during 2019*Principal position held outside the Company*

- Commissioner of the French State Shareholdings Agency

Office/Position	Title	Country	
Director	Renault	France	C
Director	Air France KLM	France	C
Director	Bpifrance	France	

Expired offices held outside the Company over the past five years*France*

- Chairman of Sicav Libertés et Solidarités
- Director of Thales

Other countries

- None

DIRECTORS ELECTED BY THE EMPLOYEES**Claire BORDENAVE, 57 years old***Position held within the Company*

Director elected by the employees

Date of appointment to the Board

23 November 2019

Expiry of current term of office

22 November 2023

Other position(s)

Member of the Corporate Responsibility Committee

Shares held

0

Nationality

French

A graduate from ESSEC business school and holder of 2-year Master's degree from INSTN (*i.e.* French Institute for Nuclear Science and Technology), Claire Bordenave began her career in the electrical and gas industries at Gaz de France's Economic & Sales Directorate in 1988 as a business engineer. She was responsible for project development and negotiation in France and internationally, as well as strategic and economic studies. She is currently in charge of studies at the EDF group Strategy Division, and has been a member of the Conseil supérieur de l'énergie (*i.e.* French higher energy council) since 2011, the Conseil économique social et environnemental (*i.e.* French economic, social and environmental council) since 2018, and is Chair of the Île-de-France Regional Economic, Social & Environmental Council's Environmental & Energy Transition Committee. Claire Bordenave is sponsored by the CGT trade union.

Offices and positions held during 2019*Principal position held outside the Company*

- Senior Analyst at the EDF group Strategy Division

Office/Position	Title	Country	
Chair	Île-de-France Regional Economic, Social & Environmental Council's Environment & Energy Transition Committee	France	
Council member	Conseil Economique Social et Environnemental (<i>i.e.</i> French economic, social and environmental council)	France	
Member	Conseil Supérieur de l'Énergie	France	

Expired offices held outside the Company over the past five years

- None.

G: EDF group company - L: listed company.

Jacky CHORIN, 60 years old

Position held within the Company

Director elected by the employees

Date of appointment to the Board

23 November 2014 ⁽¹⁾

Last re-elected

23 November 2019

Expiry of current term of office

22 November 2023

Other position(s)

Member of the Audit Committee, Strategy Committee, and Corporate Responsibility Committee

Shares held

294 ⁽²⁾

Nationality

French

A graduate from the Institut d'Études Politiques (IEP) in Paris and a Doctor of Law, Jacky Chorin began his career at EDF as a legal specialist at the Corporate Office of the Equipment Division in 1983. He is currently representative of the Human Resources Manager at the EDF Nuclear and Division. He was a member of the French National Ecological Transition Council from 2014 to 2016 and has been a member of the French Higher Energy Council since 2012. Jacky Chorin was a Director of EDF from September 2004 to November 2009, before being re-elected in 2014. He is sponsored by the Force Ouvrière (FO) trade union.

Offices and positions held during 2019

Principal position held outside the Company

- Representative of the Director of Human Resources at the EDF Nuclear & Thermal Fleet Division.

Office/Position	Title	Country
Member	Conseil supérieur de l'énergie	France

Expired offices held outside the Company over the past five years

France

- Member of the Conseil National de la Transition Ecologique (*i.e.* French national council for the energy transition)
- Member of the Conseil Economique, Social & Environnemental (*i.e.* French economic, social & environmental council)

(1) Jacky Chorin was previously director of EDF (EPIC then limited company) from September 2004 to November 2009.

(2) Shares held through the profit-sharing scheme (FCPE).

KARINE GRANGER, 52 years old⁽¹⁾

Position held within the Company

Director elected by the employees

Date of appointment to the Board

23 November 2019

Expiry of current term of office

22 November 2023

Other position(s)

Member of the Nuclear Commitments Monitoring Committee, Appointments, Remuneration & Governance Committee, and Strategy Committee

Shares held

25

Nationality

French

A graduate from the Institut universitaire de technologie du Creusot, Karine Granger began her career in 1987 at the SAT SAGEM optronic and aeronautical laboratory, then continued to gain professional experience at GEC ALSTOM group before joining EDF in 1992 at the Thermal Engineering Centre. In 2004, she was assigned to EDISON to build a combined cycle gas turbine power plant in Calabria. Back in France, she was in charge of estimating the investment costs of the Hydraulic Engineering Centre. In this role, she set up and managed a network of estimators at the Engineering Production Division, all segments included. In 2014, she was appointed Chief Executive Officer of EDF Cameroon for a public-private partnership to develop a 420MW hydraulic project. She was appointed by the French Prime Minister as Advisor on Foreign Trade for France in Cameroon in 2016. Back in France, Karine Granger became Energy Advisor at FNME CGT in charge of industrial issues. She is also a member of the Conseil supérieur de l'énergie. Karine Granger is sponsored by the CGT trade union.

Offices and positions held during 2019

Principal position held outside the Company

- EDF Hydro Operational Management Control project manager

Office/Position	Title	Country
None	Conseil Supérieur de l'Energie	

Expired offices held outside the Company over the past five years

- None.

(1) G: EDF group company - L: listed company.

4. Corporate governance

Members and functioning of the Board of Directors

Jean-Paul RIGNAC, 57 years old

Position held within the Company

Director elected by the employees

Date of appointment to the Board

1 November 2007

Last re-elected

23 November 2019

Expiry of current term of office

22 November 2023

Other position(s)

Member of the Audit Committee

Shares held

0

Nationality

French

Holder of a doctorate in energy from the Institut National Polytechnique in Toulouse, Jean-Paul Rignac joined EDF in 1991. He served as Secretary of EDF Research & Development's Joint Generation Committee for five years. He is a research engineer at EDF's Research & Development Division (Renardières Centre), and currently works on energy efficiency in the heating/air-conditioning/air quality of industrial buildings and clean rooms. Jean-Paul Rignac is sponsored by the CGT trade union.

Offices and positions held during 2019

Principal position held outside the Company

- Research Engineer at the EDF Research and Development Division

Office/Position	Title	Country
None		

Expired offices held outside the Company over the past five years

- None.

Vincent RODET, 54 years old

Position held within the Company

Director elected by the employees

Date of appointment to the Board

23 November 2019

Expiry of current term of office

22 November 2023

Other position(s)

Member of the Strategy Committee, Audit Committee, Nuclear Commitments Monitoring Committee, and Corporate Responsibility Committee

Shares held

1,873 ⁽¹⁾

Nationality

French

Holder of an advanced graduate diploma in organisational sociology from Université Lyon II, Vincent Rodet began his career in 1987 as an energy movement computer specialist (RTE), then joined the consultancy service in 1995, which then worked for both EDF and Gaz de France. From 2007 to 2014, he was EDF SA CFDT Central Trade Union Representative and EDF group CFDT coordinator. In this capacity, he was a member of the France Group Committee and the European Committee. From 2014 to 2018, he led the CFDT delegation, with responsibility for social dialogue within the Electrical and Gas Industries Division. As a member of the CSFN (*i.e.* French National Nuclear Industry Strategy Committee) in 2018, he contributed to work on reconsolidation of the nuclear industry and more broadly oversaw the Multi-year Energy Programme (Programmation pluriannuelle de l'énergie – PPE) process for the CFDT trade union. Vincent Rodet is sponsored by the CFDT trade union.

Offices and positions held during 2019

Principal position held outside the Company

- HR operator manager, Special duties at the Professionalisation & Industrial Performance Unit

Office/Position	Title	Country
Member	French National Nuclear Industry Strategy Committee (CSFN – Comité stratégique de la filière nucléaire)	France

Expired offices held outside the Company over the past five years

- None.

(1) Shares held through the profit-sharing scheme (FCPE).

Christian TAXIL, 44 years old⁽¹⁾**Position held within the Company**

Director elected by the employees

Date of appointment to the Board

23 November 2014

Last re-elected

23 November 2019

Expiry of current term of office

22 November 2023

Other position(s)

Member of the Audit Committee and Strategy Committee

Shares held1,263 ⁽¹⁾**Nationality**

French

Graduate from the ESCP Europe School, holding an Executive MBA diploma, and from the École des Mines in Douai, Christian Taxil began his career in 1999 at EDF Gaz de France Distribution in customer, local authority and concession management positions. From 2004 to 2008, he was in charge of electricity and gas industry social dialogue on the Fédération CFE-CGC Énergies union's management team. In 2008, he began work at the EDF group Auditing Division before being elected, from June 2009 to September 2014, General Secretary of the Fédération CFE-CGC Énergies union. He is currently in charge of Dalkia's Trading & Marketing Division Key Accounts Department. In November 2018, Christian Taxil also obtained the Company Director Certificate jointly issued by the IEP (*i.e.* French Institute of Political Studies) and the Institut français des administrateurs (French Institute of Directors). Christian Taxil is sponsored by the CFE-CGC trade union.

Offices and positions held during 2019**Principal position held outside the Company**

- Key Account Manager at Dalkia's Trading & Marketing Division

Office/Position	Title	Country
Elected representative	Office of the Syndicat Mixte d'Électricité, de France Gaz et de Télécommunications du Val-d'Oise (SMDEGTVO)	

Expired offices held outside the Company over the past five years

- *France*

None.

(1) Shares held through the profit-sharing scheme (FCPE).

4.2.2 Functioning of the Board of Directors

The internal rules of procedure of the Board of Directors determines the principles of its functioning and the terms and conditions according to which the Board and its specialised Committees fulfil their duties. It also defines the role and powers of the Chairman & Chief Executive Officer.

The Board's internal rules of procedure are regularly updated, particularly to take account of legislative and regulatory changes and changes to the AFEP-MEDEF Code (see section 4.1 "Corporate Governance Code"). It was last updated on 8 October 2019 and particularly reflects certain changes made by law no. 2019-486 of 22 May 2019 on the growth and transformation of businesses (PACTE law).

4.2.2.1 Term of office of directors – Staggered re-election of the Board

EDF's articles of association set the term of office of directors to four years (see section 4.2.1 "Members of the Board of Directors").

In accordance with the provisions of Article 2 of decree no. 2014-949 of 20 August 2014 regarding the implementation of the order of 20 August 2014, the Representative of the French State is appointed for a term equal to the term of office of the members of the Board of Directors, *i.e.* for a four-year term.

The Shareholders' Meeting of 15 May 2018 modified Article 13 of EDF's articles of association in order to provide that, starting from the 2019 Shareholders' Meeting, the Board of Directors, excluding Directors elected by the employees and the Representative of the French State appointed by decree, be renewed by rotation periodically in such a way that half (rounded to the nearest whole number) of the Directors elected by the Shareholders' Meeting be renewed every two years and that the Board be completely renewed, with respect to the members concerned, at the end of each four-year period. In accordance with these provisions of the articles of association, the Shareholders' Meeting of 16 May 2019 deliberated on the appointment and re-election of Directors and appointed certain Directors for terms of office of two years and others for terms of office of four years, in order to enable the implementation of the staggered re-election of the Board.

The Directors appointed by the Ordinary Shareholders' Meeting can be dismissed at any time by the Shareholders' Meeting. In accordance with Article 12 of the Law on the Democratization of the Public Sector, the Directors elected by the employees can be individually dismissed for gross negligence in the exercise of their duties by order of the President of the Tribunal de Grande Instance (regional court) delivered at summary proceedings upon request from the majority of the members of the Board. However, in the event that serious dissent disrupts the Company's administration, dismissal pronounced by the Shareholders' Meeting can be extended to employee representatives. The Representative of the French State ceases their duties by resigning or if they lose the capacity by virtue of which they were appointed; they can be replaced at any time for the remainder of the term of office.

4.2.2.2 Method of Executive Management – Appointment and powers of the Chairman & Chief Executive Officer

In accordance with the option provided for in Article 18 of the Order of 20 August 2014, EDF's articles of association state that the Chairman of the Board of Directors is the Executive Manager of the Company and holds the title of Chairman & Chief Executive Officer. The "non-separated" Executive Management structure is therefore set out in the Company's articles of association. The Board's internal rules of procedure, and in particular the limitations it applies to the powers of the Chief Executive Officer, ensure a satisfactory balance, in the Company's interest, between the Chairman & Chief Executive Officer and the Board of Directors, whilst preserving the flexibility, effectiveness and responsiveness necessary in the administration and management of the Company.

EDF's Chairman & Chief Executive Officer is appointed by decree of the President of the Republic of France, on recommendation from the Board of Directors. They can be dismissed by decree in accordance with Article 20 of the Order of 20 August 2014. In accordance with the provisions of Article 13 of the French Constitution, the Chairman is appointed based on the opinion of the Permanent Committees of the French National Assembly and Senate. At the end of this

process, Jean-Bernard Lévy was re-elected as EDF's Chairman and CEO by decree of 22 May 2019.

In case of vacation of the office of Chairman & Chief Executive Officer, Article 21 of the order of 20 August 2014 states that the French State can appoint someone to the role temporarily until the appointment of the new Chairman and CEO. In accordance with this text, Jean-Bernard Lévy was appointed, by ministerial decision of 16 May 2019, temporary Chairman & Chief Executive Officer of the Company from 16 May 2019 until 22 May 2019.

Subject to the specific legal provisions governing public sector companies and the powers specifically reserved by law or by the articles of association to the Board of Directors or to Shareholders' Meetings, and the limits to the powers of the Chairman & Chief Executive Officer provided for by the internal rules of procedure of the Board of Directors as internal rules (see section 4.2.2.3 "Powers and duties of the Board of Directors" below), the Chairman & Chief Executive Officer is vested with the most extensive powers to act on behalf of the Company under all circumstances, within the limits of the corporate purpose. The Chairman & Chief Executive Officer organises and supervises the work of the Board of Directors and reports to the Shareholders' Meeting. They oversee the proper running of the Company's bodies and, in particular, ensure that the Directors are in a position to fulfil their duties.

4.2.2.3 Powers and duties of the Board of Directors

The Board of Directors meets as often as the interest of the Company requires, in accordance with applicable legislative and regulatory provisions. In accordance with the Board's internal rules of procedure, the Directors meet once a year to discuss the strategy of the Company and of the Group as part of an *ad hoc* seminar. Moreover, under the internal rules of the Board of Directors, a meeting is to be held each year without the attendance of the Chairman & Chief Executive Officer (executive session), and shall be chaired by the Chair of the Appointments, Remuneration & Governance Committee.

The Board of Directors determines the orientations of the Company's activities and oversees their implementation, acting in its corporate interest, while taking into consideration the social and environmental issues of its activities. It defines the major strategic, economic, financial and technological orientations for the Company and the Group. Subject to powers expressly attributed to the Shareholders' Meetings and within the limits the Company's corporate purpose, the Board may deal with any issues concerning the proper running of the Company and acts, through its deliberations, on any such issue.

The Board deliberates, after examination by the competent Committee or Committees, as the case may be, on the annual budget, the medium-term plan, any significant operation falling outside the Company's announced strategy, the corporate strategic plan presenting the actions to be implemented by the Company or the Group in order to comply with the objectives of the multi-year energy plan (Programmation pluriannuelle de l'énergie) (see section 1.5.1.2 "Public service in France"), the Group's strategies relating to nuclear fuel cycle, gas and renewable energies and the public service contract. It also regularly examines, in connection with the strategy that it defines, opportunities and risks such as financial, legal, operational, social and environmental risks, as well as the measures taken as a consequence. Within this framework, it particularly examines risks and opportunities relating to climate change and their impact on the Group's strategy and its activities.

The Board ensures the implementation by the Company of a programme to prevent and detect corruption and influence-peddling and a policy to promote non-discrimination and diversity, particularly in terms of balanced representation of women and men on the Company's governing bodies. In accordance with the provisions of Article L. 225-37-1 of the French Commercial Code (*Code de commerce*), the Board of Directors deliberates annually on the Company's policy in terms of equal access to employment and equal pay and defines the Company's strategic orientations submitted to the EDF Central Social & Economic Council in accordance with Article L. 2312-17 of the French Labour Code.

In accordance with its internal rules of procedure, the Board of Directors is competent to authorise, in accordance, where appropriate, with the governance of the Group's listed companies, the following transactions prior to their implementation:

- external growth transactions (investments, mergers and acquisitions), divestments, organic growth transactions, as well as stock exchange transactions, carried out by the Company or by one of its subsidiaries, which represent overall financial exposure for the Company or the Group exceeding

€350 million; this threshold falls to €150 million for transactions not in line with the Company's or the Group's strategic orientations;

- coherent and inseparable industrial programmes of investments or works on existing assets, by the Company or one of its subsidiaries, exceeding €350 million per programme;
- real estate transactions, carried out by the Company or one of its subsidiaries, exceeding €200 million;
- certain financial transactions (long-term borrowings, debt management, securitisation or hedging transactions) whenever they exceed €5 billion (or the equivalent in any other currency);
- contracts and agreements (supplies, work or services) entered into by the Company involving amounts, including any necessary subsequent amendments, exceeding €350 million, or between €200 million and €350 million if these contracts relate to a new strategic direction or a new business line for the Group;
- long-term contracts for the purchase or sale of energy, CO₂ emission credits and quotas, by the Company or by one of its subsidiaries, for annual volumes

or amounts exceeding 10TWh for electricity, 20TWh for gas (detailed information must also be provided on long-term gas purchase or sale agreements greater than 5TWh and less than 20TWh following the meeting of the Board of Directors) and €250 million for coal, fuel oil, and CO₂ emission credits and quotas;

- strategic agreements to be entered into by the Company constituting firm and irrevocable commitments relating to cooperation or partnerships with one or more foreign partners, in the nuclear industry involving significant transfers of intellectual property or technologies on the Group's part and constituting major challenges for the Group.

The Board of Directors sets the framework of the policy for the constitution, management and risk management of assets for hedging EDF's nuclear commitments, specifically ruling on asset/liability management and asset allocation strategy. If the Nuclear Commitments Monitoring Committee issues a negative opinion on a plan to invest in unlisted assets for dedicated assets, the Board has sole authority to authorise the aforementioned plan (see section 4.2.3.2 "Nuclear Commitments Monitoring Committee").

4.2.2.4 Evaluation of Director independence

Total number of Directors	18
Number of independent Directors	5
Percentage of independent Directors*	41.7%

* Excluding Directors representing the employees.

The AFEP-MEDEF Corporate Governance Code recommends that, in companies with a controlling shareholder, the proportion of independent Directors should be at least one third of the Board of Directors and specifies that Directors representing employees are not taken into account to calculate the proportion of independent Directors.

The table below recalls the independence criteria stated by the AFEP-MEDEF Code:

Independence criteria

Criterion 1: Employee or corporate officer in the previous five years

Not to be and not to have been within the previous five years an employee or executive officer of the Company, an employee, executive officer or Director of a company consolidated within the corporation, an employee, executive officer or Director of the Company's parent company or a company consolidated within this parent company.

Criterion 2: Cross directorships

Not to be an executive officer of a company in which the Corporation holds a directorship, directly or indirectly, or in which an employee appointed as such or an executive officer of the Corporation (currently in office or having held such office within the last five years) holds a directorship.

Criterion 3: Significant business relationships

Not to be a customer, supplier, commercial banker, investment banker or consultant that is significant to the corporation or its group or for which the corporation or its group represents a significant portion of its activity. The evaluation of the significance or otherwise of the relationship with the Company or its group must be debated by the Board and the quantitative and qualitative criteria that led to this evaluation (continuity, economic dependence, exclusivity, etc.) must be explicitly stated in the annual report.

Criterion 4: Family ties

Not to be related by close family ties to a corporate officer.

Criterion 5: Auditor

Not to have been an auditor of the corporation within the previous 5 years.

Criterion 6: Period of office exceeding 12 years

Not to have been a Director of the Corporation for more than 12 years. Loss of the status of independent Director occurs on the date of the 12th anniversary.

Criterion 7: Variable compensation or performance-based compensation

Not receive variable compensation in cash or securities or any compensation related to the performance of the Company or the Group.

Criterion 8: Major shareholders

Directors representing major shareholders of the corporation or its parent company may be considered independent, provided these shareholders do not take part in the control of the corporation. Nevertheless, beyond a 10% threshold in capital or voting rights, the Board, upon a report from the Nominations Committee, should systematically the qualification as independent in the light of the make-up of the corporation's capital and the existence of a potential conflict of interest.

4. Corporate governance

Members and functioning of the Board of Directors

Evaluation of Director independence

The Board of Directors annually reviews the individual situation of the Directors with regard to the independence criteria stated by the AFEP-MEDEF Code. It may also be called upon to make a decision during the year in the event of a change in the membership of the Board or the status of a Director justifying a review of his or her independence.

At the joint meeting of 7 February 2019, the Appointments & Compensation Committee (now the Appointments, Remuneration & Governance Committee, see section 4.2.3 "Board of Directors' committees") and the Governance & Corporate Responsibility Committee (now the Corporate Responsibility Committee) examined the individual situation of Directors appointed by the Shareholders' Meeting taking into account the independence criteria provided for by the AFEP-MEDEF Code. The Board of Directors, at its meeting of 14 February 2019, performed its annual evaluation of Director independence and confirmed the classification as independent Directors of Ms. Lewiner, Ms. Parisot, Ms. Pedini, Mr. Crouzet, and Mr. Lafont.

This review was completed at a meeting of 2 April 2019 during which the Committees jointly examined the individual situation of Directors whose appointment was recommended at the Shareholders' Meeting of 16 May 2019 taking into account the independence criteria provided for by the AFEP-MEDEF Code. Based on the Committees' opinion, the Board of Directors meeting on 4 April 2019 considered that Mr. Crémel and Mr. Petitcolin met the independence criteria provided for in the Code and classified them as independent.

At a meeting on 7 February 2020, the Appointments, Remuneration & Governance Committee examined the individual situations of Directors appointed by the Shareholders' Meeting, taking into account the independence criteria provided for by the AFEP-MEDEF Code.

The Committee noted that Jean-Bernard Lévy, due to his capacity as Chairman & Chief Executive Officer, and therefore Executive Officer cannot be considered as an independent Director (criterion no. 1).

The Directors appointed on the recommendation of the French State in accordance with Article 6 of order no. 2014-948 of 20 August 2014 on the governance and equity transactions of companies with a public shareholding "represent", by virtue of this text, "the interests of the French State as shareholder". In view of the criteria set by the AFEP-MEDEF Code, these Directors cannot be considered as independent (criterion no. 8). The same holds true for the Representative of the French State appointed pursuant to the provisions of Article 2 of the order of 20 August 2014, in his capacity as representative of EDF's majority shareholder (criterion no. 8).

Finally, Directors representing employees are not subject to an assessment, in accordance with the recommendations of the AFEP-MEDEF Code.

With respect to business relationships, the Appointments, Remuneration & Governance Committee examined the situation of Ms. Lewiner, Ms. Parisot, Ms. Pedini, Mr. Crémel, and Mr. Petitcolin with regard to criterion no. 3 provided for by the AFEP-MEDEF Code. In particular, the Committee examined any business ties that might exist between the Company and companies at which these Directors hold offices or management posts, as well as groups to which they belong, on a quantitative level, (importance of any business relations existing between the Company and these companies, their groups, and sales between them recorded in the course of the 2019 fiscal year) and on a qualitative level (Director's position in the companies in question, nature of business relations, any economic dependence, exclusivity, etc.). Based on their findings, none of the companies at which the Directors hold offices or management posts, nor any of the groups to which they belong, could be classified as a significant client, supplier, business banker, financing banker or important consultant of the EDF group, nor could EDF be considered a significant client or supplier of these companies or their groups. Following this analysis, the Committee concluded on the absence of significant business ties involving these Directors.

Upon recommendation from the Committee, at its meeting on 13 February 2020, the Board conducted an annual evaluation of the independence of the Directors and confirmed Ms. Lewiner, Ms. Parisot, Ms. Pedini, Mr. Crémel, and Mr. Petitcolin as having the status of independent Directors, as the Board deemed that these Directors had no relations with the Company, its Group or its management that might compromise the exercise of their freedom of judgement.

On the date of this Universal Registration Document, the Company's Board of Directors therefore features five independent directors out of the twelve taken into account to make the calculation in accordance with the AFEP-MEDEF Code, *i.e.* a proportion of independent Directors of 41.7% (excluding Directors representing employees), higher than the recommendations of the Code (see section 4.2.1 "Members of the Board of Directors").

The table below presents the situation of the administrators classified as independent taking into account the criteria provided for by the AFEP-MEDEF Code:

	Criterion no. 1	Criterion no. 2	Criterion no. 3	Criterion no. 4	Criterion no. 5	Criterion no. 6	Criterion no. 7	Criterion no. 8	Final classification
Bruno Crémel	✓	✓	✓	✓	✓	✓	✓	✓	Independent
Colette Lewiner	✓	✓	✓	✓	✓	✓	✓	✓	Independent
Laurence Parisot	✓	✓	✓	✓	✓	✓	✓	✓	Independent
Claire Pedini	✓	✓	✓	✓	✓	✓	✓	✓	Independent
Philippe Petitcolin	✓	✓	✓	✓	✓	✓	✓	✓	Independent

✓: means that the criterion is met.

4.2.2.5 Evaluation of the functioning of the Board of Directors and its Committees

In accordance with the provisions of the AFEP-MEDEF Code, the Board's internal rules of procedure state that the Appointments, Remuneration & Governance Committee supervises annually an evaluation of the functioning of the Board of Directors and proposes areas for improvement. Once a year, therefore, the Board dedicates one item on its agenda to this evaluation and holds a discussion on its functioning and that of its Committees in order to improve its efficiency and ensure that important issues are appropriately prepared and discussed.

Every three years, this evaluation is conducted by an independent external consultant under the supervision of the Appointments, Remuneration & Governance Committee.

External evaluation

The last external evaluation was conducted in 2016 by a specialist external firm, selected following a call for tenders, under the supervision of the Governance & Corporate Responsibility Committee. Accordingly, the individual contribution of each Director to the work of the Committee was evaluated, which resulted in individual and confidential feedback being issued by the consultant to each Director.

Taking account of the major changes made to the membership of the Board of Directors in the course of the 2019 fiscal year, it was decided to postpone by one year the external evaluation of the Board and Committees, which shall therefore be conducted during the 2020 fiscal year, instead conducting an internal evaluation in December 2019.

2019 annual evaluation

The 2019 annual evaluation was conducted internally using a questionnaire including both closed-ended questions, enabling statistical monitoring of the answers provided by Directors, and open-ended questions, enabling Directors to give detailed answers, provide qualitative observations, propose changes, and share their expectations for the 2020 fiscal year. This questionnaire was filled in anonymously by Directors then analysed by the Board's Secretariat. The evaluation covered the following fields:

- number and duration of Board and Committee meetings;
- assessment of the work programme, subjects discussed by the Board and Committees and information provided;
- assessment of the membership of the Board of Directors;
- feedback on the Board's 2019 strategic seminar;
- personal opinion on the Company's governance;
- expectations and suggestions regarding high-priority themes for 2020.

The results of this evaluation were presented and debated at an executive session held on 12 December 2019.

The results of this evaluation showed that the Directors were generally satisfied with the organisation and functioning of the Board and of the Committees. The number of meetings, the work program, and the documents provided were deemed satisfactory and appropriate, as was the general level of information with which Directors were provided to fulfil their duties. The annual strategic seminar is particularly popular with Board members. The membership and diversity of the Board are also considered suited to the duties entrusted to it.

Among the areas for improvement identified, Directors mainly suggested reducing the duration of Board meetings and the number of items on the agendas of each sessions.

Finally, the high-priority themes that Directors want to see examined in greater depth in 2020 are: monitoring of financial position and trajectory, strategy and prospects, and monitoring of performance and value creation.

4.2.2.6 Information and training of Directors – Digitalisation

The Chairman & Chief Executive Officer ensures that the Directors have the necessary information for them to carry out their missions. This information is provided to them as soon as possible to enable them to carry out their work under the best conditions.

Under the terms of the Board's internal rules of procedure, it periodically receives information on the financial, treasury and off-balance sheet commitments position of the Company and the Group, as well as information on the performance of the Company's principal subsidiaries on the occasion of the presentation of the annual and half year financial statements, in addition to the purchasing and human resources policy. The Board of Directors is regularly informed of changes to the Company's markets, competitive environment and the main challenges facing the Company, including in the field of corporate social, societal and environmental responsibility.

A document reviewing the Group's current major sectors of business and the market trends, as well as the economic, financial and institutional context is regularly submitted to the Board of Directors. The Company also provides them with any information that may be appropriate between the meetings of the Board, particularly where it is of an urgent or important nature.

The Directors can add to this information by meeting with the principal executives of the Company or Group, without the Chairman's presence being necessary, to discuss issues on the Board's agenda.

Finally, each Director can receive additional training in the specific characteristics of the Company and the Group, their business activities and their field of activity, as well as specific themes falling within the remit of the Committees of which they are members. In addition, information meetings may be organised on complex matters or issues of major strategic importance, together with any training requested by members.

Since 2016, the Board of Directors has been using a digital platform, which allows for the smooth, swift and secure availability of Board and Committee files.

4.2.2.7 Obligations and duties of Directors

The internal rules of procedure of the Board of Directors state that its members are subject to obligations such as: acting in the corporate interest of the Company, informing the Board of situations of conflict of interest (see also section 4.4.1 "Conflicts of interest"), and refraining from contributing to the discussions and voting on any decision in which there might be a conflict of interest, fulfilling the obligation of confidentiality, carrying out their term of office with diligence and commitment, and complying with the EDF Stock Exchange code of ethics.

The Directors and the Chairman & Chief Executive Officer are required to immediately inform the Board of any agreement entered into by the Company in which they hold a direct or indirect interest, or which might be entered into through an intermediary.

In addition to the right to obtain disclosure of the documents and information necessary to perform their work, the Directors also have a duty to request the information they deem essential to carry out their duties.

Under the internal rules of procedure, each Director undertakes to ensure that his or her status complies with the French Commercial Code (*Code de commerce*) and the AFEP-MEDEF Code recommendations on plurality of offices and to keep the Board informed of offices they hold at other companies. The Chairman & Chief Executive Officer is also required to inform the Board of Directors before accepting an appointment in a listed company.

4. Corporate governance

Members and functioning of the Board of Directors

4.2.2.8 Activity of the Board of Directors in 2019

	2018	2019
Number of meetings	9*	12*
Average attendance rate	92.0%	91.7%
Average duration of the meetings	3 hours and 25 minutes	2 hours and 40 minutes

* In addition to this number of meetings, a one-day strategic seminar is also held.

The table below shows the individual attendance rate of Directors over the 2019 fiscal year:

Directors whose terms of office are ongoing on 31 December 2019	Average attendance rate in 2019
Jean-Bernard Lévy	100%
Véronique Bédague-Hamilius ⁽¹⁾	n/a
Claire Bordenave ⁽²⁾	100%
Jacky Chorin	100%
Bruno Crémel ⁽³⁾	100%
François Delattre ⁽⁴⁾	100%
Gilles Denoyel ⁽³⁾	100%
Karine Granger ⁽²⁾	100%
Marie-Christine Lepetit	100%
Colette Lewiner	75%
Laurence Parisot	83.3%
Claire Pedini	100%
Philippe Petitcolin ⁽³⁾	75%
Jean-Paul Rignac	100%
Vincent Rodet ⁽²⁾	100%
Michèle Rousseau	91.7%
Christian Taxil	100%
Martin Vial	91.7%

(1) Director co-opted at the last meeting of the Board of Directors held in 2019.

(2) Directors who took office on 23 November 2019.

(3) Directors who took office following the Shareholders' Meeting of 16 May 2019.

(4) Director since 28 June 2019.

In 2019, the Board of Directors examined and/or authorised, in addition to the many matters regarding the Company's day-to-day business, issues such as the final investment decisions on offshore wind turbine projects in Saint Nazaire (France) and Nearth na Gaoithe (Scotland), the progress of the Hinkley Point C and Flamanville 3 projects, as well as the findings of the review conducted by Jean-Martin Folz of the Flamanville EPR project, new nuclear prospects in France and the United Kingdom, the settlement agreement for compensation of EDF by the French State regarding the early closure of the nuclear power plant in Fessenheim, the progress of the Linky programme implemented by Enedis and the "Grand Carénage" project, the project for the construction by Edison of a high-efficiency combined cycle gas power plant in Presenzano (Italy), and the planned disposal of Edison's exploration and production activity, the employee-only share offering

organised in 2019, the Group's 2018 health and safety review, EDF's equal access to employment and equal pay policy, and the objectives the Group set itself in terms of the proportion of women in governing bodies (see in particular section 3.3.3.1.5 "Diversity and inclusion, Equal access to employment for women and men") and the 2018 reports by the French inspector general for nuclear safety and radiation protection and the inspector for hydropower safety.

At its annual strategic seminar, the Board debated the objective of achieving carbon neutrality by 2050, the prospects of changing electrical generation technology costs, the strategy of EDF's European counterparts, the challenges faced by EDF due to the changing legislative and regulatory environment and regulation of existing nuclear facilities.

4.2.3 Board of Directors' Committees

To perform its duties, the Board of Directors has created five Committees to examine and prepare certain projects before they are presented to the whole Board. These specialised Committees are: the Audit Committee, the Nuclear Commitments Monitoring Committee, the Strategy Committee, the Corporate Responsibility Committee, and the Appointments, Remuneration & Governance Committee.

The membership, functioning and duties of the Committees are governed by the internal rules of procedure of the Board of Directors. In the last update of the internal rules of procedure approved by the Board on 8 October 2019, the Governance & Corporate Responsibility Committee's governance duties were transferred to the Appointments & Compensation Committee. The Committees were then respectively renamed as the Corporate Responsibility Committee and the Appointments, Remuneration & Governance Committee.

The Committees include at least three Directors chosen by the Board, which appoints the Chair of each Committee. The Company's articles of association state that each Committee should include at least one Director representing the employees.

On the date of this document, the Chairs of the Board Committees were as follows:

- Mr. Jean-Bernard Lévy for the Strategy Committee;
- Ms. Marie-Christine Lepetit for the Audit Committee;
- Mr. Gilles Denoyel for the Nuclear Commitments Monitoring Committee;

4.2.3.1 Audit Committee

Membership

In accordance with the provisions of Article L. 823-19 of the French Commercial Code (*Code de commerce*) and the recommendations of the AFEP-MEDEF Code, the Committee includes two-thirds of independent members and does not include any executive officer.

Members of the Audit Committee

Marie-Christine Lepetit	Chair	Director appointed by the Shareholders' Meeting on recommendation from the French State
Jacky Chorin	Member	Director elected by the employees
Bruno Crémel	Member	Independent director appointed by the Shareholders' Meeting
Colette Lewiner	Member	Independent director appointed by the Shareholders' Meeting
Jean-Paul Rignac	Member	Director elected by the employees
Vincent Rodet	Member	Director elected by the employees
Christian Taxi	Member	Director elected by the employees

Mr. Bruno Crémel and Mr. Vincent Rodet became members of the Audit Committee from 16 May and 23 November 2019 respectively.

Number of members	7
Number of independent Directors	2
Percentage of independent Directors*	66.67%

* Excluding Directors representing the employees.

Article L. 823-19 of the French Commercial Code states that at least one member of the Committee must have specific skills in financial or accounting matters and be independent based on the criteria defined and made public by the Board of Directors. Furthermore, Article 16.1 of the AFEP-MEDEF Code recommends that all members of the Audit Committee have financial or accounting skills, that the re-election of the Chair of the Committee be specially examined by the Board and that the share of independent Directors on the Board be at least two-thirds (excluding Directors representing employees).

- Ms. Claire Pedini for the Corporate Responsibility Committee;
- Ms. Colette Lewiner for the Appointments, Remuneration & Governance Committee.

The members, duties and activity of each of the Committees are described below.

The Government Commissioner and the Head of the French State General Economic and Financial Supervisory Mission to the Company can attend the meetings of these Committees.

The work of the Committees is organised within a programme prepared for the year. Meetings are recorded in the form of written minutes, and there are oral reports by the Committee Chair at the following meeting of the Board of Directors.

The Board's internal rules of procedure provide that the Committees shall meet in sufficient time before the Board's meeting, whose agenda includes consideration of matters falling within their remit.

The Committees may invite Company executives, including the Chairman & Chief Executive Office, to attend their meetings. They may also invite other parties to attend, whether employed by the Company or not, provided they inform the Chairman & Chief Executive Officer in advance and on the condition that they report such attendance to the Board. The Committees may also seek external technical advice and order studies on issues falling within their remit, at the Company's expense, after having informed the Chairman & Chief Executive Officer and provided that they report this matter to the Board.

In 2019, the average overall attendance rate of the Committees was 92.9%. The average rate of attendance per Committee as well as individual attendance rates by members are provided below.

The table below outlines the membership of the Audit Committee on the date of filing of the Universal Registration Document:

4. Corporate governance

Members and functioning of the Board of Directors

Duties

The Audit Committee carries out the duties entrusted to it in accordance with Article L. 823-19 of the French Commercial Code under the supervision of the Board of Directors. In accordance with this article, the Committee is tasked with the following duties in particular:

- monitoring the process to prepare financial information and making any recommendations to guarantee its integrity;
- monitoring the effectiveness of the internal control, risk management and internal audit systems, regarding procedures relating to the preparation and processing of accounting and financial information;
- monitoring the performance of the duties of the Statutory Auditors, ensuring their independence, and approving the provision of the services mentioned in Article L. 822-11-2 of the French Commercial Code.

In fulfilling its duties, it examines and gives its opinion to the Board of Directors, on:

- the Company's financial position, the medium-term plan and the budget;
- the preliminary and consolidated annual and half-yearly financial statements and related financial reports;
- the monitoring of risks and internal control (mapping of Group risks and methods of detection, anticipation and management of risks in all areas, including social, environmental and climate change risks, organisation and evaluation of internal control processes); in this context, it ensures, in conjunction with the Corporate Responsibility Committee, the existence of programmes for the internal control and management of the main risks in terms of ethics, compliance, and corporate responsibility;

- auditing (annual audit programme, main findings and corrective actions, monitoring of their implementation);
- the monitoring of the Statutory Auditors (coordination of the auditor selection procedure, monitoring of the Statutory Auditors' fulfilment of their duties taking account, where applicable, of the findings and conclusions of the Haut Conseil du Commissariat aux Comptes (*i.e.* French High Council of Auditors), verification of the Statutory Auditors' compliance with the conditions of independence provided for in the applicable texts, opinion on the amount of fees, approval of the provision by the Statutory Auditors of non-auditing procedures according to a procedure approved by the Board of Directors on 3 November 2016);
- the financial aspects of external growth or divestment activities that are particularly significant (see section 4.2.2.3 "Powers and duties of the Board of Directors");
- the policies in terms of insurance, energy market risks and risk of bankruptcy of the Group's counterparties.

The examination of the financial statements by the Committee is accompanied by a presentation by the Statutory Auditors underlining the bases for the preparation of the financial statements, the applicable accounting frame of reference, the audit approach implemented and the conclusions of their auditing work or limited review. In addition to the meetings of the Audit Committee devoted to examining the annual and half-yearly financial statements, the Statutory Auditors also attend the meetings devoted to risk monitoring, internal control and auditing.

For the purposes of its work, the Committee regularly meets with the Statutory Auditors, Executive Management, Corporate Finance, Group Risk Management and Internal Auditing.

Activity in 2019

The table below presents the statistical data relating to the 2018 and 2019 fiscal years:

	2018	2019
Number of meetings	5	6
Average attendance rate	97.5%	100%
Average duration of the meetings	3 hours and 3 minutes	2 hours and 31 minutes

The table below presents individual attendance rates during the 2019 fiscal year by members of the Audit Committee whose terms of office are ongoing on 31 December 2019:

Members of the Audit Committee	Average attendance rate in 2019
Marie-Christine Lepetit	100%
Jacky Chorin	100%
Bruno Crémel	100%
Colette Lewiner	100%
Jean-Paul Rignac	100%
Vincent Rodet	100%
Christian Taxil	100%

In 2019, the Audit Committee, amongst other tasks, examined the half-year and annual financial statements and the related financial reports, the presentation of the Statutory Auditors' 2019 audit plan and the key points of their findings following their work, the recommended interim dividend for the 2019 fiscal year, the 2020 budget and the 2020-2022 medium-term plan (MTP), the review of the value of assets with a view to the closing of the 2019 financial statements, off-balance sheet commitments, the updated risk mapping, changes in priority risks, risk control methods and improvement initiatives identified, the summary of internal audits and of the audit programme, risks relating to climate change, management of the risk of dependency on rare and critical raw materials, the annual financial

management and financial risk control agreement and the Group's annual counterparty risk summary.

In accordance with the procedure approved by EDF's Board of Directors on 3 November 2016, the Committee authorised the Statutory Auditors and the members of their network to provide services other than the certification of the financial statements and it was informed on a half-yearly basis of the services provided as part of the pre-approval process under the terms of this procedure.

The Committee did not need to seek any external technical advice or order any studies on issues falling within its remit during the 2019 fiscal year.

4.2.3.2 Nuclear Commitments Monitoring Committee

Membership

The table below outlines the membership of the Nuclear Commitments Monitoring Committee on the date of filing of the Universal Registration Document:

Members of the Nuclear Commitments Monitoring Committee

Gilles Denoyel	Chairman	Director appointed by the Shareholders' Meeting on recommendation from the French State
Karine Granger	Member	Director elected by the employees
Marie-Christine Lepetit	Member	Director appointed by the Shareholders' Meeting on recommendation from the French State
Colette Lewiner	Member	Independent director appointed by the Shareholders' Meeting
Vincent Rodet	Member	Director elected by the employees
Michèle Rousseau	Member	Director appointed by the Shareholders' Meeting on recommendation from the French State

Mr. Denoyel became a member and Chairman of the Nuclear Commitments Monitoring Committee from 16 May 2019. Ms. Granger and Mr. Rodet became members of the Committee from 23 November 2019.

Number of members	6
Number of independent Directors	1
Percentage of independent Directors*	25%

* Excluding Directors representing the employees.

Duties

The Nuclear Commitments Monitoring Committee (NMC) was created by Article 9 of Decree no. 2007-243 of 23 February 2007 on the securing of the financing of long-term nuclear expenses. It is tasked with monitoring the value of nuclear liabilities and changes in the related provisions, issuing an opinion on issues relating to the governance of dedicated assets, the rules for asset-liability matching and on strategic allocation, as well as examining the results of the management of assets constituted by the Company and verifying the compliance of such management with the rules on constituting, managing, and controlling the financial risks of dedicated assets. It provides the Board with an opinion on the internal control procedure for the financing of the expenses set out in Article L. 594-1 of the French Environmental Code.

The Committee relies on the works of the Nuclear Commitments Financial Expertise Committee (NCFEC) which is comprised of independent experts appointed by the Board⁽¹⁾, whose duty is to assist the Company and its corporate bodies with matters relating to asset-liability matching and the management of dedicated assets.

Finally, the Committee issues an opinion prior to any investment in unlisted dedicated assets for any project exceeding a unit amount of €400 million as well as for any project (excl. real estate) exceeding a unit amount of €200 million resulting in full consolidation of the target investment by the Company. In case the Committee issues a negative opinion on an investment plan, the Board of Directors has sole authority to authorise the aforementioned plan.

Activity in 2019

	2018	2019
Number of meetings	4	3
Average attendance rate	79.2%	94.4%
Average duration of the meetings	1 hour and 52 minutes	2 hours and 45 minutes

The table below presents individual attendance rates during the 2019 fiscal year by members of the Nuclear Commitments Monitoring Committee whose terms of office are ongoing on 31 December 2019:

Members of the Nuclear Commitments Monitoring Committee	Average attendance rate in 2019
Gilles Denoyel	100%
Karine Granger*	n/a
Marie-Christine Lepetit	100%
Colette Lewiner	100%
Vincent Rodet*	n/a
Michèle Rousseau	100%

* Directors who took office after the last meeting of the NCMC held in 2019.

In 2019, the Committee examined the coverage situation and the discount rate for nuclear provisions, the performance of the portfolios of listed and unlisted dedicated assets, the three-yearly report on the securing of financing for nuclear expenses and the report on internal control which it includes, the state of progress of the first-generation nuclear power plant decommissioning programme, and the

industrial geological storage centre (CIGEO) and activated waste packaging and storage facility (ICEDA) projects (see section 1.4.1.1.4 "The nuclear fuel cycle and related issues"). The Statutory Auditors presented their nuclear liability auditing approach to the Committee. Finally, the Committee examined the recommended changes to the membership of the NCFEC prior to the Board of Directors' decision.

(1) The current members of the NCFEC were re-elected or appointed on 19 November 2019 for three years by the Board of Directors on recommendation from the NCMC.

4.2.3.3 Strategy Committee

Membership

The table below outlines the membership of the Committee on the date of filing of the Universal Registration Document. The Directors who are not members of the Strategy Committee may attend its meetings.

Members of the Strategy Committee

Jean-Bernard Lévy	Chairman	Chairman & Chief Executive Officer, Director appointed by the Shareholders' Meeting
Jacky Chorin	Member	Director elected by the employees
François Delattre	Member	Director appointed by the Shareholders' Meeting on recommendation from the French State
Karine Granger	Member	Director elected by the employees
Laurence Parisot	Member	Independent Director appointed by the Shareholders' Meeting
Philippe Petitcolin	Member	Independent Director appointed by the Shareholders' Meeting
Vincent Rodet	Member	Director elected by the employees
Christian Taxil	Member	Director elected by the employees
Martin Vial	Member	Representative of the French State

Mr. Petitcolin became a member of the Strategy Committee from 16 May 2019. Ms. Granger and Mr. Rodet became members of the Committee from 23 November 2019.

Duties

The Strategy Committee issues an opinion to the Board of Directors on the major strategic orientations of the Company and, specifically, the corporate strategic plan presenting the actions to be implemented in order to comply with the objectives of the multi-year energy plan (Programmation pluriannuelle de l'énergie) defined by the French government (see section 1.5.1.2 "Public service in France"), the

Company's strategic objectives drawn up with a view to the consultation of the EDF Central Works Council, the public service contract (see section 1.5.1.2 "Public service in France"), strategic agreements, alliances and partnerships, as well as research and development policy.

Activity in 2019

	2018	2019
Number of meetings	3	3
Average attendance rate*	92.6%	96.3%
Average duration of the meetings	2 hours and 45 minutes	3 hours and 5 minutes

* Attendance rate calculated based on the members of the Committee alone (all of the members of the Board may attend these meetings).

The table below presents individual attendance rates during the 2019 fiscal year by members of the Strategy Committee whose terms of office are ongoing on 31 December 2019:

Member of the Strategy Committee	Average attendance rate in 2019
Jean-Bernard Lévy	100%
Jacky Chorin	100%
François Delattre	100%
Karine Granger	100%
Laurence Parisot	100%
Philippe Petitcolin	67%
Vincent Rodet	100%
Christian Taxil	100%
Martin Vial	100%

In 2019, the Committee examined, among other matters, the performance and ambitions of EDF Renewables, the challenges for EDF arising from the public debate on the French National Radioactive Materials and Waste Management Plan (PNGMDR), the EDF group's Research & Development policy, the main hypotheses of the 2020-2022 MTP, as well as action plans following the report by Jean-Martin Folz on the Flamanville EPR project.

The Committee also examined the state of progress of the ongoing work to re-examine the Group's organisation (see section 1.3.3.1 "Strategy and organisation").

4.2.3.4 Corporate Responsibility Committee

In the latest update of the Board's internal rules of procedure, approved on 8 October 2019, the missions regarding governance issues of the governance & corporate responsibility committee were transferred to the Appointments & Compensation Committee and the Governance & Corporate Responsibility Committee was renamed Corporate Responsibility Committee (see section 4.2.3.5 "Appointments, Remuneration & Governance Committee" below).

Membership

The table below outlines the membership of the Corporate Responsibility Committee on the date of filing of the Universal Registration Document:

Members of the Corporate Responsibility Committee

Claire Pedini	Chair	Independent Director appointed by the Shareholders' Meeting
Claire Bordenave	Member	Director elected by the employees
Jacky Chorin	Member	Director elected by the employees
Laurence Parisot	Member	Independent Director appointed by the Shareholders' Meeting
Vincent Rodet	Member	Director elected by the employees

Ms. Pedini was appointed Chair of the Corporate Responsibility Committee from 16 May 2019. Ms. Bordenave and Mr. Rodet became members of the Committee from 23 November 2019.

Number of members	5
Number of independent Directors	2
Percentage of independent Directors*	100%

* Excluding Directors representing the employees.

Duties

The Corporate Responsibility Committee examines, in connection with the Group's strategy, the Group's commitments and policies, as well as their implementation, in terms of ethics, compliance, and corporate responsibility. It examines the way in which the Company takes account of issues relating to climate change. It makes sure, in conjunction with the Audit Committee, of the existence of programmes to identify and manage the main risks in these fields and comply with legal and regulatory provisions.

In the line of its duties, it particularly examines the information regarding the declaration of extra-financial performance included in the management report in accordance with the French Commercial Code (*Code de commerce*), in conjunction

with the Audit Committee, the annual ethics and compliance report, the EDF mediator's annual report, as well as the annual reports by the French inspector general for nuclear safety and radiation protection and the inspector for hydropower safety (see sections 1.4.1.5.1.2 "Hydropower safety" and 3.3.1.2.1 "Nuclear safety").

It submits an opinion to the Board on the way in which the Company implements a non-discrimination and diversity policy, particularly in terms of balanced representation of women and men in governing bodies.

The Committee can submit any opinions, proposals and recommendations to the Board of Directors in fields falling within its remit.

Activity in 2019

	2018	2019
Number of meetings	7*	8*
Average attendance rate	92.9%	87.5%
Average duration of the meetings	1 hour and 32 minutes	1 hour and 20 minutes

* Including two joint meetings with the Appointments & Compensation Committee (before 8 October 2019).

The table below presents individual attendance rates during the 2019 fiscal year by members of the Corporate Responsibility Committee whose terms of office are ongoing on 31 December 2019:

Members of the Corporate Responsibility Committee	Average attendance rate in 2019
Claire Pedini	100%
Claire Bordenave	100%
Jacky Chorin	100%
Laurence Parisot	50%
Vincent Rodet	100%

In 2019, the Committee examined the 2018 reports by the French inspector general for nuclear safety and radiation protection and the inspector for hydropower safety, the governance sections of the 2018 management report, the results of the 2018 "My EDF" survey, socially-responsible sub-contracting, EDF's relations with service providers in the nuclear industry and CSR in the purchasing process, the 2018 report by the EDF Mediator, EDF's equal access to employment and equal pay policy and review as well as the objectives that the Group set itself in terms of the proportion of women in governing bodies (see section 3.3.3.1.5 "Diversity and inclusion, Equal access to employment for women and men"), the Group's 2018 health and safety review, the 2018 ethics and compliance review and 2019 priorities, the plan to update the Board of Directors' internal rules of procedure, EDF's extra-financial rating results, as well as revision of the Group's materiality matrix.

The Committee also held two joint meetings with the Appointments & Compensation Committee focused on evaluation of Director independence.

4.2.3.5 Appointments, Remuneration & Governance Committee

In the update of the Board's internal rules of procedure, approved on 8 October 2019, the missions regarding governance issues of the governance & corporate responsibility committee were transferred to the Appointments & Compensation Committee. The Appointments & Compensation Committee was renamed the Appointments, Remuneration & Governance Committee.

4. Corporate governance

Members and functioning of the Board of Directors

Membership

The table below outlines the membership of the Appointments, Remuneration & Governance Committee on the date of filing of the Universal Registration Document:

Members of the Appointments, Remuneration & Governance Committee

Colette Lewiner	Chair	Independent director appointed by the Shareholders' Meeting
Karine Granger	Member	Director elected by the employees
Claire Pedini	Member	Independent Director appointed by the Shareholders' Meeting
Martin Vial	Member	Representative of the French State.

Ms. Lewiner was appointed Chair of the Appointments, Remuneration & Governance Committee from 16 May 2019 and Ms. Pedini became a member of it on the same date. Ms. Granger became a member of the Committee from 23 November 2019.

Number of members	4
Number of independent Directors	2
Percentage of independent Directors*	66.67%

* Excluding Directors representing the employees.

Duties

In terms of appointments, the Committee submits its recommendations or proposals to the Board of Directors regarding the appointment of Directors by the Shareholders' Meeting. It supervises the selection process of potential candidates and may perform its own review of the candidates. It proposes to the Board the definition and updating of a diversity policy applied to Directors. It monitors the implementation of the policy and the results achieved. The Committee ensures the existence of succession plans in order to anticipate the succession, whether unforeseen or at the end of their term, of executive corporate officers and members of the Group's Executive Committee. The Chairman & Chief Executive Officer is involved in the Committee's work in the performance of this task, except work regarding his or her own succession.

With regard to remuneration, the Committee examines and gives an opinion on the corporate officer compensation policy mentioned in Article L. 225-37-2 of the French Commercial Code (*Code de commerce*) and on the principles and criteria used to determine and distribute the fixed, variable and exceptional items of the Chairman & Chief Executive Officer's compensation and benefits of all kinds. It submits this opinion to the Board for deliberation. The Chairman of the Committee submits this opinion for approval to the French Minister for the Economy. The Committee prepares its proposals within the limits specified by Decree no. 2012-915 of 26 July 2012, which amended the Decree of 9 August 1953, relating to French State control of the compensation of the executives of public

companies, in accordance with which the Chairman & Chief Executive's annual compensation must not exceed the cap of €450,000. The Committee submits to the Board its opinion on the compensation policy of the Group's Executive Committee and the main executives, as well as on the amount and terms and conditions for the distribution of the sum set by the Shareholders' Meeting to allocate to the Directors in return for their duties.

In terms of governance, the Committee oversees issues relating to corporate governance and ensures the implementation, via the Company's corporate bodies, of the principles and rules outlined in the AFEP-MEDEF Code. It may make proposals concerning changes in the functioning or powers of the Board or its internal rules of procedure. Every year, it conducts a review of the functioning of the Board and its Committees and every three years supervises the formal evaluation conducted by an independent external consultant. Each year, the Committee examines the individual situations of the Directors according to the criteria defined by the AFEP-MEDEF Code regarding their independence and reports its findings to the Board. In the event of appointment of new members of the Audit Committee, it also examines these members' expertise in the field of finance, accounting and statutory audit. It examines and gives its opinion on situations of conflicts of interest of which it has become aware or which are reported to it and reports such situations to the Board.

Activity in 2019

	2018	2019
Number of meetings	4*	9*
Average attendance rate	100%	86.1%
Average duration of the meetings	53 minutes	24 minutes

* Including two joint meetings with the Governance & Corporate Responsibility Committee (before 8 October 2019).

The table below presents individual attendance rates during the 2019 fiscal year by members of the Appointments, Remuneration & Governance Committee whose terms of office are ongoing on 31 December 2019:

Members of the Appointments, Remuneration & Governance Committee	Average attendance rate in 2019
Colette Lewiner	100%
Karine Granger	100%
Claire Pedini	100%
Martin Vial	75%

In 2019, the Committee held several meetings focusing on the process of re-election of the Board of Directors and examination of the recommended candidates in readiness for the Shareholders' Meeting of 16 May 2019, taking account of the diversity policy applicable to Directors (see section 4.2.1 "Members

of the Board of Directors"). In this context, the Committee was assisted by a specialist external advisor in the search for candidates. It also gave its opinion to the Board on the co-optation carried out after the Shareholders' Meeting. It also examined the executive compensation policy, diversity policy applicable to members of the Board of Directors and changes to membership of the Board Committees.

The Committee also issued an opinion for the Board on the policy regarding compensation of the Chairman & Chief Executive Officer and the setting of his compensation in respect of the 2019 fiscal year.

The Committee also held two joint meetings with the Governance & Corporate Responsibility Committee focused on evaluation of Director independence.

4.3 Executive Management

The Chairman & Chief Executive Officer is assisted by an Executive Committee which includes representatives of all the Group's lines of business.

This Committee is a body that makes decisions on, considers and discusses the Group's operational and strategic issues. It examines all the Group's significant underlying and current issues, tracks the operating objectives and results and contributes to the management and forecasting of the EDF group's major challenges. It reviews and authorises significant projects, specifically the Group's investment or divestment projects for amounts which exceed certain thresholds, in accordance, where appropriate, with the governance of the Group's listed subsidiaries. The Executive Committee meets in principle each week.

In order to reinforce the examination and follow-up of projects, an Executive Committee Commitments Committee examines in-depth the most significant projects in terms of level of commitments or risks incurred before the Executive Committee makes its decision. No investment project may be submitted for review by the Board of Directors without having first been approved by this Committee.

On the date of filing of this Universal Registration Document, the Executive Committee had twelve members and a Secretary. The list of members and their personal information appear below.

4.3.1 Members of the Executive Committee

On the filing date of this Universal Registration Document, the members of the Executive Committee were as follows:

Names	Duties
Jean-Bernard Lévy	Chairman & Chief Executive Officer
Marc Benayoun	Group Senior Executive Vice-President, Customers, Services and Regions. He oversees Edison and gas activities (1)
Bruno Bensasson	Group Senior Executive Vice-President, Renewable Energies, Chairman & Chief Executive Officer of EDF Renewables
Christophe Carval	Group Senior Executive Vice-President, Group Human Resources
Xavier Girre	Group Senior Executive Vice-President, Group Finance
Véronique Lacour	Group Senior Executive Vice-President, Transformation and Operational Effectiveness
Béatrice Buffon	Group Senior Executive Vice-President, International Division (4)
Cédric Lewandowski	Group Senior Executive Vice-President, Nuclear and Thermal (2)
Alexandre Perra	Group Senior Executive Vice-President, Innovation, Corporate Responsibility and Strategy (3)
Simone Rossi	Group Senior Executive Vice-President, Chief Executive Officer of EDF Energy
Pierre Todorov	Group Senior Executive Vice-President, Group General Secretary
Xavier Ursat	Group Senior Executive Vice-President, New Nuclear Projects and Engineering

Paul-Marie Dubée is the Secretary of the Executive Committee. He is Executive Coordinator, Government Relations.

(1) Marc Benayoun replaced Henri Lafontaine from 1 July 2019.

(2) Cédric Lewandowski replaced Philippe Sasseigne from 1 July 2019.

(3) Alexandre Perra replaced Cédric Lewandowski from 1 July 2019.

(4) Béatrice Buffon replaced Marianne Laigneau from 10 February 2020.

4.3.2 Personal information on members of the Executive Committee

Marc Benayoun, 53 years old, a graduate of ESSEC business school, began his career at Paribas Group in 1989, before joining the Boston Consulting Group in 1993. He became Partner and Managing Director at the Paris office in 2001 then at the Moscow office in 2008 and during this period held a range of responsibilities, including the development of the Company's skills and activities in the natural gas sector. In 2009, he joined the EDF group as Economics, Tariffs and Prices Director, at the Commerce Division. He was notably in charge of discussions related to changes in the French regulated electricity tariffs. In 2012, he became Director, Business Customers Market. In this role, he managed the project to end regulated electricity tariffs for companies and local communities, which resulted in EDF regaining its leadership position in a competitive environment. In 2016, Marc Benayoun was appointed Member of the Executive Committee of the EDF group, Gas and Italy. As such, he served as Chief Executive Officer of Edison, the third-largest Italian energy company. He also oversaw gas procurement activities for the EDF group, and managed its portfolio of long-term contracts for the transport of natural gas by pipeline and by sea (liquefied gas), as well as the assets needed to

transport the gas to the delivery points. Since July 2019, Marc Benayoun was appointed Group Senior Executive Vice-President, Customers & Energy Services. In this capacity, he is heading the Commerce Division and supervises energy services related entities, including Dalkia. He is also a member of the EDF Trading Board of Directors, Chairman of the Edison Board of Directors and supervises EDF group gas procurement platform based in Italy.

Bruno Bensasson, 47 years old, is a graduate of the École Polytechnique and École des Mines of Paris. He started his career in 1998 at the ASN (i.e. French nuclear security authority) as head of a Regional Division (Lower and Upper Normandy) then as the Chief of Staff of the CEO. From 2004 to 2006, he was the technical adviser responsible for the environment, new energies and nuclear energy at the office of the French Minister for Industry, then technical adviser at the General Secretariat of the office of the President of the French Republic in charge of industry, the environment and transport. He joined SUEZ in 2007 as Director of economic studies at the Department of development and strategy. In 2011, he

became a member of GDF SUEZ's Executive Committee as Director for strategy and sustainable development. He was appointed CEO of GDF SUEZ Énergie France in early 2013 and, in July 2014, became the Vice-President of GDF SUEZ Energie Europe in charge of development and renewable generation. Since 2016, he has been the CEO of Engie Afrique. In May 2018, Bruno Bensasson became the EDF group Senior Executive Vice-President responsible for Renewable Energies and the Chairman & Chief Executive Officer of EDF Renewables.

Béatrice Buffon, 45 years old, is a graduate from both the École Polytechnique and the École Nationale des Ponts et Chaussées. She began her career as Finance Manager at COGETHERM, an EDF subsidiary specialized in the development of Combined Heat and Power (CHP) projects. In 2001, she joined SIF Energies, which later became EDF Renewables, where she would take up office as Project Director in 2003. From 2007 to 2009, she undertook the functions of Deputy Executive Director of POWEO Energies Renouvelables. She returned to EDF Renewables in 2010 as Director of Development for large-scale, ground-mounted solar power projects; then in 2011, she became Director of Development for Offshore Wind Power France. In 2014, Béatrice Buffon became Executive Vice-President of EDF Renewables, in charge of renewable marine energies and a member of the EDF Renewables Executive Committee. She is Chevalier de l'Ordre national du mérite. Since February 2020, she has been Group Executive Director in charge of EDF's International Division.

Christophe Carval, 59 years old, holds a degree in electrical engineering from HEI Lille engineering school, and joined the EDF group in 1982. He has held several management positions in Departmental, Regional and Inter-regional Units in the electricity and gas distribution sector. In 2007, he was appointed to head up the project to create then manage the new Shared Services Division of the EDF group. He was the Director of Human Resources, Health & Safety and the Enedis Transformation project from 2014. Since July 2017, he has held the position of Group Senior Executive Vice-President, Human Resources Division.

Xavier Girre, 51 years old, graduated HEC business school, is the holder of a Master's in business law, a graduate of IEP (i.e. Paris Institute of Political Studies) and is ENA (i.e. French National School of Administration) alumni. Xavier Girre began his career at the French National Audit Office in 1995, before joining the Veolia group in 1999 where he spent twelve years and notably held the positions of Group Risk and Auditing Director of Veolia Group, Deputy Chief Executive Officer in charge of Finance of Veolia Transportation then of Veolia Environmental Services. From 2011 to 2015, he was COO, Chief Financial Officer of La Poste group and then Chairman of the XAnge Private Equity Supervisory Board. Xavier Girre joined EDF in 2015 as France Chief Financial Officer, before being appointed to the EDF Executive Committee. He is also Director of EDF Energy, EDF Renewables, Dalkia, Edison, Chairman of the Board of Directors of EDF Trading, a member of the Supervisory Board of Enedis, Chief Executive Officer of CTE and Chairman of the Supervisory Board of RTE. Xavier Girre is also Director and Chairman of the Audit Committee of La Française des Jeux. Since March 2016, he has been Group Senior Executive Vice-President, Finance.

Véronique Lacour, 55 years old, holds a postgraduate diploma in information systems from the University of Paris I Panthéon Sorbonne. Véronique Lacour started her career at Thales in 1987, where she gained solid experience in information systems, before taking up the position of Chief Information Officer for a new Division of Thales in 2004. Between 2007 and 2009, she managed the HR Information Systems Shared Services of such Division. She moved to Safran in 2009 where she held the position, first, of Chief Information Officer for Safran Aircraft Engines (formerly Snecma), and later, in 2013, Vice-President Improvement Initiatives, where she managed continuous improvement and transformation initiatives. She went on to become Vice-President Programs for Safran Analytics, and was involved in the creation of this new Big Data-focused entity as part of the Group's digital transformation strategy. Véronique Lacour joined EDF's Executive Committee on 1 December 2016, tasked with directing the Group's activities in the areas of information systems, purchasing, property, consultancy, tertiary services and IT. Since 2016, she has been Group Senior Executive Vice-President, Transformation and Operational Effectiveness.

Cédric Lewandowski, 50 years old, is a graduate of the Paris Institute of Political Studies (IEP) and holds a postgraduate degree (DEA) in Geopolitics (Paris-VIII). Cédric Lewandowski began his career at EDF in 1998 as the Chief of Staff for the Chairman of EDF from 1998 to 2004, he then served as Director of the Electric

Transport and Vehicles Division of Électricité de France from 2005 to 2008. He subsequently became Director of EDF Regional Authorities within EDF's Commerce Division from 2008 to 2012, Chairman of the Board of Directors of H4 from 2009 to 2012, Director of Safidi from 2009 to 2012 and Chairman of the Board of Directors of Tiru from 2009 to 2012. He was then appointed Chief of Staff of the Civil and Military Cabinet of the French Ministry of Defence from May 2012 until mid-2017. He held the position of EDF group Senior Executive Vice-President, Innovation, Corporate Responsibility and Strategy from 2017 to 2019. He is Chairman of the Board of Directors of ÉS (Électricité de Strasbourg) and President of the Association Française de l'Éclairage (i.e. French Association for Lighting, AFE). He is Governor, member of the WANO Main Governing Board. He has been Group Senior Executive Vice-President, Nuclear and Thermal since July 2019.

Alexandre Perra, 39 years old, is a graduate of the Institut d'Etudes Politiques de Paris and holds a Master's degree in modern literature. He joined Thales in 2007, firstly working at the Strategy Department, before becoming head of Group internal Communications, then Media Relations and finally being appointed Deputy Director of Group Communications. Alexandre Perra joined EDF in November 2014 as Executive Director attached to the Chairman and CEO of EDF, Executive Committee's Secretary and in charge of governmental relations. He took part in the definition of the CAP 2030 company strategy, first implemented in 2015 then again in 2018, and headed up the Group's Storage plan. In 2017, he launched project Y, which mobilises young employees under the age of 35 to accelerate EDF's digital transformation. He is also a sponsor of Let's Talk Energy, a collective intelligence programme promoting dialogue between employees to develop the Company's strategy. He is Chairman of EDF Pulse Croissance Holding and a member of the Supervisory Board of Enedis, and Member of the Fondation EDF's Board of Directors. Since July 2019, he has been Executive Director in charge of the Innovation, Corporate Responsibility and Strategy Department.

Simone Rossi, 51 years old, a graduate of the University of Bocconi (Milan) in business administration. Simone Rossi began his career as a consultant, firstly at KPMG Consulting in corporate finance, then from 1996 at McKinsey & Company, where he mainly specialised in the sectors of energy, financial institutions, and information and communication technologies. In 2004, he joined Edison SpA in Milan (Italy) as Head of Strategy, before being promoted to become Director of Financial Control and Information Systems in 2007. At the end of 2009, he was appointed Chief Financial Officer of Constellation Energy Nuclear Group (CENG), a company based in Baltimore in the United States. He then became Chief Financial Officer of EDF Energy in April 2011. In March 2015, Simone Rossi was appointed EDF group Senior Executive Vice-President, International Division. Since 1 November 2017, he has been the Chief Executive Officer of EDF Energy and Group Senior Executive Vice-President of EDF.

Pierre Todorov, 61 years old, a graduate of the École normale supérieure (Ulm) and the École nationale d'administration (ENA) and holder of an advanced teaching degree in philosophy. Pierre Todorov was an auditor then Counsel at the French Council of State from 1986 to 1990. He then joined Lagardère Group, where he held a range of responsibilities in the media branch, particularly serving as International Deputy Chief Executive Officer of Hachette Filipacchi. In 1997, he was appointed General Secretary of Accor Group, a position he held until 2008. Between 2008 and 2011, he was partner at the law firm Hogan Lovells LLP, then joined PSA Peugeot Citroën in 2011, as General Secretary, member of the Executive Management Committee. Pierre Todorov has been EDF group General Secretary and a member of the Executive Committee since February 2015.

Xavier Ursat, 53 years old, a graduate of the École Polytechnique and Télécom Paris. He joined EDF in 1991, first holding various positions in the Hydraulic Engineering Department until 2002. He oversaw the construction of EDF's hydraulic engineering centres and contributed to international projects, especially in South America. From 2002 to 2005, he was a special advisor to EDF's Senior Executive Vice-President, Generation and Engineering. From 2005 to 2007, he was Assistant Director of the Alps Generation Unit in Grenoble and from 2007 to 2010, Director of the Southwest Generation Unit in Toulouse. From 2010 to 2014, he was successively Deputy Manager and Manager of the Hydraulic Generation & Engineering Division. He is also Chairman of GIFEN, an honorary governor of the World Water Council, Chairman of the Supervisory & Steering Committee of Edvance, and a member of the Supervisory & Steering Board of Framatome. He is also Chairman of the SFEN. Since March 2015, Xavier Ursat has been Group Senior Executive Vice-President, New Nuclear Projects and Engineering.

4.4 Conflicts of interest and interests of corporate officers and executives

4.4.1 Conflicts of interest

To the Company's knowledge, on the date of filing of this Universal Registration Document, there were no potential conflicts of interest involving EDF between the duties of the members of the Company's Board of Directors and Executive Management and their private interests or other duties (regarding the rules applicable to the members of the Board of Directors in terms of conflicts of interest, see section 4.2.2.7 "Obligations and duties of Directors").

Subject to the specific legal and regulatory provisions applicable to the members of the Company's Board of Directors (see section 4.2.1 "Members of the Board of Directors"), to the Company's knowledge, no arrangements or agreements have been entered into with shareholders, clients, suppliers or others under which a member of the Board of Directors or Executive Management has been appointed in this capacity.

To the Company's knowledge, no member of the Board of Directors has agreed to restrict for a fixed period of time his or her ability to sell his or her holdings in the Company's capital, except for the restrictions resulting from the EDF Stock Exchange Ethics Code (see section 4.5.2 "Trading in Company securities"). In addition, corporate officers holding shares in mutual funds through an EDF group Corporate Savings Plan invested in EDF shares, or who have acquired shares from the French State within the legal framework of the privatisation, can be subject to the lock-in and non-transferability rules resulting from the provisions applicable to these transactions.

To EDF's knowledge, there are, moreover, no family ties between members of the administrative bodies or Executive Management.

4.4.2 Absence of conviction

To EDF's knowledge, within at least the past five years, no member of the Board of Directors or of the Executive Management of EDF has been subject to: (i) a conviction for fraud, (ii) bankruptcy, receivership or liquidation, or (iii) conviction and/or official public sanction issued by the statutory or regulatory authorities.

Moreover, to EDF's knowledge, no member of the EDF Board of Directors or Executive Management has been prevented by a court from serving as a member of an administrative, management or supervisory body of an issuer or from participating in the management or direction of an issuer's affairs during the past five years.

4.4.3 Service contracts

EDF's corporate officers did not enter into any service contract with the Company or any of its subsidiaries pursuant to which they would be entitled to any kind of benefits.

4.5 Shareholding by corporate officers and trading in EDF securities by corporate officers and executives

4.5.1 EDF shareholding by Directors

As at 31 December 2019, the members of the Board of Directors of the Company, whose terms of office are ongoing as at 31 December 2019, held a total of 5,531 shares. The table, below, details the number of EDF shares held individually by these Directors on 31 December 2018 and 31 December 2019:

	Number of EDF shares held on 31/12/2018	Number of EDF shares held on 31/12/2019
Jacky Chorin ⁽¹⁾	307	294
Karine Granger	n/a	25
Colette Lewiner ⁽²⁾	1,932	1,929
Laurence Parisot	137	137
Philippe Petitcolin	n/a	10
Vincent Rodet ⁽²⁾	n/a	1,873
Christian Taxil ⁽¹⁾	1,292	1,263
TOTAL	3,668	5,531

n.a.: not applicable.

(1) Shares held through the profit-sharing scheme (FCPE).

(2) Shares held directly and through the profit-sharing scheme (FCPE).

Directors whose terms of office are ongoing on 31 December 2019 and who are not included in the above table, hold no EDF shares.

4.5.2 Trading in Company securities

In 2006, the EDF group adopted a set of principles and rules applicable to trading in shares in EDF or listed EDF group subsidiaries. These rules were compiled into an Ethics Code. This code was updated in 2016 to take account of the entry into force of regulation (EU) no. 596/2014 on market abuse (so-called "MAR" – market abuse regulation), its implementing regulations ⁽¹⁾, law no. 2016/819 of 21 June 2016 reforming the system for the repression of market abuse and the new Guide on ongoing information and the management of inside information published by the AMF on 26 October 2016.

At the same time as this Code was distributed, awareness campaigns on stock exchange rules were launched for Group employees, specifically regarding precautions and obligations relating to the holding of inside information and the black-out periods during which permanent or temporary insiders, including third parties acting in the name or on behalf of the Group, and, more specifically regarding black-out periods, all persons performing executive duties within the Group, are required to refrain from trading Company securities or other related financial instruments.

The Ethics Code also notes the obligations imposed on executives, high-level managers as well as persons closely linked to them to declare to the AMF and to the Company trades in EDF securities or other related financial instruments that they make on their own behalf. Indeed, under the terms of Article 19 of MAR, specified in Article 223–22 A of the AMF general regulations, the executives of companies with shares listed for trading on a regulated market must declare trades in Company securities to the AMF and to the Company within three working days of their completion, when the combined amount of these trades exceeds the sum of €20,000 for the current calendar year.

Pursuant to the AMF general regulations ⁽²⁾, the EDF Board of Directors must mention in its annual report to the Shareholders' Meeting trades that have been declared by executives and similar persons ⁽³⁾ over the past fiscal year.

No trades in EDF securities were declared to the AMF or to the Company during the 2019 fiscal year by the members of the Board of Directors and the Company's Executive Committee.

(1) Delegated regulation (EU) 2016/522 of 17 December 2015 as regards the indicators of market manipulation, the disclosure thresholds, the permission for trading during closed periods and types of notifiable managers' transactions; delegated regulation (EU) 2016/908 of 26 February 2016 with regard to accepted market practices; delegated regulation (EU) 2016/909 of 1 March 2016 with regard to notifications and lists of financial instruments to be submitted to competent authorities in accordance with Article 4 of MAR; delegated regulation (EU) 2016/1052 of 8 March 2016 with regard to the conditions applicable to buy-back programmes and stabilisation measures; delegated regulation (EU) 2016/957 of 9 March 2016 with regard to abusive practices or suspicious orders or transactions; delegated regulation (EU) 2016/958 of 9 March 2016 with regard to technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest; delegated regulation (EU) 2016/960 of 17 May 2016 with regard to market soundings; implementing regulation (EU) 2016/347 of 10 March 2016 regarding insider lists; Commission implementing regulation (EU) 2016/523 of 10 March 2016 with regard to managers' transactions; implementing regulation (EU) 2016/378 of 11 March 2016 laying down implementing technical standards with regard to the timing, format and template of the submission of notifications according to Article 4 of MAR; implementing regulation (EU) 2016/959 of 17 May 2016 relating to market soundings; implementing regulation (EU) 2016/1055 of 29 June 2016 with regard to the technical means for appropriate public disclosure of inside information and for delaying the public disclosure of inside information.

(2) Article 223–26 of the AMF general regulations.

(3) At EDF, staff "similar to executives" are the members of the Company's Executive Committee.

4.6. Compensation and benefits of corporate officers

4.6.1 Compensation of corporate officers

The compensation and benefits of all kinds paid in the 2019 fiscal year to corporate officers by the Company and the companies it controls are listed below. The tables below were drawn up in accordance with the format recommended by the AFEP-MEDEF Code of Corporate Governance and the AMF's position-recommendation no. 2009-16, modified on 13 April 2015.

The policy on the compensation of corporate officers, drawn up by the Board of Directors in accordance with Article L. 225-37-2 of the French Commercial Code (*Code de commerce*) with a view to its submission to the Shareholders' Meeting scheduled for 7 May 2020, features in section 8.4 "Appendices" of this Universal Registration Document.

4.6.1.1 Total compensation of the Chairman & Chief Executive Officer

SUMMARY TABLE OF COMPENSATION AND OPTIONS AND SHARES ALLOCATED TO THE CHAIRMAN & CHIEF EXECUTIVE OFFICER (1)

(in euros)	2018 fiscal year	2019 fiscal year
Jean-Bernard Lévy, Chairman & Chief Executive Officer		
Compensation due for the fiscal year	452,868	453,660
Valuation of multi-year variable compensation allocated during the fiscal year	none	none
Valuation of options allocated during the fiscal year ⁽²⁾	none	none
Valuation of bonus shares allocated during the fiscal year ⁽²⁾	none	none
TOTAL	452,868	453,660

(1) Table 1 of AMF position-recommendation no. 2009-16.

(2) As indicated in section 4.6.2, the Company has not implemented any stock options plans and the corporate officers receive no allocation of bonus shares.

The table below details the compensation of all kinds owed and paid to Jean-Bernard Lévy, Chairman & Chief Executive Officer, for the 2018 and 2019 fiscal years.

SUMMARY TABLE OF THE COMPENSATION OF THE CHAIRMAN & CHIEF EXECUTIVE OFFICER ⁽¹⁾

(in euros)	2018 fiscal year		2019 fiscal year	
	Amounts due for the fiscal year	Amounts paid during the fiscal year	Amounts due for the fiscal year	Amounts paid during the fiscal year
Jean-Bernard Lévy, Chairman & Chief Executive Officer				
Fixed compensation	450,000	450,000	450,000	450,000
Variable compensation	none	none	none	none
Multi-year variable compensation	none	none	none	none
Exceptional compensation	none	none	none	none
Compensation of the office of Director	none	none	none	none
Benefits in kind ⁽²⁾	2,868	2,868	3,660	3,660
TOTAL	452,868	452,868	453,660	453,660

(1) At EDF, staff "similar to executives" are the members of the Company's Executive Committee.

(2) Table 2 of AMF position-recommendation no. 2009-16.

4.6.1.1.1 Terms and conditions for the setting of compensation

In accordance with Article 3 of decree no. 53-707 of 9 August 1953 and Articles L. 225-47 and L. 225-53 of the French Commercial Code, the items comprising the compensation of the Chairman & Chief Executive Officer are set by the Company's Board of Directors on the recommendation from the Appointments, Remuneration & Governance Committee and submitted for approval by the French Minister for the Economy after consultation of the relevant Ministers (see section 4.2.3.5 "Appointments, Remuneration & Governance Committee").

Decree no. 2012-915 of 26 July 2012 modified the decree of 9 August 1953 by introducing a limit of €450,000 on compensation payable to corporate officers of French State-owned companies to which this decree is applicable.

Pursuant to the provisions of Article L. 225-37-2 of the French Commercial Code, the compensation policy and the items comprising the compensation of the Chairman & Chief Executive Officer are subject to resolutions submitted to the approval of the Shareholders' Meeting (see compensation policy in section 8.4 "Appendices – Remuneration policy" of this Universal Registration Document).

4.6.1.1.2 Setting of the compensation of the Chairman & Chief Executive Officer

Compensation for the 2019 fiscal year

The Committee responsible for appointments and compensation (now called Appointments, Remuneration & Governance Committee), in their meeting of 7 February 2019, reviewed the policy regarding compensation of the Chairman & Chief Executive Officer and decided to recommend to the Board of Directors that the principles and criteria for the determination of items comprising his compensation be maintained for the 2019 fiscal year.

On recommendation from the Committee, the Board meeting on 14 February 2019 decided to maintain the fixed annual compensation of the Chairman & Chief Executive Officer for the 2019 fiscal year at €450,000 gross. This fixed annual compensation has remained unchanged since the appointment of Mr. Jean-Bernard Lévy as the Chairman & Chief Executive Officer of EDF in 2014 (see section 4.2.2.2 "Method of Executive Management – Appointment and powers of the Chairman & Chief Executive Officer").

Corporate governance

4.6. Compensation and benefits of corporate officers

Compensation for the 2020 fiscal year

The Appointments, Remuneration & Governance Committee meeting of 7 February 2020 reviewed the policy regarding compensation of the Chairman & Chief Executive Officer and decided to recommend to the Board of Directors that the principles and criteria for the determination of items comprising his compensation be maintained for the 2020 fiscal year.

On recommendation from the Committee, the Board meeting on 13 February 2020 decided to maintain the fixed annual compensation of the Chairman & Chief Executive Officer for the 2020 fiscal year at €450,000 gross. The Chairman & Chief Executive Officer's compensation also includes benefits in kind amounting to €3,660.

4.6.1.1.3 Other items of compensation

In 2019, Mr. Jean-Bernard Lévy did not receive any compensation for his terms of office as a Director (compensation allocated to Directors for their work in accordance with Article L. 22545 of the French Commercial Code) and as Chairman of the Board of Directors. He also did not receive any compensation for the positions held at companies controlled by EDF, or any compensation of any kind whatsoever from the companies it controls.

The Company allocated no stock options to the Chairman & Chief Executive Officer in 2019 and no options were exercised during the fiscal year. Similarly, no bonus shares were allocated to the Chairman & Chief Executive Officer during the past fiscal year, and none became available.

Mr. Jean-Bernard Lévy did not receive any hiring bonus from EDF.

EMPLOYMENT CONTRACT, SUPPLEMENTAL PENSION, SEVERANCE PAYMENTS AND NON-COMPETITION CLAUSE

Executive Corporate Officer*	Employment contract	Supplemental pension plan	Compensation or benefits due or liable to be due for termination or modification of duties	Non-competition clause compensation
Jean-Bernard Lévy, Chairman & Chief Executive Officer	no	no	no	no

* Table 11 of AMF position-recommendation no. 2009-16.

4.6.1.2 Total compensation of Directors

The tables below shows the gross amounts of compensation allocated for the 2018 and 2019 fiscal years and paid to the members of the Board of Directors for their terms of office, in accordance with Article L. 225-45 of the French Commercial Code. No exceptional compensation or any other type of compensation was paid to Directors during the 2018 and 2019 fiscal years.

COMPENSATION ALLOCATED TO DIRECTORS DURING THE 2018 AND 2019 FISCAL YEARS:

Directors whose terms of office are ongoing on 31 December 2019	2018 ⁽¹⁾	2019 ⁽¹⁾
Véronique Bédague-Hamilius ⁽²⁾	n/a	761
Bruno Crémel ⁽²⁾	n/a	27,141
François Delattre ⁽²⁾	n/a	18,330
Gilles Denoyel ⁽²⁾	n/a	27,141
Marie-Christine Lepetit	46,258	45,745
Jean-Bernard Lévy	n/a	n/a
Colette Lewiner	49,806	51,011
Laurence Parisot	37,742	35,213
Claire Pedini	41,290	44,574
Philippe Petitcolin ⁽²⁾	n/a	20,705
Michèle Rousseau	36,323	37,553
Martin Vial	39,161	39,309
TOTAL (IN EUROS)	250,580	347,483

n.a.: not applicable.

(1) The compensation allocated for a fiscal year includes the entirety of the fixed portion and the variable portion due for the fiscal year.

(2) Directors whose terms of office began during the 2019 fiscal year.

Directors whose terms of office expired during the 2019 fiscal year	2018 ⁽¹⁾	2019 ⁽¹⁾
Olivier Appert	37,032	12,752
Philippe Crouzet	42,710	14,507
Maurice Gourdault-Montagne	32,065	16,298
Bruno Lafont	40,581	18,018
Bruno Léchevin	37,032	15,093
Anne Rigail	n/a	15,794
TOTAL (IN EUROS)	189,420	92,462

n.a.: not applicable.

COMPENSATION PAID TO DIRECTORS DURING THE 2018 AND 2019 FISCAL YEARS:

Directors whose terms of office are ongoing on 31 December 2019	2018 ⁽¹⁾	2019 ⁽¹⁾
Bruno Crémel ⁽²⁾	n/a	2,514
François Delattre ⁽²⁾	n/a	138
Gilles Denoyel ⁽²⁾	n/a	2,514
Marie-Christine Lepetit	45,581	46,258
Jean-Bernard Lévy	n/a	n/a
Colette Lewiner	49,419	49,806
Laurence Parisot	39,826	37,742
Claire Pedini	39,826	41,290
Philippe Petitcolin ⁽²⁾	n/a	2,514
Michèle Rousseau	37,907	36,323
Martin Vial	39,826	39,161
TOTAL (IN EUROS)	252,385	258,260

n.a.: not applicable.

(1) The payments made during a fiscal year include 50% of the fixed portion and the entirety of the variable portion for the preceding fiscal year and 50% of the fixed portion for the current fiscal year.

(2) Director whose term of office began during the 2019 fiscal year

Directors whose terms of office expired during the 2019 fiscal year	2018 ⁽¹⁾	2019 ⁽¹⁾
Olivier Appert	39,186	34,518
Philippe Crouzet	41,744	40,196
Maurice Gourdault-Montagne	21,400	31,926
Bruno Lafont	37,907	38,067
Bruno Léchevin	36,628	34,518
Anne Rigail	n/a	2,514
TOTAL (IN EUROS)	176,865	181,739

n.a.: not applicable.

Budget and distribution of compensation paid to Directors in accordance with Article L. 225-45 of the French Commercial Code (*Code de commerce*).

The Directors representing the employees hold office without compensation in accordance with law no. 83-675 of 26 July 1983 concerning the democratisation of the public sector, and the Chairman & Chief Executive Officer receives no compensation for his or her term of office as a Director.

In accordance with order no. 2014-948 of 20 August 2014, the compensation allocated, for their term of office, to Directors appointed by the Shareholders' Meeting on recommendation from the French State in accordance with Article 6 of the order and who are French civil servants are paid to the French State budget.

As regards other Directors appointed by the Shareholders' Meeting on recommendation from the French State and who are not civil servants, an order of the French Minister for the Economy and Finance dated 5 January 2018 ⁽¹⁾ states that the Company pays into the French State budget 15% of the compensation allocated to them for their term of office, with the remaining 85% paid to the Director.

Regarding the Representative of the French State appointed in accordance with Article 4 of the order of 20 August 2014, any compensation that he or she is entitled to receive for the performance of his or her duties is paid to the French State budget.

(1) The provisions of the order of 5 January 2018, amending the order of 18 December 2014 in accordance with Article 6-V of the order dated 20 August 2014, have been applicable since 1 February 2018. Prior to that, the order of 18 December 2014 provided that the compensation to be received by these Directors was paid to the tune of 30% to the Directors in question, with the remaining 70% paid into the French State budget.

After the issuing of an opinion by the Appointments, Remuneration & Governance Committee, the Board of Directors submits for approval to the Shareholders' Meeting an annual fixed sum to be allocated to the Directors based on the distribution approved by the Board. The Board, meeting on 13 February 2020, decided to submit to the Shareholders' Meeting scheduled for 7 May 2020 an annual budget of €440,000 for the 2020 fiscal year.

The terms and conditions for the distribution of this annual budget, applicable since the 2011 fiscal year, were re-examined and confirmed by the Board of Directors on 13 February 2020. The total budget is distributed between a fixed portion and a variable portion, each representing half of the budget, distributed as follows:

- the fixed portion is shared equally among the Directors in question; 50% of the fixed annual portion is paid during the fiscal year it is allocated and the remaining 50% at the beginning of the following fiscal year;
- the distribution of the variable portion among the Directors is established through the application of a specific coefficient depending on the type of meetings (Board or Committee) and depending on the particular positions held by each Director (Committee member or Chairman): a coefficient of 2 for the presence of a Director at a meeting of the Board of Directors, a coefficient of 1 for the presence of a Director as a member at a Committee meeting and a coefficient of 2 for chairmanship of a Committee. The variable portion is divided by the total of the coefficients for the fiscal year in order to set the unit value of the coefficient; the variable portion for a fiscal year is fully paid at the start of the following fiscal year.

4.6.2 Stock options – Bonus shares

The Company has not implemented any stock options plans and the corporate officers receive no allocation of bonus shares ⁽¹⁾.

⁽¹⁾ With the exception of any Directors elected by the employees who may benefit from the systems implemented by the Company for the benefit of all its employees.



5.

The Group's financial performance and outlook

CONTENTS

5.1	Operating and financial review in 2019	244	5.2	Subsequent events	275
5.1.1	Key figures	244	5.3	Changes in market prices at the end of February 2020	275
5.1.2	Economic environment	246	5.4	Outlook	275
5.1.3	Significant events of 2019	252			
5.1.4	Analysis of the business and the consolidated income statements for 2018 and 2019	254			
5.1.5	Cash flow and net indebtedness	261			
5.1.6	Management and control of market risks	266			

5.1 Operating and financial review in 2019

5.1.1 Key figures

Pursuant to European regulation no. 1606/2002 of 19 July 2002 on the adoption of international accounting standards, the EDF group's consolidated financial statements for the year ended 31 December 2019 are prepared under the international accounting standards published by the IASB and approved by the European Union for application at 31 December 2019. These international standards are IAS (International Accounting Standards), IFRS (International Financial Reporting Standards), and SIC and IFRIC interpretations.

The Group's accounting policies are presented in note 1 to the consolidated financial statements for the year ended 31 December 2019.

The figures presented in this document are taken from the EDF group's consolidated financial statements at 31 December 2019.

Since 1 January 2019, the Group has applied IFRS 16 "Leases" under the modified retrospective approach. Restatement of comparative figures for the impacts of application of IFRS 16 is not required. Consequently, the financial statements at 31 December 2019 are prepared with no prior year restatements (see note 2.1 to the 2019 consolidated financial statements).

The sale of Edison's Exploration and Production (E&P) operations was classified as a discontinued operation as defined by IFRS 5 from 1 January 2019. As a result, the net income of discontinued operations is reported on a specific line of the income statement for the periods published. The impact of application of IFRS 5 on the figures published in 2018 is presented in note 2.3 to the 2019 consolidated financial statements.

The Group's key figures for 2019 are shown in the following tables:

EXTRACT FROM THE CONSOLIDATED INCOME STATEMENT

<i>(in millions of euros)</i>	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)	Organic growth (%)
Sales	71,317	68,546	2,771	+4.0	+3.5
Operating profit before depreciation and amortisation (EBITDA)	16,708	14,898	1,810	+12.1	+8.4
Operating profit (EBIT)	6,760	5,454	1,306	+23.9	+25.4
Income before taxes of consolidated companies	6,399	656	5,743	n.a.	n.a.
EDF net income	5,155	1,177	3,978	n.a.	n.a.
Net income excluding non-recurring items ⁽³⁾	3,871	2,452	1,419	+57.9	+60.8

n.a.: not applicable.

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019. In accordance with the new standard's transition provisions, the comparative figures have not been restated.

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

(3) Net income excluding non-recurring items is not defined by IFRS, and is not directly visible in the Group's consolidated income statement. It corresponds to the Group's share of net income (EDF net income) excluding non-recurring items, net changes in the fair value of energy and commodity derivatives (excluding trading activities), and net changes in the fair value of debt and equity instruments, net of tax (see section 5.1.4.10 "Net income excluding non-recurring items").

FROM EDF NET INCOME TO NET INCOME EXCLUDING NON-RECURRING ITEMS

<i>(in millions of euros)</i>	2019	2018
EDF net income	5,155	1,177
Other, including net changes in fair value on energy and commodity derivatives, excluding trading activities and changes in the fair value of debt and equity instruments	(2,167)	777
Impairment	883	498
<i>Including impairment booked by Edison related to the sale of E&P operations (in application of IFRS 5)</i>	500	228
NET INCOME EXCLUDING NON-RECURRING ITEMS	3,871	2,452
Payments to bearers of perpetual subordinated bonds	(589)	(584)
NET INCOME EXCLUDING NON-RECURRING ITEMS, ADJUSTED FOR PAYMENTS ON HYBRID BONDS	3,282	1,868

EXTRACT FROM THE CONSOLIDATED BALANCE SHEET

(in millions of euros)	31/12/2019*	31/12/2018
Intangible and tangible assets	174,345	162,219
Other non-current assets	55,120	48,165
Non-current assets	229,465	210,384
Inventories and trade receivables	29,655	30,137
Other current assets	36,568	39,358
Cash and cash equivalents	3,934	3,290
Current assets	70,157	72,785
Assets held for sale	3,662	-
TOTAL ASSETS	303,284	283,169
Equity (EDF's share)	46,466	44,469
Equity (non-controlling interests)	9,324	8,177
Total equity	55,790	52,646
Non-current provisions	80,760	71,772
Special concession assets	47,465	46,924
Non-current other liabilities	64,225	59,012
Non current liabilities	192,450	177,708
Current liabilities	54,001	52,815
Liabilities related to assets classified as held for sale	1,043	-
TOTAL EQUITY AND LIABILITIES	303,284	283,169

* The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (see note 2.1 to the 2019 consolidated financial statements).

GROUP CASH FLOW

(in millions of euros)	2019	2018 ⁽¹⁾	Variation	Variation (%)
Group cash flow ^{(2) (3)}	(791)	(601)	(190)	-31.6

(1) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

(2) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019. The comparative figures have not been restated. The impact on Group cash flow would have been +€609 million.

(3) Group cash flow is not an aggregate defined by IFRS as a measure of financial performance, and is not comparable with indicators of the same name reported by other companies. It is equivalent to the operating cash flow less asset disposals, income taxes paid, net financial expenses disbursed, allocations to dedicated assets, dividend paid in cash, and investments related to Hinkley Point C and Linky projects (see section 5.1.5.2 of this financial report).

DETAILS OF NET INDEBTEDNESS

(in millions of euros)	31/12/2019	31/12/2018	Variation	Variation (%)
Loans and other financial liabilities	67,380	59,188	8,192	+13.8
Derivatives used to hedge liabilities	(3,387)	(1,972)	(1,415)	+71.8
Cash and cash equivalents	(3,934)	(3,290)	(644)	+19.6
Available-for-sale financial assets – Liquid assets	(18,900)	(20,538)	1,638	-8.0
Net indebtedness of assets held for sale	(26)	-	(26)	n.a.
NET INDEBTEDNESS ^{(1) (2)}	41,133	33,388	7,745	+23.2

n.a.: not applicable.

(1) Net indebtedness is not defined in the accounting standards and is not directly visible in the Group's consolidated balance sheet. It comprises total loans and financial liabilities, less cash and cash equivalents and liquid assets. Liquid assets are financial assets consisting of funds or securities with initial maturity of over three months that are readily convertible into cash and are managed according to a liquidity-oriented policy. The calculation of net indebtedness is presented in note 41.3 to the 2019 consolidated financial statements.

(2) Net indebtedness at 31 December 2019 includes IFRS 16 from 1 January 2019 for €4,492 million.

5.1.2 Economic environment

5.1.2.1 Market prices for electricity and the principal energy sources

In an interconnected European market, analysis of market prices in France and the rest of Europe provides important context.

Spot electricity prices in Europe were lower in 2019 than 2018.

5.1.2.1.1 SPOT ELECTRICITY PRICES IN EUROPE⁽¹⁾

	France	United Kingdom	Italy	Germany	Belgium
Average baseload price for 2019 (€/MWh)	39.4	49.0	52.3	37.7	39.3
Variation in average baseload prices, 2019/2018	-21.4%	-24.5%	-14.7%	-15.3%	-28.8%
Average peakload price for 2019 (€/MWh)	46.3	53.5	58.4	44.5	46.3
Variation in average peakload prices, 2019/2018	-21.6%	-23.6%	-14.0%	-14.7%	-28.6%

The comments below concern baseload prices.

In **France**, average spot electricity prices for 2019 stood at €39.4/MWh (baseload) and €46.3/MWh (peakload), respectively €10.7/MWh and €12.8/MWh lower than in 2018. The primary explanation for this decrease is the lower coal and gas prices over the last three quarters of the year, partly offset by higher CO₂ prices. Wind and solar power output was also up compared to 2018.

The downward trend in spot prices began at the end of the winter, when temperatures were well above normal in contrast to the previous year's late cold spell. Between June and December, the decrease observed in spot prices was €20/MWh more than in the corresponding period of 2018. Below-normal rainfall levels from the start of the year were followed by surplus precipitation in the final three months of the year, which helped to keep spot prices down during that quarter.

However, this decrease was mitigated by a significant year-on-year rise in spot prices in January, caused by temperatures that were almost 4°C lower than in 2018 and thus induced higher consumption (+5.4TWh). The average price for January was thus €61.2/MWh, €26.2/MWh higher than the previous year. The same effect, although on a more moderate scale, was observed in April and May when prices increased (+€4.5/MWh and +€2.8/MWh respectively, baseload) due to lower temperatures than in 2018, and consumption was 3TWh higher in total over the period. Lower hydropower generation also contributed to a rise in spot prices in those months.

In 2019, demand in France stood at 469.7TWh, down by 6.5TWh from 2018. More use was made of gas-fired plants (+7.9TWh) as nuclear plant availability (and therefore generation) and hydropower output both declined (by -13.7TWh and -5.7TWh respectively compared to 2018). Wind and solar power generation, meanwhile, increased by 5.9TWh and 1.7TWh to reach the respective levels of 32.7TWh and 11.4TWh in 2019.

France's export balance was 4.4TWh⁽²⁾ lower in 2019 than 2018. It decreased significantly in January (-6.0TWh) due to lower year-on-year temperatures and hydro conditions. Although milder temperatures in February and March then led to a 6TWh rise in net exports compared to 2018, exports were down throughout the rest of the year. This is explained by lower interconnection availability with the United Kingdom and Spain in the spring, high wind power generation in Germany in 2019, and less nuclear plant availability at the end of the year.

In the **United Kingdom**, average spot electricity prices were €15.9/MWh lower than in 2018, standing at €49.0/MWh for 2019. The downturn was first observed in February, in sharp contrast with the record levels of February and March 2018. This was accentuated when the 1GW NEMO UK-Belgium interconnection service came on line. Subsequently, declining gas prices pulled spot electricity prices downwards from April, when average monthly prices began a general decline taking them 32% below 2018 levels (-€21/MWh on average).

In **Italy**, average spot prices were down by €9.0/MWh from 2018, to an average €52.3/MWh for 2019. The decrease principally concerned the months of August to December, when prices were 30% below 2018 levels in the wake of declining gas prices. Early in the year, January prices were 38% higher year-on-year, due to the colder temperatures of 2019.

In **Germany**, spot prices for electricity decreased by €6.8/MWh from 2018 to an average €37.7/MWh in 2019. However, prices registered a rise at the start of the year. This rise was very pronounced in January, when prices were €19.9/MWh higher than in 2018 due to lower temperatures. Apart from March, when prices were down by €6.7/MWh because of very windy conditions (average +7.2GW of wind power compared to 2018), prices moved in line with CO₂ and coal prices during the rest of the year. Until July, the sharp rise in CO₂ quota prices drove prices upwards as coal prices saw a smaller decrease. From August onwards, there was a substantial downturn in prices echoing movements in coal prices, which became the dominant factor over the CO₂ price increase. Since then, monthly spot electricity prices have fallen by almost €17.3/MWh compared to the same period of 2018. Wind power output was up by 15.2TWh from 2018, reaching 123.8TWh in 2019, while photovoltaic power output was up by 0.7TWh to 41.9TWh in 2019. At 31 December 2019, Germany's total installed wind power and photovoltaic power capacities were around 61GW and 49GW respectively. Several periods of significant wind and photovoltaic power generation led to negative prices (211 hours in 2019 against 134 hours in 2018). The lowest hourly price was -€90.0/MWh, registered on 8 June.

In **Belgium**, spot prices retreated by €15.9/MWh from 2018, with an average price of €39.3/MWh for 2019. The decrease principally concerned the months of June to December, when prices were around 45% lower than in 2018, in line with lower fuel prices and better nuclear plant availability than the previous year, although January prices were nearly 65% higher due to colder temperatures.

(1) **France and Germany:** average previous day EPEXSPOT price for same-day delivery;
Belgium: average previous day Belpex price for same-day delivery;
United Kingdom: average previous day EDF Trading OTC price for same-day delivery;
Italy: average previous day GME price for same-day delivery.
(2) Source: ENTSO-E Transparency Website.

5.1.2.1.2 Forward electricity prices in Europe⁽¹⁾

	France	United Kingdom	Italy	Germany	Belgium
Average forward baseload price under the 2020 annual contract for 2019 (€/MWh)	50.9	58.4	59.8	47.8	51.0
Variation in average forward baseload price under the annual contracts, 2019/2018	+4.0%	-2.8%	+1.3%	+8.6%	+0.0%
Forward baseload price under the 2020 annual contract at 31 December 2019 (€/MWh)	44.1	51.2	50.9	41.3	41.9
Average forward peakload price under the 2020 annual contract for 2019 (€/MWh)	63.6	64.8	66.8	57.7	62.5
Variation in average forward peakload price under the annual contracts, 2019/2018	+2.4%	-1.6%	0.0%	+6.5%	-2.0%
Forward peakload price under the 2020 annual contract at 31 December 2019 (€/MWh)	54.2	57.1	59.7	50.0	52.3

Average annual contract prices for baseload and peakload electricity were higher in 2019 than 2018 all over Europe in the first half of the year, then turned downwards in the second half. This downturn was principally due to the decline of coal and gas prices. The two contrasting trends neutralised each other overall, leading to relative stability in the average price of the year-ahead annual contract in 2019.

In **France**, the average annual contract baseload price for next-year delivery was €50.9/MWh, 4% higher than in 2018. This moderate increase comprised a period of substantial rises in the first half of the year, driven by the significant increase in CO₂ prices, and a period of substantial decrease, associated with the pronounced decline in fuel prices in the second half of the year and a smaller increase in CO₂ prices, as coal prices dropped by an average \$25.9/t and gas prices by €5.5/MWh during that period. The Calendar N+1 contract price ended the year 2019 at €44.1/MWh.

In the **United Kingdom**, the April Ahead contract baseload price for 1 April Y+1 to 31 March Y+2 decreased by 2.8% from 2018 to an average €58.4/MWh for 2019. Similar to the situation in France, this price saw a strong rise in the first half of the year compared to 2018, then a substantial decrease associated in particular

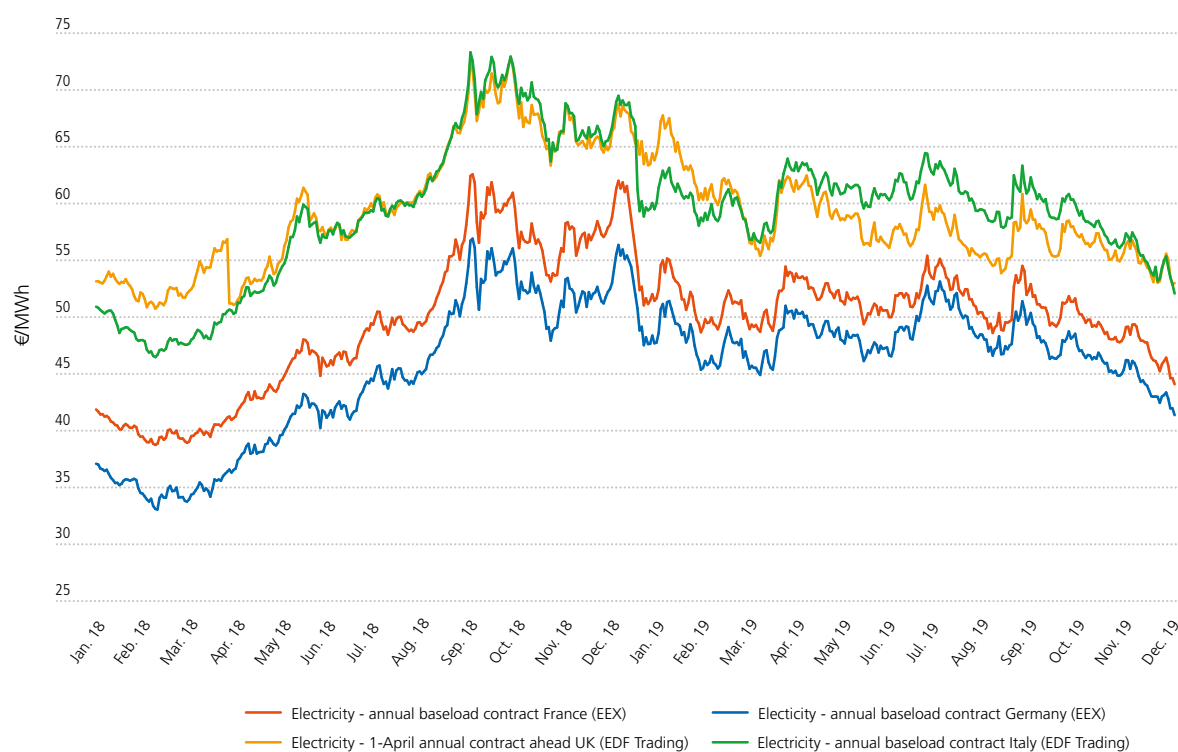
with the decline in gas prices, as gas-fired facilities make a significant contribution to the formation of British electricity prices.

In **Italy**, the annual contract baseload price for next-year delivery increased, to an average €59.8/MWh for 2019, 1.3% higher than in 2018. Here again this stability masks an upward trend in the first half of the year followed by a strong downward trend in the second half, in the wake of fuel prices.

In **Germany**, the average annual contract baseload price for next-year delivery was up by 8.6% from 2018, to €47.8/MWh in 2019. This increase is explained by the significant rises in CO₂ prices, since coal-fired facilities still make a significant contribution to the formation of German electricity prices, and are more strongly affected than gas-fired facilities by higher CO₂ prices.

In **Belgium**, the annual contract baseload price for next-year delivery was stable compared to 2018, standing at an average €51.0/MWh in 2019. There was a particularly sharp decrease in the second half of the year, echoing movements in fuel prices against a background of better nuclear plant availability than the previous year.

→ Principal forward electricity prices in Europe (baseload year ahead)



⁽¹⁾ **France and Germany:** average year-ahead EEX price;
Belgium and Italy: average year-ahead EDF Trading price;
United Kingdom: average ICE annual contract prices, April 2019 then April 2020 (in the UK, annual contract deliveries take place from 1 April to 31 March).

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.2.1.3 CO₂ emission rights prices⁽¹⁾

The price of CO₂ emission rights for delivery in December Y+1 ended the year at €24.6/t, down by €0.4/t compared to December 2018. Quota prices declined substantially in the early part of the year, falling to €19.2/t in mid-February. This decrease is explained by the announcement of a plan to close 12.5GW of coal-fired power plants while cancellation of the corresponding quotas had not been

confirmed. Prices were also affected at this stage by anticipation of a "hard Brexit" and the United Kingdom's possible departure from the EU-ETS system end of 2019.

CO₂ prices then progressed strongly, rising to €30.2/t in mid-July level in ten years, boosted by the deferral of Brexit to the end of October. Another downward movement then followed, to €22.8/t in mid-October, and afterwards CO₂ prices remained around the €25/t mark until the end of the year.

→ CO₂ emission rights prices



5.1.2.1.4 Fossil fuel prices⁽²⁾

	Coal (US\$/t)	Oil (US\$/bbl)	Natural gas (€/MWhg)
Average price for 2019	69.5	64.2	18.4
Average price variation, 2019/2018	-20.1%	-10.5%	-11.8%
Highest price in 2019	87.0	74.6	21.8
Lowest price in 2019	56.3	54.9	15.9
Closing price, 2019	56.4	66.0	16.0
Closing price, 2018	85.9	53.8	20.4

Coal prices for next-year delivery in Europe stood at an average US\$69.5/t in 2019 (-20.1% or -US\$17.5/t compared to 2018).

The decline is principally attributable to sluggish demand in Asia, high stocks from the start of the year, and more competition from gas since CO₂ prices were much higher than in 2018. In September, coal prices rose briefly under the impetus of a spike in oil prices, and because announcements about the deviations from technical standards noted in Framatome's component manufacturing processes had led to fears of greater use of thermal plants. In the fourth quarter the price declined again, due to anticipation of mild temperatures and the prospect of temporary coal-fired plant closures in South Korea in the winter.

Oil prices stood at an average US\$64.2/bbl for 2019 (-10.5% or -US\$7.5/bbl compared to 2018).

Over the year, price movements were mostly driven by the prospect of plentiful supplies and low demand. Focusing on world growth, the market modulated the general downward trend in response to successive announcements about progress on the US-China trade deal.

American shale oil production rose all year, and in September the United States became the world's biggest producer of oil. Against this influx of oil, the OPEC confirmed at the meetings of 1 July and 6 December that it wanted to support prices by reducing production. This curbed fears about production levels, although several incidents in the Middle East sent prices soaring, particularly on 20 June when an American drone was shot down by Tehran, in July when tensions escalated between Washington and Tehran, and on 14 September when there were attacks on Saudi Arabian oil facilities.

The annual gas contract for next-year delivery in the PEG zone traded at an average €18.4/MWh in 2019 (-11.8% or -€2.5/MWh compared to 2018).

(1) Average ICE prices for the annual contract, Phase III (2013-2020).

(2) **Coal:** average ICE prices for delivery in Europe (CIF ARA) for the next calendar year (US\$/t);

Oil: Brent first reference crude oil barrel, IPE index (front month) (US\$/barrel);

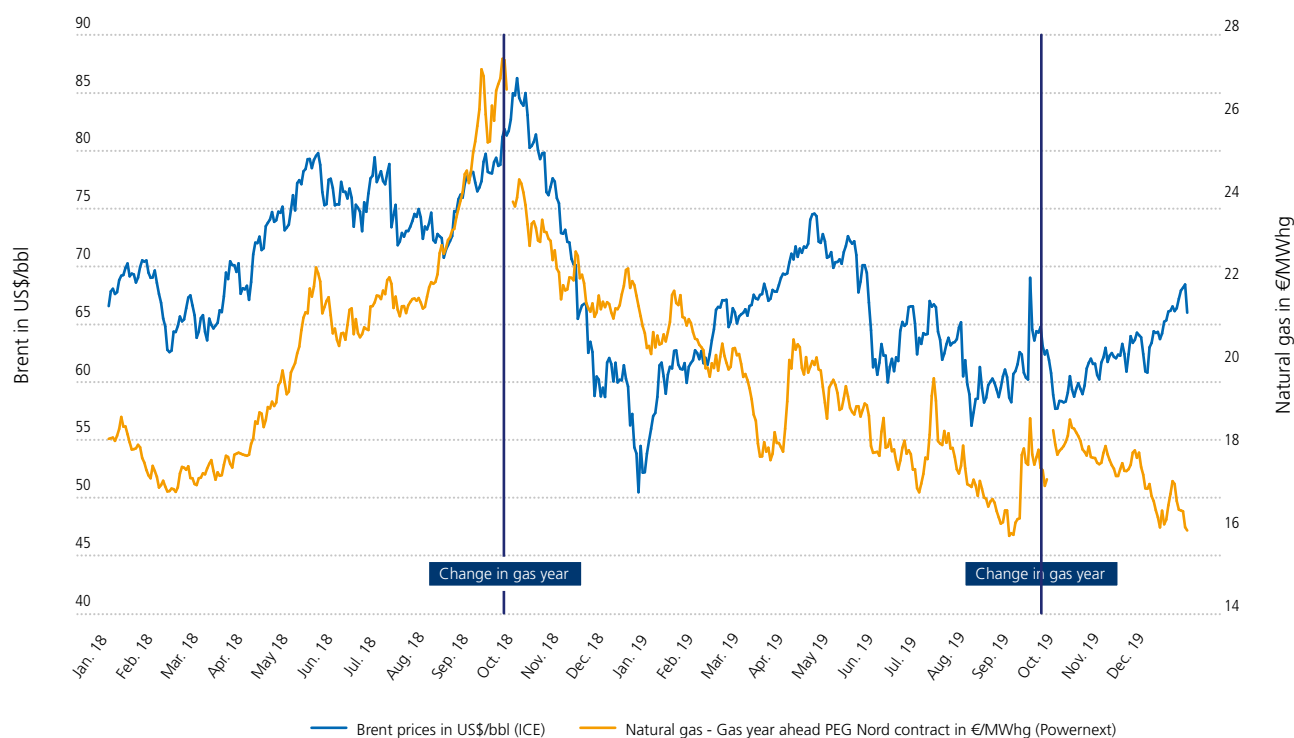
Natural gas: average ICE OTC prices, for delivery starting from October of the following year in France (PEG Nord) (€/MWhg).

The price of **gas** declined almost constantly over the year, affected by three main factors: the level of stocks, mild temperatures, and arrivals of LNG in Europe.

The massive influx of LNG into Europe particularly resulted from the boom in North American production, and a preference for the European rather the Asian market to sell some of the LNG produced, given the geographical proximity to the North-East

American coast and the price levels in the two zones. Meanwhile, European demand remained moderate as the late winter was milder than the previous year. Stock levels rose, reaching saturation point in October, and stayed at record levels throughout the final quarter (95% during the quarter on average, compared to 86% in 2018).

→ Natural gas and oil prices



5.1.2.2 Electricity and gas consumption

5.1.2.2.1 Electricity and gas consumption in France

Electricity consumption in **France**⁽¹⁾ reached 473.7TWh in 2019, down from 2018 (-1.0%). Only the second quarter of 2019 showed a year-on-year increase (+3.0%). After correction for weather effects, electricity consumption in France was slightly lower than in 2018 (-0.5%).

Natural gas consumption in **France**⁽²⁾ increased by +1.9% between 2018 and 2019 to 479.0TWh. In January 2019, lower year-on-year temperatures drove demand for heating up. Consumption rose overall in 2019 due to higher use of gas-fired plants for electricity generation throughout the year (+7.9TWh).

5.1.2.2.2 Electricity and gas consumption in Italy

Electricity consumption in **Italy**⁽³⁾ in 2019 totalled 319.6TWh, down slightly (-0.6%) from 2018. The lower level of hydropower output, principally resulting from unfavourable weather conditions in the first half of 2019, was offset by an increase in thermoelectric, wind power and solar power generation. Net imports were down by 13.1%.

Domestic demand for natural gas in **Italy**⁽⁴⁾ increased by 2.2% after the rise in gas-fired thermal generation. The milder temperatures of the first quarter of 2019 resulted in a 1.9% downturn in consumption on the residential market. Industrial consumption decreased by 1.9%.

(1) Sources for **France**: unadjusted data and data adjusted for weather effects provided by RTE (data for December 2019 are estimates as final figures are not yet available).

(2) Sources for **France**: unadjusted data provided by Smart GRTgaz.

(3) Sources for **Italy**: unadjusted data and data provided by Terna, the Italian national grid operator, and adjusted by Edison.

(4) Sources for **Italy**: Ministry for Economic Development (MSE), Snam Rete Gas data adjusted by Edison on the basis of 1Bcm = 10.76TWh.

5. The Group's financial performance and outlook
 Operating and financial review in 2019

5.1.2.3 Electricity and natural gas sales tariffs

In **France**, the regulated tariffs were raised as follows:

- the "blue" tariffs for residential and non-residential customers were raised by +7.7% (excluding taxes) from 1 June 2019;
- the "blue" tariffs were raised by +1.47% (excluding taxes) for residential customers and +1.34% (excluding taxes) for non-residential customers from 1 August 2019.

(see note 4.2 to the 2019 consolidated financial statements).

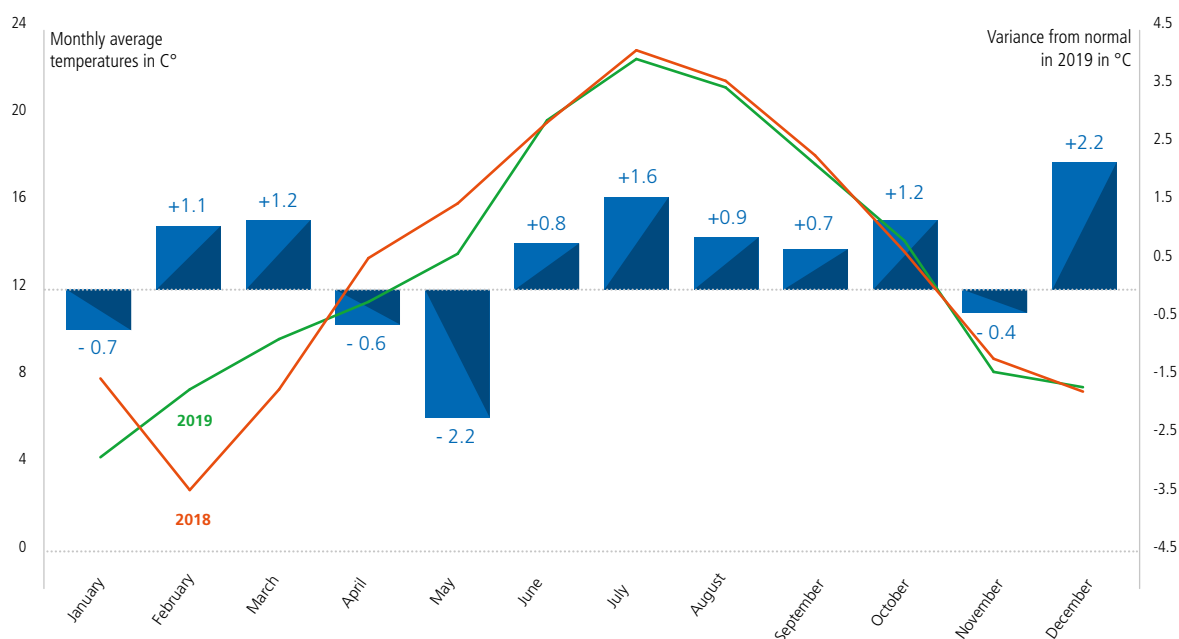
In the **United Kingdom**, a cap on variable residential tariffs for electricity and gas was introduced on 1 January 2019. The cap was raised by 10% on 1 April 2019, then reduced by 6% from 1 October 2019 to reflect developments in wholesale market prices.

5.1.2.4 Weather conditions: temperatures and rainfall

5.1.2.4.1 Temperatures

2019 was a warm year, with temperatures 0.5°C above normal overall. The average annual temperature in France was 13.1°C, just behind 2018 (average 13.4°C). December was particularly mild, registering temperatures 2.2° higher than normal.

➔ **Temperatures ^{(1) (2)} in France in 2019 and 2018**



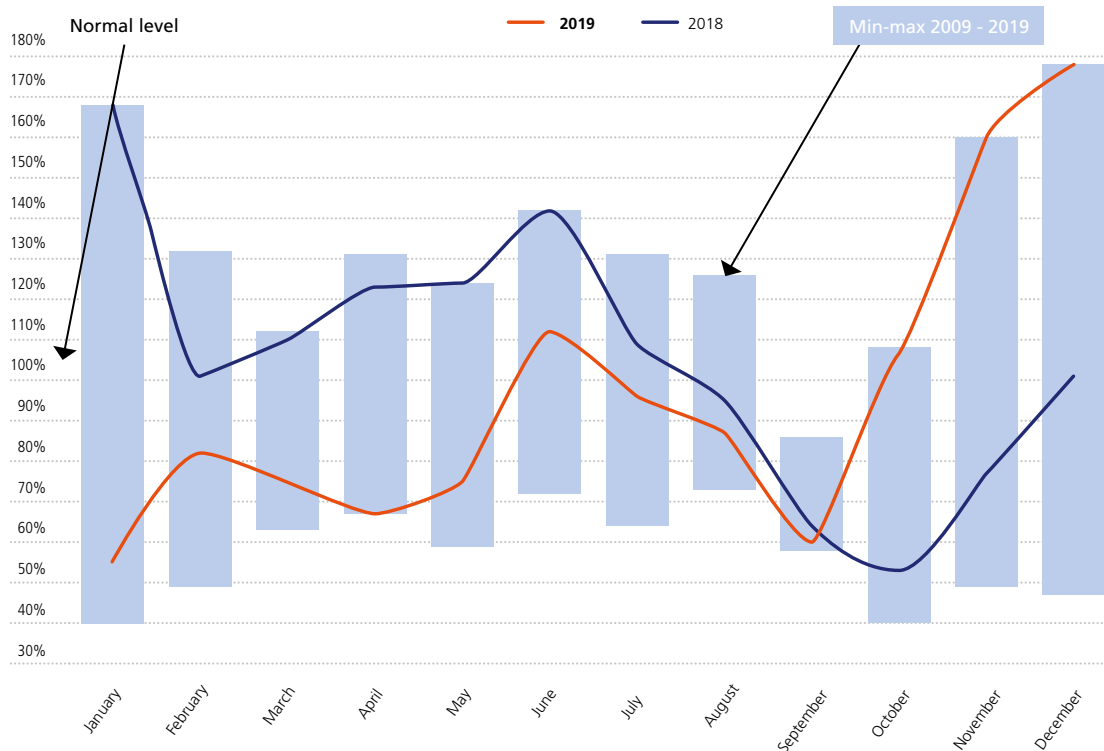
(1) Average temperatures recorded in 32 cities weighted by electricity consumption.
 (2) Source: Miréor (data from Météo-France).

5.1.2.4.2 Rainfall

2019 was another year of contrasts in terms of rainfall:

- in the first half of the year and the summer, there was a shortage of precipitation over much of the southern half of Europe (including France), as well as in Germany and part of Central Europe, while precipitation levels were close to normal in North Europe;
- the autumn was particularly rainy (especially in the south-east of France).

→ Water flow coefficients in France in 2019 and 2018⁽¹⁾



(1) Weekly monitoring by EDF's OSGE energy observatory of French reservoir levels (Miréor project) as far as the coast.

France suffered a shortfall of precipitation in the first eight months of the year (particularly in February, June and September) and snowfall varied widely between different mountain ranges. The summer was hot and dry once again, with two intense but relatively short heatwaves in less than a month, resulting in fairly harsh summer droughts across a very large area of the Massif Central and in North-East France. The drought was ended in October by abundant rainfall in all zones from the middle of the month. By the end of the year, cumulative precipitation was very high.

As a result of these contrasting weather conditions, water flow coefficients in France were below normal in the first eight months of the year (except in June which benefited from a concentrated thaw), until the situation improved substantially in mid-October. In the last two months of 2019, the aggregate coefficient for France was the highest recorded in more than 50 years (higher than 1992 and 2002). Over the year as a whole, however, it remained slightly (3%) below normal.

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.3 Significant events of 2019⁽¹⁾

This chapter reports on significant events following the publication, on 15 March 2019, of the 2018 Reference Document (see section 5.1.3 "Significant events of 2018" and 5.2 "Subsequent events").

5.1.3.1 Major events

5.1.3.1.1 Sustainable development and Group Renewables

EDF Renewables⁽²⁾

- The EDF group moved into Ireland by acquiring 50% of the Codling offshore wind project (see press release of 11 February 2020).
- The EDF group launched the construction of Neart na Gaoithe 450MW offshore wind farm along with new Irish partner, ESB which took a 50% stake in the project (see press release of 28 November 2019 and note 3.4.5 to the 2019 consolidated financial statements).
- United Kingdom: EDF group accelerates its development of battery storage and electric vehicle (EV) charging infrastructure by acquiring Pivot Power (see press release of 4 November 2019 and note 3.4.7 to the 2019 consolidated financial statements).
- EDF Renewables acquired a significant pipeline of 300MW wind projects under development in Germany (see press release of 12 September 2019 and note 3.4.6 to the 2019 consolidated financial statements).
- EDF Renewables acquired PowerFlex Systems to accelerate deployment of large scale electric vehicle infrastructure in the United States (see press release of 3 September 2019).
- The Council of State approved the final administrative permits for the Fécamp and Courseulles-sur-Mer offshore wind farm projects (see press release of 24 July 2019 and note 3.4.1 to the 2019 consolidated financial statements).
- EDF-led consortium selected for the Dunkirk offshore wind power project (see press release of 14 June 2019 and note 3.4.1 to the 2019 consolidated financial statements).
- The Council of State approved the Saint-Nazaire offshore wind farm operating permit (see press release of 7 June 2019 and note 3.4.1 to the 2019 consolidated financial statements).
- Consortium of EDF, Masdar and Green of Africa named as successful bidder for Morocco's landmark Noor Midelt I solar project (see press release of 22 May 2019 and note 3.4.4 to the 2019 consolidated financial statements).
- EDF Renewables completed the acquisition of LUXEL Group, a French utility that develops and operates solar projects (see press release of 1 April 2019 and note 3.4.2 to the 2019 consolidated financial statements).
- EDF signed agreement to build and operate two offshore wind farms in China and to optimize a heating and air-conditioning networks in the city of Wuhan (see press release of 25 March 2019 and note 3.4.3 to the 2019 consolidated financial statements).
- In 2019, EDF Renewables commissioned new facilities, signed electricity sales agreements and undertook new projects.

Hydropower

- Inauguration of the "La Coche" hydro plant (Savoie): 20% of additional power in support of energy storage (see press release of 14 October 2019).

EDF Pulse Croissance

- EDF acquired Energy2market (e2m) and strengthened its position in the field of decentralized energy management in Europe (see press release of 13 June 2019).
- EDF launched DREEV, its new subsidiary to turn innovative smart charging solutions into a reality (see press release of 20 May 2019).
- EDF launched Hynamics, a subsidiary to produce and market low-carbon hydrogen (see press release of 2 April 2019).

Other

- The EDF group acquired Pod Point, one of the UK's largest electric vehicle charging companies (see press release of 13 February 2020).

5.1.3.1.2 Nuclear industry

- EDF unveiled "excell", an excellence plan for the nuclear industry (see press release of 13 December 2019).
- EDF and Véolia announced the creation of Graphitech (see press release of 10 December 2019).
- Update on the outlook for nuclear output for 2019 (see press release of 14 November 2019).
- Update on EDF's nuclear plants (see press release of 25 October 2019):
 - discrepancies in relation to the technical framework for the production of nuclear reactor components by Framatome;
 - outlook for nuclear production in France for 2019.
- Flamanville EPR: EDF has adopted a scenario for upgrading the main secondary system penetration welds with robots and has adjusted the construction schedule and estimated cost accordingly⁽³⁾. The second hot functional test phase has started on site (see press release of 9 October 2019 and note 3.1.1 to the 2019 consolidated financial statements).
- The second EPR reactor at China's Taishan nuclear power plant about to enter into commercial operation (see press release of 6 September 2019). Commercial commissioning on 7 September 2019 (see note 3.1.4 to the 2019 consolidated financial statements).
- Closure of Fessenheim nuclear power plant (see press release of 30 September 2019 and note 3.1.6 to the 2019 consolidated financial statements).
- Hinkley Point C:
 - update on Hinkley Point C project: a detailed review of the project's costs, schedule and organisation was performed (see press release of 25 September 2019 and note 3.1.3 to the 2019 consolidated financial statements);
 - Hinkley Point C hit its biggest milestone yet with the completion of the base for the first reactor (see EDF Energy's press release of 28 June 2019, available on the website www.edfenergy.com).
- CEA, EDF, Naval Group and TechnicAtome unveiled "NUWARD"™, their jointly developed SMR project (see press release of 17 September 2019 and note 3.1.5 to the 2019 consolidated financial statements).

5.1.3.2 Assets disposal plan

- EDF notified the exercise of its put option on its stake in CENG (see press release of 20 November 2019 and note 3.2.2 to the 2019 consolidated financial statements).
- Edison announced the signing of the agreement to sell its exploration and production of gas to Energean Oil and Gas (see press release of 4 July 2019 available on Edison website www.edison.it and note 2.3 to the 2019 consolidated financial statements).
- EDF announced the completion of the disposal of its 25% stake in Alpiq (see press release of 28 May 2019 and note 3.2.1 to the 2019 consolidated financial statements).

⁽¹⁾ A full list of press releases is available from the EDF website: www.edf.fr

⁽²⁾ A full list of press releases is available from the EDF Renewables website: www.edf-renouvelables.com

⁽³⁾ In 2015 Euros and excluding interim interest.

5.1.3.3 Financial structure

- EDF announced the final results of its tender offer for US dollar-denominated hybrid notes launched on 26 November 2019 (see press release of 12 December 2019 and note 3.3.3 to the 2019 consolidated financial statements).
- EDF raised €1.25 billion at 30 years as part of its EMTN program (see press release of 3 December 2019 and note 3.3.4 to the 2019 consolidated financial statements).
- EDF raised US\$2 billion at 50 year as part of its EMTN program (see press release of 28 November 2019 and note 3.3.4 to the 2019 consolidated financial statements).
- EDF raised its €500 million hybrid note offering (see press release of 26 November 2019 and note 3.3.2 to the 2019 consolidated financial statements).
- EDF signed two bilateral sustainable revolving credit facilities with Crédit Agricole CIB and Societe Generale CIB, bringing the total of its sustainability-linked loans to over €5 billion (see press release of 22 July 2019 and note 3.3.1 to the 2019 consolidated financial statements).
- EDF and BBVA signed a €300 million sustainability-linked revolving credit facility (RCF) which incorporates a pricing adjustment based on EDF's sustainability performance linked to CO₂ emissions and energy efficiency (see press release of 22 March 2019 and note 3.3.1 to the 2019 consolidated financial statements).

5.1.3.4 Regulatory environment

Regulatory changes are described in detail in the following notes to the 2019 consolidated financial statements:

- note 4.1 "France's multi-year energy programme (PPE) and The Energy and Climate law";
- note 4.2 "Regulated electricity sales tariffs in France";
- note 4.3 "TURPE network access tariffs";
- note 4.4 "Compensation for public energy service charges (CSPE)";
- note 4.5 "French capacity mechanism";
- note 4.6 "Energy savings certificates";
- note 4.7 "ARENH".

5.1.3.5 Other significant events

- Béatrice Buffon was appointed as Executive Director in charge of EDF's International Division, succeeding Marianne Laigneau, who was appointed Chair of the Enedis Management Board (see press release of 4 February 2020).
- Véronique Bédague-Hamilius was appointed as a member of the EDF Board of Directors, replacing Anne Rigail (see press release of 18 December 2019).
- EDF announced the results of the option to receive the 2019 interim dividend in shares (see press release of 16 December 2019).
- The EDF group successfully completed its share offer reserved for employees and former employees (see press release of 10 July 2019).
- Directors representing employees took up their functions on 23 November 2019: Christine Chabauty and Christophe Cu villiez (CGT), were replaced by Karine Migliorini and Claire Bordenave. Vincent Rodet succeeded Marie-Hélène Meyling (CFDT). The terms of office of Jacky Chorin (FO), Jean-Paul Rignac (CGT) and Christian Taxil (CFE-CGC) were renewed.
- At its meeting of 28 June 2019 the Board of Directors provisionally appointed François Delattre as Director to replace Maurice Gourdault-Montagne.
- EDF announced the results of the option for payment of the balance of the 2018 dividend (see press release of 17 June 2019 and note 30.3 to the 2019 consolidated financial statements).
- The following changes occurred in the EDF group's Executive Committee (see press release of 20 May 2019):
 - Marc BENAYOUN was appointed Group Senior Executive Vice President in charge of Customers, Services and Regional Action, whilst remaining in charge of the Gas and Italy business;
 - Cédric LEWANDOWSKI was appointed Group Senior Executive Vice President in charge of the Nuclear and Thermal business;
 - Alexandre PERRA was appointed Group Senior Executive Vice President in charge of Innovation, Corporate Social Responsibility and Strategy.
- The following changes occurred in EDF's Board of Directors (see press release of 16 May 2019):
 - renewal of Jean-Bernard Lévy's term of office as Director;
 - appointment of Anne Rigail, Bruno Crémel, Gilles Denoyel and Philippe Petitcolin as Directors;
 - renewal of the terms of office of Marie-Christine Lepetit, Colette Lewiner, Laurence Parisot, Michèle Rousseau and Maurice Gourdault-Montagne.

5.1.4 Analysis of the business and the consolidated income statements for 2018 and 2019

Presentation and analysis of the consolidated income statement for 2018 and 2019 is shown at two levels of analysis for Sales and EBITDA: a first focusing on the Group, then a second reporting on the different business segments (France –

Generation and supply activities, France – Regulated activities, EDF Renewables, Dalkia, Framatome, United Kingdom, Italy, Other international and Other activities). EBIT (operating profit) and net income are analysed from a general standpoint.

<i>(in millions of euros)</i>	2019 ⁽¹⁾	2018 ⁽²⁾
Sales	71,317	68,546
Fuel and energy purchases	(35,091)	(33,056)
Other external purchases	(8,619)	(9,262)
Personnel expenses	(13,793)	(13,642)
Taxes other than income taxes	(3,798)	(3,690)
Other operating income and expenses	6,692	6,002
Operating profit before depreciation and amortisation (EBITDA)	16,708	14,898
Net changes in fair value on Energy and Commodity derivatives, excluding trading activities	642	(224)
Net depreciation and amortisation	(9,994)	(8,775)
Net increases in provisions for renewal of property, plant and equipment operated under concessions	(8)	(50)
(Impairment)/reversals	(403)	(290)
Other income and expenses	(185)	(105)
Operating profit (EBIT)	6,760	5,454
Cost of gross financial indebtedness	(1,806)	(1,712)
Discount effect	(3,161)	(3,464)
Other financial income and expenses	4,606	378
Financial result	(361)	(4,798)
Income before taxes of consolidated companies	6,399	656
Income taxes	(1,581)	178
Share in net income of associates and joint ventures	818	569
Net income of discontinued operations	(454)	(212)
CONSOLIDATED NET INCOME	5,182	1,191
EDF net income	5,155	1,177
Net income of continuing operations	5,597	1,384
Net income of discontinued operations	(442)	(207)
Net income attributable to non-controlling interests	27	14
Net income of continuing operations	39	19
Net income of discontinued operations	(12)	(5)
EARNINGS PER SHARE (EDF SHARE) (IN EUROS)		
Basic earnings per share	1.50	0.20
Diluted earnings per share	1.50	0.20
Earnings per share of continuing operations	1.65	0.27
Diluted earnings per share of continuing operations	1.65	0.27

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019. In accordance with the new standard's transition provisions, the comparative figures have not been restated.

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

5.1.4.1 Sales

Consolidated sales were up by 4.0% corresponding to an organic increase of 3.5%.

5.1.4.1.1 Change in Group sales

(in millions of euros)	2019	2018*	Variation	Variation (%)	Organic growth (%)
Sales	71,317	68,546	2,771	+4.0	+3.5

* The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

Sales amounted to €71,317 million in 2019, up by €2,771 million (+4.0%) from 2018. Excluding the effects of exchange rates (+€151 million) and changes in the scope of consolidation (+€198 million), consolidated sales showed organic growth of 3.5%.

5.1.4.1.2 Change in sales by segment

The following table shows sales by segment, excluding inter-segment eliminations.

(in millions of euros)	2019	2018 ⁽¹⁾	Variation	Variation (%)	Organic growth (%)
France – Generation and supply activities ⁽²⁾	27,870	26,096	1,774	+6.8	+6.5
France – Regulated activities ⁽³⁾	16,087	16,048	39	+0.2	+0.2
EDF Renewables	1,565	1,505	60	+4.0	+2.9
Dalkia	4,281	4,189	92	+2.2	+1.6
Framatome	3,377	3,313	64	+1.9	+0.6
United Kingdom	9,574	8,970	604	+6.7	+5.9
Italy	7,567	8,077	(510)	-6.3	-8.1
Other international	2,690	2,411	279	+11.6	+10.9
Other activities	2,728	2,601	127	+4.9	+6.8
Eliminations	(4,422)	(4,664)	242	-5.2	-5.2
GROUP SALES	71,317	68,546	2,771	+4.0	+3.5

(1) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

(2) Generation, supply and optimisation in mainland France, and sales of engineering and consulting services.

(3) Regulated activities comprise distribution in mainland France, which is carried out by Enedis⁽¹⁾, EDF's Island activities and the activities of Électricité de Strasbourg. In mainland France, distribution network activities are regulated via the network access tariff TURPE (tarifs d'utilisation des réseaux publics d'électricité).

5.1.4.1.2.1 France – Generation and supply activities

Sales by the **France – Generation and supply activities** segment amounted to €27,870 million, an organic increase of €1,691 million (+6.5%) from 2018.

Downstream market conditions had a positive effect estimated at +€757 million on sales. The negative effect of market share erosion was outweighed by positive price effects for electricity and capacity, as well as by growth in revenues from gas supply activities. The changes in the non-delivery component of regulated sale tariffs⁽²⁾ had a positive impact of around +€588 million due to higher electricity prices and capacity prices.

The increase in the price of energy savings certificates led to an estimated +€132 million increase in sales, with no equivalent effect on the margin.

Resales of electricity subject to purchase obligations saw a negative change of -€112 million, mainly caused by declining market prices in the second half of the year (with a neutral effect on EBITDA because expenses relating to purchase obligations are compensated by the CSPE mechanism).

The volumes sold under the ARENH mechanism and the balance of purchases and sales on the wholesale markets (excluding purchase obligations and long-term contracts) had an estimated -€50 million negative impact on sales.

A number of other factors contributed to the favourable change in sales, including long-term contracts and structured sales.

Electricity generation

Nuclear output totalled 379.5TWh in 2019, down by 13.7TWh from 2018. This decrease is notably explained by the nuclear plant fleet's lower availability in 2019: there were more shutdown extensions than in 2018 as a large number of 10-year inspections were scheduled.

Hydropower output stood at 39.7TWh⁽³⁾, a decrease of 14.7% compared to 2018 (-6.8TWh) caused by the fact that hydrological conditions were very favourable in 2018 and unfavourable in 2019 (see section 5.1.2.4 "Weather conditions: temperatures and rainfall").

Thermal generation facilities were used slightly less than in 2018. Their output declined by -1.1TWh to 9.9TWh.

Sales volumes to final customers (a market segment that includes local distribution companies and excludes foreign operators) were down by -20.3TWh, including -15.6TWh reflecting the impact of losses of customers.

EDF was a net seller on the wholesale markets to the extent of 62.9TWh. The -15.8TWh decline in net sales on these markets compared to 2018 is mainly explained by the lower level of nuclear and hydropower generation.

(1) Enedis is an independent EDF subsidiary as defined in the French Energy Code.

(2) Tariff changes in 2019: from 1 August 2019: +1.47% excluding taxes on blue tariffs for residential customers and +1.34% excluding taxes on blue tariffs for non-residential customers (incorporating an indexed adjustment of +3.04% to the TURPE 5 distribution tariff); from 1 June 2019: +7.7% excluding taxes on blue tariffs for residential and non-residential customers.

Tariff changes in 2018: +0.7% on blue tariffs for residential customers, +1.6% on blue tariffs for non-residential customers from 1 February 2018, and -0.5% on blue tariffs for residential customers and +1.1% on blue tariffs for non-residential customers from 1 August 2018 (incorporating an indexed adjustment of -0.21% to the TURPE 5 distribution tariff at 1 August 2018).

(3) After deduction of pumped volumes, hydropower production for 2019 stood at 33.4TWh (39.2TWh for 2018).

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.4.1.2.2 France – Regulated activities

Sales by the **France – Regulated activities** segment amounted to €16,087 million, with an organic rise of €39 million (+0.2%) from 2018.

Sales essentially benefited, for Enedis ⁽¹⁾, from favourable effects relating to tariff changes ⁽²⁾ including the tariff optimisation operated by suppliers, and the increase in network connection services.

The impacts of unfavourable weather effect on sales is estimated at -€80 million.

5.1.4.1.2.3 EDF Renewables

EDF Renewables' sales totalled €1,565 million in 2019, with an organic increase of €43 million (+2.9%) from 2018.

This rise was mainly driven by generation activities, which benefited from positive price effects although output volumes showed an organic decline of -0.3TWh (-2.0%) compared to the previous year due to the disposals undertaken in late 2018 and early 2019, despite better wind conditions, particularly in France and the United States.

5.1.4.1.2.4 Dalkia

Dalkia's contribution to Group sales in 2019 was €4,281 million, corresponding to an organic growth of €68 million (+1.6%) compared to 2018.

This development is mainly explained by business growth, especially in France with the conclusion and renewal of contracts, for example the new 15.5-year public service delegation for urban heating in Grande Île at Vaulx-en-Velin and Villeurbanne, and in the United Kingdom. Sales revenues were also adversely affected by a year-on-year decrease in gas prices.

5.1.4.1.2.5 Framatome

Framatome's sales amounted to €3,377 million in 2019, with an organic increase of 0.6% over 2018. A significant portion of sales concern Group entities.

Order intake amounted to €3.3 billion in 2019 (more than 60% of orders were from non-Group entities).

In commercial developments, Rosatom awarded Framatome the contract to supply the principal instrumentation and control (I&C) system for the Hanhikivi-1 nuclear plant in Finland and the PAKS2 nuclear plant in Hungary. In the United States, the acquisition of FoxGuard Solutions, a leading cybersecurity and industrial IT company, was completed on 1 October 2019.

5.1.4.1.2.6 United Kingdom

The **United Kingdom's** contribution to Group sales in 2019 amounted to €9,574 million, up by €604 million from 2018. Excluding foreign exchange effects (€75 million), the organic growth in sales compared to 2018 was 5.9%.

The rise in UK sales is primarily explained by tariff increases on the residential and business markets, the higher realised sales prices for nuclear power, and an increase in capacity revenue. These effects were partly offset by a decrease in sales volumes on the wholesale markets, due to the lower nuclear power output, and a decrease in gas sales volumes, since there was no equivalent in 2019 to the cold weather experienced in the first half of 2018.

5.1.4.1.2.7 Italy

Italy contributed €7,567 million to Group sales, an organic decrease (-8.1%) from 2018.

In the gas activities, sales were down due to the lower prices across all markets (this had only a limited impact on the margin), and a decline in volumes sold on the wholesale markets, which was partly counterbalanced by an increase in volumes sold to industrial customers.

In the electricity activities, sales were up, mainly as a result of higher sales volumes and prices to business and residential customers, and increases in hydropower and wind power generation.

5.1.4.1.2.8 Other international

The **Other international** segment principally covers operations in Belgium, the United States, Brazil and Asia (China, Vietnam and Laos).

Sales by this segment amounted to €2,690 million in 2019, with an organic increase of €263 million (+10.9%) compared to 2018.

In Belgium ⁽³⁾, sales amounted to €1,909 million, corresponding to organic year-on-year growth of +4.8%, including a price increase for electricity and gas sales and a decrease in volumes supplied due to the intensely competitive market.

In energy generation, wind power capacities rose to 519MW gross in Belgium, up by +18% from 2018. Winter 2018 was affected by lengthy shutdowns of nuclear reactors operated by the Engie group, which had no equivalent in 2019. The nuclear fleet's availability improved accordingly, with fewer unscheduled outages and early resumption of operations by units 3 at Tihange and Doel.

In Brazil, sales amounted to €563 million, an organic increase of +35.8% from 2018. This rise reflects changes (with no impact on EBITDA) in the IMCS tax ⁽⁴⁾, and the positive effect of annual revision of EDF Norte Fluminense's electricity sale contract tariff.

5.1.4.1.2.9 Other activities

Other activities comprise, among other entities, EDF Trading and the gas activities.

Sales by this segment amounted to €2,728 million in 2019, with an organic increase of €178 million (+6.8%) from 2018.

Sales by the gas activities amounted to €1,221 million. The positive environment for LNG activities led to a +€376 million (+42.4%) organic rise in sales by the gas activities, reflecting better use of Group capacities.

EDF Trading's sales totalled €1,026 million, corresponding to an organic growth of 18.9%. This growth reflects a good performance throughout the year, associated with volatility on the commodity markets in a down trending market and favourable positions on electricity and gas markets in Europe. Good business levels in the United States, LNG (liquefied natural gas) trading and optimisation at worldwide level and LPG (liquid petroleum gas) activities also contributed to this performance.

(1) Enedis is an independent EDF subsidiary as defined in the French Energy Code.

(2) Indexed adjustments of the TURPE 5 distribution tariff +3.04% from 1 August 2019 and -0.21% from 1 August 2018.

(3) Belgium comprises Luminus and EDF Belgium.

(4) Tax on Circulation of Merchandise and Services in Brazil.

5.1.4.2 Operating profit before depreciation and amortisation (EBITDA)

EBITDA increased by 12.1%, and registered an organic growth of +8.4%.

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)	Organic growth (%)
Sales	71,317	68,546	2,771	+4.0	+3.5
Fuel and energy purchases	(35,091)	(33,056)	(2,035)	+6.2	+5.8
Other external expenses	(8,619)	(9,262)	643	-6.9	-1.2
Personnel expenses	(13,793)	(13,642)	(151)	+1.1	+0.6
Taxes other than income taxes	(3,798)	(3,690)	(108)	+2.9	+3.3
Other operating income and expenses	6,692	6,002	690	+11.5	+14.2
EBITDA	16,708	14,898	1,810	+12.1	+8.4

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019. In accordance with the new standard's transition provisions, the comparative figures have not been restated.

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

5.1.4.2.1 Change in consolidated EBITDA and analysis

The Group's consolidated **EBITDA** for 2019 amounted to €16,708 million, with an increase of 12.1% from 2018. Excluding the effects of application of IFRS 16 (+€517 million), foreign exchange effects (+€34 million) and changes in the scope of consolidation (+€1 million), EBITDA showed organic growth of +8.4%.

The Group's **fuel and energy purchases** amounted to €35,091 million in 2019, up by €2,035 million (+6.2%) from 2018, or an organic increase of €1,926 million (+5.8%):

- in the **France – Generation and supply activities** segment, fuel and energy purchases stood at €12,821 million, corresponding to organic growth of €1,437 million (+12.6%) from 2018, mainly driven by higher purchase obligations for photovoltaic power, wind power and cogeneration, an increase in purchases to cover downturns in nuclear and hydropower generation, and the capacity mechanism;
- in the **United Kingdom**, the organic increase of €475 million (+8.2%) principally relates to the rise in energy prices, which was partly offset by the decrease in gas prices, since 2019 had no equivalent to the cold weather experienced in the first half of 2018, and lower consumption of nuclear fuel as a result of lower generation output;
- **Italy** saw an organic decrease of €787 million (-11.6%) in fuel and energy purchases, essentially reflecting lower gas prices and gas sales volumes (on the wholesale market).

Other external expenses amounted to €8,619 million, down by -€643 million from 2018 (-6.9%). Excluding the effects of application of IFRS 16 (+€683 million), foreign exchange effects (-€41 million) and changes in the scope of consolidation (-€109 million), other external expenses showed an organic decline of -1.2%:

- in the **France – Generation and supply activities** segment, other external expenses totalled €2,426 million. The organic decrease of €195 million (-6.8%) notably reflects continued cost-cutting actions as part of performance improvement plans across all areas of business;
- in the **France – Regulated activities** segment, other external expenses totalled €1,557 million. The organic decrease of €40 million (-2.3%) notably reflects continued cost-cutting actions as part of performance improvement plans across all areas of business;

- **Dalkia** registered a €57 million organic increase in other external expenses (+3.7%), reflecting the expansion of its service activities.

The Group's **personnel expenses** totalled €13,793 million, up by €151 million from 2018, corresponding to an organic growth of €77 million (+0.6%):

- in the **France – Generation and supply activities** segment, personnel expenses totalled €6,032 million, down slightly from 2018 as a result of the efforts made to control payroll costs. The average workforce shrank by 1.4% ⁽¹⁾ from its 2018 level, with decreases in all areas of business;
- in the **France – Regulated activities** segment, personnel expenses were stable compared to 2018 at €3,139 million. Average workforce numbers at Enedis decreased slightly (-0.2% year-on-year);
- **EDF Renewables** registered a €36 million organic increase in personnel expenses which is principally explained by an increase in its workforce, in line with the level of activity in development and construction;
- **Dalkia** registered a €29 million organic increase in personnel expenses which reflects its expanding service activities.

Taxes other than income taxes amounted to €3,798 million for 2019, up by €108 million (+2.9%) compared to 2018 (organic growth of +3.3%):

- the €127 million increase in Brazil is principally attributable to the ICMS tax (with no impact on EBITDA);

Other operating income and expenses generated net income of €6,692 million in 2019, up by €690 million from 2018 (an organic change of +€851 million or +14.2%):

- in the **France – Generation and supply activities** segment, there was an organic increase in net income of €628 million (+15.8%) which mainly relates to the CSPE;
- **EDF Renewables** registered an organic increase of +€275 million in other operating income and expenses, principally generated by the sale to the Irish electricity company ESB of 50% of the Neart na Gaoithe (NnG) Scottish offshore wind farm project.

(1) Excluding apprentices and work-study contracts.

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.4.2.2 Change in consolidated EBITDA and analysis by segment

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)	Organic growth (%)
France – Generation and supply activities	7,615	6,327	1,288	+20.4	+16.1
France – Regulated activities	5,101	4,916	185	+3.8	+0.4
EDF Renewables	1,193	856	337	+39.4	+33.5
Dalkia	349	292	57	+19.5	+4.8
Framatome	256	202	54	+26.7	+3.0
United Kingdom	772	783	(11)	-1.4	-4.6
Italy	578	424	154	+36.3	+20.8
Other international	339	240	99	+41.3	+36.3
Other activities	505	858	(353)	-41.1	-26.2
GROUP EBITDA	16,708	14,898	1,810	+12.1	+8.4

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019. In accordance with the new standard's transition provisions, the comparative figures have not been restated.

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

5.1.4.2.2.1 France – Generation and supply activities

EBITDA for the **France – Generation and supply activities** segment amounted to €7,615 million, corresponding to an organic increase of €1,019 million (+16.1%) from 2018.

This substantial increase is mainly due to favourable energy price effects totalling an estimated +€2,230 million, which is related to the positive market price movements and the +7.7% (excluding taxes) rise in regulated sales tariffs on 1 June 2019.

The decrease in generation, mainly, of nuclear power (-13.7TWh) and hydropower (-5.8TWh after pumping) had an unfavourable effect estimated at -€899 million.

The erosion of market shares and the end of the tariff catch-up component in regulated tariffs, which had a favourable effect in 2018 with no equivalent in 2019, had an estimated -€211 million unfavourable effect on EBITDA.

Operating expenses ⁽¹⁾ were cut by €342 million (-3.9%) through control of purchases and payroll costs. These measures are being implemented across all entities: they notably helped lower support function costs and adjust selling costs, as well as reduce operating costs for the nuclear, hydropower and thermal power plant fleet.

A number of other factors, principally changes in nuclear provisions and employee benefit commitments, had a total effect of -€443 million on EBITDA. The lower volumes of nuclear fuel consumed due to lower production levels had a small favourable impact.

5.1.4.2.2.2 France – Regulated activities

EBITDA for the **France – Regulated activities** segment stood at €5,101 million, with an organic increase of €18 million (+0.4%) from 2018.

Price changes had a positive effect of +€65 million: indexed adjustments to the TURPE 5 distribution and transmission tariffs ⁽²⁾ on 1 August 2019 were partly counterbalanced by the tariff optimisation operated by suppliers.

Business growth in network connection services is continuing, and made a positive contribution estimated at +€25 million to EBITDA in 2019.

The rise in EBITDA also benefited from the decrease in operating expenses ⁽³⁾ (+€83 million).

However, the unfavourable climate effect over the entire year and the exceptional weather events in the second half of the year affected EBITDA to the extent of approximately -€95 million.

Other factors had a combined estimated negative impact of -€60 million on EBITDA.

5.1.4.2.2.3 EDF Renewables

EDF Renewables' contribution to Group EBITDA for 2019 was €1,193 million. The organic year-on-year growth of +€287 million (+33.5%) was driven by development and sales of structured assets, and essentially reflects the sale to the Irish electricity company ESB of 50% of the Neart na Gaoithe (NnG) Scottish offshore wind farm project.

EBITDA from generation was affected by the disposals that took place in late 2018 and early 2019, and stood at €917 million, an organic decline of -0.9% compared to 2018 despite a positive price effect (portfolio effect).

At 31 December 2019, net installed capacities totalled 8.1GW compared to 8.3GW at 31 December 2018. Excluding transfers of assets inside the EDF group, capacities increased by +0.6GW (+7.8%). The gross portfolio of projects under construction reached a record level of 5.0GW with 3.4GW for wind power (including 0.9GW for offshore wind farms in France and Scotland) and 1.5GW for solar power.

Development and support function costs were on the rise, in order to keep pace with business growth together with expansion into new areas, and to support innovative and digitalisation projects.

5.1.4.2.2.4 Dalkia

Dalkia's EBITDA for 2019 amounted to €349 million, reflecting an organic growth of €14 million (+4.8%). This increase was driven by improved competitiveness resulting from the operational performance plan, and good control of overheads.

The rise in EBITDA also reflects Dalkia's dynamic sales activity with in particular the renewal of many contracts (80% were renewed during the year). Dalkia signed and renewed a large number of contracts, including energy performance and heat network contracts in France (a new 26-site multiservice contract with Safran, and a new 15.5-year public service delegation for urban heating in Grande Île at Vaulx-en-Velin and Villeurbanne).

Sales of energy saving certificates improved compared to 2018.

(1) Sum of personnel expenses and other external expenses. Based on comparable scope, standard and exchange rates and constant discount rates for pensions. Excluding changes in operating expenses of the service activities.

(2) Indexed adjustments of TURPE 5 distribution tariff of +3.04% on 1 August 2019 (-0.21% on 1 August 2018) and of the TURPE 5 transmission tariff of +2.16% at 1 August 2019 (+3.0% at 1 August 2018).

(3) Sum of personnel expenses and other external expenses. Based on comparable scope, standard and exchange rates, and constant discount rates for pensions. Excluding changes in operating expenses of the service activities.

5.1.4.2.2.5 Framatome

Framatome's EBITDA was €527 million (including the margin realised with other EDF group entities), corresponding to an organic growth of +3.0% between 2018 and 2019.

Framatome's contribution to Group EBITDA for 2019 stood at €256 million, a year-on-year organic increase of +3.0%. This includes the effects of a non-recurring €42 million expense in 2018 related to the revaluation of inventories undertaken to determine Framatome's acquisition balance sheet at 31 December 2017.

In a highly competitive market, Framatome's "Installed base" and "Instrumentation & Control" businesses registered better performances in the United States and Germany (80% exports). "Installed base" business was affected by rising execution costs on certain French and export projects.

Profitability of the "Components manufacturing" business improved thanks to a step-up in production of equipment to replace steam generators, and equipment for new projects.

The "Fuel" business benefited from sustained production levels, and fuel assembly deliveries for the Taishan EPRs in China.

There was growth in the "Large projects" business as the Hinkley Point C EPR project in United Kingdom was ramping up (with no impact on Group EBITDA), compensating for the decline in business activity after the Taishan EPRs commissioning in China.

Framatome's EBITDA also benefited from continuation of its overhead cost reduction plan.

5.1.4.2.2.6 United Kingdom

The **United Kingdom's** contribution to Group EBITDA for 2019 was €772 million, with an organic decline of 4.6% from 2018.

EBITDA in the United Kingdom was impacted by the downturn in nuclear power generation and the introduction at 1 January 2019 of a cap on residential tariffs for electricity and gas (the Standard Variable Tariff). These unfavourable factors were partly counterbalanced by an increase in capacity revenue (€309 million⁽¹⁾ recorded in 2019) following reinstatement of the capacity market in October 2019, and the higher realised prices for nuclear power (around +€4/MWh).

Nuclear generation output totalled 51TWh in 2019, down by 8.1TWh from 2018. The downturn is explained by the extensions of the Hunterston B and Dungeness B outages in 2019.

Despite intense competitive pressure, the residential customer portfolio increased slightly (+2% compared to 2018), thanks to the transfer of Toto Energy's⁽²⁾ customer base, with the business customer segment also performing well with increased margins.

5.1.4.2.2.7 Italy

Italy's contribution to Group EBITDA for 2019 amounted to €578 million, corresponding to an organic growth of €88 million (+20.8%) compared to 2018.

EBITDA for the electricity activities was up, essentially due to the good performance of electricity ancillary services, hydropower generation and new wind farms generation (+165MW).

EBITDA for the gas activities was also up, mainly as a result of better optimisation of long-term contracts for gas supplies *via* pipeline in 2019. In 2018 this EBITDA was affected by tensions over supplies and purchases at high prices.

The contribution by the sales activities was lower than in 2018 due to smaller margins on the residential customer segment for both electricity and gas.

In the service activities, results were affected by a slight decline in margins on key account customers and by favourable non-recurring items in 2018.

5.1.4.2.2.8 Other international

EBITDA for the **Other international** segment stood at €339 million in 2019, with an organic increase of €87 million (+36.3%) compared to 2018.

In Belgium, EBITDA showed organic growth of €54 million (+38.6%). The principal factor in this growth was a higher nuclear plant availability, which had been very low in 2018, and the increase in wind power generation. Gross wind power capacities were up by +18.0% compared to the previous year, at 519MW. Retail activities remained resilient despite a strongly competitive environment.

EBITDA in Brazil also showed organic growth of +€48 million (+60.0%), largely due to the +16% adjustment to the Power Purchase Agreement (PPA) price in November 2018 relating to the Norte Fluminense plant. This growth also reflected a good operating performance with a record level of availability, a smaller maintenance programme than in 2018 and better gas supply conditions.

5.1.4.2.2.9 Other activities

The **Other activities** segment contributed €505 million to Group EBITDA for 2019, with an organic decrease of €225 million (-26.2%) from 2018.

A capital gain on a real estate sale in 2018, for which there was no equivalent in 2019, also affected the evolution of this segment's EBITDA.

Gas activity was impacted by a provision for onerous contracts, booked in view of the downward revision of medium-term and long-term spreads. However, there was a high level of gas activities in 2019 thanks to growing competitiveness in European gas-fired generation, and better use of the Group's capacities.

EBITDA at EDF Trading amounted to €733 million in 2019, with a year-on-year organic increase of €113 million (+17.9%). This rise follows the increase in the trading margin mentioned earlier in the discussion of sales (see section 5.1.4.1.2.9), which was driven by high volatility on the markets and favourable positions on the electricity and gas markets in Europe, together with a good level of business in the United States. Thanks to the joint venture formed on 2 April 2019 with JERA, LNG (liquefied natural gas) trading and optimisation at worldwide level and LPG (liquid petroleum gas) activities also contributed to this performance.

⁽¹⁾ Including revenue for the 4th quarter of 2018.

⁽²⁾ This transfer was decided by Ofgem, the British regulator for gas and electricity markets, when Toto Energy lost its licence.

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.4.3 Operating profit (EBIT)

EBIT was up by 23.9% from 2018.

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)
EBITDA	16,708	14,898	1,810	+12.1
Net changes in fair value on Energy and Commodity derivatives, excluding trading activities	642	(224)	866	n.a.
Net depreciation and amortisation	(9,994)	(8,775)	(1,219)	+13.9
Net increases in provisions for renewal of property, plant and equipment operated under concessions	(8)	(50)	42	-84.0
(Impairment)/reversals	(403)	(290)	(113)	+39.0
Other income and expenses	(185)	(105)	(80)	+76.2
EBIT	6,760	5,454	1,306	+23.9

n.a.: not applicable.

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019. In accordance with the new standard's transition provisions, the comparative figures have not been restated.

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

The Group's consolidated **EBIT** amounted to €6,760 million in 2019, up by +€1,306 million from 2018. This development is essentially explained by the growth in EBITDA and the favourable impact of net changes in fair value on energy and commodity derivatives, excluding trading activities. It was partly offset by a rise in net depreciation and amortisation.

5.1.4.3.1 Net changes in fair value on Energy and Commodity derivatives, excluding trading activities

The net changes in fair value on Energy and Commodity derivatives, excluding trading activities, increased from -€224 million in 2018 to +€642 million in 2019, principally reflecting the higher price volatility on commodity transactions, particularly concerning Edison's gas positions.

5.1.4.3.2 Net depreciation and amortisation

Net depreciation and amortisation was €1,219 million higher than in 2018. Excluding the effects of application of IFRS 16 (-€634 million), foreign exchange effects (-€25 million) and changes in the scope of consolidation (+€27 million), net depreciation and amortisation was up by €587 million.

The **France – Generation and supply activities** segment registered a €740 million increase in net depreciation and amortisation. After adjustment for the effect of application of IFRS 16, the increase in net depreciation and amortisation was €450 million. This rise is essentially explained by a volume effect related to newly-commissioned facilities in the nuclear fleet, and to a lesser degree accelerated depreciation of the coal-fired fleet from 1 June 2019.

The **France – Regulated activities** segment registered a €250 million increase in net depreciation and amortisation. After adjustment for the effect of application of IFRS 16, the increase in net depreciation and amortisation was €92 million, principally attributable to the step-up in the Linky ⁽¹⁾ project and investments in connections and network reinforcements.

5.1.4.3.3 Net increases in provisions for renewal of property, plant and equipment operated under concessions

The €42 million decrease between 2018 and 2019 in net increases in provisions for renewal of property, plant and equipment operated under concessions is attributable to the France – Regulated activities segment.

5.1.4.3.4 Impairment/reversals

In 2019, impairment amounted to €403 million (see note 14 to the 2019 consolidated financial statements).

In 2018, impairment amounted to €290 ⁽²⁾ million.

5.1.4.3.5 Other income and expenses

In 2019, other income and expenses amounted to -€185 million. This particularly includes the expense for the preferential employee reserved offer which took place during the first half of 2019 (see note 15 to the 2019 consolidated financial statements), and restructuring provisions in certain Group entities.

In 2018, other income and expenses amounted to -€105 million.

5.1.4.4 Financial result

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)
Cost of gross financial indebtedness	(1,806)	(1,712)	(94)	+5.5
Discount effect	(3,161)	(3,464)	303	-8.7
Other financial income and expenses	4,606	378	4,228	n.a.
FINANCIAL RESULT	(361)	(4,798)	4,437	-92.5

n.a.: not applicable.

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019. In accordance with the new standard's transition provisions, the comparative figures have not been restated.

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

(1) Linky is a project led by Enedis, an independent EDF subsidiary as defined in the French Energy Code.

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

The financial result for 2019 corresponds to a financial expense of €361 million, with an improvement of €4,437 million from 2018. This change is explained by:

- an increase in the cost of gross financial indebtedness. Excluding the effect of application of IFRS 16 (-€74 million), the cost of gross financial indebtedness is stable;
- a favourable change of €303 million in the discount effect, principally due to a smaller year-on-year decrease in the discount rate used for nuclear provisions in France. At 31 December 2019 the discount rate for nuclear provisions was 3.7% incorporating an assumed inflation rate of 1.4% (respectively 3.9% and 1.5% at 31 December 2018).
- a €4,228 million increase in other financial income and expenses, primarily due to the favourable change in the dedicated asset portfolio (€3,534 million) reflecting stronger performances on the equity and bond markets in 2019 than in 2018.

5.1.4.5 Income taxes

Income taxes amounted to -€1,581 million in 2019, corresponding to an effective tax rate of 24.71% (compared to an income of +€178 million in 2018 corresponding to an effective tax rate of -27.13%⁽¹⁾). The €1,759 million increase in the Group's tax charge between 2019 and 2018 essentially reflects the higher net income before taxes, which rose by €5,743 million (notably resulting from the increase in EBITDA and changes in unrealised gains and losses on EDF SA's portfolio of financial assets), which generated an additional tax charge of €1,977 million in application of the French income tax rate of 34.43%.

After eliminating non-recurring items (mainly changes in unrealised gains and losses on EDF SA's portfolio of financial assets, impairment and disposals), the effective tax rate for 2019 is 19.1%, compared to 22.6%⁽¹⁾ for 2018.

5.1.4.6 Share in net income of associates and joint ventures

The Group's share in net income of associates and joint ventures was a positive €818 million in 2019, compared to €569 million in 2018.

5.1.5 Cash flow and net indebtedness

5.1.5.1 Cash flow

(in millions of euros)

	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)
Net cash flow from operating activities	14,022	13,364	658	+4.9
Net cash flow used in investing activities	(15,650)	(17,165)	1,515	-8.8
Net cash flow from financing activities	2,223	3,530	(1,307)	-37.0
NET INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS	595	(271)	866	n.a.
Cash and cash equivalents – opening balance	3,290	3,692	(402)	-10.9
Net increase (decrease) in cash and cash equivalents	595	(271)	866	n.a.
Effect of currency fluctuations	(5)	(95)	90	-94.7
Financial income on cash and cash equivalents	17	13	4	+30.8
Effect of reclassifications	37	(49)	86	n.a.
CASH AND CASH EQUIVALENTS – CLOSING BALANCE	3,934	3,290	644	+19.6

n.a.: not applicable.

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (see note 2.1 to the 2019 consolidated financial statements).

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

This +€249 million change is mainly explained by the increase in CENG's net income.

The share in net income of associates in 2019 includes impairment totalling -€73 million. Details of this impairment are given in note 26 to the 2019 consolidated financial statements, "Investments in associates and joint ventures".

5.1.4.7 Net income of discontinued operations

The specific line "Net income of discontinued operations" comprises items from the income statement of Edison's E&P operations for 2018 and 2019, and impairment on these assets recognised in those two periods (see note 19 to the 2019 consolidated financial statements).

5.1.4.8 Net income attributable to non-controlling interests

Net income attributable to non-controlling interests amounted to €27 million in 2019, up by €13 million compared to 2018.

5.1.4.9 EDF net income

EDF net income totalled €5,155 million in 2019, an increase of +€3,978 million in comparison to 2018, notably due to improvement of the financial result.

5.1.4.10 Net income excluding non-recurring items

The Group's net income excluding non-recurring items⁽²⁾ stood at €3,871 million in 2019, up by 57.9% compared to 2018.

(1) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

(2) EDF net income excluding: non-recurring items, net changes in fair value on energy and commodity derivatives (excluding trading activities), and net changes in the fair value of debt and equity instruments, net of tax.

Amount of non-recurring items, net changes in fair value on energy and commodity derivatives, excluding trading activities, and net changes in the fair value of debt and equity instruments, net of tax:

-€986 million of impairment and other non-recurring items in 2019, compared to -€385 million in 2018;

+€490 million of net changes in the fair value of energy and commodity derivatives, excluding trading activities, net of tax in 2019, compared to -€145 million in 2018;

+€1,780 million of net changes in the fair value of debt and equity instruments in 2019, compared to -€745 million in 2018.

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.5.1.1 Net cash flow from operating activities

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)
Income before taxes of consolidated companies	5,983	473	5,510	n.a.
Income before taxes of continuing operations	(416)	(183)	(233)	n.a.
Income before taxes of consolidated companies	6,399	656	5,743	n.a.
(Impairment)/reversals	403	290	113	+39.0
Accumulated depreciation and amortisation, provisions and changes in fair value	8,328	12,957	(4,629)	-35.7
Financial income and expenses	97	718	(621)	-86.5
Dividends received from associates and joint ventures	349	387	(38)	-9.8
Capital gains/losses	(508)	(1,014)	506	-49.9
Change in working capital	452	470	(18)	-3.8
Net cash flow from operations	15,520	14,464	1,056	+7.3
Net financial expenses disbursed	(798)	(1,048)	250	-23.9
Income taxes paid	(922)	(309)	(613)	n.a.
NET CASH FLOW FROM CONTINUING OPERATING ACTIVITIES	13,800	13,107	693	+5.3
NET CASH FLOW FROM OPERATING ACTIVITIES RELATING TO DISCONTINUED OPERATIONS	222	257	(35)	-13.6
NET CASH FLOW FROM OPERATING ACTIVITIES	14,022	13,364	658	+4.9

n.a.: not applicable.

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (see note 2.1 to the 2019 consolidated financial statements).

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

The net cash flow from operating activities amounted to €14,022 million in 2019, up by €658 million from 2018.

This change primarily reflects a €1,056 million increase in the net cash flow from continuing operating activities, resulting from:

- the change in the income before taxes of consolidated companies after correction for impairment, depreciation, provisions and changes in fair value, which totalled €15,130 million in 2019 compared to €13,903 million in 2018, with an increase of €1,227 million;
- the lower financial expenses (-€621 million compared to 2018);

- a decrease in capital gains (+€506 million), essentially reflecting the lower level of gains in 2019 (mainly resulting from the sale of NnG in renewable energies) compared to 2018 (when they mainly concerned sales of real estate and Dunkerque LNG).

5.1.5.1.2 Net cash flow used in investing activities

The net cash outflow for investing activities in 2019 amounted to €15,650 million, compared to €17,165 million in 2018. The following table sets forth the breakdown of the net cash flow used in investing activities between purchases and disposals of property, plant and equipment and intangible assets, acquisitions and disposals of companies net of cash acquired/transferred, and the change in financial assets:

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)
Investments in intangible assets and property, plant and equipment	(16,709)	(16,016)	(693)	+4.3
Net proceeds from sale of intangible assets and property, plant and equipment	94	577	(483)	-83.7
Net capex	(16,615)	(15,439)	(1,176)	+7.6
Acquisitions of equity investments, net of cash acquired	(456)	(484)	28	-5.8
Disposals of equity investments, net of cash transferred	293	1,261	(968)	-76.8
Changes in financial assets	1,294	(2,367)	3,661	n.a.
NET CASH FLOW FROM CONTINUING INVESTING ACTIVITIES	(15,484)	(17,029)	1,545	-9.1
NET CASH FLOW FROM INVESTING ACTIVITIES RELATING TO DISCONTINUED OPERATIONS	(166)	(136)	(30)	+22.1
NET CASH FLOW USED IN INVESTING ACTIVITIES	(15,650)	(17,165)	1,515	-8.8

n.a.: not applicable.

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (see note 2.1 to the 2019 consolidated financial statements).

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

Net capex

Net capital expenditure amounted to -€16,615 million in 2019, up by €1,176 million (+7.6%) from 2018.

Changes in the Group's net capital expenditure over the period were as follows:

(in millions of euros)	2019	2018	Variation	Variation (%)
France – Generation and supply activities	(6,074)	(5,507)	(567)	+10.3
France – Regulated activities	(4,601)	(4,308)	(293)	+6.8
EDF Renewables	(1,598)	(1,898)	300	-15.8
Dalkia	(269)	(385)	116	-30.1
Framatome	(208)	(261)	53	-20.3
United Kingdom	(3,345)	(2,938)	(407)	+13.9
Italy	(286)	(271)	(15)	+5.5
Other international	(223)	(199)	(24)	+12.1
Other activities	(11)	328	(339)	n.a.
NET CAPEX	(16,615)	(15,439)	(1,176)	+7.6

n.a.: not applicable.

Capital expenditure is one of the components of net investments for which details are given in section 5.1.5.2.1.2 "Net investments (excluding 2019-2020 disposals, Hinkley Point C and Linky projects)".

Acquisitions/disposals of equity investments, net of cash acquired/transferred

New investments in 2019, net of cash acquired, amounted to €456 million and chiefly concerned acquisition of companies by EDF Renewables.

Disposals of investments, net of cash transferred, were down by €968 million from 2018 to €293 million in 2019. This change primarily reflects the sale of Dunkerque LNG in 2018.

Changes in financial assets

The change in financial assets in 2019 was an increase of +€1,294 million, principally corresponding to sales of liquid assets (other than dedicated assets).

The change in financial assets in 2018 was a decrease of -€2,367 million, principally corresponding to acquisitions of liquid assets (other than dedicated assets).

5.1.5.1.3 Net cash flow from financing activities

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)
Transactions with non-controlling interests ⁽³⁾	1,055	1,548	(493)	-31.8
Dividends paid by parent company	(58)	(511)	453	-88.6
Dividends paid to non-controlling interests	(155)	(183)	28	-15.3
Purchases/sales of treasury shares	(14)	(3)	(11)	n.a.
Cash flows with shareholders	828	851	(23)	-2.7
Issuance of borrowings	9,080	5,711	3,369	+59.0
Repayment of borrowings	(6,976)	(2,724)	(4,252)	n.a.
Issuance of perpetual subordinated bonds	493	1,243	(750)	-60.3
Redemptions of perpetual subordinated bonds	(1,280)	(1,329)	49	-3.7
Issuance of perpetual subordinated bonds	(589)	(584)	(5)	+0.9
Funding contributions received for assets operated under concessions	143	131	12	+9.2
Investment subsidies	543	351	192	+54.7
Other cash flows from financing activities	1,414	2,799	(1,385)	-49.5
NET CASH FLOW FROM CONTINUING FINANCING ACTIVITIES	2,242	3,650	(1,408)	-38.6
NET CASH FLOW FROM FINANCING ACTIVITIES RELATING TO DISCONTINUED OPERATIONS	(19)	(120)	101	-84.2
NET CASH FLOW FROM FINANCING ACTIVITIES	2,223	3,530	(1,307)	-37.0

n.a.: not applicable.

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (see note 2.1 to the 2019 consolidated financial statements).

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

(3) Contributions via capital increases and reductions and acquisitions of additional interests in controlled companies.

Cash flows related to financing activities generated a net inflow of €2,223 million in 2019, down by €1,307 million from 2018. This change is primarily attributable to the following:

- transactions with non-controlling interests, which decreased by €493 million. In 2019, these transactions include €951 million corresponding to CGN's

contribution to the Hinkley Point C capital increases. In 2018, transactions with non-controlling interests included £701 million received for the sale to Dalmore Capital Limited and Pensions Infrastructure Platform of a 49% stake in twenty-four UK wind farms (around 550MW), and €743 million corresponding to CGN's contribution to the Hinkley Point C capital increases;

5. The Group's financial performance and outlook

Operating and financial review in 2019

- dividends paid by the parent company, which were down by €453 million. In 2019, dividends paid comprised a cash dividend of €(31) million and an interim dividend of €(27) million. In 2018, dividends paid comprised a cash dividend of €(60) million and an interim dividend of €(451) million;
- issuance of perpetual subordinated bonds, which decreased by €750 million. This change reflects the issuance of a €500 million hybrid bond on 26 November 2019, and a €1.25 billion "reset perpetual 6 year non-call hybrid note" on 25 September 2018;
- issues (see section 5.1.6.1.1.2) and redemption of bonds, which were down by €883 million compared to 2018.

5.1.5.2 Net indebtedness

Net indebtedness comprises total loans and financial liabilities, less cash and cash equivalents and liquid assets. Liquid assets are financial assets consisting of funds or securities with initial maturity of over three months that are readily convertible into cash and are managed according to a liquidity-oriented policy.

The Group's net indebtedness stood at €41,133 million in 2019 and include IFRS 16 from 1 January 2019 for €4,492 million. It stood at €33,388 million at 31 December 2018.

(in millions of euros)	2019 ⁽¹⁾	2018 ⁽²⁾	Variation	Variation (%)
Operating profit before depreciation and amortisation (EBITDA)	16,708	14,898	1,810	+12.1
Cancellation of non-monetary items included in EBITDA	(1,943)	(1,245)		
Cash EBITDA	14,765	13,653		
Change in working capital	452	470		
Net investments ⁽³⁾ (excluding 2019-2020 asset disposals, Hinkley Point C and Linky projects)	(11,345)	(11,508)		
Other items including dividends received from associates and joint ventures	303	383		
Operating cash flow ⁽⁴⁾	4,175	2,998	1,177	+39.3
Asset disposals	531	1,937		
Income taxes paid	(922)	(309)		
Net financial expenses disbursed	(798)	(1,048)		
Dedicated assets	(394)	(501)		
Dividends paid in cash	(801)	(1,278)		
Operating cash flow before Hinkley Point C and Linky projects	1,791	1,799		
Hinkley Point C and Linky projects	(2,582)	(2,400)		
Group Cash flow ⁽⁵⁾	(791)	(601)		
Issuance of perpetual subordinated bonds	493	1,243		
Redemptions of perpetual subordinated bonds	(1,618)	(1,329)		
Other monetary changes	(470)	(22)		
(Increase)/decrease in net indebtedness, excluding the impact of changes in exchange rate	(2,386)	(709)		
Effect of change in exchange rates	(341)	96		
Effect of other non-monetary changes	(5,039)	121		
(Increase)/decrease in net indebtedness of continuing operations	(7,766)	(492)		
(Increase)/decrease in net indebtedness of discontinued operations ⁽⁶⁾	21	119		
Net indebtedness at beginning of period	33,388	33,015		
NET INDEBTEDNESS AT END OF PERIOD	41,133	33,388		

(1) The statements as of 31 December 2019 have been prepared in accordance with IFRS 16 (see note 2.1 to the 2019 consolidated financial statements).

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations.

(3) Net investments are operating investments and financial investments for growth, net of disposals. They also include net debts acquired or transferred in acquisitions or disposals of securities, investment subsidies received and non-Group partner investments. They do not include the 2019-2020 asset disposals, Hinkley Point C and Linky projects.

(4) Operating cash flow is not an aggregate defined by IFRS as a measure of financial performance, and is not directly comparable with indicators of the same name reported by other companies. This indicator, also known as Funds From Operations ("FFO"), is equivalent to net cash flow from operating activities, changes in working capital after adjustment where relevant for the impact of non-recurring effects, net investments (excluding 2019-2020 asset disposals, Hinkley Point C and Linky projects) and other items including dividends received from associates and joint ventures.

(5) Group cash flow is not an aggregate defined by IFRS as a measure of financial performance, and is not comparable with indicators of the same name reported by other companies. It is equivalent to the operating cash flow less asset disposals, income taxes paid, net financial expenses disbursed, dedicated assets, dividend paid in cash, Hinkley Point C and Linky projects.

(6) This corresponds to the net indebtedness of Edison's E&P operations (discontinued operations).

5.1.5.2.1 Operating cash flow

The operating cash flow amounted to €4,175 million in 2019 compared to €2,998 million in 2018, with an increase of €1,177 million.

EBITDA (see section 5.1.4.2) adjusted for non-cash items amounted to €14,765 million, up by €1,112 million from 2018.

The increase in non-cash items (-€698 million) principally results from the change in the fair value of EDF Trading's financial instruments, in coherence with the growth in its activity.

5.1.5.2.1.1 Change in working capital

Working capital improved by €452 million in 2019.

(in millions of euros)

	2019	2018*	Variation	Variation (%)
France – Generation and supply activities	6,329	5,349	980	+18.3
France – Regulated activities	3,622	3,371	251	+7.4
EDF Renewables	(276)	506	(782)	n.a.
Dalkia	138	293	(155)	-52.9
Framatome	134	261	(127)	-48.7
United Kingdom	659	606	53	+8.7
Italy	344	705	(361)	-51.2
Other international	309	373	(64)	-17.2
Other activities	86	44	42	+95.5
NET INVESTMENTS	11,345	11,508	(163)	-1.4

n.a.: not applicable.

* The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations and the reclassification of investments included in New Developments in 2018 (excluding Hinkley Point C and Linky projects).

Net investments by the **France – Generation and supply activities** segment rose by €980 million (+18.3%). This increase is mainly attributable to investments in nuclear maintenance, in line with the schedule for plant inspections.

Net investments by the **France – Regulated activities** segment were up by €251 million (+7.4%), primarily as a result of higher expenditure for customer connections, reinforcement of the network and improvement of the quality of service.

Net investments by **EDF Renewables** decreased by €782 million, mainly as a result of the partial sale of the Scottish "Neart na Gaoithe" offshore wind farm (leading to deconsolidation of the debt relating to the acquisition that took place in 2018). Higher volumes of subsidies in the United States also contributed to the decrease.

In **Italy**, net investments were down by €361 million, principally due to the acquisition in 2018 of Gas Natural Vendita Italia and Zephyro, as there was no equivalent operation in 2019.

5.1.5.2.2 Cash flow before Hinkley Point C and Linky projects

The cash flow before Hinkley Point C and Linky projects consequently amounted to €1,791 million in 2019 (compared to €1,799 million ⁽¹⁾ in 2018).

5.1.5.2.2.1 2019-2020 asset disposals

Asset disposals concern EDF's sale of its 25.04% investment in the Swiss energy operator Alpiq.

5.1.5.2.2.2 Dedicated assets

In compliance with the French Law no. 2006-739 of 28 June 2006 on the sustainable management of radioactive materials and waste, EDF has built up a portfolio of dedicated assets for secure financing of its long-term nuclear obligations which amounted to €29,844 million at 31 December 2019.

Overall, the changes in dedicated assets comprise:

- allocations to reach full coverage of obligations;

This change was mainly due to the favourable development of working capital from the optimisation/trading activity.

The difference between the 2018 and 2019 change in working capital (-€18 million) is essentially explained by:

- an increase in CSPE expenses (-€1,104 million);
- the optimisation/trading activity (+€593 million);
- a favourable timing effect for social security liabilities (+€630 million).

5.1.5.2.1.2 Net investments (excluding 2019-2020 disposals, Hinkley Point C and Linky projects)

Net investments amounted to €11,345 million in 2019 compared to €11,508 million in 2018, a decrease of -€163 million (-1.4%). Details are as follows:

- reinvestment of financial income (dividends and interest) generated by these assets;
- withdrawals of assets corresponding to the costs incurred over the period to meet long-term nuclear obligations falling within the scope of the Law of 28 June 2006;
- exceptional withdrawals proposed to the governance bodies in charge of managing dedicated assets when the value of the portfolio exceeds the amount of the obligations to be financed; such withdrawals must be validated by these bodies.

The net change of -€394 million in dedicated assets in 2019 corresponds to the first three categories above.

5.1.5.2.2.3 Dividend paid in cash

Dividends paid in cash during 2019 (-€801 million) comprise:

- the balance of the 2018 dividend (-€31 million) and an interim dividend for 2019 (-€27 million), the major share of dividends having been paid in the form of a scrip dividend;
- payments made in 2019 to bearers of perpetual subordinated bonds for the "hybrid" bond issues of January 2013 and January 2014 (-€589 million);
- dividends paid by Group subsidiaries to their minority shareholders (-€154 million).

5.1.5.2.3 Group cash flow

The Group cash flow amounted to -€791 million at 31 December 2019, versus -€601 million at 31 December 2018.

5.1.5.2.4 Effect of change in exchange rates

The foreign exchange effect (mainly the rise of the pound sterling and the US dollar against the euro ⁽²⁾) had an unfavourable impact of -€341 million on the Group's net indebtedness at 31 December 2019.

(1) Application of IFRS 16 at 31 December 2019 would have increased the cash flow before Hinkley Point C and Linky projects by approximately +€609 million.

(2) The pound sterling rose by 5.1% against the euro, from €1.118/£1 at 31 December 2018 to €1.175/£1 at 31 December 2019. The US dollar rose by 1.9% against the euro, from €0.873/\$1 at 31 December 2018 to €0.89/\$1 at 31 December 2019.

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.5.2.5 Other non-monetary changes

Other non-monetary changes declined by -€5,160 million compared to 2018, principally reflecting the application of IFRS 16 from 1 January 2019

(-€4,878 million, comprising -€4,492 for the initial liability recognised at 1 January 2019 and -€386 million of changes in IFRS 16 liabilities in 2019).

5.1.5.3 Financial ratios

	2019	2018 ⁽¹⁾	2017
Net indebtedness/EBITDA	2.46	2.24	2.40
Net indebtedness/(Net indebtedness + equity) ⁽²⁾	42%	39%	40%

(1) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations and the reclassification of investments included in New Developments in 2018 (excluding the Hinkley Point C and Linky projects).

(2) Equity including non-controlling interests.

5.1.6 Management and control of market risks

5.1.6.1 Management and control of financial risks

This section sets forth the policies and principles for management of the Group's financial risks defined in the Strategic financial management framework (liquidity, interest rate, foreign exchange rate and equity risks), and the Group counterparty risk management policy set up by the EDF group. These principles apply only to EDF and operationally controlled subsidiaries or subsidiaries that do not benefit by law from specific guarantees of independent management such as Enedis. In compliance with IFRS 7, the following paragraphs describe the nature of risks resulting from financial instruments, based on analyses of sensitivities and credit (counterparty) risks.

Since 2002, a dedicated body – the Financial Risks Control Department (Département contrôle des risques financiers et investissements – CRFI) – has been in charge of financial risk control at Group level, mainly by ensuring correct application of the principles of the Strategic Financial Management Framework (July 2015). This department, which has reported to the Group's Risk Division since 2008, is an independent unit that also has the task of carrying out a second-level check of the risk of counterparty default (methodology and organisation) for EDF entities and operationally controlled Group subsidiaries (excluding Enedis), and a first-level check of financing activities by EDF SA's Trading room. The CRFI Department also carries out a second-level check of management activities concerning the dedicated asset portfolio.

The CRFI Department issues daily and weekly monitoring reports of risk indicators relevant to activities in EDF SA's trading room.

Regular internal audits are carried out to ensure controls are actually applied and are effective.

5.1.6.1.1 Liquidity position and management of liquidity risk

5.1.6.1.1.1 Liquidity position

At 31 December 2019, the Group's liquidities, consisting of liquid assets, cash and cash equivalents, totalled €22,895 million and available credit lines amounted to €10,490 million.

For 2020, the Group's scheduled debt repayments (principal and interest) are forecast at 31 December 2019 at €13,357 million, including €3,836 million for bonds (excluding hybrid bonds).

No Group company was in default on any borrowing at 31 December 2019.

5.1.6.1.1.2 Management of liquidity risk

On 27 November 2019, EDF raised \$2 billion through issuance of a US dollar-denominated senior bond with 50-year maturity and a fixed coupon of 4.50%. This transaction demonstrates the Group's capacity to attract a highly diversified investor base at the long end of the credit curve.

In addition, on 2 December 2019, EDF raised €1.25 billion through issuance of a euro-denominated senior bond, with 30-year maturity and a fixed coupon of 2.00%. This is the largest amount raised by a corporate issuer on this maturity in the Euro market.

Details of the Group's bond borrowings are given in note 41.2 to the 2019 consolidated financial statements "Loans and other financial liabilities".

The average maturity of the Group's gross debt was 15.4 years at 31 December 2019, compared to 13.6 years at 31 December 2018. For EDF SA, the average maturity was 15.9 years at 31 December 2019, against 14.2 years at 31 December 2018.

At 31 December 2019, the residual maturities of financial liabilities (including interest payments) are as follows under IFR 9 (valued on the basis of exchange and interest rates at 31 December 2019):

31 December 2019 (in millions of euros)	Hedging instruments*			Guarantee given on borrowings
	Debt	Interest rate swaps	Currency swaps	
2019	13,369	(283)	(420)	77
2020-2023	22,276	(942)	(1,437)	475
2024 and later	79,998	(920)	(4,068)	478
TOTAL	115,643	(2,145)	(5,925)	1,030
debt repayment	66,049			
interest expense	49,594			

* Data on hedging instruments include both assets and liabilities.

The EDF group was able to meet its financing needs by conservative liquidity management, and has obtained financing on satisfactory terms.

A range of specific levers are used to manage the Group's liquidity risk:

- the Group's cash pooling system, which centralises cash management for controlled subsidiaries. The subsidiaries' cash balances are made available to EDF SA in return for interest, so as to optimise the Group's cash management and provide subsidiaries with a system that guarantees them market-equivalent financial terms;
- centralisation of financing for controlled subsidiaries at the level of the Group's Cash Management Department. Changes in subsidiaries' working capital are financed by this department in the form of stand-by credit lines provided for subsidiaries, which may also be granted revolving credit from the Group. EDF SA and the investment subsidiary EDF Investissements Groupe (EDF IG), set up in partnership with the bank Natixis Belgique Investissements, also provide medium and long-term financing for EDF group operations outside France,

arranged by EDF SA and EDF IG on a totally independent basis: each company sets its own terms, which are the same as the subsidiary would have in an arm's-length market transaction;

- active management and diversification of financing sources used by the Group: the Group has access to short-term resources on various markets through programmes for French commercial paper (*billets de trésorerie*) and US commercial paper. For EDF, the ceilings for these programmes are €6 billion for the NEU CP programmes and \$10 billion for its US commercial paper.

At 31 December 2019, the amount of the Group's commercial paper outstanding was €785 million for French commercial paper, and US\$1,175 million for US commercial paper. EDF has access to the world's main bond markets: the Euro markets through its EMTN programme, which currently has a ceiling of €45 billion, particularly for euro and sterling issues; and the domestic markets used for stand-alone issues in US dollars (144A bonds), yen (Samurai bonds) and Swiss francs.

The Group's main borrowings at 31 December 2019 are as follows:

Type of borrowing <i>(in millions of currency units)</i>	Entity	Issue date*	Maturity	Nominal amount	Currency	Rate
Bond	EDF	01/2010	01/2020	1,400	USD	4.60%
Euro MTN	EDF	05/2008	05/2020	1,200	EUR	5.38%
Bond	EDF	10/2015	10/2020	1,500	USD	2.35%
Euro MTN	EDF	01/2009	01/2021	2,000	EUR	6.25%
Euro MTN (green bond)	EDF	11/2013	04/2021	1,400	EUR	2.25%
Euro MTN	EDF	01/2012	01/2022	2,000	EUR	3.88%
Euro MTN	EDF	09/2012	03/2023	2,000	EUR	2.75%
Euro MTN	EDF	09/2009	09/2024	2,500	EUR	4.63%
Bond (green bond)	EDF	10/2015	10/2025	1,250	USD	3.63%
Euro MTN	EDF	11/2010	11/2025	750	EUR	4.00%
Euro MTN (green bond)	EDF	10/2016	10/2026	1,750	EUR	1.00%
Bond	EDF	01/2017	01/2027	107,900	JPY	1.09%
Euro MTN	EDF	03/2012	03/2027	1,000	EUR	4.13%
Bond	EDF	09/2018	09/2028	1,800	USD	4.50%
Euro MTN	EDF	04/2010	04/2030	1,500	EUR	4.63%
Euro MTN	EDF	10/2018	10/2030	1,000	EUR	2.00%
Euro MTN	EDF	07/2001	07/2031	650	GBP	5.88%
Euro MTN	EDF	02/2003	02/2033	850	EUR	5.63%
Euro MTN	EDF	06/2009	06/2034	1,500	GBP	6.13%
Euro MTN	EDF	10/2016	10/2036	750	EUR	1.88%
Bond	EDF	09/2018	09/2038	650	USD	4.88%
Bond	EDF	01/2009	01/2039	1,750	USD	6.95%
Euro MTN	EDF	11/2010	11/2040	750	EUR	4.50%
Euro MTN	EDF	10/2011	10/2041	1,250	GBP	5.50%
Bond	EDF	01/2014	01/2044	1,000	USD	4.88%
Bond	EDF	10/2015	10/2045	1,500	USD	4.75%
Bond	EDF	10/2015	10/2045	1,150	USD	4.95%
Bond	EDF	09/2018	09/2048	1,300	USD	5.00%
Euro MTN	EDF	12/2019	12/2049	1,250	EUR	2.00%
Euro MTN	EDF	09/2010	09/2050	1,000	GBP	5.13%
Euro MTN	EDF	10/2016	10/2056	2,164	USD	4.99%
Euro MTN	EDF	11/2019	12/2069	2,000	USD	4.50%
Bond	EDF	01/2014	01/2114	1,350	GBP	6.00%

* Date funds were received.

5. The Group's financial performance and outlook

Operating and financial review in 2019

At 31 December 2019, EDF has an overall amount of €10,067 million in available credit facilities (syndicated credit and bilateral lines):

- the syndicated credit line amounts to €4 billion and expires in December 2024. No drawings had been made on this syndicated credit line at 31 December 2019;
- bilateral lines represent an available amount of €6,067 million, with expiry dates extending to June 2024. The level of this available financing is very frequently reviewed to ensure the Group has sufficient backup credit facilities;
- the amount available from the credit lines with the European Investment Bank is nil. Four credit lines were fully drawn at 31 December 2019 for amounts of €500 million, €225 million, €500 million and €250 million.

EDF Chile has a syndicated credit facility for €107 million (expiring in September 2024). At 31 December 2019, this credit facility was fully drawn.

Edison has a credit line with the European Investment Bank for €257 million (available amount €40 million) and a credit line with a pool of banks for €100 million, which was drawn to the extent of €50 million at 31 December 2019.

5.1.6.1.2 Credit rating

The financial ratings agencies Standard & Poor's, Moody's and Fitch Ratings attributed the following long-term and short-term ratings to EDF group entities at 31 December 2019:

Company	Agency	Long-term rating	Short-term rating
EDF	Standard & Poor's	A-, negative outlook ⁽¹⁾	A-2
	Moody's	A3, stable outlook	P-2
	Fitch Ratings	A-, stable outlook	F2
EDF Trading	Moody's	Baa2, stable outlook	n.a.
EDF Energy	Standard & Poor's	BBB-, negative outlook	A-3
Edison	Standard & Poor's	BBB-, stable outlook	A-3
	Moody's	Baa3, positive outlook ⁽²⁾	n.a.

n.a.: not applicable.

(1) S&P revised EDF outlook from stable to negative on 10 October 2019.

(2) Moody's revised EDISON's outlook from stable to positive on 19 September 2019.

5.1.6.1.3 Management of foreign exchange risk

Due to the diversification of its activities and geographical locations, the Group is exposed to the risk of exchange rate fluctuations, which may have an impact on the translation differences affecting balance sheet items, Group financial expenses, equity and net income.

To limit exposure to foreign exchange risks, the Group has introduced the following management principles:

- local currency financing: to the extent possible given the local financial markets' capacities, each entity finances its activities in its own functional currency. When financing is contracted in other currencies, derivatives may be used to limit foreign exchange risk;
- matching of assets and liabilities: the net assets of subsidiaries located outside the Euro zone expose the Group to a foreign exchange risk. The foreign exchange risk in the consolidated balance sheet is managed by market hedging involving use of financial derivatives. Hedging of net assets in foreign currencies complies

with risk/return targets, and the hedging ratio varies depending on the currency, ranging from 34% to 86% for the principal exposures. If no hedging instruments are available, or if hedging costs are prohibitive, the foreign exchange positions remain open and the risk on such positions is monitored by sensitivity calculations;

- hedging of operating cash flows in foreign currencies: in general, the operating cash flows of EDF and its subsidiaries are in the relevant local currencies, with the exception of flows related to fuel purchases which are primarily in US dollars, and certain flows related to purchases of equipment, which concern lower amounts. Under the principles laid down in the Strategic financial management framework, EDF and the main subsidiaries concerned by foreign exchange risks (EDF Energy, EDF Trading, Edison, EDF Renewables) are required to hedge firm or highly probable commitments related to these future operating cash flows.

As a result of the financing and foreign exchange risk hedging policy, the Group's gross debt at 31 December 2019 breaks down as follows by currency after hedging:

GROSS DEBT STRUCTURE BY CURRENCY BEFORE AND AFTER HEDGING

31 December 2019 (in millions of currency unit)	Initial debt structure	Impact of hedging instruments*	Debt structure after hedges	% of debt
Borrowings in EUR	33,360	18,491	51,851	77%
Borrowings in USD	20,867	(14,814)	6,053	9%
Borrowings in GBP	10,269	(1,705)	8,564	13%
Borrowings in other currencies	2,884	(1,972)	912	1%
TOTAL DEBT	67,380	-	67,380	100%

* Hedges of liabilities and net assets of foreign subsidiaries.

The table below presents the impact on equity of a variation in exchange rates on the Group's gross debt at 31 December 2019:

EXCHANGE RATE SENSITIVITY OF THE GROUP'S GROSS DEBT

31 December 2019 (in millions of euros)	Debt after hedging instruments converted into Euros	Impact of a 10% unfavourable variation in exchange rates	Debt after a 10% unfavourable variation in exchange rates
Borrowings in EUR	51,851	-	51,851
Borrowings in USD	6,053	605	6,658
Borrowings in GBP	8,564	856	9,420
Borrowings in other currencies	912	91	1,003
TOTAL DEBT	67,380	1,552	68,932

Due to the Group's hedging policy for foreign exchange risk on the Group's gross debt, the income statement for companies controlled by the Group is marginally exposed to foreign exchange rate risk.

The table below sets forth the foreign exchange position relating to net assets in foreign currencies of the Group's subsidiaries.

NET ASSET POSITION

31 December 2019* (in millions of currency units)	Net assets	Bonds	Derivatives	Net assets after management
USD	5,613	2,850	1,974	789
CHF (Switzerland)	29	-	28	1
GBP (United Kingdom)	17,717	5,435	504	11,778
PLN (Poland)	294	-	153	141
BRL (Brazil)	1,202	-	-	1,202
CNY (China)	11,148	-	-	11,148

* Net assets as stated at 31 December 2019; bonds and derivatives as stated at 31 December 2019. The net positions shown exclude certain non-significant exposures.

The above table shows the assets of the Group's foreign subsidiaries in foreign currencies, adjusted for changes in the fair value of cash flow hedges and of debt and equity instruments recorded in equity, and changes in the fair value of financial instruments recorded in income.

The following table sets forth the risk for equity of foreign exchange losses on net assets in foreign currencies of the Group's principal subsidiaries at 31 December 2019, assuming unfavourable, uniform exchange rate variations of 10% against the euro. Net assets are converted at the closing rate and impacts are reported in absolute value.

EXCHANGE RATE SENSITIVITY OF NET ASSETS

(in millions of currency units)	At 31 December 2019			At 31 December 2018		
	Net assets after management into currency	Net assets after management converted into euros	Impact on equity of a 10% variation in exchange rates	Net assets after management into currency	Net assets after management converted into euros	Impact on equity of a 10% variation in exchange rates
USD	789	702	70	2,107	1,840	184
CHF (Switzerland)	1	1	-	202	179	18
GBP (United Kingdom)	11,778	13,843	1,384	11,085	12,392	1,239
CLP (Chile)	-	-	-	(6,663)	(8)	(1)
PLN (Poland)	141	33	3	154	36	4
BRL (Brazil)	1,202	266	27	1,164	262	26
CNY (China)	11,148	1,425	143	9,932	1,261	126

The foreign exchange risk on available-for-sale securities is mostly concentrated in EDF's dedicated asset portfolio, which is discussed in section 5.1.6.1.6 "Management of financial risk on EDF SA's dedicated asset portfolio".

The foreign exchange risk associated with short-term investments and operating liabilities in foreign currencies remains restricted for the Group at 31 December 2019.

5. The Group's financial performance and outlook

Operating and financial review in 2019

5.1.6.1.4 Management of interest rate risk

The exposure of the Group's net indebtedness to interest rate fluctuations covers two types of risk: a risk of change in the net financial expenses on floating-rate financial assets and liabilities, and a risk of change in the value of financial assets invested at fixed rates. These risks are managed by monitoring the floating-rate portion of net indebtedness, defined by reference to the risk/return for net financial expenses, taking into consideration expected movements in interest rates.

Some of the debt is variabilised and the Group may use interest rate derivatives for hedging purposes. The distribution of exposure between fixed and floating rates is monitored.

The Group's debt after hedging instruments at 31 December 2019 comprised 61.0% at fixed rates and 39.0% at floating rates.

A 1% uniform annual rise in interest rates would generate an approximate €263 million increase in financial expenses at 31 December 2019, based on gross floating-rate debt after hedging.

The average cost of Group debt (weighted interest rate on outstanding amounts) was 2.69% at the end of 2019.

The table below sets forth the structure of Group debt and the impact of a 1% variation in interest rates at 31 December 2019. The impact of the change in interest rates is stable in comparison to 2018.

STRUCTURE AND INTEREST RATE SENSITIVITY OF GROUP'S DEBT

31 December 2019 (in millions of euros)	Initial debt structure	Impact of hedging instruments	Debt structure after hedging	Impact on income of a 1% variation in interest rates
Fixed rate	62,128	(21,035)	41,093	-
Floating rate	5,252	21,035	26,287	263
TOTAL	67,380	-	67,380	263

Concerning financial assets, the table below presents the interest rate risk on the floating-rate notes and short-term deposits held by EDF, and their sensitivity to interest rate risks (impact on net income).

INTEREST RATE SENSITIVITY OF FLOATING-RATE INSTRUMENTS

31 December 2019 (in millions of euros)	Value	Impact on income of a 1% variation of interest rates	Value after a 1% variation in interest rates
FLOATING-RATE INSTRUMENTS	2,487	(25)	2,462

The Group's interest rate risk notably relates to the value of the Group's long-term nuclear obligations (see note 32 to the 2019 consolidated financial statements) and its pension and other specific employee benefit obligations (see note 34 to the 2019 consolidated financial statements), which are adjusted to present value using discount rates that depend on interest rates at various time horizons, and debt securities held in connection with the management of the dedicated assets set aside to cover these obligations (see section 5.1.6.1.6 "Management of financial risk on EDF's dedicated asset portfolio").

5.1.6.1.5 Management of equity risks

The equity risk is concentrated in the following areas:

Coverage of EDF's nuclear obligations

Analysis of the equity risk is presented in section 5.1.6.1.6 "Management of financial risk on EDF SA's dedicated asset portfolio".

Coverage of employee benefit obligations for EDF SA, EDF Energy and British Energy

Assets covering EDF's employee benefit liabilities are partly invested on the international and European equities markets. Market trends therefore affect the value of these assets, and a downturn in equity prices would lead to a rise in balance sheet provisions.

31.6% of the assets covering EDF's employee benefit obligations were invested in equities at 31 December 2019, representing an amount of €4 billion of equities.

At 31 December 2019, the two pension funds sponsored by EDF Energy (EDF Energy Pension Scheme and EDF Energy Group Electricity Supply Pension Scheme) were invested to the extent of 14.3% in equities and 8.4% in equity funds, representing an amount of £237 million of equities.

At 31 December 2019, the British Energy pension funds were invested to the extent of 11.1% in equities and equity funds, representing an amount of £768 million of equities.

CENG fund

CENG is exposed to equity risks in the management of its funds established to cover nuclear decommissioning expenses.

EDF's long-term cash management

As part of its long-term cash management policy, EDF has continued its strategy to reduce the portion of equity-correlated investments, resulting in a non-significant position well below €1 million at 31 December 2019.

5.1.6.1.6 Management of financial risk on EDF's dedicated asset portfolio

Dedicated assets have been built up progressively by EDF since 1999 for secure financing of its long-term nuclear obligations. The Law of 28 June 2006 and its implementing regulations defined provisions not related to the operating cycle, which must therefore be covered by dedicated assets; they are listed in note 48 to the 2019 consolidated financial statements, "EDF's dedicated assets".

The dedicated asset portfolio is managed under the supervision of the Board of Directors and its advisory committees (Nuclear Commitments Monitoring Committee, Audit committee).

The **Nuclear Commitments Monitoring Committee (CSEN)** is a specialised Committee set up by EDF's Board of Directors in 2007.

A **Nuclear Commitments Financial Expertise Committee (CEFEN)** exists to assist the Company and its governance bodies on questions of matching assets and liabilities and asset management. The members of this Committee are independent of EDF. They are selected for their skills and diversity of experience, particularly in the fields of asset/liability management, economic and financial research, and asset management.

Governance and management principles

The governance principles setting forth the structure of dedicated assets, and the relevant decision-making and control processes for their management, are validated by EDF's Board of Directors. These principles also lay down rules for the asset portfolio's structure, selection of financial managers, and the legal, accounting and tax structure of the funds.

Strategic asset allocation is based on asset/liability reviews carried out to define the most appropriate target portfolio for financing long-term nuclear expenses. Strategic allocation is validated by EDF's Board of Directors and reviewed every three years unless circumstances require otherwise. A new strategic allocation was validated during 2018. This target allocation consists of a yield portfolio, a growth portfolio and a fixed-income portfolio, respectively accounting for 30%, 40% and 30% of the total portfolio. The yield portfolio consists of real estate assets and infrastructure assets; the growth portfolio consists of equities and equity funds (both listed and unlisted); the fixed-income portfolio consists of bonds, debt funds (both listed and unlisted), the CSPE receivable and cash. These portfolios are managed by the Listed Asset Management division and by EDF Invest (formed in 2013 following the decree of 24 July 2013).

The "cash" pocket of the portfolio exists to provide secure coverage for future disbursements related to the purpose of the asset covered, and may be reinforced tactically, particularly when a conservative approach is required in the event of a market crisis.

The CSPE receivable was allocated to dedicated assets on 13 February 2013 (see note 48 to the 2019 consolidated financial statements).

Tactical management of the growth assets and fixed-income assets has several focal areas:

- monitoring of exposure between growth assets and fixed-income assets;

- within each sub-portfolio, allocation by "secondary asset class";
- selection of investment funds, aiming for diversification:
 - by style (growth securities, unlisted securities, yield securities),
 - by capitalisation (major stocks, medium and small stocks),
 - by investment process (macroeconomic and sector-based approach, selection of securities on a "quantitative" basis, etc.),
 - by investment vehicle (for compliance with maximum investment ratios);
- for bonds, a choice of securities held directly, through brokers, or *via* investment funds incorporating the concern for diversification:
 - by type of issue (fixed income, indexed income),
 - by type of instrument (government or supranational bonds, covered bonds and similar, corporate bonds),
 - by issuer and by maturity.

The allocation policy between growth assets and fixed-income assets was developed by the Operational Management Committee⁽¹⁾ on the basis of the economic and financial outlook for each market and geographical area, a review of market appreciation in different markets and market segments, and risk analyses produced by the CRFI Department.

Content and performance of EDF's dedicated asset portfolio BREAKDOWN OF THE PORTFOLIO

	31/12/2019	31/12/2018
Yield assets	19.2%	19.3%
Growth assets	42.1%	36.5%
Fixed-income assets	38.7%	44.2%
TOTAL	100%	100%

At 31 December 2019, the total value of the portfolio was €31,624 million compared to €27,689 million in 2018.

The content of the financial portfolio is also presented in note 48 to the 2019 consolidated financial statements, "Dedicated assets".

PORTFOLIO CONTENT UNDER THE CLASSIFICATION FROM ARTICLE 4, DECREE 2007-243 OF 23 FEBRUARY 2007

Categories <i>(in millions of euros)</i>	31 December 2019		31 December 2018	
	Net book value ⁽¹⁾	Realisable value	Net book value ⁽¹⁾	Realisable value
CTE (the holding company that holds 100% of RTE) ⁽²⁾	2,705	2,926	2,705	2,738
Derivatives	(10)	(10)	-	-
Other unlisted securities	2,826	3,164	2,333	2,618
YIELD ASSETS	5,521	6,080	5,038	5,356
Funds not exclusively invested in OECD bonds	10,865	12,978	9,370	9,844
Hedges, deposits, amounts receivable	-	46	20	45
Other unlisted securities	263	276	198	219
GROWTH ASSETS	11,128	13,300	9,588	10,108
OECD government bonds and similar	4,338	4,548	4,362	4,443
OECD corporate (non-government) bonds	1,793	1,827	946	950
Funds investing in the above two categories	4,830	5,038	4,580	4,647
CSPE after funding	684	688	2,060	2,080
Other unlisted securities	146	142	114	105
Derivatives	5	1	-	-
FIXED INCOME ASSETS	11,796	12,244	12,062	12,225
TOTAL DEDICATED ASSETS	28,445	31,624	26,688	27,689

(1) Net book value in the parent company financial statements.

(2) In 2019 and 2018, dedicated assets include 50.1% of Coentreprise de Transport d'Électricité (CTE).

(1) A permanent Internal Committee for evaluation, consultation and operational decision-making in the management of dedicated assets.

5. The Group's financial performance and outlook

Operating and financial review in 2019

The table below presents the performance by portfolio at 31 December 2019 and 31 December 2018:

PERFORMANCE OF EDF'S DEDICATED ASSET PORTFOLIO

	31/12/2019	Performance for 2019	31/12/2018	Performance for 2018
	Stock market or realisable value	Portfolio	Stock market or realisable value	Portfolio
<i>(in millions of euros)</i>				
Yield assets	6,080	8.9%	5,356	7.0%
Growth assets	13,300	25.9%	10,108	-7.0%
Fixed income assets	12,244	5.2%	12,225	-0.4%
TOTAL DEDICATED ASSETS	31,624	13.5%	27,689	-1.6%

BREAKDOWN OF PORTFOLIO PERFORMANCE UNDER THE CLASSIFICATION FROM ARTICLE 4, DECREE 2007-243 OF 23 FEBRUARY 2007

	31/12/2019	Performance for 2019	31/12/2018	Performance for 2018
	Stock market or realisable value	Portfolio	Stock market or realisable value	Portfolio
<i>(in millions of euros)</i>				
CTE (the holding company that holds 100% of RTE) ⁽¹⁾	2,926	12.6%	2,738	7.0%
Other unlisted securities ^{(2) (3)}	3,572	6.0%	2,942	7.9%
Equity funds including derivatives ⁽³⁾	13,024	26.3%	9,889	-7.4%
Bonds, negotiable debt securities and bond funds ⁽³⁾	11,226	6.1%	10,010	-0.8%
Monetary funds	188	-0.3%	30	-0.3%
CSPE after funding	688	0.6%	2,080	0.4%
TOTAL DEDICATED ASSETS	31,624	13.5%	27,689	-1.6%

(1) In 2019 and 2018, dedicated assets include 50.1% of Coentreprise de Transport d'Électricité (CTE).

(2) EDF Invest without CTE. The performance of EDF Invest including CTE is 9.0% in 2019 and 7.5% in 2018.

(3) Including derivatives.

Changes in the portfolio during 2019

After a difficult 2018, the stock markets had a better year in 2019. With the exceptions of May and August, the equities markets registered practically continuous growth that took them to new record levels, helped by the conciliatory tone of the principal central banks.

The Fed and the ECB lowered their base rates, and the ECB also revitalised its asset purchase programme. Growth stabilised and there were hopes of a more positive outlook for corporate results. These decisive moves by the central banks also had a major impact on the bond markets. Contrary to most investors' expectations, the rates on government bonds in the Euro zone decreased significantly until the end of August before embarking on a gradual increase that gathered pace at the end of the year. It was nonetheless a positive year overall for the bond markets, considering that 10-year German rates moved from +0.25% to -0.19% after hitting a low point at -0.71% in late August. The performance of the riskiest bond assets was even more pronounced: credit spreads retreated substantially, as did the spread on Italian government instruments (-0.9%).

In 2019, the overall after-tax performance of dedicated assets (impacts on reserves and net income) was +€2,758 million, comprising +€16 million for the CSPE (+€24 million before tax), +€308 million for the CTE shares allocated to dedicated assets, and +€2,434 million for other securities (+€3,450 million before tax).

EDF continued to invest the amounts received in repayment of the CSPE receivable, maintaining a prudent allocation, with lower volatility than the benchmark indexes, but an equivalent performance. The overall performance of the dedicated asset portfolio, comprising yield assets, growth assets and fixed-income assets, was +13.5%.

In May 2019, the rest of the minority stake in Nam Theun Power Company (NTPC, a hydroelectric dam in operation in Laos) acquired by EDF Invest in December 2018 was allocated to dedicated assets. In December 2019, EDF SA acquired an

investment in US solar power and wind power facilities from EDF Renewables US, and some of that investment was allocated to dedicated assets at 31 December 2019. These new investments were added to EDF Invest's "Infrastructures" asset class, diversifying its portfolio into renewable energies. EDF Invest also purchased an office building in Germany in early 2019 and a portfolio of hotel buildings in France and Italy in December 2019. The unlisted assets managed by EDF Invest are distributed between yield assets, growth assets and fixed-income assets. The total value of this portfolio, including CTE, was €6.5 billion at 31 December 2019 compared to €5.7 billion at 31 December 2018. The annual performance of EDF Invest's portfolio including CTE for 2019 was 9%.

Thanks to the rise on the listed equity and bond markets, the growth asset pocket, which exceeded its target 40% proportion all year, produced an overall performance of +25.9%, comprising +26.3% for listed equities and +9.6% for growth funds. Regarding listed equities, the selected Japanese and emerging funds outperformed their respective indexes. In the North American pocket where asset funds generally had lower performances, continued passive management for more than 85% of assets kept the performance close to the index, despite the presence of low-volatility funds. The European pocket's performance also declined slightly, although at the end of the year the chosen funds began to catch up with their benchmark index. Finally, currency management had positive results, particularly due to the above-target concentration on the pound sterling.

The performance of fixed-income assets was satisfactory in both absolute (+5.2%) and relative terms. The listed bond portfolio achieved growth of +6.1%, just below its benchmark index. The high proportion of credit assets, which began to be built up at the start of the year and was subsequently accentuated, combined with a good performance by the management systems, made up for the interest rate effect. Meanwhile, bond funds registered a performance of +9.7% and the performance by the portfolio of short-term receivables, which primarily consists of the CSPE receivable, was +0.4%.

Dedicated assets' exposure to risks

EDF is exposed to equity risks, interest rate risks and foreign exchange risks through its dedicated asset portfolio.

The market value of the listed equities in EDF's dedicated asset portfolio was €13,024 million at 31 December 2019. The volatility of the listed equities at the same date was 9.2% based on 52 weekly performances, compared to 14.3% at 31 December 2018. Applying this volatility to the value of listed equity assets at the same date, the Group estimates the annual volatility of the equities portion of dedicated assets at €1,198 million.

At 31 December 2019, the sensitivity of the listed bonds (€11,226 million) was 6.1, *i.e.* a uniform 100 base point rise in interest rates would result in a €682 million decline in market value. This sensitivity was 5.3 at 31 December 2018.

5.1.6.1.7 Management of counterparty/credit risks

Counterparty risk is defined as the total loss that the EDF group would sustain on its business and market transactions if a counterparty defaulted and failed to perform its contractual obligations.

The Group has a counterparty risk management policy which applies to EDF and all operationally controlled subsidiaries. This policy sets out the governance associated with monitoring for this type of risk, and organisation of the counterparty risk management and monitoring. The policy also involves monthly consolidation of the Group's exposures, updated monthly for financial and energy market activities and quarterly for other activities. The CRFI (Financial Risks Control) Department closely monitors Group counterparties (daily review of alerts, special cautionary measures for certain counterparties).

The table below gives details, by rating, of the EDF group's consolidated exposure to counterparty risk. At 30 September 2019, 90% of the Group's exposure concerns "investment grade" counterparties, mainly as a result of the predominance of exposures generated by the cash and asset management activity, as most short-term investments concern low-risk assets:

	Good credit rating	Poor credit rating	No internal rating	Total
31/03/2019	90%	8%	2%	100%
30/09/2019	90%	9%	1%	100%

The exposure to counterparty risk by nature of activity is distributed as follows:

	Purchases	Insurance	Distribution and sales	Cash and asset management	Fuel purchases and energy trading	Total
31/03/2019	6%	1%	10%	77%	6%	100%
30/09/2019	7%	-	11%	76%	6%	100%

Exposure in the energy trading activities is concentrated in EDF Trading, where each counterparty is assigned a limit that depends on its financial robustness. A range of methods are used to reduce counterparty risk at EDF Trading, primarily position netting agreements, cash-collateral agreements and establishment of guarantees from banks or affiliates.

For counterparties dealing with EDF's trading room, the CRFI Department has drawn up a framework specifying counterparty authorisation procedures and the methodology for calculation of allocated limits. The level of exposure can be consulted in real time and is systematically monitored on a daily basis. The suitability of limits is reviewed without delay in the event of an alert or unfavourable development affecting a counterparty.

As the political and financial situation in the Euro zone is still uncertain, EDF has continued to apply a conservative management policy for its cash investments in non-core countries. Only banking, sovereign and corporate counterparties with good credit ratings are authorised, for limited amounts and maturities.

5.1.6.2 Management and control of energy market

5.1.6.2.1 Management and control of energy market risks

In keeping with the opening of the final customer market, the growth of wholesale markets and its international development, the EDF group is exposed to price variations on the energy market which can significantly affect its financial statements (see section 2.2.2) of the Universal Registration Document, "Energy market risks").

Consequently, the Group has an "energy markets" risk policy for all energy commodities, applicable to EDF and entities over which it has operational control.

The purpose of this policy is to:

- define the general framework for management of energy market risks, governing the various Group entities' asset portfolio management activities (energy generation, optimisation and sale), and trading for EDF Trading;
- define the responsibilities of asset managers and traders, and the various levels of control of activities;
- implement a coordinated Group-wide hedging policy that is coherent with the Group's financial commitments;
- consolidate the exposure of the various entities operationally controlled by EDF on the structured energy-related markets.

The Group Risk Division presents an annual report on the implementation of this policy to the Board of Directors' Audit Committee.

At entities not operationally controlled by EDF, the risk management framework is reviewed by the governance bodies.

5.1.6.2.2 Organisation of risk control and general risk hedging principle

The process for controlling energy market risks for entities operationally controlled by the Group is based on:

- a governance and market risk exposure measurement system, clearly separating management and risk control responsibilities;
- an express delegation to each entity, defining hedging strategies and establishing the associated risk limits. This enables the Executive Committee to set out and monitor an annual Group risk profile consistent with the financial objectives, and thus direct operational management of energy market risks over market horizons (generally three years).

5. The Group's financial performance and outlook

Operating and financial review in 2019

The basic principle for hedging is:

- netting of upstream/downstream positions; wherever possible, sales to final customers are hedged by Internal sales;
- gradual closing of positions before the end of the budget year, based on a predefined hedging trajectory ⁽¹⁾ that captures an average price, potentially with overweighting of year N-1 in view of liquidity constraints on the forward markets.

On the French electricity market, EDF is exposed to very high uncertainty over its net exposure due to the fact that the ARENH mechanism is optional and uncertainty regarding possible changes to the relevant regulations (in particular, the risk that the ceiling for volumes made available could be raised to 150TWh under the Energy and Climate law adopted in 2019). Since the volumes subscribed are only known shortly before the delivery period, EDF is obliged to use assumptions for ARENH subscriptions, which include prudence margins. In addition, suppliers have the possibility to revise upwards or downwards their Arenh subscription request at each half-yearly gate, subject to compliance with Article R336-16 of the Energy Code, which prohibits them from making requests in the opposite direction at the next half-yearly gate. For example, if a supplier brings its request to zero at one half-yearly gate, it cannot make an Arenh request at the next gate. EDF thus remains subject to risks that the assumptions may not correspond to reality, such that during the year it could find itself obliged to sell reserved volumes that in the end were not actually subscribed, or conversely to purchase volumes sold before the ARENH bids took place on the assumption that there would be no subscriptions. This risk is particularly high as the energy + capacity price on the wholesale market is close to the ARENH price (€42/MWh).

Given its close interaction with the decisions made in the generation, supply and trading activities, the energy risk management process involves Group management and is based on a risk indicator and measurement system incorporating escalation procedures in the event risk limits are exceeded.

The Group's exposure to energy market risks through operationally controlled entities is reported three times a year to the Executive Committee. The control processes are regularly evaluated and audited.

5.1.6.2.3 Principles for operational management and control of energy market risks

The principles for operational management and control of energy market risks for the Group's operationally controlled entities are based on strict segregation of responsibilities for managing those risks, distinguishing between management of assets (generation and supply) and trading.

The operators of generation and supply assets are responsible for implementing a risk management strategy that smoothes the impact of energy market risks on the variability of their financial statements (the accounting classifications of the hedges used are described in note 44 to the 2019 consolidated financial statements, "Derivatives and Hedge accounting"). However, they are still exposed to structural price trends to the extent of volumes that are not yet hedged, and uncertainties over volumes (relating to the ARENH system, generation plant availability, and customer consumption).

For operationally controlled entities in the Group, positions on the energy markets are taken predominantly by EDF Trading, the Group's trading entity, which operates on the markets on behalf of other Group entities and for the purposes of its own trading activity associated with the Group's industrial assets. Consequently, EDF Trading is subject to a strict governance and control framework, particularly the European regulations on trading companies.

EDF Trading trades on organised or OTC markets in derivatives such as futures, forwards, swaps and options (regardless of the accounting classification applied at Group level). Its exposure on the energy markets is strictly controlled through daily limit monitoring overseen by the subsidiary's management and by the division in charge of energy market risk control at Group level. Automatic escalation procedures also exist to inform members of EDF Trading's Board of Directors of any breach of risk limits (value at risk limit) or losses (stop-loss limits). Value at Risk (VaR) is a statistical measure of the potential maximum loss in market value on a portfolio in the event of unfavourable market movements, over a given time horizon and with a given confidence interval ⁽²⁾. Specific Capital at Risk (CaR) limits are also used in certain areas (operations on illiquid markets, long-term contracts and structured contracts) where VaR is difficult to apply. The stop-loss limit stipulates the acceptable risk for the trading business, setting a maximum level of loss over a rolling three-month period. If these limits are exceeded, EDF Trading's Board of Directors takes appropriate action, which may include closing certain positions.

In 2019, EDF Trading's commitment on the markets was subject to a VaR limit of €35 million, a CaR limit for long-term contracts and a CaR limit for operations on illiquid markets of €250 million each, and a stop-loss limit of €180 million.

Only the CaR limit for operations on illiquid markets was exceeded in 2019, temporarily and by a very small amount. The stop-loss has never been triggered since its introduction.

For an analysis of fair value hedges of the Group's commodities, see note 44.5 to the 2019 consolidated financial statements. For details of commodity derivatives not classified as hedges by the Group, see note 45.3 to the same consolidated financial statements.

(1) The risk management frameworks, which are approved annually by the Group for each entity with exposure to energy market risks, may include acceleration or deceleration plans allowing departures from these trajectories if predefined price thresholds are exceeded. Since these plans do not comply with the general principle of gradual hedging, they can only be applied under strict conditions.

(2) EDF Trading estimates the VaR by the "Monte Carlo" method, which is based on volatilities and historical correlations measured using observed market prices over the 40 most recent business days. The VaR limit applies to the total EDF Trading portfolio.

5.2 Subsequent events

There were no post-closing events other than those presented in the other sections of the Universal Registration Document.

5.3 Changes in market prices at the end of February 2020

Spot (current for next day) electricity prices in France in January/February 2020 averaged at €32.3/MWh base load and €39.5/MWh peak load, down sharply from January/February 2019 prices. The prices for January 2019 were €54.3/MWh base load and €62.6/MWh peak load. This decrease can be explained by a decrease in consumption of 5.9TWh due to above-normal temperatures this year (+2.1°C), whereas they were close to normal last year. Also to blame are lower coal and gas prices as well as higher wind and hydropower generation compared to January/February 2019. For the same reasons, German spot prices have fallen sharply for January/February 2020. These prices averaged at €28.7/MWh base load and €38.2/MWh peak load, down by €17.6/MWh and €17.2/MWh respectively from January/February 2019. It should be noted that German wind power generation in February 2020 exceeded 20TWh, exceeding the previous monthly record by 4TWh.

At the end of February 2020, the prices of French yearly contracts for base load and peak load delivery in 2021 were €42.0/MWh and €52.7/MWh respectively. A year earlier, forward electricity prices for delivery in France in 2020 closed at a base load price of € 51.3/MWh and a peak demand price of € 66.2/MWh. This fall in prices is mainly due to the fall in gas and coal prices.

In January/February 2020, spot gas prices on the French market averaged at €10.2/MWh. This sharp drop (€10.0/MWh lower than average January/February 2019 prices) reflects a particularly "slack" supply-demand balance in Europe. Despite an increase in the production of combined-cycle gas power plants due to their greater competitiveness compared to coal, European inventories remain at historically high levels due to mild temperatures and massive LNG arrivals in Europe. The latter are due to an increase in world supply, particularly in the United States, while growth in Asian LNG demand continues to slow down.

At the end of February 2020, the price of Brent was \$50.5/bbl, down \$15.5/bbl compared with the end of February 2019. After rising almost continuously until May 2019, the price was mainly driven down by the prospect of abundant supply and sluggish demand, prompting the market to watch for signs of strength, particularly in light of the progress of the Sino-US trade agreement. While US shale oil production continued to grow throughout the year, OPEC and Russia confirmed their willingness to support prices by reducing production during the peaks of 1 July

and 6 December. There have been some occasional price spikes during incidents in the Middle East. Nevertheless, and despite the signing of phase 1 of the Sino-American trade agreement on 15 January 2020, barrel prices fell again throughout the beginning of 2020, weighed down by the spread of the Coronavirus epidemic and its impact on growth and oil demand.

The price of coal for delivery in Europe in 2021 ended February 2020 at \$57.0/t, down by \$23.7/t compared to the 2020 contract closed at the end of February 2019. With the exception of a few episodes of increase linked to reduced production at the extraction mines (strikes, collapses, increased controls, flooding or environmental protests), the price of coal fell steadily over the year 2019 and then in the beginning of the year 2020. The high price of CO₂ coupled with the low price of gas has favoured the use of gas for power generation in 2019. Electricity generation from medium coal thus fell by almost 27% in Europe in 2019 compared to 2018. In early January 2020, the price rose when heavy rains made coal mining in South Africa difficult and Indonesia announced a 10% reduction in its exports in 2020. However, the downward trend resumed in mid-January, mainly as a result of the Coronavirus epidemic and the declining growth prospects. Since the Coronavirus epidemic also has an impact on domestic production of Chinese coal, it has had a one-off upward impact on the price, for example in early February.

The price of the CO₂ emission certificate for delivery in December 2020 closed the month of February at €23.6/t. It stood at 22.1 €/t at the end of February 2019 for delivery in December 2019. The CO₂ price was affected throughout 2019 by various announcements concerning the closure of German coal-fired power plants and the possible cancellation of the corresponding quotas. Developments with Brexit also played a dominant role in the price, generating considerable uncertainty about the future of the UK players' obligations in the EU-ETS system. In this uncertain context, the 2019 UK allowance auctions had been suspended. After the Brexit vote in December, noting that the British would participate in the 2020 withdrawal, the market therefore monitored the announcements in the beginning of 2020 regarding the auctioning of these allowances, concerned about the consequences of a sudden influx of allowances in the event of time-concentrated volume auctioning. Prices finished on a downward trend at the end of February, weakened by the growth impact of the coronavirus epidemic.

5.4 Outlook

Targets 2020

- **EBITDA** ⁽¹⁾: between €17.5 billion and €18.0 billion;
- **Operating expenses** ⁽²⁾: stable in €₂₀₁₉;
- **Total net investments** excluding Group acquisitions and 2019-2020 disposals: around €15.5 billion per year;
- **2019-2020 Group disposals** ⁽³⁾: between €2 and €3 billion;
- **Net financial debt/EBITDA** ⁽¹⁾: ≤ 2.6x;

- **Targeted payout ratio**, based on net income excluding non-recurring items ⁽⁴⁾ ⁽⁵⁾: 45% -50%.

2021 Ambitions

- **Net financial debt/EBITDA** ⁽¹⁾: ≤ 2.7x;
- **Targeted payout ratio**, based on net income excluding non-recurring items ⁽⁵⁾: 45% -50%.

(1) On the basis of the scope and exchange rates as of 01/01/2020 and assumptions for nuclear generation in France ranging from 375TWh to 390TWh for 2020.

(2) Sum of personnel expenses and other external expenses. At comparable scope, standards and exchange rates. At constant pension discount rate. Excluding change in operating expenses for service activities.

(3) The objective includes exercising the put option on CENG securities in 2020. Completion of the transaction is likely to be deferred to 2021 depending on the timetable for obtaining regulatory approvals.

(4) With the French State committed to opting for a share-based payment for the balance of 2019 and for 2020.

(5) Adjusted for the remuneration of hybrid bonds accounted for in equity.

5. The Group's financial performance and outlook



6.

Financial statements

CONTENTS

6.1 Consolidated financial statements	278	6.4 Statutory Auditors' report on the financial statements	454
Consolidated income statement	278		
Consolidated statement of comprehensive income	279	6.5 Dividend policy	457
Consolidated balance sheet	280	6.6 Other items	458
Consolidated cash flow statement	281		
Change in consolidated equity	282	6.7 Information relating to the allocation of proceeds raised through Green Bonds issued by EDF	460
Notes to the consolidated financial statements	285		
6.2 Statutory auditors' report on the consolidated financial statements	394		
6.3 Financial statements	399		
Income statement	399		
Balance sheet	400		
Cash flow statement	402		

6.1 Consolidated financial statements

The Group's consolidated financial statements for the year ended 31 December 2019, prepared under IAS-IFRS, are presented below. They will be submitted for approval at the General Shareholders' Meeting to be held on 7 May 2020.

Consolidated income statement

<i>(in millions of euros)</i>	Notes	2019 ⁽¹⁾	2018 ⁽²⁾
Sales	7	71,317	68,546
Fuel and energy purchases	8	(35,091)	(33,056)
Other external expenses	9	(8,619)	(9,262)
Personnel expenses	10	(13,793)	(13,642)
Taxes other than income taxes	11	(3,798)	(3,690)
Other operating income and expenses	12	6,692	6,002
Operating profit before depreciation and amortisation		16,708	14,898
Net changes in fair value on energy and commodity derivatives, excluding trading activities	13	642	(224)
Net depreciation and amortisation		(9,994)	(8,775)
Net increases in provisions for replacement of property, plant and equipment operated under concessions		(8)	(50)
(Impairment)/reversals	14	(403)	(290)
Other income and expenses	15	(185)	(105)
Operating profit		6,760	5,454
Cost of gross financial indebtedness	16.1	(1,806)	(1,712)
Discount effect	16.2	(3,161)	(3,464)
Other financial income and expenses	16.3	4,606	378
Financial result	16	(361)	(4,798)
Income before taxes of consolidated companies		6,399	656
Income taxes	17	(1,581)	178
Share in net income of associates and joint ventures	26	818	569
Net income of discontinued operations	19	(454)	(212)
CONSOLIDATED NET INCOME		5,182	1,191
EDF net income		5,155	1,177
Net income of continuing operations		5,597	1,384
Net income of discontinued operations		(442)	(207)
Net income attributable to non-controlling interests		27	14
Net income of continuing operations		39	19
Net income of discontinued operations		(12)	(5)
Earnings per share (EDF share) (in euros):	20		
Basic earnings per share		1.50	0.20
Diluted earnings per share		1.50	0.20
Basic earnings per share of continuing operations		1.65	0.27
Diluted earnings per share of continuing operations		1.65	0.27

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (using the modified retrospective approach). In accordance with the new standard's transition provisions, the comparative figures have not been restated (see note 2.1).

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations (see note 2.3).

In application of IFRS 5, the net income of discontinued operations is presented on a separate line of the income statement for the financial periods presented. The impact of application of IFRS 5 on the published figures for 2018 is presented in note 2.3.

Consolidated statement of comprehensive income

	2019 ⁽¹⁾			2018		
	EDF net income	Net income attributable to non-controlling interests	Total	EDF net income	Net income attributable to non-controlling interests	Total
<i>(in millions of euros)</i>						
Consolidated net income	5,155	27	5,182	1,177	14	1,191
Gross change in fair value of hedging instruments ⁽²⁾	818	(55)	763	34	(19)	15
Related tax effect	(367)	2	(365)	(89)	-	(89)
Associates' and joint ventures' share of fair value of hedging instruments	2	-	2	(7)	-	(7)
Change in fair value of hedging instruments	453	(53)	400	(62)	(19)	(81)
Translation adjustments – controlled entities	732	357	1,089	(38)	(79)	(117)
Translation adjustments – associates and joint ventures	90	-	90	117	-	117
Translation adjustments	822	357	1,179	79	(79)	-
Gross change in fair value of debt instruments ⁽²⁾	293	-	293	(115)	-	(115)
Related tax effect	(93)	-	(93)	42	-	42
Associates' and joint ventures' share of fair value of debt instruments	5	-	5	(1)	-	(1)
Change in fair value of debt instruments	205	-	205	(74)	-	(74)
Gains and losses recorded in equity with recycling	1,480	304	1,784	(57)	(98)	(155)
Gross change in fair value of equity instruments	(22)	-	(22)	(37)	-	(37)
Related tax effect	-	-	-	-	-	-
Associates' and joint ventures' share of fair value of equity instruments	-	-	-	-	-	-
Change in fair value of equity instruments	(22)	-	(22)	(37)	-	(37)
Gross change in actuarial gains and losses on post-employment benefits ⁽³⁾	(2,501)	39	(2,462)	3,141	11	3,152
Related tax effect	(62)	(7)	(69)	(309)	(1)	(310)
Associates' and joint ventures' share of change in actuarial gains and losses on post-employment benefits	(153)	-	(153)	69	-	69
Change in actuarial gains and losses on post-employment benefits	(2,716)	32	(2,684)	2,901	10	2,911
Gains and losses recorded in equity with no recycling	(2,738)	32	(2,706)	2,864	10	2,874
Total gains and losses recorded in equity	(1,258)	336	(922)	2,807	(88)	2,719
CONSOLIDATED COMPREHENSIVE INCOME	3,897	363	4,260	3,984	(74)	3,910
Comprehensive income of continuing operations	4,337	375	4,712	4,191	(69)	4,122
Comprehensive income of discontinued operations	(440)	(12)	(452)	(207)	(5)	(212)

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (using the modified retrospective approach). In accordance with the new standard's transition provisions, the comparative figures have not been restated (see note 2.1).

(2) Gross changes in fair value recycled to profit and loss in respect of debt and equity securities and hedging instruments are presented in notes 39.2 and 44.4 respectively.

(3) Gross changes in actuarial gains and losses are presented in note 34.1.2.

Consolidated balance sheet

ASSETS

<i>(in millions of euros)</i>	Notes	31/12/2019 *	31/12/2018
Goodwill	21	10,623	10,195
Other intangible assets	22	9,350	9,918
Property, plant and equipment operated under French public electricity distribution concessions	23	58,413	56,515
Property, plant and equipment operated under concessions for other activities	24	6,860	7,339
Property, plant and equipment used in generation and other tangible assets owned by the Group, including right-of-use assets	25	89,099	78,252
Investments in associates and joint ventures	26	6,414	8,287
Non-current financial assets	39	46,219	37,104
Other non-current receivables	29	1,930	1,796
Deferred tax assets	17.3	557	978
Non-current assets		229,465	210,384
Inventories	27	14,049	14,227
Trade receivables	28	15,606	15,910
Current financial assets	39	29,401	31,143
Current tax assets		286	869
Other current receivables	29	6,881	7,346
Cash and cash equivalents	40	3,934	3,290
Current assets		70,157	72,785
Assets classified as held for sale	46	3,662	-
TOTAL ASSETS		303,284	283,169

EQUITY AND LIABILITIES

<i>(in millions of euros)</i>	Notes	31/12/2019*	31/12/2018
Capital	30	1,552	1,505
EDF net income and consolidated reserves		44,914	42,964
Equity (EDF share)		46,466	44,469
Equity (non-controlling interests)	30.5	9,324	8,177
Total equity	30	55,790	52,646
Provisions related to nuclear generation – back-end of the nuclear cycle, plant decommissioning and last cores	31	55,583	49,204
Other provisions for decommissioning	31	1,573	2,033
Provisions for employee benefits	34	20,539	17,627
Other provisions	31	3,065	2,908
Non-current provisions	31	80,760	71,772
Special French public electricity distribution concession liabilities	36	47,465	46,924
Non-current financial liabilities	41	57,002	52,129
Other non-current liabilities	38	4,928	4,896
Deferred tax liabilities	17.3	2,295	1,987
Non-current liabilities		192,450	177,708
Current provisions	31	5,556	6,010
Trade payables	37	12,867	13,421
Current financial liabilities	41	18,535	17,167
Current tax liabilities		433	205
Other current liabilities	38	16,610	16,012
Current liabilities		54,001	52,815
Liabilities related to assets classified as held for sale	46	1,043	-
TOTAL EQUITY AND LIABILITIES		303,284	283,169

* The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (using the modified retrospective approach). In accordance with the new standard's transition provisions, the comparative figures have not been restated (see note 2.1).

Consolidated cash flow statement

<i>(in millions of euros)</i>	<i>Notes</i>	2019 ⁽¹⁾	2018 ⁽²⁾
Operating activities:			
Income before taxes		5,983	473
Income before taxes of discontinued operations		(416)	(183)
Income before taxes of consolidated companies		6,399	656
Impairment/(reversals)		403	290
Accumulated depreciation and amortisation, provisions and changes in fair value		8,328	12,957
Financial income and expenses		97	718
Dividends received from associates and joint ventures		349	387
Capital gains/losses		(508)	(1,014)
Change in working capital	47.1	452	470
Net cash flow from operations		15,520	14,464
Net financial expenses disbursed		(798)	(1,048)
Income taxes paid		(922)	(309)
Net cash flow from continuing operating activities		13,800	13,107
Net cash flow from operating activities relating to discontinued operations		222	257
Net cash flow from operating activities		14,022	13,364
Investing activities:			
Acquisitions of equity investments, net of cash acquired		(456)	(484)
Disposals of equity investments, net of cash transferred		293	1,261
Investments in intangible assets and property, plant and equipment	47.2	(16,709)	(16,016)
Net proceeds from sale of intangible assets and property, plant and equipment		94	577
Changes in financial assets		1,294	(2,367)
Net cash flow from continuing investing activities		(15,484)	(17,029)
Net cash flow from investing activities relating to discontinued operations		(166)	(136)
Net cash flow from investing activities		(15,650)	(17,165)
Financing activities:			
Transactions with non-controlling interests ⁽³⁾		1,055	1,548
Dividends paid by parent company	30.3	(58)	(511)
Dividends paid to non-controlling interests		(155)	(183)
Purchases/sales of treasury shares		(14)	(3)
Cash flows with shareholders		828	851
Issuance of borrowings		9,080	5,711
Repayment of borrowings		(6,976)	(2,724)
Issuance of perpetual subordinated bonds	3.3.2	493	1,243
Redemptions of perpetual subordinated bonds	3.3.3	(1,280)	(1,329)
Payments to bearers of perpetual subordinated bonds	30.4	(589)	(584)
Funding contributions received for assets operated under concessions		143	131
Investment subsidies		543	351
Other cash flows from financing activities		1,414	2,799
Net cash flow from continuing financing activities		2,242	3,650
Net cash flow from financing activities relating to discontinued operations		(19)	(120)
Net cash flow from financing activities		2,223	3,530
Net cash flow from continuing operations		558	(272)
Net cash flow from discontinued operations		37	1
Net increase/(decrease) in cash and cash equivalents		595	(271)
CASH AND CASH EQUIVALENTS – OPENING BALANCE		3,290	3,692
Net increase/(decrease) in cash and cash equivalents		595	(271)
Effect of currency fluctuations		(5)	(95)
Financial income on cash and cash equivalents		17	13
Effect of reclassifications		37	(49)
CASH AND CASH EQUIVALENTS – CLOSING BALANCE	40	3,934	3,290

(1) The financial statements at 31 December 2019 apply IFRS 16 from 1 January 2019 (using the modified retrospective approach). In accordance with the new standard's transition provisions, the comparative figures have not been restated (see note 2.1).

(2) The published figures for 2018 have been restated due to the impact of presenting the E&P operations as discontinued operations (see note 2.3).

(3) Contributions via capital increases, or capital reductions and acquisitions of additional interests or disposals of interests in controlled companies. In 2019, this item includes an amount of €968 million relating to CGN's payment for the NNB Holding Ltd. and Sizewell C Holding Co. capital increases (€743 million at 31 December 2018). In 2018 it also included an amount of €797 million relating to the sale of 49% of EDF Renewables' wind farms (see note 3.5.1).

Change in consolidated equity

Details of the change in equity between 1 January and 31 December 2019 are as follows:

(in millions of euros)	Capital	Treasury shares	Translation adjustments ⁽¹⁾	Fair value adjustment of financial instruments (OCI with recycling) ⁽²⁾	Other consolidated reserves and net income ⁽³⁾	Equity (EDF share)	Equity (non-controlling interests)	Total equity
EQUITY RESTATED UNDER IFRS 9 AT 01/01/2018	1,464	(40)	136	(1,720)	41,517	41,357	7,341	48,698
Gains and losses recorded in equity	-	-	79	(136)	2,864	2,807	(88)	2,719
Net income	-	-	-	-	1,177	1,177	14	1,191
Consolidated comprehensive income			79	(136)	4,041	3,984	(74)	3,910
Payments on perpetual subordinated bonds	-	-	-	-	(584)	(584)	-	(584)
Issuance/Redemption of perpetual subordinated bonds	-	-	-	-	(86)	(86)	-	(86)
Dividends paid	-	-	-	-	(1,360)	(1,360)	(183)	(1,543)
Purchases/sales of treasury shares	-	(16)	-	-	-	(16)	-	(16)
Capital increase by EDF ⁽⁴⁾	41	-	-	-	806	847	-	847
Other changes ⁽⁵⁾	-	-	-	-	327	327	1,093	1,420
EQUITY AS PUBLISHED AT 31/12/2018	1,505	(56)	215	(1,856)	44,661	44,469	8,177	52,646
IFRIC 23 restatements (see note 2.2)	-	-	-	-	(10)	(10)	-	(10)
EQUITY RESTATED AT 01/01/2019	1,505	(56)	215	(1,856)	44,651	44,459	8,177	52,636
Gains and losses recorded in equity	-	-	822	658	(2,738)	(1,258)	336	(922)
Net income	-	-	-	-	5,155	5,155	27	5,182
Consolidated comprehensive income			822	658	2,417	3,897	363	4,260
Payments on perpetual subordinated bonds	-	-	-	-	(589)	(589)	-	(589)
Issuance/Redemption of perpetual subordinated bonds (see notes 3.3.2 and 3.3.3)	-	-	-	-	(1,125)	(1,125)	-	(1,125)
Dividends paid	-	-	-	-	(941)	(941)	(155)	(1,096)
Purchases/sales of treasury shares	-	(8)	-	-	-	(8)	-	(8)
Capital increase by EDF ⁽⁶⁾	47	-	-	-	834	881	-	881
Other changes ⁽⁷⁾	-	-	-	-	(108)	(108)	939	831
EQUITY AT 31/12/2019	1,552	(64)	1,037	(1,198)	45,139	46,466	9,324	55,790

(1) Changes in translation adjustments amount to €822 million at 31 December 2019, mainly relating to the pound sterling and the recycling of Alpiq's conversion reserves to profit and loss following the sale of 28 May 2019.

(2) Changes in reserves recorded in OCI (Other Comprehensive Income) with recycling are shown in the Statement of Comprehensive Income. They correspond to the effects of fair value adjustments of debt securities and financial instruments hedging cash flows and net foreign investments, and amounts recycled to profit and loss in respect of terminated contracts and debt instruments transferred.

(3) Fair value changes recorded in OCI with no recycling are presented in the "Other consolidated reserves and net income" column.

(4) In 2018, the changes in capital and other consolidated reserves (issue premium) relate to payment of the balance of the scrip dividend for 2017 totalling €847 million.

(5) In 2018, the changes in consolidated reserves and equity (non-controlling interests) include in particular the effect of the sale of 49% of EDF Renewables' wind farms. "Other changes" in equity (non-controlling interests) also include the capital increases funded by CGN for NNB Holding Ltd. and Sizewell C Holding Co. amounting to €743 million, and the effects of the sale of Dunkerque LNG amounting to €(433) million.

(6) In 2019, the changes in capital and other consolidated reserves (issue premium) relate to payment of the balance of the scrip dividend for 2018 and the interim dividend for 2019 totalling €881 million (see note 30.1).

(7) In 2019, "Other changes" in equity (non-controlling interests) include the effect of capital increases funded by CGN for NNB Holding Ltd. and Sizewell C Holding Co. amounting to €967 million.

Notes to the consolidated financial statements

Note 1	Group accounting policies	286	Note 12	Other operating income and expenses	321
1.1	Declaration of conformity and Group accounting policies	286	12.1	Operating subsidies	321
1.2	Changes in accounting standards at 31 December 2019	286	12.2	Net income on deconsolidation and gains on disposal of fixed assets	321
1.3	Summary of the principal accounting and valuation methods	287	12.3	Other items	321
Note 2	Comparability	301	Note 13	Net changes in fair value on energy and commodity derivatives, excluding trading activities	321
2.1	IFRS 16 "Leases"	301	Note 14	Impairment/reversals	322
2.2	IFRIC 23 "Uncertainty over income tax treatments"	302	14.1	Impairment by category of asset	322
2.3	IFRS 5 "Planned Sale of E&P Operations"	302	14.2	Impairment tests on goodwill, intangible assets and property, plant and equipment	322
Note 3	Significant events and transactions	305	Note 15	Other income and expenses	325
3.1	Nuclear developments	305	Note 16	Financial result	326
3.2	Disposals	307	16.1	Cost of gross financial indebtedness	326
3.3	Financing operations	307	16.2	Discount effect	326
3.4	Renewable energies	308	16.3	Other financial income and expenses	326
3.5	Significant events and transactions of 2018	309	Note 17	Income taxes	327
Note 4	Regulatory changes in France	310	17.1	Breakdown of tax expense	327
4.1	France's multi-year energy programme (PPE) and The Energy and Climate law	310	17.2	Reconciliation of the theoretical and effective tax expense (tax proof)	327
4.2	Regulated electricity sales tariffs in France – "Blue" tariffs	312	17.3	Change in deferred tax assets and liabilities	328
4.3	"TURPE" network access tariffs	312	17.4	Breakdown of deferred tax assets and liabilities by nature	328
4.4	Compensation for public energy service charges (CSPE)	313	Note 18	Leases	329
4.5	French capacity mechanism	314	Note 19	Net income of discontinued operations	329
4.6	Energy savings certificates	314	Note 20	Basic earnings per share and diluted earnings per share	330
4.7	ARENH	315	Operating assets and liabilities, equity	330	
Note 5	Changes in the scope of consolidation	315	Note 21	Goodwill	330
Note 6	Segment reporting	316	21.1	Changes in goodwill	330
6.1	Reporting by operating segment	316	21.2	Goodwill by operating segment	331
6.2	Sales to external customers, by product and service group	318	Note 22	Other intangible assets	331
Income statement	319	Note 23	Property, plant and equipment operated under French public electricity distribution concessions	332	
Note 7	Sales	319	23.1	Net value of property, plant and equipment operated under French public electricity distribution concessions	332
Note 8	Fuel and energy purchases	319	23.2	Movements in property, plant and equipment operated under French public electricity distribution concessions (excluding assets in progress)	332
Note 9	Other external expenses	320			
Note 10	Personnel expenses	320			
10.1	Personnel expenses	320			
10.2	Average workforce	320			
Note 11	Taxes other than income taxes	321			

Note 24	Property, plant and equipment operated under concessions for other activities	332	Note 35	Other provisions	359
24.1	Net value of property, plant and equipment operated under concessions for other activities	332	Note 36	Special French public electricity distribution concession liabilities	359
24.2	Movements in property, plant and equipment operated under concessions for other activities (excluding assets in progress)	333	Note 37	Trade payables	360
Note 25	Property, plant and equipment used in generation and other tangible assets owned by the Group, including right-of-use assets	333	Note 38	Other liabilities	360
25.1	Net value of property, plant and equipment used in generation and other tangible assets owned by the Group, including right-of-use assets	333	38.1	Advances and progress payments received	360
25.2	Movements in property, plant and equipment used in generation and other tangible assets owned by the Group (excluding assets in progress and right-of-use assets)	334	38.2	Tax liabilities	360
25.3	Right-of-use assets	335	38.3	Deferred income on long-term contracts	360
Note 26	Investments in associates and joint ventures	335	38.4	Other items	360
26.1	Coentreprise de Transport d'Électricité (CTE)	336	38.5	Contract liabilities	361
26.2	Taishan	336	Financial assets and liabilities		362
Note 27	Inventories	337	Note 39	Current and non-current financial assets	362
Note 28	Trade receivables	337	39.1	Breakdown between current and non-current financial assets	362
28.1	Trade receivables due and not yet due	338	39.2	Debt and equity securities	362
28.2	Assignment of receivables	338	39.3	Loans and financial receivables	363
28.3	Contract assets	338	39.4	Change in financial assets other than derivatives	363
Note 29	Other receivables	338	Note 40	Cash and cash equivalents	364
Note 30	Equity	339	Note 41	Current and non-current financial liabilities	364
30.1	Share capital	339	41.1	Breakdown between current and non-current financial liabilities	364
30.2	Treasury shares	339	41.2	Loans and other financial liabilities	365
30.3	Dividends	339	41.3	Net indebtedness	368
30.4	Equity instruments	339	Note 42	Other information on financial assets and liabilities	369
30.5	Non-controlling interests (minority interests)	340	42.1	Fair value of financial instruments	369
Note 31	Provisions	341	42.2	Offsetting of financial assets and liabilities	370
Note 32	Provisions related to nuclear generation – back-end of the nuclear cycle, plant decommissioning and last cores	341	Note 43	Management of market and counterparty risks	371
32.1	Nuclear provisions in France	342	Note 44	Derivatives and hedge accounting	371
32.2	EDF Energy's nuclear provisions	349	44.1	Fair value hedges	372
Note 33	Other provisions for decommissioning	351	44.2	Cash flow hedges	372
Note 34	Provisions for employee benefits	351	44.3	Hedges of net investments in foreign entities	372
34.1	EDF group	351	44.4	Impact of hedging derivatives on equity	372
34.2	France (Regulated activities and Generation and Supply)	353	44.5	Commodity-related fair value hedges	374
34.3	United Kingdom	356	Note 45	Non-hedging derivatives	375
			45.1	Interest rate derivatives held for trading	375
			45.2	Currency derivatives held for trading	375
			45.3	Non-hedging commodity derivatives	376

Assets held for sale and related liabilities	377	Note 50 Contingent liabilities	386
Note 46 Assets held for sale and related liabilities	377	50.1 Tax inspections	386
Cash flows and other information	378	50.2 Labour litigation	386
Note 47 Cash flows	378	50.3 Litigation with photovoltaic producers	387
47.1 Change in working capital	378	50.4 Edison – Sale of Ausimont (Bussi)	387
47.2 Investments in intangible and tangible assets	378	50.5 Enedis – Quadlogic	387
47.3 Payments relating to leases	378	Note 51 Related parties	388
Note 48 EDF's dedicated assets	379	51.1 Transactions with entities included in the scope of consolidation	388
48.1 Regulations	379	51.2 Relations with the French State and State-owned entities	388
48.2 Portfolio contents and measurement	379	51.3 Management compensation	389
48.3 Valuation of EDF's dedicated assets	380	Note 52 Subsequent events	389
48.4 Coverage of long-term nuclear obligations	380	Note 53 Scope of consolidation at 31 December 2019	389
48.5 Changes in dedicated assets in 2019	381	53.1 Fully consolidated companies	390
48.6 Dedicated assets of Framatome and Cyclife France (formerly SOCODEI)	381	53.2 Company held in the form of a joint operation	391
Note 49 Off-balance sheet commitments	382	53.3 Companies accounted for by the equity method	392
49.1 Commitments given	382	53.4 Companies in which the EDF group's voting rights differ from its percentage ownership	392
49.2 Commitments received	385	Note 54 Statutory Auditors' fees	393

Notes to the consolidated financial statements

Électricité de France (EDF or the "Company") is a French société anonyme governed by French law, and registered in France.

The consolidated financial statements reflect the accounting position of the Company and its subsidiaries (which together form the "Group") and the Group's interests in associates, joint arrangements classified as joint operations, and joint ventures, for the year ended 31 December 2019.

The Group is an integrated energy operator engaged in all aspects of the energy business: generation, transmission, distribution, supply, trading, energy services, production of equipment and fuel assemblies, and reactor services.

The Group's consolidated financial statements at 31 December 2019 were prepared under the responsibility of the Board of Directors and approved by the Directors at the Board meeting held on 13 February 2020. They will become final after approval at the General Shareholders' Meeting to be held on 7 May 2020.

Note 1 Group accounting policies

1.1 Declaration of conformity and Group accounting policies

Pursuant to European regulation 1606/2002 of 19 July 2002 on the adoption of international accounting standards, the EDF group's consolidated financial statements at 31 December 2019 are prepared under the presentation, recognition and measurement rules set out in the international accounting standards published by the IASB and approved by the European Union for application at 31 December 2019. These international standards are IAS (International Accounting Standards), IFRS (International Financial Reporting Standards), and SIC and IFRIC interpretations.

The Group has not opted for early application of standards and interpretations that were not yet mandatory in 2019.

1.2 Changes in accounting standards at 31 December 2019

The accounting and valuation methods applied by the Group in the consolidated financial statements at 31 December 2019 are identical to those used in the consolidated financial statements at 31 December 2018, with the exception of the following changes:

1.2.1 IFRS 16 "Leases"

IFRS 16 "Leases", which is mandatory for financial years beginning on or after 1 January 2019, was adopted by the European Union on 31 October 2017. The recognition and measurement principles that now apply to lease contracts are described in note 1.3.13, and the information required by IAS 8 and IFRS 16 about the effects of the new standard's application by the Group is provided in note 2.1.

1.2.2 IFRIC 23 "Uncertainty over income tax treatments"

This interpretation was adopted by the European Union on 23 October 2018 and is effective for financial years beginning on or after 1 January 2019.

It clarifies application of the provisions of IAS 12 "Income taxes" regarding recognition and measurement of income tax when fiscal uncertainty exists. The applicable methods are presented in note 1.3.8 and the impacts are described in note 2.2.

1.2.3 Annual improvements to IFRS, 2015–2017 cycle

These improvements were adopted by the European Union on 14 March 2019 and contain amendments to:

- IAS 23 "Borrowing costs": specific borrowings for a qualifying asset must be included in the general borrowings pool once construction of the qualifying asset is complete;
- IFRS 3 and IFRS 11: measurement of previously held interests in a joint operation when control or joint control is obtained;
- IAS 12 "Income taxes": recognition in profit and loss of the tax consequences of dividend distributions.

These amendments have no impact on the Group's consolidated financial statements.

1.2.4 Amendments to IAS 19 "Plan Amendment, Curtailment or Settlement"

These amendments were adopted by the European Union on 13 March 2019. They clarify that when a plan is amended, curtailed or settled during the accounting period, a company must update its actuarial assumptions at the date of the change to measure and record the current service cost and the net interest expense on the net defined benefit liability over the remainder of the reporting period, from the date of the change affecting the plan.

These amendments have been implemented by the Group for the settlement of the Framatome segment's US pension plan. They have no significant impact on the Group's consolidated financial statements (see note 34.1.1).

1.2.5 Amendments to IAS 28 "Long-term Interests in Associates and Joint Ventures"

These amendments were adopted by the European Union on 8 February 2019. They clarify that an entity should first apply IFRS 9 "Financial Instruments" for impairment of other interests in an associate or joint venture that form part of its net investment in that associate or joint venture but are not accounted for by the equity method.

These amendments have no impact on the Group's consolidated financial statements.

1.2.6 Amendments to IFRS 9 "Prepayment Features with Negative Compensation"

Under these amendments, which were adopted by the European Union on 22 March 2018, financial assets with an early redemption option that results in negative compensation qualify for measurement at amortised cost, subject to certain conditions.

These amendments have no impact on the Group's consolidated financial statements.

1.2.7 Standards, amendments and interpretations published by the IASB but not yet adopted by the European Union

Amendments to IFRS 3 "Business Combinations: Definition of a Business", published on 22 October 2018

These amendments are expected to apply to business combinations taking place from 1 January 2020. They aim to clarify the distinction between the purchase of a business and the purchase of a group of assets.

The Group does not currently anticipate that application of these amendments will have any impact.

1.2.8 Other decisions: Physical Settlement of Contracts to Buy or Sell a Non-financial Item (IFRS 9 Financial Instruments)

In March 2019 the IFRS Interpretations Committee published a decision regarding the accounting treatment of particular contracts to buy or sell a non-financial item in the future at a fixed price. This decision has no impact of the Group's current practice, nor on the presentation of its financial statements.

1.2.9 Standards, amendments and interpretations adopted by the European Union and applicable for financial years beginning on or after 1 January 2020

Interest Rate Benchmark Reform (Amendments to IFRS 9, IAS 39 and IFRS 7)

The Group has organised a progressive transition towards alternative risk-free rates (RFRs)⁽¹⁾, working with the finance, legal, risk and IT functions and all group entities. Meanwhile, the Group remains attentive to work by other entities and publications by official bodies, particularly IFRIC and IASB releases about the potential effects on hedge accounting.

The Group does not currently anticipate that application of these amendments will have any material impact.

1.3 Summary of the principal accounting and valuation methods

The following accounting methods have been applied consistently through all the periods presented in the consolidated financial statements.

1.3.1 Valuation

The consolidated financial statements are prepared on a historical cost basis, with the exception of assets acquired and liabilities assumed through business combinations, and of certain financial instruments, which are stated at fair value.

1.3.2 Management judgements and estimates

The preparation of the financial statements requires the use of judgments, best estimates and assumptions in determining the value of assets and liabilities, income and expenses recorded for the period, considering positive and negative contingencies existing at year-end. The figures in the Group's future financial statements could differ significantly from current estimates due to changes in these assumptions or economic conditions.

In a context characterised by financial market volatility, the parameters used to prepare estimates are based on macro-economic assumptions appropriate to the very long-term cycle of Group assets.

The principal operations for which the Group uses estimates and judgments are the following:

1.3.2.1 Depreciation period of nuclear power plants in France

In the specific case of the depreciation period of its French nuclear power plants, the EDF group's industrial strategy is to continue operation beyond 40 years, in optimum conditions as regards safety and efficiency.

The depreciation period of 900MW series power plants was extended from 40 years to 50 years in 2016 (except for Fessenheim) since all the technical, economic and governance conditions were fulfilled. The depreciation period of other Group series in France (1,300MW and 1,450MW), which are more recent, is currently unchanged at 40 years, as the conditions for extension are not yet fulfilled.

These depreciation periods take into account the date of recoupling with the network after the most recent 10-year inspection.

The Tricastin plant's reactor 1 was reconnected to the grid on 23 December 2019 after the fourth 10-year inspection. This is the first 900MW series unit to pass the 40-year mark.

As explained in note 4.1, under the proposed new multi-year energy programme (PPE), two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the

final PPE adopted, it could lead to prospective modification of the depreciation period for the two units concerned. As this situation would bring forward the shutdown of two reactors in the Group's fleet by a few years, the potential effect on the annual depreciation expense, which will depend on the reactors selected for shutdown, is expected to be limited.

1.3.2.2 Nuclear provisions

The measurement of provisions for the back-end of the nuclear cycle, decommissioning and last cores is sensitive to assumptions concerning technical processes, costs, inflation rates, long-term discount rates, the depreciation period of plants currently in operation and disbursement schedules.

As explained in note 4.1, under the proposed new PPE, two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the final PPE adopted, it could lead to a change in the amount of corresponding nuclear provisions. As this situation would bring forward the shutdown of two reactors in the Group's fleet by a few years, the potential impact on nuclear provisions could be an increase of some tens of millions of euros, with an adjustment to the relevant balance sheet assets.

These parameters are therefore re-estimated at each closing date to ensure that the amounts accrued correspond to the best estimate of the costs eventually to be borne by the Group.

The Group considers that the assumptions used at 31 December 2019 are appropriate and justified. However, any future change in assumptions could have a significant impact on the Group's balance sheet and income statement.

The main assumptions and sensitivity analyses relating to nuclear provisions are presented in note 32.1.5.

The calculation of provisions incorporates a level of risks and unknowns as appropriate to the operations concerned. The valuation of costs carries uncertainty factors such as:

- changes in the regulations, particularly on safety, security and environmental protection, and financing of nuclear expenses;
- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisation;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (Agence nationale pour la gestion des déchets radioactifs);
- changes in certain financial parameters such as discount rates, notably in relation to the regulatory limit, inflation rates, or changes in the contractual terms of spent fuel management.

1.3.2.3 Pensions and other long-term and post-employment benefit obligations

The value of pensions and other long-term and post-employment benefit obligations is based on actuarial valuations that are sensitive to all the actuarial assumptions used, particularly concerning discount rates, inflation rates and wage increase rates.

The principal actuarial assumptions used to calculate these post-employment and long-term benefits at 31 December 2019 are presented in note 34. These assumptions are updated annually. The Group considers the actuarial assumptions used at 31 December 2019 appropriate and well-founded, but future changes in these assumptions could have a significant effect on the amount of the obligations and the Group's equity and net income. Sensitivity analyses are therefore presented in note 34.

1.3.2.4 Impairment of goodwill and long-term assets

Impairment tests on goodwill and long-term assets are sensitive to the macro-economic and segment assumptions used – particularly concerning energy price movements – and medium-term financial forecasts. The Group therefore revises the underlying estimates and assumptions based on regularly updated information.

These assumptions, which are specific to Group companies, are presented in note 14.

(1) Alternative RFRs are set to become the new reference rates after the discontinuation of critical reference rates.

6. Financial statements

Notes to the consolidated financial statements

1.3.2.5 Financial instruments

In measuring the fair value of unlisted financial instruments (essentially energy contracts), the Group uses valuation models based on a certain number of assumptions subject to unforeseeable developments.

1.3.2.6 Energy supplied but not yet measured and billed

As explained in note 1.3.7, the quantities of energy supplied but not yet measured and billed are calculated at the reporting date based on consumption statistic models and selling price estimates. Determination of the unbilled portion of sales revenues at the year-end is sensitive to the assumptions used to prepare these statistics and estimates.

1.3.2.7 Obligations concerning French public distribution concession assets to be replaced

In view of the specific nature of French public electricity distribution concessions, the Group has opted to present its obligation to replace concession assets in the balance sheet at a value based on the amount of contractual commitments as calculated and disclosed to the concession-granting authorities in the annual business reports (see note 1.3.12.2.1). An alternative approach would be to value the obligations based on the present value of future payments necessary to replace these assets at the end of their industrial useful life. The impacts this alternative approach would have had on the accounts are shown in note 1.3.22 for information. Whatever valuation method is used, measurement of the concession liability concerning assets to be replaced is notably subject to unforeseeable developments in terms of costs, useful life and disbursement dates.

1.3.2.8 Deferred tax assets

The use of estimates and assumptions over recovery horizons is particularly important in the recognition of deferred tax assets.

1.3.2.9 Other judgements

- For the application of IFRS 10 and IFRS 11, the Group uses judgment to assess control or classify the type of partnership arrangement represented by a jointly-controlled entity.

In particular, EDF has set up "reserved" investment funds for some of its funds set aside for secure financing of nuclear plant decommissioning expenses and long-term storage expenses for radioactive waste (see note 48.3). In view of the funds' characteristics, the prerogatives exercised by their managers and the procedures for defining the management strategies applicable to them, the Group considers that it does not have control, as defined by IFRS 10, over these funds. They are consequently treated as debt securities, in application of IFRS 9.

Furthermore, through its subsidiary Edison, since 2014 the Group has held a 30% investment in Edens, with F2i. However, the governance arrangements and contractual agreements introduced for Edens in connection with this transaction give Edison exclusive control over the company. In application of IFRS 10, Edens is therefore fully consolidated (*via* Edison) in the Group's consolidated financial statements.

- When there is no standard or interpretation applicable to a specific transaction, the Group exercises judgment to define and apply accounting methods that supply relevant and reliable information for preparation of its financial statements.

1.3.3 Consolidation methods

A list of the main subsidiaries, associates and joint ventures is presented in note 53.

1.3.3.1 Controlled entities

Subsidiaries are companies in which the Group exercises exclusive control and are fully consolidated. The Group controls an entity when the three following conditions are fulfilled:

- it holds power over the entity;
- it is exposed, or has rights, to variable returns from its involvement with the entity;
- it has the ability to use its power to affect the amount of the investor's returns.

The Group considers all facts and circumstances when assessing control. All substantive potential voting rights exercisable, including by another party, are also taken into consideration.

1.3.3.2 Investments in associates and joint ventures

An associate is an entity in which the Group exercises significant influence on financial and operational policies without having exclusive or joint control. Significant influence is presumed to exist when the Group's investment is at least 20%.

A joint venture is a partnership in which the parties (joint venturers) that exercise joint control over the entity have rights to the entity's net assets. Joint control is the contractually agreed sharing of control of an entity operated jointly by a limited number of partners or shareholders, such that the financial and operational policies result from unanimous consent of the parties.

Investments in associates and joint ventures are accounted for by the equity method. They are carried in the balance sheet at historical cost, adjusted for the share in net assets generated after the acquisition, less any impairment. The share in the net income for the period is reported in "Share in net income of associates and joint ventures" in the income statement.

1.3.3.3 Investments in joint operations

A joint operation is a joint arrangement in which the parties (joint operators) that exercise joint control over the entity have direct rights to its assets, and obligations for its liabilities. The Group, as an operator in a joint operation, reports the assets and liabilities and income and expenses related to its investment line by line.

The Group's principal joint operations are the LNG optimisation activities of Jera Global Markets, co-owned by EDF Trading, and the gas storage operator activity carried out by Friedeburger Speicherbetriebsgesellschaft GmbH (FSG).

1.3.4 Financial statement presentation rules

Assets and liabilities contributing to working capital used in the entity's normal operating cycle are classified as current in the consolidated balance sheet. Other assets and liabilities are classified as current if they mature within one year of the closing date, and non-current if they mature more than one year after the closing date.

The income statement presents items by nature. The heading "Other income and expenses" presented below the operating profit before depreciation and amortisation comprises items of an unusual nature or amount.

1.3.5 Translation methods

1.3.5.1 Reporting currency

The parent company's functional currency is the euro. The Group's financial statements are presented in millions of euros.

1.3.5.2 Functional currency

An entity's functional currency is the currency of the economic environment in which it primarily operates. In most cases, the local currency is the functional currency. But for some entities, a functional currency other than the local currency may be used when it reflects the currency used in the principal transactions.

1.3.5.3 Translation of the financial statements of foreign companies whose functional currency is not the Euro

The financial statements of foreign companies whose functional currency is not the euro are translated as follows:

- balance sheets are translated into Euros at the closing rate;
- income statements and cash flows are translated at the average rate for the period;
- resulting differences are recognised in equity under the heading "Translation adjustments".

Translation adjustments affecting a monetary item that is an integral part of the Group's net investment in a consolidated foreign company are included in consolidated equity until the disposal or liquidation of the net investment, at which date they are recognised as income or expenses in the income statement, in the same way as other exchange differences concerning the Company.

1.3.5.4 Translation of transactions in foreign currencies

In application of IAS 21, transactions expressed in foreign currencies are initially translated and recorded in the functional currency of the entity concerned, using the rate in force at the transaction date.

At each reporting date, monetary assets and liabilities expressed in foreign currencies are translated at the closing rate. The resulting foreign exchange differences are taken to the income statement.

In application of IFRIC 22, any payment or receipt of a non-monetary advance in a foreign currency must be translated at the exchange rate of the transaction date, with no subsequent adjustment.

1.3.6 Related parties

Related parties include the French State, companies in which the State holds majority ownership and certain of their subsidiaries, and companies in which the EDF group exercises joint control or significant influence. They also include members of the Group's management and governance bodies.

1.3.7 Sales

Sales essentially comprise income from energy sales (to final customers and as part of trading activities), delivery services related to use of the transmission and distribution network, and connection services. They also comprise income from other services and deliveries of goods, mainly engineering, operating and maintenance services, services related to energy sales, design, delivery and commissioning services for power plants or their major components.

Income on energy sales is recognised as deliveries are made to customers.

The quantities of energy supplied but not yet measured and billed are calculated using consumption statistics and selling price estimates, and are recognised in sales on that basis.

Some Group entities conduct optimisation operations on the wholesale gas and electricity markets, to balance supply and demand in compliance with the Group's risk management policy. The sales concerned are recorded net of purchases. When an entity has a net short position in euros, it is included in "energy sales". A net long position in euros is included in "fuel and energy purchases".

In accordance with the provisions of IFRS 15 on the principal/agent distinction, energy delivery services are recognised in sales upon delivery to the customer in the following two cases:

- when these services are not distinct from the energy supply service;
- when they are distinct from the energy supply service and the entity concerned is acting as a principal, notably because it bears the risk of execution of the service or is able to set the tariff for delivery to the final customer.

Income from connections to the French electricity network is recognised in sales at the date when the connection becomes operational.

The sales revenue from other services or deliveries of goods is recognised over time in the three following cases, based on a contractual analysis:

- when the customer simultaneously receives and consumes all the benefits generated as the service is performed by the Group (this is notably the case of operations and maintenance services);
- when the good or service to be supplied cannot be reallocated to another customer, and the Group is entitled to payment for the work done so far (this is notably the case of certain design, delivery and commissioning activities for power plants or major components designed specifically for a customer);
- when the service creates or enhances an asset (good or service) for which the customer acquires control as performance of the service progresses.

Sales revenues also include energy trading operations included in the scope of IFRS 9, which are recognised at the amount of the margin realised.

Capacity mechanism

Capacity mechanisms have been set up in France, the UK and Italy to ensure secure power supplies during peak periods.

- **French system:** French law 2010-1488 of 7 December 2010 on the new organisation of the electricity market introduced an obligation in France to contribute to power supply security from January 2017.

Operators of electricity generation facilities and load-shedding operators must have their capacities certified by RTE, and commit to a forecast level of availability for a given year of delivery. In return, they are awarded capacity certificates. Meanwhile, electricity suppliers and purchasers of power to compensate for network losses (obligated actors) must have capacity certificates equivalent to consumption by their customers in peak periods. Suppliers pass on the cost of the capacity mechanism to final customers through their sale prices.

The system is completed by registers for capacity trading between actors. Capacity auctions are held several times a year.

The Group is concerned by both aspects of this system, as an operator of electricity plants (EDF SA, Dalkia, EDF Renewables) and as an electricity supplier (EDF SA, Électricité de Strasbourg) and a purchaser of power to compensate for network losses (Enedis and Électricité de Strasbourg).

The operations are recorded as follows:

- sales of certificates are recognised in income when the auctions or over-the-counter sales take place;
- the cost of the capacity mechanism passed on to final customers through regulated sales tariffs and market-price offers is recognised in sales revenues as and when the electricity is delivered. However, the ARENH price has included a capacity value since 1 January 2017 when the capacity mechanism took effect, as the terms of transfer for the capacity guarantees associated with the ARENH system were defined by the CRE;
- stocks of certificates are stated either at their certification value (*i.e.* cost of certification by RTE) or at their purchase value on the markets;
- decreases in the stock of certificates are valued at the weighted average unit cost. The timing of recognition depends on the actor:
 - operators of installations: when the auction sales take place,
 - Obligated actors: spread on a straight-line basis over the 5-month peak period;
- for obligated actors, if there is a shortfall in the stocks of capacity certificates, a provision is recorded equivalent to the best estimate of the expense necessary to extinguish the obligation;
- at the closing date, if the realisable value of the stock of capacity certificates is lower than its net book value, impairment is recognised.

6. Financial statements

Notes to the consolidated financial statements

■ **British system:** The British capacity mechanism, introduced in 2014, is based on a system of auctions for operators, organised by the network operator "National Grid" to procure capacity 4 years ahead of delivery; delivery years run from 1 October to 30 September. Capacity operators which have been successful at the auctions are remunerated in the year of delivery out of a fund consisting of contributions from electricity suppliers.

The electricity suppliers' contribution to this mechanism is proportional to their sales to customers in the peak period and the cost of capacity is passed on to final customers through their sale price.

EDF Energy is concerned by both aspects of this system, as an operator of electricity plants and a supplier.

For accounting purposes, the remuneration received in its capacity as an operator is recognised in sales revenues in the year of delivery and the contribution paid to the mechanism in its capacity as an electricity supplier is recognised in expenses over the peak period. The cost of the capacity mechanism passed on to final customers is recognised in sales revenues as and when the electricity is delivered.

On 15 November 2018, the UK's Capacity Market was suspended after a ruling by the European Court of Justice concluding that it did not comply with EU rules on state aid. No capacity market revenues were thus recognised for the suspension period in 2018.

On 24 October 2019, following an in-depth investigation, the European Commission reapproved the UK capacity market scheme under EU State aid rules. The decision enabled payments that had been suspended since November 2018 to be made. Suppliers were required to make back-payments of the capacity supplier charge in 2019 and capacity providers have recognised revenue for the whole standstill period with cash received in January and February 2020.

■ **Italian system:** A capacity market was set up in 2019 using rules approved in a decree of 28 June 2019 issued by the Economic Development Ministry.

This mechanism is based on an auction process organised by TERNA, the Italian transmission grid operator, for each delivery year. Operators of existing and future production or storage units can participate in the auctions. The operators of the capacities selected are paid through a fixed premium during one year for existing capacities and 15 years for future capacities. The fixed premium is paid during the delivery year.

The selected operator must offer its capacity on the day-ahead market (*Mercato del Giorno Prima*) and the balancing market (*Mercato per il Servizio di Dispacciamento*). If the selling price on these markets reaches a level exceeding a strike price defined by the Italian Regulatory Authority for Energy, Networks and Environment (ARERA), the operator must repay the surplus to TERNA.

Two auctions were held during 2019 for delivery dates set in 2022 and 2023, and Edison won 3.8GW for 2022 and 3.3GW for 2023 for an annual price of €75,000/MW for new capacities and €33,000/MW for existing capacities.

The fixed premium will be recorded in income during the corresponding delivery year, and reduced by any repayments to TERNA or if the capacity is unavailable.

1.3.8 Income taxes

Income taxes include the current tax expense (income) and the deferred tax expense (income), calculated under the tax legislation in force in the countries where earnings are taxable.

In compliance with IAS 12, current and deferred taxes are generally recorded in the income statement or in equity symmetrically to the underlying operation.

Under IAS 32, income taxes on distributions to holders of equity instruments (notably dividends and the remuneration paid to holders of perpetual subordinated bonds) must be recognised in accordance with IAS 12. The Group considers that these distributions are paid out of previous years' accumulated profits and as a result the associated tax effects are included in the net income for the period.

In application of IFRIC 23, a tax asset or liability is recognised when there is uncertainty over income tax treatments. If the Group considers it likely that the tax authorities will not accept its chosen treatment, it recognises a tax liability, and if it considers it likely that the tax authorities will reimburse a tax that has already been paid, it recognises a tax asset. The tax assets and liabilities relating to these uncertainties are estimated on a case-by-case basis and stated at the most likely

amount, or the weighted average of the various outcomes considered. These tax assets and liabilities are included in deferred taxes.

The current tax expense (income) is the estimated amount of tax due on the taxable income for the period, calculated using the tax rates adopted at the year-end.

Deferred taxes result from temporary differences between the book value of assets and liabilities and their tax basis. No deferred taxes are recognised for temporary differences generated by:

- goodwill which is not tax deductible;
- the initial recognition of an asset or liability in a transaction which is not a business combination and does not affect the accounting profit or taxable profit (tax loss) at the transaction date;
- investments in subsidiaries and associates, investments in branches and interests in joint arrangements, when the Group controls the timing of reversal of the temporary differences, and it is probable that the temporary differences will not reverse in the foreseeable future.

Deferred tax assets and liabilities are valued at the expected tax rate for the period in which the asset will be realised or the liability extinguished, based on tax rates adopted at the year-end. If the tax rate changes, deferred taxes are adjusted to the new rate and the adjustment is recorded in the income statement, unless it relates to an underlying for which changes in value are recorded in equity, for example in accounting for actuarial gains and losses or fair value on hedging instruments and debt or equity securities.

Deferred taxes are reviewed at each closing date, to take into account changes in tax legislation and the prospects for recovery of deductible temporary differences. Deferred tax assets are only recognised when it is probable that the Group will have sufficient taxable profit to utilise the benefit of the asset in the foreseeable future, or beyond that horizon, if there are deferred tax liabilities with the same maturity.

Deferred tax assets and liabilities are reported on a net basis, determined at the level of a tax entity or tax group.

1.3.9 Business combinations

In application of IFRS 3 business combinations arising since 1 January 2010 are measured and recognised under the following principles:

- at the date of acquisition, the identifiable assets acquired and liabilities assumed, measured at fair value, and any non-controlling interests in the company acquired (minority interests) are recorded separately from goodwill;
- non-controlling interests may be valued either at fair value (full goodwill method) or their share in the fair value of the net assets of the acquired company (partial goodwill method). The decision is made individually for each transaction;
- any acquisition or disposal of an investment in a subsidiary that does not affect control is considered as a transaction between shareholders and must be recorded directly in equity;
- if additional interests are acquired in a joint venture, joint operation or associate without resulting in acquisition of control, the value of the previously-acquired assets and liabilities remains unchanged in the consolidated financial statements;
- if control is acquired in stages, the cost of the business combination includes the fair value, at the date control is acquired, of the purchaser's previously-held interest in the acquired company;
- related costs directly attributable to an acquisition leading to control are treated as expenses for the periods in which they were incurred, except for issuance costs for debt securities or equity instruments, which must be recorded in compliance with IAS 32 and IFRS 9;
- IFRS 3 does not apply to common control business combinations, which are examined on a case-by-case basis to determine the appropriate accounting treatment;
- commitments given by the Group to purchase minority interests in Group-controlled companies are included in liabilities. For commitments of this kind given since 1 January 2010, the date of the Group's first application of IAS 27 (amended) and IFRS 3 (revised), the differential between the value of the non-controlling interests and the liability corresponding to the commitment is recorded in equity.

1.3.10 Goodwill and other intangible assets

1.3.10.1 Goodwill

1.3.10.1.1 Determination of goodwill

In application of IFRS 3, "Business combinations", goodwill is the difference between:

- the sum of the following items:
 - the acquisition-date fair value of the price paid to acquire control,
 - the value of non-controlling interests in the entity acquired, and
 - for acquisitions achieved in stages, the acquisition-date fair value of the Group's share in the acquired entity before it acquired control; and
- the net value of the assets acquired and liabilities assumed, measured at fair value at the acquisition date.

When this difference is negative it is immediately included in net income.

The fair values of assets and liabilities and the resulting goodwill are finalised within twelve months of the acquisition.

1.3.10.1.2 Measurement and presentation of goodwill

Goodwill on acquisition of subsidiaries is disclosed separately in the balance sheet. Impairment on this goodwill is reported under the heading "Impairment" in the income statement. After initial recognition, goodwill is carried at cost less any impairment recognised.

Goodwill on acquisition of associates and joint ventures is included in the investment's net book value. Impairment on this goodwill is included under the heading "Share in income of associates and joint ventures".

Goodwill is not amortised, but impairment tests are carried out as soon as there is an indication of possible loss of value, and at least annually, as described in note 1.3.14.

1.3.10.2 Other intangible assets

1.3.10.2.1 Research and development expenses

Research expenses are recognised as expenses in the financial period incurred.

Development costs that qualify for capitalisation under IAS 38 are included in intangible assets and amortised on a straight-line basis over their foreseeable useful life.

1.3.10.2.2 Other self-produced or purchased intangible assets

Other intangible assets mainly comprise:

- software, which is amortised on a straight-line basis over its useful life;
- purchased brands with an indefinite useful life, or amortised on a straight-line basis over their useful life;
- operating or usage rights for power plants, which are amortised on a straight-line basis over the useful life of the underlying asset;
- rights or licenses relating to hydrocarbon concessions, which are amortised under the Unit Of Production (UOP) method, and exploration expenses amortised over the year (see note 1.3.10.2.3);
- intangible assets related to environmental regulations (greenhouse gas emission rights and renewable energy certificates acquired for a consideration – see note 1.3.26);
- the positive value of energy purchase/sale contracts stated at fair value as part of a business combination governed by IFRS 3: this value is amortised as the contractual deliveries take place;
- assets related to concession contracts governed by IFRIC 12, under the "intangible model" (see note 1.3.12.2.4);
- technology related to activities as designer and supplier of nuclear steam supply systems and manufacturer of control rod clusters and nuclear fuel (Framatome) including codes and methods, EPR technology, patents and manufacturing processes, all amortised over their useful life;
- purchased customer contracts and relations, amortised over their useful life.

1.3.10.2.3 Hydrocarbon prospecting, exploration and generation

The Group applies IFRS 6, "Exploration for and Evaluation of Mineral Resources".

Prospection and exploration costs and costs incurred in connection with geological surveys, exploration tests, geological and geophysical mapping and exploratory drilling are recognised as intangible assets and fully amortised in the year they are incurred.

Development costs related to commercially viable mineral wells and investments in facilities to extract and store hydrocarbons are recognised as "Property, plant and equipment used in generation and other tangible assets owned by the Group" or "Property, plant and equipment operated under concessions for other activities" as appropriate.

They are amortised under the Unit Of Production (UOP) method.

This concerns discontinued E&P operations (see note 2.3).

1.3.11 Concession assets, generation assets and other property, plant and equipment

The Group's property, plant and equipment is reported under three balance sheet headings, as appropriate to the business and contractual circumstances of their use:

- property, plant and equipment operated under French public electricity distribution concessions;
- property, plant and equipment operated under concessions for other activities;
- property, plant and equipment used in generation and other tangible assets owned by the Group.

1.3.11.1 Initial measurement

Property, plant and equipment is recorded at acquisition or production cost:

- the cost of facilities developed in-house includes all labour and materials costs, and all other production costs that can be included in the construction of the asset;
- borrowing costs attributable to the financing of an asset incurred during the construction period are included in the value of the asset provided it is a qualifying asset as defined by IAS 23 "Borrowing costs";
- the cost of property, plant and equipment also includes the initial estimate of decommissioning costs. These assets are associated with the provisions recorded to cover decommissioning obligations. At the date of commissioning, property, plant and equipment is measured and recorded in the same way as the corresponding provision (see note 1.3.20);
- decommissioning costs for nuclear generation installations also include last core costs (see note 1.3.20).

When some of the decommissioning costs for a plant are to be borne by a partner, the expected reimbursement is recognised as accrued income in the assets. The difference between the provision and the accrued income is recorded in Property, plant and equipment, and subsequent payments by the partner are deducted from the accrued income.

The Group capitalises safety expenses incurred as a result of legal and regulatory obligations sanctioning non-compliance by an administrative ban from operation.

Strategic safety spare parts for generation facilities are treated as property, plant and equipment, and depreciated over the residual useful life of the installations.

The costs of operations that are necessary for generation assets to remain in service, and are undertaken at the time of scheduled shutdowns, particularly during major inspections, are capitalised and amortised over a period corresponding to the time elapsing between two inspections.

When a part of an asset has a different useful life from the overall asset's useful life, it is identified as an asset component and depreciated over a specific period.

6. Financial statements

Notes to the consolidated financial statements

1.3.11.2 Depreciation

Items of property, plant and equipment are depreciated on a straight-line basis over their useful life, defined as the period during which the Group expects to draw future economic benefits from their use.

Depending on each country's specific regulations and contractual arrangements, the expected useful lives for the main facilities are as follows:

- hydroelectric dams: 75 years;
- electromechanical equipment used in hydropower plants: 50 years;
- fossil-fired power plants: 25 to 45 years;
- nuclear generation facilities:
 - in France: 40 to 50 years,
 - outside France: 35 to 60 years;
- transmission and distribution installations (lines, substations): 20 to 60 years;
- wind farm and photovoltaic facilities: 20 to 25 years;
- other general plant and machinery: 10 to 20 years.

1.3.12 Concession agreements

1.3.12.1 Accounting treatment

The accounting treatment of public and private agreements depends on the nature of the agreements and their specific contractual features.

For most of its concessions, other than concessions for heat generation and distribution, the Group considers that in substance the grantors do not have the characteristic features of control over infrastructures as defined in IFRIC 12.

1.3.12.2 French concessions

In France, the Group is the operator for four types of public service concessions:

- public electricity distribution concessions granted by local authorities (municipalities or syndicated municipalities);
- hydropower concessions granted by the State;
- the public transmission network operated under concession from the State;
- concessions from public authorities for heat generation and distribution.

1.3.12.2.1 Public electricity distribution concessions

General background

Since the enactment of the French Law of 8 April 1946, EDF, and then Enedis, has been the operator of most of the public distribution networks in France.

In accordance with France's Energy Code and Local Authorities Code, the public distribution of electricity is principally operated under the public service concessions system. The authorities granting the concessions (local authorities or public establishments for cooperation acting as an Energy Distribution Organisation Authority, *Autorité organisatrice de la distribution d'énergie – AODE*) organise the public electricity distribution service through concession agreements with specifications that define the respective rights and obligations of the parties. Enedis distributes electricity to 95% of the population of mainland France under such concessions. The other 5% are served by Local Distribution Companies (including *Électricité de Strasbourg*).

Concession agreement models

Enedis' concession agreements correspond to different models depending on the date of signature.

1992 concession agreement model

The 1992 concession specifications model (updated in 2007) was negotiated with the FNCCR (National Federation of licensing authorities) and EDF, and approved by the public authorities. This model places Enedis under an obligation to record industrial depreciation and establish provisions for replacement.

2017 concession agreement model

On 21 December 2017, the FNCCR, France Urbaine, EDF and Enedis signed a framework agreement for a new concession agreement model. This new model modernises the relationship between Enedis and concession-granting authorities in the long term and reflects the parties' attachment to the principles of French concessions for electricity distribution: public service, regional solidarity and national optimisation. The FNCCR and France Urbaine represent the concession-granting authorities, particularly towns, syndicated municipalities, boroughs and major cities when they are the authorities with competence to grant public electricity distribution concessions.

As of 2018, newly-signed concession agreements apply the concession agreement model validated on 21 December 2017. At the effective date of a new agreement, the existing special concession liabilities recorded in application of the previous concession agreement to represent the concession-granting authority's rights in the concession assets remain in the accounts. Like earlier concession agreements signed since 2011, the contractual obligation to establish provisions for replacement no longer exists, and the governance of investments is different.

To provide an effective public service, the distribution network operator and the concession-granting authority now agree to jointly set up a governance system to oversee investments in the public electricity distribution network over the area covered by the concession, including replacement of infrastructures. This system mainly takes the form of a master plan taking a long-term view of developments in the network over the concession area, and multi-year investment plans (*programmes pluriannuels d'investissements – PPIs*) for 4 and 5-year periods that are medium-term applications of the master plan.

PPIs contain detailed objectives for each investment purpose, concerning a selection of quantified, localised investments with financial valuations for the duration of the plan.

PPIs are revised when necessary, after consulting with Enedis and the authority granting the concession, to take account of changes in each party's investment priorities and financial resources.

If it were observed at the end of a PPI that any investment concerned by Enedis' financial commitment had not been made, the concession-granting authority could oblige Enedis to deposit a sum equal to 7% of the investments still to be made. This deposit would then be returned or retained after a two-year period, depending on the investments made by that time.

Accounting treatment

The accounting treatment of concessions is based on the concession agreements, with particular reference to their special clauses. It takes into consideration the possibility that the EDF group, particularly Enedis, may one day lose its status as the sole authorised State concession operator.

All assets used by the EDF group in public electricity distribution concessions in France, whether they are owned by the concession-granting authority or the operator, are reported together on a specific line in the balance sheet assets at acquisition cost, or their estimated value at the transfer date when supplied by the concession-granting authority.

1.3.12.2.2 Hydropower concessions

Hydropower concessions follow standard rules approved by decree. Hydropower concession assets consist solely of hydropower generation equipment (dams, pipes, turbines, etc.) for initial concessions. In other concessions, they comprise hydropower generation equipment and switching facilities (alternators, etc.).

Assets used in these concessions, whether operated under the concession agreement or owned by the EDF group, are recorded under "Property, plant and equipment operated under concessions for other activities" at acquisition cost.

Hydropower concessions have an initial term of 75 years pursuant to the French Law of 16 October 1919 relating to hydropower use. Most hydropower concessions that expired before 2012 were renewed for terms of 30 to 50 years. However, the French government has not yet renewed 12 concessions that have expired. Since their expiry these concessions have thus been in the "rolling extension" situation defined by the law, which stipulates that at the expiry date of a concession, if no new concession has been established "the concession is extended on the existing terms until such time as a new concession is granted", so as to ensure continuity of operations in the meantime (Article L. 521-16 par. 3 of the French Energy Code).

1.3.12.2.3 Public transmission concession

Under French law, assets assigned to the public transmission concession belong to Réseau de Transport d'Électricité (RTE). These assets are included in calculating the equity value of CTE, RTE's sole shareholder, in the consolidated balance sheet.

1.3.12.2.4 Heat generation and distribution concessions

Heat generation and distribution concession agreements signed by Dalkia with public authorities confer the right to operate facilities remitted by or constructed at the request of those authorities for a limited period, under the concession-granting authority's supervision.

These agreements set the terms for remuneration and transfer of the facilities to the concession-granting authority or another operator taking over at the end of the agreement.

The assets are recorded as intangible assets, in accordance with IFRIC 12 "Service concession agreements".

1.3.12.3 Foreign concessions

Foreign concessions are governed by a range of contracts and national laws. Most assets operated under foreign concessions are recorded under "Property, plant and equipment operated under concessions for other activities". Foreign concessions essentially concern Edison in Italy, which operates local gas distribution networks, hydropower generating plants and energy services under concessions. Edison owns all the assets except for some items of property, plant and equipment on the hydropower generation sites, which will be returned to the concession-granting authority for nil consideration or with an indemnity when the concession ends. In compliance with IFRIC 12, certain concession agreements are recorded as intangible assets.

Hydropower generation assets which will be returned for nil consideration at the end of the concession are depreciated over the duration of the concession.

1.3.13 Leases

The Group's accounting rules and methods were changed as follows at 1 January 2019. These accounting rules for leases only apply in 2019, and the comparative period of 2018 is still presented in accordance with IAS 17.

Under IFRS 16, a contract is, or contains, a lease if it confers the right to control the use of an identified asset for a period of time in exchange for a consideration.

Identified arrangements that do not have the legal form of a lease contract but nonetheless convey the right to control the use of an asset or group of specific assets to the purchaser are classified as leases by reference to IFRS 16.

1.3.13.1 Recognition of a lease contract as lessee under IFRS 16

The Group's lease contracts as lessee essentially concern real estate assets (office and residential properties), industrial installations (land, wind farms) and to a lesser extent vehicles and IT and industrial equipment.

IFRS 16 requires leases to be recognised in the lessee's balance sheet when the leased asset is made available, in the form of a "right-of-use" asset, presented in "Property, plant and equipment used in generation and other tangible assets owned by the Group, including right-of-use assets" with a corresponding financial liability associated with the lease commitment, presented in "Current and non-current financial liabilities".

Upon initial recognition of a lease, the right of use and the lease liability are valued by discounting the future lease payments over the term of the lease, taking into consideration assumptions regarding the renewal or termination of leases if the relevant options are reasonably certain to be exercised.

As a rule, since the implicit interest rate in a lease is difficult to determine, the lessee's incremental borrowing rate is used to discount the lease liability. This rate is based on zero-coupon EDF bond rates, adjusted for the currency risk, a country risk premium, the term of the lease contracts and the subsidiary's credit risk at the date of initial recognition of the contract. In certain cases, it is based on a subsidiary's specific incremental borrowing rate.

Subsequently, the right of use is amortised over the expected term of the lease, while the lease liability is stated at amortised cost, *i.e.* adding the interest recognised in the financial result, and deducting the amount of the lease payments made.

The Group has decided to apply the two exemptions allowed by IFRS 16, and as a result leases with a term of 12 months or less and leases of assets with individual value when new of less than USD 5,000 are not recognised in the balance sheet. Consequently, the payments on these leases are recognised on a straight-line basis over the lease term in the income statement.

If the Group performs a sale and leaseback operation – consisting of selling an asset to a third party and then renting it back as lessee – which is classified as a sale under IFRS 15, it measures the right-of-use asset resulting from the lease as the proportion of the asset's previous book value that corresponds to the right of use retained by the Group. Also, the gain on the sale of the asset by the Group only corresponds to the proportion of the right of use actually transferred to the third party. The lease liability is not adjusted, unless the conditions of the sale or lease do not reflect market values.

Off-balance sheet commitments presented in note 49.1.1 concern:

- short-term leases (12 months or less);
- leases of assets with low value (less than USD 5,000 when new);
- leases signed for which the leased assets have not yet been made available (for example, assets under construction).

1.3.13.2 Recognition of a lease contract as lessor

The accounting treatment of a lease contract in which the Group is lessor depends on the classification of the contract. For a finance lease which transfers substantially all risks and rewards inherent to ownership of the underlying asset to the lessee, the Group recognises a financial asset in its balance sheet instead of the initial fixed asset; in this case, the receivable is equal to the discounted value of future lease payments.

1.3.14 Impairment of goodwill, intangible assets and property, plant and equipment

At the year-end and at each interim reporting date, in application of IAS 36, the Group assesses whether there is an indication that an asset could have been significantly impaired. An impairment test is also carried out at least once a year on cash-generating units (CGUs) or groups of CGUs including an intangible asset with an indefinite useful life, or to which goodwill has been partly or totally allocated.

Impairment tests are carried out as follows:

- the Group measures any long-term asset impairment by comparing the carrying value of these assets and goodwill, grouped into CGUs where necessary, and their recoverable amount;
- CGUs are groups of homogeneous assets that generate identifiable independent cash flows. They reflect the way activities are managed in the Group: they may be subgroups when the activity is optimised across the whole subgroup, or CGUs formed by parts of subgroups corresponding to different types of activity that are managed separately (fossil-fired generation, renewable energy production, services). Goodwill is allocated to the CGUs that benefit from synergies resulting from the acquisition;
- the recoverable value of these CGUs is the higher of fair value net of disposal costs, and value in use. When this recoverable value is lower than the carrying amount in the balance sheet, an amount equal to the difference is booked under the heading "Impairment". The loss is allocated first to goodwill, and any surplus to the other assets of the CGU concerned;
- fair value is the asset's potential sale price in a normal transaction between economic actors;
- value in use is calculated based on projected future cash flows:
 - over a horizon that is coherent with the asset's useful life and/or operating life,
 - for certain intangible assets with an indefinite useful life (such as brands), beyond the horizon that can be observed or modelled, a terminal value is determined by discounting to infinity a normative cash flow,
 - excluding development projects other than those that have been decided at the valuation date,
 - and discounted at a rate that reflects the risk profile of the asset or CGU;
- the discount rates used are based on the weighted average cost of capital (WACC) for each asset or group of assets concerned, determined by geographical area and by business segment under the CAPM. WACC is calculated after taxes;
- future cash flows are calculated on the basis of the best available information at the valuation date:
 - for the first few years, the flows correspond to the Medium-Term Plan (MTP). Over the MTP horizon, energy and commodity prices are determined based on available forward prices, taking hedges into consideration,
 - beyond the MTP horizon, cash flows are estimated based on long-term assumptions prepared for each country and each energy, using a process that is updated annually. Medium and long-term electricity prices are constructed analytically by assembling blocks of assumptions, e.g. economic growth, commodity prices (oil, gas, coal) and CO₂, demand for electricity, interconnections, and developments in the energy mix (rise of renewable energies, installed nuclear capacity, etc.) with fundamental models of supply-demand balance. The Group refers in particular to external analyses for each assumption object (for example, for commodities and CO₂, which are primary factors in electricity prices, the Group compares its own scenarios with scenarios developed by organisations such as the AIE, IHS or Wood Mackenzie, bearing in mind that each of these analysts itself proposes a cone of scenarios corresponding to different macro-economic environments);
- income from capacity market mechanisms is also taken into consideration in valuing generation assets, starting from the MTP horizon where relevant, provided the countries concerned have introduced or announced the future introduction of a capacity revenue mechanism.

These calculations may be influenced by several variables:

- changes in discount rates;
- changes in market prices for energy and commodities and tariff regulations;
- changes in demand and the Group's market share, and the attrition rate on customer portfolios;
- the useful life of facilities, or the duration of concession agreements where relevant;
- the growth rates used beyond the medium-term plans and where relevant the terminal values taken into consideration.

Impairment recognised on goodwill is irreversible.

1.3.15 Financial assets and liabilities

Classification and measurement of financial instruments depend on the business model and the instruments' contractual characteristics. In application of IFRS 9, upon initial recognition, financial assets are carried at amortised cost, fair value through other comprehensive income (OCI), or fair value through profit and loss.

In the Group, financial assets comprise equity instruments (particularly non-consolidated investments), debt securities, loans and receivables at amortised cost including trade receivables, and the positive fair values of derivatives.

Financial instruments allocated to dedicated assets are presented in note 48.

Financial liabilities comprise loans and other financial liabilities, trade payables, bank credit and the negative fair value of derivatives.

Financial assets and liabilities are recorded in the balance sheet as current if they mature within one year and non-current if they mature after one year, apart from derivatives held for trading, which are all classified as current.

1.3.15.1 Valuation and classification of financial assets and liabilities

Financial instruments are stated at fair value, which corresponds to the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction on the principal or most advantageous market at the measurement date.

The valuation methods for each level are generally as follows:

- level 1 (unadjusted quoted prices): prices accessible to the entity at the measurement date on active markets, for identical assets or liabilities;
- level 2 (observable data): data concerning the asset or liability, other than the market prices included in initial level 1 input, which are directly observable (such as a price) or indirectly observable (*i.e.* deducted from observable prices);
- level 3 (non-observable data): data that are not observable on a market, including observable data that have been significantly adjusted.

1.3.15.1.1 Financial assets carried at fair value through OCI

Financial assets carried at fair value through OCI comprise:

- certain non-consolidated investments for which the Group has elected the irrevocable option to recognise subsequent fair value changes in OCI, with no recycling to profit and loss in the event of sale. Only dividends received from these investments are recognised in the income statement, under "Other financial income";
- debt securities (such as bonds) invested under a mixed "collect and sell" business model for which contractual cash flows consist entirely of principal and interest payments reflecting the time value of money and the credit risk associated with the instrument (the IFRS 9 "SPPI" test – Solely Payment of Principal and Interest). Changes in fair value are recorded directly in OCI with recycling and transferred to profit and loss when the securities are sold. For these debt securities, interest income is calculated at the effective interest rate and credited to the income statement under the heading "Other financial income".

Upon initial recognition, these financial assets are recorded at fair value plus transaction costs attributable to their acquisition. They are subsequently adjusted at each reporting date to fair value based on quoted prices where possible or using the discounted future cash flow method, or by reference to external sources otherwise.

1.3.15.1.2 Financial assets carried at fair value through profit and loss

Financial assets carried at fair value through profit and loss are classified as such at the inception of the operation when they are:

- assets acquired from inception with the intention of resale in the short term;
- derivatives not classified as hedges (derivatives held for trading);
- equity instruments (non-consolidated investments) for which the Group has not made the irrevocable option to classify them as at fair value through OCI with no recycling;
- debt securities that are not managed under the “collect and sell” business model and do not meet the requirements of the SPPI test. This chiefly concerns shares in investment funds, which are debt securities that do not pass the SPPI test regardless of the business model.

These assets are recorded at the transaction date at fair value, which is generally equal to the amount of cash paid out. Transaction costs directly attributable to the acquisition are recorded in the income statement. At each subsequent reporting date they are adjusted to fair value, based on quoted prices, or using recognised valuation techniques such as the discounted cash flow method or reference to external sources for other financial instruments.

Changes in fair value other than those concerning commodity contracts are recorded in the income statement under the heading “Other financial income and expenses”.

Changes in the fair value of commodity trading contracts are recorded in the income statement under “Sales”.

Changes in the fair value of certain non-trading commodity transactions are reported separately on a specific line of the income statement, “Net changes in fair value on Energy and Commodity derivatives, excluding trading activities” below the operating profit before depreciation and amortisation. These are transactions in the scope of IFRS 9, which for accounting purposes are not eligible for hedge accounting or the IFRS 9 “own use” exemption (see note 1.3.15.3).

1.3.15.1.3 Loans and financial receivables

Loans and financial receivables are carried at amortised cost if the business model involves holding the instrument in order to collect contractual cash flows which consist entirely of principal and interest.

Interest received is calculated under the effective interest rate method and recorded in “Other financial income” in the income statement.

Loans and financial receivables that do not qualify for classification at amortised cost are classified as at fair value through profit and loss, via “Other financial income and expenses” in the income statement.

1.3.15.1.4 Loans and financial liabilities

When specific hedge accounting treatments are not applied (see note 1.3.15.3.3 (A)), loans and financial liabilities are recorded at amortised cost, with separation of embedded derivatives where applicable. Interest expenses are calculated at the effective interest rate and recorded in the income statement under the heading “Cost of gross financial indebtedness” over the duration of the loan or financial liability.

1.3.15.2 Impairment of financial assets carried at fair value through OCI or at amortised cost

IFRS 9 establishes an impairment model based on expected credit loss (ECL).

For securities in the bond portfolio, the Group applies a rating-based approach for counterparties with low credit risk. In application of the risk management policy,

the Group’s bond portfolio consists almost entirely of instruments issued by low-risk counterparties rated “Investment Grade”.

In this situation, the ECL is estimated over a 12-month horizon following the closing date.

The threshold marking a significant increase in credit risk is reached when the counterparty ceases to be rated “Investment Grade”. In such situations, the significant increase in the default risk may lead to reassessment of ECLs over the instrument’s residual life.

For loans and receivables, the Group has chosen an approach based on the probability of default by the counterparty and assessment of changes in the credit risk.

1.3.15.3 Derivatives

1.3.15.3.1 Scope

The scope of derivatives applied by the Group corresponds to the principles set out in IFRS 9.

In particular, forward purchases and sales for physical delivery of energy or commodities are considered to fall outside the scope of application of IFRS 9 when the contract concerned is considered to have been entered into as part of the Group’s normal business activity (“own use”). This is demonstrated to be the case when all the following conditions are fulfilled:

- a physical delivery takes place under all such contracts;
- the volumes purchased or sold under the contracts correspond to the Group’s operating requirements;
- the contracts cannot be considered as options as defined by the standard. In the specific case of electricity sale contracts, the contract is equivalent to a firm forward sale or can be considered as a capacity sale.

The Group considers that transactions negotiated with a view to balancing the volumes between electricity purchase and sale commitments are part of its business as an integrated electricity operator, and are outside the scope of IFRS 9.

The Group analyses all its contracts concerning financial liabilities or non-financial items, to identify any “embedded” derivatives. Any component of a contract that affects the cash flows of that contract in the same way as a stand-alone derivative corresponds to the definition of an embedded derivative and is recognised separately at fair value from the contract’s inception date.

1.3.15.3.2 Measurement and recognition

Derivatives are initially recorded at fair value, based on quoted prices and market data available from external sources. If no quoted prices are available, the Group may refer to recent comparable transactions or if no such transactions exist base its valuation on internal models that are recognised by market participants, giving priority to information directly derived from observable data, such as over-the-counter listings.

Changes in the fair value of these derivatives are recorded in the income statement, unless they are designated as hedges for a cash flow or net investment (see note 1.3.15.3.3).

In the specific case of financial instruments entered into as part of the trading business, realised and unrealised gains and losses are reported net under the heading “Sales”.

In application of IFRS 13, the fair value of derivatives incorporates the counterparty credit risk for derivative assets and the own credit risk for derivative liabilities.

6. Financial statements

Notes to the consolidated financial statements

1.3.15.3 Derivatives classified as hedges

The EDF group uses derivatives to hedge its foreign exchange and interest rate risks, as well as risks related to certain commodity contracts.

The Group applies the criteria defined by IFRS 9 to identify operations subject to hedge accounting:

- the hedging relationship must only concern eligible hedging instruments and hedged items;
- the hedging relationship must be formally designated as such and have structured documentation from its inception;
- the hedging relationship must meet hedging efficiency requirements, particularly respect of a hedging ratio.

In the case of cash flow hedges, the future transaction being hedged must be highly probable.

The hedging relationship ends when it ceases to satisfy the above criteria. This includes situations in which the hedging instrument expires or is sold, terminated or exercised, or when the risk management objectives initially documented are no longer met.

Only derivatives external to the Group, and internal derivatives that are matched with similar transactions external to the Group, qualify for hedge accounting.

The Group uses the following categories for hedges:

(A) Fair value hedges

These instruments hedge the exposure to changes in the fair value of an asset or liability recorded in the balance sheet, or a firm commitment to purchase or sell an asset. Changes in the fair value of the hedged item attributable to the hedged component of that item are recorded in the income statement and offset by corresponding variations in the fair value of the hedging instrument. Only the ineffective portion of the hedge has an impact on income.

Some loans and financial liabilities are covered by a fair value hedge. In application of hedge accounting, their balance sheet value is adjusted for changes in fair value attributable to the hedged risks (foreign exchange and interest rate risks).

(B) Cash flow hedges

These instruments hedge exposure to variability in cash flows associated with an asset or liability, or a highly probable future transaction, for which variations in cash flows generated by the hedged item are offset by changes in the value of the hedging instrument.

The effective portion of accumulated changes in the hedge's fair value is recorded in equity, and the ineffective portion (*i.e.* changes in the fair value of the hedging instrument in excess of changes in the fair value of the hedged item) is recorded in the income statement.

When the hedged cash flows materialize, the amounts previously recognised in equity are recycled to profit and loss in the same way as for the hedged item, or are treated as an adjustment to the value of the asset acquired.

(C) Hedges of a net investment

These instruments hedge exposure to the foreign exchange risk related to a net investment in an entity which does not have the same functional currency as the Group. The effective portion of accumulated changes in the hedge's fair value is recorded in equity until the disposal or liquidation of the net investment, when it is included in the gain or loss on disposal. The ineffective portion (defined in the same way as for cash flow hedges) is recorded directly in the income statement.

The change in fair value resulting from the foreign exchange effect and interest rate effect of derivatives hedging a net investment in a foreign operation is recorded in equity.

1.3.15.4 Derecognition of financial assets and liabilities

The Group derecognises a financial asset when:

- the contractual rights to the cash flows generated by the asset expire; or
- the Group transfers the rights to receive contractual cash flows related to the financial asset through the transfer of substantially all of the risks and rewards associated with ownership of the asset.

Any interest created or retained by the Group in transferred financial assets is recorded as a separate asset or liability.

The Group derecognises a financial liability when its contractual obligations are extinguished, cancelled or expire. When a debt is renegotiated with a lender on substantially different terms, a new liability is recognised.

1.3.15.5 Assignment of receivables

When it can be demonstrated that the Group has transferred substantially all the risks and benefits related to assignment of receivables, particularly the credit risk, the items concerned are derecognised.

Otherwise, the operation is considered as a financing operation, and the receivables remain in the balance sheet assets, with recognition of a corresponding financial liability.

1.3.16 Inventories

Inventories are recognised at the lower of acquisition cost or net realisable value, except for inventories held for trading activities, which are carried at market value. Inventories consumed are generally valued by the weighted average unit cost method.

Cost includes all direct material costs, labour costs, and a share of indirect production costs.

1.3.16.1 Nuclear fuel

Inventory accounts include:

- nuclear materials, whatever their form during the fuel production cycle;
- and fuel components in the warehouse or in the reactor.

The stated value of nuclear fuel and materials and work-in-progress is determined based on direct processing costs including materials, labour and subcontracted services (e.g. fluorination, enrichment, production, etc.).

In accordance with regulatory obligations specific to each country, inventories of fuel (new or not entirely consumed) may also comprise expenses for spent fuel management and long-term radioactive waste management, with corresponding provisions or debts in the liabilities, or full and final payments made when the fuel is loaded.

In France, in application of the concept of "loaded fuel" as defined in the decree of 21 March 2007, the cost of inventories for fuel loaded in the reactors but not yet irradiated includes expenses for spent fuel management and long-term radioactive waste management. The corresponding amounts are taken into account in the relevant provisions.

In compliance with IAS 23, interest expenses incurred in financing inventories of nuclear fuels are charged to expenses for the period provided these inventories are manufactured in large quantities on a repetitive basis.

Nuclear fuel consumption is determined by component (natural uranium, fluorination, enrichment, fuel assembly production) as a proportion of the expected output when the fuel is loaded in the reactor. These quantities are valued at weighted average cost of inventories. Inventories are periodically corrected in view of forecast spent quantities based on neutronic measurements and physical inventories.

1.3.16.2 Other inventories

Other inventories comprise:

- other fuels, comprising fossil fuels required for operation of fossil-fired power plants and gas stocks;
- other operating supplies, consisting of operating materials and equipment such as spare parts supplied under a maintenance programme (excluding capitalised strategic safety spare parts);
- goods and services in progress, particularly relating to the businesses of EDF Renewables, Dalkia and Framatome;
- other inventories, mainly consisting of certificates issued under the various environmental schemes (see note 1.3.26) and capacity obligation mechanisms (capacity guarantees in France – see note 1.3.7).

Other non-trading operating inventories are generally valued at weighted average cost including direct and indirect purchasing costs.

Impairment of spare parts principally depends on the turnover of these parts.

1.3.17 Trade receivables

Trade receivables are initially recognised at the fair value of the consideration received or receivable, and subsequently carried at amortised cost or at fair value through OCI.

Trade receivables also include the value of unbilled receivables for energy already supplied, which are presented net of advances received from customers who pay in regular monthly instalments.

The Group applies IFRS 9's simplified approach to measure expected credit losses on trade receivables, using provision matrices established on the basis of credit loss histories.

1.3.18 Cash and cash equivalents

Cash and cash equivalents comprise immediately available liquidities and very short-term investments that are readily convertible into a known amount of cash, usually maturing within three months or less of the acquisition date, and with negligible risk of fluctuation in value.

Securities held short-term and classified as "Cash equivalents" are recorded at fair value, with changes in fair value included in the heading "Other financial income and expenses".

1.3.19 Equity

1.3.19.1 Fair value adjustment of financial instruments

The fair value adjustment of financial instruments results from the restatement to fair value of debt and equity securities and certain hedging instruments.

1.3.19.2 Share issue expenses

Share issue expenses correspond exclusively to external costs expressly related to the capital increase. They are charged against the issue premium at their net-of-tax value.

Other expenses are classified as expenses of the period.

1.3.19.3 Treasury shares

Treasury shares are shares issued by EDF and held either by that company or by other entities in the consolidated Group. They are valued at acquisition cost and deducted from equity until the date of disposal. Net gains or losses on disposals of treasury shares are directly included in equity and do not affect net income.

1.3.19.4 Perpetual subordinated bonds

The perpetual subordinated bonds issued by the Group ("hybrid" bond issue) incorporate options for redemption at the initiative of EDF. These options may be exercised after a minimum period that depends on the specific terms of each issue, and subsequently at each coupon date or in the event of highly specific circumstances (such as a change in IFRS or tax regime). The annual yield is fixed and reviewable based on contractual clauses that vary according to the specific terms of the issuance. There is no obligation for EDF to make any payment, due to the existence of contractual clauses entitling it to defer payment indefinitely. However, those clauses stipulate that any deferred payments must be made in the event of a dividend distribution. All these features give EDF an unconditional right to avoid paying out cash or another financial asset for the principal or interest. Consequently, in compliance with IAS 32, these bonds are recorded as equity instruments and any payment made is treated in the same way as dividends (see notes 3.3.2, 3.3.3 and 30.4).

1.3.20 Provisions other than employee benefit provisions

The Group recognises provisions when it has a present obligation (legal or constructive) arising from a past event, an outflow of resources will probably be required to settle the obligation, and the obligation amount can be estimated reliably.

If it is anticipated that all or part of the expenses covered by a provision will be reimbursed, the reimbursement is recognised under receivables if and only if the Group is virtually certain of receiving it.

Provisions are determined based on the Group's expectation of the cost necessary to settle the obligation. Estimates are based on management data from the information system, assumptions adopted by the Group, and if necessary, experience of similar transactions, or in some cases based on independent expert reports or contractor quotes. The various assumptions are reviewed for each closing of the accounts.

The expected costs are estimated based on year-end economic conditions and spread over a forecast disbursement schedule. They are then adjusted to Euros of the year of payment through application of a forecast long-term inflation rate and discounted to present value using a nominal discount rate. The provisions are based on these discounted future cash flows.

The rate of inflation and the discount rate are based on the economic and regulatory parameters of the country where the economic entity is located, considering the long operating cycle of the Group's assets and the maturities of commitments.

The discount effect generated at each closing to reflect the passage of time is recorded under "Discount effect" in financial expenses.

In extremely rare situations, a provision cannot be booked due to lack of a reliable estimate. In such cases, the obligation is mentioned in the notes as a contingent liability, unless there is little likelihood of an outflow of resources.

1.3.20.1 Provisions related to nuclear generation

Provisions related to nuclear generation mainly cover the following:

- back-end nuclear cycle expenses: provisions for spent fuel management, for waste removal and conditioning and long-term radioactive waste management are established in accordance with the obligations and final contributions specific to each country;
- costs for decommissioning power plants and losses relating to fuel in the reactor when the reactor is shut down (provision for last cores).

Last core expenses correspond to the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints, and the cost of fuel processing, and removal and storage of the resulting waste.

Changes in provisions resulting from a change in discount rates, a change in the disbursement schedule or a change in contractor quote are recorded:

- as an increase or decrease in the corresponding assets, up to the net book value, if the provision was initially covered by balance sheet assets (decommissioning of plants still in operation, long-term management of the radioactive waste resulting from such decommissioning, and last cores);
- in the income statement in all other cases.

Detailed information on the principles for determining provisions related to nuclear generation in France and the United Kingdom is given in note 32.

1.3.20.2 Other provisions

Other provisions primarily concern:

- contingencies related to subsidiaries and investments;
- tax liabilities excluding income taxes;
- litigation;
- onerous contracts and losses on completion;
- environmental schemes.

Provisions for onerous contracts primarily relate to multi-year agreements for the purchase or sale of energy and services:

- losses on energy purchase agreements are measured by comparing the acquisition cost under the contractual terms with the forecast market price;

6. Financial statements

Notes to the consolidated financial statements

- losses on energy sale agreements are measured by comparing the estimated income under the contractual terms with the cost of the energy to be supplied;
- losses on gas-related service agreements are measured by comparing the costs of fulfilling a contract with the resulting economic benefits, based on market and sales assumptions.

The revenues and margin on Framatome's long-term contracts are recorded under the percentage-of-completion method. When the estimated result upon completion is negative, the loss is immediately recorded in profit and loss, after deducting the loss already recognised under the percentage-of-completion method, and a provision is booked.

Provisions for environmental schemes may be established to cover the shortfall in greenhouse gas emission quotas, renewable energy certificates, and energy savings certificates, compared to the assigned targets (see note 1.3.26).

In extremely rare cases, description of a specific litigation covered by a provision may be omitted from the notes to the financial statements if such disclosure could cause serious prejudice to the Group.

1.3.21 Provisions for employee benefits

The Group grants its employees post-employment benefits (pension plans, retirement indemnities, etc.) and other long-term benefits (e.g. long-service awards) in compliance with the specific laws and measures in force in each country where it does business.

1.3.21.1 Calculation and recognition of employee benefits

Obligations under defined-benefit plans are calculated by the projected unit credit method, which determines the present value of entitlements earned by employees at year-end under all types of plan, taking into consideration the prospects for wage increases and each country's specific economic conditions.

Post-employment benefit obligations are valued mainly using the following methods and assumptions:

- retirement age, determined on the basis of the applicable rules for each plan, and the requirements to qualify for a full pension;
- career-end salary levels, with reference to employee seniority, projected salary levels at the time of retirement based on the expected effects of career advancement, and estimated trends in pension levels;
- forecast numbers of pensioners, determined based on employee turnover rates and mortality data available in each country;
- reversion pensions where relevant, taking into account both the life expectancy of the employee and his/her spouse and the marriage rate;
- a discount rate that depends on the geographical zone and the duration of the obligations, determined at the year-end date by reference to the market yield on high-quality corporate bonds or the rate on government bonds whose duration is coherent with EDF group's commitments to employees.

The amount of the provision corresponds to the value of obligations less the fair value of the fund assets that cover those obligations.

The net expense booked during the year for employee benefit obligations includes:

- in the income statement:
 - the current service cost, corresponding to additional benefit entitlements earned during the year,
 - the net interest expense, corresponding to interest on obligations net of the return on fund assets, which is calculated using the same discount rate as for the obligations,
 - the past service cost, including the income or expense related to amendments or settlements of benefit plans or introduction of new plans,
 - the actuarial gains and losses relating to other long-term benefits;
- in other components of consolidated comprehensive income:
 - the actuarial gains and losses relating to post-employment benefits and any return on hedging assets in excess of the discount rates used,
 - the effect of the limitation to the asset ceiling if any.

1.3.21.2 Post-employment benefit obligations

When they retire, Group employees benefit from pensions determined under local rules. They may also be entitled to benefits directly paid by the companies, and additional benefits prescribed by the relevant regulations.

1.3.21.2.1 French entities covered by the IEG system

Entities belonging to the specific IEG (electricity and gas) sector system, namely EDF, Enedis, the CTE subgroup, Électricité de Strasbourg, EDF PEI and certain subsidiaries of the Dalkia subgroup, are Group companies where almost all employees benefit from the IEG statutes, including the special pension system and other statutory benefits.

Since the financing reform for the IEG sector system took effect on 1 January 2005, the CNIIEG (Caisse Nationale des IEG, the sector's specific pension body) has managed not only the special IEG pension system, but also the industrial accident, invalidity and death insurance system for the sector.

The CNIIEG is a social security body governed by private law, formed by the Law of 9 August 2004. It has legal entity status and reports to the French government, operating under the joint supervision of France's ministers for the Budget, Social Security and Energy.

Under the funding arrangements introduced by the Law, IEG sector companies establish pension provisions to cover entitlements not funded by France's standard systems (CNAV, AGIRC and ARRCO), to which the IEG system is affiliated, or by the CTA (*Contribution Tarifaire d'Acheminement*) levy on gas and electricity transmission and distribution services.

As a result of this funding mechanism, any change (whether favourable or unfavourable to employees) in the standard French pension system that is not passed on to the IEG pension system is likely to cause a variation in the amount of the provisions recorded by the Group to cover its obligations.

The obligations concerned by the pensions and for which a provision is recorded thus include:

- specific benefits of employees in the deregulated or competitive activities;
- specific benefits earned by employees from 1 January 2005 for the regulated activities (transmission and distribution) (benefits earned prior to that date are financed by the CTA levy).

In addition to pensions, other benefits are granted to IEG status former employees (not currently in active service), as detailed below:

- benefits in kind: Article 28 of the IEG national statutes entitles such employees and current employees to benefits in kind in the form of supplies of electricity or gas at preferential prices. The obligation for supplies of energy to employees of the EDF and Engie (formerly GDF-Suez) groups corresponds to the probable present value of kWh to be supplied to beneficiaries or their dependants during their retirement, valued on the basis of the unit cost. It also includes the payment made under the energy exchange agreement with Engie;
- retirement gratuities: these are paid upon retirement to employees due to receive the statutory old-age pension, or to their dependants if the employee dies before reaching retirement. These obligations are almost totally covered by an insurance policy;
- bereavement benefit: this is paid out upon the death of an inactive or disabled employee, in order to provide financial assistance for the expenses incurred at such a time (Article 26 – § 5 of the National Statutes). It is paid to the deceased's principal dependants (statutory indemnity equal to three months' pension, subject to a ceiling) or to a third party that has paid funeral costs (discretionary indemnity equal to the costs incurred);
- bonus pre-retirement paid leave: all employees eligible to benefit immediately from the statutory old-age pension and aged at least 55 at their retirement date are entitled to 18 days of bonus paid leave during the last twelve months of their employment;
- other benefits include help with the cost of studies, time banking for pre-retirement leave, and pensions for personnel sent on secondment to subsidiaries not covered by the IEG system.

1.3.21.2.2 French and foreign subsidiaries not covered by the special IEG system

Pension obligations principally relate to the British companies and are mostly covered by defined-benefit plans.

In the United Kingdom, EDF Energy has three principal defined-benefit pension plans:

- the British Energy Generation Group (BEGG) plan affiliated to the Electricity Supply Pension Scheme (ESPS), of which the majority of members are employees in Nuclear Generation. The BEGG plan was closed to new members in August 2012;
- the EDF Energy Generation and Supply Group (EEGSG) plan, also affiliated to the ESPS, which was established in December 2010 for the employees remaining with EDF Energy following the transfer of the former Group plan to UK Power Networks as part of the sale of the Networks. The EEGSG plan has not accepted any new members since then;
- the EDF Energy Pension Scheme (EEPS). This scheme was established in March 2004 and membership remains open to new employees.

In 2016 EDF Energy introduced a new defined-benefit section of the EEPS pension plan named EEPS CARE (Career Average Revalued Earnings). Under EEPS CARE, pensions are based on a pensionable salary corresponding to the average salary over the beneficiary's entire career, adjusted for inflation. In 2017 a CARE section was also introduced in the BEGG pension plan, open to new employees in Nuclear Generation on equivalent terms to the corresponding section of the EEPS pension plan. Pensions for the other sections continue to be based on the beneficiary's most recent pensionable salary.

Each pension plan is financially independent of the others. The BEGG and EEGSG plans are part of the industry-wide ESPS which is one of the largest private-sector pension schemes in the United Kingdom.

The plans are externally managed by separate trusts whose trustees are appointed by the firm and the plan participants to manage the funds in their exclusive interests. The trustees carry out an actuarial review of the plan every three years, defining the funding level, the necessary employer and employee contributions and the payment schedules. The trustees are responsible for defining the plans' investment strategy, in agreement with the firm.

1.3.21.3 Other long-term benefit obligations

These benefits concern employees currently in service, and are earned according to local regulations, particularly the statutory regulations for the electricity and gas sector for EDF and French subsidiaries covered by the IEG regime. They include:

- annuities following incapacity, invalidity, industrial accident or work-related illness; like their counterparts in the general national system, IEG employees are entitled to financial support in the event of industrial accident or work-related illness, and invalidity and incapacity annuities and benefits. The obligation is measured as the probable present value of future benefits payable to current beneficiaries, including any possible reversions;
- long-service awards;
- specific benefits for employees who have been in contact with asbestos.

1.3.22 Special concession liabilities

These liabilities represent the contractual obligations specific to the concession rules for public electricity distribution concessions in France, and comprise the following:

- the concession-granting authority's rights in existing assets (its right to recover all the concession assets), consisting of the value in kind of the facilities (the net book value of assets operated under concessions), less any as yet unamortised financing provided by the operator;

- the concession-granting authority's rights in assets to be replaced (the operator's obligations relating to assets due for replacement). These non-financial liabilities comprise:

- depreciation recorded on the portion of assets deemed financed by the concession-granting authority,
- the provision for replacement, exclusively for assets due for replacement before the end of the concession, (the 1992 concession agreement model). This is accrued over the asset's useful life, based on the difference between the asset's replacement value for identical capacity and functions, and the original value. The replacement value is adjusted at each year-end based on indexes from official publications, and the impact of the adjustment is spread over the residual useful life of the assets concerned.

When assets are replaced, amortisation recognised on the portion of assets considered to be financed by the concession-granting authority, and the provision for replacement established for the relevant asset, are cancelled and transferred to rights in existing assets. Any excess provision is taken to income.

During the concession, the concession-granting authority's rights in assets to be replaced are thus transferred upon the asset's replacement to become the concession-granting authority's rights in existing assets, with no outflow of cash to the benefit of the concession-granting authority.

In general, the value of special concession liabilities is determined as follows:

- the concession-granting authority's rights in existing assets, representing the share deemed to be held by the concession-granting authority in the concession assets, are valued on the basis of the assets recorded in the balance sheet;
- the obligations relating to assets to be replaced are valued on the basis of the estimated value of the relevant assets, measured at each year-end taking into consideration wear and tear on the asset at that date:
 - based on the difference between the asset's replacement value as assessed at year-end and the historical cost for calculation of the provision for replacement. Annual allocations to the provision are based on this difference, less any existing provisions, with the net amount spread over the residual useful life of the assets. Consequently, the expenses recognised for a given item increase over time,
 - based on the share of the asset's historical cost financed by the concession-granting authority for amortisation of the concession-granting authority's financing.

The Group considers that the obligations related to assets to be replaced are to be valued on the basis of the special clauses contained in the concession agreements. Under this approach, these obligations are stated at the value of the contractual obligations as calculated and reported annually in the reports to the concession-granting authorities. This contractual value also reflects the possibility that the EDF group may one day lose its status as the concession operator.

If no such clauses existed, an alternative approach would be to state contractual obligations at the present value of future payments required for replacement of assets operated under concession at the end of their industrial useful life.

For information, the Group reports below the impacts of this alternative approach, *i.e.* the discounting of the future obligation to contribute to financing of assets to be replaced.

The principal assumptions used in preparing this simulation are as follows:

- the basis for calculation of the provision for replacement is the estimated replacement value at the end of the asset's useful life, applying a forecast annual inflation rate of 1.4%, less the asset's historical value. This amount is based on the wear and tear on the asset and discounted at a rate of 3.7% (inflation rate of 1.6% and discount rate of 4.00% at 31 December 2018);
- amortisation of the concession-granting authority's financing is also discounted at the rate of 3.7%.

6. Financial statements

Notes to the consolidated financial statements

The following table shows the impacts of this simulation for Enedis in 2019:

IMPACTS ON THE INCOME STATEMENT

<i>(in millions of euros, before taxes)</i>	2019
Operating profit	2,388
Financial result	(637)
Income before taxes of consolidated companies	1,751

IMPACTS ON THE BALANCE SHEET – EQUITY

<i>(in millions of euros, before taxes)</i>	2019
At opening date	1,251
At closing date	3,003

Valuation of concession liabilities under this method is subject to uncertainty over costs and disbursements, and is also sensitive to inflation and discount rates.

1.3.23 Investment subsidies

Investment subsidies received by Group companies are included in liabilities under the heading “Other liabilities” and transferred to income as and when the economic benefits of the corresponding assets are utilised.

1.3.24 Assets classified as held for sale and related liabilities, and discontinued operations

Assets that qualify as held for sale and related liabilities are disclosed separately from other assets and liabilities in the balance sheet.

When assets or groups of assets are classified as discontinued operations, income and expenses relating to these discontinued operations are disclosed in a single net amount after taxes in the income statement and net changes in cash and cash equivalents of discontinued operations are also reported separately in the cash flow statement.

Impairment is booked when the realisable value is lower than the net book value.

1.3.25 Nature and extent of restrictions on the Group’s ability to access and use assets or settle liabilities

The main restrictions that may limit the Group’s ability to access or use its assets or settle its liabilities concern the following items:

- assets held to fund employee benefits (principally in France and the United Kingdom – see note 1.3.21) and expenses related to nuclear liabilities (principally in France – see note 48 – and the United Kingdom – see note 32.2);
- tangible and intangible assets and the related liabilities associated with concession agreements, whether or not they are subject to regulatory mechanisms (obligations to supply energy or energy-related services, rules governing investments, an obligation to return concession facilities at the end of the contract, amounts payable at the end of the contract, tariff constraints, etc.). These restrictions mainly apply to assets of this type in France (EDF, Enedis, Électricité de Strasbourg and Dalkia), and to a lesser extent Italy (see notes 1.3.12 and 1.3.22);
- the sale of Group investments in certain subsidiaries requires authorisations from State bodies, particularly when they exercise a regulated activity or operate nuclear power plants (this is the case for EDF Nuclear Generation Ltd. in the United Kingdom, Taishan (TNPJVC) in China and CENG in the United States);
- prudential reserves established and measures taken as regards distribution capacity, so that the insurance subsidiaries will meet their prudential ratio requirements;

- the cash of certain entities that use financing arrangements stipulating that dividend distribution is subject to conditions concerning repayment of bank debt (or qualification for loans) and shareholders, or are subject to regulatory limitations in certain countries.

Certain shareholder agreements concerning companies controlled by the Group include clauses to protect minority shareholders, requiring approval from minority shareholders for certain particularly important decisions.

Finally, certain financing loans granted to Group entities contain early repayment clauses (see note 41.2.6), and certain items of cash and cash equivalents are subject to restrictions (see note 40).

1.3.26 Environment

1.3.26.1 Greenhouse gas emission rights

In ratifying the Kyoto Protocol, Europe made a commitment to reduce its greenhouse gas emissions. EU Directive 2003/87/EC set up a greenhouse gas emission quota system for the European Union which has been in operation since 1 January 2005.

This system was incorporated into national laws. Among other things it requires obligated actors, which is the case of EDF, to surrender to the State a number of greenhouse gas emission credits each year, corresponding to their emissions for the year. The rights and obligations associated with this system are periodically reviewed.

One of the main features of the third phase, running from 1 January 2013 to 31 December 2020, is the discontinuation of free allocation of emission rights in certain countries, including France and United Kingdom.

In the EDF group, the entities subject to this Directive are EDF, EDF Energy, Edison, Dalkia, and Luminus (formerly EDF Luminus).

The accounting treatment of emission rights depends on the holding intention. Two economic models coexist in the Group:

- rights held under the “Trading” model are included in “Other inventories” at fair value. The change in fair value observed over the year is recorded in the income statement;
- rights held to comply with regulatory requirements on greenhouse gas emissions (the “Generation” model) are recorded in “Greenhouse gas emission rights – green certificates”:
 - at acquisition cost when purchased on the market,
 - at nil value when allocated free of charge (in countries that still have a free allocation system).

When the estimated emissions by a Group entity over a given period are higher than the rights allocated for no consideration for the period less any allocated rights sold on the spot or forward market, a provision is established to cover the excess emissions. This provision is equal to the shortfall in rights held (difference between actual emissions and allocated rights held at the closing date).

If no emission rights are allocated free of charge, a provision is systematically recorded equivalent to the actual emissions at the closing date.

In either case, the provision is measured on the basis of the acquisition cost up to the amount of rights acquired on the spot or forward markets, and on market prices for the balance. It is cancelled when the rights are surrendered to the State.

At the closing date, the portfolio of emission rights and the obligation to surrender rights for the emissions of the year are presented gross, without netting.

If the number of purchased emission rights recorded as intangible assets at the end of the year and not subject to forward sale is higher than the number of purchased rights that will be surrendered to the State for the year's emissions, an impairment test must be applied to the excess. If the realisable value is lower than the net book value, impairment is booked.

1.3.26.2 Renewable energy certificates

In application of EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources, every EU member state has set national targets for consumption of electricity from renewable sources.

There are two ways for States to meet these targets:

- incorporating the costs of generating such electricity into the sale price for electricity (this is the approach taken in France);
- introducing a renewable energy certificate system (as is the case in the United Kingdom, Italy and Belgium).

The renewable energy certificate system may apply to:

- non-obligated electricity producers when the obligation applies to energy sales (EDF Renewables);
- obligated electricity producers when the obligation applies to generation;
- producers who are also sellers of electricity when the obligation applies to energy sales (EDF Energy, Edison and Luminus).

The EDF group applies the following accounting treatments:

- for non-obligated electricity producers, certificates obtained based on generation output are recorded in "Other inventories" until they are sold on to suppliers;
- for obligated producers and an entity that both produces and supplies energy and is under an obligation to sell a specified quantity of renewable energy, the Group uses the following accounting treatments for certificates obtained based on generation output:
 - up to the level of the obligation, these certificates are not recognised,
 - certificates in excess of the obligation are recorded in "Other inventories",
 - in the specific situation when an entity is not in a position to meet its obligation at the year-end, the Group applies the following accounting treatment:
 - certificates acquired for a consideration in order to meet the obligation are recorded in intangible assets at acquisition cost, and
 - a provision is established equivalent to the shortfall in certificates compared to the obligation at the year-end. The value of this provision is

based on the acquisition price of certificates already purchased on the spot or forward market, and market prices or penalty prices for the balance. The provision is cancelled when the certificates are surrendered to the State.

Forward purchases/sales of certificates related to trading activities are recorded in accordance with IFRS 9, stated at fair value in the balance sheet date. The change in fair value is recorded in the income statement.

1.3.26.3 Energy savings certificates

In all its subsidiaries, the Group is engaged in a process to control energy consumption through various measures developed by national legislation, in application of European Union Directives.

In France, the Law of 13 July 2005 introduced a system of energy savings certificates. Suppliers of energy (electricity, gas, heat, cold, domestic fuel oil and fuel for vehicles) with sales above a certain level became subject to energy savings obligations, initially for a three-year period.

To meet this obligation, three sources are available to the EDF group: supporting consumers in their energy efficiency operations, funding ministry-approved energy savings certificate schemes, and purchasing certificates from eligible actors.

Expenses incurred for this purpose are recorded in expenses of the year concerned, in "Other operating income and expenses". Expenses in excess of the accumulated obligation at year-end are included in inventories and may be used to cover the obligation in later years.

A provision is recognised if the energy savings achieved are lower than the cumulative energy savings obligation at the year-end. The amount of the provision is equal to the cost of actions still to be taken to meet the obligations related to the energy sales made. If these actions cannot be taken, the provision is assessed using the cost of the applicable penalties.

1.3.26.4 Environmental expenses

Environmental expenses are identifiable expenses incurred to prevent, reduce or repair damage to the environment that has been or may be caused by the Group as a result of its activities. These expenses are treated as follows:

- they are capitalised if they are incurred to prevent or reduce future damage or protect resources (e.g. expenses for structures to facilitate the passage of migrating fish, effluent treatment installations, etc.);
- they are booked as environmental liabilities and increases to provisions for environmental risks if they correspond to an obligation that exists at the year-end and it is probable or certain at the reporting date that they will lead to an outflow of resources;
- they are recognised as expenses if they are operating expenses for the units in charge of environmental concerns, environmental supervision, environmental duties and taxes, processing of liquid and gas effluents and non-radioactive waste, or research unrelated to an investment.

Note 2 Comparability

2.1 IFRS 16 "Leases"

IFRS 16 "Leases" was adopted by the European Union on 31 October 2017 and is mandatory for financial years beginning on or after 1 January 2019.

The Group decided to apply the modified retrospective approach, in which the cumulative impact of first application of the standard is recognised as an adjustment to retained earnings at the date of first application, i.e. 1 January 2019. This approach involves recognition of a liability equal to the discounted value of residual lease payments and a corresponding right-of-use asset adjusted for the amount of prepaid or accrued payments on the lease. The Group has opted to value the right-of-use asset at an amount equal to the lease payment liability.

Restatement of comparative figures in the main financial statements and the accompanying notes for the impacts of application of IFRS 16 is not required.

The weighted average discount rate applied by the Group to calculate the lease liability at 1 January 2019 over the residual term of its lease contracts is 1.61% (see note 1.3.13).

The Group also decided to apply the exemptions allowed by IFRS 16 as indicated in note 1.3.13.1, and not to reassess agreements previously classified as leases or service contracts under IFRIC 4 at the date of first application.

6. Financial statements

Notes to the consolidated financial statements

2.1.1 Impact of the transition at 1 January 2019

Under the modified retrospective approach, application of IFRS 16 at the transition date has an impact on net indebtedness, and results in recognition of a €4,492 million right-of-use asset.

The differences between the operating lease commitments under IAS 17 reported at 31 December 2018 and the estimated lease liability under IFRS 16 relating to the same contracts at 1 January 2019 are explained in the following table:

<i>(in millions of euros)</i>	01/01/2019
Operating lease commitments as lessee at 31/12/2018 (note 49.1.1.3)	4,375
Unrecognised contracts (IFRS 16 exemptions) and other	(105)
Differences in the durations applied for termination and extension options that are reasonably certain to be exercised	1,125
Leases signed in 2018 for an asset available after 1 January 2019	(329)
Non-discounted lease liability under IFRS 16 at 01/01/2019	5,066
Discount effect	(574)
Discounted lease liability under IFRS 16 at 01/01/2019	4,492

This amount for the right-of-use asset and the lease liability is recognised in addition to finance-leased assets at 31 December 2018, amounting to €96 million (see note 25), and the finance lease liability amounting to €324 million (see note 41.2.1).

The sale price stated in the agreement is based on an enterprise value of \$750 million, with an additional consideration of \$100 million contingent on commissioning of the Cassiopea gas project in Italy. Additionally, Edison will be entitled to royalties from further developments in Egypt that could bring the aggregate value close to \$1 billion. All of Edison's future decommissioning obligations will be transferred to the buyer under the sale agreement.

2.1.2 Impacts on the Group's consolidated financial statements at 31 December 2019

At 31 December 2019, the net value of the right-of-use asset amounts to €4,333 million and the lease liability amounts to €4,510 million. In 2019, the amortisation expense for the right-of-use asset amounts to €(660) million and the interest on the lease liability amounts to €(85) million.

Edison Exploration and Production manages all of Edison's activities, mining titles and corporate shareholdings in the hydrocarbons business in Italy and abroad. In particular, Edison E&P owns a portfolio of approximately 90 licences in 9 countries in the Mediterranean and Northern Europe, corresponding to a production quota of approximately 49,000 barrels per day at 31 December 2018.

For information, based on the Group's calculations, application of IFRS 16 under the modified retrospective approach would have had a positive impact of some €517 million on operating profit before depreciation and amortisation for 2018 (including a partial cancellation of realised gains on sale amounting to €(166) million). The consolidated net income would not have been significantly different.

On 23 December 2019, Edison disclosed that the sale to Energean Oil and Gas announced on 4 July 2019 was still awaiting government authorisations. Edison also stated that it had been invited by the Algerian authorities to discuss an agreement with Sonatrach regarding its E&P assets in Algeria.

2.2 IFRIC 23 "Uncertainty over income tax treatments"

In application of the modified retrospective method, implementation of IFRIC 23 at the transition date has a non-significant impact on tax liabilities (€10 million) that is recognised *via* equity, with no restatement of the comparative figures.

Edison and Energean are collaborating and confirm the objective of completing the transaction as soon as possible in 2020.

Following the IFRIC's decision of September 2019 regarding presentation of uncertain tax positions, the Group has reclassified the amounts previously reported as provisions for tax liabilities as deferred tax liabilities.

2.3.1 Presentation of the E&P operations in the consolidated financial statements

2.3 IFRS 5 "Planned Sale of E&P Operations"

EDF's Board of Directors (on 28 June 2019) and Edison's Board of Directors (on 3 July 2019) approved the purchase offer made for the Group's investment in Edison's Exploration and Production (E&P) operations. On 4 July 2019, Edison therefore announced the signature of the agreement with Energean Oil and Gas to sell 100% of Edison's E&P operations and its subsidiaries specialising in the hydrocarbon exploration and production business (oil and natural gas).

As Edison is the only Group entity with E&P operations, which account for a large portion of the "Italy" operating segment, the sale of the E&P operations is classified as a discontinued operation as defined by IFRS 5 from 1 January 2019.

As a result, the net income of discontinued operations is reported on a specific line of the income statement for the periods published. Similarly, in the cash flow statement, the net change in cash from discontinued operations is reported on a specific line for the periods published.

Following application of IFRS 5, based on the terms of the purchase offer, the amounts of Edison's E&P assets and liabilities at 31 December 2019 are reported in specific lines of the consolidated balance sheet. Details of the assets and liabilities of these discontinued operations are given in note 46. The impacts of application of IFRS 5 on the Group's income statement and cash flow statement at 31 December 2018 are presented below.

Based on the consolidated net value of these E&P operations at 31 December 2019 and the sale price as stated in the indicative purchase offer, impairment of €(513) million was booked during the year (see note 19), included in the line "net income of discontinued operations".

2.3.2 Impacts on the 2018 income statement

<i>(in millions of euros)</i>	2018 as published	Impact of IFRS 5	2018 restated
Sales	68,976	(430)	68,546
Fuel and energy purchases	(33,012)	(44)	(33,056)
Other external expenses	(9,364)	102	(9,262)
Personnel expenses	(13,690)	48	(13,642)
Taxes other than income taxes	(3,697)	7	(3,690)
Other operating income and expenses	6,052	(50)	6,002
Operating profit before depreciation and amortisation	15,265	(367)	14,898
Net changes in fair value on energy and commodity derivatives, excluding trading activities	(224)	-	(224)
Net depreciation and amortisation	(9,006)	231	(8,775)
Net increases in provisions for replacement of property, plant and equipment operated under concessions	(50)	-	(50)
(Impairment)/reversals	(598)	308	(290)
Other income and expenses	(105)	-	(105)
Operating profit	5,282	172	5,454
Cost of gross financial indebtedness	(1,716)	4	(1,712)
Discount effect	(3,486)	22	(3,464)
Other financial income and expenses	393	(15)	378
Financial result	(4,809)	11	(4,798)
Income before taxes of consolidated companies	473	183	656
Income taxes	149	29	178
Share in net income of associates and joint ventures	569	-	569
Net income of discontinued operations	-	(212)	(212)
CONSOLIDATED NET INCOME	1,191	-	1,191
EDF net income	1,177	-	1,177
Net income of continuing operations	1,177	207	1,384
Net income of discontinued operations	-	(207)	(207)
Net income attributable to non-controlling interests	14	-	14
Net income of continuing operations	14	5	19
Net income of discontinued operations	-	(5)	(5)

6. Financial statements

Notes to the consolidated financial statements

2.3.3 Impacts on the 2018 consolidated cash flow statement

<i>(in millions of euros)</i>	2018 as published	Impact of IFRS 5	2018 restated
Operating activities:			
Income before taxes	473	-	473
Income before taxes of discontinued operations	-	(183)	(183)
Income before taxes of consolidated companies	473	183	656
Impairment/(reversals)	598	(308)	290
Accumulated depreciation and amortisation, provisions and changes in fair value	13,180	(223)	12,957
Financial income and expenses	729	(11)	718
Dividends received from associates and joint ventures	387	-	387
Capital gains/losses	(1,014)	-	(1,014)
Change in working capital	462	8	470
Net cash flow from continuing operations	14,815	(351)	14,464
Net cash flow relating to discontinued operations	-	351	351
Net cash flow from operations	14,815	-	14,815
Net financial expenses disbursed	(1,062)	14	(1,048)
Income taxes paid	(389)	80	(309)
Net cash flow from continuing operating activities	13,364	(257)	13,107
Net cash flow from operating activities relating to discontinued operations	-	257	257
Net cash flow from operating activities	13,364	-	13,364
Investing activities:			
Acquisitions of equity investments, net of cash acquired	(484)	-	(484)
Disposals of equity investments, net of cash transferred	1,261	-	1,261
Investments in intangible assets and property, plant and equipment	(16,186)	170	(16,016)
Net proceeds from sale of intangible assets and property, plant and equipment	611	(34)	577
Changes in financial assets	(2,367)	-	(2,367)
Net cash flow from continuing investing activities	(17,165)	136	(17,029)
Net cash flow from investing activities relating to discontinued operations	-	(136)	(136)
Net cash flow from investing activities	(17,165)	-	(17,165)
Financing activities:			
EDF capital increase	-	-	-
Transactions with non-controlling interests	1,548	-	1,548
Dividends paid by parent company	(511)	-	(511)
Dividends paid to non-controlling interests	(183)	-	(183)
Purchases/sales of treasury shares	(3)	-	(3)
Cash flows with shareholders	851	-	851
Issuance of borrowings	5,711	-	5,711
Repayment of borrowings	(2,844)	120	(2,724)
Issuance of perpetual subordinated bonds	1,243	-	1,243
Redemptions of perpetual subordinated bonds	(1,329)	-	(1,329)
Payments to bearers of perpetual subordinated bonds	(584)	-	(584)
Funding contributions received for assets operated under concessions	131	-	131
Investment subsidies	351	-	351
Other cash flows from financing activities	2,679	120	2,799
Net cash flow from continuing financing activities	3,530	120	3,650
Net cash flow from financing activities relating to discontinued operations	-	(120)	(120)
Net cash flow from financing activities	3,530	-	3,530
Net increase/(decrease) in cash and cash equivalents from continuing operations	(271)	(1)	(272)
Net increase/(decrease) in cash and cash equivalents from discontinued operations	-	1	1
Net increase/(decrease) in cash and cash equivalents	(271)	-	(271)
CASH AND CASH EQUIVALENTS – OPENING BALANCE	3,692	-	3,692
Net increase/(decrease) in cash and cash equivalents	(271)	-	(271)
Effect of currency fluctuations	(95)	-	(95)
Financial income on cash and cash equivalents	13	-	13
Effect of reclassifications	(49)	-	(49)
CASH AND CASH EQUIVALENTS – CLOSING BALANCE	3,290	-	3,290

Note 3 Significant events and transactions

In addition to the planned disposal of E&P operations presented in note 2.3, the main significant events and transactions of 2019 are the following:

3.1 Nuclear developments

3.1.1 Flamanville 3 EPR

NB: The following information should be read in conjunction with the reminders of the key points of 2018 presented in note 3.5.3.

On 11 April 2019⁽¹⁾, EDF announced that it was aware of the opinion of the Permanent Group of experts for nuclear pressure equipment (GP ESPN), made public on 11 April 2019, regarding the quality deviations affecting the welds located on the main steam transfer pipes covered by the break preclusion principle⁽²⁾ at the Flamanville EPR.

The Nuclear Safety Authority (ASN) had held a meeting of the GP ESPN on 9 April 2019 as part of its investigation into these quality deviations:

- on 3 December 2018, EDF submitted a technical file to the ASN presenting the procedures for repairing and upgrading the main secondary circuit welds, which had shown deficiencies with respect to the break preclusion requirements, as well as for the specific justification method for the 8 welds located in the reactor containment building structure;
- the file was examined by the ASN, with technical support from the Institute for Radiation Protection and Nuclear Safety (IRSN);
- based on this examination, discussions took place at a GP ESPN meeting attended by EDF, which presented the background facts, their analysis and the methods for dealing with the issue. EDF answered all the Permanent Group of experts' questions for the technical examination of this file.

EDF indicated at the time that the recommendations and solution avenues suggested by the Permanent Group of experts could have an impact on the commissioning schedule and construction cost, and that the Group would continue its discussions with the ASN, which was to issue its decision regarding action to be taken on this matter a few weeks later.

Consequently, the Group stated that a detailed update of the schedule and construction cost for the Flamanville EPR would be given after the ASN's decision had been published.

On 20 June 2019⁽³⁾, EDF announced that it was aware of the decision issued by the ASN in its letter of 19 June 2019 regarding the quality deviations affecting the welds located on the main steam transfer pipes covered by the break preclusion principle at the Flamanville EPR.

In that letter, the ASN asked EDF to repair the eight containment penetration welds at the Flamanville EPR that were not compliant with the break preclusion principle.

On 26 July 2019⁽⁴⁾, EDF announced that three scenarios for upgrading the penetration welds were under consideration, and that after a detailed examination of the three scenarios and discussions with the ASN, the Group would communicate the schedule and cost implications of the selected scenario in the next few months. The Group also stated that commissioning could not be expected before the end of 2022.

This work resulted in discussions with the ASN, which sent EDF⁽⁵⁾ a letter on 4 October concerning the technical feasibility of these three scenarios.

The penetration weld repair scenario preferred by EDF involves the use of remote-operated robots, designed to conduct high-precision operations inside the piping concerned. This technology has been developed for nuclear power plants in operation and must be qualified for penetration weld repairs. The aim is to qualify this scenario with validation by the ASN by the end of 2020, at which date EDF will be able to initiate the repair work. A second scenario involving extraction and realignment work in the Safeguard Auxiliary Buildings is held at this stage as a fall-back solution.

Based on this penetration weld repair strategy, the EDF Board of Directors approved continuation of the Flamanville EPR construction at a meeting held on 8 October 2019.

This led the Group to adjust the schedule and the estimated construction cost for the Flamanville EPR⁽⁶⁾.

The provisional schedule for implementation of the preferred penetration weld repair scenario, if the objective of ASN validation is achieved, sets the date of fuel loading in late 2022 and the revised construction cost at €12.4 billion⁽⁷⁾, an increase of €1.5 billion. Most of these additional costs will be treated in operating profit⁽⁸⁾, rather than being capitalised. These costs will affect the financial years 2020, 2021 and 2022. For 2020, the impact on EDF net income is estimated at €(0.4) billion, all other things being equal, with no impact on net income excluding non-recurring items.

The process of realignment of the 58 welds on the secondary system with quality deviations or not in compliance with the break preclusion principle requirements defined by EDF is being continued on site. At the same time, the second hot functional test phase was started on 21 September 2019. Hot functional testing checks plant performance under simulated normal operating conditions.

3.1.2 Deviation from technical standards governing the manufacture of nuclear reactor components by Framatome

Framatome has informed EDF⁽⁹⁾ of a deviation from technical standards governing the manufacture of nuclear reactor components. The deviation relates to the performance of the manufacturing process used, which did not respect temperature ranges in certain areas during manufacturing operations involving stress-relieving heat treatment on some steam generator welds. It concerns in-service components as well as new components which have not yet been put into operation or installed on any sites.

On 9 September 2019, EDF informed the ASN of its initial investigations concerning the deviation in a post-weld stress-relieving heat-treatment process applied to certain nuclear reactor components.

Work conducted since then by EDF and Framatome⁽¹⁰⁾ to make an inventory of the equipment and reactors concerned and confirm that they are fit for operation has identified 18 steam generators installed on six reactors currently in operation: reactors no. 3 and 4 at Blayais, reactor no. 3 at Bugey, reactor no. 2 at Fessenheim, reactor no. 4 at Dampierre-en-Burly and reactor no. 2 at Paluel.

(1) Cf. press release of 11 April 2019.

(2) The break preclusion principle is a very high standard of quality with stricter requirements than nuclear pressure equipment regulations for the design, manufacturing and in-service monitoring of certain items of equipment. These stricter requirements must be sufficient to consider that rupture of this equipment is highly unlikely. (When this standard is applied, a comprehensive study of the consequences of breaks in this piping is not required in the plant safety case).

(3) Cf. press release of 20 June 2019.

(4) Cf. press release of 26 July 2019.

(5) Cf. press release of 9 October 2019.

(6) The issue of deviation from the technical manufacturing standards for Framatome reactor components (stress-relieving heat treatment process for the welds with electrical resistance) which concerns the four steam generators and pressuriser at Flamanville 3 EPR is explained in note 3.1.2.

(7) In 2015 Euros, excluding interim interest.

(8) IAS 16.22 concerning abnormal costs incurred in connection with self-constructed assets.

(9) Cf. press release of 10 September 2019.

(10) Cf. press release of 18 September 2019.

6. Financial statements

Notes to the consolidated financial statements

The components that are not yet in service are the four steam generators and the pressuriser at the Flamanville 3 EPR, as well as 3 new steam generators that have not yet been installed and were made to replace the steam generators on reactors no. 5 and 6 at Gravelines.

Following publication by the ASN on 24 October 2019 of the information notice entitled "Manufacturing deviation at Framatome stress-relieving heat treatment of welds", EDF⁽¹⁾ took note that the reactors involved can continue to function as they are, with no need to be shut down for the checks required to address the discrepancies. Physical checks were carried out on the relevant welds in the new steam generators when they were installed at Gravelines 5, the relevant welds of in-service steam generators when they were shut down for fuel reloading (Blayais 4, Paluel 2 and Dampierre 4) and the weld on the Fessenheim 2 steam generator. For the other steam generators in operation the same checks will be carried out on the relevant welds during their next scheduled shutdown for fuel reloading, before the end of the first half-year of 2020 (Bugey 3 and Blayais 3). It is not anticipated at this stage that these shutdowns will need to be extended.

3.1.3 Hinkley Point C

The Hinkley Point C project delivered J-0, the completion of the nuclear island "common raft" for its first unit in June 2019, in line with the schedule announced in September 2016.

Following this major milestone a detailed review of the project's costs, schedule and organisation was performed. The review has concluded that:

- the next milestone of completing the common raft for Unit 2 in June 2020, which was announced earlier in 2019, is confirmed;
- the previously communicated risk of delay in the Commercial Operation Date (COD) for units one and two (of 15 months and nine months respectively) has increased⁽²⁾;
- the project completion cost⁽³⁾ is now estimated at between £21.5 billion and £22.5 billion, an increase of £1.9-£2.9 billion⁽⁴⁾ compared to the previous estimate. The range depends on the effectiveness of action plans to be delivered in partnership with contractors.

Cost increases reflect challenging ground conditions which made earthworks more expensive than anticipated, revised action plan targets and extra costs needed to implement the completed functional design, which has been adapted for a first-of-a-kind application in the UK regulatory context.

Under the terms of the Contract for Difference, this new cost estimate has no impact for UK consumers or taxpayers. EDF's rate of return for Hinkley Point C (IRR)⁽⁵⁾ is now estimated at between 7.6% and 7.8%.

The management of the project remains mobilised to begin generating power from Unit 1 at the end of 2025. To achieve this, operational action plans overseen by the project management are being put in place. These involve the EDF Group's engineering teams in Great Britain and France, buildings and ancillary works contractors, and suppliers of equipment and systems throughout the supply chain.

3.1.4 Taishan

On 14 December 2018, CGN and EDF announced that Taishan nuclear power plant's unit 1 had become the world's first EPR to begin commercial operation. This last milestone was reached on 13 December 2018 after successful completion of the final statutory test of continuous operation at full power for 168 hours.

Unit 2 began commercial operation on 7 September 2019. All the requirements for the reactor's safe operation were met barely nine months after Unit 1 was commissioned.

Comprising two 1,750-MW EPR reactors, Taishan nuclear power plant is the biggest cooperation project between China and France in the energy sector. Taishan's two reactors are capable of supplying the Chinese power grid with up to 24TWh of carbon-free electricity a year, tantamount to the annual electricity consumption of 5 million Chinese users, whilst at the same time preventing the emission of 21 million tonnes of CO₂ a year.

The Taishan project is led by TNPJVC, a joint venture founded by CGN (51%), EDF (30%) and the Chinese utility Guangdong Energy Group (19%). The EDF Group and its subsidiary Framatome supplied the EPR technology for the plant. The project capitalised on 35 years of strategic cooperation between EDF and CGN, as well as operating experience from the Flamanville 3 EPR and the complementarity between the French and Chinese nuclear sectors.

Experience acquired through the commissioning of the first reactor on 13 December 2018 made it possible to shorten the period between fuel loading and the start of commercial operation by three months, with identical safety conditions.

The Taishan project is contributing experience in project management and technological expertise to EPR reactors around the world. The first reactors to benefit from this experience are the two Hinkley Point C units currently being built in the UK. EDF and CGN are also partners in two other British projects: the Sizewell C two-EPR project, and the Bradwell B project which is based on Hualong technology.

3.1.5 NUWARD, a joint Small Modular Reactor (SMR) project

On 17 September 2019, during the IAEA General Conference in Vienna, the French Alternative Energies and Atomic Energy Commission (CEA), EDF, Naval Group and TechnicAtome unveiled "NUWARD"TM, their jointly-developed small modular reactor (SMR) project. NUWARD is a PWR (pressurised water reactor)-based solution to meet the growing world demand for decarbonised, safe and competitive electricity generation in the 300-400MWe range.

The CEA and EDF have also initiated discussions with Westinghouse Electric Company to explore potential cooperation on SMR development.

3.1.6 Closure of Fessenheim nuclear power plant

EDF has submitted an application to the ASN and France's Ministry for the Ecological and Inclusive Transition for the termination of operations and a declaration of the permanent shutdown of both reactors at Fessenheim nuclear power plant. The shutdown of reactor no. 1 is planned for 22 February 2020, whilst the shutdown of reactor no. 2 is planned for 30 June 2020.

This submission followed the signature by the French State and EDF on 27 September 2019 of a protocol agreement whereby the State will compensate EDF for the early closure of Fessenheim, which results from the cap on nuclear power output set by the "energy transition for green growth" law of 17 August 2015.

(1) Cf. press release of 25 October 2019.

(2) If this risk were to materialise, it would entail an additional cost of around £0.7 billion in 2015 sterling. Under this assumption the IRR for EDF would be lower by 0.3%.

(3) In 2015 sterling, excluding interim interest and excluding foreign exchange effect versus the reference exchange rate for the project of £1 = €1.23.

(4) Additional costs net of action plans.

(5) EDF's forecast IRR calculated at the exchange rate £1 = €1.15 and including the capped compensation mechanism between shareholders for surplus costs or delays.

The compensation paid under the terms of this protocol will comprise:

- initial instalments to compensate for expenses incurred after the closure of the plant (end-of-operations expenditure, BNI taxes, dismantling costs and staff redeployment costs), which will be paid over a 4-year period following the closure. These payments are expected to amount to a total of nearly €400 million.

This compensation will be recognised as income in profit and loss as and when the associated costs are incurred;

- subsequent payments corresponding to the lost income that would have been generated by future power generation up until 2041, based on Fessenheim's previous output figures and calculated "ex post" on the basis of nuclear power sale prices, particularly observed market prices.

3.2 Disposals

3.2.1 Disposal of EDF's 25% stake in Alpiq

On 4 April 2019, following the approval given by their respective governance bodies, EDF, EBM (*Coopérative Elektra Birseck*) and EOS (EOS Holding SA) signed an agreement on EDF's disposal of its stake in Swiss power producer Alpiq (25.04% of the company's capital and voting rights) to EBM and EOS (each entity acquiring half of this stake).

This operation valued EDF's stake in Alpiq at approximately CHF489 million (around €434 million), based on a purchase price of CHF70 per Alpiq share. It reduced the Group's net indebtedness by €434 million. The Shares Purchase Agreement includes potential earn-out mechanisms. The sale was completed on 28 May 2019 after it received clearance from the German competition authority.

The impact on the consolidated net income is not significant.

3.2.2 EDF notifies the exercise of its put option on its investment in CENG

Pursuant to the agreements concluded with Exelon in 2014 ⁽¹⁾, EDF notified Exelon on 20 November 2019 the exercise of its put option on 49.99% of the shares of CENG.

CENG owns five nuclear reactors across three nuclear power plants located in the states of New York and Maryland, with total capacity of 4,041MW (company-owned capacity).

This put option was exercisable by EDF from 1 January 2016 to 30 June 2022. The transaction price will be based on the fair market value of CENG shares, determined pursuant to the contractual provisions of the put option agreement.

Completion of the transaction will be conditional upon obtaining the required regulatory approvals.

This sale of CENG shares is part of the disposal plan concerning non-core assets announced by EDF Group.

The Group has reclassified its investment in CENG as assets held for sale (see note 46).

3.3 Financing operations

3.3.1 Signature of three credit lines indexed on ESG criteria

Through these new agreements, which form a continuity with two other credit lines indexed on the Group's sustainability performance signed in 2017 and 2018, EDF is

reaffirming the central role of sustainable financing instruments in its finance strategy. ESG-indexed renewable credit lines total more than €5 billion at 31 December 2019, accounting for around 48% of the EDF group's credit lines.

On 22 March 2019 EDF and BBVA signed a €300 million revolving credit facility.

On 22 July 2019 EDF signed two €300 million revolving credit facilities. One is with the Crédit Agricole Group, led by Crédit Agricole CIB and including LCL and Crédit Agricole d'Ile-de-France, and the other is with Société Générale CIB.

These three credit facilities incorporate an adjustment mechanism that links their cost to three of the Group's sustainability KPIs: direct CO₂ emissions, use of online consumption monitoring tools by its French residential customers (as a proxy for EDF's success in getting French residential customers actively engaged with their energy consumption), and electrification of its light vehicle fleet.

3.3.2 Issuance of perpetual subordinated bonds

On 26 November 2019, EDF issued a euro-denominated 500 million hybrid bond, with a 3.00% coupon and an 8-year first call date.

This offering shows the Company's strong commitment to financing through hybrid securities, which are a permanent part of its capital structure. The Company pro-actively manages its stock of hybrid bonds: the funds resulting from this issue were mainly used to finance the partial repurchase of several outstanding series of hybrid bonds, and for general corporate purposes of the Company and the EDF Group, as the case may be.

In compliance with IAS 32, the issuance of perpetual subordinated bonds (see note 1.3.19.4) was recorded in equity upon receipt of the funds, at the amounts of €493 million net of expenses.

3.3.3 Redemption of certain series of hybrid bonds

On 26 November 2019, EDF issued a cash tender offer for redemption of the following hybrid bonds:

- €1,000 million Reset Perpetual Subordinated Notes with a first redemption at the option of the Company on 22 January 2022, which are admitted to trading on Euronext Paris, of which €661.8 million was outstanding. The amount redeemed amounted to €394.9 million and settlement took place on 13 December 2019;
- \$3,000 million Reset Perpetual Subordinated Notes with a first redemption at the option of the Company on 29 January 2023, which are admitted to trading on the regulated market of the Luxembourg Stock Exchange, of which \$3 billion was outstanding. The amount redeemed amounted to \$902.4 million and settlement took place on 31 December 2019.

EDF also exercised its option to fully redeem the €1.25 billion Reset Perpetual Subordinated Notes, of which €338.2 million was outstanding, on 29 January 2020. As the redemption was certain, EDF reclassified these equity instruments as financial liabilities at 31 December 2019 in the amount of €338.2 million (see note 30.4).

Consequently, taking into account the issuance on 26 November 2019 of a €500 million hybrid bond with 3.00% coupon and an 8-year first call date (see note 3.3.2), these transactions reduced the total stock of hybrid instruments in EDF's balance sheet by approximately 8% to €9.8 billion while generating a saving net of interest estimated at around €44 million in 2020 and around €58 million from 2021.

In compliance with IAS 32, this redemption of perpetual subordinated bonds (see note 1.3.19.4) was recorded in equity upon disbursement of the funds or when the redemption commitment was made, at the amount of €1,618 million net of expenses.

(1) EDF Press Release of 1 April 2014 "EDF and Exelon finalize agreement on CENG".

6. Financial statements

Notes to the consolidated financial statements

3.3.4 Senior bond issues: EDF raises \$2 billion and €1.25 billion

On 27 November 2019, EDF raised \$2 billion through issuance of a senior bond with 50-year maturity and a fixed coupon of 4.50%. This transaction demonstrates the Group's capacity to attract a highly diversified investor base at the long end of the credit curve.

In addition, on 2 December 2019, EDF raised €1.25 billion through issuance of a senior bond, with 30-year maturity and a fixed coupon of 2.00%. This is the largest amount raised by a corporate issuer on this maturity in the Euro market.

3.4 Renewable energies

3.4.1 Offshore wind power: France

■ In early June 2019, the French Council of State validated the plan to build a 480MW 80-turbine wind farm off the west coast of France near Saint-Nazaire, dismissing the appeals filed by environmental associations. After examining the merits of the appeal proceedings, France's highest administrative court rejected the applications by the *Groupement des résidents pour la sauvegarde environnementale de La Baule* and the *Association pour la protection du site et de l'environnement de Sainte-Marguerite*. The Council of State's decision allows EDF Renewables and its Canadian partner Enbridge to continue development of the project. Construction of this first French offshore wind farm began in September 2019.

■ Following a public tender procedure, France's Ministry for the Ecological and Inclusive Transition selected the EDF group, via its subsidiary EDF Renewables, in partnership with Innogy and Enbridge, to design, build, operate and maintain the future Dunkirk offshore wind farm off France's north coast.

This is the fourth offshore project that the Group has won through French government tender procedures, after its successful bids for three projects in 2012 at Saint-Nazaire, Fécamp and Courseulles-sur-Mer. The future Dunkirk wind farm will be more than 10km off the coast and will have installed capacity of almost 600MW. It will supply the equivalent of around 40% of the *département du Nord's* electricity needs.

These projects are being undertaken with industrial partners, and are accounted for under the equity method in the Group's consolidated financial statements.

3.4.2 Acquisition of the Luxel Group

On 28 March 2019, EDF Renewables acquired the Luxel Group, an independent photovoltaic energy operator in France which holds a portfolio of 1GWc of projects already in operation, ready to build or under development. This acquisition significantly reinforces EDF Renewables' position in solar power in France, with a view to achieving the ambitious objectives in EDF's Solar Plan.

3.4.3 Signature of agreements in China for two offshore wind farms and heat network optimisation

On 25 March 2019 EDF signed two agreements for low-carbon projects in China:

■ the cooperation agreement signed with China Energy Investment, a leading industrial player on China's electricity market, concerns EDF's acquisition of a stake in the Dongtai IV and V offshore wind power projects, located off the coast of Jiangsu Province north of Shanghai;

■ the Dongtai IV and Dongtai V projects are currently being built. Subject to execution of the final contracts, both partners will build and operate total installed capacity of 500MW which will be gradually commissioned up until 2021;

■ EDF and the electricity utility Huadian have signed a cooperation agreement to enhance the performance of a heating and air-conditioning network for one of the districts of the city of Wuhan in central China. The network will eventually provide heating for 100,000 customers and air-conditioning for 500,000m² of office space. The signatories will jointly examine the feasibility of incorporating all

the smart energy management tools that are already being used by the EDF Group for the heating network in the city of Sanmenxia.

3.4.4 Noor Midelt I solar project in Morocco

After a competitive international bidding process, the Moroccan Agency for Sustainable Energy (MASEN) announced in 2019 that it had chosen the consortium formed by EDF (through its subsidiary EDF Renewables), Masdar (also known as the Abu Dhabi Future Energy Company), and Green of Africa (a Moroccan developer of renewable energies) for the design, construction, operation and maintenance of the first phase of the Noor Midelt I multi-technologies solar power plant.

With an installed capacity of 800MW, this hybrid solar project will use an innovative combination of concentrated solar power (CSP) and photovoltaic (PV) technologies.

3.4.5 Offshore wind power: EDF launches the Neart na Gaoithe offshore wind farm with ESB

On 28 November 2019 the EDF Group announced the construction of the Scottish Neart na Gaoithe (NnG) offshore wind farm project and a new partnership with the Irish electricity company ESB, which is taking a 50% stake in the project, acquired in May 2018 from Mainstream Renewable Power (see note 5.2 to the financial statements at 31 December 2018). ESB operates across the electricity market on the island of Ireland, from generation, through transmission and distribution to the supply of customers with an expanding presence across Great Britain. In 2017, ESB opened an office in Scotland and is spearheading further development of renewable energy projects, in particular onshore and offshore wind power.

The 450MW NnG project is part of EDF's offshore wind power development strategy and confirms its position in carbon-free energy production in the United Kingdom, a country where EDF already has a strong footprint in both nuclear and renewable power.

Neart na Gaoithe ⁽¹⁾ will consist of 54 turbines and will be located in the North Sea approximately 15km off the coast of Fife in south-east Scotland. When fully operational, the NnG offshore wind farm will generate electricity equivalent to the annual needs of over 375,000 households each year, corresponding to 4% of Scotland's electricity consumption. This fully consented offshore wind project has a 15-year Contract for Difference (CfD) at £114.39/MWh in 2012 sterling, and grid connection agreements are in place.

Onshore construction of components is now underway. Offshore construction should start in June 2020 and full commissioning is expected in 2023.

This sale operation was completed on 4 December 2019 and accounts for a large share of EDF Renewables' gains on sales of generation assets in 2019 (a total €560 million, recorded in other operating income and expenses, compared to €192 million in 2018 – see note 12.2) and contributed a €1.2 billion reduction in the EDF group's net indebtedness, due to the debt-reducing effect of loss of control over NnG.

Following this sale, the 50% holding in NnG, stated at fair value, is accounted for by the equity method.

3.4.6 Acquisition of a significant pipeline of 300MW wind projects under development in Germany

On 12 September 2019 EDF Renewables announced the acquisition of a significant wind projects pipeline of around 300MW under development across Germany from Altus AG. Altus AG will pursue the local development of these projects closely with EDF Renewables up to the construction of the future wind farms.

Located in 10 different federal states, the projects are at various stages of the development process. The land lease contracts have been secured and environmental studies are ongoing.

Once fully authorised, the projects will participate in the onshore wind power auctions organized by the German Federal Government in order to secure 20-year Power Purchase Agreements.

These wind farms should be commissioned during the next five years.

(1) Gaelic for "strength of the wind".

3.4.7 Acquisition of Pivot Power

On 4 November 2019 the EDF group announced the acquisition of a British start-up called Pivot Power, specialising in battery storage and electric vehicle charging infrastructures. This move will enable EDF, already the largest low-carbon electricity producer in the UK, to become a leader in battery storage there.

Pivot Power has an extensive portfolio of battery storage projects across more than 40 locations throughout the UK, with a total capacity of close to 2GW. There are plans to install batteries connected directly to the high-voltage transmission system. The first two storage projects at Kemsley (Kent) and Cowley (Oxford) have land, planning and grid connection agreements in place and are expected to be commissioned in 2020.

As part of EDF's Electricity Storage Plan, this acquisition contributes to the Group's target of being the leader in Europe with 10GW of additional storage by 2035. The acquisition is also in line with the EDF Electric Mobility Plan to become the leading electric mobility company by 2022 in the UK, France, Italy and Belgium. Beyond that date, the Group's goal is to provide power for 600,000 electric vehicles and install 75,000 charging points.

3.5 Significant events and transactions of 2018

3.5.1 A new partner for EDF Renewables in twenty-four UK wind farms

On 29 June 2018, EDF Renewables sold a 49% minority stake in twenty-four of its UK wind farms (around 550MW), for the price of £701 million.

The new partnership with Dalmore Capital Limited and Pensions Infrastructure Platform, with investments from large UK local authority pension schemes, will enable EDF Renewables to continue to expand the renewable energy business.

EDF Renewables retained a 51% share in this portfolio of wind farms. It also continues to run the sites and to provide operations and maintenance and asset management services.

EDF Energy also continues to purchase all of the electricity and ROCs (Renewables Obligation Certificates) generated by the wind farms, on market-standard terms.

The sale of this investment, which was considered as a transaction between shareholders with no change of control, was recognised in equity and had no impact on the Group's income statement (see the statement of Change in consolidated equity).

3.5.2 Completion of the sale of EDF's stake in Dunkerque LNG

Following a competitive auction process launched in early 2018, the EDF group announced on 29 June 2018 that it had entered into exclusive negotiations with two groups of investors for the disposal of its 65.01% interest in the share capital of Dunkerque LNG, owner and operator of the liquefied natural gas (LNG) terminal in Dunkirk.

Based on the prices paid by the two consortia, the average enterprise value for 100% of Dunkerque LNG amounted to €2.4 billion.

This transaction allowed Fluxys, already a 25% shareholder of Dunkerque LNG, to take control of and consolidate Dunkerque LNG with the support of Axa Investment Managers – Real Assets and Crédit Agricole Assurances.

EDF, as a customer of Dunkerque LNG, is still committed in the long term to the terminal, which will continue serving the Group's gas strategy.

Once the required regulatory approvals had been given, the EDF group completed the sale of its stake in the Dunkerque LNG terminal on 30 October 2018.

Following this sale, valuation of the long-term agreement between EDF and Dunkerque LNG for reservation of LNG regasification capacities led to recognition of a €737 million increase in provisions for onerous contracts. Due to the gain of €755 million generated, this operation had a net impact of €18 million on other income and expenses. It also contributed a €1.5 billion reduction in the EDF Group's net financial indebtedness, based on a sale price of approximately €1 billion net of cash transferred.

3.5.3 Flamanville 3 EPR Project

NB: This summary of the key points of 2018, which were included in the financial statements at 31 December 2018 published on 15 February 2019, should be read in conjunction with the summary of developments in 2019 presented in note 3.1.1.

Major milestones were reached during 2018:

- completion of cold functional testing, consisting of a large number of test operations including the leak performance test on the primary system at a pressure greater than 240 bar – higher than the pressure of this system once in operation;
- successful testing of the reactor containment building in April 2018. This is an in-air test that checks the concrete structure's mechanical behaviour and airtightness by raising pressure inside the building to six times the outside air pressure;
- integration of an instrumentation and control (I&C) configuration involving around 250 modifications, completed in early September 2018, so that hot functional testing can take place in a stable, coherent I&C configuration.

Equipment manufacturing and quality

At 31 December 2018, almost all the equipment for the nuclear section and the conventional island, had been delivered and assembled on site. The situation at that date as regards the quality of equipment manufactured by Framatome for the primary system is described in the following paragraphs.

Vessel

The issue of the higher-than expected carbon content in the vessel head and bottom was examined by the French Nuclear Safety Authority ASN (Agence de sécurité nucléaire) during the first half of 2017 on the basis of documentation submitted by Framatome under the supervision of EDF. Based on the opinion of a group of ASN-appointed experts, the ASN issued an opinion on 11 October 2017 concluding that the mechanical properties of the vessel head and bottom head were adequate for their uses, including in the event of an accident.

On 9 October 2018, the ASN authorised:

- the commissioning of the vessel bottom, subject to functional checks;
- the commissioning of the vessel head, for a limited operating life until 2024 unless the technical feasibility of checks comparable to the vessel bottom checks can be demonstrated.

EDF worked on development of in-service vessel head checks, in order to go back to the ASN later in 2019 for permission to retain the current vessel head if such checks were industrially feasible. If permission were not given, EDF could remain liable for some or all of the costs incurred to manufacture a replacement vessel head. These costs are not included in the target construction cost, since if they arise they would do so after the plant's commissioning. EDF SA initiated arbitration proceedings against AREVA SA on this matter.

Break preclusion and quality deviations in the welds of the main secondary system

On 30 November 2017, EDF declared a significant event to the ASN regarding the detection of a quality deviation in the welding of the secondary system that conducts the steam from the steam generators to the turbine of the Flamanville 3 EPR.

6. Financial statements

Notes to the consolidated financial statements

This system (main steam lines) was designed and manufactured according to the “break preclusion” concept, with stricter requirements for design, manufacture and in-service monitoring. These stricter requirements, requested by EDF, are backed up by a “high quality” requirement for the building of these systems.

Although these requirements were applied during the design phase, they were not properly incorporated into the welding work. Failure to meet these requirements does not necessarily entail non-compliance with the nuclear pressure equipment regulations.

From 21 March 2018, during an initial comprehensive inspection, EDF detected other quality deviations in welds on the pipes in the main secondary system of the Flamanville 3 EPR. The initial comprehensive inspection is a mandatory by law before commissioning plant, and mainly involves examination of the welds on the primary and secondary systems. It gives rise to an initial benchmark report on the state of plant before it begins operation.

In accordance with industrial procedures, the welds had been checked by the consortium of contractors in charge of manufacturing the system and each one had been declared compliant as the work was done.

On 10 April 2018 (see EDF’s press release of the same date), EDF notified the ASN of a significant event relating to the detection of deviations in the performance checks on these welds (part of the main secondary system was already concerned by the insufficient application of the “break preclusion” requirements).

EDF therefore began a further inspection during the second quarter of 2018 of all 150 welds concerned in the main secondary system. Of these 150 welds:

- 87 welds were compliant with requirements;
- 33 welds had quality deficiencies and had to be repaired. The work on site to repair these welds began in late July 2018;
- EDF also decided to rework a further 20 welds which, although they had no defects, did not meet the break preclusion requirements defined by EDF during the EPR design phase. The files for adjustments to the first welds was sent to the ASN, and on-site welding work began in November 2018;

- for 10 other welds, EDF submitted a proposal to the ASN detailing a specific justification method to confirm the high level of safety at the plant throughout its operating life. After a final analysis this number was reduced to eight. It also became clear from checks that one of these eight welds had a small quality defect. The ASN was due to closely examine EDF’s specific justification method in the following few months:

Commissioning schedule and construction costs

On 25 July 2018 (see EDF’s press release of the same date), the Group presented an update concerning these inspections, and adjusted the Flamanville EPR schedule and target construction costs.

- the target date for loading the nuclear fuel was scheduled for the end of the fourth quarter of 2019, with start-up and hot functional testing planned for late 2018;
- the target construction costs were revised from €10.5 billion to €10.9 billion (in 2015 euros, excluding borrowing costs).

On 21 January 2019 (see EDF’s press release of the same date) EDF announced that the schedule for hot functional testing had been revised, and was now expected to commence during the second half of February 2019.

The schedule and estimated construction costs remained tight. They included a timetable for receiving authorisations from the ASN as explained above, which among other factors was contingent on the ASN completing its examination of the methods proposed by EDF for repairing the welds in the main secondary system, as stated in the Group’s press release of 31 January 2019.

On 29 January 2019 the Chairman of the ASN announced that the ASN would issue a statement in May 2019 concerning the validation programme for the welds in the main secondary system, saying “if it turns out that the eight welds in the reactor containment building structure also need reworking then it will not be possible to meet the deadline.” A detailed update on progress on the Flamanville EPR, particularly the schedule and construction cost, would be issued after the ASN’s statement had been published. EDF was not in a position at that date to assess the impact in the event the ASN did not validate the proposed approach.

Note 4 Regulatory changes in France

4.1 France’s multi-year energy programme (PPE) and The Energy and Climate law

The multi-year energy programme (PPE) is a tool for the energy policy introduced by the French law on the energy transition for green growth adopted in 2015.

In principle, the PPE covers two successive five-year periods. The first PPE published in October 2016 departed from this rule by setting out two successive periods of three and five years respectively, 2016-2018 and 2019-2023. The revised PPE, which is not yet finalised, will cover the periods 2019-2023 and 2024-2028.

An initial draft PPE published on 25 January 2019 by the Ministry for the Ecological and Inclusive Transition

For nuclear electricity generation, the French government has now set the deadline of 2035 for reaching the objective of a 50% nuclear share in the national electricity mix.

To achieve this, 12 nuclear reactors will have to be shut down by 2035, in addition to the closure of the two Fessenheim reactors in the spring of 2020. The reactors concerned will be shut down when their fifth 10-year inspection is due, except for 2 reactors which will be shut down earlier in 2027 and 2028, provided the criterion of secure supply is respected. Two additional reactors could also be shut down

in 2025-2026 if certain conditions relating to electricity prices, secure supply and European electricity market trends are fulfilled.

The draft PPE states that the French government will propose the terms of a new regulation system for existing nuclear plants that will protect consumers against rising market prices after 2025, while giving EDF the financial capacity to ensure economic sustainability of generation facilities and meet the requirements of the PPE in low-price scenarios.

It also states that “the Government, together with the industry, will conduct a programme of work by mid-2021 to examine the questions of the cost of new nuclear energy production and its advantages and disadvantages in relation to other low-carbon generation methods, the possible financing models, the project management modalities for new reactor projects and public consultation, and matters relating to the management of waste generated by the potential new nuclear fleet [...]. Based on this information and depending on developments in the energy situation, the Government will make a decision regarding the suitability of launching a renewal programme for nuclear installations”.

For fossil-fired electricity generation, the objective is to close down the last entirely coal-fired plants by 2022, and stop granting authorisations for new power plants that produce electricity exclusively from fossil fuels.

This draft PPE also sets the objective of a significant step-up in the pace of development of renewable energies.

The draft went through various consultation processes in 2019 and 2020.

The Energy and Climate law

France's Energy and Climate law of 8 November 2019 was published in the *Journal officiel* on 9 November 2019. Its principal measures affecting the Group's business are the following:

Article 1 revises the objectives of France's energy policy in the light of results of preparatory work for the national low-carbon strategy and the Multi-Year Energy Programme (PPE):

- the objective of "dividing greenhouse gas emissions by four between 1990 and 2050" is replaced by the objective of "achieving carbon neutrality by 2050, by reducing greenhouse gas emissions by a factor of more than six between 1990 and 2050";
- the objective of "reducing primary fossil fuel energy consumption by 30%, compared to the reference year of 2012, by 2030" is replaced by the objective of "reducing primary fossil fuel energy consumption by 40% by 2030";
- and finally, the time horizon for reducing the nuclear share of France's electricity output to 50% is set at 2035.

Article 12 introduces a cap on greenhouse gas emissions, applicable from 1 January 2022 to installations generating energy from fossil fuel. This cap was set by decree 2019-1467 of 26 December 2019, and will lead to the closure of entirely coal-fired plants by 1 January 2022. State support measures will be provided for the employees and subcontractors concerned, and local projects are planned, as indicated in the press file on the closure of coal-fired power plants by 2022 released by the Ministry for the Ecological and Inclusive Transition.

Based on the proposed version of this law, the Group had previously announced that it intended to close down the Le Havre plant by the spring of 2021, and was still examining the possibilities of converting the Cordemais plant to a biomass plant. After a meeting held on 24 January 2019, EDF and the Ministry for the Ecological and Inclusive Transition approved a programme of work prior to making a decision about the Ecocombust project for production of an innovative, ecological fuel that could be used by heating facilities or electricity plants that currently run on coal. To guarantee a secure electricity supply, if the studies by RTE commissioned by the French government confirm the need, some or all of the biomass produced could be used to provide 80% of the fuel for the current Cordemais units until 2026, to keep the electricity network in the west of France secure at the highest peak consumption times.

As a result, the ends of the depreciation periods for the Le Havre and Cordemais plants were changed in the first half of 2019 and set at 2021 for Le Havre and 2026 for Cordemais. The closure date for Le Havre has been confirmed as 1 April 2021, but the dates for Cordemais could still change depending on final decisions yet to be made, particularly concerning the Ecocombust project.

The principal consequence of this prospective modification of the depreciation periods in the Group's financial statements at 31 December 2019 is an increase of some €141 million in the depreciation expense.

Article 62 of The Energy and Climate law aims to modify the calculation of the price supplements in the ARENH mechanism for Regulated access to historic nuclear power, to take account of the effect of the ceiling defined in Article L. 336-1 of the Energy Code. A key objective of these price supplements is to ensure that demand from suppliers for ARENH is commensurate with their requirements, and thus avoid effects that are detrimental to the public interest.

The ARENH ceiling was raised to 150TWh from 1 January 2020. However, the volume limit that determines the maximum total volume of ARENH deliveries allowed per year (up to the ceiling) has not been changed for 2020, and thus remains at 100TWh.

The Energy and Climate law also contains four articles concerning regulated sales tariffs, following the rejection of provisions initially proposed in the draft "PACTE" law for business growth and transformation:

- Article 63 sets out the terms for the discontinuation of regulated gas sales tariffs for all consumers, to bring French law into line with European Union law. Sales of regulated-tariff gas contracts were discontinued in the month following enactment of the law, and it is now impossible to subscribe or modify a new natural gas contract on regulated sales tariffs. The regulated tariffs will be discontinued for small businesses from 1 December 2020, and for all consumers

from 1 July 2023. The necessary support measures for these tariff discontinuations are defined in the law;

- Articles 64 and following set out the terms for the discontinuation of regulated electricity sales tariffs for non-residential customers with more than 10 employees or annual sales, total income or balance sheet total of more than €2 million.

A new draft PPE taking account of comments and opinions expressed was published on 20 January 2020 by the Ministry for the Ecological and Inclusive Transition and is subject to a consultation process until 19 February 2020

Concerning nuclear electricity and the objective of having 50% nuclear power in France's energy mix by 2035, which is now part of the Energy Code as a result of the Energy and Climate law of 8 November 2019, this revised draft PPE specifies the details and conditions for the reactor shutdowns. Priority will be given to shutdowns that minimise the economic and social impact, have the lowest impact on the electricity network, and do not entail closure of an entire site. At the request of the French government, based on these criteria, on 20 January 2020 EDF proposed to examine the possibility of shutting down pairs of reactors at the sites of Blayais, Bugey, Chinon, Cruas, Dampierre, Gravelines and Tricastin.

It is also now stipulated that early reactor shutdowns will be confirmed 3 years prior to implementation.

Finalisation and adoption of this PPE would result in reflection in the Group's financial statements of the two early reactor shutdowns in 2027 and 2028, ahead of their fifth 10-year inspection. The change to their operating life would lead to prospective modification of the depreciation period, and a change in estimate for the nuclear provisions. As this situation would bring forward the shutdown of two reactors in the fleet by a few years, the various scenarios examined indicate that the potential effect on nuclear provisions, particularly the decommissioning provision, could be an increase of some tens of millions of euros, which would be recognised via an adjustment to the relevant balance sheet assets.

Public consultation on regulation of existing nuclear facilities

In January 2020, the French government launched a consultation process, to have the opinions of actors from the world of energy on the reform of regulation of existing nuclear facilities (ARENH).

This consultation has been undertaken in application of the draft Multi-Year Energy Programme (PPE), which states that "the Government will propose the terms of a new regulation system for existing nuclear plants that will protect consumers against rising market prices after 2025 by allowing them to benefit from the competitive advantage of investments made in the historical nuclear power plant fleet, while giving EDF the financial capacity to ensure economic sustainability of generation facilities and meet the requirements of the PPE in low-price scenarios".

To achieve this objective, the French government intends to introduce economic regulations obliging EDF to provide a service of general economic interest (SGEI) to the benefit of all French consumers, in a transparent and non-discriminatory manner, with a focus on protection of the consumer and the climate.

This SGEI would be supported by economic regulation of the existing nuclear fleet, to reconcile and contribute to the following aims:

- long-term protection of all consumers located on French territory, regardless of their supplier and with respect to some of their non-peak power supplies, by enabling them to benefit from stable conditions for carbon-free, manageable production of electricity by the existing nuclear fleet they helped to finance;
- achievement of the climate targets France has set itself, and also of its objectives for a secure power supply and energy independence, by safeguarding the carbon-free electricity supply in France and more broadly in Europe, through secure long-term financing for operation of the existing nuclear installations that are necessary for that supply.

Like many other actors in the sector, the EDF group will take part in this consultation, which is to continue until 17 March 2020.

4.2 Regulated electricity sales tariffs in France – “Blue” tariffs

Modification of the legislative and regulatory framework

In response to matters submitted by ANODE (the national association of retail energy operators) and Engie, France’s Council of State ruled in decisions of 18 May and 3 October 2018 that the principle of regulated electricity sales tariffs is compatible with European Union law when such tariffs serve the objective of guaranteeing consumers an electricity price that is more stable than market prices. The Council of State confirmed that this objective cannot be achieved by softer State intervention and that regulation of sales tariffs guarantees electricity firms equal access to consumers and is not discriminatory.

However, the Council of State considered that the tariff regulation was disproportionate in its duration, which is permanent, and its scope of application, which covers large business sites with subscribed power levels below 36kVA. These facts were cited as justification for partial cancellation of the tariff decisions of 28 July 2016 and 27 July 2017.

Directive (EU) 2019/944 of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU was published in the OJEU on 14 June 2019. This directive requires continuation of regulated sales tariffs for residential customers and very small businesses.

France’s Energy and Climate law sets out the terms of the discontinuation of regulated electricity sales tariffs for non-residential customers, in compliance with this directive and the Council of State’s decision. These tariffs are now reserved for all consumers, whether residential or business customers, with subscribed power levels of 36kVA provided they have fewer than 10 employees and their annual sales, income or balance sheet total is below €2 million.

The discontinuation of regulated electricity sales tariffs for customers who are no longer eligible will take effect at 1 January 2021. In the meantime, The Energy and Climate law and the official decisions⁽¹⁾ made for application of that law define a process to be led by the historical suppliers. The steps in this process include identifying and informing the customers concerned, and making their data available to alternative suppliers, in compliance with the rules governing management of personal data. Consumers affected by discontinuation of the regulated sales tariffs will no longer be able to subscribe or modify a regulated-tariff contract from 1 January 2020. From 1 January 2021, any such consumers who have not subscribed a new contract will automatically be switched to a market-rate contract with their previous supplier.

Tariff changes

Since 8 December 2015, in accordance with the NOME Law on organisation of the French electricity market (Articles L. 337-4 and L. 337-13 of the French Energy Code), the French Energy Regulatory Commission (Commission de régulation de l’énergie or CRE) has been responsible for sending the Ministers for the Economy and Energy its reasoned proposals for regulated sales tariffs for electricity. If no objections are made within three months, the proposals are deemed to have been approved.

In a decision of 7 February 2019 published on 12 February 2019, the CRE proposed an increase of 7.7% (excluding taxes) in the “blue” regulated tariffs for residential and non-residential customers, or 5.9% including taxes. The government had announced in late 2018 that electricity tariffs would not increase during the winter period, and only approved the CRE’s proposal in early May 2019, within the three-month period allowed under the Energy Code. The tariff decisions of 28 May 2019 were published in the *Journal officiel* of 30 May 2019 and took effect on 1 June 2019.

The consumer associations *UFC Que Choisir* and *Consommation Cadre de Vie Logement* (CLCV) challenged these decisions through an ultra vires application to the Council of State requesting their cancellation, together with an urgent petition for suspension of execution of the decisions until a ruling on the merits of the case could be issued. In an ordinance of 12 July 2019, the urgent applications judge

refused to grant the suspension since there was no urgency. The Council of State subsequently rejected the merits of the challenge in a decision of 6 November 2019, thus validating the tariff structure implemented by the CRE on the grounds of the Energy Code.

Also, given the change in the “TURPE” network access tariff applicable from 1 August 2019, and in application of the Energy Code, in a decision of 25 June 2019 published on 2 July 2019 the CRE proposed an increase of 1.47% excluding taxes (1.26% including taxes) in “blue” tariffs for residential customers and 1.34% excluding taxes (1.10% including taxes) in “blue” tariffs for non-residential customers. The CRE’s proposal was confirmed in a tariff decision of 30 July 2019, published in the *Journal officiel* of 31 July 2019, and implemented on 1 August 2019.

Finally, in a decision of 16 January 2020 the CRE proposed an increase of 2.4% (including taxes) in the “blue” tariffs for residential and non-residential customers (3.0% excluding taxes for residential customers and 3.1% excluding taxes for non-residential customers). This proposed increase takes account of the rise in prices on the wholesale energy markets, the level of ARENH curtailments for 2020, higher selling costs including the costs of purchasing energy savings certificates, and the adjustments made to narrow the gap between costs and revenues observed on regulated electricity sales tariffs during 2019, notably following application from 1 June 2019 of the CRE’s tariff proposal of 7 February 2019. This latest CRE proposal was confirmed by tariff decisions of 29 January 2020 that were published in the *Journal officiel* of 31 January 2020, and applied from 1 February 2020.

4.3 “TURPE” network access tariffs

On 17 November 2016, the CRE published its decisions for the TURPE 5 Transmission (high voltage) and TURPE 5 Distribution (medium voltage and low voltage) tariffs for the period 2017-2020. The new TURPE 5 tariff frame took effect on 1 August 2017.

TURPE 5 Transmission tariffs

The TURPE 5 Transmission tariff came into force with a 6.76% tariff increase effective from 1 August 2017, to be followed by subsequent estimated rises on 1 August in the years 2018 to 2020, based on average inflation observed over the previous calendar year, adjusted by a correcting factor to balance the income and expenses adjustment account (CRCP)⁽²⁾. The TURPE 5 Transmission tariff sets the weighted average cost of capital (WACC) at 6.125% for the return on RTE’s asset base versus 7.25% for TURPE 4.

On 6 June 2019 the CRE adopted a decision concerning the TURPE 5 tariff for the high voltage network and its revision at 1 August 2019, following the 3% increase on 1 August 2018. The tariff scale increased by an average 2.16% from 1 August 2019, comprising +1.61% for inflation and +0.55% to balance the CRCP.

TURPE 5 and TURPE 5 bis Distribution tariffs

TURPE 5

The TURPE 5 Distribution tariff came into force with a 2.71% tariff increase, which took effect on 1 August 2017, to be followed by subsequent estimated rises on 1 August in the years 2018 to 2020, based on average inflation observed over the previous calendar year, adjusted by a correcting factor to balance the CRCP. The TURPE 5 continues to use the previous method for calculating cost of capital, setting the margin on assets at 2.6% and the return on regulated equity at 4.1%.

Action against the TURPE 5 HTA/BT (medium/low voltage) tariffs

- By a decision of 12 January 2017 published in the *Journal officiel* of 17 January 2017, the French Minister for Energy, acting within the two-month response period, requested a new decision from the CRE as in her opinion the decision of 17 November 2016 had not taken national energy policy orientations into consideration. In a new decision of 19 January 2017, the CRE reiterated its initial decision of 17 November 2016. Both decisions were published in the *Journal officiel* of 28 January 2017;

(1) Decision of 12 December 2019 concerning identification and provision of the list of non-domestic customers no longer eligible for regulated electricity sales tariffs;
Decision of 12 December 2019 concerning information of consumers on regulated electricity sales tariffs, by their supplier, about the discontinuation of their regulated-tariff contracts;
Decision of 26 December 2019 listing the data suppliers offering regulated-tariff electricity sales contracts must make available to other electricity suppliers upon request.

(2) A mechanism to measure and offset differences between the actual figures and the forecasts on which tariffs are based.

- On 2 February 2017, Enedis filed an application before the Council of State for cancellation of these two CRE decisions;
- On 3 February 2017, EDF, in its capacity as the shareholder of Enedis, also filed an application before the Council of State for cancellation of the same CRE decisions;
- By a decision of 9 March 2018, the Council of State partly cancelled the TURPE 5 decisions since the regulator "did not, in determining the cost of capital invested, apply, in addition to the 'risk premium', the 'risk-free rate' to the assets corresponding to items funded, at the time of replacement of installations, by recovery of the remaining portion of the provisions established during the tariff period covered by the 'TURPE 2' tariffs, and the corresponding portion of the installations handed over by the concessionary authorities to the network operator during the same period".

Second TURPE 5 HTA/BT (medium/low voltage) tariffs

On 28 June 2018, the CRE adopted a decision regarding the TURPE 5 HTA-BT (medium voltage – low voltage) tariff and the change from 1 August 2018 to that tariff, known as the "second TURPE 5 HTA-BT". This decision included an adjustment of an average -0.21% to the TURPE 5 from 1 August 2018, following a combination of factors:

- implementation of the Council of State's partial cancellation decision on 9 March 2018, and the concurrent application of a lower corporate income tax rate: these two effects almost totally offset each other over the period 2018-2020 (combined effect of +0.06%);
- the standard inflation-based adjustment at 1 August (+1%) and balancing of the CRCP (-1.27%);
- the -0.21% reduction is modulated according to the tariff structure: on average -1.16% for users of the medium voltage networks (HTA), -0.59% for low voltage networks (BT) above 36kVA, and +0.14% for low voltage networks (BT) below 36kVA.

This decision had no impact on the tariff preparation method, the operating expense trajectory, the principle of regulation for incentive purposes, or the regulations applicable to Linky meters. The change in the corporate income tax rate is equivalent to adjusting the return on regulated equity to 4% and the margin on assets to 2.5% (previously 4.1% and 2.6% respectively).

The decision also reiterated previous CRE decisions about expenses relating to customer management under a single contract (decision of 26 October 2017), via the management component, and collective auto consumption (decision of 7 June 2018), via the energy withdrawal component. It was published in the *Journal officiel* on 29 July 2018.

In particular, to implement the Council of State's decision of 9 March 2018, the CRE added back an annual amount of around €1.6 billion (and will add back declining amounts until 2073) to regulated equity. The CRE considers that this will lead to Enedis receiving additional remuneration equivalent to €750 million (in 2018 euros) expressed in the present value of pre-tax cash flows. This add-back to regulated equity results in remuneration of some €60 million per year in the first few years, on a basis that will reduce progressively until 2073 at a (nominal pre-tax) rate that may, under the present method, be revised by the CRE at each tariff period.

On 25 June 2019 the CRE adopted a decision concerning revision of the TURPE 5 tariff for the medium and low voltage network at 1 August 2019. The tariff scale increased by an average +3.04% from 1 August 2019, comprising +1.61% for inflation, +1.45% to balance the CRCP, and -0.02% in application of the Council of State's decision of 9 March 2018.

Supplier commissioning

After Law 2017-1839 of 30 December 2017 confirmed the CRE's competence for supplier commissioning, the CRE issued a new decision on 18 January 2018, published in the *Journal officiel* of 25 January 2018. This decision reiterated the principles adopted in its previous decision of 26 October 2017 regarding remuneration payable by distribution network operators to suppliers for the service of managing single-contract customers on their behalf.

The content of these decisions upheld the principle of identical commissions for all suppliers selling single-contract market-price offers. Only regulated electricity tariffs were to give rise to slightly lower commissions (€4.50 instead of €6.80 per point of delivery until 1 August 2019), with progressive reduction of this difference to zero by 1 August 2022.

For remuneration of past customer management charges (prior to 1 January 2018), the CRE's decision set an amount it considered as a cap that can be passed on through the TURPE tariff.

However, Law 2017-1839 of 30 December 2017 introduced a measure intended to rule out the possibility of suppliers receiving remuneration from network managers for past customer management services.

On 23 December 2016, Engie brought an action against Enedis before the Paris Commercial Court claiming such remuneration. In the course of this litigation, Engie filed an application for a preliminary ruling on constitutionality (*question prioritaire de constitutionnalité*) concerning the arrangements introduced by the French "Hydrocarbons" law which ended the possibility of obtaining supplier commissioning for past services. These arrangements were validated by the Constitutional Council in its decision 2019-776 of 19 April 2019. The proceedings are still ongoing.

Electricity Equalisation Fund

On 22 March 2018, the CRE published its consultation on the levels of contribution due to the Electricity Equalisation Fund for EDF SEI and Électricité de Mayotte for the years 2018 to 2021. The annual average contribution to the Electricity Equalisation Fund for EDF SEI, including the planned smart metering system, is €185 million for the period 2018-2021.

The draft amended decisions for the period 2012-2017 and the proposed decisions for the years 2018 and 2019 were published in the *Journal officiel* on 21 June 2019 and 19 October 2019. Their implications are as follows:

- for Enedis, an additional retroactive contribution to the Electricity Equalisation Fund amounting to €188 million (€159 million for 2012-2017 and €29 million for 2018), and a contribution of €28 million for 2019. All of these charges will be covered by the tariff, through the CRCP mechanism;
- a system to spread payment of the arrears for 2012-2017 over 2019 and 2020 has been decided, allowing Enedis to distribute the effect of the €159 million contribution between 2019 and 2020. A provision of €140 million had been established at 31 December 2018, and was fully reversed in 2019;
- for Électricité de Strasbourg, an additional retroactive contribution to the Electricity Equalisation Fund amounting to €22.3 million (€18.7 million for 2012-2017 and €1.9 million for 2018), and a contribution of €1.7 million for 2019.

4.4 Compensation for public energy service charges (CSPE)

Legal and regulatory framework

The compensation mechanism for public energy service charges (*compensation des charges de service public de l'énergie*) results from a reform introduced by France's amended finance law for 2015, published in the *Journal officiel* on 30 December 2015. Under the legislative and regulatory framework, the public energy service charges (electricity and gas) were to be compensated via two State budget items included in France's finance laws from 2016 onwards. The initial finance law for 2020 marks a continuation from 2019, defining the following measures for compensation of charges for 2020:

- a special "energy transition" budget item of €6.3 billion, principally to compensate for the additional costs associated with all contracts obliging the operators to purchase renewable energies and (to a much smaller degree) biogas, and covering the last annual contribution to repayment of the accumulated shortfall in compensation due to EDF;
- a "Public Energy Service" item of €2.7 billion in the general budget, notably to cover solidarity charges borne by gas and electricity suppliers, costs associated with purchase obligations excluding renewable energies (essentially cogeneration), and the cost of applying the standard national tariffs to zones that are not connected to France's mainland network. The interest on the accumulated shortfall to be repaid to EDF is also funded through the general budget.

Since 1 January 2018, the "basic necessity" rates for electricity and the "special solidarity" rates for gas have been replaced by an energy voucher system. The cost of this system is not borne by EDF, but has been budgeted by the State in the "Public Energy Service" programme. However, EDF bore solidarity charges in 2019 and will bear such charges in 2020 for the national housing solidarity fund and services for vulnerable customers.

6. Financial statements

Notes to the consolidated financial statements

In 2020, this mechanism of compensation for public service charges will be funded as follows:

- the costs linked to the energy transition, which correspond to the subsidy mechanisms for renewable energies, and the reimbursement of the past accumulated shortfall in compensation borne by EDF as measured at 31 December 2015, are registered in a special "energy transition" budget item created by the amended finance law for 2015. Law no. 2016-1917 of 29 December 2016 (the finance law for 2017) stipulated that the two sources of additional funding for this special budget item would be a portion of the domestic tax on coal, lignite and coke (TICC), and a portion of the domestic tax on energy products (TICPE), the latter providing most of the funding. The finance law for 2020 replaces the percentages of the TICC and TICPE by a set amount, to avoid the uncertainties of forecast income from these taxes, and broadens the sources of funding for the "energy transition" budget item by including the proceeds of auctions of Guarantees of Origin as allowed by Article L. 314-14-1 of the Energy Code. The initial French finance law for 2020 also proposes to discontinue this "energy transition" budget item in 2021, with the costs concerned subsequently covered directly by the general budget;
- other public service charges excluding costs associated with the subsidy mechanisms for renewable energies (*i.e.* costs relating to fuel poverty, tariff equalisation in zones that are not connected to France's mainland network, cogeneration, the budget for the energy ombudsman, etc.) are registered directly in the general budget;
- income generated by the domestic tax on the final consumption of electricity, now renamed the Compensation for Public Electricity Charges (CSPE) goes directly into the general budget. The CSPE tax is collected directly from final consumers of electricity in the form of an additional levy on the electricity sale price (and collected from electricity suppliers), or directly from electricity producers that produce electricity for their own uses.

The level of the CSPE tax was set in 2016 at a full rate of €22.5/MWh, and eight reduced rates ranging from €12/MWh to €0.5/MWh depending on criteria of electro-intensiveness, business category and the risk of carbon leakage from installations (the risk of industries relocating to countries where greenhouse gas emissions are higher due to their electricity mix). The level remains unchanged in 2020.

The amended finance law for 2019 applied a downward adjustment to the amounts of compensation payable by the State for public service charges borne in 2019, which had decreased due to the smaller differential between the market price for electricity and the purchase obligation tariff payable to producers. For the same reason, the State adjusted the reduction in compensation levels paid in 2019, since the final expenses for 2018 were lower than the reforecasts on which compensation paid in 2018 had been based.

Public service charges borne by EDF

The amount of expenses (excluding the annual contribution to repayment and associated interest) to be compensated to EDF for 2019 is €7,662 million.

The amounts received in the year 2019 (excluding the annual contribution to repayment and associated interest) totalled €6,800 million (including €4,458 million for the dedicated "energy transition" budget account and €2,342 million for the general budget). EDF also paid the CRE an amount of €12.5 million in December 2019 as a first instalment of reimbursement of residual amounts from the former CSPE mechanism prior to 2016.

A repayment schedule for EDF's receivable corresponding to the accumulated shortfall in compensation, which amounted to €5,780 million at 31 December 2015, was set out in the ministerial decision of 13 May 2016, amended on 2 December 2016. Under this schedule the receivable will be fully repaid by 2020. On 22 December 2016 EDF securitised a portion of this receivable (€1.5 billion) through a State-approved "Daily law" assignment to two groups of assignees. Consequently, since 1 January 2017 EDF has received 73.6% of payments made by the State in reimbursement of the receivable as set out in the repayment schedule. The remainder is paid directly to the assignees.

During 2019, the State paid EDF €1,353 million of the principal amount of the financial receivable, equal to the annual contribution for 2019 as set out in the repayment schedule. At 31 December 2019, EDF's share of the outstanding financial receivable amounted to €660 million which is due to be paid to EDF by the State.

The operating receivable owed by the State to EDF still amounts to €1,647 million at 31 December 2019. The situation will be closely monitored in view of the Finance Law for 2020 adopted by vote in late 2019, which provides for discontinuation of the special "energy transition" budget item from 2021.

Finally, in accordance with decree 2016-158 of 18 February 2016 concerning compensation for public energy service charges, on 11 July 2019 the CRE published its decision 2019-172 recording the public service charges for 2018 (€6,656 million) and providing a revised forecast of charges for 2019 (€7,123 million) and a forecast of charges for 2020 (€7,206 million).

4.5 French capacity mechanism

The French capacity mechanism took effect on 1 January 2017. It was introduced by France's Energy Code to ensure secure national power supplies.

The market reference prices for 2017, 2018 and 2019 were established respectively at €10.00/kWh, €9.34/kWh and €17.37/kWh. The first "rebalancing" auction for 2019 held on 16 May 2019 resulted in a price of €0.00/kWh.

Six auctions held in 2019 for energy deliveries in 2020 resulted in the following prices: €20/kWh, €20/kWh, €22.4/kWh, €20/kWh, €17.8/kWh and €16.6/kWh.

4.6 Energy savings certificates

Decree 2017-690 of 2 May 2017 issued by the French Ministry for the Environment, Energy and the Sea substantially raised the obligation levels for the fourth period of energy savings obligations running from 1 January 2018 to 31 December 2020, to 1,200TWhc for the "standard" obligations and 400TWhc for the obligations that are intended to benefit households in situations of energy poverty, compared to 700TWhc and 150TWhc respectively for the previous period.

This significant increase, combined with a shallow market for energy savings certificates and doubts over that market's future liquidity, exposed the Group in 2018 to the risk of a fine payable to the Treasury (under Article L221-4 of the Energy Code) of €15 per MWhc of shortfall in respect of its obligation, due to insufficient certificates for the fourth period of the scheme.

In order to meet these requirements, the Group is making every effort to gradually increase its number of energy savings certificates, taking advantage of the "Coup de pouce" operations launched in France early in 2019 (financial aid for replacing oil heating by heat pumps, 50% additional energy savings subsidy for heat pump users, special offers for heat pump maintenance contracts, etc.). The volume of certificates earned doubled between 2017 and 2019, with a particularly notable increase of 44% between 2018 and 2019.

The law no. 2019-1147 of 8 November 2019 relating to Energy and the Climate, as well as prolonging the fourth period of the energy savings certificates scheme, includes a chapter on measures against fraud concerning these certificates designed to make controls and sanctions more efficient.

Subsequently, decree 2019-1320 of 9 December 2019, published in the *Journal officiel* on 11 December 2019, extended the fourth period by one year to 31 December 2021 under identical annual obligations. Also, Article 143 of the "PACTE" law for business growth and transformation broadens the scope of energy savings certificates to include facilities classified for environmental protection that are subject to greenhouse gas emission trading systems, by modifying Article L. 221-7 of the Energy Code.

The Group currently considers that due to the combined effect of the increase in certificates held and the extension of the fourth period, there is no risk of a shortfall in energy savings certificates at 31 December 2021.

4.7 ARENH

For the ARENH applications of November 2018, demand from alternative suppliers totalled 132.98TWh excluding EDF subsidiaries, more than the maximum total volume of 100TWh. EDF thus delivered 100TWh in 2019 under the ARENH system for supply to competitors' final customers. Subscriptions to cover network losses amounted to 20.4TWh.

These applications were made at a time when the ARENH price (which includes a capacity guarantee in its €42/MWh) was competitive in comparison to forward baseload prices for 2019.

No modifications were made to ARENH applications during the May 2019 session, and consequently no changes were made to the ARENH deliveries for 2019 after that session.

In decisions no. 2018-222 of 25 October 2018, no. 2019-090 of 9 May 2019 and no. 2019-237 of 30 October 2019, as required by the Energy Code the CRE set out the method for allocating ARENH volumes when applications exceed the maximum total volume defined for the year concerned (2018 or 2019). These decisions stipulated that if the ARENH was oversubscribed in November 2018, May 2019 or November 2019, curtailment would only apply to new ARENH applications made in the session that exceeded the maximum, and that EDF-controlled subsidiaries' excess applications would be fully curtailed (this does not apply to network

operators). Finally, the decisions stated that EDF-controlled subsidiaries could enter into contracts with the parent company replicating the ARENH system and the terms of supply, particularly the curtailment rate for alternative suppliers. In the method proposed by the CRE in decision no. 2019-028 on the calculation of regulated sales tariffs for electricity, this curtailment mechanism, when applied, makes reference to market prices more influential in determining regulated sales tariffs.

The Energy and Climate law introduced new measures. It raised the ceiling for the ARENH system, initially set at 100TWh, to 150TWh from 1 January 2020, allowing the French government to raise the maximum total volume above 100TWh, and to revise the ARENH price by ministerial decision during a transition period. However, the Ministry for the Ecological and Inclusive Transition announced that no change would be made to the ARENH price or volume for 2020.

Against this background, ARENH applications during the November 2019 session for delivery in 2020 totalled 147TWh (excluding applications from EDF subsidiaries). Since the maximum total volume has not been modified, only 100TWh will be supplied and as in the previous year the CRE will determine the curtailment of each supplier's application.

In January 2020, the French government launched a consultation process concerning the reform of regulation of existing nuclear facilities (ARENH), involving actors from the world of energy (ARENH) (see note 4.1).

Note 5 Changes in the scope of consolidation

There was no significant change in the Group's scope of consolidation during 2019, apart from the operations presented in notes 3.2.1, 3.4.2, 3.4.5 and 3.4.7.

Note 6 Segment reporting

6.1 Reporting by operating segment

Segment reporting presentation complies with IFRS 8, "Operating segments".

Segment reporting is presented before inter-segment eliminations. Inter-segment transactions take place at market prices.

In accordance with IFRS 8, the breakdown used by the EDF group corresponds to the operating segments as regularly reviewed by the Management Committee (the Group's chief operating decision-maker).

The Group's segments are:

- **"France – Generation and Supply"**: EDF's energy production and sales activities, commodity trading, and other activities;

- **"France – Regulated activities"**: distribution, transmission, EDF's island activities and the activities of Électricité de Strasbourg;
- **"Framatome"**: the entities of the Framatome subgroup;
- **"United Kingdom"**: the entities of the EDF Energy subgroup;
- **"Italy"**: Edison entities and TdE SpA;
- **"Other international"**: EDF International and the other gas and electricity entities located in continental Europe, the US, Latin America and Asia;
- **"EDF Renewables"**: the entities of the EDF Renewables subgroup;
- **"Dalkia"**: the entities of the Dalkia subgroup;
- **"Other activities"**: comprising in particular EDF Trading and EDF Investissements Groupe.

No segments have been merged.

6.1.1 At 31 December 2019

(in millions of euros)	France – Generation and Supply	France – Regulated activities	Framatome	United Kingdom	Italy	Other interna- tional	EDF Renew- ables	Dalkia	Other activities	Inter- segment eli- mi- na- tions	Total
Income statements:											
External sales	26,658	16,072	1,895	9,570	7,535	2,507	1,043	3,732	2,305	-	71,317
Inter-segment sales	1,212	15	1,482	4	32	183	522	549	423	(4,422)	-
TOTAL SALES	27,870	16,087	3,377	9,574	7,567	2,690	1,565	4,281	2,728	(4,422)	71,317
OPERATING PROFIT BEFORE DEPRECIATION AND AMORTISATION											
OPERATING PROFIT	3,483	1,892	230	(349)	72	42	670	(18)	1,009	(271)	6,760
Balance sheet:											
Goodwill	72	223	1,341	7,965	103	33	199	544	143	-	10,623
Intangible assets and property, plant and equipment	58,275	63,499	2,591	19,034	5,410	2,226	9,773	2,288	626	-	163,722
Investments in associates and joint ventures ⁽¹⁾	2,593	-	90	127	104	2,058	1,063	75	304	-	6,414
Other segment assets ⁽²⁾	19,190	4,473	1,912	5,268	1,788	620	659	1,911	2,645	-	38,466
Assets classified as held for sale	-	-	-	-	1,737	1,925	-	-	-	-	3,662
Other non-allocated assets	-	-	-	-	-	-	-	-	-	-	80,397
TOTAL ASSETS	80,130	68,195	5,934	32,394	9,142	6,862	11,694	4,818	3,718	-	303,284
Other information:											
Net depreciation and amortisation	(4,047)	(3,192)	(263)	(1,009)	(409)	(269)	(474)	(259)	(72)	-	(9,994)
Impairment	(29)	-	(10)	(127)	(60)	-	(49)	(105)	(23)	-	(403)
Equity (non-controlling interests)	117	42	163	6,622	262	398	922	279	519	-	9,324
Investments in intangible assets and property, plant and equipment	6,091	4,610	210	3,352	288	227	1,608	275	48	-	16,709

(1) At 31 December 2019, investments in associates and joint ventures include 50.1% of CTE (the joint venture holding RTE's shares) which is part of the France – Generation and Supply segment.

(2) Other segment assets include inventories, trade receivables and other receivables. By convention, the CSPE receivable is totally allocated to the France – Regulated Activities segment, in the amount of €1,667 million (see note 29).

6.1.2 At 31 December 2018

<i>(in millions of euros)</i>	France – Generation and Supply	France – Regulated activities	Framatome	United Kingdom	Italy ⁽¹⁾	Other inter- national	EDF Renew- ables	Dalkia	Other activities	Inter- segment elimina- tions	Total
Income statements:											
External sales	24,937	16,007	1,904	8,965	8,047	2,227	1,089	3,633	1,737	-	68,546
Inter-segment sales	1,159	41	1,409	5	30	184	416	556	864	(4,664)	-
TOTAL SALES	26,096	16,048	3,313	8,970	8,077	2,411	1,505	4,189	2,601	(4,664)	68,546
OPERATING PROFIT BEFORE DEPRECIATION AND AMORTISATION											
OPERATING PROFIT	2,963	1,914	240	(397)	45	(10)	316	72	574	(263)	5,454
Balance sheet:											
Goodwill	53	223	1,317	7,578	108	20	206	548	142	-	10,195
Intangible assets and property, plant and equipment	53,219	60,802	2,392	15,467	6,197	2,119	8,856	2,283	689	-	152,024
Investments in associates and joint ventures ⁽²⁾	2,394	-	87	79	73	4,053	1,307	29	265	-	8,287
Other segment assets ⁽³⁾	19,313	3,583	1,965	4,604	2,541	647	824	1,909	3,893	-	39,279
Assets classified as held for sale	-	-	-	-	-	-	-	-	-	-	-
Other non-allocated assets	-	-	-	-	-	-	-	-	-	-	73,384
TOTAL ASSETS	74,979	64,608	5,761	27,728	8,919	6,839	11,193	4,769	4,989	-	283,169
Other information:											
Net depreciation and amortisation	(3,307)	(2,942)	(211)	(982)	(343)	(249)	(437)	(205)	(99)	-	(8,775)
Impairment	(2)	-	(12)	(163)	(6)	-	(103)	-	(4)	-	(290)
Equity (non-controlling interests)	109	42	194	5,425	336	401	848	304	518	-	8,177
Investments in intangible assets and property, plant and equipment	5,526	4,334	261	2,983	277	216	1,919	388	112	-	16,016

(1) Restated for the impacts of IFRS 5 concerning the discontinued E&P operations.

(2) At 31 December 2018, investments in associates and joint ventures include 50.1% of CTE (the joint venture holding RTE's shares) which is part of the France – Generation and Supply segment.

(3) Other segment assets include inventories, trade receivables and other receivables. By convention, the CSPE receivable is totally allocated to the France – Regulated Activities segment, in the amount of €799 million (see note 29).

6. Financial statements

Notes to the consolidated financial statements

6.2 Sales to external customers, by product and service group

The Group's sales are broken down by product and service group as follows:

- **"Generation/Supply"**: energy generation and energy sales to industry, local authorities, small businesses and residential consumers. This segment also includes EDF Trading;
- **"Distribution"**: management of the low and medium-voltage public electricity distribution networks;

- **"Other"**: services and production of equipment and fuel for reactors, energy services (district heating, thermal energy services, etc.) for industry and local authorities, and new businesses mainly aimed at boosting electricity generation through cogeneration and renewable energy sources (e.g. wind turbines, photovoltaic panels, etc.).

<i>(in millions of euros)</i>	Generation-Supply	Distribution	Other ⁽¹⁾	Total
2019:				
External sales:				
■ France ⁽²⁾	26,834	15,607	289	42,730
■ International and Other activities	21,854	-	6,733	28,587
SALES	48,688	15,607	7,022	71,317

<i>(in millions of euros)</i>	Generation-Supply	Distribution	Other	Total
2018:				
External sales:				
■ France ⁽²⁾	25,217	15,555	172	40,944
■ International and Other activities ⁽³⁾	20,962	-	6,640	27,602
SALES	46,179	15,555	6,812	68,546

(1) "Other" groups of services include Framatome, which was acquired on 31 December 2017.

(2) "France" comprises the two operating segments France – Generation and Supply and France – Regulated activities (see note 6.1).

(3) Restated for the impacts of IFRS 5 concerning the discontinued E&P operations.

Income statement

Note 7 Sales

Sales are comprised of:

<i>(in millions of euros)</i>	2019	2018 ⁽¹⁾
Sales of energy and energy-related services	65,760	63,283
energy ⁽²⁾	46,590	44,473
energy-related services (including delivery ⁽³⁾)	19,170	18,810
Other sales of goods and services	4,531	4,387
Trading	1,026	876
SALES	71,317	68,546

(1) Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

(2) Sales of energy include €1,548 million of sales related to optimisation operations on the wholesale gas and electricity markets in 2019 (€1,432 million in 2018). These operations are carried out by certain Group entities to balance supply and demand, in compliance with the Group's risk management policy (see note 1.3.7). In 2019, the principal operating segments with a net short position in euros on the markets are France – Generation and Supply (gas), Italy (electricity) and the United Kingdom (electricity). In 2018, the principal operating segments were Italy (electricity) and the United Kingdom (electricity).

(3) Delivery services included in this item concern the distribution network operators Enedis, Électricité de Strasbourg and EDF SA for non-interconnected zones. However, delivery services concerning EDF Energy and Edison are included in Sales of energy, because those entities are classified as the principal under IFRS 15 for both supply and delivery (see note 1.3.7). The delivery services by EDF Energy and Edison have no impact on net income because they are included in "Transmission and delivery expenses" in note 8.

Excluding the effects of exchange rates and changes in the scope of consolidation, sales for 2019 were up by 3.5% or €2.4 billion, principally in the France – Generation and Supply segment (+6.6% or +€1.6 billion), the United Kingdom (+5.9% or +€0.5 billion) and Other activities (+35.6% or +€0.6 billion), with a decrease in Italy (-€0.7 billion or -8.1%).

The increase in sales in the France – Generation and Supply segment in 2019 is mainly due to rising price effects amounting to an estimated €2.1 billion, mainly reflecting the positive price movements on market-price offers and the 7.7% (excluding taxes) rise in regulated sales tariffs on 1 June 2019.

The rise in sales in the United Kingdom is primarily explained by a favourable price effect for electricity and an increase in capacity revenue after the capacity market resumed (see note 1.3.7), despite a decrease in sales volumes on the wholesale markets, while the decrease in sales in Italy mainly results from gas activities due to lower prices, and, to a lesser degree, a decline in volumes sold.

The increase in sales by the Other activities segment essentially relates to the LNG activities, which saw good business levels in 2019 thanks to the competitiveness of gas facilities in Europe and better use of the Group's capacities.

Note 8 Fuel and energy purchases

Fuel and energy purchases comprise:

<i>(in millions of euros)</i>	2019	2018 ⁽¹⁾
Fuel purchases used – power generation ⁽²⁾	(11,700)	(12,404)
Energy purchases ⁽²⁾	(15,041)	(13,351)
Transmission and delivery expenses	(8,325)	(7,701)
Gain/loss on hedge accounting	(7)	(18)
(Increase)/decrease in provisions related to nuclear fuels and energy purchases	(18)	418
FUEL AND ENERGY PURCHASES	(35,091)	(33,056)

(1) Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

(2) Fuel purchases used and Energy purchases include respectively €417 million and €3,117 million for optimisation operations on the wholesale gas and electricity markets in 2019 (€271 million and €2,694 million in 2018). In 2019 the principal operating segments with net long positions in euros on the markets are France – Generation and Supply (electricity), the United Kingdom (gas), Other international (Luminus – gas and electricity) and Dalkia (gas). In 2018, the segments were the same.

Fuel purchases used include costs relating to raw materials for energy generation (coal, biomass, oil, propane, fissile materials, nuclear fuels and gas), purchases of services related to the nuclear fuel cycle, and costs associated with environmental schemes (mainly greenhouse gas emission rights and renewable energy certificates).

Energy purchases include energy generated by third parties, incorporating energy derived from cogeneration intended for resale.

6. Financial statements

Notes to the consolidated financial statements

Note 9 Other external expenses

Other external expenses comprise:

<i>(in millions of euros)</i>	2019	2018*
External services	(13,120)	(13,089)
Other purchases (excluding external services, fuel and energy)	(3,598)	(3,494)
Change in inventories and capitalised production	7,932	7,139
(Increase)/decrease in provisions on other external expenses	167	182
OTHER EXTERNAL EXPENSES	(8,619)	(9,262)

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

After elimination of changes in foreign exchange rates, the scope of consolidation and the standards applied (IFRS 16), other external expenses decreased by 1.2% compared to 2018.

Note 10 Personnel expenses

10.1 Personnel expenses

Personnel expenses comprise:

<i>(in millions of euros)</i>	2019	2018*
Wages and salaries	(8,911)	(8,736)
Social contributions	(1,951)	(1,957)
Employee profit sharing	(277)	(278)
Other contributions related to personnel	(360)	(388)
Other expenses linked to short-term benefits	(250)	(231)
Short-term benefits	(11,749)	(11,590)
Expenses under defined-contribution plans	(988)	(1,033)
Expenses under defined-benefit plans	(801)	(1,017)
Post-employment benefits	(1,789)	(2,050)
Other long-term expenses	(222)	-
Termination payments	(33)	(2)
Other personnel expenses	(255)	(2)
PERSONNEL EXPENSES	(13,793)	(13,642)

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

Excluding foreign exchange effects and changes in the scope of consolidation, personnel expenses increased by 0.6% from 2018, mainly in the Other activities, EDF Renewables and Dalkia.

10.2 Average workforce

	2019	2018
IEG status	96,818	98,358
Other	64,704	63,850
AVERAGE WORKFORCE	161,522	162,208

Average workforce numbers for the controlled entities and joint operations are reported on a full-time equivalent basis.

A more detailed presentation of workforce categories can be found in the "Environmental and Societal Information – Human Resources" section of the Universal Registration Document (formerly Reference Document) in section 3.4.1, "Indicators".

Note 11 Taxes other than income taxes

Taxes other than income taxes break down as follows:

<i>(in millions of euros)</i>	2019	2018*
Payroll taxes	(250)	(297)
Energy taxes	(1,674)	(1,561)
Other non-income taxes	(1,874)	(1,832)
TAXES OTHER THAN INCOME TAXES	(3,798)	(3,690)

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

Taxes other than income taxes mainly concern France and essentially comprise land tax and the French business taxes on land and value added.

Note 12 Other operating income and expenses

Other operating income and expenses comprise:

<i>(in millions of euros)</i>	Notes	2019	2018*
Operating subsidies	12.1	7,834	6,846
Net income on deconsolidation	12.2	576	194
Gains on disposal of fixed assets	12.2	(188)	54
Net increase in provisions on current assets		(107)	76
Net increase in provisions for operating contingencies and losses		(41)	(132)
Other items	12.3	(1,382)	(1,036)
OTHER OPERATING INCOME AND EXPENSES		6,692	6,002

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

12.1 Operating subsidies

This item mainly comprises the subsidy received or receivable by EDF in respect of the CSPE, reflected in the financial statements through recognition of income of €7,662 million for 2019 (€6,554 million for 2018).

12.2 Net income on deconsolidation and gains on disposal of fixed assets

In 2019, net income on deconsolidation and gains on disposal of property, plant and equipment mainly includes:

- gains on sales of EDF Renewables' generation assets as part of the Development and Sale of Structured Assets (DSSA) activities, amounting to €560 million (€192 million in 2018), notably including the sale of NnG (see note 3.4.5);

- gains on sales real estate assets in France, amounting to €22 million (€262 million in France for 2018).

12.3 Other items

Other items mainly include costs relating to Energy Savings Certificates used or consumed during the year, and losses consisting of non-recoverable operating receivables. The unfavourable change in other items in 2019 is principally explained by the rising costs related to Energy Savings Certificates, and changes in compensation payable for power cuts associated with weather events of 2019.

Note 13 Net changes in fair value on energy and commodity derivatives, excluding trading activities

<i>(in millions of euros)</i>	2019	2018
NET CHANGES IN FAIR VALUE ON ENERGY AND COMMODITY DERIVATIVES, EXCLUDING TRADING ACTIVITIES	642	(224)

This item essentially consists of changes over the period in the fair value of derivatives used for economic hedging of commodity purchases or sales that are not eligible for hedge accounting as defined in IFRS 9, and are therefore included directly in profit and loss. The Group reports these changes in a specific line of the income statement, "Net changes in fair value on Energy and Commodity derivatives, excluding trading activities" below the operating profit before depreciation and amortisation.

Net changes in fair value on Energy and Commodity derivatives, excluding trading activities, increased from €(224) million in 2018 to €642 million in 2019, principally as a result of Edison's gas positions and high price volatility on the markets for other commodities, particularly electricity in 2019 (mostly a price effect rather than a volume effect).

Note 14 Impairment/reversals

14.1 Impairment by category of asset

Details of impairment recognised and reversed are as follows:

<i>(in millions of euros)</i>	Notes	2019	2018*
Impairment of goodwill	21	(57)	-
Impairment of other intangible assets	22	(47)	(52)
Impairment of tangible assets	24-25	(299)	(238)
IMPAIRMENT NET OF REVERSALS		(403)	(290)

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

In 2018, the €(290) million of impairment recorded concerned:

- thermal assets: €(122) million in the United Kingdom;
- various CGUs of EDF Renewables (particularly a wind farm and a biomass technology company in the United States): €(103) million;
- intangible assets other than goodwill: €(52) million, notably including impairment of €(34) million in respect of the British Energy brand.

Impairment of €(39) million was also booked at 31 December 2018 in respect of associates (see note 26).

Impairment recognised in 2019 amounts to €(403) million. Details are given below.

14.2 Impairment tests on goodwill, intangible assets and property, plant and equipment

The following tables present the results of impairment tests carried out on the main goodwill, intangible assets with indefinite useful lives and other Group assets in 2019, and some of the key assumptions used.

For application of IFRS 16 at 1 January 2019, where relevant the Group adapted the impairment test methodology as appropriate to the specific features of each CGU.

IMPAIRMENT OF GOODWILL AND INTANGIBLE ASSETS WITH INDEFINITE USEFUL LIVES

Operating segment	Cash-Generating Unit or asset	Net book value <i>(in millions of euros)</i>	WACC after tax	Growth rate to infinity	Impairment 2019 <i>(in millions of euros)</i>
United Kingdom	EDF Energy goodwill	7,653	6.0%	-	-
	Edison brand	945	6.1%	2.0%	-
	Zephyro goodwill (energy services)	17	6.1%	-	(17)
Framatome	Framatome goodwill	1,326	5.7%	0.5%	-
	Dalkia goodwill	555	4.3%	1.7%	-
Dalkia	Poland CGU goodwill	8	6.3%	1.7%	(8)
	Dalkia Wastenergy goodwill	5	-	-	(5)
Dalkia	Dalkia brand	137	4.8%	1.7%	-
EDF Renewables	Futuren goodwill (Germany)	17	4.25%	1.5%	(17)
Other impairment					(10)
IMPAIRMENT OF GOODWILL AND INTANGIBLE ASSETS WITH INDEFINITE USEFUL LIVES					(57)

IMPAIRMENT OF OTHER INTANGIBLE ASSETS AND PROPERTY, PLANT AND EQUIPMENT

Operating segment	Cash-Generating Unit or asset	Impairment indicators	WACC after tax	Impairment 2019 <i>(in millions of euros)</i>
	CCGT	Decline in spark spreads and long-term capacity revenue prospects	6.0%	(118)
United Kingdom	Other thermal assets	Plants in the process of shutting down	5.4%-6.0%	(9)
	Hydropower assets	Unfavourable change in regulations on hydropower concessions	6.1%	(33)
Italy	Energy services	Lower profitability on certain contracts	6.1%-7.2%	(5)
France		Discontinued projects	-	(24)
	Poland CGU	Less favourable market prospects	6.3%	(48)
Dalkia	Other Dalkia CGUs		4.9%	(44)
EDF Renewables	Some CGUs	Unfavourable tariff prospects	3.4%-6.5%	(29)
Other impairment				(36)
IMPAIRMENT OF OTHER INTANGIBLE ASSETS AND PROPERTY, PLANT AND EQUIPMENT				(346)

General assumptions

Note 1.3.14 explains the methodology used by the Group for impairment testing.

The weighted average costs of capital (WACC) in reference European countries are down slightly compared to 31 December 2018, as current market conditions led to a decline in the risk-free rate. The other parameters used to calculate WACC remained stable overall compared to 31 December 2018. The test results are subjected to discount rate sensitivity analyses.

The market environment in 2019 showed a slight improvement from 2018, with small rises in market prices in France and Belgium. In Italy, the situation was stable compared to the previous year. However, electricity prices in the United Kingdom retreated slightly.

On the market horizon, the forward prices used were in line with these developments.

On the long-term horizon, visibility of fundamentals was stable year-on-year, as the benchmark scenario used for impairment testing at the 2018 year-end anticipated lower commodity price trajectories for gas and coal. The upward trajectory for CO₂ quota prices under the ETS (EU Emissions Trading System) was retained since Phase 3 of the system is working well towards achieving the objectives of the European decarbonisation policy. Nonetheless, a slight dip in the curve is observed at the beginning of the horizon, reflecting the higher energy efficiency assumptions, and to a lesser degree the lower prices for gas delivered in Europe. This is followed at the end of the horizon by a slight recovery, due to higher assumptions concerning electric vehicles and hydrogen. As these assumptions are crucial in determining recoverable value, sensitivity analyses are applied to long-term price curves when impairment tests are undertaken.

In addition, although some uncertainties remain, the capacity mechanisms progressively being introduced under different approaches in different countries are generating income that contributes to the profitability of certain generation assets, confirming the assumptions used in impairment testing. After the suspension in late 2018 of the United Kingdom's Capacity Market, on 24 October 2019 the European Commission confirmed its initial decision to grant a State aid authorisation allowing the British government to resume its mechanism. In Italy, the country's first capacity auctions took place in November for deliveries in 2022 and 2023.

At 31 December 2019, the macro-economic context presented above does not introduce any new major risk for the Group in addition to the risks already noted in previous years' financial statements; the impairment booked reflects the risks of certain CGUs or specific assets.

United Kingdom – EDF Energy

Thermal assets

Significant amounts of impairment have been booked in recent years in respect of the Group's thermal assets in England, notably reducing the net book value of coal-fired plants and gas storage facilities practically to zero. At 31 December 2019, the necessary investments made in the Cottam and West Burton A coal-fired plants are fully depreciated for an amount of €(6) million, consistent with the decisions to close these plants early: on 7 February 2019 EDF Energy announced its decision to close the Cottam coal-fired plant in September 2019, and closure of the West Burton A plant will be dependent on the capacity contracts. Concerning gas facilities, the investments made during 2019 in the Hole House gas storage assets are fully depreciated for an amount of €(3) million.

At 31 December 2019, despite the resumption of the Capacity Market, the lower long-term prospects compared to 2018 for spark spreads and capacity revenue, combined with the expectation that network expenses will be higher than anticipated at the previous year-end, led to recognition of additional impairment of €(118) million related to the West Burton B CCGT plant. The value of this plant is sensitive to price variations, such that a 5% change in spark spreads would have an impact of approximately 6% on its recoverable value.

Nuclear assets (plants in operation and the Hinkley Point C project) and goodwill

The recoverable value of existing nuclear assets (8 power plants) is estimated by discounting future cash flows over the assets' useful life, assuming a 20-year extension for the Sizewell B PWR plant (other, Advanced Gas-cooled Reactor (AGR) plants have already had their useful life extended by the British Nuclear Authority, the most recent decisions dating from February 2016). As the generation difficulties experienced by Hunterston and Dungeness in 2018 carried over into 2019, a conservative approach was taken in impairment testing, with downward revision of the assumed generation output. Updating these generation assumptions has an unfavourable effect on the recoverable value of EDF Energy's nuclear power plants, which is lower than in 2018, but still well above the book value. A 5% decrease in electricity prices compared to the trajectory assumed for the test would have a 15% impact on the assets' recoverable value, but they would still be higher than their net book value.

EDF Energy's goodwill amounted to €8 billion (or £6.7 billion) at 31 December 2019 and mainly resulted from the takeover of British Energy in 2009.

6. Financial statements

Notes to the consolidated financial statements

The recoverable value of EDF Energy is estimated by discounting future cash flows over the assets' expected useful life, taking into consideration the plan to construct two EPRs with a 60-year useful life at the Hinkley Point site, a project for which the final contracts were signed on 29 September 2016. Future cash flows relating to these plants are determined by reference to the Contract for Difference (CfD) between the Group and the UK government. The CfD sets stable, predictable prices for EDF Energy for a period of 35 years from the date the two EPRs are first commissioned: if market prices fall below the CfD exercise price, EDF Energy will receive an additional payment.

The 2019 impairment test incorporates the latest estimates of the revised HPC project costs (see note 3.1.3) *i.e.* total project completion costs (excluding borrowing costs and exchange rate effects compared to the project's benchmark rate of £1 = €1.23) of £21.5-22.5 billion (in 2015 sterling), £1.9-2.9 billion more than the previous estimate, still assuming delivery of Unit 1 by the end of 2025. The range will depend on the effectiveness of operational action plans to be undertaken in partnership with contractors. The additional costs essentially result from challenging ground conditions that made earthworks more expensive than anticipated, revised action plan targets, and extra costs needed to implement the completed functional design, which has been adapted for a first-of-a-kind application in the UK context. EDF's projected rate of return (IRR) is now estimated at 7.6-7.9% (compared to about 9% initially).

On these revised bases, taking into consideration the unfavourable effects for existing nuclear assets described above, the positive difference between the recoverable value and the book value of EDF Energy remains significant at 31 December 2019. Sensitivity analyses of the WACC show that a 50 base point increase in WACC would not entail any risk of impairment.

For HPC, the most recent project review identified a greater risk of deferral of the Commercial Operation Date (COD), estimated at 15 months for Unit 1 and 9 months for Unit 2, entailing a potential additional cost of around £0.7 billion (in 2015 sterling) which would reduce the IRR for EDF by around 0.3%. This risk of deferral and the associated additional cost would reduce the margin resulting from the EDF Energy impairment test by approximately 20%.

Sensitivity analyses were also conducted for information purposes, using extremely pessimistic assumptions, for example a 4-year deferral of the COD and an associated additional cost of £4 billion. The results suggest a risk of impairment, all other things being equal.

The recoverable value of EDF Energy also, as in 2018, reflects conservative assumptions for the Sales and Supply segment, in line with the competitive and regulatory situation on the British market, particularly considering the cap on the Standard Variable Tariff. Sensitivity analyses were conducted on the assumptions for margin rate and loss of market share: a 25 base point decline in the long-term margin rate would reduce the margin resulting from the EDF Energy impairment test by around 6%, while market share losses of 10% on the B2C segment and 2% on the B2B segment would have an unfavourable impact of some 10% on the test margin.

Finally, although Brexit has no immediate impact on impairment tests of EDF Energy's assets since most cash flows (income, costs, investments) and assets are stated in pounds sterling, the longer-term consequences are still hard to predict in view of the uncertainties over the timing and concrete terms of the UK's departure from the European Union. The Group will monitor movements in the rates of return demanded by investors and changes in fuel prices, CO₂ prices and macro-economic data such as GDP growth, which could affect price curves.

Italy – Edison

As an intangible asset with an indefinite useful life, the Edison brand, first recognised at the value of €945 million when Edison was taken over in 2012, was subjected to an impairment test that did not identify any risk of impairment. The brand's value excluding discontinued E&P operations (see note 2.3) remains justified. This test used the royalty relief method. In late 2018, an external study of the brand value was conducted and concluded that the brand's value in use was higher than its net book value, even when E&P operations are excluded.

At 31 December 2019, the recoverable value of certain hydropower assets located in the Autonomous province of Trento was significantly affected by changes in local hydropower concession regulation, leading to recognition of impairment of €(33) million. More generally, including the measures of the "Semplificazione 2019" decree, concerning the terms of concession renewals in Italy, in impairment tests of the Edison hydropower CGU significantly reduces the margin resulting from the test. The margin's sensitivity to a 10% decline in prices would lead to recognition of impairment of around €(50) million.

Concerning energy services, impairment of €(27) million was recognised on specific assets, including €(17) million in respect of the goodwill on a recent acquisition (Zephyro) whose recoverable value was affected by delayed implementation of a significant contract.

The recoverable value of wind power assets is improving, in line with the investments made in high-profitability projects.

Thermal assets benefited from high-profitability investments due to construction of the new Marghera CCGT plant. Good long-term prospects for clean spark spreads and capacity revenue also have a favourable influence on the margin resulting from the test. Sensitivity tests were conducted in respect of these assets, and the results show that a 10% decline in electricity prices or a 50 base point increase in WACC does not entail any risk of impairment.

Framatome

At 31 December 2019, the goodwill of Framatome amounts to €1,326 million, resulting from EDF's acquisition of 75.5% of the capital of Framatome in late 2017. The Group finalised recognition of the business combination in its financial statements at 31 December 2018.

The recoverable value of Framatome is determined on the basis of a 10-year business plan and a terminal value. This business plan is sensitive to assumptions concerning the completion of major construction projects that are incorporated into the reactor scenario, and market share assumptions used in assessing services to the installed base and fuel deliveries to customers' reactors. The WACC applied in discounting future cash flows is weighted according to a conservative view of the allocation of Framatome's EBITDA between its businesses according to their risk profile. The test conducted at 31 December 2019 shows that the CGU's recoverable value is significantly higher than its book value.

Sensitivity analyses were conducted using a 50 base point increase in WACC and a 0% growth rate to infinity. The test conclusions were not affected.

EDF Renewables

In 2019, impairment of €(49) million was recognised in respect of EDF Renewables' CGUs. This includes €(17) million of impairment of the goodwill on a recently acquired German entity (Futuren) in response to less favourable prospects on that market. Other impairment concerns specific assets and notably results from downward tariff trends driven by contractual terms or regulatory changes (particularly in China).

Dalkia

At 31 December 2019, Dalkia's goodwill amounts to €555 million, principally resulting from acquisition of the Dalkia group in France under the agreement of 25 March 2014 with Veolia Environnement.

The recoverable value of the Dalkia group is based on future cash flows projected over a medium-term horizon, and a terminal value that represents cash flow projections to infinity. According to revised assumptions for 2019, the recoverable value remains higher than the book value. The key parameters of the test are the calculation method for the terminal value, and the discount rate: both were subjected to sensitivity analyses and the results did not affect the positive difference between the recoverable value and the book value.

The Dalkia brand, which was recognised as an asset when the Group took control of Dalkia in 2014 at the value of €130 million, is estimated by the royalty relief method. An updated test at 31 December 2019 shows that this book value is justified.

Impairment was also recognised on various CGUs of the Dalkia group. In Poland for example, the recoverable value of Dalkia entities was significantly affected by lower income prospects than forecast in previous years, masking the impact of higher compliance investments. Impairment of €(55) million was therefore recognised in respect of these assets, including €(8) million on goodwill.

Impairment on other CGUs during 2019 resulted from specific situations, for example:

- the sudden collapse of paper prices in Canada and the resulting business conditions, which led to recognition of €(11) million of impairment in respect of Dalkia Wastenergy, including €(5) million concerning goodwill;
- the placing of Arjowiggins in receivership on 29 March 2019, leading to losses of the cogeneration heat customer CCB and recognition of €(12) million of impairment on the corresponding assets.

Impairment has also been recognised on other individual assets, for the combined total of €(27) million.

France – Generation and Supply

Due to the integrated management and interdependence of the different generation facilities that make up the French fleet (nuclear, thermal and hydropower plants), independently of their maximum technical capacities, the Group considers the entire fleet as a single CGU. This CGU does not include any goodwill.

Even when there is no indication of any loss of value, an impairment test is performed due to the highly significant value of this CGU in the Group's financial statements and its substantial exposure to market prices since the "yellow" and "green" regulated tariffs were discontinued on 1 January 2016.

The recoverable value of the generation fleet is estimated by discounting future cash flows under the Group's usual methodology, described in note 1.3.14, over the assets' useful life, using an after-tax WACC of 5.1% at 31 December 2019. For nuclear assets currently in operation (except for Fessenheim), the Group's benchmark model assumes that the useful life is extended to 50 years, in line with its industrial strategy. The nuclear capacity remains subject to a ceiling of 63.2GW in the test, consistent with France's energy transition law.

Note 15 Other income and expenses

Other income and expenses amount to €(185) million for 2019. They include the €(30) million cost of the ERO 2019 employee shareholding offer undertaken during the first half of 2019 (see below), restructuring expenses in certain Group entities, and other items which are operating income and expenses by nature but of non-significant amounts individually.

Other income and expenses amounted to €(105) million for 2018, mainly including a gain of €755 million on the sale of Dunkerque LNG and an allocation of €(737) million to provisions for onerous contracts associated with the long-term contract with Dunkerque LNG, giving a net impact of €18 million. Other income and expenses also included €(36) million of exceptional solidarity bonuses in France, and €(15) million resulting from the adjustment of EDF Energy's guaranteed minimum pension scheme.

The capacity revenue assumptions used in the test are higher than the previous year, in line with the system fundamentals analysis in the benchmark scenario. The average auction price achieved in 2019 was €19.5/KW.

The impairment test takes into consideration the latest forecasts concerning Flamanville 3 (see note 3.1.1) which adjusted the schedule, setting the fuel loading date in late 2022, and revised the estimated cost of construction to €12.4 billion in 2015 euros, excluding borrowing costs, an increase of €1.5 billion from the previous estimate. The test takes into consideration the fact that most of these additional costs will be included in other operating income and expenses.

The test results indicated a significant positive difference between the recoverable value and the book value of the generation fleet in France. The margin resulting from the test is higher than at 31 December 2018, as the higher costs and deferred commissioning of Flamanville 3 were outweighed by favourable effects, essentially concerning the lower discount rate and the positive effect of cash outflows in 2019.

The key assumptions used in the test include the useful life of nuclear assets, the long-term price scenario, the discount rate, developments in costs and investments, and the assumed capacity revenue. Each of these assumptions has been subjected to a sensitivity analysis, which does not call into question the existence of a positive difference between the recoverable value and book value. The test conducted at 31 December 2019 also takes into consideration the sensitivity associated with early closure proposals for certain nuclear units, as set out in the proposed multi-year energy programme. This did not affect the conclusions of the test.

France – Impairment of specific assets

The Group also booked €(24) million of impairment in respect of the decision to discontinue two projects, one hydropower project and one IT development project.

Other International – Belgium

The impairment test applied to Luminus did not indicate any risk of impairment. However, the margin resulting from the test is adversely affected by the Tihange 2 and 3 and Doel 3 and 4 nuclear assets, in which Luminus owns a 10.2% share.

Finally, impairment of €(73) million was booked in respect of associates at 31 December 2019. Details are given in note 26.

The Employee Reserved Offer (ERO) followed a decision by the Board of Directors of EDF on 4 April 2019 concerning the principle of an employee shareholding operation. This was carried out by the sale of 7,704,974 existing shares by the State to EDF which immediately sold them to eligible employees, former employees and retired employees. This operation does not constitute a capital increase for the Group.

The sale price for these shares was fixed on 20 June 2019. It included a discount of 20% on the reference price based on the volume-weighted average price of EDF shares traded on Euronext Paris for the twenty trading days preceding the day when the price was set.

The shares were delivered on 16 July 2019.

Note 16 Financial result

16.1 Cost of gross financial indebtedness

Details of the components of the cost of gross financial indebtedness are as follows:

<i>(in millions of euros)</i>	2019	2018 ⁽¹⁾
Interest expenses on financing operations ⁽²⁾	(1,801)	(1,765)
Change in the fair value of derivatives and hedges of liabilities	(14)	(93)
Transfer to income of changes in the fair value of cash flow hedges	(40)	102
Net foreign exchange gain on indebtedness	49	44
COST OF GROSS FINANCIAL INDEBTEDNESS	(1,806)	(1,712)

(1) Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

(2) In 2019, interest expenses on financing operations include interest on the lease liability (IFRS 16) amounting to €(85) million at 31 December 2019.

16.2 Discount effect

The effect of unwinding the discount primarily concerns provisions for the back-end of the nuclear cycle, decommissioning and last cores, and long-term and post-employment employee benefits.

Details of the final discount effect are as follows:

<i>(in millions of euros)</i>	2019	2018 ⁽¹⁾
Provisions for long-term and post-employment employee benefits	(931)	(875)
Provisions for the back-end of the nuclear cycle, decommissioning and last cores ⁽²⁾	(2,116)	(2,480)
Other provisions and advances	(114)	(109)
DISCOUNT EFFECT	(3,161)	(3,464)

(1) Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

(2) Including the effect of discounting the receivable corresponding to amounts reimbursable by the NLF (see note 39.3).

The lower discount effect on nuclear provisions is explained by a 10 base point decrease in the real interest rate applied to nuclear provisions in France in 2019, compared to a 20 base point decrease in 2018.

16.3 Other financial income and expenses

Other financial income and expenses comprise:

<i>(in millions of euros)</i>	2019	2018*
Financial income on cash and cash equivalents	17	13
Gains/(losses) on other financial assets (including loans and financial receivables)	248	254
Gains/(losses) on debt and equity securities	878	496
Changes in financial instruments carried at fair value through profit and loss	2,338	(995)
Other financial expenses	(129)	(274)
Foreign exchange gain/loss on financial items other than debts	(9)	(93)
Return on fund assets	523	475
Capitalised borrowing costs	740	502
OTHER FINANCIAL INCOME AND EXPENSES	4,606	378

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

"Gains/(losses) on debt and equity securities" in 2019 principally include:

- €740 million of dividends and interest income on debt securities (€494 million in 2018);
- €138 million of net gains and losses on sales of debt securities carried at fair value through OCI with recycling (including €136 million on dedicated assets), compared to €2 million in 2018 (including €(12) million on dedicated assets).

Other financial income and expenses include changes in fair value on financial instruments, amounting to €2,338 million. This favourable development, in a

context of rising markets, is explained by the €2,586 million change in the fair value of debt and equity securities (including €2,545 million on dedicated assets) and changes in the fair value of derivatives (€(248) million). In 2018, changes in financial instruments carried at fair value through profit and loss amounted to €(995) million, including €(989) million relating to dedicated assets.

The increase in capitalised borrowing costs relates to the increase in work in progress for Flamanville 3 and HPC.

Note 17 Income taxes

17.1 Breakdown of tax expense

Details are as follows:

<i>(in millions of euros)</i>	2019	2018*
Current tax expense	(1,609)	(266)
Deferred taxes	28	444
TOTAL	(1,581)	178

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

In 2019, €(1,519) million of the current tax expense relates to French companies, and €(90) million relates to other subsidiaries (€(168) million and €(98) million respectively in 2018).

17.2 Reconciliation of the theoretical and effective tax expense (tax proof)

<i>(in millions of euros)</i>	2019	2018⁽¹⁾
Income of consolidated companies before tax	6,399	656
Income tax rate applicable to the parent company	34.43%	34.43%
Theoretical tax expense	(2,203)	(226)
Differences in tax rate ⁽²⁾	185	1
Permanent differences ⁽³⁾	162	30
Taxes without basis ⁽⁴⁾	118	239
Unrecognised deferred tax assets	156	132
Other	1	2
ACTUAL TAX EXPENSE	(1,581)	178
EFFECTIVE TAX RATE	24.71%	-27.13%

(1) Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

The income tax expense amounts to €(1,581) million in 2019, corresponding to an effective tax rate of 24.71% (compared to an income tax receivable of €178 million in 2018, corresponding to an effective tax rate of -27.13%). The €1,759 million increase in the Group's tax expense between 2018 and 2019 essentially reflects the €5,743 million increase in net income before tax (notably resulting from changes in unrealised gains and losses on EDF SA's portfolio of financial assets), which generated an additional tax charge of €1,977 million in application of the French income tax rate of 34.43%.

After elimination of these non-recurring items (mainly changes in unrealised gains and losses on EDF SA's portfolio of financial assets, impairment and disposals), the effective current tax rate for 2019 is 19.1%, compared to 22.6% in 2018.

The main factors explaining the difference between the theoretical tax rate and this effective rate are:

- 2019:
 - (2) the favourable impact of differences in tax rates between the French rate of 34.43%, the Italian rate of 24% and the British rate of 19%, amounting to €185 million,
 - (3) the favourable impact of disposals of investments and assets subject to a reduced tax rate, amounting to €160 million (principally Alpiq and NnG),
 - (4) the impact of deduction of payments made to bearers of perpetual subordinated bonds, amounting to €204 million;
- 2018:
 - (3) the favourable impact of sales of investments and assets subject to a reduced tax rate, amounting to €199 million (principally Dunkerque LNG),
 - (4) the impact of deduction of payments made to bearers of perpetual subordinated bonds, amounting to €203 million.

6. Financial statements

Notes to the consolidated financial statements

17.3 Change in deferred tax assets and liabilities

<i>(in millions of euros)</i>	2019	2018
Deferred tax assets	978	1,220
Deferred tax liabilities	(1,987)	(2,362)
Net deferred taxes at 1 January	(1,009)	(1,142)
Change in net income	28	508
Change in equity	(402)	(354)
Translation adjustments	(66)	23
Changes in scope of consolidation ⁽¹⁾	(275)	(28)
Other movements ⁽²⁾	(14)	(16)
NET DEFERRED TAXES AT 31 DECEMBER	(1,738)	(1,009)
Deferred tax assets	557	978
Deferred tax liabilities	(2,295)	(1,987)

(1) Changes in the scope of consolidation essentially concern the reclassification of E&P concession assets as assets held for sale.

(2) This includes the reclassification of the provision for tax litigation as deferred tax liabilities in the amount of €235 million, in compliance with IFRIC 23 (see note 35) and a deferred tax asset relating to the tax inspections of EDF International (see note 50.1).

In 2019, €(69) million of the change in deferred tax assets included in equity results from actuarial gains and losses on post-employment benefits (€(309) million

in 2018), and €(233) million corresponds to changes in the fair value of commodity hedges (€(11) million in 2018).

17.4 Breakdown of deferred tax assets and liabilities by nature

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Deferred taxes:		
Fixed assets	(6,141)	(5,627)
Provisions for employee benefits	5,018	4,493
Other provisions and impairment	561	557
Financial instruments	74	172
Tax loss carryforwards and unused tax credits	1,292	1,448
Other	333	187
Total deferred tax assets and liabilities	1,137	1,230
Unrecognised deferred tax assets	(2,875)	(2,239)
NET DEFERRED TAXES	(1,738)	(1,009)

At 31 December 2019, unrecognised deferred tax assets represent a potential tax saving of €2,875 million (€2,239 million at 31 December 2018), mainly relating to France and the United States.

In France, this potential tax saving, which amounts to €2,091 million (€1,449 million at 31 December 2018), essentially concerns deferred tax assets on employee benefits. These deferred tax assets have no expiry date.

In the United States, this potential tax saving amounts to €473 million (€485 million in 2018) and relates to negative taxable earnings generating losses which can be carried forward until dates between 2030 and 2037.

Recognised deferred tax assets on tax loss carryforwards amount to €395 million (€662 million in 2018) and principally concern the United States (€197 million in 2019, €230 million in 2018), France (€37 million in 2019, €214 million in 2018). They have been recognised due to the existence of deferred tax liabilities on the same tax entities that will reverse over the same time horizon, or because there are prospects of taxable profits.

Note 18 Leases

The main impacts of recognition in the income statement of lease contracts as lessor, in accordance with IFRS 16, are as follows:

<i>(in millions of euros)</i>	2019
Income from subleases	73
Variable lease expenses	(45)
Expenses on short-term leases or leases of low-value assets	(167)
Income from sale and leaseback operations	-
Operating profit before depreciation and amortisation	(139)
Depreciation on right-of-use assets	(660)
Operating profit	(799)
Interest expense on the lease liability	(85)
Income before taxes of consolidated companies	(884)

Note 19 Net income of discontinued operations

The line "Net income of discontinued operations" comprises income statement items for the E&P operations for 2018 and 2019, and impairment recognised in respect of these assets in both these periods. In 2019, this includes €(513) million

of impairment on the assets and liabilities concerned, determined as the difference between the book value and the fair value net of costs to sell (see note 2.3.1).

The principal profit and loss indicators for the E&P operations in these periods are as follows:

<i>(in millions of euros)</i>	2019	2018
Sales	407	430
Operating profit before depreciation and amortisation	252	367
Operating profit	122	136
Financial result	(25)	(11)
Income taxes	(38)	(103)
NET INCOME	59	22
Impairment of discontinued operations, net of income taxes	(513)	(234)
NET INCOME OF DISCONTINUED OPERATIONS	(454)	(212)

6. Financial statements

Notes to the consolidated financial statements

Note 20 Basic earnings per share and diluted earnings per share

The diluted earnings per share is calculated by dividing the Group's share of net income, corrected for dilutive instruments and the payments made during the year to bearers of perpetual subordinated bonds, by the weighted average number of potential shares outstanding over the period after elimination of treasury shares.

The following table shows the reconciliation of the basic and diluted earnings used to calculate earnings per share (basic and diluted), and the variation in the weighted average number of shares used in calculating basic and diluted earnings per share:

<i>(in millions of euros)</i>	2019	2018
Net income attributable to ordinary shares	5,155	1,177
- EDF net income from continuing operations	5,597	1,384
- EDF net income from discontinued operations	(442)	(207)
Payments on perpetual subordinated bonds	(589)	(584)
Effect of dilutive instruments	-	-
Net income used to calculate earnings per share	4,566	593
- from continuing operations	5,008	800
- from discontinued operations	(442)	(207)
Average weighted number of ordinary shares outstanding during the year	3,029,504,511	2,968,327,473
Average weighted number of diluted shares outstanding during the year	3,029,504,511	2,968,327,473
Earnings per share (in euros):		
BASIC EARNINGS PER SHARE	1.50	0.20
DILUTED EARNINGS PER SHARE	1.50	0.20
BASIC EARNINGS PER SHARE OF CONTINUING OPERATIONS	1.65	0.27
DILUTED EARNINGS PER SHARE OF CONTINUING OPERATIONS	1.65	0.27
BASIC EARNINGS PER SHARE OF DISCONTINUED OPERATIONS	(0.15)	(0.07)
DILUTED EARNINGS PER SHARE OF DISCONTINUED OPERATIONS	(0.15)	(0.07)

In 2019, payment of the outstanding scrip dividend for 2018 and the interim dividend for 2019 led to an increase in the share capital and an issue premium totalling €881 million, corresponding to the issuance of 93,353,410 shares.

Operating assets and liabilities, equity

Note 21 Goodwill

21.1 Changes in goodwill

Goodwill on consolidated entities comprises the following:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Net book value at opening date	10,195	10,036
Acquisitions	66	116
Disposals	-	-
Impairment (note 14)	(57)	-
Translation adjustments	392	(61)
Other changes	27	104
NET BOOK VALUE AT CLOSING DATE	10,623	10,195
Gross value at closing date	11,418	10,960
Accumulated impairment at closing date	(795)	(765)

The changes in goodwill in 2019 primarily related to:

- the acquisition of Foxguard by Framatome, acquisition of service entities in Belgium, and the first consolidation of the Cyclife subsidiaries in the United Kingdom and Sweden;
- translation adjustments of €392 million, principally due to the pound sterling's rise against the euro.

The changes in goodwill in 2018 primarily related to the revised goodwill following finalisation of the business combination accounts for the acquisition of Framatome at 31 December 2017 (€58 million), Edison's acquisition of Edison Energie (formerly GNVI) and Attiva in Italy (for €80 million and €13 million respectively), and translation adjustments of €(61) million, largely reflecting the pound sterling's rise against the euro.

21.2 Goodwill by operating segment

The breakdown of goodwill between the new segments as presented in note 6.1 is as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
France – Generation and Supply	72	53
France – Regulated activities	223	223
Framatome	1,341	1,317
United Kingdom (EDF Energy)	7,965	7,578
Italy	104	108
Other international	33	20
Dalkia	544	548
EDF Renewables	199	206
Other activities	142	142
GROUP TOTAL	10,623	10,195

Note 22 Other intangible assets

The net value of other intangible assets breaks down as follows:

<i>(in millions of euros)</i>	31/12/2018	Acquisitions	Disposals	Translation adjustments	Changes in scope ⁽²⁾	Other movements	31/12/2019
Software	4,664	726	(93)	50	(42)	(10)	5,295
Positive fair value of commodity contracts acquired in a business combination	581	-	-	-	-	(77)	504
Greenhouse gas emission rights – green certificates	501	1,400	(1,436)	11	-	(2)	474
Other intangible assets	8,720	460	(15)	37	(1,195)	(88)	7,919
Intangible assets in development ⁽¹⁾	1,233	183	(10)	8	(10)	11	1,415
Gross value	15,699	2,769	(1,554)	106	(1,247)	(166)	15,607
Software	(2,417)	(656)	92	(36)	41	13	(2,963)
Positive fair value of commodity contracts acquired in a business combination	(233)	(35)	-	-	-	77	(191)
Other intangible assets	(3,131)	(446)	11	(18)	475	6	(3,103)
Accumulated amortisation and impairment	(5,781)	(1,137)	103	(54)	516	96	(6,257)
NET VALUE	9,918	1,632	(1,451)	52	(731)	(70)	9,350

(1) Increases in intangible assets in development are presented net of the effect of commissioning new assets.

(2) Changes in scope essentially concern the reclassification of E&P concession assets as assets held for sale, and the sale of NnG (see note 3.4.5).

The gross value of other intangible assets at 31 December 2019 includes:

- the Edison brand and intangible assets related to Edison's hydropower concessions, amounting to €945 million and €729 million respectively;
- the Dalkia brand and intangible assets related to Dalkia's concession agreements in France, amounting to €130 million and €1,120 million respectively;
- the Framatome brand, Framatome's nuclear technology-related intangible assets and Framatome's customer contracts, amounting to €151 million, €777 million and €344 million respectively.

Intangible assets in development include studies currently in process for the EPR 2 project, amounting to €414 million.

Impairment of €(47) million was recorded in respect of other intangible assets in 2019 (€(52) million in 2018).

EDF's research and development expenses recorded in the income statement total €523 million for 2019 (€510 million in 2018).

Note 23 Property, plant and equipment operated under French public electricity distribution concessions

23.1 Net value of property, plant and equipment operated under French public electricity distribution concessions

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Property, plant and equipment	56,533	54,677
Property, plant and equipment in progress	1,880	1,838
PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSIONS	58,413	56,515

23.2 Movements in property, plant and equipment operated under French public electricity distribution concessions (excluding assets in progress)

<i>(in millions of euros)</i>	Land and buildings	Networks	Other installations, plant, machinery, equipment & other	Total
Gross value at 31/12/2018	2,895	93,279	4,378	100,552
Increases ⁽¹⁾	178	4,232	422	4,832
Decreases	(12)	(541)	(176)	(729)
GROSS VALUE AT 31/12/2019	3,061	96,970	4,624	104,655
Depreciation and impairment at 31/12/2018	(1,458)	(41,694)	(2,723)	(45,875)
Net depreciation	(69)	(235)	(199)	(503)
Disposals	16	447	162	625
Other movements ⁽²⁾	(12)	(2,242)	(115)	(2,369)
DEPRECIATION AND IMPAIRMENT AT 31/12/2019	(1,523)	(43,724)	(2,875)	(48,122)
Net value at 31/12/2018	1,437	51,585	1,655	54,677
NET VALUE AT 31/12/2019	1,538	53,246	1,749	56,533

(1) Increases also include facilities provided by the concession-granting authorities.

(2) Other movements mainly concern depreciation of assets operated under concessions, booked against amortization recorded in the special concession liability accounts.

Note 24 Property, plant and equipment operated under concessions for other activities

24.1 Net value of property, plant and equipment operated under concessions for other activities

The net value of property, plant and equipment operated under concessions for other activities breaks down as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Property, plant and equipment	5,705	6,026
Property, plant and equipment in progress	1,155	1,313
PROPERTY, PLANT AND EQUIPMENT OPERATED UNDER CONCESSIONS FOR OTHER ACTIVITIES	6,860	7,339

24.2 Movements in property, plant and equipment operated under concessions for other activities (excluding assets in progress)

<i>(in millions of euros)</i>	Land and buildings	Fossil-fired & hydropower plants	Networks	Other installations, plant, machinery, equipment & other	Total
Gross value at 31/12/2018	1,510	12,902	24	609	15,045
Increases	23	259	8	33	323
Decreases	(6)	(33)	(6)	(11)	(56)
Translation adjustments	-	7	-	1	8
Changes in the scope of consolidation*	-	(2,131)	-	(8)	(2,139)
Other movements	1	17	1	-	19
GROSS VALUE AT 31/12/2019	1,528	11,021	27	624	13,200
Depreciation and impairment at 31/12/2018	(929)	(7,653)	(15)	(422)	(9,019)
Net depreciation	(32)	(264)	(6)	(31)	(333)
Impairment net of reversals	-	-	-	-	-
Disposals	5	29	1	10	45
Translation adjustments	-	(5)	-	-	(5)
Changes in the scope of consolidation*	-	1,805	-	14	1,819
Other movements	-	7	-	(9)	(2)
DEPRECIATION AND IMPAIRMENT AT 31/12/2019	(956)	(6,081)	(20)	(438)	(7,495)
Net value at 31/12/2018	581	5,249	9	187	6,026
NET VALUE AT 31/12/2019	572	4,940	7	186	5,705

* Changes in the scope of consolidation essentially concern the reclassification of E&P concession assets as assets held for sale.

Property, plant and equipment operated under concessions for other activities comprise concession facilities mainly located in France (hydropower, excluding public electricity distribution) and take account of the presentation of Edison's E&P concessions as assets held for sale.

In 2019, impairment of property, plant and equipment in progress amount to €(14) million.

The change in 2019 in assets operated under concessions principally concerns the reclassification of Edison's E&P operations as assets held for sale, at the amount of €(546) million.

Note 25 Property, plant and equipment used in generation and other tangible assets owned by the Group, including right-of-use assets

25.1 Net value of property, plant and equipment used in generation and other tangible assets owned by the Group, including right-of-use assets

The net value of property, plant and equipment used in generation and other tangible assets owned by the Group, including right-of-use assets, breaks down as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Property, plant and equipment	50,011	47,779
Property, plant and equipment in progress	34,755	30,377
Finance-leased property, plant and equipment*	n.a.	96
Right-of-use assets*	4,333	n.a.
PROPERTY, PLANT AND EQUIPMENT USED IN GENERATION AND OTHER TANGIBLE ASSETS OWNED BY THE GROUP, INCLUDING RIGHT-OF-USE ASSETS	89,099	78,252

n.a.: not applicable.

* At 31 December 2018, these assets consisted only of finance-leased assets (€96 million).

At 31 December 2019, they also include all assets leased as lessee by all Group subsidiaries (IFRS 16).

6. Financial statements

Notes to the consolidated financial statements

At 31 December 2019, property, plant and equipment in progress owned by the Group mainly concerns investments for the EPR reactors at Flamanville 3 (€13,653 million including capitalised borrowing costs of €3,028 million), and Hinkley Point C (€10,942 million including capitalised borrowing costs of €318 million).

The capitalised value of the Flamanville 3 EPR project in the financial statements at 31 December 2019 is €10,833 million excluding borrowing costs (€10,645 million in property, plant and equipment in progress and €188 million⁽¹⁾ in property, plant and equipment in operation). This includes the following, in addition to the construction cost:

- an inventory of spare parts and capitalised amounts totalling €422 million for related projects (notably the initial comprehensive inspection and North Area development);
- €611 million of pre-operating expenses and other property, plant and equipment related to the Flamanville project; and
- the elimination of internal balances on balance sheet items and margins between Framatome and EDF SA in connection with the Flamanville 3 EPR project (€476 million, essentially consisting of advances and progress payments),

(1) €252 million gross, less €64 million of depreciation.

giving a construction cost at historical value of €9,800 million in the consolidated financial statements at 31 December 2019, and a construction cost at completion (excluding borrowing costs) of £12.4 billion (in 2015 euros), as announced on 9 October 2019.

Property, plant and equipment in progress increased by €4,378 million as the level of investment in 2019 was significantly higher than the amount of assets brought into service during the year (see note 25.2). Investments in property, plant and equipment and intangible assets during 2019 mainly concern:

- the France – Generation and Supply segment for €5,689 million, primarily investments made under the “Grand Carénage” programme, investments for Flamanville 3, and investments in hydropower generation;
- the United Kingdom segment for €3,381 million, where investments principally related to nuclear power generation;
- the EDF Renewables segment for €1,721 million, which saw a significant rise in wind and solar capacities under construction in France and North America, and in emerging countries.

25.2 Movements in property, plant and equipment used in generation and other tangible assets owned by the Group (excluding assets in progress and right-of-use assets)

<i>(in millions of euros)</i>	Land and buildings	Nuclear power plants	Fossil-fired & hydropower plants	Other installations, plant, machinery, equipment & other	Total
Gross value at 31/12/2018	12,968	71,390	19,445	19,354	123,157
Increases	824	3,999	394	2,375	7,592
Decreases	(76)	(1,225)	(127)	(447)	(1,875)
Translation adjustments	52	563	162	293	1,070
Changes in the scope of consolidation ⁽¹⁾	26	-	(1,419)	(178)	(1,571)
Other movements ⁽²⁾	3	486	31	(81)	439
GROSS VALUE AT 31/12/2019	13,797	75,213	18,486	21,316	128,812
Depreciation and impairment at 31/12/2018	(7,191)	(47,224)	(12,599)	(8,364)	(75,378)
Net depreciation	(350)	(3,115)	(609)	(1,286)	(5,360)
Impairment net of reversals	(23)	-	(131)	(110)	(264)
Disposals	59	1,129	122	403	1,713
Translation adjustments	(7)	(290)	(151)	(106)	(554)
Changes in the scope of consolidation ⁽¹⁾	(8)	-	630	149	771
Other movements ⁽²⁾	2	155	(27)	141	271
DEPRECIATION AND IMPAIRMENT AT 31/12/2019	(7,518)	(49,345)	(12,765)	(9,173)	(78,801)
Net value at 31/12/2018	5,777	24,166	6,846	10,990	47,779
NET VALUE AT 31/12/2019	6,279	25,868	5,721	12,143	50,011

(1) Changes in the scope of consolidation essentially relate to reclassification of the E&P operations as assets held for sale.

(2) Other movements include the effect on assets associated with provisions and underlying assets of the €336 million change in the real discount rate used to calculate provisions related to EDF's nuclear generation (see note 32.1).

25.3 Right-of-use assets

<i>(in millions of euros)</i>	Land and buildings	Installations, plant, machinery, equipment & other	Total
Gross value at 31/12/2018	10	469	479
Restatement under IFRS 16 (see note 2.1)	4,199	293	4,492
Restated gross value at 01/01/2019	4,209	762	4,971
Increases ⁽¹⁾	462	82	544
Decreases	-	-	-
Translation adjustments	27	1	28
Changes in the scope of consolidation	(7)	6	(1)
Other movements ⁽²⁾	(171)	(16)	(187)
Gross value at 31/12/2019	4,520	835	5,355
Depreciation and impairment at 31/12/2018	(5)	(378)	(383)
Net depreciation	(542)	(118)	(660)
Disposals	-	-	-
Translation adjustments	(1)	-	(1)
Changes in the scope of consolidation	5	(3)	2
Other movements	2	18	20
Depreciation and impairment at 31/12/2019	(541)	(481)	(1,022)
Net value at 31/12/2018	5	91	96
Restated net value at 01/01/2019	4,204	384	4,588
NET VALUE AT 31/12/2019	3,979	354	4,333

(1) Increases concern right-of-use assets recognised in respect of new leases.

(2) Other movements include the effect of contract revisions on right-of-use assets.

Note 26 Investments in associates and joint ventures

Investments in associates and joint ventures are as follows:

<i>(in millions of euros)</i>	Principal activity ⁽¹⁾	31/12/2019			31/12/2018	
		Ownership%	Share of net equity	Share of net income	Share of net equity	Share of net income
Principal investments in associates						
CTE	O	50.10	1,417	308	1,406	283
Taishan (TNPJVC) ⁽²⁾	G	30.00	n.c.	n.c.	984	(2)
Other investments held by EDF SA			1,448	59	1,216	110
Investments held by EDF Renewables			1,063	77	1,307	79
Other investments in associates and joint ventures			n.c.	n.c.	1,085	38
Subtotal			6,414	519	5,998	508
CENG (reclassified as assets held for sale – see note 46)	G	49.99	n.a.	288	1,667	102
Alpiq (sold on 28 May 2019)	G, D, O, T	n.a.	n.a.	11	622	(41)
Subtotal				299	2,289	61
TOTAL				818	8,287	569

n.a.: not applicable.

n.c.: not communicated.

(1) G = generation, D = distribution, T = transmission, O = other.

(2) The financial data for Taishan at 31 December 2019 are not reported in this table as CGN (Taishan's parent company) publishes its consolidated financial statements later than the Group.

6. Financial statements

Notes to the consolidated financial statements

The other investments held by EDF SA are dedicated assets (see note 48.3).

Other investments in associates and joint ventures principally concern Compagnie Énergétique de Sinop (CES) (whose first turbine began operation on 16 September 2019 and the second on 18 October 2019), Jiangxi Datang International Fuzhou Power Generation Company Ltd., Nachtigal (for which construction began in March 2019, with commissioning expected in late 2023) and certain companies owned by EDF Renewables.

The CENG shares have been reclassified under IFRS 5 following the Group's notification of its intention to exercise the put option related to its investment (see notes 3.2.2 and 46).

The investment in Alpiq was sold on 28 May 2019 (see note 3.2.1).

In 2019, €(73) million of impairment was booked in respect of investments in associates and joint ventures and a number of specific assets. This impairment is not detailed below due to its low materiality for the Group's financial statements.

In 2018, €(39) million of impairment was booked in respect of investments in associates and joint ventures and a number of specific assets.

26.1 Coentreprise de Transport d'Électricité (CTE)

26.1.1 CTE – financial indicators

The key financial indicators for the CTE subgroup (on a 100% basis) are as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Non-current assets	18,568	17,740
Current assets	3,120	2,854
TOTAL ASSETS	21,688	20,593
Equity	2,829	2,807
Non-current liabilities	15,059	13,225
Current liabilities	3,800	4,561
TOTAL EQUITY AND LIABILITIES	21,688	20,593
Sales	4,856	4,817
Operating profit before depreciation and amortisation	2,181	2,058
Net income	615	566
Net indebtedness	12,256	11,799
Gains and losses recorded directly in equity	(279)	78
Dividends paid	313	313

CTE's affiliate, RTE (Réseau de Transport d'Électricité), is responsible for managing the high voltage and very high voltage public electricity transmission network.

Enedis uses RTE's network to convey energy to the distribution network.

26.2 Taishan

26.2.1 Taishan – financial indicators

The key financial indicators published for Taishan (on a 100% basis) are as follows:

<i>(in millions of euros)</i>	31/12/2018	31/12/2017
Non-current assets	11,595	11,030
Current assets	451	350
TOTAL ASSETS	12,046	11,380
Equity	3,279	3,316
Non-current liabilities	7,777	6,864
Current liabilities	990	1,200
TOTAL EQUITY AND LIABILITIES	12,046	11,380
Sales	32	-
Net income	(8)	(56)
Dividends paid	-	-

26.2.2 Transactions between the EDF group and Taishan

EDF owns 30% of Taishan Nuclear Power Joint Venture Company Limited (TNPJVC), which was set up to build and operate two EPR nuclear reactors in Taishan, in the province of Guangdong in China. CGN holds a 51% stake and Yudean a 19% stake.

Framatome has two contracts with TNPJVC:

- supply of two EPR nuclear islands in a consortium with CNPDC and CNPEC;
- delivery of fuels (initial core and first refuelling for each unit).

Following the start of commercial operation by the first reactor on 13 December 2018, the second reactor began commercial operation on 7 September 2019 (see note 3.1.4).

On 20 March 2019, the NDRC (National Development and Reform Commission) attributed regulated tariffs to the first three 3rd-generation nuclear projects in China, one of which is Taishan.

The tariff attributed to Taishan is set at RMB435/MWh until the end of 2021, with retroactive effect to the date the first unit was commissioned (13 December 2018).

Indexing mechanisms and the post-2021 tariff levels were not set out in this decision.

The business plan was updated to incorporate this temporary tariff decision. This did not lead to recognition of any impairment on these assets in the financial statements at 31 December 2019.

Note 27 Inventories

The carrying value of inventories, broken down by nature, is as follows:

<i>(in millions of euros)</i>	31/12/2019			31/12/2018		
	Gross value	Provision	Net value	Gross value	Provision	Net value
Nuclear fuel	10,649	(4)	10,645	10,671	(6)	10,665
Other fuel	872	(30)	842	957	(14)	943
Other supplies	1,624	(360)	1,264	1,613	(302)	1,311
Work-in-progress for production of goods and services	497	(30)	467	538	(30)	508
Other inventories	869	(38)	831	840	(40)	800
TOTAL INVENTORIES	14,511	(462)	14,049	14,619	(392)	14,227

The long-term portion (more than one year) mainly concerns nuclear fuel inventories amounting to €7,828 million at 31 December 2019 (€7,810 million at 31 December 2018).

The value of EDF Trading's inventories stated at market value is recognised in "Other fuel" and "Other inventories" and stands at €141 million at 31 December 2019 (€142 million at 31 December 2018).

Note 28 Trade receivables

Details of net trade receivables are as follows:

<i>(in millions of euros)</i>	Note	31/12/2019	31/12/2018
Trade receivables, gross value – excluding EDF Trading		15,066	14,468
- contract assets	28.3	400	439
Trade receivables, gross value – EDF Trading		1,583	2,446
Impairment		(1,043)	(1,004)
TRADE RECEIVABLES, NET VALUE		15,606	15,910

Most trade receivables mature within one year.

Advances received from customers in France who pay in regular monthly instalments, amounting to €6,719 million at 31 December 2019 (€6,827 million at 31 December 2018), are deducted from trade receivables.

6. Financial statements

Notes to the consolidated financial statements

28.1 Trade receivables due and not yet due

<i>(in millions of euros)</i>	31/12/2019			31/12/2018		
	Gross value	Provision	Net value	Gross value	Provision	Net value
TRADE RECEIVABLES	16,649	(1,043)	15,606	16,914	(1,004)	15,910
overdue by up to 6 months	1,262	(187)	1,075	1,318	(214)	1,104
overdue by 6-12 months	367	(124)	243	393	(152)	241
overdue by more than 12 months	940	(514)	426	877	(511)	366
Trade receivables due	2,569	(825)	1,744	2,588	(877)	1,711
Trade receivables not yet due	14,080	(218)	13,862	14,326	(127)	14,199

28.2 Assignment of receivables

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Trade receivables assigned and wholly retained in the balance sheet	-	-
Trade receivables assigned and partly retained in the balance sheet	32	38
Trade receivables assigned and wholly derecognised	1,042	1,095

The Group assigned trade receivables for a total of €1,042 million at 31 December 2019, mainly concerning Edison, EDF SA and Dalkia (€1,095 million at 31 December 2018).

As most assignment operations are carried out on a recurrent, without-recourse basis, the corresponding receivables are no longer carried in the Group's consolidated balance sheet.

28.3 Contract assets

Contract assets are rights held by an entity to receive a consideration in return for goods or services supplied to customers, when such rights are conditional on something other than the passage of time. Most contract assets mature within one year.

The contract assets included in receivables represent an amount of €400 million at 31 December 2019 and €439 million at 31 December 2018 and mainly concern Framatome, Dalkia and EDF Renewables.

Note 29 Other receivables

Details of other receivables are as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Prepaid expenses	1,429	1,719
Compensation for Public Energy Service charges (CSPE)	1,667	799
VAT receivables	2,022	2,133
Other tax receivables	153	342
Other operating receivables	3,540	4,149
OTHER RECEIVABLES	8,811	9,142
Non-current portion	1,930	1,796
Current portion	6,881	7,346
Gross value	8,877	9,197
Impairment	(66)	(55)

At 31 December 2019, other receivables include an amount of €1,667 million corresponding to the CSPE receivable (€799 million at 31 December 2018). The rest of the CSPE receivable is included in "Loans and financial receivables" (see note 39.3).

Other operating receivables include €1,278 million of advances paid to suppliers (€1,192 million at 31 December 2018). Most of these advances concern the France – Generation and Supply segment.

Note 30 Equity

30.1 Share capital

At 31 December 2019, EDF's share capital amounts to €1,551,810,543 comprising 3,103,621,086 fully subscribed and paid-up shares with nominal value of €0.50, owned 83.58% by the French State, 14.92% by the public (institutional and private investors) and 1.34% by current and retired Group employees, with 0.16% held by EDF as treasury shares.

In June 2019, payment of part of the balance of dividends for 2018 in the form of a scrip dividend led to a €20 million increase in the share capital and an issue premium of €431 million following issuance of 40,701,950 new shares. The legal formalities for this operation were finalised in June 2019.

In December 2019, payment of part of the interim dividend for 2019 in the form of a scrip dividend led to a €27 million increase in the share capital and an issue premium of €403 million following the issuance of 52,651,460 new shares.

Under Article L. 111-67 of the French Energy Code, the French State must hold more than 70% of the capital of EDF at all times.

30.2 Treasury shares

A share repurchase programme authorised by the General Shareholders' Meeting of 9 June 2006 was implemented by the Board of Directors, within the limit of 10% of the total number of shares making up the Company's capital. The initial duration of the programme was 18 months, renewed for 12 months then by tacit agreement every year.

A liquidity contract exists for this programme, as required by the French market regulator AMF (Autorité des marchés financiers).

At 31 December 2019, treasury shares deducted from consolidated equity represent 4,882,938 shares with total value of €64 million.

30.3 Dividends

The General Shareholders' Meeting of 16 May 2019 decided to distribute an ordinary dividend of €0.31 per share in respect of 2018, offering shareholders the choice of payment in cash or shares (scrip option).

In application of Article 24 of the Company's articles of association, shareholders who had held their shares continuously for at least 2 years at the year-end and still held them at the dividend distribution date benefit from a 10% bonus on their dividends. The number of shares carrying an entitlement to the bonus dividend cannot exceed 0.5% of the Company's capital per shareholder. The bonus dividend amounts to €0.341 per share.

As interim dividends of €0.15 per share had been paid in the form of cash on 10 December 2018, the balance payable for 2018 amounted to €0.16 per share benefiting from the ordinary dividend and €0.191 per share benefiting from the bonus dividend. The balance of the dividend was paid out on 18 June 2019.

The French government opted for the scrip dividend for the balance of 2018 dividends payable.

The balance of the cash dividend paid to shareholders who did not opt for the scrip dividend for 2018 amounts to €31 million.

On 19 November 2019, EDF's Board of Directors decided to distribute an interim dividend of €0.15 per share in respect of 2019. This interim dividend amounting to a total of €458 million was paid out in the form of new shares (scrip option) or cash on 17 December 2019.

The French government opted for the scrip interim dividend for 2019.

The amount of the cash dividend paid to shareholders who did not opt for the scrip interim dividend for 2019 amounted to €27 million.

30.4 Equity instruments

At 31 December 2019, perpetual subordinated bonds carried in equity amounted to €9,209 million (less net-of-tax transaction costs).

Issues and redemptions of perpetual subordinated bonds were recorded in equity at 31 December 2019 at the total net value of €(1,125) million (see notes 3.3.2 and 3.3.3).

Interest paid by EDF to the bearers of perpetual subordinated bonds issued totalled €589 million in 2019 and €584 million in 2018. The resulting cash payout is reflected in a corresponding reduction in Group equity.

In January 2020, EDF paid interest of around €286 million to the bearers of perpetual subordinated bonds.

PERPETUAL SUBORDINATED BONDS IN THE ACCOUNTS OF EDF

(in millions of currencies)

Entity	Issue	Nominal amount	Currency	Redemption option	Coupon
EDF	01/2013	1,250	EUR	12 years	5.38%
EDF	01/2013	1,250	GBP	13 years	6.00%
EDF	01/2013	2,098	USD	10 years	5.25%
EDF	01/2014	1,500	USD	10 years	5.63%
EDF	01/2014	267	EUR	8 years	4.13%
EDF	01/2014	1,000	EUR	12 years	5.00%
EDF	01/2014	750	GBP	15 years	5.88%
EDF	10/2018	1,250	EUR	6 years	4.00%
EDF	11/2019	500	EUR	8 years	3.00%

6. Financial statements

Notes to the consolidated financial statements

30.5 Non-controlling interests (minority interests)

30.5.1 Details of non-controlling interests

<i>(in millions of euros)</i>	31/12/2019			31/12/2018	
	Ownership%	Equity (non-controlling interests)	Net income attributable to non-controlling interests	Equity (non-controlling interests)	Net income attributable to non-controlling interests
Principal non-controlling interests:					
EDF Energy Nuclear Generation Ltd.	20.0%	2,764	(16)	2,612	(21)
NNB Holding Ltd.	33.5%	3,977	5	2,849	(3)
EDF Investissements Groupe SA	6.1%	516	10	516	11
Luminus SA (formerly EDF Luminus SA)	31.4%	376	(6)	380	(21)
Framatome	24.5%	163	(22)	194	24
Other non-controlling interests	-	1,528	56	1,626	24
TOTAL	-	9,324	27	8,177	14

Non-controlling interests in EDF Energy Nuclear Generation Ltd. (formerly British Energy), which is owned 80% by the Group *via* EDF Energy, correspond to Centrica's share.

Non-controlling interests in NNB Holding Limited, the holding company for the Hinkley Point C project, which is owned 66.5% by the Group *via* EDF Energy, correspond to CGN's share.

Non-controlling interests in Framatome, the group which was acquired on 31 December 2017 and is owned 75.5% by the Group *via* EDF SA, correspond to the 19.5% share held by Mitsubishi Heavy Industries and the 5% share held by Assystem.

Non-controlling interests in Luminus correspond to the investments held by Belgian local authorities.

Non-controlling interests in EDF Investissements Groupe correspond to the investment held by Natixis Belgique Investissements.

Other non-controlling interests in 2018 and 2019 principally comprised minority interests in Sizewell C Holding Co. and subsidiaries of the Edison and EDF Renewables subgroups.

Other non-controlling interests also include instruments in the form of bonds convertible into shares, issued by the Dalkia group and subscribed by minority interests, amounting to a total €239 million at 31 December 2019 (€260 million in 2018).

30.5.2 Non-controlling interests in EDF Energy

The key financial indicators (100% basis) for EDF Energy Nuclear Generation Ltd. are as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Non-current assets	25,807	21,304
Current assets	3,649	3,289
TOTAL ASSETS	29,456	24,593
Equity	13,820	13,061
Non-current liabilities	15,175	10,805
Current liabilities	461	727
TOTAL EQUITY AND LIABILITIES	29,456	24,593
Sales	2,807	2,765
Net income	(81)	(106)
Gains and losses recorded directly in equity	841	(100)
Net cash flow from operating activities	328	649
Net cash flow from investing activities	(474)	(555)
Net cash flow from financing activities	-	(113)
CASH AND CASH EQUIVALENTS – OPENING BALANCE	472	483
Net increase/(decrease) in cash and cash equivalents	(146)	(19)
Effect of currency fluctuations	17	1
Other	(14)	7
CASH AND CASH EQUIVALENTS – CLOSING BALANCE	329	472
Dividends paid to non-controlling interests	-	23

Note 31 Provisions

The breakdown between current and non-current provisions is as follows:

(in millions of euros)	Notes	31/12/2019			31/12/2018		
		Current	Non-current	Total	Current	Non-current	Total
Provisions for the back-end of the nuclear cycle		1,432	23,822	25,254	1,515	22,362	23,877
Provisions for decommissioning and last cores		364	31,761	32,125	302	26,842	27,144
Provisions related to nuclear generation	32	1,796	55,583	57,379	1,817	49,204	51,021
Other provisions for decommissioning	33	105	1,573	1,678	91	2,033	2,124
Provisions for employee benefits	34	945	20,539	21,484	998	17,627	18,625
Other provisions	35	2,710	3,065	5,775	3,104	2,908	6,012
TOTAL PROVISIONS		5,556	80,760	86,316	6,010	71,772	77,782

Note 32 Provisions related to nuclear generation – back-end of the nuclear cycle, plant decommissioning and last cores

Provisions related to nuclear generation comprise provisions for back-end nuclear cycle expenses (management of spent fuel and radioactive waste), provisions for plant decommissioning and provisions for last cores.

Provisions are estimated under the principles presented in note 1.3.2.2.

Obligations can vary noticeably depending on each country's legislation and regulations, and the technologies and industrial scenarios involved.

The movement in provisions for the back-end of the nuclear cycle, provisions for decommissioning and provisions for last cores breaks down as follows:

(in millions of euros)	31/12/2018	Increases	Decreases	Discount effect	Translation adjustments	Other movements	31/12/2019
Provisions for spent fuel management	12,162	548	(1,092)	576	74	58	12,326
Provisions for waste removal and conditioning	1,120	32	(29)	51	23	140	1,337
Provisions for long-term radioactive waste management	10,595	165	(232)	680	46	337	11,591
Provisions for the back-end of the nuclear cycle	23,877	745	(1,353)	1,307	143	535	25,254
Provisions for nuclear plant decommissioning	23,040	105	(174)	984	444	3,210	27,609
Provisions for last cores	4,104	-	-	167	88	157	4,516
Provisions for decommissioning and last cores	27,144	105	(174)	1,151	532	3,367	32,125
PROVISIONS RELATED TO NUCLEAR GENERATION	51,021	850	(1,527)	2,458	675	3,902	57,379

The change in provisions related to nuclear generation in 2019 is mainly due to:

- a lower real discount rate in France and the United Kingdom. The corresponding effects are included in the "Discount effect" (€449 million) for provisions with corresponding entries in the income statement, and in "Other movements" (€1,708 million) for changes in provisions with related assets (assets associated with provisions and underlying assets in France; the NLF receivable in the United Kingdom);

- revision of the assumptions used to determine nuclear plant decommissioning liabilities in the United Kingdom. The related effects (€1,994 million) are presented in "Other movements" and correspond to changes in provisions associated with the NLF receivable (see note 32.2.3).

6. Financial statements

Notes to the consolidated financial statements

The breakdown of provisions by company is shown below:

	EDF	EDF Energy	Belgium	Total
	Note 32.1	Note 32.2		
<i>(in millions of euros)</i>				
Provisions for spent fuel management	10,823	1,503	-	12,326
Provisions for waste removal and conditioning	805	532	-	1,337
Provisions for long-term radioactive waste management	10,531	1,053	7	11,591
PROVISIONS FOR THE BACK-END OF THE NUCLEAR CYCLE AT 31/12/2019	22,159	3,088	7	25,254
Provisions for the back-end of the nuclear cycle at 31/12/2018	21,295	2,576	6	23,877
Provisions for nuclear plant decommissioning	16,937	10,303	369	27,609
Provisions for last cores	2,624	1,892	-	4,516
PROVISIONS FOR DECOMMISSIONING AND LAST CORES AT 31/12/2019	19,561	12,195	369	32,125
Provisions for decommissioning and last cores at 31/12/2018	18,511	8,332	301	27,144

Details of nuclear provisions in France and the United Kingdom are provided in notes 32.1 and 32.2 respectively.

In Belgium, the Belgian law of 11 April 2003 assigned management of provisions concerning the Belgian nuclear plants, and the funds that cover them, to Synatom (a subsidiary of the Engie Group). Luminus contributes *via* Synatom to these funds, to cover its share of plant decommissioning and back-end nuclear fuel expenses as a co-owner of 4 nuclear plants. These funding mechanisms are reflected through the following items in the consolidated financial statements:

- obligations presented in the liabilities in the form of provisions, amounting to €259 million at 31 December 2019 (€209 million at 31 December 2018);
- a receivable representing the advance payments made to Synatom, recognised in the consolidated balance sheet assets as financial assets carried at fair value (see note 39.3) at the value of €230 million at 31 December 2019 (€203 million at 31 December 2018). This receivable, which corresponds to the fair value of the share of funds held by Synatom on behalf of Luminus, is discounted by applying the same real discount rate used to determine the obligations they will cover.

32.1 Nuclear provisions in France

In France, the provisions established by EDF SA for the nuclear generation fleet result from the Law of 28 June 2006 on long-term management of radioactive materials and waste, and the associated implementing provisions concerning secure financing of nuclear expenses.

In compliance with the accounting principles described in note 1.3.2.2:

- EDF books provisions to cover all obligations related to the nuclear facilities it operates;
- EDF holds dedicated assets for secure financing of long-term obligations (see note 48).

The calculation of provisions incorporates a level of risks and unknowns as appropriate to the operations concerned. The valuation of costs carries uncertainty factors such as:

- changes in legislation, particularly regarding safety, security and environmental protection, and financing of long-term nuclear expenses;
- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisation;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (Agence nationale pour la gestion des déchets radioactifs);
- changes in certain financial parameters such as discount rates, notably in view of the regulatory limits, inflation rates, or changes in the contractual terms of spent fuel management.

Details of changes in provisions for the back-end of the nuclear cycle, decommissioning and last cores are as follows:

(in millions of euros)	Notes	31/12/2018	Increases	Decreases	Discount effect ⁽¹⁾	Other movements ⁽²⁾	31/12/2019
Provisions for spent fuel management	32.1.1	10,698	535	(890)	515	(35)	10,823
Provisions for waste removal and conditioning	32.1.2	751	29	(29)	36	18	805
Provisions for long-term radioactive waste management	32.1.2	9,846	161	(232)	650	106	10,531
Provisions for the back-end of the nuclear cycle		21,295	725	(1,151)	1,201	89	22,159
Provisions for nuclear plant decommissioning	32.1.3	15,985	105	(141)	694	294	16,937
Provisions for last cores	32.1.4	2,526	-	-	97	1	2,624
Provisions for decommissioning and last cores		18,511	105	(141)	791	295	19,561
PROVISIONS RELATED TO NUCLEAR GENERATION		39,806	830	(1,292)	1,992	384	41,720

(1) The discount effect comprises the €1,543 million cost of unwinding the discount, and the €449 million effect of the change in the real discount rate in 2019, which were recorded in the income statement for provisions with no related assets (costs of unwinding the discount).

(2) Other movements mainly include the €361 million effect of the change in the real discount rate at 31 December 2019 for provisions with related assets.

Concerning non-EDF installations:

- EDF, COGEMA (now Orano Cycle) and the French Atomic Energy Commission (Commissariat à l'énergie atomique or CEA) signed an agreement in December 2004 which transferred the management and financing of final shutdown, decommissioning and waste recovery and reconditioning for the UP1 reprocessing facility at Marcoule to the CEA. In return, EDF paid the CEA a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs;
- EDF, AREVA and AREVA NC (now Orano Cycle) signed two agreements in December 2008 and July 2010 defining the legal and financial terms for the transfer to AREVA NC of EDF's contractual obligations regarding its financial contribution to the dismantling of La Hague installations and the recovery and conditioning of waste. In application of those agreements, EDF paid AREVA NC a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs.

32.1.1 Provisions for spent fuel management

EDF's currently adopted strategy with regards to the fuel cycle, in agreement with the French State, is to process spent fuel and to recycle the separated plutonium in the form of MOX fuel (Mixed OXide of plutonium and uranium).

The quantities processed by Orano at the request of EDF, totalling approximately 1,100 tonnes per year, are determined based on the quantity of recyclable plutonium in the reactors that are authorised to load MOX fuel.

Consequently, provisions for spent fuel cover services associated with the following:

- removal of spent fuel from EDF's generation centres, as well as reception and interim storage;
- processing, including conditioning and storage of recyclable matter.

The processing expenses included in these provisions exclusively concern spent fuel that can be recycled in existing facilities, including the portion in reactors but not yet irradiated.

Expenses are measured based on forecast physical flows at the year-end, with reference to the contracts with Orano which define the terms for implementation of the framework agreement for the period 2008-2040. The most recent contract, signed on 5 February 2016, covers the period 2016-2023. These contracts contain price indexes that will be revised annually.

In 2018 the Board of Directors approved resumption of recycling of uranium from reprocessing (which had been suspended in 2013 pending availability of a new industrial schema), with loading of the first fuel assemblies scheduled for 2023, subject to technical adaptations and the necessary authorisations from the Nuclear Safety Authority. The objective is to start recycling in certain 900MW units, and later in certain 1,300MW units. The corresponding contracts were signed with the respective suppliers in the second quarter of 2018. In 2019 EDF continued to monitor the plants' preparation trajectory with reference to those contracts.

The portion of the provision for spent fuel management relating to uranium from reprocessing (€759 million) will be recovered once all the industrial, regulatory and economic conditions for resumption of uranium recycling have been fulfilled, but EDF has no control over fulfilment of some of these conditions (currently, no advance timetable has been set).

This provision also covers long-term storage of spent fuel that cannot currently be recycled in existing installations: plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis until fourth-generation reactors become available. Dedicated assets are held in association with this provision (see note 48.4).

32.1.2 Provisions for waste removal and conditioning – Provisions for long-term radioactive waste management

32.1.2.1 Provisions for waste removal and conditioning

The provisions for waste removal and conditioning are reported separately from 1 January 2017.

They cover the following future expenses for radioactive waste resulting from operations or decommissioning (apart from spent fuel):

- characterisation and conditioning of waste;
- interim storage of waste.

Equipment assembly for the conditioning and intermediate storage facility for radioactive waste (*installation de conditionnement et d'entreposage des déchets actifs* – ICEDA) was completed in December 2018 and pre-service testing is currently in process. Information on the identification of EIP equipment (equipment that is important for protection of interests) has been added to the commissioning permit application (DAMS) and the documents required for examination of the commissioning authorisation application sent to the ASN. The ICEDA is expected to start operations in the first half of 2020.

6. Financial statements

Notes to the consolidated financial statements

32.1.2.2 Provisions for long-term radioactive waste management

These provisions concern future expenses for:

- removal and storage of radioactive waste resulting from decommissioning of nuclear installations operated by EDF;
- interim storage, removal and storage of radioactive waste packages resulting from spent fuel processing;
- direct storage, where relevant, of spent fuel that cannot be recycled in existing installations: specifically plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis;

The provisions for long-term radioactive waste management break down as follows:

(in millions of euros)

	31/12/2019	31/12/2018
Very low-level and low and medium-level waste	1,561	1,278
Long-lived low-level waste	330	292
Long-lived medium and high-level waste	8,640	8,276
PROVISIONS FOR LONG-TERM RADIOACTIVE WASTE MANAGEMENT	10,531	9,846

Very low-level and low and medium-level waste

Very low-level waste mainly comes from nuclear plant decommissioning, and generally takes the form of rubble (concrete, scrap metal, insulating materials and piping). This type of waste is stored at surface level at the Morvilliers storage centre managed by ANDRA.

Low and medium-level waste comes from nuclear facilities (gloves, filters, resins). This type of waste is stored at surface level at the Soulaines storage centre managed by ANDRA.

The cost of removing and storing short-lived waste (very low-level and low and medium-level) is assessed on the basis of current contracts with transporters, Cyclife France (for waste processing) and ANDRA for operation of the existing storage centres. In 2019, the cost and inventory assumptions were updated by applying a long-term projection based on time series analysis of past waste removal and better characterisation of future volumes. The effects resulting from the work on updating cost estimates led to a €206 million increase in the provision (with an unfavourable effect of €132 million on the income statement, while the rest of the change was recognised *via* adjustments to fixed assets).

Long-lived low-level waste

Long-lived low-level waste belonging to EDF essentially consists of graphite waste from the ongoing decommissioning of the former UNGG (natural uranium graphite gas-cooled) reactors.

As this waste has a long lifetime but is lower-level than long-lived medium and high-level waste, specific subsurface storage requirements apply under the French Law of 28 June 2006.

Following the initial geological investigations, in July 2015 ANDRA remitted a report on the proposed storage centre for long-lived low-level waste on a site located in the Soulaines region (Aube) in France. This report was submitted to the ASN for its opinion. Uncertainties remain about the site's capacity to accommodate all of the waste included in the baseline inventory of the long-lived low-level waste storage facility. Further studies are planned under the 2016-2018 period of the National Plan for the Management of Radioactive Materials and Waste (PNGMDR), concerning both the feasibility of this storage centre and the search for additional waste management solutions. A general industrial strategy for management of all long-lived low-level radioactive waste is currently under examination prior to finalisation under the National Plan.

Long-lived medium and high-level waste

Long-lived medium and high-level waste essentially comes from processing of spent fuel, and to a lesser extent waste resulting from nuclear plant decommissioning (metallic components that have been inside the reactor).

The French Law of 28 June 2006 requires reversible storage in deep geological layers for this type of waste.

The provision established for long-lived medium and high-level waste is the largest component of provisions for long-term radioactive waste management.

Until June 2015 the gross value and disbursement schedules for forecast expenses were based on a scenario of industrial geological waste storage, following conclusions presented in the first half of 2005 by a working group formed under

- EDF's share of the costs of studies, construction, operation and maintenance, shutdown and surveillance of existing and future storage centres.

The volumes of waste concerned by provisions include existing packages of waste and all waste to be conditioned, resulting from plant decommissioning or spent fuel processing at La Hague (comprising all fuel in reactors at 31 December, irradiated or otherwise). These volumes are regularly reviewed, in keeping with the data declared for the purposes of the national waste inventory undertaken by ANDRA.

supervision of the State involving representatives of the administrations concerned, ANDRA and the producers of waste (EDF, Orano, CEA). EDF applied a reasonable approach to information supplied by this working group, leading to a benchmark cost, for storage of waste from all producers, of €14.1 billion under the economic conditions of 2003 (€20.8 billion under 2011 economic conditions).

In 2012 ANDRA carried out preliminary conceptual studies for the Cigéo geological storage project, after discussing the technical optimisations proposed by the producers of waste.

On this basis, ANDRA drew up figures which, in compliance with the Law of 28 June 2006, were subjected to a consultation process with waste producers started in late 2014 by the French Department for Energy and Climate (Direction générale de l'énergie et du climat or DGEC). In April 2015 EDF and the other producers sent the DGEC their comments on ANDRA's report and a joint estimation of the target Cigéo storage cost due to divergent approaches. All this information was included, together with the ASN's opinion, in a report submitted to the Minister for Ecology, Sustainable Development and Energy.

On 15 January 2016 the Ministry of Ecology, Sustainable Development and Energy issued a Ministerial Order setting the target cost for the Cigéo storage project at €25 billion under 2011 year-end economic conditions. The cost as defined constitutes an objective to be met by ANDRA, in compliance with safety standards set by the ASN, working in close liaison with the operators of nuclear installations.

Publication of this Order entailed an €820 million adjustment to the provision shown in the Group's financial statements at 31 December 2015. The cost of the Cigéo project defined in the Order has replaced the estimated benchmark cost of €20.8 billion previously used by EDF for its consolidated financial statements.

In application of this Ministerial Order, the cost of the Cigéo project will be regularly updated, at least at each key milestone in the course of the project's development (authorisation to create the facility, commissioning, end of the "pilot industrial phase", safety reviews) in accordance with the opinion of the ASN.

Design studies for future facilities are currently in process with ANDRA and stakeholders. They include technical and economic optimisation and the responses to the safety option report sent by ANDRA to the ASN in April 2016. The law of 11 July 2016 also clarified the concept of reversibility. In 2017 ANDRA opted for a new configuration to provide the basis for the preliminary project.

On 11 January 2018, the ASN issued its opinion on the Cigéo safety option file (DOS Cigéo). It considered that the project had reached satisfactory overall technological maturity at that stage. This opinion included a requirement for examination of alternatives to the proposals for storage of bituminous waste at Cigéo. A group of experts appointed by the DGEC in September 2018 to draw up a report on current bituminous waste management concluded in September 2019 that various options were feasible (storage or neutralisation) but stressed the importance of continuing the studies in order to identify the most appropriate option.

Under the schedule prepared by ANDRA, the application to develop Cigéo (classified as a basic nuclear facility) is now due to be made in 2020, with a corresponding extension for obtaining authorisation. After an industrial pilot phase extending to 2030, producers are still currently working on the hypothesis that the first waste packages would be received in 2031. The provision is therefore unaffected by this change to the schedule.

32.1.3 Decommissioning provisions for nuclear power plants

EDF bears full technical and financial responsibility for decommissioning of the nuclear plants it operates. The decommissioning process is governed by French Law of 13 June 2006, Decree 2007-1557 of 2 November 2007, and the French Environment Code (Articles L. 593-25 and following). It involves the following operations for each site:

- a shutdown declaration, to be made at least two years prior to the planned shutdown date:
 - since the Energy Transition Law of 17 August 2015, the final shutdown, which takes place during the operating phase of the basic nuclear facility, is considered separately from dismantling, as a notable change of lesser importance (simply requiring a declaration by the operator to the Minister and the ASN);
- an application for decommissioning, which after examination by the authorities and a public inquiry, leads to a single decree authorising the decommissioning;
- key progress reviews with the ASN, included in a formal safety procedure specific to dismantling operations;
- an internal authorisation procedure for the operator, independent of operational personnel and audited by the ASN, allowing some specific work to be started ahead of the authorised safety procedure;
- finally, once these operations are complete, declassification of the facility to remove it from the legal regime governing basic nuclear facilities.

The decommissioning scenario adopted by EDF complies with France's Environmental Code, which requires as short a period as possible to elapse between final shutdown and dismantling in economically acceptable conditions and in compliance with the principles laid down in Article L. 1333-1 of the Public Health Code (radioprotection) and section II of Article L. 110-1 of the Environmental Code (protection of the environment). The intended end-state is industrial use: the sites will be restored to their original condition and will be reusable for industrial facilities.

Details of changes in decommissioning provisions for nuclear power plants are as follows:

<i>(in millions of euros)</i>	31/12/2018	Increases	Decreases	Discount effect	Other movements	31/12/2019
Provisions for decommissioning nuclear plants in operation	12,480	2	(20)	488	294	13,244
Provisions for decommissioning permanently shut-down nuclear plants	3,505	103	(121)	206	-	3,693
DECOMMISSIONING PROVISIONS FOR NUCLEAR POWER PLANTS	15,985	105	(141)	694	294	16,937

For nuclear power plants currently in operation (PWR pressurized water reactor plants with 900MW, 1,300MW and N4 reactors)

Until 2013, provisions were estimated based on a 1991 study by the French Ministry of Trade and Industry, which set an estimated benchmark cost for decommissioning expressed in €/MW, confirming the assumptions defined in 1979 by the PEON commission. These estimates had been confirmed from 2009 by a detailed study of decommissioning costs conducted by EDF at the representative site of Dampierre (four 900MW units), and its results were corroborated by an intercomparison with the study carried out by consultants LaGuardia, based mainly on the Maine Yankee reactor in the US.

In 2014 the Dampierre study was reviewed by EDF to make sure that the previous calculations were still valid in view of recent developments and experience, both internationally and internally. For this revision, the decommissioning provisions for

the ongoing operations concern plants that were constructed and operated before the current nuclear fleet ("first-generation" plants), and the Superphenix plant and Irradiated Materials Workshop. These operations cover four different technologies: a heavy water reactor (Brennilis), a sodium-cooled fast-neutron reactor (the Superphenix at Creys-Malville), natural uranium graphite gas-cooled (UNGG) reactors (at Chinon, Saint Laurent and Bugey) and a pressurised water reactor (PWR at Chooz). Each of them is a first for EDF, and apart from the PWR, they concern reactor technologies for which there is little or no international experience. They therefore require development of new methods and technologies that are riskier than technologies for which feedback already exists. Decommissioning of the Chooz PWR is benefiting from past experience (essentially in the US and limited), but the reactor has the specificity of being located in a cave, making this a unique operation, generating experience that is not immediately transposable and involves specific risks.

The experience gained from dismantling the Chooz PWR will nonetheless make the studies and estimates of future decommissioning of the nuclear fleet currently in operation ("second-generation" plants) as robust as possible. But so far, neither EDF nor any other operator has begun a decommissioning programme on a scale comparable to the current PWR fleet, and as a result the estimates include both opportunities and risks, especially the risks associated with the scale effect.

The decommissioning provisions cover future decommissioning expenses as described above (excluding the cost of removing and storing waste, which is covered by the provisions for long-term waste management).

The preliminary dismantling plan and the orientations for the fourth periodic review of Fessenheim (RP4) were sent to the ASN in July 2018. The Consolidated Preliminary Plan (*avant-projet consolidé* or APC) was finalised in late 2018, with more in-depth studies for derisking of the Summary Preliminary Plan (*avant-projet sommaire* or APS). Studies in 2019 focused on preparing the dismantling plan, with the objective of filing the dismantling and RP4 documents in mid-2020.

On 30 September 2019 EDF sent the Minister for the Ecological and Inclusive Transition and the ASN its application requesting approval for the termination of operations, and a declaration of the permanent shutdown of both reactors at Fessenheim nuclear power plant, scheduled for 22 February 2020 for reactor 1 and 30 June 2020 for reactor 2 (see note 3.1.6).

plants in operation were based on costs resulting from the Dampierre study, in order to incorporate best estimates and feedback from inside and outside France. This change of estimate had no significant impact on the level of provisions at 31 December 2014.

Between June 2014 and July 2015, an audit of dismantling costs for EDF's nuclear fleet currently in operation was conducted by specialised consulting firms, at the request of the French Department for Energy and Climate (Direction générale de l'énergie et du climat or DGEC). On 15 January 2016 the DGEC published a summary of the audit report. It stated that although estimating the cost of decommissioning nuclear reactors is a demanding exercise due to relatively limited past experience, the prospects of changes in techniques, and the distant timing of the expenditure, overall, the audit confirmed EDF's estimate of decommissioning costs for its nuclear fleet currently in operation. The DGEC also made a number of recommendations to EDF following this audit.

6. Financial statements

Notes to the consolidated financial statements

In 2016, EDF revised the decommissioning estimate, in order to incorporate the audit recommendations and past experience gained from dismantling operations for first-generation reactors (particularly Chooz A).

A detailed analytical approach was used to revise this estimate, identifying all costs for the engineering, construction work, operation and waste processing involved in future decommissioning of reactors currently in operation. This led to figures based on detailed timetables for plant decommissioning. The approach adopted made it possible to explore more thoroughly the assessment of costs specific to the initial units of each series, estimated for each series based on transposition coefficients applied to the baseline costs for the initial 900MW unit, and the series and mutualisation effects, as these costs and effects are inherent to the fleet's size and configuration.

The natures of the principal mutualisation and series effects used to arrive at the estimate are explained below.

There are several types of mutualisation effects:

- some of them relate to the fact that several reactors may share common buildings and facilities on the same site, and these buildings and facilities will not have to be decommissioned twice. Structurally, decommissioning a pair of reactors on the same site costs less than decommissioning two standalone reactors on two different sites. In France, unlike other countries, there are no single reactors but sites with two or four, and in one case six reactors;
- certain costs are no higher when 2 or 4 reactors are decommissioned on the same site. This is usually the case for surveillance costs and cost of maintaining safe operating conditions on the site;
- waste processing in centralised facilities (for example for dismantling major components) costs less than having several waste processing facilities at the decommissioning location.

Series effects are mainly of two types:

- first, in a fleet using the same technology, many of the studies do not need to be repeated each time;
- second, in a fleet using the same technology, robots and tooling can be largely reused from one site to another.

Such series effects are comparable in nature to the effects observed during construction of the fleet, in terms of studies or component manufacturing plants.

For example, for the 900MW fleet, a series effect of approximately 20% is expected between the first-of-a-kind reactor with 2 units and an average 2-units reactor.

Series and mutualisation effects in particular explain why it is not appropriate simply to compare the average decommissioning cost per reactor between the French fleet and other countries' nuclear fleets.

The figures only marginally reflect changes in productivity and the learning effect. The external audit of the decommissioning cost for the fleet currently in operation, ordered by the DGEC, considered that the learning effect incorporated into the estimate was conservative.

For reasons of prudence, the estimate also includes an assessment of risks, contingencies and uncertainties.

The Group considers that the work done to revise the estimate answers the recommendations issued after the audit. The approach adopted and its results have been presented to the administrative authority and gave rise to further questions and discussions.

EDF is also continuing to support its analyses through an international comparison, making it sure it takes into consideration a number of factors that could distort direct comparisons, for example differences in the scope concerned by costs estimate, or national and regulatory contexts.

The results of this detailed approach led to limited changes overall in the cost estimate and the associated provisions at 31 December 2016, apart from the consequences of the change in the depreciation period for 900MW series plants (excluding Fessenheim) at 1 January 2016, and the effect of changes in discount rates at 31 December 2016, *i.e.*:

- an increase of €321 million in the estimated decommissioning costs and an increase of €334 million in the estimated cost of long-term management of long-lived medium-level waste;
- a decrease of €(451) million in the provision for plant decommissioning, and an increase of €162 million in the provision for long-term management of long-lived medium-level waste, with corresponding changes in the underlying assets.

After its revision in 2016, it was decided that the estimate would be reviewed annually. Reviews since 2017 have led to non-significant adjustments.

The scope of the provision for very low-level and low and medium-level waste includes the cost of demolishing back-up diesel facilities and installations for processing control rod cluster guide tubes commissioned in 2019, and this resulted in a €43 million increase in the provision.

For permanently shut-down nuclear power plants

Unlike the PWR fleet currently in operation, the first-generation reactors now shut down used a range of different technologies: a PWR reactor at Chooz A, UNGG (natural uranium graphite gas-cooled) reactors at Bugey, St-Laurent and Chinon, a heavy water reactor at Brennilis, and a sodium-cooled fast neutron reactor at Creys-Malville.

The decommissioning costs are based on contractor quotes, which take account of accumulated industrial experience, unforeseen and regulatory developments, and the latest available figures.

In 2015 the industrial decommissioning strategy for UNGG plants was totally revised. The previously selected strategy was based on a scenario involving "underwater" dismantling of caissons (UNGG reactor buildings) for four of the reactors, with direct graphite storage in a centre currently under examination by ANDRA (see Long-lived low-level waste, note 32.1.2). Several new technical developments showed that the alternative "in-air" dismantling solution for the caissons would improve industrial control of operations and was apparently more favourable in terms of safety, radioprotection and environmental impact. The Company therefore selected a new "in-air" dismantling scenario as the benchmark strategy for all six caissons. This scenario includes a consolidation phase, building on experience acquired from dismantling the first caisson before beginning work on the other five. The decommissioning phase will ultimately be longer than previously planned, leading to higher contractor quotes due to the induced operating costs.

Updating the industrial decommissioning scenario for first-generation power plants, particularly UNGGs plants, led to a €590 million increase in the provision at 31 December 2015.

After the revision of the estimated cost in 2015, the decision was made that it should be reviewed annually. The 2016 review led to non-significant adjustments, apart from one increase of €125 million for a specific installation (the Irradiated Materials Workshop at Chinon). Since 2017, this annual review has given rise to non-significant adjustments.

The amended industrial scenario in 2015 was presented to the ASN's commissioners on 29 March 2016. In 2018 the ASN issued its main questions and conclusions about the UNGG strategy file. A consensus was reached regarding "in-air" dismantling for all reactors, the usefulness of an industrial demonstrator, and the timetable for dismantling the first-of-a-kind reactor (Chinon A2), but discussions continued regarding the dismantling timetable for the other 5 reactors. EDF's proposed schedule allows for significant experience-based adjustments (after dismantling the first reactor) before beginning almost simultaneous dismantling of the other 5 reactors. On 12 February 2019, EDF presented all the information justifying the Group's chosen timetable to the ASN's commissioners. The ASN then issued draft decisions that were submitted to public consultation between July and November 2019, setting the deadline for filing regulatory applications for authorisation of dismantling work, and the dismantling schedule to be included in the applications. In those draft decisions, the ASN has acknowledged that the required operations are complex, and that EDF's proposed risk control strategy (industrial demonstrator, significant experience with a first reactor) is justified. However, it is asking for work on the five reactors after the first-of-a-kind reactor to be brought forward slightly and begin no later than 2055. The results of this consultation, which is now closed, should not fundamentally call into question the draft decisions.

In view of the ASN's draft decisions, the nuclear provisions were increased in 2019 by a total €108 million (*via* profit and loss): €77 million for decommissioning provisions for permanently shut-down nuclear power plants and €31 million for provisions for long-term radioactive waste management (long-lived low-level waste, very low-level and low and medium-level waste). The final decisions are expected to be issued in 2020.

32.1.4 Provisions for last cores

These provisions cover the future expenses resulting from scrapping fuel that will only be partially irradiated when the reactor is shut down. It is measured based on:

- the cost of the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints;
- the cost of fuel processing, and waste removal and storage operations. These costs are valued in a similar way to provisions for spent fuel management and long-term radioactive waste management.

These unavoidable costs are components of the cost of nuclear reactor shutdown and decommissioning. As such, they are fully covered by provision from the commissioning date and an asset associated with the provision is recognised.

32.1.5 Discounting of provisions related to nuclear generation and sensitivity analyses

32.1.5.1 Discount rate and inflation rate

Calculation of the discount rate and inflation rate

The discount rate is determined based on long-series data for a sample of bonds with maturities as close as possible to that of the liability. However, some expenses covered by these provisions will be disbursed over periods significantly longer than the duration of instruments generally traded on the financial markets.

The benchmark used to determine the discount rate is the sliding 10-year average of the return on French OAT 2055 treasury bonds which have a similar duration to the obligations, plus the spread of corporate bonds rated A to AA, which include EDF.

The methodology used to determine the discount rate, particularly the reference to sliding 10-year averages, is able to prioritise long-term trends in rates, in keeping with the long-term horizon for disbursements. The discount rate is therefore revised in response to structural developments in the economy leading to medium and long-term changes.

Until 31 December 2018, the assumed inflation rate used was determined in line with the consensus forecast and expected inflation based on the returns on

inflation-linked bonds. From 2019, as declining forecasts made short-term consensus forecast projections less appropriate, the inflation rate used was deduced from inflation swaps.

Considering the long durations of nuclear obligations for which the long-term inflation rate is needed, and the volatility according to the date of the swaps, the assumed average inflation rate at 31 December 2019 is thus 1.4% (1.5% at 31 December 2018).

The discount rate determined is thus 3.7% at 31 December 2019, assuming inflation of 1.4% (3.9% and 1.5% respectively at 31 December 2018), giving a real discount rate of 2.3% at 31 December 2019 (2.4% at 31 December 2018).

Regulatory discount rate limit

The discount rate applied must comply with two regulatory limits. Under the amended decree of 23 February 2007 and the ministerial order of 21 March 2007, itself modified by the order of 29 December 2017, the discount rate must be lower than:

- a regulatory maximum, set until 31 December 2026 as the weighted average of two terms, the first set at 4.3%, and the second corresponding to the arithmetic average over the 48 most recent months of the TEC 30-year rate plus 100 points. The weighting given to the first constant term of 4.3% reduces on a straight-line basis from 100% at 31 December 2016 to 0% at 31 December 2026; and
- the expected rate of return on assets covering the liability (dedicated assets).

The ceiling rate based on the TEC 30-year rate is 3.8% (3.75% rounded up to 3.8%) at 31 December 2019 (4.0% at 31 December 2018).

The discount rate used at 31 December 2019 is 3.7%.

By a letter dated 12 February 2020, the Minister for the Ecological and Inclusive Transition and the Minister of the Economy and Finance informed EDF of their decisions to change certain regulations regarding secure financing of nuclear expenses:

- the regulatory discount rate limit will be expressed in real value, and will correspond to the Ultimate Forward Rate applicable at the date concerned, published by the European Insurance and Occupational Pensions Authority, plus 150 base points. This change will be introduced gradually on a straight-line basis over 5 years from 1 January 2020, starting from a real rate of 2.3%;
- the obligation to hold assets providing a coverage rate between 100% and 110%, to offset the impact on provisions of changes in assumptions, will be cancelled and the threshold above which withdrawals can be made from those assets will be raised from 110% to 120%. The remaining obligation in respect of 2018 (€797 million) will nonetheless remain applicable. No allocation is required in respect of 2019;
- the limitation period for necessary measures by the administrative authorities in the event of a shortfall in coverage will be increased from 3 to 5 years from the end of the accounting year in which that shortfall was recorded.

6. Financial statements

Notes to the consolidated financial statements

32.1.5.2 Analyses of sensitivity to macro-economic assumptions

Sensitivity to assumptions concerning costs, inflation rate, long-term discount rate, and disbursement schedules can be estimated through comparison of the gross amount estimated under year-end economic conditions with the present value of the amount.

	31/12/2019		31/12/2018	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
Spent fuel management	19,455	10,823	18,737	10,698
Waste removal and conditioning	1,243	805	1,194	751
Long-term radioactive waste management	32,372	10,531	30,970	9,846
BACK-END NUCLEAR CYCLE EXPENSES	53,070	22,159	50,901	21,295
Decommissioning of nuclear plants in operation	21,134	13,244	20,755	12,480
Decommissioning of shut-down nuclear plants	6,428	3,693	6,576	3,505
Last cores	4,331	2,624	4,346	2,526
DECOMMISSIONING AND LAST CORE EXPENSES	31,893	19,561	31,677	18,511

This approach can be complemented by estimating the impact of a change in the discount rate on the present value.

In application of Article 11 of the Decree of 23 February 2007, the following table reports these details for the main components of provisions for the back-end of the nuclear cycle, decommissioning of nuclear plants and last cores:

AT 31 DECEMBER 2019

	Amounts in provisions at present value	Sensitivity to discount rate			
		Balance sheet provisions		Pre-tax net income	
		+0.20%	-0.20%	+0.20%	-0.20%
<i>(in millions of euros)</i>					
Back-end nuclear cycle expenses:					
■ spent fuel management	10,823	(228)	249	196	(215)
■ waste removal and conditioning	805	(25)	27	16	(17)
■ long-term radioactive waste management	10,531	(659)	750	554	(636)
Decommissioning and last core expenses:					
■ decommissioning of nuclear plants in operation	13,244	(506)	529	7	(7)
■ decommissioning of shut-down nuclear plants	3,693	(139)	150	139	(150)
■ last cores	2,624	(88)	94	-	-
TOTAL	41,720	(1,645)	1,799	912	(1,025)

AT 31 DECEMBER 2018

	Amounts in provisions at present value	Sensitivity to discount rate			
		Balance sheet provisions		Pre-tax net income	
		+0.20%	-0.20%	+0.20%	-0.20%
<i>(in millions of euros)</i>					
Back-end nuclear cycle expenses:					
■ spent fuel management	10,698	(218)	237	185	(202)
■ waste removal and conditioning	751	(23)	25	14	(15)
■ long-term radioactive waste management	9,846	(597)	780	498	(673)
Decommissioning and last core expenses:					
■ decommissioning of nuclear plants in operation	12,480	(496)	520	7	(7)
■ decommissioning of shut-down nuclear plants	3,505	(138)	149	138	(149)
■ last cores	2,526	(88)	94	-	-
TOTAL	39,806	(1,560)	1,805	842	(1,046)

32.2 EDF Energy's nuclear provisions

The specific financing terms for long-term nuclear obligations related to EDF Energy are reflected as follows in the EDF group's financial statements:

- the obligations are reported in liabilities in the form of provisions amounting to €15,282 million at 31 December 2019;
- in the assets, EDF Energy reports receivables corresponding to the amounts payable under the restructuring agreements by the NLF, for non-contracted obligations or decommissioning obligations, and by the British Government for contracted obligations (or historical liabilities).

These receivables are discounted at the same real rate as the obligations they are intended to finance. They are included in "Financial assets" in the consolidated balance sheet (see note 39.3) at the amount of €13,303 million at 31 December 2019 (€9,220 million at 31 December 2018).

Details of changes in provisions for the back-end of the nuclear cycle and provisions for decommissioning and last cores are as follows:

(in millions of euros)	31/12/2018	Increases	Decreases	Discount effect	Translation adjustments	Other movements*	31/12/2019
Provisions for spent fuel management	1,464	13	(202)	61	74	93	1,503
Provisions for waste removal and conditioning	369	3	-	15	23	122	532
Provisions for long-term radioactive waste management	743	3	-	30	46	231	1,053
Provisions for the back-end of the nuclear cycle	2,576	19	(202)	106	143	446	3,088
Provisions for nuclear plant decommissioning	6,754	-	(33)	280	444	2,858	10,303
Provisions for last cores	1,578	-	-	70	88	156	1,892
Provisions for decommissioning and last cores	8,332	-	(33)	350	532	3,014	12,195
PROVISIONS RELATED TO NUCLEAR GENERATION	10,908	19	(235)	456	675	3,460	15,283

* Other movements include the change in nuclear liabilities, with an equivalent change in the receivable corresponding to amounts reimbursable by the NLF (Nuclear Liabilities Fund) and the British government. This change results from the €1,347 million decrease in the discount rate and the €1,994 million effect of revision of assumptions used to calculate nuclear obligations (see note 32.2.3).

32.2.1 Regulatory and contractual framework

Amendments signed with the Nuclear Liabilities Fund (NLF – an independent trust set up by the UK Government as part of the restructuring of British Energy) following the EDF group's acquisition of British Energy had a limited impact on the contractual financing commitments made to British Energy by the UK Secretary of State and the NLF under the "Restructuring Agreements". These agreements were entered into by British Energy on 14 January 2005 as part of the restructuring led by the UK Government from 2005 in order to stabilise British Energy's financial position. British Energy Generation Limited changed its name to EDF Energy Nuclear Generation Limited on 1 July 2011 and replaced British Energy in these agreements and amendments.

Under the terms of the Restructuring Agreements:

- the NLF agreed to fund, to the extent of its assets: (i) qualifying contingent and/or latent nuclear liabilities (including liabilities for management of spent fuel from the Sizewell B power station); and (ii) qualifying decommissioning costs for EDF Energy's existing nuclear power stations;
- the Secretary of State agreed to fund: (i) qualifying contingent and/or latent nuclear liabilities (including liabilities for the management of spent fuel from the

Sizewell B power station) and qualifying decommissioning costs related to EDF Energy's existing nuclear power stations, to the extent that they exceed the assets of the NLF; and (ii) subject to a cap of £2,185 million (in December 2002 monetary values, adjusted accordingly), qualifying known existing liabilities for EDF Energy's spent fuel (including liabilities for management of spent fuel from plants other than Sizewell B loaded in reactors prior to 15 January 2005);

- EDF Energy is responsible for funding certain excluded or disqualified liabilities (e.g. those defined as EDF Energy liabilities), and additional liabilities which could be created as a result of failure by EDF Energy to meet minimum performance standards under applicable law. The obligations of EDF Energy to the NLF and the Secretary of State are guaranteed by the assets of the principal members of EDF Energy.

EDF Energy also made commitments to pay:

- annual decommissioning contributions for a period limited to the useful life of the plants as at the date of the "restructuring agreements"; the corresponding provision amounts to €117 million at 31 December 2019;
- €150,000 (indexed to inflation) per tonne of uranium loaded in the Sizewell B reactor after the date of the "restructuring agreements".

6. Financial statements

Notes to the consolidated financial statements

Furthermore, EDF Energy entered into a separate contract with the Nuclear Decommissioning Authority (NDA) for management of AGR spent fuel and associated radioactive waste resulting from operation of power plants other than Sizewell B after 15 January 2005, and bears no responsibility for this fuel and waste once it is transferred to the processing site at Sellafield. The corresponding costs of £150,000 (indexed to inflation) per tonne of loaded uranium – plus a rebate or surcharge dependent on market electricity price and electricity generated in the year – are included in inventories (see note 1.3.16.1).

EDF Energy and the British authorities began discussions in 2019 to clarify the terms for implementing certain agreements concluded in January 2005 when British Energy was restructured, particularly the Nuclear Liabilities Funding Agreement (NLFA), in view of future nuclear plant closures. The purpose of these discussions is to have a more detailed definition of the dismantling costs to be recovered by EDF Energy from the Nuclear Liabilities Fund (and potentially from the UK Treasury which guarantees the NLF), and of the conditions in which the British authorities can exercise their option to purchase the nuclear power plants after the defueling phase (a right governed by the Option Agreement). A set of principles was agreed in 2019 as a result of these discussions, which are continuing with a view to achieving comprehensive binding agreements.

EDF Energy is drafting a modification for the Baseline Decommissioning Plan (BDP), which was approved in 2017 and is currently in force, in order to reflect the

proposed change in the division of liability between EDF Energy during the defueling phase and the NDA (Nuclear Decommissioning Authority), a public body, during the decommissioning phase. In the first stage, concerning updating the estimated cost of removing the fuel, EDF Energy filed its Decommissioning Plan in January 2020 and the NDA's response is expected in April 2020. The second stage, concerning updating the estimated cost of decommissioning, is expected to take place in 2021.

32.2.2 Provisions for the back-end of the nuclear cycle

Spent fuel from the Sizewell B PWR (pressurised water reactor) plant is stored on site. Spent fuel from other plants is transferred to Sellafield for storage and reprocessing.

EDF Energy's provisions for the back-end of the nuclear cycle concern obligations for reprocessing and storage of spent fuel and long-term storage of radioactive waste, required by the existing regulations in the UK approved by the Nuclear Decommissioning Authority (NDA). Their amount is based on contractual agreements or if this is not possible, on the most recent technical estimates.

	31/12/2019		31/12/2018	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
Spent fuel management	2,655	1,503	2,665	1,464
Waste removal and conditioning	1,979	532	1,856	369
Long-term radioactive waste management	3,886	1,053	3,645	743
BACK-END NUCLEAR CYCLE EXPENSES	8,520	3,088	8,166	2,576

32.2.3 Provisions for nuclear plant decommissioning

Provisions for decommissioning of nuclear plants result from the Group management's best estimates. They cover the full cost of decommissioning and are measured on the basis of existing techniques and methods that are most likely to be used for application of current regulations.

As explained above, in late January 2020 EDF Energy undertook the first phase of the Decommissioning Plan Submission (DPS 2020). The plan submitted contains an update for the strategy, plan and estimates for the defueling phase of Advanced Gas-Cooled Reactor (AGR) power plants. This led to a €1.9 billion increase in the provision (to €3.9 billion, against the previous estimate of €2 billion), notably

reflecting i) the extension of the defueling period following risk and contingency modelling, ii) better definition of the costs covered, and iii) an updated estimate of the costs of preparing and removing fuel, following a review of the industrial scenario.

The NDA is due to examine the proposals in the DPS 2020 by April 2020. All the costs stated in these proposals are considered admissible by the NDA, and the NLF receivable has therefore been updated.

The second phase of the DPS 2020 should take place in 2021. It will involve updates of all the other decommissioning activities for the AGR plants, decommissioning of Sizewell, and an update to the non-contractual commitment plan.

	31/12/2019		31/12/2018	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
PLANT DECOMMISSIONING EXPENSES	19,278	10,187	15,741	6,637

The table above concerns decommissioning obligations excluding the present value of decommissioning contributions payable to the NLF, which is €117 million at 31 December 2019 (see note 32.2.1).

32.2.4 Discounting of provisions related to nuclear generation

The discount rate has been calculated using an average series of data for a sample of UK Government gilts over the longest available durations plus the spread of UK

Corporate bonds rated A to AA, again over the longest-term duration. The implicit inflation rate used in determining a discount rate is based on a long-term forecast of adjusted retail prices (the UK's CPIH index).

At 31 December 2019, EDF Energy applied a real discount rate of 2% to nuclear liabilities in the United Kingdom (2.5% at 31 December 2018).

Note 33 Other provisions for decommissioning

The breakdown by company is as follows:

(in millions of euros)	EDF	EDF Energy	Edison ⁽¹⁾	Framatome ⁽²⁾	Other entities ⁽³⁾	Total
OTHER PROVISIONS FOR DECOMMISSIONING AT 31/12/2019 ⁽³⁾	667	143	161	388	319	1,678
Other provisions for decommissioning at 31/12/2018	658	132	716	350	268	2,124

(1) The decrease in Edison's other provisions for decommissioning is essentially explained by the reclassification of the E&P operations as assets held for sale and related liabilities (see notes 2.3 and 46).

(2) Including €83 million of provisions concerning basic nuclear facilities in France.

(3) Including €48 million of provisions concerning basic nuclear facilities of Cyclife France (formerly SOCODEI).

Other provisions for decommissioning principally concern fossil-fired power plants, installations for the production of nuclear fuel assemblies, and dismantling of wind farms.

The costs of decommissioning fossil-fired power plants are calculated using regularly updated studies based on estimated future costs, measured by reference

to the charges recorded on past operations and the most recent estimates for plants still in operation.

The provision recorded at 31 December 2019 reflects the most recent known cost estimates and includes rehabilitation costs for generation sites.

Note 34 Provisions for employee benefits

34.1 EDF group

(in millions of euros)	31/12/2019	31/12/2018
Provisions for employee benefits – current portion	945	998
Provisions for employee benefits – non-current portion	20,539	17,627
PROVISIONS FOR EMPLOYEE BENEFITS	21,484	18,625

34.1.1 Breakdown of the change in the net liability

(in millions of euros)	Obligations	Fund assets	Net Liability
Balance at 31/12/2018 ⁽¹⁾	38,479	(20,791)	17,688
Net expense for 2019	1,954	(523)	1,431
Actuarial gains and losses	5,130	(2,668)	2,462
Employer's contributions to funds	-	(283)	(283)
Employees' contributions to funds	12	(12)	-
Benefits paid ⁽²⁾	(2,128)	1,117	(1,011)
Translation adjustment	455	(501)	(46)
Changes in scope of consolidation	-	-	-
Other movements	(3)	-	(3)
BALANCE AT 31/12/2019	43,899	(23,661)	20,238
Including:			
Provisions for employee benefits			21,484
Non-current financial assets			(1,246)

(1) The net liability at 31 December 2018 comprised €18,625 million for the provisions for employee benefits and €(937) million of non-current financial assets, giving a net liability amount of €17,688 million.

(2) Including €272 million for a plan settlement in the United States.

6. Financial statements

Notes to the consolidated financial statements

Actuarial gains and losses on obligations amount to €5,130 million for 2019, including:

- €4,151 million in France as a result of:
 - the €5,515 million change in the discount rate,
 - the €(926) million change in the inflation rate,
 - €(285) million due to the proposed law on social security system funding for 2020,
 - €(183) million due to an update of the wage law;
- €873 million in the United Kingdom, essentially associated with changes in the discount and inflation rates (see note 34.3.6).

Actuarial gains and losses on fund assets amount to €(2,668) million for 2019. They mainly result from a €(998) million change in the United Kingdom and a €(1,647) million change in France due to a very good performance on the equity markets.

Actuarial gains and losses on obligations amounted to €(3,898) million for 2018, including:

- €(3,323) million in France as a result of the €(2,174) million change in the discount rate, €(462) million due to an update of the official mortality table, and €(491) million due to an update of the wage law;
- €(518) million in the United Kingdom, essentially associated with changes in the discount and inflation rates.

34.1.2 Post-employment and other long-term employee benefit expenses

<i>(in millions of euros)</i>	2019	2018
Current service cost	(821)	(1,018)
Past service cost	3	(19)
Actuarial gains and losses – long-term benefits	(205)	20
Net expenses recorded as operating expenses	(1,023)	(1,017)
Interest expense (discount effect)	(931)	(875)
Return on fund assets	523	475
Net interest expense included in financial result	(408)	(400)
EMPLOYEE BENEFIT EXPENSES RECORDED IN THE INCOME STATEMENT	(1,431)	(1,417)
Actuarial gains and losses – post-employment benefits	(5,130)	3,898
Actuarial gains and losses on fund assets	2,668	(746)
Translation adjustments	46	(8)
Actuarial gains and losses	(2,462)	3,152
GAINS AND LOSSES ON EMPLOYEE BENEFITS RECORDED DIRECTLY IN EQUITY	(2,416)	3,144

34.1.3 Net employee benefit liability by geographical area

<i>(in millions of euros)</i>	France ⁽¹⁾	United Kingdom	Other	Total
Obligations at 31/12/2018	29,201	8,248	1,030	38,479
Net expense for 2019	1,436	473	45	1,954
Actuarial gains and losses	4,151	873	106	5,130
Employees' contributions to funds	-	11	1	12
Benefits paid	(1,478)	(369)	(281)	(2,128)
Translation adjustment	-	454	1	455
Changes in scope of consolidation	-	-	-	-
Other movements	-	-	(3)	(3)
OBLIGATIONS AT 31/12/2019	33,310	9,690	899	43,899
Fair value of fund assets	(12,581)	(10,712)	(368)	(23,661)
NET EMPLOYEE BENEFIT LIABILITY AT 31/12/2019	20,729	(1,022)	531	20,238
Including:				
Provisions for employee benefits	20,729	224	531	21,484
Non-current financial assets ⁽²⁾		(1,246)		(1,246)

(1) France comprises the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 34.2).

(2) At 31 December 2019, EDF Energy recognised surplus funding on its EEGSG and BEGG pension schemes (see note 34.3.1).

<i>(in millions of euros)</i>	France*	United Kingdom	Other	Total
Obligations at 31/12/2018	29,201	8,248	1,030	38,479
Fair value of fund assets	(11,165)	(9,039)	(587)	(20,791)
PROVISIONS FOR EMPLOYEE BENEFITS AT 31/12/2018	18,036	(791)	443	17,688
Including:				
Provisions for employee benefits	18,036	146	443	18,625
Non-current financial assets		(937)		(937)

* France comprises the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 34.2).

34.2 France (Regulated activities and Generation and Supply)

Given the strong similarities between their pension schemes, the two operating segments "France – Generation and Supply" and "France – Regulated activities" (see note 6.1) are combined here into a single subtotal, "France", which primarily

includes EDF and Enedis. Almost all of these companies' employees have IEG status, including the special IEG pension and other IEG benefits.

These benefits are described in note 1.3.21.

34.2.1 Details of changes in the provisions

<i>(in millions of euros)</i>	Obligations	Fund assets	Provisions in the balance sheet
Balances at 31/12/2018	29,201	(11,165)	18,036
Net expense for 2019	1,436	(252)	1,184
Actuarial gains and losses	4,151	(1,647)	2,504
Contributions to funds	-	-	-
Benefits paid	(1,478)	483	(995)
BALANCES AT 31/12/2019	33,310	(12,581)	20,729

34.2.2 Post-employment and other long-term employee benefit expenses

<i>(in millions of euros)</i>	2019	2018
Current service cost	(563)	(732)
Past service cost	-	-
Actuarial gains and losses – other long-term benefits	(205)	17
Net expenses recorded as operating expenses	(768)	(715)
Interest expense (discount effect)	(668)	(627)
Return on fund assets	252	221
Net interest expense included in financial result	(416)	(406)
EMPLOYEE BENEFIT EXPENSES RECORDED IN THE INCOME STATEMENT	(1,184)	(1,121)
Actuarial gains and losses – post-employment benefits	(4,151)	3,323
Actuarial gains and losses on fund assets	1,647	(259)
Actuarial gains and losses	(2,504)	3,064
GAINS AND LOSSES ON EMPLOYEE BENEFITS RECORDED DIRECTLY IN EQUITY	(2,504)	3,064

6. Financial statements

Notes to the consolidated financial statements

Actuarial gains and losses on post-employment benefits break down as follows:

<i>(in millions of euros)</i>	2019	2018
Experience adjustments	(95)	(90)
Changes in demographic assumptions	(1)	462
Changes in financial assumptions*	(4,260)	2,968
ACTUARIAL GAINS AND LOSSES ON OBLIGATIONS	(4,356)	3,340
Including:		
Actuarial gains and losses on post-employment benefits	(4,151)	3,323
Actuarial gains and losses on other long-term benefits	(205)	17

* Financial assumptions mainly concern the discount rate, inflation rate and wage increase rate.

The actuarial gains and losses on obligations generated over 2019 amount to €(4,356) million, and are mainly associated with changes in the discount rate, the inflation rate, the proposed law on social security system funding for 2020 and the updating of the wage law (see note 34.2.7).

The actuarial gains and losses on obligations generated over 2018 amount to €3,340 million and are mainly associated with changes in the discount rate, the wage increase rate and the updating of the mortality table.

34.2.3 Provisions for employee benefits by nature

At 31 December 2019

<i>(in millions of euros)</i>	Obligations	Fund assets	Provisions in the balance sheet
Provisions for post-employment benefits at 31/12/2019	31,776	(12,581)	19,195
Comprising:			
Pensions	24,463	(11,778)	12,685
Benefits in kind (electricity/gas)	4,876	-	4,876
Retirement gratuities	898	(787)	111
Other	1,539	(16)	1,523
Provisions for other long-term employee benefits at 31/12/2019	1,534	-	1,534
Comprising:			
Annuities following work-related accident and illness, and invalidity	1,290	-	1,290
Long service awards	214	-	214
Other	30	-	30
PROVISIONS FOR EMPLOYEE BENEFITS AT 31/12/2019	33,310	(12,581)	20,729

At 31 December 2018

<i>(in millions of euros)</i>	Obligations	Fund assets	Provisions in the balance sheet
Provisions for post-employment benefits at 31/12/2018	27,798	(11,165)	16,633
Comprising:			
Pensions	21,514	(10,416)	11,098
Benefits in kind (electricity/gas)	4,233	-	4,233
Retirement gratuities	822	(734)	88
Other	1,229	(15)	1,214
Provisions for other long-term employee benefits at 31/12/2018	1,403	-	1,403
Comprising:			
Annuities following work-related accident and illness, and invalidity	1,177	-	1,177
Long service awards	197	-	197
Other	29	-	29
PROVISIONS FOR EMPLOYEE BENEFITS AT 31/12/2018	29,201	(11,165)	18,036

34.2.4 Breakdown of obligations by type of beneficiary

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Current employees	18,994	16,009
Retirees	14,316	13,192
OBLIGATIONS	33,310	29,201

34.2.5 Fund assets

For France, fund assets, managed under an asset/liability model, amount to €12,581 million at 31 December 2019 (€11,165 million at 31 December 2018) and concern the coverage of retirement gratuities and the specific benefits of the special pension system.

Fund assets break down as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
FUND ASSETS	12,581	11,165
Assets funding special pension benefits	11,778	10,416
Comprising (%)		
Listed equity instruments (<i>shares</i>)	31%	27%
Listed debt instruments (<i>bonds</i>)	69%	73%
Assets funding retirement gratuities	787	734
Comprising (%)		
Listed equity instruments (<i>shares</i>)	34%	27%
Listed debt instruments (<i>bonds</i>)	66%	73%
Other fund assets	16	15

They consist of insurance contracts with the following risk profile:

- 69% in a hedging pocket consisting of bonds, designed to replicate variations in the obligation caused by changes in interest rates;
- 31% in a growth asset pocket consisting of international equities.

At 31 December 2019, the equities held as part of fund assets are distributed as follows:

- approximately 57% of the total are shares in North American companies;
- approximately 19% of the total are shares in European companies;
- approximately 24% of the total are shares in companies in the Asia-Pacific zone and emerging countries.

This distribution is relatively stable compared to the distribution at 31 December 2018.

At 31 December 2019, the bonds held as part of fund assets are distributed as follows:

- approximately 84% of the total are AAA and AA-rated bonds;
- approximately 16% of the total are bonds with A, BBB and other ratings.

Around 80% of bonds are sovereign bonds issued by Euro zone countries, and the balance mainly consists of bonds issued by financial and non-financial firms.

The performance of pension fund assets in France is +17.4% in 2019.

34.2.6 Future Cash Flows

Cash flows related to future employee benefits are as follows:

<i>(in millions of euros)</i>	Cash flow under year-end economic conditions	Amount covered by provisions (present value)
Less than one year	1,427	1,418
One to five years	4,837	4,645
Five to ten years	5,033	4,514
More than ten years	36,539	22,733
CASH FLOWS RELATED TO EMPLOYEE BENEFITS	47,836	33,310

6. Financial statements

Notes to the consolidated financial statements

At 31 December 2019, the average duration of employee benefit commitments in France is 19.6 years.

34.2.7 Actuarial assumptions

(in %)	31/12/2019	31/12/2018
Discount rate/rate of return on assets ⁽¹⁾	1.30%	2.30%
Inflation rate	1.30%	1.50%
Wage increase rate ⁽²⁾	2.40%	2.60%

(1) The interest income generated by assets is calculated using the discount rate. The difference between this interest income and the return on assets is recorded in equity.

(2) Average wage increase rate, including inflation and projected over a full career.

In France, the discount rate used for employee benefit obligations is determined by applying the yield rate on high-quality corporate bonds of appropriate duration to maturities corresponding to the future disbursements resulting from these obligations. For longer durations, the calculation also takes into consideration data from a wider selection of corporate bonds adjusted for comparability with the high-quality bonds, given the smaller panel of bonds with these durations since 2017. The substantial decrease in the discount rate (100 bp) essentially relates to the decrease in risk-free rates observed over 2019.

Changes at 31 December 2019 in the economic and market parameters used have led the Group to set the discount rate at 1.30% at 31 December 2019 (2.30% at 31 December 2018).

Until 31 December 2018, the assumed inflation rate used was determined in line with the consensus forecast and expected inflation based on the returns on inflation-linked bonds. From 2019, as declining forecasts made short-term

consensus forecast projections less appropriate, the inflation rate used was deduced from inflation swaps

As a result, the assumed average inflation rate used as the Group's benchmark for Euro zone countries is 1.3% at 31 December 2019 (1.5% at 31 December 2018).

The wage law used to calculate obligations was updated in 2019 by applying wage increase rates observed over the period 2015-2018 (adjusted for non-recurring effects), instead of the changes observed over the period 2010-2012 adjusted by a coefficient to reflect the lower expected long-term wage increases. This update had no significant impact on the valuation of the obligations.

The mortality table used to calculate obligations is adjusted for specificities of the IEG (gas and electricity sector) system; in 2018 it was updated by using the INSEE 2013-2070 generation table (produced by the French statistics office), instead of the INSEE 2007-2060 generation table.

34.2.8 Sensitivity analysis

Sensitivity analyses on the amount of the obligation are as follows:

(in %)	31/12/2019
Impact of a 25bp increase or decrease in the discount rate	-4.8% / +5.2%
Impact of a 25bp increase or decrease in the inflation rate	+4.6% / -4.9%
Impact of a 25bp increase or decrease in the wage increase rate	+4.6% / -4.3%

34.3 United Kingdom

The United Kingdom segment chiefly comprises EDF Energy, whose principal employee benefits are described in note 1.3.21.

34.3.1 Details of the change in the net liability

(in millions of euros)	Obligations	Fund assets	Net liability
Balances at 31/12/2018	8,248	(9,039)	(791)
Net expense for 2019	473	(263)	210
Actuarial gains and losses	873	(998)	(125)
Employer's contributions to funds	-	(269)	(269)
Employees' contributions to funds	11	(11)	-
Benefits paid	(369)	369	-
Translation adjustment	454	(501)	(47)
BALANCES AT 31/12/2019	9,690	(10,712)	(1,022)
Including:			
Provisions for employee benefits	-	-	224
Non-current financial assets	-	-	(1,246)

At 31 December 2019, EDF Energy's EEGSG and BEGG pension schemes (see note 1.3.21.2.2) were overfunded to the extent of €1,246 million compared to €937 million at 31 December 2018.

The surplus funding, which has increased due to the good performance by fund assets, is recognised in balance sheet assets as "non-current financial assets".

EDF Energy also recorded a €224 million provision in respect of its EEPS pension scheme at 31 December 2019, compared to €146 million at 31 December 2018.

34.3.2 Post-employment benefit and other long-term employee benefit expenses

<i>(in millions of euros)</i>	2019	2018
Current service cost	(230)	(258)
Past service cost	-	(15)
Actuarial gains and losses – other long-term benefits	-	-
Net expenses recorded as operating expenses	(230)	(273)
Interest expense (discount effect)	(243)	(232)
Return on fund assets	263	248
Net interest expense included in financial result	20	16
EMPLOYEE BENEFIT EXPENSES RECORDED IN THE INCOME STATEMENT	(210)	(257)
Actuarial gains and losses – post-employment benefits	(873)	518
Actuarial gains and losses on fund assets	998	(463)
Actuarial gains and losses	125	55
Translation adjustments	47	(6)
GAINS AND LOSSES ON EMPLOYEE BENEFITS RECORDED DIRECTLY IN EQUITY	172	49

34.3.3 Breakdown of obligations by type of beneficiary

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Current employees	5,202	4,948
Retirees	4,488	3,300
OBLIGATIONS	9,690	8,248

34.3.4 Fund assets

Pension obligations in the United Kingdom are partly covered by external funds with a present value of €10,712 million at 31 December 2019 (€9,039 million at 31 December 2018).

These assets break down as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
BEGG pension fund	8,144	6,963
EEGSG pension fund	1,493	1,267
EEPS pension fund	1,075	809
FUND ASSETS	10,712	9,039
Comprising (%)		
Listed equity instruments (<i>shares</i>)	11%	9%
Listed debt instruments (<i>bonds</i>)	57%	61%
Real estate properties	7%	8%
Cash and cash equivalents	2%	3%
Other	23%	19%

The investment strategy applied in these funds is a liability driven investment strategy. The allocation between growth and back-to-back is regularly reviewed by the trustees, at least after every actuarial valuation, to ensure that the funds' overall investment strategy remains coherent in order to achieve the target coverage level required.

6. Financial statements

Notes to the consolidated financial statements

At 31 December 2019, the equities held as part of fund assets are distributed as follows:

- approximately 64% of the total are shares in North American companies;
- approximately 21% of the total are shares in European companies;
- approximately 15% of the total are shares in companies in the Asia-Pacific zone and emerging countries.

At 31 December 2019, the bonds held as part of fund assets are distributed as follows:

- approximately 68% of the total are AAA and AA-rated bonds;
- approximately 32% of the total are bonds with A, BBB and other ratings.

Around 67% of all these bonds are sovereign bonds, mainly issued by the United Kingdom. The balance mainly consists of bonds issued by financial and non-financial firms.

The portion of sovereign bonds issued by the United Kingdom was 7 percentage points higher than at 31 December 2018.

34.3.5 Future cash flows

Cash flows related to future employee benefits are as follows:

<i>(in millions of euros)</i>	Cash flow under year-end economic conditions	Amount covered by provisions (present value)
Less than one year	269	264
One to five years	1,093	1,050
Five to ten years	1,515	1,353
More than ten years	12,953	7,023
CASH FLOWS RELATED TO EMPLOYEE BENEFITS	15,830	9,690

The contribution to funds for 2020 is estimated at approximately €289 million (€277 million contributed by the employer and €12 million by the employees).

The average weighted duration of funds in the United Kingdom is 19.5 years at 31 December 2019.

34.3.6 Actuarial assumptions

<i>(in %)</i>	31/12/2019	31/12/2018
Discount rate/rate of return on assets*	2.11%	2.86%
Inflation rate	2.89%	2.99%
Wage increase rate	2.28%	2.39%

* The interest income generated by assets is calculated using the discount rate. The difference between this interest income and the return on assets is recorded in equity.

In the United Kingdom, the discount rate used for employee benefit obligations is determined by applying the yield rate on high-quality non-financial corporate bonds

based on their duration to maturities corresponding to the future disbursements resulting from these obligations.

34.3.7 Sensitivity analyses

Sensitivity analyses on the amount of the obligations are as follows:

<i>(in %)</i>	31/12/2019
Impact of a 25bp increase or decrease in the discount rate	-4.6% / +4.9%
Impact of a 25bp increase or decrease in the inflation rate	+3.6% / -3.4%
Impact of a 25bp increase or decrease in the wage increase rate	+0.4% / -0.4%

Note 35 Other provisions

Details of changes in other provisions are as follows:

(in millions of euros)	31/12/2018	Increases	Decreases		Changes in scope	Other Changes	31/12/2019
			Utilisations	Reversals			
Provisions for contingencies related to subsidiaries and investments ⁽¹⁾	934	9	(201)	-	-	24	766
Provisions for tax liabilities ⁽²⁾	448	59	(91)	(3)	(2)	(256)	155
Provisions for litigation	562	64	(69)	(86)	-	8	479
Provisions for onerous contracts and losses on completion ⁽³⁾	1,208	448	(324)	(14)	-	38	1,356
Provisions related to environmental schemes	1,137	1,847	(1,529)	(13)	-	75	1,517
Other provisions for risks and liabilities ⁽⁴⁾	1,723	694	(732)	(115)	(20)	(48)	1,502
TOTAL	6,012	3,121	(2,946)	(231)	(22)	(159)	5,775

(1) Including the reversal of the provision concerning Alpiq.

(2) Reclassification of the provision for fiscal liabilities as deferred taxes (see note 17.3) in the amount of €235 million, in accordance with IFRIC 23.

(3) Provisions for onerous contracts are mainly attributable to the long-term contract with Dunkerque LNG and long-term power purchase and sale agreements.

(4) These provisions cover various contingencies and expenses related to operations (employers' matching contributions to employee profit sharing, restructuring operations, contractual maintenance obligations, etc.). No individual provision is significant.

Provisions related to environmental schemes

Provisions related to environmental schemes include provisions for greenhouse gas emission rights, renewable energy certificates and energy savings certificates (see note 1.3.26).

The provisions related to environmental schemes principally correspond to provisions for renewable energy certificates in the United Kingdom.

The increase in these provisions over the year principally results from over-quota emissions by the Group; amounting to €414 million at 31 December 2019 (€175 million at 31 December 2018).

Gas emission quotas

One of the main features of the third phase of the European Union greenhouse gas emission quota system, running from 2013 to 2020, is the discontinuation of free allocation of emission rights to electricity producers in certain countries, including France and United Kingdom.

In the EDF group, the entities concerned by this system are EDF, EDF Energy, Edison, Dalkia, and Luminus.

In 2019, the Group surrendered 26 million tonnes in respect of emissions generated in 2018. In 2018, the Group surrendered 30 million tonnes in respect of emissions generated in 2017.

The Group's total emission rights allocation for 2019 recorded in the national registers is 1 million tonnes (1 million tonnes for 2018).

The volume of emissions at 31 December 2019 stood at 21 million tonnes (24 million tonnes for 2018).

Renewable energy certificates

Through the renewable energy certificates scheme, the EDF group has an obligation to surrender renewable energy certificates, particularly in the United Kingdom and Belgium.

At 31 December 2019, a provision of €1,103 million was booked in connection with the obligation to surrender renewable energy certificates at that date, essentially concerning EDF Energy (United Kingdom) and Luminus (Belgium). A large portion of these obligations is covered by purchases of certificates included in intangible assets.

Note 36 Special French public electricity distribution concession liabilities

The changes in special concession liabilities for existing assets and assets to be replaced are as follows:

(in millions of euros)	31/12/2019	31/12/2018
Value in kind of assets*	51,085	49,327
Unamortised financing by the operator	(27,387)	(25,669)
Rights in existing assets – net value	23,698	23,658
Amortisation of financing by the concession-granting authority	14,389	13,792
Provisions for replacement	9,378	9,474
Rights in assets to be replaced	23,767	23,266
SPECIAL FRENCH PUBLIC ELECTRICITY DISTRIBUTION CONCESSION LIABILITIES	47,465	46,924

* Including contributions received to finance concession assets, amounting to €131 million (€131 million in 2018).

6. Financial statements

Notes to the consolidated financial statements

Note 37 Trade payables

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Trade payables – excluding EDF Trading	11,243	11,177
Trade payables – EDF Trading	1,624	2,244
TRADE PAYABLES	12,867	13,421

The Group has a reverse factoring programme allowing suppliers to transfer their receivables on EDF to a factoring company, at their own initiative.

For the Group, this programme does not cause any change in the substance and features of the receivables held by suppliers on EDF. In particular it does not affect

the sequences of operating cash flows. The associated liabilities are therefore included in “trade payables” in the Group’s financial statements.

Note 38 Other liabilities

Details of other liabilities are as follows:

<i>(in millions of euros)</i>	31/12/2019	Including contract liabilities	31/12/2018	Including contract liabilities
Advances and progress payments received	1,975	1,761	1,920	1,858
Liabilities related to property, plant and equipment	3,824	-	3,757	-
Tax liabilities	4,439	-	4,624	-
Social charges	4,535	-	4,388	-
Deferred income on long-term contracts	3,412	3,412	3,413	3,413
Other deferred income	641	509	609	577
Other	2,712	-	2,198	-
OTHER LIABILITIES	21,538	5,682	20,908	5,848
Non-current portion	4,928	3,473	4,896	3,805
Current portion	16,610	2,209	16,012	2,043

38.1 Advances and progress payments received

Advances and progress payments received comprise €651 million of payments made by the customers in Framatome’s long-term contracts (€679 million at 31 December 2018).

38.2 Tax liabilities

At 31 December 2019, tax liabilities mainly include an amount of €560 million for the CSPE to be collected by EDF on energy supplied but not yet billed, less the CSPE collected on advances from customers who pay in regular monthly instalments (€659 million at 31 December 2018).

38.3 Deferred income on long-term contracts

EDF’s deferred income on long-term contracts at 31 December 2019 comprises €1,709 million (€1,663 million at 31 December 2018) of partner advances made to EDF under the nuclear plant financing plans.

Deferred income on long-term contracts also includes an advance of €1.7 billion paid to the EDF group in 2010 under the agreement with the Exeltium consortium. This advance is transferred to the income statement progressively over the term of the contract (24 years).

38.4 Other items

The “Other” line of the table includes investment subsidies received during 2019, amounting to €543 million (€351 million in 2018).

38.5 Contract liabilities

Contract liabilities represent an entity's obligations to provide customers with goods or services for which it has already been paid, or for which payment is due. Changes in contract liabilities were as follows:

<i>(in millions of euros)</i>	31/12/2018	Amounts recorded during the period	Amounts transferred to sales during the period	Amounts cancelled during the period with no impact on sales	Effect of unwinding the discount	Change in scope of consolidation	Foreign exchange effect	31/12/2019
Advance payments received	1,858	1,915	(1,992)	(37)	(1)	-	18	1,761
Deferred income on long-term contracts	3,413	476	(545)	(2)	64	4	2	3,412
Other deferred income	577	413	(481)	-	-	-	-	509

These liabilities comprise the majority of advances and progress payments received, amounting to €1,761 million (principally concerning the Framatome, United Kingdom and France – Regulated Activities segments), and the majority of deferred income (on long-term and other contracts), amounting to €3,921 million (principally concerning the France – Generation and Supply segment). They thus total €5,682 million at 31 December 2019 (€5,848 million at 31 December 2018).

Contracts expiring in more than one year on which obligations are unfulfilled or partially fulfilled at the reporting date should generate sales revenues of approximately €12,388 million which have not yet been recognised. €1,330 million of these sales revenues will be recognised progressively until 2034 on the Exeltium contract, and the balance will be recognised over the operating period for contracts relating to jointly-operated power plants, and over the term of the contract for other firm sale contracts (excluding energy sales).

6. Financial statements

Notes to the consolidated financial statements

Financial assets and liabilities

Note 39 Current and non-current financial assets

39.1 Breakdown between current and non-current financial assets

Current and non-current financial assets break down as follows:

(in millions of euros)	31/12/2019			31/12/2018		
	Current	Non-current	Total	Current	Non-current	Total
Instruments at fair value through OCI with recycling	17,711	6,208	23,919	17,659	5,279	22,938
Instruments at fair value through OCI with no recycling	5	447	452	6	407	413
Instruments at fair value through profit and loss	1,593	20,193	21,786	3,175	16,985	20,160
Debt and equity securities	19,309	26,848	46,157	20,840	22,671	43,511
Trading derivatives – Positive fair value in profit and loss	6,813	-	6,813	6,404	-	6,404
Hedging derivatives – Positive fair value in profit and loss	1,803	3,956	5,759	1,646	2,737	4,383
Loans and financial receivables*	1,476	15,415	16,891	2,253	11,696	13,949
CURRENT AND NON-CURRENT FINANCIAL ASSETS	29,401	46,219	75,620	31,143	37,104	68,247

* Including impairment of €(352) million at 31 December 2019 (€(281) million at 31 December 2018).

39.2 Debt and equity securities

Details of debt and equity securities are shown in the table below:

(in millions of euros)	31/12/2019			31/12/2018	
	At fair value through OCI with recycling	At fair value through OCI with no recycling	At fair value through profit and loss	Total	Total
Debt and equity securities					
EDF dedicated assets	6,253	-	19,765	26,018	21,820
Liquid assets	17,347	-	1,553	18,900	20,538
Other securities*	320	452	468	1,240	1,153
TOTAL	23,919	452	21,786	46,157	43,511

* Investments in non-consolidated companies, principally EDF Invest.

Information on EDF's dedicated assets is given in note 48.

Changes in the fair value of debt and equity securities were recorded in equity (EDF share) over the period as follows:

(in millions of euros)	2019			2018		
	Gross changes in fair value recorded in OCI with recycling ⁽¹⁾	Gross changes in fair value recorded in OCI with no recycling ⁽¹⁾	Gross changes in fair value recycled to profit and loss ⁽²⁾	Gross changes in fair value recorded in OCI with recycling ⁽¹⁾	Gross changes in fair value recorded in OCI with no recycling ⁽¹⁾	Gross changes in fair value recycled to profit and loss ⁽²⁾
EDF dedicated assets	297	-	136	(72)	-	(12)
Liquid assets	139	-	7	(43)	-	12
Other assets	-	(22)	-	-	(37)	-
DEBT AND EQUITY SECURITIES ⁽³⁾	436	(22)	143	(115)	(37)	-

(1) +/(-): increase/(decrease) in equity (EDF share).

(2) +/(-): increase/(decrease) in income (EDF share).

(3) Excluding associates and joint ventures.

In 2019, gross changes in fair value recorded in OCI with recycling principally concern EDF (€293 million, including €161 million for dedicated assets).

In 2018, gross changes in fair value recorded in OCI with recycling principally concern EDF (€(115) million, including €(60) million for dedicated assets).

No significant impairment was recorded in 2019.

39.2.1 Dedicated assets

Diversified bond investments and equities included in EDF's dedicated assets are recorded as "debt and equity securities". The general management policy for dedicated assets is presented in note 48.

39.2.2 Liquid assets

Liquid assets are financial assets consisting of funds or interest rate instruments with initial maturity of over three months that are readily convertible into cash, and are managed according to a liquidity-oriented policy.

EDF's monetary UCITS, included in liquid assets, amount to €409 million at 31 December 2019 (€2,863 million at 31 December 2018).

39.3 Loans and financial receivables

Loans and financial receivables consist of the following:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Loans and financial receivables – amounts receivable from the NLF	13,303	9,220
Loans and financial receivables – CSPE*	684	2,060
Loans and financial receivables – other	2,904	2,669
LOANS AND FINANCIAL RECEIVABLES	16,891	13,949

* Including €684 million allocated to dedicated assets at 31 December 2019 (€2,060 million at 31 December 2018).

At 31 December 2019 loans and financial receivables mainly include:

- amounts representing reimbursements receivable from the NLF and the British government for coverage of long-term nuclear obligations, totalling €13,303 million at 31 December 2019 (€9,220 million at 31 December 2018), discounted at the same rate as the provisions they finance. The increase in the NLF receivable in 2019 is a corollary of the increase in provisions following changes to the cost estimates as explained in note 32.2;
- the receivable corresponding to the balance of the shortfall in the Contribution to the Public Electricity Service (CSPE) at 31 December 2017 and the costs of bearing that shortfall. Reimbursements of principal and interest during 2019 amounted to €1,399 million, in line with the schedule published in the ministerial orders of 13 May 2016 and 2 December 2016, made in application of

Article R. 121-31 of the French Energy Code. This CSPE receivable is allocated in its entirety to dedicated assets;

- other loans and financial receivables notably include:
 - the overfunding of EDF Energy's EEGSG and BEGG pension schemes by €1,246 million, compared to €937 million at 31 December 2018;
 - an amount of €230 million representing the advance payments made by Luminus to Synatom to cover long-term nuclear obligations (€203 million at 31 December 2018). In Luminus' financial statements these amounts are discounted at the same rate as the provisions they fund. This receivable is equal to the fair value of the amounts held by Synatom on behalf of Luminus as fund assets.

39.4 Change in financial assets other than derivatives

The variation in financial assets is as follows:

39.4.1 At 31 December 2019

<i>(in millions of euros)</i>	31/12/2018	Net increases	Changes in fair value	Discount effect	Changes in scope	Translation adjustments	Other	31/12/2019
Instruments at fair value through OCI with recycling	22,938	445	468	-	-	50	18	23,919
Instruments at fair value through OCI with no recycling	413	39	(48)	-	10	1	37	452
Instruments at fair value through profit and loss	20,160	(1,079)	2,792	-	(30)	-	(57)	21,786
Loans and financial receivables	13,949	(1,754)	-	378	194	657	3,467	16,891

The net decrease in loans and financial receivables includes the €(1,376) million change in the CSPE receivable.

Other changes in loans and financial receivables principally correspond to the changes in the financial asset that corresponds to the receivable representing amounts reimbursable by the Nuclear Liabilities Fund (NLF) and the British

government (€13,303 million at 31 December 2019 compared to €9,220 million at 31 December 2018), and the surplus funding of EDF Energy's EEGSG and BEGG pension schemes (€1,246 million at 31 December 2019, compared to €937 million at 31 December 2018).

6. Financial statements

Notes to the consolidated financial statements

39.4.2 At 31 December 2018

<i>(in millions of euros)</i>	31/12/2017	Change of method	Net increases	Changes in fair value	Discount effect	Changes in scope	Translation adjustments	Other	31/12/2018
Available-for-sale financial assets	40,924	(40,924)	-	-	-	-	-	-	-
Instruments at fair value through OCI with recycling	-	20,828	2,060	(102)	-	-	112	40	22,938
Instruments at fair value through OCI with no recycling	-	444	(9)	(37)	-	7	-	8	413
Instruments at fair value through profit and loss	-	19,652	1,489	(847)	-	(6)	-	(128)	20,160
Loans and financial receivables	14,622	-	(1,362)	-	460	(34)	(96)	359	13,949

Note 40 Cash and cash equivalents

Cash and cash equivalents comprise cash in hand and at bank and investments in money market instruments. Cash and cash equivalents as stated in the cash flow statements include the following amounts recorded in the balance sheet:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Cash	3,698	2,855
Cash equivalents*	236	435
Financial current accounts	-	-
CASH AND CASH EQUIVALENTS	3,934	3,290

* Items stated at fair value amount to €236 million at 31 December 2019 (€435 million at 31 December 2018).

Cash restrictions

Cash and cash equivalents include €213 million of cash subject to restrictions at 31 December 2019 (€235 million at 31 December 2018) (see note 1.3.25).

Note 41 Current and non-current financial liabilities

41.1 Breakdown between current and non-current financial liabilities

Current and non-current financial liabilities break down as follows:

<i>(in millions of euros)</i>	31/12/2019			31/12/2018		
	Non-current	Current	Total	Non-current	Current	Total
Loans and other financial liabilities	56,306	11,074	67,380	50,901	8,287	59,188
Negative fair value of derivatives held for trading	-	6,327	6,327	-	7,160	7,160
Negative fair value of hedging derivatives	696	1,134	1,830	1,228	1,720	2,948
FINANCIAL LIABILITIES	57,002	18,535	75,537	52,129	17,167	69,296

41.2 Loans and other financial liabilities

41.2.1 Changes in loans and other financial liabilities

<i>(in millions of euros)</i>	Bonds	Loans from financial institutions	Other financial liabilities	Lease liability ⁽¹⁾	Accrued Interest	Total
Balances at 31/12/2018	50,401	3,098	4,026	324	1,339	59,188
IFRS 16 restatements (see note 2.1)	-	-	-	4,492	-	4,492
Restated balances at 01/01/2019	50,401	3,098	4,026	4,816	1,339	63,680
Increases	3,025	1,789	4,266	544	188	9,812
Decreases	(3,336)	(533)	(2,679)	(721)	(185)	(7,454)
Translation adjustments	311	32	26	26	-	395
Changes in scope of consolidation ⁽²⁾	-	(1,266)	(17)	3	-	(1,280)
Changes in fair value	2,047	-	(38)	-	-	2,009
Other changes	-	19	367	(158)	(11)	217
BALANCES AT 31/12/2019	52,448	3,139	5,952	4,510	1,331	67,380

(1) At 31 December 2018 this consists of loans related to finance-leased assets.

At 31 December 2019, finance-leased assets are included in the lease liability.

(2) Changes in the scope of consolidation essentially concern the effect of loss of control over NnG (see note 3.4.5).

A breakdown of the issuance and repayments of borrowings presented in the cash flow statement is presented below:

<i>(in millions of euros)</i>	Bonds	Loans from financial institutions	Other financial liabilities	Lease liability	Termination of hedging derivatives	31/12/2019
Issuance of borrowings	3,025	1,789	4,266	-	-	9,080
Repayments of borrowings	(3,336)	(533)	(2,679)	(721)	293	(6,976)

Loans and other financial liabilities of the Group's main entities are as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
EDF and other related subsidiaries ⁽¹⁾	56,777	48,650
EDF Energy ⁽²⁾	3,711	3,345
EDF Renewables	5,438	5,741
Edison ⁽³⁾	654	549
Other	800	903
LOANS AND OTHER FINANCIAL LIABILITIES	67,380	59,188

(1) Enedis, EDF PEI, EDF International, EDF Holding SAS, C3 and EDF Investissements Groupe.

(2) Including holding companies.

(3) Edison excluding TdE SpA.

At 31 December 2019, none of these entities had defaulted on any borrowing.

6. Financial statements

Notes to the consolidated financial statements

The Group's principal borrowings at 31 December 2019 are as follows:

Type of borrowing <i>(in millions of currencies)</i>	Entity	Issue*	Maturity	Issue amount	Currency	Rate
Bond	EDF	01/2010	01/2020	1,400	USD	4.60%
Euro MTN	EDF	05/2008	05/2020	1,200	EUR	5.38%
Bond	EDF	10/2015	10/2020	1,500	USD	2.35%
Euro MTN	EDF	01/2009	01/2021	2,000	EUR	6.25%
Euro MTN (green bond)	EDF	11/2013	04/2021	1,400	EUR	2.25%
Euro MTN	EDF	01/2012	01/2022	2,000	EUR	3.88%
Euro MTN	EDF	09/2012	03/2023	2,000	EUR	2.75%
Euro MTN	EDF	09/2009	09/2024	2,500	EUR	4.63%
Bond (green bond)	EDF	10/2015	10/2025	1,250	USD	3.63%
Euro MTN	EDF	11/2010	11/2025	750	EUR	4.00%
Euro MTN (green bond)	EDF	10/2016	10/2026	1,750	EUR	1.00%
Bond	EDF	01/2017	01/2027	107,900	JPY	1.09%
Euro MTN	EDF	03/2012	03/2027	1,000	EUR	4.13%
Bond	EDF	09/2018	09/2028	1,800	USD	4.50%
Euro MTN	EDF	04/2010	04/2030	1,500	EUR	4.63%
Euro MTN	EDF	10/2018	10/2030	1,000	EUR	2.00%
Euro MTN	EDF	07/2001	07/2031	650	GBP	5.88%
Euro MTN	EDF	02/2003	02/2033	850	EUR	5.63%
Euro MTN	EDF	06/2009	06/2034	1,500	GBP	6.13%
Euro MTN	EDF	10/2016	10/2036	750	EUR	1.88%
Bond	EDF	09/2018	09/2038	650	USD	4.88%
Bond	EDF	01/2009	01/2039	1,750	USD	6.95%
Euro MTN	EDF	11/2010	11/2040	750	EUR	4.50%
Euro MTN	EDF	10/2011	10/2041	1,250	GBP	5.50%
Bond	EDF	01/2014	01/2044	1,000	USD	4.88%
Bond	EDF	10/2015	10/2045	1,500	USD	4.75%
Bond	EDF	10/2015	10/2045	1,150	USD	4.95%
Bond	EDF	09/2018	09/2048	1,300	USD	5.00%
Euro MTN	EDF	12/2019	12/2049	1,250	EUR	2.00%
Euro MTN	EDF	09/2010	09/2050	1,000	GBP	5.13%
Euro MTN	EDF	10/2016	10/2056	2,164	USD	4.99%
Euro MTN	EDF	11/2019	12/2069	2,000	USD	4.50%
Bond	EDF	01/2014	01/2114	1,350	GBP	6.00%

* Date funds were received.

On 27 November and 2 December 2019, EDF raised US\$2 billion and €1.25 billion respectively as part of its EMTN program (see note 3.3.4).

At 31 December 2019, the total ceiling on EDF's EMTN (Euro Medium Term Notes) programme, allowing issuance of borrowings under the programme, is €45 billion.

41.2.2 Maturity of loans and other financial liabilities

At 31 December 2019

(in millions of euros)	Bonds	Loans from financial institutions	Other financial liabilities	Lease liability*	Accrued Interest	Total
Less than one year	3,741	271	5,391	645	1,026	11,074
From one to five years	11,194	906	-	2,225	74	14,399
More than five years	37,513	1,962	561	1,640	231	41,907
LOANS AND OTHER FINANCIAL LIABILITIES AT 31/12/2019	52,448	3,139	5,952	4,510	1,331	67,380

* At 31 December 2018, this item consisted of loans related to finance-leased assets.
At 31 December 2019, finance-leased assets are included in the lease liability.

At 31 December 2018

(in millions of euros)	Bonds	Loans from financial institutions	Other financial liabilities	Loans related to finance-leased assets	Accrued Interest	Total
Less than one year	3,316	464	3,382	45	1,080	8,287
From one to five years	11,908	650	81	111	39	12,789
More than five years	35,177	1,984	563	168	220	38,112
LOANS AND OTHER FINANCIAL LIABILITIES AT 31/12/2018	50,401	3,098	4,026	324	1,339	59,188

The non-discounted lease liability matures as follows:

(in millions of euros)	31/12/2019			
	Total	Maturity		
		< 1 year	1-5 years	> 5 years
NON-DISCOUNTED CONTRACTUAL CASH FLOWS	5,052	709	2,338	2,005

41.2.3 Breakdown of loans and other financial liabilities by currency

(in millions of euros)	31/12/2019			31/12/2018		
	Initial debt structure	Impact of hedging instruments*	Debt structure after hedging	Initial debt structure	Impact of hedging instruments*	Debt structure after hedging
Euro (EUR)	33,360	18,491	51,851	26,783	21,438	48,221
American dollar (USD)	20,867	(14,814)	6,053	20,546	(17,564)	2,982
Pound sterling (GBP)	10,269	(1,705)	8,564	9,250	(2,414)	6,836
Other	2,884	(1,972)	912	2,609	(1,460)	1,149
LOANS AND OTHER FINANCIAL LIABILITIES	67,380	-	67,380	59,188	-	59,188

* Hedges of liabilities and net investments in foreign subsidiaries.

6. Financial statements

Notes to the consolidated financial statements

41.2.4 Breakdown of loans and other financial liabilities by type of interest rate

(in millions of euros)	31/12/2019			31/12/2018		
	Initial debt structure	Impact of derivatives	Final debt structure	Initial debt structure	Impact of derivatives	Final debt structure
Fixed rates	62,128	(21,035)	41,093	55,810	(21,949)	33,861
Floating rates	5,252	21,035	26,287	3,378	21,949	25,327
LOANS AND OTHER FINANCIAL LIABILITIES	67,380	-	67,380	59,188	-	59,188

The breakdown of loans and financial liabilities by interest rate includes the impact of all derivatives classified as hedges in accordance with IFRS 9.

A large portion of the EDF group's fixed-rate loans is swapped to variable rates.

41.2.5 Credit lines

At 31 December 2019, the Group has unused credit lines with various banks totalling €10,490 million (€11,393 million at 31 December 2018). This total

includes €5,050 million of credit lines indexed on ESG criteria, which were totally undrawn at 31 December 2019 (see note 3.3.1).

(in millions of euros)	31/12/2019				31/12/2018
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
CONFIRMED CREDIT LINES	10,490	1,371	9,099	20	11,393

41.2.6 Early repayment clauses

Project financing loans to EDF Renewables from non-Group parties generally include early repayment clauses, mainly applicable when the project company concerned fails to maintain a minimum Debt Service Coverage Ratio (DSCR). In general, early repayment clauses are activated when this ratio falls below 1.

In other Group entities, certain clauses contained in contracts for financing or other commitments may make reference to Group ratings but are not classified as covenants.

Two borrowings with a combined total of €750 million contain a rendezvous clause requiring contact between the borrower and lender if the borrower's rating falls below a specified level, possibly leading to renegotiation of the terms of the loan.

No early repayment took place in 2019 as a result of any Group entity's failure to comply with contractual clauses concerning loans.

41.3 Net indebtedness

Net indebtedness is not defined in the accounting standards and is not directly presented in the consolidated balance sheet. It comprises total loans and financial liabilities, less cash and cash equivalents and liquid assets. Liquid assets are financial assets consisting of funds or interest rate instruments with initial maturity of over three months that are readily convertible into cash and are managed according to a liquidity-oriented policy.

(in millions of euros)	Notes	31/12/2019	31/12/2018
Loans and other financial liabilities*	41.2.1	67,380	59,188
Derivatives used to hedge liabilities	44	(3,387)	(1,972)
Cash and cash equivalents	40	(3,934)	(3,290)
Debt and equity securities – liquid assets	39.2.2	(18,900)	(20,538)
Net indebtedness of assets held for sale		(26)	-
NET INDEBTEDNESS*		41,133	33,388

* From 1 January 2019, due to application of IFRS 16, net indebtedness includes the lease liability, amounting to €4,492 million (see note 41.2).

Note 42 Other information on financial assets and liabilities

42.1 Fair value of financial instruments

The following tables show the breakdown of financial assets and liabilities in the balance sheet, by level.

42.1.1 At 31 December 2019

<i>(in millions of euros)</i>	Balance sheet value	Fair value	Level 1 Unadjusted quoted prices	Level 2 Observable data	Level 3 Non-observable data
Financial assets at fair value through profit and loss ⁽¹⁾	6,813	6,813	53	6,244	516
Debt and equity securities	46,157	46,157	3,733	41,800	624
Positive fair value of hedging derivatives	5,759	5,759	15	5,731	13
Cash equivalents carried at fair value	236	236	156	80	-
FINANCIAL ASSETS CARRIED AT FAIR VALUE IN THE BALANCE SHEET	58,965	58,965	3,957	53,855	1,153
Loans and financial receivables – assets receivable from the NLF	13,303	13,303	-	13,303	-
Loans and financial receivables – CSPE	684	688	-	688	-
Other loans and financial receivables	2,904	2,904	-	2,904	-
FINANCIAL ASSETS CARRIED AT AMORTISED COST	16,891	16,895	-	16,895	-
Negative fair value of hedging derivatives	1,830	1,830	5	1,825	-
Negative fair value of trading derivatives	6,327	6,327	38	5,914	375
FINANCIAL LIABILITIES CARRIED AT FAIR VALUE IN THE BALANCE SHEET	8,157	8,157	43	7,739	375
Loans and other financial liabilities ⁽²⁾	67,380	75,407	-	75,407	-
FINANCIAL LIABILITIES CARRIED AT AMORTISED COST	67,380	75,407	-	75,407	-

(1) Including €6,813 million for the positive fair value of trading derivatives.

(2) Loans and other financial liabilities are carried in the balance sheet at amortised cost, adjusted for changes in the fair value of risks covered by a fair value hedge.

Level 3 debt and equity securities are principally non-consolidated investments carried at historical value.

Cash equivalents, which principally take the form of negotiable debt instruments and short-term investments, are generally valued using yield curves, and therefore observable market data.

6. Financial statements

Notes to the consolidated financial statements

42.1.2 At 31 December 2018

(in millions of euros)	Balance sheet value	Fair value	Level 1 Unadjusted quoted prices	Level 2 Observable data	Level 3 Non-observable data
Financial assets at fair value through profit and loss ⁽¹⁾	6,404	6,404	569	5,497	338
Debt and equity securities	43,511	43,511	2,442	40,470	599
Positive fair value of hedging derivatives	4,383	4,383	68	4,315	-
Cash equivalents carried at fair value	435	435	181	254	-
FINANCIAL ASSETS CARRIED AT FAIR VALUE IN THE BALANCE SHEET	54,733	54,733	3,260	50,536	937
Loans and financial receivables – assets receivable from the NLF	9,220	9,220	-	9,220	-
Loans and financial receivables – CSPE	2,060	2,080	-	2,080	-
Other loans and financial receivables	2,669	2,669	-	2,669	-
FINANCIAL ASSETS CARRIED AT AMORTISED COST	13,949	13,969	-	13,969	-
Negative fair value of hedging derivatives	2,948	2,948	96	2,852	-
Negative fair value of trading derivatives	7,160	7,160	554	6,274	332
FINANCIAL LIABILITIES CARRIED AT FAIR VALUE IN THE BALANCE SHEET	10,108	10,108	650	9,126	332
Loans and other financial liabilities ⁽²⁾	59,188	63,772	-	63,772	-
FINANCIAL LIABILITIES CARRIED AT AMORTISED COST	59,188	63,772	-	63,772	-

(1) Including €6,404 million for the positive fair value of trading derivatives.

(2) Loans and other financial liabilities are carried in the balance sheet at amortised cost, adjusted for changes in the fair value of risks covered by a fair value hedge.

42.2 Offsetting of financial assets and liabilities

42.2.1 At 31 December 2019

(in millions of euros)	As reported in balance sheet	Balance without offsetting	Balance with offsetting under IAS 32			Amounts covered by a general offsetting agreement but not offset under IAS 32		
			Gross amount recognised (before offsetting)	Gross amount offset under IAS 32	Net amount recognised after offsetting under IAS 32	Financial instruments	Fair value of financial collateral	Net amount
Fair value of derivatives – assets	12,572	3,752	13,300	(4,480)	8,820	(1,298)	(3,097)	4,425
Fair value of derivatives – liabilities	(8,157)	(3,785)	(8,852)	4,480	(4,372)	1,298	531	(2,543)

42.2.2 At 31 December 2018

(in millions of euros)	As reported in balance sheet	Balance without offsetting	Balance with offsetting under IAS 32			Amounts covered by a general offsetting agreement but not offset under IAS 32		
			Gross amount recognised (before offsetting)	Gross amount offset under IAS 32	Net amount recognised after offsetting under IAS 32	Financial instruments	Fair value of financial collateral	Net amount
Fair value of derivatives – assets	10,787	218	16,481	(5,912)	10,569	(1,711)	(960)	7,898
Fair value of derivatives – liabilities	(10,108)	(848)	(15,172)	5,912	(9,260)	1,711	959	(6,590)

Note 43 Management of market and counterparty risks

As an operator in the energy sector worldwide, the EDF group is exposed to financial market risks, energy market risks and counterparty risks. All these risks could generate volatility in the financial statements.

■ Financial market risks

The main financial market risks to which the Group is exposed are the liquidity risk, the foreign exchange risk, the interest rate risk and the equity risk.

The objective of the Group's liquidity risk management is to seek resources at optimum cost and ensure their constant accessibility.

The foreign exchange risk relates to the diversification of the Group's businesses and geographical locations, and results from exposure to the risk of exchange rate fluctuations. These fluctuations can affect the Group's translation differences, balance sheet items, financial expenses, equity and net income.

The interest rate risk results from exposure to the risk of fluctuations in interest rates that can affect the value of assets invested by the Group, the value of the liabilities covered by provision, or its financial expenses.

The Group is exposed to equity risks, particularly through its dedicated asset portfolio held for secure financing of long-term nuclear commitments, through external pension funds, and to a lesser extent through its cash assets and directly-held investments.

A more detailed description of these risks can be found in section 5.1.6.1 of the Universal Registration Document (formerly Reference Document), "Financial Information – Management and control of financial risks".

■ Energy market risks

With the opening of the final customer market, development of the wholesale markets and international business expansion, the EDF group operates on deregulated energy markets, mainly in Europe, through its generation and supply activities. This exposes the Group to price variations on the wholesale markets for energy (electricity, gas, coal, oil products) and the CO₂ emissions quota market, with a potentially significant impact on the financial statements.

A more detailed description of these risks can be found in section 5.1.6.2 of the Universal Registration Document (formerly Reference Document), "Financial Information – Management and control of energy market risks".

■ Counterparty risks

Counterparty risk is defined as the total loss that the EDF group would sustain on its business and market transactions if a counterparty defaulted and failed to perform its contractual obligations.

A more detailed description of these risks can be found in section 5.1.6.1.7 of the Universal Registration Document (formerly Reference Document), "Financial Information – Management and control of market risks".

Regarding the customer risk, which is another component of the counterparty risk, a statement of receivables not yet due and overdue is shown in note 28.

The sensitivity analyses required by IFRS 7 are presented in section 5.1.6.1 of the Universal Registration Document (formerly Reference Document), "Financial Information – Management and control of financial risks":

- foreign exchange risks: section 5.1.6.1.3,
- interest rate risks: section 5.1.6.1.4,
- equity risk on financial assets: sections 5.1.6.1.5 and 5.1.6.1.6.

The principal information on financial assets and liabilities is described by theme in the following notes and sections:

- liquidity risks:
 - maturity of loans and other financial liabilities: note 41.2.2 to the consolidated financial statements,
 - credit lines: note 41.2.5 to the consolidated financial statements,
 - early repayment clauses for borrowings: note 41.2.6 to the consolidated financial statements,
 - off-balance sheet commitments: note 49 to the consolidated financial statements;
- foreign exchange risks:
 - breakdown of loans and financial liabilities by currency and type of interest rate: notes 41.2.3 and 41.2.4 to the consolidated financial statements;
- equity risks (sections 5.1.6.1.5 and 5.1.6.1.6 of the Universal Registration Document (formerly Reference Document), "Financial Information – Management of equity risks/Management of risk on the dedicated asset portfolio"):
 - coverage of nuclear obligations: notes 49 and 32.1.5 to the consolidated financial statements,
 - coverage of social obligations: notes 34.2.5 and 34.3.4 to the consolidated financial statements,
 - long-term cash management,
 - direct investments;
- interest rate risks:
 - discount rate for nuclear provisions: calculation method and sensitivity: note 32.1.5.2 to the consolidated financial statements,
 - discount rate used for employee benefits: notes 34.2.7 and 34.3.6 to the consolidated financial statements,
 - breakdown of loans by currency and interest rate: notes 41.2.3 and 41.2.4 to the consolidated financial statements;
- balance sheet treatment of financial and market risks:
 - derivatives and hedge accounting: note 44 to the consolidated financial statements, and the statement of changes in equity,
 - derivatives not classified as hedges: note 45 to the consolidated financial statements.

Note 44 Derivatives and hedge accounting

Hedge accounting is applied in compliance with IFRS 9, and concerns interest rate derivatives used to hedge long-term indebtedness, currency derivatives used to

hedge net foreign investments and debts in foreign currencies, and currency and commodity derivatives used to hedge future cash flows.

The fair value of hedging derivatives reported in the balance sheet breaks down as follows:

(in millions of euros)

	Notes	31/12/2019	31/12/2018
Positive fair value of hedging derivatives	39.1	5,759	4,383
Negative fair value of hedging derivatives	41.1	(1,830)	(2,948)
FAIR VALUE OF HEDGING DERIVATIVES		3,929	1,435
Interest rate hedging derivatives	44.4.1	2,939	1,550
Exchange rate hedging derivatives	44.4.2	877	582
Commodity-related cash flow hedges	44.4.3	48	(645)
Commodity-related fair value hedges	44.5	65	(52)

6. Financial statements

Notes to the consolidated financial statements

An alternative breakdown of hedging derivatives is shown below:

<i>(in millions of euros)</i>	<i>Notes</i>	31/12/2019	31/12/2018
Fair value of derivatives hedging liabilities	41.3	3,387	1,972
Fair value of derivatives hedging net foreign investments		261	106
Fair value of other hedging derivatives (commodities)		281	(643)
FAIR VALUE OF HEDGING DERIVATIVES		3,929	1,435

44.1 Fair value hedges

The EDF group hedges the exposure to changes in the fair value of fixed-rate debts. The derivatives used for this hedging are fixed/floating interest rate swaps and cross currency swaps, with changes in fair value recorded in the income statement. Fair value hedges also include currency hedging instruments on certain firm purchase commitments.

In 2019, the ineffective portion of fair value hedges represents a loss of €(17) million (loss of €(3) million in 2018), included in the financial result.

44.2 Cash flow hedges

The EDF group uses cash flow hedging principally for the following purposes:

- to hedge its floating-rate debt, using interest-rate swaps (floating/fixed rate);
- to hedge the exchange rate risk related to debts contracted in foreign currencies, using cross currency swaps;

44.4 Impact of hedging derivatives on equity

Changes during the period in the fair value of hedging instruments included in equity (EDF share) are detailed below:

<i>(in millions of euros)</i>	2019			2018		
	Gross changes in fair value recorded in equity ⁽¹⁾	Gross changes in fair value transferred to income – Recycling ⁽²⁾	Gross changes in fair value transferred to income – Ineffectiveness	Gross changes in fair value recorded in equity ⁽¹⁾	Gross changes in fair value transferred to income – Recycling ⁽²⁾	Gross changes in fair value transferred to income – Ineffectiveness
Interest rate hedging	(39)	(106)	3	(73)	-	1
Exchange rate hedging	(200)	(156)	(17)	890	443	(5)
Net foreign investment hedging	(416)	(448)	-	(85)	-	-
Commodity hedging	1,482	719	3	(1,043)	(788)	(9)
HEDGING DERIVATIVES ⁽³⁾	827	9	(11)	(311)	(345)	(13)

(1) +/(-): increase/(decrease) in equity (EDF share).

(2) +/(-): increase/(decrease) in net income (EDF share).

(3) Excluding associates and joint ventures.

- to hedge future cash flows related to expected sales and purchases of electricity, gas, and coal, using futures, forwards and swaps.

The EDF group also hedges the currency risk associated with fuel and commodity purchases.

The ineffective portion of cash flow hedges in 2019 represents a gain of €3 million which was included in the financial result (gain of €5 million in 2018).

44.3 Hedges of net investments in foreign entities

Hedging of net foreign investments is used for protection against exposure to the exchange rate risk related to net investments in the Group's foreign entities.

This risk is hedged at Group level either by contracting debts for investments in the same currency, or through the markets, in which case the Group uses currency swaps and forward exchange contracts.

44.4.1 Interest rate hedging derivatives

Interest rate hedging derivatives break down as follows:

<i>(in millions of euros)</i>	Notional at 31/12/2019			Total	Notional at	Fair value	
	< 1 year	1-5 years	> 5 years		31/12/2018	31/12/2019	31/12/2018
Fixed rate payer/floating rate receiver	39	1,377	1,317	2,733	1,168	(51)	(75)
Floating rate payer/fixed rate receiver	1,905	4,399	17,329	23,633	23,143	3,143	1,619
Floating rate/floating rate	-	800	1,647	2,447	3,031	60	56
Fixed rate/fixed rate	912	1,294	7,695	9,901	14,053	(213)	(50)
Interest rate swaps	2,856	7,870	27,988	38,714	41,395	2,939	1,550
INTEREST RATE HEDGING DERIVATIVES	2,856	7,870	27,988	38,714	41,395	2,939	1,550

The fair value of interest rate/exchange rate cross-currency swaps comprises the interest rate effect only.

A large portion of the EDF group's fixed-rate loans is swapped to variable rates.

The notional value of cross-currency swaps is included both in this note and the note on exchange rate hedging derivatives (see note 44.4.2).

44.4.2 Exchange rate hedging derivatives

Exchange rate hedging derivatives break down as follows:

At 31 December 2019

<i>(in millions of euros)</i>	Notional amount to be received at 31/12/2019				Notional amount to be given at 31/12/2019				Fair value
	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2019
Forward exchange transactions	1,843	1,357	-	3,200	1,838	1,526	-	3,364	3
Swaps	19,619	6,566	17,367	43,552	19,006	6,268	16,892	42,166	874
EXCHANGE RATE HEDGING DERIVATIVES	21,462	7,923	17,367	46,752	20,844	7,794	16,892	45,530	877

At 31 December 2018

<i>(in millions of euros)</i>	Notional amount to be received at 31/12/2018				Notional amount to be given at 31/12/2018				Fair value
	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2018
Forward exchange transactions	1,550	393	-	1,943	1,540	387	-	1,927	17
Swaps	17,085	9,543	16,884	43,512	16,791	9,163	16,785	42,739	565
EXCHANGE RATE HEDGING DERIVATIVES	18,635	9,936	16,884	45,455	18,331	9,550	16,785	44,666	582

The notional value of cross-currency swaps shown in this note is also included in the note on interest rate hedging derivatives (see note 44.4.1).

44.4.3 Commodity-related cash flow hedges

For commodities, changes in fair value are mainly explained by:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Electricity hedging contracts	510	(629)
Gas hedging contracts	763	(231)
Coal hedging contracts	(56)	(107)
Oil product hedging contracts	51	(446)
CO ₂ emission rights hedging contracts	214	370
CHANGES IN FAIR VALUE BEFORE TAXES	1,482	(1,043)

6. Financial statements

Notes to the consolidated financial statements

The main components of the amount transferred to operating profit before depreciation and amortisation in respect of commodity hedges terminated during the year are:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Electricity hedging contracts	(753)	(388)
Gas hedging contracts	1,428	(280)
Coal hedging contracts	2	(109)
Oil product hedging contracts	(61)	(194)
CO ₂ emission rights hedging contracts	103	183
CHANGES IN FAIR VALUE BEFORE TAXES	719	(788)

Details of commodity-related cash flow hedges are as follows:

<i>(in millions of euros)</i>	Units of measure	31/12/2019				31/12/2018		
		Net notional				Fair value	Net notional	Fair value
		< 1 year	1-5 years	> 5 years	Total			
Swaps		(9)	-	-	(9)	105	(4)	50
Forwards/futures		(4)	(36)	-	(40)	288	(51)	(859)
Electricity	TWh	(13)	(36)	-	(49)	393	(55)	(809)
Swaps		74	77	-	151	(24)	(190)	9
Forwards/futures		1,038	1,066	-	2,104	(373)	1,504	25
Gas	Millions of therms	1,112	1,143	-	2,255	(397)	1,314	34
Swaps		2,027	4,589	-	6,616	7	10,402	(53)
Options		-	-	-	-	-	180	-
Oil products	Thousands of barrels	2,027	4,589	-	6,616	7	10,582	(53)
Swaps		-	(1)	-	(1)	1	-	-
Coal	Millions of tonnes	-	(1)	-	(1)	1	-	-
Swaps		-	-	-	-	-	-	-
Forwards/futures		15,710	10,956	-	26,666	44	13,488	183
CO₂	Thousands of tonnes	15,710	10,956	-	26,666	44	13,488	183
COMMODITY-RELATED CASH FLOW HEDGES						48		(645)

44.5 Commodity-related fair value hedges

Details of commodity-related fair value hedges are as follows:

<i>(in millions of euros)</i>	Units of measure	31/12/2019		31/12/2018	
		Net notional	Fair value	Net notional	Fair value
Coal and freight	Millions of tonnes	(415)	71	(3)	2
Oil products	Thousands of barrels	7,021	(5)	5,136	(23)
Gas	Millions of therms	(2)	(1)	(93)	(31)
COMMODITY-RELATED FAIR VALUE HEDGES			65		(52)

Note 45 Non-hedging derivatives

Details of the fair value of trading derivatives reported in the balance sheet are as follows:

<i>(in millions of euros)</i>	Notes	31/12/2019	31/12/2018
Positive fair value of trading derivatives	39.1	6,813	6,404
Negative fair value of trading derivatives	41.1	(6,327)	(7,160)
Fair value of trading derivatives		486	(756)
Interest rate derivatives held for trading	45.1	(22)	(60)
Currency derivatives held for trading	45.2	(185)	(96)
Non-hedging commodity derivatives	45.3	693	(641)
Other contracts		-	41

45.1 Interest rate derivatives held for trading

Interest rate derivatives held for trading break down as follows:

<i>(in millions of euros)</i>	Notional at 31/12/2019			Total	Notional at 31/12/2018		Fair value	
	< 1 year	1-5 years	> 5 years		Total	31/12/2019	31/12/2018	
Purchases of options	-	-	520	520	516	14	7	
Interest rate operations	-	-	520	520	516	14	7	
Fixed rate payer/floating rate receiver	-	3,848	935	4,783	3,885	(33)	(64)	
Floating rate payer/fixed rate receiver	93	28	-	121	122	(1)	(4)	
Floating rate/floating rate	1	10	-	11	5	-	-	
Fixed rate/fixed rate	42	45	179	266	140	(2)	1	
Interest rate swaps	136	3,931	1,114	5,181	4,152	(36)	(67)	
INTEREST RATE DERIVATIVES HELD FOR TRADING	136	3,931	1,634	5,701	4,668	(22)	(60)	

45.2 Currency derivatives held for trading

Currency derivatives held for trading break down as follows:

At 31 December 2019

<i>(in millions of euros)</i>	Notional amount to be received at 31/12/2019				Notional amount to be given at 31/12/2019				Fair value
	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2019
Forward transactions	4,220	3,280	-	7,500	4,187	3,262	-	7,449	29
Swaps	14,203	6,387	198	20,788	14,328	6,536	198	21,062	(214)
CURRENCY DERIVATIVES HELD FOR TRADING	18,423	9,667	198	28,288	18,515	9,798	198	28,511	(185)

6. Financial statements

Notes to the consolidated financial statements

At 31 December 2018

<i>(in millions of euros)</i>	Notional amount to be received at 31/12/2018				Notional amount to be given at 31/12/2018				Fair value
	< 1 year	1-5 years	> 5 years	Total	< 1 year	1-5 years	> 5 years	Total	31/12/2018
Forward transactions	3,223	2,017	4	5,244	3,215	1,989	5	5,209	2
Swaps	11,885	6,570	70	18,525	11,981	6,689	69	18,739	(98)
CURRENCY DERIVATIVES HELD FOR TRADING	15,108	8,587	74	23,769	15,196	8,678	74	23,948	(96)

45.3 Non-hedging commodity derivatives

Details of commodity derivatives not classified as hedges are as follows:

<i>(in millions of euros)</i>	Unit of measure	31/12/2019		31/12/2018	
		Net notional	Fair value	Net notional	Fair value
Swaps		(10)	366	3	502
Options		-	49	4	(22)
Forwards/futures		(7)	409	(50)	(123)
Electricity	TWh	(17)	824	(43)	357
Swaps		(166)	(219)	(510)	(515)
Options		(720)	49	32	185
Forwards/futures		(6,940)	246	16,323	80
Gas	Millions of therms	(7,826)	76	15,845	(250)
Swaps		15,162	11	27,715	(82)
Options		(875)	(3)	500	1
Forwards/futures		3	-	(360)	(3)
Oil products	Thousands of barrels	14,290	8	27,855	(84)
Swaps		-	(1)	(2,521)	6
Options		-	(6)	-	(14)
Forwards/futures		-	-	-	-
Freight		2	(5)	3,232	(2)
Coal and freight	Millions of tonnes	2	(12)	711	(10)
Swaps		-	-	-	-
Options		(2,626)	(124)	(5,000)	(150)
Forwards/futures		(38,978)	(4)	(56,433)	(446)
CO₂	Thousands of tonnes	(41,604)	(128)	(61,433)	(596)
Swaps/options		-	(56)	-	29
Forwards/futures		-	(19)	-	(87)
Other commodities		-	(75)	-	(58)
Embedded commodity derivatives		-	-	-	-
NON-HEDGING COMMODITY DERIVATIVES			693		(641)

These mainly include contracts included in EDF Trading's portfolio.

Assets held for sale and related liabilities

Note 46 Assets held for sale and related liabilities

(in millions of euros)

	31/12/2019	31/12/2018
ASSETS HELD FOR SALE	3,662	-
LIABILITIES RELATED TO ASSETS HELD FOR SALE	1,043	-

The Group reclassified the balance sheet items concerned by the following operations as assets held for sale and related liabilities at 31 December 2019:

- the sale of Exploration and Production (E&P) operations, which is currently in process (see note 2.3);
- the sale of CENG shares, which is currently in process (see note 3.2.2).

(in millions of euros)

	31/12/2019
Non-current non-financial assets	893
Non-current financial assets	-
Current non-financial assets	784
Current financial assets	60
TOTAL ASSETS HELD FOR SALE	1,737

(in millions of euros)

	31/12/2019
Non-current non-financial liabilities	711
Non-current financial liabilities	34
Current non-financial liabilities	298
Current financial liabilities	-
TOTAL LIABILITIES RELATED TO ASSETS HELD FOR SALE	1,043

The E&P operations contributed €(26) million to the Group's net indebtedness at 31 December 2019 (see note 41.3).

CENG

EDF notified Exelon on 20 November 2019 that it had decided to exercise its put option on 49.99% of the shares of CENG (see note 3.2.2).

The investment in CENG has been reclassified as assets held for sale at the amount of €1,925 million.

Although completion of this operation is conditional on obtaining the required regulatory approvals and will take several months, in view of the terms of the contractual agreements, the Group is engaged in an irrevocable process. The range

E&P operations

In application of IFRS 5, details of the assets and liabilities of the E&P operations presented as assets held for sale and related liabilities at 31 December 2019 are shown below:

of valuations determined with consultants for use in the contractual determination method for the put option sale price does not indicate any risk of impairment, given that Exelon has not yet informed the Group of its own valuation.

These valuations are very sensitive to market price forecasts, which could change significantly in the course of the put option exercise process. They are also sensitive to the effects of New York State's Zero Emission Credit (ZEC) programme of subsidies for nuclear power plants, which provides additional income for the Ginna and Nine Mile Point plants. This programme is currently the subject of legal proceedings. On 8 October 2019, the New York Supreme Court dismissed the court case against the ZEC and declared the programme legal. The applicants have filed an appeal, but the risk of cancellation is low in view of the stated grounds for the Supreme Court's decision.

Cash flows and other information

Note 47 Cash flows

47.1 Change in working capital

<i>(in millions of euros)</i>	2019	2018*
Change in inventories	191	(12)
Change in the receivable for Contribution to the Public Electricity Service (CSPE)	(864)	357
Change in trade receivables	174	1,230
Change in trade payables	(46)	(664)
Change in other receivables and payables (excluding CSPE)	997	(441)
CHANGE IN WORKING CAPITAL	452	470

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

47.2 Investments in intangible and tangible assets

<i>(in millions of euros)</i>	2019	2018*
Acquisitions of intangible assets	(1,370)	(1,798)
Acquisitions of tangible assets	(15,436)	(13,850)
Change in payables to suppliers of fixed assets	97	(368)
INVESTMENTS IN INTANGIBLE AND TANGIBLE ASSETS	(16,709)	(16,016)

* Restated for the impacts of IFRS 5 concerning the discontinued E&P operations (see note 2.3).

47.3 Payments relating to leases

<i>(in millions of euros)</i>	2019
TOTAL PAYMENTS RELATING TO THE LEASE LIABILITY	(790)

Payments relating to the lease liability mainly concern principal repayments, and amount to €721 million.

Note 48 EDF's dedicated assets

48.1 Regulations

Article L. 594 of France's Environment Code and its implementing regulations require assets (dedicated assets) to be set aside for secure financing of nuclear plant decommissioning expenses and long-term storage expenses for radioactive waste. These regulations govern the way dedicated assets are built up, and the management and governance of the funds themselves. Dedicated assets are clearly identified and managed separately from the Company's other financial assets and investments. They are also subject to specific monitoring and control by the Board of Directors and the administrative authorities.

The law requires the realisable value of dedicated assets to be higher than the value of the provisions corresponding to the present value of the long-term nuclear expenses defined above.

The Decree of 24 March 2015 contains two measures concerning dedicated assets:

- the annual allocation to dedicated assets, net of any increases to provisions, must be positive or zero as long as their realisable value is below 110% of the amount of the provisions concerned;
- subject to certain conditions, real estate property owned by the operators of nuclear facilities may be allocated to coverage of these provisions.

The Decree of 29 December 2010 made RTE shares eligible for inclusion in dedicated assets subject to certain conditions and administrative authorisation. The Decree of 19 December 2016 authorised allocation of the shares of CTE, which holds 100% of the capital of RTE, to the portfolio of dedicated assets from 31 December 2017, subject to conditions (see note 48.2.2 below).

The Decree of 24 July 2013 revised the list of eligible assets by reference to the Insurance Code, making unlisted assets eligible subject to certain conditions.

EDF received ministerial authorisation on 31 May 2018 to increase the portion of unlisted assets in its dedicated assets from 10% to 15% subject to conditions (this does not apply to the shares of CTE or real estate assets).

48.2 Portfolio contents and measurement

Given the applicable regulations, these dedicated assets are a highly specific category of assets.

Dedicated assets are structured and managed according to a strategic allocation defined by the Board of Directors and reported to the administrative authorities. The strategic allocation is designed to meet the overall objective of long-term coverage of obligations, and determines the structure and management of the portfolio as a whole. It takes into account regulatory constraints concerning the nature and liquidity of the dedicated assets, the financial outlook for the equity and bond markets, and the diversifying contribution of unlisted assets.

As part of the strategic allocation review process and in order to pursue the diversification into unlisted assets begun in 2010 with the shares in RTE, in 2013 the Board of Directors approved the introduction of an unlisted asset portfolio alongside the diversified equity and bond investments. This portfolio is managed by the EDF SA Division "EDF Invest", which was formed following the Decree of 24 July 2013 on secure funding for nuclear expenses. EDF Invest has the following target asset classes: infrastructures, real estate and debt or equity funds.

Following the French government's authorisation issued on 8 February 2013, and the approval of the Nuclear Commitments Monitoring Committee and the Board of Directors' decision of 13 February 2013, EDF allocated the entire receivable recognised by the French State, representing the accumulated shortfall in CSPE financing at 31 December 2012, to its dedicated assets.

This financial receivable was increased in the financial statements at 31 December 2015 by an additional amount estimated at €644 million that was not allocated to dedicated assets, corresponding to the shortfalls in compensation that arose between the beginning of 2013 and the end of 2015, as acknowledged by the State in a ministerial letter of 26 January 2016. In accordance with this letter, the

total financial receivable bears interest at 1.72% and will be repaid under a revised schedule ending in late 2020. This schedule was laid down in a ministerial order of 2 December 2016, based on the CRE's confirmation of the shortfall for 2015.

On 22 December 2016, EDF assigned a 26.4% portion of this financial receivable, including the additional receivable corresponding to the shortfalls in compensation between 2013 and 2015, to a pool of investors. Consequently, the realisable value of the non-assigned portion of the receivable, which is totally allocated to dedicated assets, is calculated based on the assignment value at that date. The amount received for assignment of the portion of the CSPE receivable that was allocated to dedicated assets (€894 million) was reinvested in dedicated assets, in the same way as the reimbursements received.

After receiving the ministerial letter of 31 May 2018 authorising EDF, subject to conditions, to increase the portion of unlisted assets in its dedicated assets, on 29 June 2018 the Board of Directors validated the following new strategic allocation for dedicated assets:

- Yield assets (target of 30% of dedicated assets), consisting of infrastructure assets, including the shares of CTE, and real estate property;
- Growth assets (target of 40% of dedicated assets), consisting of equity funds investing in listed or unlisted equities;
- Fixed-income assets (target of 30% of dedicated assets), consisting of listed bonds or listed bond funds, unlisted debt funds, receivables and cash.

These targets should be reached gradually, mainly by reinvesting fixed-income assets in yield assets.

48.2.1 Growth assets and fixed-income assets

Certain growth and fixed-income assets take the form of bonds held directly by EDF. Others consist of specialised collective investment funds on leading international markets, managed by independent asset management companies. They take the form of open-end funds and "reserved" funds established for the Group (which does not participate in the fund management).

The listed equity funds consist of international equities (mainly in North America but also in Europe, Asia-Pacific and emerging countries). Listed bonds and listed bond funds consist of sovereign and corporate bonds.

These investments are structured and managed in line with the strategic allocation, which takes into consideration international stock market cycles, for which the statistical inversion generally observed between equity market cycles and bond market cycles – as well as between geographical areas – has led the Group to define a long-term investment policy with appropriate allocation between growth assets and fixed-income assets.

Under the new strategic allocation, growth assets also include a small portion of funds invested in unlisted equities, and fixed-income assets also include a small portion of funds invested in unlisted debt. These funds are managed by EDF Invest (see note 48.2.2).

Since the application of IFRS 9 from 1 January 2018, all these assets have been included in debt and equity securities.

At the year-end, dedicated assets are presented in debt and equity securities in the balance sheet, at their liquidation value.

In the course of operational asset monitoring, the Group applies long-term, specific management rules defined and supervised by its governance bodies (maximum investment ratios, volatility analyses and assessment of individual fund manager quality).

48.2.2 Yield assets

The yield assets managed by EDF Invest consist mainly of assets related to investments in infrastructures and real estate.

Through investment funds, EDF Invest also manages growth assets and fixed-income assets (see note 48.2.1).

6. Financial statements

Notes to the consolidated financial statements

At 31 December 2019, the assets managed by EDF Invest represent a total realisable value of €6,498 million, including €6,080 million of yield assets. Yield assets particularly include:

- 50.1% of the Group's shares in CTE, the joint venture that owns RTE, in compliance with Decree 2016-1781 of 19 December 2016 amending the Decree of 23 February 2007. These shares amount to €2,926 million at 31 December 2019 (€2,738 million at 31 December 2018), and are presented in investments in associates in the consolidated balance sheet;
- the Group's investments in Terega, Porterbrook, Autostrade per l'Italia, Q-Park and companies that own wind farms in the United Kingdom (Bicker Fen, Glass

Moor II, Green Rigg, Rusholme), which are presented in debt and equity securities in the consolidated balance sheet;

- the Group's investments in Madriëña Red de Gas (MRG), Géosel, Thyssengas, Aéroports de la Côte d'Azur, Central Sicaf, Fallago Rig, Fenland, Ecowest SCI A and B, Nam Theun Power Company and companies that own solar farms (Catalina Solar, Switch) and wind farms (MiRose, Red Pine) in the United States, which are presented in investments in associates in the consolidated balance sheet.

48.3 Valuation of EDF's dedicated assets

EDF's dedicated assets are included in the Group's consolidated financial statements at the following values:

(in millions of euros)	Consolidated balance sheet presentation	31/12/2019		31/12/2018	
		Book value	Realisable value	Book value	Realisable value
Yield assets (EDF Invest)		4,304	6,080	3,919	5,356
CTE	Investments in associates ⁽¹⁾	1,417	2,926	1,406	2,738
Other associates	Investments in associates ⁽²⁾	1,563	1,777	1,167	1,234
Other unlisted assets	Debt and equity securities and other net assets ⁽³⁾	1,334	1,387	1,346	1,384
Derivatives	Fair value of derivatives	(10)	(10)	-	-
Growth assets		13,300	13,300	10,108	10,108
Equities ⁽⁴⁾	Debt securities	12,978	12,978	9,844	9,844
Unlisted equity funds (EDF Invest)	Debt securities	276	276	219	219
Derivatives	Fair value of derivatives	46	46	45	45
Fixed-income assets		12,240	12,244	12,205	12,225
Bonds	Debt securities	11,225	11,225	10,010	10,010
Unlisted debt funds (EDF Invest)	Debt securities	142	142	105	105
Cash portfolio ⁽⁵⁾	Debt securities	188	188	30	30
CSPE receivable ⁽⁶⁾	Loans and financial receivables	684	688	2,060	2,080
Derivatives	Fair value of derivatives	1	1	-	-
TOTAL EDF DEDICATED ASSETS		29,844	31,624	26,232	27,689

(1) The Group's investment of 50.1% of CTE, the company that holds 100% of the shares in RTE. The CTE shares are included at their equity value in the consolidated financial statements (book value in the table). The realisable value of CTE in the above table has been determined by an independent assessor, in the same way as for EDF Invest's other assets.

(2) Including the value of the share in equity of the controlled companies owning these investments.

(3) Including debt and equity securities amounting to €1,209 million and the value of the share in equity of other controlled companies.

(4) Including €391 million of securities acquired in late December 2018 for which payment took place in early January 2019.

(5) After deduction of the €391 million of liabilities on securities acquired in late December 2018 for which payment took place in early January 2019.

(6) The receivable consisting of accumulated shortfalls in compensation at 31 December 2015, less the portion assigned on 22 December 2016 and reimbursements received since then, in line with the repayment schedule. The realisable value of the CSPE receivable is estimated based on market rates.

Structured entities – Investment funds

The investment funds held by the Group (see note 1.3.2.9) reported in the table under "Debt and equity securities" are located in France and owned by EDF. The Group has not given these funds any financial support.

The value of the assets of these investment funds amounts to €8,492 million at 31 December 2019 (€4,898 million at 31 December 2018). The funds mainly consist of 12 listed funds with total value of €7,875 million (at 31 December 2018, 11 listed funds with total value of €4,340 million).

48.4 Coverage of long-term nuclear obligations

At 31 December 2019, by the regulatory calculations provisions are 105.5% covered by dedicated assets. The regulatory limit on the realisable value of certain investments (decree 2007-243) has no effect at 31 December 2019.

At 31 December 2018, by the regulatory calculations provisions were 98.3% covered by dedicated assets. The regulatory limit on the realisable value of certain investments (decree 2007-243) also had no effect at 31 December 2018.

Withdrawals from dedicated assets in 2019 totalled €442 million, equivalent to payments made in respect of the long-term nuclear obligations to be covered during the year (€403 million in 2018).

Because of changes (other than regulatory modifications) in the assumptions used to calculate long-term nuclear provisions, the required allocation to dedicated assets for 2018 amounted to €1,337 million. The administrative authorities authorised EDF to spread this allocation as follows: €540 million in 2019 and 2020, and €257 million in 2021. Allocations to dedicated assets in 2019 thus totalled €540 million in realisable value (€387 million in 2018) (see note 48.5), and took the form of shares rather than cash. At 1 January 2020, the outstanding required allocation for 2018 amounts to €797 million. In accordance with the letter received on 12 February 2020 (see note 32.1.5.1), this allocation must be made in 2020, but no allocation is required in respect of 2019.

(in millions of euros)

	31/12/2019	31/12/2018
Provisions for spent fuel management – portion unrelated to the operating cycle as defined in the regulations	1,152	1,067
Provisions for long-term radioactive waste management	10,531	9,846
Provisions for waste removal and conditioning	805	751
Provisions for nuclear plant decommissioning	16,937	15,985
Provisions for last cores – portion for future long-term radioactive waste management	550	518
PRESENT COST OF LONG-TERM NUCLEAR OBLIGATIONS	29,975	28,167

48.5 Changes in dedicated assets in 2019

Under the new strategic allocation for dedicated assets which increased the portion of unlisted assets from one quarter to one third, in December 2018 EDF SA acquired EDF International's minority interest in Nam Theun Power Company (NTPC), a hydroelectric dam in Laos, part of which was allocated to dedicated assets at that date in the EDF Invest subgroup. The rest was allocated during 2019. In December 2019 EDF SA acquired an investment in solar power plants (Catalina Solar, Switch) and wind farms (MiRose, Red Pine) in the United States from EDF Renewables US, and some of this investment was allocated to dedicated assets in the EDF Invest subgroup during 2019.

The total realisable value of assets allocated to dedicated assets in 2019 is €540 million.

Positive changes in the fair value of the dedicated asset portfolio (investment funds, equities) amounting to €2,545 million were recognised in the financial result in 2019 (see note 16.3), compared to negative changes amounting to €(989) million in 2018.

Over a 10-year horizon, disbursements will be made to the following extent (at year-end economic conditions, i.e. in 2019 euros):

- 15% of provisions for long-term radioactive waste management;
- 11% of provisions for decommissioning.

Over a 50-year horizon, disbursements will be made to the following extent (at year-end economic conditions, i.e. in 2019 euros):

- 37% of provisions for long-term radioactive waste management;
- 93% of provisions for decommissioning.

The Group's long-term nuclear obligations in France concerned by the regulations for dedicated assets related to nuclear generation are included in the EDF group's consolidated financial statements at the following values:

Positive changes in the fair value of the bonds in the dedicated asset portfolio amounting to €162 million were recognised in OCI in 2019 (see note 39.2), compared to negative changes amounting to €(60) million in 2018.

48.6 Dedicated assets of Framatome and Cyclife France (formerly SOCODEI)

The dedicated assets of Framatome and Cyclife France (formerly SOCODEI) relating to Basic nuclear facilities (INB) in France have realisable values of €92 million and €54 million respectively and the degree of coverage of provisions according to the regulations is 110.1% for Framatome and 113.4% for Cyclife France (calculated using EDF group discount and inflation rates for nuclear provisions in France – see note 32).

These two entities' long-term nuclear obligations in France concerned by the regulations for dedicated assets are included in the EDF group's consolidated financial statements at the amounts of €83 million for Framatome and €48 million for Cyclife France (see note 33).

6. Financial statements

Notes to the consolidated financial statements

Note 49 Off-balance sheet commitments

This note presents off-balance sheet commitments given and received by the Group at 31 December 2019. The amounts of commitments correspond to non-discounted contractual values.

49.1 Commitments given

The table below shows off-balance sheet commitments given by the Group that have been valued. Other commitments are described separately in the detailed notes.

<i>(in millions of euros)</i>	Notes	31/12/2019	31/12/2018
Operating commitments given	49.1.1	41,110	45,370
Investment commitments given	49.1.2	18,237	17,572
Financing commitments given	49.1.3	6,343	5,494
TOTAL COMMITMENTS GIVEN		65,690	68,436

In almost all cases, these are reciprocal commitments, and the third parties concerned are under a contractual obligation to supply the Group with assets or services related to operating, investment and financing activities.

49.1.1 Operating commitments given

Operating commitments given by the Group at 31 December 2019 are as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Fuel and energy purchase commitments*	25,373	26,878
Operating contract performance commitments given	15,248	14,117
Operating lease commitments as lessee	489	4,375
TOTAL OPERATING COMMITMENTS GIVEN	41,110	45,370

* Excluding gas purchases and related services.

49.1.1.1 Fuel and energy purchase commitments

In the course of its ordinary generation and supply activities, the Group has entered into long-term contracts for purchases of electricity, gas, other energies and commodities and nuclear fuel, for periods of up to 20 years.

The Group has also entered into long-term purchase contracts with a certain number of electricity producers, by contributing to the financing of power plants.

At 31 December 2019, fuel and energy purchase commitments mature as follows:

<i>(in millions of euros)</i>	Total	31/12/2019				31/12/2018
		Maturity				Total
		< 1 year	1-5 years	5-10 years	> 10 years	
Electricity purchases and related services ⁽¹⁾	9,999	2,305	3,614	2,157	1,923	10,368
Other energy and commodity purchases ⁽²⁾	281	62	144	75	-	377
Nuclear fuel purchases	15,093	1,580	6,142	4,771	2,600	16,133
FUEL AND ENERGY PURCHASE COMMITMENTS	25,373	3,947	9,900	7,003	4,523	26,878

(1) Including commitments given by controlled entities to joint ventures, amounting to €569 million at 31 December 2019 (€604 million at 31 December 2018).

(2) Excluding gas purchases and related services – see note 49.1.1.1.4.

49.1.1.1.1 Electricity purchases and related services

Electricity purchase commitments mainly concern EDF and EDF Energy. In the case of EDF many of these commitments are borne by the Island Energy Systems (SEI), which have made commitments to purchase the electricity generated using bagasse and coal.

In addition to the obligations reported above and under Article 10 of the Law of 10 February 2000, in mainland France, EDF is obliged, at the producer's request

and subject to compliance with certain technical features, to purchase the power produced by co-generation plants and renewable energy generation units (wind turbines, small hydro-electric plants, photovoltaic power, etc.). The additional costs generated by this obligation are offset, after validation by the CRE, by the CSPE. These purchase obligations total 57TWh for 2019 (53TWh for 2018), including 7TWh for co-generation (7TWh for 2018), 30TWh for wind power (26TWh for 2018), 11TWh for photovoltaic power (9TWh for 2018) and 3TWh for hydropower (3TWh for 2018).

49.1.1.1.2 Other energy and commodity purchases

Purchase commitments for other energies and commodities mainly concern coal and oil used to operate the fossil-fired plants, and purchases of biomass fuel used by Dalkia in the course of its business.

49.1.1.1.3 Nuclear fuel purchases

Commitments for purchases of nuclear fuel arise from supply contracts for the nuclear plants intended to cover the EDF group's needs for uranium and fluorination, enrichment and fuel assembly production services.

49.1.1.1.4 Gas purchases and related services

Gas purchase commitments are principally undertaken by Edison and EDF. The volumes concerned for both entities at 31 December 2019 are as follows:

(in billions of m ³)	31/12/2019				31/12/2018
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
Edison	135	12	44	79	140
EDF	24	2	6	16	22

Gas purchase contracts

Edison has entered into agreements to import natural gas from Russia, Libya, Algeria and Qatar, for a total maximum volume of 12.4 billion m³ per year. The residual terms of these contracts vary between 1 and 15 years.

The contract with Algeria was renewed in 2019 for 1 billion m³ per year until 2027. The long-term contract for gas from Russia terminated in 2019 and Edison signed a new contract for 1 billion m³ per year for 2020.

EDF has entered into an import contract for LNG from the United States, concerning an annual supply of 0.7 million tonnes of LNG (1 billion m³ of natural gas per year) for a 20-year period beginning in May 2020.

Gas-related service contracts

Under the contract with Terminale GNL Adriatico, Edison also benefits from approximately 80% of the terminal's regasification capacities until 2034.

Under the contract with the Dunkerque LNG methane terminal, EDF benefits from approximately 61% of the terminal's regasification capacities until 2037, in return for payment of an annual premium of approximately €150 million. A provision for onerous contracts has been recorded in connection with this contract.

Other commitments and risks

Edison has recently signed two significant purchase contracts for gas from Azerbaijan (1 billion m³ per year), with deliveries scheduled to start in 2021, and LNG from the United States (1 million tonnes per year), with deliveries scheduled to start in 2023.

49.1.1.2 Operating contract performance commitments given

At 31 December 2019, these commitments mature as follows:

(in millions of euros)	31/12/2019				31/12/2018
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
Operating guarantees given	7,349	2,243	2,133	2,973	7,047
Operating purchase commitments ⁽¹⁾	7,594	4,100	2,717	777	6,898
Other operating commitments	305	82	131	92	172
OPERATING CONTRACT PERFORMANCE COMMITMENTS GIVEN ⁽²⁾	15,248	6,425	4,981	3,842	14,117

(1) Excluding fuel and energy.

(2) Including commitments given by controlled entities to joint ventures, amounting to €1,019 million at 31 December 2019 (€982 million at 31 December 2018).

In the course of its business, the Group provides contract performance guarantees, generally through the intermediary of banks.

Operating guarantees given at 31 December 2019 mainly consist of guarantees given by EDF, Edison and EDF Renewables in connection with its development projects.

49.1.1.2.1 Operating guarantees given

Operating guarantees given are as follows:

(in millions of euros)	31/12/2019	31/12/2018
EDF	2,081	2,038
EDF Renewables	1,612	1,677
Edison	1,319	1,262
EDF Energy	912	795
Framatome	552	517
Other entities	873	758
TOTAL	7,349	7,047

6. Financial statements

Notes to the consolidated financial statements

49.1.1.2.2 Operating purchase commitments

Operating purchase commitments are as follows:

(in millions of euros)	31/12/2019	31/12/2018
EDF	3,028	2,533
Framatome	1,880	2,024
Enedis	829	764
EDF Energy	613	524
Other entities	1,244	1,053
TOTAL	7,594	6,898

49.1.1.3 Lease commitments as lessee

At 31 December 2019, lease commitments as lessee break down as follows:

(in millions of euros)	31/12/2019				31/12/2018
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
LEASE COMMITMENTS AS LESSEE	489	67	222	200	4,375

From 1 January 2019, most existing leases are recognised in the balance sheet in application of IFRS 16, while at 31 December 2018 they were reported as off-balance sheet commitments.

The residual off-balance sheet lease commitments amounted to €434 million at 1 January 2019 (see note 2.1.1).

The only remaining off-balance sheet lease commitments are:

- leases that are exempt from recognition in application of IFRS 16. The total amount concerned at 31 December 2019 is €211 million (€105 million at 31 December 2018);

- leases of assets that have not yet been made available to the Group (principally real estate and LNG tankers under construction). The right-of-use assets and the lease liability will be recognised in the balance sheet when the leased asset is made available. The total amount concerned at 31 December 2019 is €278 million (€329 million at 31 December 2018).

49.1.2 Investment commitments given

At 31 December 2019, details of investment commitments are as follows:

(in millions of euros)	31/12/2019				31/12/2018
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
Commitments related to acquisition of tangible and intangible assets	17,430	9,422	7,245	763	16,545
Commitments related to acquisition of financial assets	583	54	431	98	746
Other commitments related to investments	224	184	40	-	281
TOTAL INVESTMENT COMMITMENTS GIVEN*	18,237	9,660	7,716	861	17,572

* Including commitments given by controlled entities to joint ventures, amounting to €265 million at 31 December 2019 (€399 million at 31 December 2018).

49.1.2.1 Commitments related to acquisition of tangible and intangible fixed assets

The commitments related to acquisition of tangible and intangible fixed assets are as follows:

(in millions of euros)	31/12/2019	31/12/2018
EDF	4,654	4,715
EDF Energy	6,466	6,082
Enedis	2,555	3,092
EDF Renewables	2,437	1,622
Framatome	517	587
Other entities	801	447
TOTAL	17,430	16,545

The increase in commitments given related to acquisition of tangible and intangible fixed assets is mainly explained by the projects in development, notably EDF Renewables projects in the United States, Brazil and India, Edison's Marghera

levante thermoelectric plant project, and a rise in commitments associated with EDF Energy's HPC project. The decrease in Enedis' commitments is due to further progress on the rollout of Linky meters.

49.1.2.2 Commitments related to acquisition of financial assets

The main share purchase commitments that cannot be valued concern Luminus.

Luminus signed an amendment to the shareholder pact on 26 October 2015 defining a liquidity clause for the investments held by its minority shareholders, which could, in certain conditions under the control of EDF, result in sale of their shares through an IPO, or purchase of their shares by the Group at market value. This liquidity clause is valid at all times from 1 July 2018 to 31 December 2025.

Regarding the investment in EDF Investissements Groupe (EIG), C3 (a fully-owned EDF subsidiary) and NBI (Natixis Belgique Investissement, a subsidiary of the Natixis group) amended the agreements for their investment in EIG on 19 December 2018.

C3 now has a call option to buy EIG shares held by NBI at a fixed price, exercisable at any time until May 2026. Meanwhile, NBI has a put option to sell EDF all of its EIG shares for a fixed amount of cash, exercisable subject to certain conditions between February 2024 and May 2025.

Due to their features, in compliance with IAS 32, NBI's put option and C3's call option are considered as derivatives and their net value is included in the positive or negative fair value of trading derivatives. At 31 December 2019, the fair value of these trading derivatives is not significant.

49.1.2.3 Other commitments related to investments

Other commitments given related to investments at 31 December 2019 mainly comprise guarantees given by EDF Norte Fluminense in connection with its 51% investment in CES, the company in charge of constructing and operating a hydroelectric dam on the Teles Pires river in Brazil.

49.1.3 Financing commitments given

Financing commitments given by the Group at 31 December 2019 comprise the following:

(in millions of euros)	31/12/2019				31/12/2018
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
Security interests in real property	4,587	231	1,998	2,358	4,226
Guarantees related to borrowings	1,314	77	475	762	974
Other financing commitments	442	426	5	11	294
TOTAL FINANCING COMMITMENTS GIVEN*	6,343	734	2,478	3,131	5,494

* Including commitments given by controlled entities to joint ventures, amounting to €1,225 million at 31 December 2019 (€917 million at 31 December 2018). These financing commitments to joint ventures mainly concern EDF Renewables.

Security interests and assets provided as guarantees mainly concern pledges or mortgages of tangible assets and shares representing investments in consolidated subsidiaries which own property, plant and equipment, for EDF Renewables.

49.2 Commitments received

The table below shows off-balance sheet commitments received by the Group that have been valued. Other commitments received are described separately in the detailed notes.

(in millions of euros)	Notes	31/12/2019	31/12/2018
Operating commitments received ⁽¹⁾	49.2.1	9,291	9,539
Investment commitments received	49.2.2	181	183
Financing commitments received	49.2.3	22	31
TOTAL COMMITMENTS RECEIVED ⁽²⁾		9,494	9,753

(1) Excluding commitments related to supplies of energy and related services (see note 49.2.1.4)

(2) Excluding commitments related to credit lines, which are described in note 41.2.5.

49.2.1 Operating commitments received

Operating commitments received by the Group at 31 December 2019 comprise the following:

(in millions of euros)	31/12/2019				31/12/2018
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
Operating lease commitments as lessor	770	118	414	238	678
Operating sale commitments	6,706	1,911	3,733	1,062	7,004
Operating guarantees received	1,756	962	560	234	1,791
Other operating commitments received	59	21	20	19	66
OPERATING COMMITMENTS RECEIVED	9,291	3,012	4,727	1,553	9,539

6. Financial statements

Notes to the consolidated financial statements

49.2.1.1 Operating lease commitments as lessor

The Group benefits from commitments as lessor in operating leases amounting to €770 million.

These commitments mainly concern the Asian Independent Power Projects (IPPs) and real estate leases.

49.2.1.2 Operating sale commitments

Operating sale commitments received exclude energy deliveries and principally concern firm orders made through contracts recorded on a percentage-of-completion basis at Framatome (construction and engineering contracts) and EDF Renewables (agreements for operation services, maintenance services, and development and sale of structured assets).

49.2.2 Investment commitments received

(in millions of euros)

	31/12/2019			31/12/2018	
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
INVESTMENT COMMITMENTS RECEIVED	181	60	121	-	183

Under the terms of the agreement signed with Exelon on 29 July 2013 and finalised on 1 April 2014, EDF had an option to sell its investment in CENG to Exelon at fair

49.2.1.3 Operating guarantees received

Operating guarantees received primarily concern EDF and relate to guarantees received from suppliers, particularly in connection with deliveries under the ARENH system.

49.2.1.4 Electricity supply commitments

In the course of its business, the EDF group has signed long-term contracts to supply electricity as follows:

- long-term contracts with a number of European electricity operators, for a specific plant or for a defined group of plants in the French nuclear generation fleet, corresponding to installed power capacity of 3.5GW;
- in execution of France's NOME Law on organisation of the French electricity market, EDF has a commitment to sell some of the energy generated by its existing nuclear power plants to other suppliers. This covers volumes of up to 150TWh each year until 31 December 2025.

	31/12/2019			31/12/2018	
	Total	Maturity			Total
		< 1 year	1-5 years	> 5 years	
INVESTMENT COMMITMENTS RECEIVED	181	60	121	-	183

value, exercisable between January 2016 and June 2022. On 20 November 2019 EDF notified Exelon that it had decided to exercise this option (see note 3.2.2).

49.2.3 Financing commitments received

(in millions of euros)

	31/12/2019			31/12/2018	
	Total	Maturity			Total
		< 1 an	1-5 years	> 5 years	
FINANCING COMMITMENTS RECEIVED	22	6	6	10	30

	31/12/2019			31/12/2018	
	Total	Maturity			Total
		< 1 an	1-5 years	> 5 years	
FINANCING COMMITMENTS RECEIVED	22	6	6	10	30

Note 50 Contingent liabilities

In addition to the matters reported in note 4.2 and 4.3, the principal contingent liabilities at 31 December 2019 are the following.

50.1 Tax inspections

EDF

For the period 2008 to 2017, EDF was notified of proposed tax adjustments, notably concerning the tax-deductibility of certain long-term liabilities. This recurrent reassessment, which is applied for each year, represents a cumulative financial risk of some €556 million in income taxes at 31 December 2019. In two rulings made in 2017 and another in 2019, Montreuil Administrative Court recognised the tax-deductibility of these liabilities and validated the position taken by the Company. The Minister appealed against two of these rulings. In January 2020, the Versailles Administrative Court upheld EDF's position for the year 2008.

For the years 2012 to 2017, the French tax authorities notified the Company of certain recurrent tax reassessments concerning the *Cotisation sur la Valeur ajoutée des Entreprises* (tax on corporate value added) and questioned the deductibility of long-term provisions.

EDF International

Following the tax inspections of EDF International for the years 2009 to 2014, the French tax authorities questioned the valuation of the bond convertible into shares issued to refinance the acquisition of British Energy. The total amount concerned is approximately €310 million. EDF International has contested this reassessment, and considers it has good chances of winning the dispute.

In a judgement of 2 July 2019, Montreuil Administrative Court confirmed the related tax readjustments for the period 2009-2013. The Company has therefore paid the tax in execution of this decision, which it has also appealed. The amount concerned has been recorded in deferred tax assets, in accordance with IFRIC 23 (see note 17.3).

50.2 Labour litigation

EDF and its subsidiaries are party to a number of labour lawsuits. The Group considers that none of these lawsuits, individually, is likely to have a significant impact on its financial results or financial position. However, because they relate to situations that could concern a large number of EDF's employees in France, any increase in such litigations could have a potentially negative impact on the Group's financial position.

50.3 Litigation with photovoltaic producers

Announcements in 2010 of a cut in electricity purchase tariffs triggered an upsurge, particularly in August 2010, in connection applications submitted to distribution network operators in mainland France and in zones not interconnected to the mainland national grid (since at the time the applicable tariff depended on the date at which a complete connection application was filed). By a decree of 9 December 2010 (the "moratorium decree") the Government suspended the conclusion of new contracts with purchase obligations for a three-month period, and stated that any applications not approved by 2 December 2010 would have to be resubmitted at the end of this three-month period, based on a new decision fixing the purchase price for photovoltaic electricity. That tariff decision was issued on 4 March 2011, and significantly reduced the electricity purchase prices. A tender system was developed in parallel.

A ruling given by the French Council of State on 16 November 2011 rejecting appeals against the moratorium decree generated a large volume of legal proceedings against Enedis and EDF in late 2011 which continued through 2012, 2013, 2014 and 2015. Since March 2016, new actions for compensation in relation with the photovoltaic moratorium are definitively barred.

Most of these legal proceedings were initiated by electricity producers who argued that they were forced to abandon their projects because the new electricity purchase tariffs made operating conditions less favourable. These producers consider the network operators responsible for this situation, on the grounds that they did not issue the technical and financial connection proposals in time for them to benefit from more advantageous electricity purchase terms.

The first instance and appeal court rulings given have varied in their reasoning and verdicts: some have rejected all claims while others have awarded indemnities, which have generally been smaller than the amounts initially claimed.

In December 2015 Versailles Appeal Court decided to apply to the Court of Justice of the European Union (CJEU) for a preliminary ruling on the point of whether the tariff decisions of 2006 and 2010 complied with European law on State aid.

This application was considered irreceivable for procedural reasons. On 20 September 2016, Versailles Appeal Court made another application to the CJEU for a preliminary ruling on the same point, and decided to suspend its own ruling. In an order of 15 March 2017, the CJEU confirmed that the decisions of 10 July 2006 and 12 January 2010 setting the purchase tariffs for photovoltaic electricity constituted "intervention by the State or using State resources", one of the four criteria that characterise State aid. The Court stated that such a support measure, implemented without prior notification to the Commission, is illegal, and concluded that it was now up to the national courts to act accordingly, particularly by banning application of these illegal decisions.

Several courts found in favour of Enedis during 2018. Notably, in early July 2018 Versailles Appeal Court dismissed 150 producers' claims, because there was no evidence establishing misconduct by Enedis, or because there was no causal link between Enedis' misconduct and the prejudice, or because the prejudice was not deemed eligible for compensation since the tariff decisions of 2006 and 2010 are illegal, as the European Commission did not receive the prior notification required by State aid control rules. Appeals were filed before the Court of Cassation against most of these decisions. On 18 September 2019, the French Court of Cassation issued several decisions rejecting claims concerning both Enedis and EDF, judging the aid illegal because the tariff decisions were not notified to the European Commission as required by Article 108 of the TFEU. Consequently, the Court of

Cassation concluded that the prejudice of producers who could not benefit from that aid is deemed not legally reparable.

In parallel to the compensation claims before civil courts, EDF and Enedis sought to apply their Civil Liability insurance policy, but the insurers refused their claim. The French Court of Cassation considered in a ruling of 9 June 2015 (for the Green Yellow case) that the insurance payment was due and that the distribution network operator was at fault. Following that ruling, Enedis and EDF brought action against their insurers in April 2017, applying to the courts for formal recognition of two partial serial claims. If the courts were to recognise the existence of two partial serial claims, a single excess and a single limit would apply for all claims with the same technical cause.

50.4 Edison – Sale of Ausimont (Bussi)

Several legal actions were begun following the sale of the Ausimont SpA industrial complex to Solvay Solexis SpA in 2002. The criminal proceedings are now closed, but several proceedings are still ongoing:

- two administrative cases:
 - on 28 February 2018, the Province of Pescara notified Solvay Specialty Polymers Italy SpA (formerly Solvay Solexis SpA) and Edison SpA of the launch of an administrative procedure to determine who was responsible for the pollution of the land outside the industrial complex belonging to Ausimont SpA which had been sold. The Province also ordered Edison SpA to remove waste that was on the land concerned. Following rejection of Edison's appeal before Pescara regional administrative court, Edison lodged an appeal against the decision with the Italian Council of State. These proceedings are ongoing,
 - in an announcement of 18 December 2019, the Province of Pescara ordered Edison SpA to clean up the land located inside the industrial complex. Edison intends to challenge this order before Pescara regional administrative court;
- one arbitration case: in 2012, arbitration proceedings were launched by Solvay SA and Solvay Specialty Polymers Italy SpA for violation of the representations and warranties in environmental matters concerning the Bussi and Spinetta Marengo sites contained in the agreement for the sale of Agora SpA (the company that controls Ausimont SpA), which was signed in December 2001 between Montedison SpA and Longside International SA, and Solvay Solexis SpA (Solvay Specialty Polymers Italy SpA). After a phase of preliminary questions and applications for preliminary rulings, this procedure is continuing with examination of the merits of the parties' claims;
- one civil case: on 8 April 2019, the Italian Ministry for the Environment brought a civil action against Edison, claiming damages for environmental disaster. These proceedings are ongoing.

50.5 Enedis – Quadlogic

On 24 February 2016, Enedis received a summons for proceedings brought before the Paris Regional Court by an American company, Quadlogic Controls Corporation (QCC), for alleged infringement of a European patent held by QCC. Enedis strongly contests both QCC's inventive input and the alleged infringement.

In November 2017, the Paris Regional Court ruled in favour of Enedis and cancelled QCC's European patent in France. QCC filed an appeal against this ruling on 12 March 2018. The matter is currently before the Paris Appeal Court.

Note 51 Related parties

Details of transactions with related parties are as follows:

(in millions of euros)	Associates and joint ventures		Joint operations		French State or State-owned entities*		Group Total	
	31/12/2019	31/12/2018	31/12/2019	31/12/2018	31/12/2019	31/12/2018	31/12/2019	31/12/2018
Sales	455	560	-	-	1,889	1,708	2,344	2,268
Energy purchases	4,063	4,071	4	5	2,104	2,031	6,171	6,107
External purchases	18	4	3	3	253	251	274	258
Financial assets	150	294	-	-	-	-	150	294
Other assets	633	730	-	-	532	486	1,165	1,216
Financial liabilities	-	-	-	-	-	-	-	-
Other liabilities	1,228	1,162	1	1	624	631	1,853	1,794

* Excluding tax and social liabilities and the CSPE receivable.

51.1 Transactions with entities included in the scope of consolidation

Transactions with the principal associates (CTE, the company that owns RTE, CENG and Taishan) are presented in note 26.

Transactions with other associates, joint ventures, and partner entities in joint arrangements with the Group mainly consist of sales and purchases of energy.

51.2 Relations with the French State and State-owned entities

51.2.1 Relations with the French State

The French State holds 83.58% of the capital of EDF at 31 December 2019, and is thus entitled in the same way as any majority shareholder to control decisions that require approval by the shareholders.

In accordance with the legislation applicable to all companies having the French State as their majority shareholder, the EDF group is subject to certain inspection procedures, in particular economic and financial inspections by the State, audits by the French Court of Auditors (Cour des Comptes) or Parliament, and verifications by the French General Finance Inspectorate (Inspection générale des finances).

The public service contract between the French State and EDF was signed on 24 October 2005. This contract is intended to form the framework for public service missions assigned to EDF by the lawmaker for an unlimited period. The Law of 9 August 2004 does not stipulate the duration of the contract.

51.2.2 Relations with GRDF

The common service function shared by Enedis and GRDF is defined by Article L. 111-71 of the French Energy Code. Its missions in the electricity and gas distribution sector are building structures, site project management, network operation and maintenance, and metering operations. This service is not a legal entity in its own right.

Enedis and GRDF's relations in this common service are governed by an agreement that defines the scope of the service and the resulting division of costs. The

agreement has an unlimited term and can be terminated at any time subject to 18 months notice: in such a case, the parties undertake to renegotiate the agreement during the notice period. It is updated regularly.

In July 2014, Enedis and GRDF issued a joint announcement that their joint activities of meter reading and work on meter panels would be discontinued in the future. Currently, Enedis prioritises a structure consisting of regional divisions covering all its operational missions at local level. A network of smaller units is used for very local activities.

In March 2018, Enedis and GRDF reorganised some of their joint operations by creating two mixed entities: one handles employment contracts, studies and medical/social matters and the other is the IT and telecoms operator for all telephone and office technology activities. These two entities took effect from 1 January 2019.

The support functions for Real Estate, Vehicles and Machines, Litigation and Insurance, Training and Recruitment, and Office purchases, which were previously combined, are now handled separately by each of the two companies.

51.2.3 Relations with public sector entities

The EDF group's relations with public sector entities mainly concern the two entities belonging to the former AREVA group (Orano and AREVA SA).

Transactions with Orano concern:

- the front-end of the nuclear fuel cycle (uranium supplies, conversion and enrichment services);
- the back-end of the nuclear fuel cycle (transportation, storage, processing and recycling services for spent fuel).

Front-end of the cycle

Several important long-term agreements were negotiated between EDF and Orano:

- for supplies of natural uranium: Orano Mining contracts;
- for fluorination: an Orano cycle contract;
- for enrichment of natural uranium into uranium 235: an Orano Cycle contract.

Back-end of the cycle

Relations between EDF and Orano concerning transportation, processing and recycling of spent fuels are described in note 32.1.1.

51.3 Management compensation

The Company's key management and governance personnel are the Chairman and CEO, the members of the COMEX (Executive Committee) throughout 2019 or since their date of appointment if they joined the COMEX during the year, and the Directors. Directors representing the employees receive no remuneration for their services.

The total compensation paid by EDF and controlled companies to the Group's key management and governance personnel amounted to €12.6 million in 2019

(€12.4 million in 2018). This amount covered short-term benefits (basic salaries, performance-related salary, profit share and benefits in kind), special IEG post-employment benefits where relevant, and the corresponding employer contributions, plus any director's fees.

EDF's key management and governance personnel benefit from no special pension system, starting bonus or severance payment entitlement except by contractual negotiation. EDF's Chairman and CEO could benefit from a termination indemnity if his term of office were ended.

Note 52 Subsequent events

No developments have occurred since the year-end in addition to those presented in other notes.

Note 53 Scope of consolidation at 31 December 2019

The Group's activities are defined as follows:

- **"Generation/Supply"** (G): energy generation and energy sales to industry, local authorities, small businesses and residential consumers. This segment also includes EDF's commodity trading activities;
- **"Distribution"** (D): management of the low and medium-voltage public electricity distribution networks;
- **"Transmission"** (T): operation, maintenance and development of the high-voltage and very-high-voltage electricity transmission networks;
- **"Reactors and Services (Framatome)"** (R): services and production of equipment and fuel for nuclear reactors;
- **"Other"** (O): energy services (district heating, thermal energy services, etc.) for industry and local authorities, and new businesses mainly aimed at boosting electricity generation through cogeneration and renewable energy sources (e.g. wind turbines, photovoltaic panels, etc.). This activity also includes EDF Invest's holding companies and entities that are classified as dedicated assets.

6. Financial statements

Notes to the consolidated financial statements

53.1 Fully consolidated companies

		Percentage of ownership at 31/12/2019	Percentage of ownership at 31/12/2018	Business sector
FRANCE – GENERATION AND SUPPLY				
Électricité de France – Parent Company		100.00	100.00	G,D,O
Group Support Services (G2S)		100.00	100.00	O
Edvance		95.10	95.10	O
Cyclife France (formerly Société pour le Conditionnement des Déchets et Effluents Industriels, SOCODEI)*		-	100.00	O
Cyclife*		100.00	-	O
CHAM SAS		100.00	100.00	O
Sowee		100.00	100.00	O
IZI Solutions		100.00	-	O
ENRS		100.00	-	O
Immo C47		51.00	51.00	O
Other holding companies (EDF Invest)		100.00	100.00	O
FRANCE – REGULATED ACTIVITIES				
Enedis		100.00	100.00	D
Électricité de Strasbourg		88.64	88.64	G, D
EDF Production Électrique Insulaire (EDF PEI)		100.00	100.00	G
FRAMATOME				
Framatome	France	75.50	75.50	R
UNITED KINGDOM				
EDF Energy Holdings Limited (EDF Energy)		100.00	100.00	G, O
EDF Energy UK Ltd.		100.00	100.00	O
EDF Development Company Ltd.		100.00	100.00	O
ITALY				
Edison SpA (Edison)		97.45	97.45	G, O
Transalpina di Energia SpA (TdE SpA)		100.00	100.00	O
OTHER INTERNATIONAL				
EDF International SAS	France	100.00	100.00	O
EDF Belgium SA	Belgium	100.00	100.00	G
Luminus SA (formerly EDF Luminus SA)	Belgium	68.63	68.63	G, O
EDF Norte Fluminense SA	Brazil	100.00	100.00	G
Ute Paracambi SA	Brazil	100.00	100.00	G
French Investment Guangxi Laibin Electric Power Co., Ltd. (Figlec)	China	100.00	100.00	G
EDF (China) Holding Ltd.	China	100.00	100.00	O
EDF Inc.	USA	100.00	100.00	O
EDF Alpes Investissements SARL	Switzerland	100.00	100.00	O
Mekong Energy Company Ltd. (MECO)	Vietnam	56.25	56.25	G
EDF Andes Spa (formerly EDF Chile Spa)	Chile	100.00	100.00	G

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other.

* Cyclife France (formerly SOCODEI) is included in the Cyclife subgroup from 2019.

		Percentage of ownership at 31/12/2019	Percentage of ownership at 31/12/2018	Business sector
EDF RENEWABLES				
EDF Renewables	France	100.00	100.00	G,O
DALKIA				
Dalkia	France	99.94	99.94	O
OTHER ACTIVITIES				
EDF Développement Environnement SA	France	100.00	100.00	O
Société Française d'Ingénierie Électronucléaire et d'Assistance (SOFINEL) ⁽¹⁾	France	-	88.98	O
EDF IMMO and real estate subsidiaries	France	100.00	100.00	O
Société C2 ⁽²⁾	France	-	100.00	O
Société C3	France	100.00	100.00	O
EDF Holding SAS	France	100.00	100.00	O
Citelum	France	100.00	100.00	O
EDF Trading Ltd.	UK	100.00	100.00	O
Wagram Insurance Company DAC	Ireland	100.00	100.00	O
EDF Investissements Groupe SA	Belgium	93.89	93.89	O
Océane Re	Luxembourg	99.98	99.98	O
EDF Gas Deutschland GmbH	Germany	100.00	100.00	O

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other.

(1) Société Française d'Ingénierie Électronucléaire et d'Assistance (SOFINEL) has been liquidated.

(2) Société C2 has been merged with Société C3.

53.2 Company held in the form of a joint operation

		Percentage of ownership at 31/12/2019	Percentage of ownership at 31/12/2018	Business sector
Other activities				
Friedeburger Speicherbetriebsgesellschaft GmbH (Crystal)	Germany	50.00	50.00	O

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other.

6. Financial statements

Notes to the consolidated financial statements

53.3 Companies accounted for by the equity method

		Percentage of ownership at 31/12/2019	Percentage of ownership at 31/12/2018	Business sector
FRANCE – GENERATION AND SUPPLY				
Domofinance	France	45.00	45.00	O
CTE (EDF Invest) ⁽¹⁾	France	50.10	50.10	O
Elisandra IV (Madrileña Red de Gas Holding) (EDF Invest)	Spain	20.00	20.00	O
Alba Real Estate SCS (EDF Invest)	Luxembourg	24.66	46.50	O
Géosel Manosque (EDF Invest)	France	38.35	38.35	O
Transport Stockage Hydrocarbures (TSH) (EDF Invest)	France	50.00	50.00	O
Central Sicaf (EDF Invest)	Italy	24.50	24.50	O
Thyssengaz (EDF Invest)	Germany	50.00	50.00	O
Aéroports Côte d'Azur (EDF Invest)	France	19.40	19.40	O
Ecowest SCI A and B (EDF Invest)	France	50.00	50.00	O
Fallago Rig (EDF Invest)	United Kingdom	20.00	20.00	G
Fenland Wind Farm (EDF Invest)	United Kingdom	20.00	20.00	G
Catalinar Solar (EDF Invest)	USA	50.00	-	G
Switch (EDF Invest)	USA	50.00	-	G
MiRose (EDF Invest)	USA	50.00	-	G
Red Pine (EDF Invest)	USA	50.00	-	G
OTHER INTERNATIONAL				
Compagnie Énergétique de Sinop (CES)	Brasil	51.00	51.00	G
Constellation Energy Nuclear Group LLC (CENG)	USA	49.99	49.99	G
SLOE Centrale Holding BV	Netherlands	50.00	50.00	G
Shandong Zhonghua Power Company, Ltd.	China	19.60	19.60	G
Datang Sanmenxia Power Generation Co., Ltd.	China	35.00	35.00	G
Taishan Nuclear Power Joint Venture Company Ltd. (TNPJVC)	China	30.00	30.00	G
Jiangxi Datang International Fuzhou Power Generation Company Ltd.	China	49.00	49.00	G
Nam Theun 2 Power Company (NTPC) (EDF Invest)	Laos	40.00	40.00	G
Alpiq ⁽²⁾	Switzerland	-	25.04	G, D T, O
Generadora Metropolitana (GM) (formerly Central El Campesino SpA)	Chile	50.00	-	G
Nachtigal Hydro Power Company	Cameroon	40.00	-	G

Business segments: G = Generation, D = Distribution, T = Transmission, R = Reactors, O = Other.

(1) Coentreprise de Transport d'Électricité or CTE, the company holding 100% of RTE.

(2) Alpiq was sold on 28 May 2019 (see note 3.2.1).

53.4 Companies in which the EDF group's voting rights differ from its percentage ownership

The percentage of voting rights, which is decisive for assessing control, differs from the Group's percentage ownership for the following entities:

	Percentage of ownership at 31/12/2019	Percentage of voting rights at 31/12/2019
Edison SpA	97.45	99.48
EDF Investissements Groupe SA	93.89	50.00

Note 54 Statutory Auditors' fees

The following table sets forth the fees paid for work done by the Statutory Auditors and their network during 2019:

(in thousands of euros)	Deloitte network		KPMG network	
	Amount (excluding taxes)	%	Amount (excluding taxes)	%
Audit – Statutory audit, certification, review of company and consolidated accounts				
EDF	2,709	19.2	2,822	17.1
Controlled entities ⁽¹⁾	8,104	57.4	11,654	70.6
Sub-total	10,813	76.6	14,476	87.7
Non-audit services ⁽²⁾				
EDF	883	6.3	867	5.3
Controlled entities ⁽¹⁾	2,425	17.1	1,152	7.0
Sub-total	3,308	23.4	2,020	12.3
TOTAL	14,121	100	16,496	100

(1) Fully consolidated subsidiaries and jointly controlled entities whose auditors' fees are included in the consolidated income statement.

(2) Services required by laws and regulations, and services supplied at the request of the Group. Non-audit services mainly correspond to (i) certifications of financial and accounting information or independent reports on social, environmental and societal information required under Article L. 225-102-1 of the French Commercial Code, (ii) services relating to disposals of entities, (iii) tax services authorised by local legislation, and (iv) operating process reviews and information system consulting services that are unrelated to the production of accounting and financial information.

Statutory Auditors' fees for 2018

The following table sets forth the fees paid for work done by the Statutory Auditors and their network during 2018:

(in thousands of euros)	Deloitte network		KPMG network	
	Amount (excluding taxes)	%	Amount (excluding taxes)	%
Audit – Statutory audit, certification, review of company and consolidated accounts				
EDF	3,133	21.1	2,954	18.2
Controlled entities	7,249	48.8	10,839	66.9
Sub-total	10,382	69.9	13,793	85.1
Non-audit services				
EDF	397	2.7	772	4.8
Controlled entities	4,071	27.4	1,640	10.1
Sub-total	4,468	30.1	2,412	14.9
TOTAL	14,850	100	16,204	100

6.2 Statutory auditors' report on the consolidated financial statements

For the year ended December 31, 2019

This is a translation into English of the statutory auditors' report on the consolidated financial statements of the Company issued in French and it is provided solely for the convenience of English-speaking users.

This statutory auditors' report includes information required by European regulation and French law, such as information about the appointment of the statutory auditors or verification of the information concerning the Group presented in the management report. This report should be read in conjunction with, and construed in accordance with, French law and professional auditing standards applicable in France.

To the Shareholders,

Opinion

In compliance with the engagement entrusted to us by your General Meeting, we have audited the accompanying consolidated financial statements of Électricité de France S.A. ("EDF", the "Company" or the "Group") for the year ended December 31, 2019.

In our opinion, the consolidated financial statements give a true and fair view of the assets and liabilities and of the financial position of the Group as at December 31, 2019 and of the results of its operations for the year then ended in accordance with International Financial Reporting Standards as adopted by the European Union.

The audit opinion expressed above is consistent with our report to the Audit Committee.

Basis for Opinion

Audit Framework

We conducted our audit in accordance with professional standards applicable in France. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Our responsibilities under those standards are further described herein in the *Statutory Auditors' Responsibilities for the Audit of the Consolidated Financial Statements* section of our report.

Independence

We conducted our audit engagement in compliance with independence rules applicable to us, for the period from January 1, 2019 to the date of our report and specifically we did not provide any prohibited non-audit services referred to in Article 5(1) of Regulation (EU) No 537/2014 or in the French Code of ethics (*Code de Déontologie*) for statutory auditors.

Observation

Without qualifying our conclusion, we draw your attention to the notes 1.2.1, 1.3.13 and 2.1 of the consolidated financial statements, which disclose the effects of the application of IFRS 16 "Leases", new standards adopted in the European Union and applicable for financial years beginning on or after January 1, 2019.

Justification of Assessments – Key Audit Matters

In accordance with the requirements of Articles L. 823-9 and R. 823-7 of the French Commercial Code (*Code de Commerce*) relating to the justification of our assessments, we inform you of the key audit matters relating to risks of material misstatement that, in our professional judgment, were of most significance in our audit of the consolidated financial statements of the current period, as well as how we addressed those risks.

These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on specific items of the consolidated financial statements.

Valuation of provisions related to nuclear generation in France – back-end of the nuclear cycle, plant decommissioning and last cores – and dedicated assets

Notes 1.3.2.2, 1.3.15.2, 1.3.20.1, 4.1, 32.1 and 48 to the consolidated financial statements

Key Audit Matter

As at December 31, 2019, the provisions recorded to cover obligations relating to nuclear power plants for which EDF is the operator in France total €41,720 million, including €22,159 million with respect to the back-end of the nuclear cycle (management of spent fuel and radioactive waste) and €19,561 million with respect to the decommissioning of nuclear power plants and last cores.

The valuation of these provisions is described in Notes 1.3.2.2, 1.3.20.1 and 32.1. It requires defining technical and financial assumptions and using complex calculation models and falls within the scope of the regulatory context described in Note 4.1 and 32.1.

They are updated and the assumptions taken into consideration in the models are reviewed at least once a year. These assumptions reflect management's best estimate at the reporting date of the impacts of the applicable regulation, the implementation of decommissioning and storage processes or changes in the main financial parameters.

Furthermore, the Company is required to allocate so-called "dedicated" assets to secure financing of certain categories of nuclear provisions in France. The realizable value of these assets should allow the Company's commitments relating to the decommissioning of nuclear power plants and long-term storage of radioactive waste in France to be covered (Notes 1.3.15.2 and 48). The realizable value of these dedicated assets, for an amount of €31,624 million (or a net carrying amount of €29,844 million) as of December 31, 2019, was determined based on the fair value of diversified equity and bonds investments, and the equity value of a non-listed assets portfolio managed by the division EDF Invest.

We considered the valuation of nuclear provisions and dedicated assets to be a key audit matter due to:

- the sensitivity of the assumptions on which the valuation of these provisions is based, notably in terms of cost, inflation and long-term discount rates, as well as the depreciation periods of nuclear power plants in operation, and forecast cash outflows; the modification of these parameters can lead to a material revision in the provisioned amounts;
- the negative impacts on the financial position of the Company (cash earmarked to increase the amount of dedicated assets) in the event of an increase in nuclear provisions in France, a change in the realisable values of dedicated assets or changes in the coverage rate of nuclear provisions for dedicated assets,

it being specified that the valuation of provisions covers and includes uncertainties related to the fact that certain scenarios and technical solutions have never been implemented.

Responses

We have analysed the measures for recognising provisions related to nuclear generation in France and gained an understanding of the industrial scenarios for decommissioning nuclear power plants and the solutions adopted in terms of management of spent fuel and radioactive waste. We have assessed the compliance of the provisions with regard to applicable accounting, legal and regulatory measures.

We have verified the calculation models used by the Company and assessed the sensitivity of the valuations to the assumptions adopted in terms of cost, forecast cash outflows and financial parameters (discount and inflation rates).

Our work also consisted in verifying the type of costs used to determine provisions, assessing the consistency of industrial scenarios adopted by the Company and verifying the reconciliation of forecast costs and forecast cash outflows with these scenarios as well as the available studies and quotes.

We have also assessed the reasonableness of:

- margins for uncertainties and risks included in the provisions, to take into account the degree of control over decommissioning techniques and the management of spent fuel and radioactive waste.
- the series and mutualisation effects adopted in the quotes for decommissioning nuclear power plants in operation, for which the nominal cost represents €21,134 million to economic conditions at the end of the period, for a provision of €13,244 million in discounted value (Notes 32.1.3 and 32.1.5.2).

Concerning the inflation and discount rates adopted by management, we have verified their compliance with applicable accounting standards and regulatory measures, notably the ministerial order of March 21, 2007, as amended. We have reconciled the data used for this purpose with market data and available historical information.

Concerning the securing of financing for certain of these provisions through dedicated assets, we have verified, by sampling, the portfolio movements and reconciled the realisable value of the dedicated assets in the portfolio at the reporting date with the available certificate of depository statements, and available external data and valuations. We have also assessed the accounting treatment and their valuation, in particular, the compliance with the accounting standard of the impairment criteria described in Note 1.3.15.2.

Finally, we have verified the appropriateness of the disclosures given for the provisions related to nuclear generation in France and the dedicated assets in the notes to the consolidated financial statements, notably regarding the sensitivity of the valuation of provisions to changes in macro-economic assumptions (Note 32.1.5.2).

6. Financial statements

Statutory auditors' report on the consolidated financial statements

Valuation of goodwill, intangible assets with indefinite useful life, property, plants and equipments, and investments in associates and joint ventures

Notes 1.3.2.4, 1.3.14, 14 and 26 to the consolidated financial statements

Key Audit Matter

As at December 31, 2019, the goodwill, intangible assets with indefinite useful life, tangible assets and investments in associates and joint ventures represent significant amounts of the Group's equity. They are mainly related to non-regulated activities in which the EDF Group operates.

Notes 1.3.2.4, 1.3.14 and 14 describe the methodologies adopted and applied to determine if indicators exist showing that an asset may be subject to an impairment loss. These notes also describe the methods for performing impairment tests. The tests and the determination of recoverable amounts are carried out annually at the cash-generating unit (CGU) level for those holding intangible assets with indefinite lives or goodwill. The recoverable amount corresponds, for the majority of these CGU, to the value in use determined based on the discounted value of future cash flows.

We considered the valuation of non-regulated assets in France, the United Kingdom and in Italy, and associates in the United States, to be a key audit matter, due to the sensitivity of valuations to macro-economic, industry and financial assumptions to determine recoverable amounts and the estimates and judgments that they require from management.

In particular, an unfavorable and volatile market with low electricity market prices and persistent electricity generation over-capacity, added to a stagnation of the demand for energy in the main markets where EDF operates, significantly decreases the recoverable amount of certain goodwill, intangible assets, property, plant and equipment or investments in associates and joint ventures allocated to non-regulated activities and may lead to significant impairment losses.

Responses

As part of our work, we analysed the existence of indicators of impairment losses at the CGU level. We have also gained an understanding of the process for formulating estimates and assumptions made by management as part of impairment testing and we have also assessed the appropriateness of the valuation model.

We have verified, for the CGU tested, that the discounted future cash flow projections correspond to those generated by the assets included in these CGU and that they were consistent with (i) the budget data, medium-term plans (MTP) and, beyond, with the Group's long-term assumptions, (ii) past performances, (iii), market outlook and (iv) the expected operating life of the assets.

We have assessed, by conducting interviews with management, the different underlying assumptions (economic growth, price of raw material and CO₂, electricity demands, production capacities and interconnections and changes in energetic mix) on which the medium and long-term price assumptions are based, by substantiating them with external studies carried out by international organisms or experts in energy.

We have verified the determination methods and the consistency of the discount rate assumptions, based on the weighted average cost of capital (WACC) by geographic area and by activity and, in particular, analysed, with the assistance of our internal experts, the consistency of risk-free rates and the risk premiums adopted by management with the underlying market assumptions.

We have assessed the highly probable aspect of the disposals decided by the Group and the items considered to evaluate the realizable value as describe in Notes 2.3, 3.2.2 and 46 on the assets and liabilities held for sale.

Finally, we have assessed if Notes 1.3.14, 14 and 26 of the consolidated financial statements provide appropriate disclosure in particular in terms of assumptions adopted to perform impairment tests and sensitivity analyses.

Specific Verifications

As required by law, we have also verified in accordance with professional standards applicable in France the information pertaining to the Group presented in the management report of the Board of Directors.

We have no matters to report as to its fair presentation and its consistency with the consolidated financial statements.

We attest that the consolidated non-financial statement required by Article L.225-102-1 of the French Commercial Code is included in the information pertaining to the Group presented in the management report, being specified that, in accordance with the provisions of Article L.823-10 of the code, we have not verified the fair presentation and the consistency with the consolidated financial statements of the information contained therein and should be reported on by an independent insurance services provide.

Report on Other Legal and Regulatory Requirements

Appointment of the Statutory Auditors

We were appointed as statutory auditors of Electricité de France S.A. by the General meeting of June 6, 2005 for KPMG Audit and the by decision of the Board of Directors of April 25, 2002 for Deloitte & Associés.

As at December 31, 2019, KPMG Audit was in the 15th year of total uninterrupted engagement and Deloitte & Associés was in the 18th year of total uninterrupted engagement, which for both 15 years since securities of the Company were admitted to trading on a regulated market.

Responsibilities of Management and Those Charged with Governance for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with International Financial Reporting Standards as adopted by the European Union, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless it is expected to liquidate the Company or to cease operations.

The Audit Committee is responsible for monitoring the financial reporting process and the effectiveness of internal control and risks management systems and where applicable, its internal audit, regarding the accounting and financial reporting procedures.

The consolidated financial statements were approved by the Board of Directors.

Statutory Auditors' Responsibilities for the Audit of the Consolidated Financial Statements

Objectives and audit approach

Our role is to issue a report on the consolidated financial statements. Our objective is to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with professional standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As specified in Article L. 823-10-1 of the French Commercial Code (*Code de commerce*), our statutory audit does not include assurance on the viability of the Company or the quality of management of the affairs of the Company.

As part of an audit conducted in accordance with professional standards applicable in France, the statutory auditor exercises professional judgment throughout the audit and furthermore:

- Identifies and assesses the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, designs and performs audit procedures responsive to those risks, and obtains audit evidence considered to be sufficient and appropriate to provide a basis for his opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- Obtains an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control;
- Evaluates the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management in the consolidated financial statements;
- Assesses the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. This assessment is based on the audit evidence obtained up to the date of his audit report. However, future events or conditions may cause the Company to cease to continue as a going concern. If the statutory auditor concludes that a material uncertainty exists, there is a requirement to draw attention in the audit report to the related disclosures in the consolidated financial statements or, if such disclosures are not provided or inadequate, to modify the opinion expressed therein;
- Evaluates the overall presentation of the consolidated financial statements and assesses whether these statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtains sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group to express an opinion on the consolidated financial statements. The statutory auditor is responsible for the direction, supervision and performance of the audit of the consolidated financial statements and for the opinion expressed on these consolidated financial statements.

Report to the Audit Committee

We submit a report to the Audit Committee which includes in particular a description of the scope of the audit and the audit program implemented, as well as the results of our audit. We also report, if any, significant deficiencies in internal control regarding the accounting and financial reporting procedures that we have identified.

Our report to the Audit Committee includes the risks of material misstatement that, in our professional judgment, were of most significance in the audit of the consolidated financial statements of the current period and which are therefore the key audit matters, that we are required to describe in this report.

We also provide the Audit Committee with the declaration provided for in Article 6 of Regulation (EU) N° 537/2014, confirming our independence within the meaning of the rules applicable in France such as they are set in particular by Articles L.822-10 to L.822-14 of the French Commercial Code (code de commerce) and in the French Code of Ethics (*Code de Déontologie*) for statutory auditors. Where appropriate, we discuss with the Audit Committee the risks that may reasonably be thought to bear on our independence, and the related safeguards.

Paris La Défense, February 13, 2020

The Statutory Auditors

KPMG S.A.

Deloitte & Associés

Jay Nirsimloo

Michel Piette

Damien Leurent

Christophe Patrier

6.3 Financial statements

NB: Most figures in the tables are reported in millions of euros. The resulting approximation can lead to slight differences in totals or movements and changes.

Income statement

<i>(in millions of euros)</i>	<i>Notes</i>	2019		2018
SALES*	4		46,155	44,874
Change in inventories and capitalised production			1,447	1,217
Operating subsidies	5		7,670	6,566
Reversals of provisions and depreciation	6		3,279	2,996
Other operating income and transfers of charges	7		849	850
I TOTAL OPERATING INCOME			59,400	56,503
Purchases and other external expenses	8		38,090	37,410
Fuel purchases used		3,498		3,172
Energy purchases		18,232		17,057
Services and other purchases used		16,360		17,181
Taxes other than income taxes	9		2,674	2,662
Personnel expenses	10		6,453	6,565
Depreciation, amortisation and provisions	11		6,590	6,471
Depreciation and amortisation	11.1	3,975		3,531
Provisions and impairment	11.2	2,615		2,940
Other operating expenses	12		2,241	1,743
II TOTAL OPERATING EXPENSES			56,048	54,851
OPERATING PROFIT (I - II)			3,352	1,652
III JOINT OPERATIONS			-	-
IV FINANCIAL RESULT	13		(1,701)	(1,756)
PROFIT OR LOSS BEFORE INCOME TAXES AND EXCEPTIONAL ITEMS (I - II + III + IV)			1,651	(104)
V EXCEPTIONAL RESULT	14		547	939
VI INCOME TAXES	15		(605)	756
PROFIT OR LOSS (I - II + III + IV + V + VI)			1,593	1,591

* Production of goods for export in 2019: €10,267 million; production of services for export in 2019: €370 million.

Balance sheet

Assets

	Notes	31/12/2019			31/12/2018
		Gross values	Amortisation, depreciation and impairment	Net values	Net values
<i>(in millions of euros)</i>					
Intangible assets	16 - 17	2,391	1,305	1,086	1,017
Property, plant and equipment owned by EDF	16 - 17	89,093	59,772	29,321	27,405
Property, plant and equipment operated under concessions	16 - 17	15,004	8,976	6,028	5,956
Tangible and intangible assets in progress	16 - 17	21,712	94	21,618	20,937
Investments and related receivables		59,532	578	58,954	58,951
Investment securities		22,623	104	22,519	20,421
Loans and other financial assets		12,710	116	12,594	12,484
Financial assets	18	94,865	798	94,067	91,856
TOTAL I FIXED ASSETS		223,065	70,945	152,120	147,171
Inventories and work-in-progress	19	10,031	245	9,786	9,907
Advances on orders	20	694	1	693	689
Trade and other receivables	20	21,327	383	20,944	20,697
Marketable securities	21	14,693	3	14,690	16,861
Cash instruments	20	2,672	-	2,672	2,605
Cash and cash equivalents	22	4,714	-	4,714	4,619
Prepaid expenses	20	1,087	-	1,087	1,449
TOTAL II CURRENT ASSETS		55,218	632	54,586	56,827
Deferred charges (III)		249	-	249	255
Bond redemption premiums (IV)		790	277	513	507
Unrealised foreign exchange losses (V)	23	1,305	-	1,305	767
TOTAL ASSETS (I + II + III + IV + V)		280,627	71,854	208,773	205,527

Equity and liabilities

(in millions of euros)

	<i>Notes</i>	31/12/2019	31/12/2018
Capital		1 552	1 505
Capital-related premiums		16,506	15,672
Revaluation surplus		677	676
Reserves			
Legal reserves		151	146
Other reserves		3,000	3,000
Retained earnings		8,005	7,351
Profit or loss for the financial year		1,593	1,591
Interim dividend		(458)	(451)
Investment subsidies		159	166
Tax-regulated provisions		5,935	6,056
EQUITY	24	37,120	35,712
Additional equity	25	9,781	10,620
Special concession accounts	26	2,234	2,199
TOTAL I EQUITY AND CONCESSION ACCOUNTS		49,135	48,531
Provisions for risks	27	2,688	2,544
Provisions related to nuclear generation (Back-end of the nuclear cycle, plant decommissioning and last cores)	28	41,720	39,806
Provisions for decommissioning of non-nuclear facilities	29	667	659
Provisions for employee benefits	30	11,430	11,240
Provisions for other expenses	31	872	866
Provisions for expenses		54,689	52,571
TOTAL II PROVISIONS		57,377	55,115
Financial liabilities	33	55,171	54,644
Advances and progress payments received	32	7,050	7,134
Operating, investment and other liabilities	32	32,322	33,229
Cash instruments	32	4,387	3,462
Deferred income	32	3,112	3,116
TOTAL III LIABILITIES	32	102,042	101,585
Unrealised foreign exchange gains (IV)	34	219	296
TOTAL EQUITY AND LIABILITIES (I + II + III + IV)		208,773	205,527

Cash flow statement

<i>(in millions of euros)</i>	Notes	2019	2018
Operating activities:			
Profit/(loss) before income tax		2,198	835
Amortisation, depreciation and provisions		5,393	7,153
Capital (gains)/losses		(181)	(499)
Financial income and expenses		(557)	(2,133)
Changes in working capital ⁽¹⁾		1,012	3,238
Net cash flow from operations		7,865	8,594
Net financial expenses, including dividends received ⁽²⁾		(787)	1,435
Income taxes paid		(452)	(29)
Net cash flow from operating activities (A)		6,626	10,000
Investing activities:			
Investments in property, plant and equipment and intangible assets		(6,365)	(5,982)
Proceeds from sale of property, plant and equipment and intangible assets		23	24
Changes in financial assets ⁽³⁾		251	(4,776)
Net cash flow used in investing activities (B)		(6,091)	(10,734)
Financing activities:			
Issuance of borrowings and underwriting agreements		5,109	4,938
Repayment of borrowings and underwriting agreements ⁽⁴⁾		(3,522)	(2,359)
Dividends paid	24	(58)	(513)
Issuance and redemption of perpetual subordinated bonds, net of expenses ⁽⁴⁾	2.2.2 - 2.2.3	(636)	(76)
Funding contributions received for assets operated under concessions		5	6
Investment subsidies		4	11
Net cash flow from financing activities (C)		902	2,007
Net increase/(decrease) in cash and cash equivalents (A)+(B)+(C)		1,437	1,273
CASH AND CASH EQUIVALENTS – OPENING BALANCE	22	(1,563)	(2,875)
Effect of currency fluctuations		15	(13)
Financial income on cash and cash equivalents		31	52
CASH AND CASH EQUIVALENTS – CLOSING BALANCE ⁽⁵⁾	22	(80)	(1,563)

(1) Including in 2018 a positive impact of €2,068 million following changes in the classification of certain cash management agreements with subsidiaries (C2, C3, EDF Holding SAS, EDEV, EDF International, EDF Energy UK and EDF Inc) which are now included in changes in working capital, and certain current account agreements (Enedis, Sofilo, PEI et GGF) which are now included in changes in cash in the cash flow statement (see note 22 and the 2018 financial statements).

(2) This change is principally explained by the lower level of dividends received in 2019 compared to 2018 (see note 13), and the foreign exchange result.

(3) Changes in financial assets are primarily explained by the decrease in the portfolio of investment funds (see note 21) and changes in the portfolio of investment securities included in dedicated assets.

(4) In 2018, repayment of borrowings and underwriting agreements included €(76) million of expenses on perpetual subordinated bonds, which have been reclassified and are now included in Issuance and redemption of perpetual subordinated bonds, net of expenses.

(5) "Cash and cash equivalents – opening balance" and "Cash and cash equivalents – closing balance" do not include investment funds or negotiable debt instruments maturing in more than three months. Details of the variation in cash and cash equivalents are presented in note 22.

Notes to the financial statements

Note 1	Accounting principles and methods	405	Note 9	Taxes other than income taxes	420
1.1	Accounting standards	405	Note 10	Personnel expenses	421
1.2	Management judgments and estimates	405	Note 11	Operating depreciation, amortisation and provisions	421
1.3	Sales	406	11.1	Depreciation and amortisation	421
1.4	Intangible assets	406	11.2	Provisions and impairment	421
1.5	Property, plant and equipment	406	Note 12	Other operating expenses	422
1.6	Long-term asset impairment	407	Note 13	Financial result	422
1.7	Financial assets	407	Note 14	Exceptional result	422
1.8	Inventories and work-in-progress	408	Note 15	Income taxes	423
1.9	Accounts receivable and marketable securities	408	15.1	Tax group	423
1.10	Bond issuance expenses and redemption premiums	408	15.2	Income tax payable	423
1.11	Unrealised foreign exchange gains and losses	409	15.3	Tax credit for competitiveness and employment (CICE)	423
1.12	Tax-regulated provisions	409	15.4	Deferred taxes	423
1.13	Additional equity	409	Balance sheet		424
1.14	Special concession liabilities	409	Note 16	Gross values of intangible and tangible fixed assets	424
1.15	Provisions other than employee benefit provisions	409	Note 17	Depreciation, amortisation and impairment of intangible and tangible fixed assets	425
1.16	Employee benefits	410	17.1	Impairment tests on assets	425
1.17	Derivatives	411	Note 18	Financial assets	426
1.18	Commodity contracts	411	18.1	Change in financial assets	426
1.19	Environment	411	18.2	Subsidiaries and investments of at least 50% of capital	427
Note 2	Significant events and transactions	412	18.3	Subsidiaries and investments under 50%	428
2.1	Nuclear developments	412	18.4	Investment securities portfolio	428
2.2	Financing operations	413	18.5	Variation in treasury shares	428
2.3	"Ero 2019" employee reserved offer	414	18.6	Financial loans and receivables related to investments	429
Note 3	Regulatory changes in France	414	Note 19	Inventories and work-in-progress	429
3.1	France's multi-year energy programme (PPE) and The Energy and Climate law	414	Note 20	Other current assets	429
3.2	Regulated electricity sales tariffs in France – "Blue" tariffs	416	Note 21	Marketable securities	430
3.3	Supplier commissioning	416	Note 22	Variation in cash and cash equivalents reported in the cash flow statement	430
3.4	Electricity Equalisation Fund	417	Note 23	Unrealised foreign exchange losses	431
3.5	Compensation for public energy service charges (CSPE)	417	Note 24	Changes in equity	431
3.6	Capacity mechanism	417	24.1	Share capital	431
3.7	Energy savings certificates	418	24.2	Dividends	431
3.8	ARENH	418	Note 25	Additional equity	432
Income statement		419			
Note 4	Sales	419			
Note 5	Operating subsidies	419			
Note 6	Reversals of provisions and impairment	419			
Note 7	Other operating income and transfers of charges	420			
Note 8	Purchases and other external expenses	420			

Note 26	Special concession liabilities	432	Other information	446	
Note 27	Provisions for risks	433	Note 35	Financial instruments	446
Note 28	Provisions related to nuclear generation – Back-end of the nuclear cycle, plant decommissioning and last cores	433	35.1	Off-balance sheet commitments related to currency and interest rate derivatives	446
28.1	Provisions for spent nuclear fuel management	434	35.2	Impacts of financial instrument transactions on net income	447
28.2	Provision for waste removal and conditioning – Provision for long-term radioactive waste management	434	35.3	Fair value of derivative financial instruments	447
28.3	Decommissioning provisions for nuclear power plants	435	Note 36	Other off-balance sheet commitments and operations	447
28.4	Provisions for last cores	437	36.1	Commitments given	448
28.5	Discounting of provisions related to nuclear generation and sensitivity analyses	438	36.2	Commitments received	448
Note 29	Other provisions for decommissioning	439	36.3	Other types of commitment	448
Note 30	Provisions for employee benefits	439	Note 37	Contingent liabilities	449
30.1	Provisions for post-employment benefits	440	Note 38	Dedicated assets	449
30.2	Provisions for other long-term benefits for current employees	441	38.1	Regulations	449
30.3	Fund assets	441	38.2	Portfolio contents and measurement	449
30.4	Actuarial assumptions	442	Note 39	Related parties	452
Note 31	Provisions for other expenses	442	39.1	Relations with subsidiaries	452
Note 32	Liabilities	443	39.2	Relations with the french state and state-owned entities	452
Note 33	Financial liabilities	444	Note 40	Management compensation	453
33.1	Breakdown of loans by currency, before and after hedging instruments	444	Note 41	Subsequent events	453
33.2	Breakdown of loans by type of interest rate before and after hedging	445			
Note 34	Unrealised foreign exchange gains	445			

Électricité de France SA (EDF), the parent company of the EDF group, is a French *société anonyme* operating in electricity generation and electricity and gas supply. EDF also covers all the business activities of Island Energy Systems (SEI) for Corsica and France's overseas departments.

Note 1 Accounting principles and methods

1.1 Accounting standards

EDF's financial statements are prepared in accordance with the accounting principles and methods defined in regulation 2014-03 of 5 June 2014 issued by the ANC (Autorité des normes comptables, France's Accounting Standards Authority) concerning the revised national chart of accounts.

The accounting and valuation methods applied are identical to those used in the financial statements for the year ended 31 December 2018.

1.2 Management judgments and estimates

The preparation of the financial statements requires the use of judgments, best estimates and assumptions in determining the value of assets and liabilities, income and expenses recorded for the period, considering positive and negative contingencies existing at year-end. The figures in EDF's future financial statements could differ significantly from current estimates due to changes in these assumptions or economic conditions.

In a context characterised by financial market volatility, the parameters used to prepare estimates are based on macro-economic assumptions appropriate to the very long-term cycle of EDF's assets.

The principal operations for which EDF uses estimates and judgments are the following:

1.2.1 Depreciation period of nuclear power plants

In the specific case of the depreciation period of its nuclear power plants, EDF's industrial strategy is to continue operation beyond 40 years, in optimum conditions as regards safety and efficiency.

The depreciation period of 900MW series power plants was extended from 40 years to 50 years in 2016 (except for Fessenheim) since all the technical, economic and governance conditions were fulfilled. The depreciation period of other Group series in France (1300MW and 1450MW), which are more recent, is currently unchanged at 40 years, as the conditions for extension are not yet fulfilled.

These depreciation periods take into account the date of recoupling with the network after the most recent 10-year inspection.

The Tricastin plant's reactor 1 was reconnected to the grid on 23 December 2019 after the fourth 10-year inspection. This is the first 900MW series unit to pass the 40-year mark.

As explained in note 3.1, under the proposed new multi-year energy programme (PPE), two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the final PPE adopted, it could lead to prospective modification of the depreciation period for the two units concerned. As this situation would bring forward the shutdown of two reactors in the fleet by a few years, the potential effect on the annual depreciation expense, which will depend on the reactors selected for shutdown, is expected to be limited.

1.2.2 Nuclear provisions

The measurement of provisions for the back-end of the nuclear cycle, decommissioning and last cores is sensitive to assumptions concerning technical

processes, costs, inflation rates, long-term discount rates, the depreciation period of plants currently in operation and disbursement schedules.

As explained in note 3.1, under the proposed new PPE, two nuclear reactors would, subject to certain conditions, be shut down in 2027 and 2028, ahead of their fifth 10-year inspection. If this is confirmed in the final PPE adopted, it could lead to a change in the amount of corresponding nuclear provisions. As this situation would bring forward the shutdown of two reactors in the fleet by a few years, the potential impact on nuclear provisions could be an increase of some tens of millions of euros, with an adjustment to the relevant balance sheet assets.

The provision parameters are re-estimated at each closing date to ensure that the amounts accrued correspond to the best estimate of the costs eventually to be borne by EDF.

EDF considers that the assumptions used at 31 December 2019 are appropriate and justified. However, any future change in assumptions could have a significant impact on EDF's balance sheet and income statement.

The main assumptions and sensitivity analyses relating to nuclear provisions are presented in note 28.5.

The calculation of provisions incorporates a level of risks and unknowns as appropriate to the operations concerned. The valuation of costs carries uncertainty factors such as:

- changes in the regulations, particularly on safety, security and environmental protection, and financing of nuclear expenses;
- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisation;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (Agence nationale pour la gestion des déchets radioactifs);
- changes in certain financial parameters such as discount rates, notably in relation to the regulatory limit, inflation rates, or changes in the contractual terms of spent fuel management.

1.2.3 Pensions and other long-term and post-employment benefit obligations

The value of pensions and other long-term and post-employment benefit obligations is based on actuarial valuations that are sensitive to all the actuarial assumptions used, particularly concerning discount rates, inflation rates and wage increase rates.

The principal actuarial assumptions used to calculate these post-employment and long-term benefits at 31 December 2019 are presented in note 30.4. These assumptions are updated annually. EDF considers the actuarial assumptions used at 31 December 2019 appropriate and well-founded, but future changes in these assumptions could have a significant effect on the amount of the obligations and EDF's net income.

1.2.4 Energy supplied but not yet measured and billed

As explained in note 1.3, the quantities of energy supplied but not yet measured and billed are calculated at the reporting date based on consumption statistic models and selling price estimates. Determination of the unbilled portion of sales revenues at the year-end is sensitive to the assumptions used to prepare these statistics and estimates.

1.3 Sales

Sales essentially comprise income from energy sales (to final customers and as part of trading activities), and sales of services. EDF's energy sales revenues include delivery services through the energy distribution network purchased from the subsidiary Enedis and invoiced to end-customers.

Sales are recognised when delivery of goods has taken place or the service has been completed.

The quantities of energy delivered to EDF customers but not yet measured and billed at the end of the period are calculated based on the quantities used by the sites of the EDF balance-responsible entity less the quantities billed, after losses measured by a statistical method presented to the Commission de régulation de l'énergie (CRE), the French Energy Regulation Commission. These quantities are valued using an average price determined by reference to energy invoiced in the previous month.

Sales of goods and services not completed at the balance sheet date are valued by reference to the stage of completion at that date.

Sales of energy to EDF Trading, the Group's trading company, are recorded at their contractually stipulated amount.

1.3.1 Capacity mechanism

A capacity mechanism has been set up in France to ensure secure power supplies during peak periods.

French law 2010-1488 of 7 December 2010 on the new organisation of the electricity market introduced an obligation in France to contribute to power supply security from 1 January 2017.

Operators of electricity generation facilities and load-shedding operators must have their capacities certified by RTE, and commit to a forecast level of availability for a given year of delivery. In return, they are awarded capacity certificates. Meanwhile, electricity suppliers and purchasers of power to compensate for network losses (obligated actors) must have capacity certificates equivalent to consumption by their customers in peak periods. Suppliers pass on the cost of the capacity mechanism to final customers through their sale prices.

The system is completed by registers for trading of capacities between actors. Capacity auctions are held several times a year.

EDF is concerned by both aspects of this system, as an operator of electricity plants and as an electricity supplier.

The operations are recorded as follows:

- sales of certificates are recognised in income when the auctions or over-the-counter sales take place;
- the cost of the capacity mechanism passed on to final customers through regulated sales tariffs and market-price offers is recognised in sales revenues as and when the electricity is delivered. However, the ARENH price has included a capacity value since 2017 when the capacity mechanism took effect, as the terms of transfer for the capacity guarantees associated with the ARENH system were defined by the CRE;
- stocks of certificates are stated either at their certification value (*i.e.* cost of certification by RTE) or at their purchase value on the markets;
- decreases in the stock of certificates are valued at the weighted average unit cost. The timing of recognition depends on the actor:
 - operators of installations: when the auction sales take place,
 - obligated actors: spread on a straight-line basis over the 5-month peak period,
- for obligated actors, if there is a shortfall in the stocks of capacity certificates, a provision is recorded equivalent to the best estimate of the expense necessary to extinguish the obligation;
- at the closing date, if the realisable value of the stock of capacity certificates is lower than its net book value, impairment is recognised.

1.4 Intangible assets

1.4.1 Research and development expenses

Research expenses are recognised as expenses in the financial period incurred.

Development costs that meet the requirements for capitalisation laid down in Article 211-5 of the French national chart of accounts are included in intangible assets and amortised on a straight-line basis over their foreseeable useful life.

1.4.2 Other intangible assets

Other intangible assets mainly consist of software and storage capacity reservation costs.

They are amortised on a straight-line basis over their useful lives regardless of whether they are generated in-house or purchased.

1.5 Property, plant and equipment

EDF's property, plant and equipment is reported under two balance sheet headings, as appropriate to the business and contractual circumstances of the assets' use:

- property, plant and equipment owned by EDF, essentially nuclear generation facilities;
- property, plant and equipment operated under concessions.

1.5.1 Initial measurement

Property, plant and equipment is recorded at acquisition or production cost:

- the cost of facilities developed in-house includes all labour and materials costs, and all other production costs attributable to the construction of the asset;
- the cost of property, plant and equipment also includes the initial estimate of decommissioning costs. These assets are associated with the provisions recorded to cover decommissioning obligations. At the date of commissioning, property, plant and equipment is measured and recorded in the same way as the corresponding provision (see note 1.15);
- decommissioning costs for nuclear generation installations also include last core costs (see note 1.15).

When some of the decommissioning costs for a plant are to be borne by a partner, the expected reimbursement is recognised as accrued income in the assets. The difference between the provision and the accrued income is recorded in Property, plant and equipment, and subsequent payments by the partner are deducted from the accrued income.

The Group capitalises safety expenses incurred as a result of legal and regulatory obligations sanctioning non-compliance by an administrative ban from operation.

Strategic safety spare parts for generation facilities are treated as property, plant and equipment, and depreciated over the residual useful life of the installations.

The costs of operations that are necessary for generation assets to remain in service, and are undertaken at the time of scheduled shutdowns, particularly during major inspections, are capitalised and amortised over a period corresponding to the time elapsing between two inspections.

When a part of an asset has a different useful life from the overall asset's useful life, it is identified as an asset component and depreciated over a specific period.

Borrowing costs attributable to the financing of an asset incurred during the construction period are recognised as expenses.

1.5.2 Depreciation

Items of property, plant and equipment are depreciated on a straight-line basis over their useful life, defined as the period during which the Company expects to draw future economic benefits from their use.

The expected useful lives for the main facilities are as follows:

- hydroelectric dams: 75 years;
- electromechanical equipment used in hydropower plants: 50 years;
- fossil-fired power plants: 25 to 45 years;
- nuclear generation facilities: 40 to 50 years;
- distribution installations (lines, substations): 20 to 45 years.

1.5.3 Concession agreements

EDF is the operator for two types of public service concessions:

- public electricity distribution concessions granted by local authorities (municipalities or syndicated municipalities);
- hydropower concessions granted by the French State.

The accounting treatment of concessions follows certain principles from the 1975 accounting guide for concession operator firms, as there are no specific instructions in the national chart of accounts.

1.5.3.1 Public electricity distribution concessions

EDF is the concession operator for the island public distribution networks located in Corsica and France's overseas departments, under concession agreements that generally use standard concession specifications established in 1992 (and updated in 2007), which were negotiated with the National Federation of Licensing Authorities (Fédération nationale des collectivités concédantes et régies – FNCCR) and approved by the public authorities.

On 21 December 2017, a framework agreement for a new concession agreement model was signed with FNCCR and France Urbaine. As of 2018, newly-signed concession agreements apply this new agreement model.

Assets used under concessions are reported in the balance sheet assets as property, plant and equipment operated under concessions, regardless of their initial financing, at acquisition cost or their estimated value at the transfer date when supplied by the grantor. An offsetting liability is recognised for any assets supplied for nil consideration by concession grantors.

1.5.3.2 Hydropower concessions

Hydropower concessions follow standard rules approved by decree.

Hydropower concession assets consist solely of hydropower generation equipment (dams, pipes, turbines, etc.) for initial concessions. In other concessions, they comprise hydropower generation equipment and switching facilities (alternators, etc).

Assets used in these concessions are recorded under "Property, plant and equipment operated under concessions" at acquisition cost.

Depreciation is calculated over their useful life, which is generally identical to the term of the concession.

Additional depreciation is booked in the balance sheet liabilities for assets operated under concessions (see note 1.14.2).

Hydropower concessions have an initial term of 75 years pursuant to the French Law of 16 October 1919 relating to hydropower use. Most hydropower concessions that expired before 2012 were renewed for terms of 30 to 50 years. However, the French government has not yet renewed 12 concessions that have expired. Since their expiry these concessions have thus been in the "rolling extension" situation defined by the law, which stipulates that at the expiry date of a concession, if no new concession has been established "the concession is extended on the existing terms until such time as a new concession is granted", so as to ensure continuity of operations in the meantime (Article L. 521-16 par. 3 of the French Energy Code).

1.6 Long-term asset impairment

At each reporting date, EDF assesses whether there is an indication that an asset could have significantly lost value. If so, an impairment test is carried out as follows:

- EDF measures any long-term asset impairment by comparing the carrying value of these assets, combined into groups where necessary, and their recoverable amount, usually determined using the discounted future net cash flow method. When this recoverable amount is lower than the value in the balance sheet, an amount equivalent to the difference is written off under "Depreciation and impairment";
- the discount rates used for these purposes are based on the weighted average cost of capital (WACC) for each asset or group of assets concerned;
- future cash flows are calculated on the basis of the best available information at the valuation date;
 - for the first few years, the flows correspond to the Medium-Term Plan (MTP). Over the MTP horizon, energy and commodity prices are determined based on available forward prices, taking hedges into consideration,
 - beyond the MTP horizon, cash flows are estimated based on long-term assumptions prepared for each energy, using a process that is updated annually. Medium and long-term electricity prices are constructed analytically by assembling blocks of assumptions, e.g. economic growth, commodity (oil, gas, coal) and CO₂ prices, demand for electricity, interconnections, and developments in the energy mix (rise of renewable energies, installed nuclear capacity, etc.) with fundamental models of supply-demand balance. EDF refers in particular to external analyses for each assumption object (for example, for commodities and CO₂, which are primary factors in electricity prices, EDF compares its own scenarios with scenarios developed by organisations such as the IEA, IHS or Wood Mackenzie, bearing in mind that each of these analysts itself proposes a cone of scenarios corresponding to different macro-economic environments),
 - income from capacity market mechanisms is also taken into consideration in valuing generation assets.

These calculations may be influenced by several variables:

- changes in discount rates;
- changes in market prices for energy and commodities, and tariff regulations;
- changes in demand and EDF's market share, and the attrition rate on customer portfolios;
- the useful life of facilities, or the duration of concession agreements where relevant;
- the growth rates used beyond the medium-term plans and where relevant the terminal values taken into consideration.

1.7 Financial assets

1.7.1 Investments

Investments are carried at acquisition cost.

Gains and losses on sales of investments are valued using the FIFO (first in first out) method.

Transfer duties, fees and commissions and legal fees related to acquisitions of investments are included in the cost of acquisition of the asset.

Expenses of this type relating to other shares are included in expenses. Tax-regulated amortisation of acquisition costs is recorded in an excess depreciation account.

When the book value of investments is higher than their value in use, impairment is recorded equivalent to the difference.

The value in use of listed securities in non-consolidated entities is based on stock market price.

For unlisted and listed securities in companies included in the EDF group consolidation, the value in use is determined by reference to the transaction value, equity value or net adjusted consolidated assets, taking into account expert valuation data and information that has become known since the previous year-end when necessary.

1.7.2 Investment securities

EDF holds investment securities comprising financial assets intended to finance the end of nuclear fuel cycle operations, for which provisions have been accrued. These assets are managed separately from other financial assets and investments in view of their specific objective, and consist of bonds, equities, collective investment funds and "reserved" funds.

Other investments also include treasury shares that cover obligations relating to debt instruments providing access to the company's capital, acquired under a liquidity contract with an investment services company or through an external operation or capital reduction.

Shares are recorded at acquisition cost. Transfer duties, professional fees, commissions, legal expenses and purchasing costs are all charged to expenses, applying the option used for other investments.

Investment securities (shares and bonds) are recorded at acquisition cost. If the carrying amount of a security is lower than the acquisition cost, the unrealised capital loss is fully covered by a provision without being netted against potential gains on other securities. The carrying amount of listed securities is assessed individually, taking the stock market price into account. For unlisted securities, the carrying amount is also assessed individually, mainly by reference to the growth prospects of the companies concerned.

1.7.3 Other financial assets

As part of Group activities, EDF grants short-term loans in foreign currencies to its subsidiaries.

In order to reduce exposure to foreign exchange risks, EDF mainly finances these loans by short-term commercial paper issues in foreign currencies and in euros, together with the use of currency hedging derivatives. Capitalised receivables are stated at nominal value. Impairment is recognised when the market value falls below the book value.

1.8 Inventories and work-in-progress

The initial cost of inventories includes all direct material costs (including the effect of hedging), labour costs and a share of indirect production costs.

Inventory consumption is generally valued under the weighted average unit cost method. Consumption of greenhouse gas emission rights and Energy Savings Certificates is valued under the FIFO (first in first out) method.

Inventories are carried at the lower of historical cost or net realisable value.

1.8.1 Nuclear fuel and materials

Inventory accounts include:

- nuclear materials, whatever their form during the fuel production cycle;
- fuel components in the warehouse or in the reactor.

The stated value of nuclear fuel and materials and work-in-progress is determined based on direct processing costs including materials, labour and subcontracted services (e.g. fluorination, enrichment, production, etc.).

In application of the concept of "loaded fuel" as defined in the decision of 21 March 2007, the cost of inventories for fuel loaded in the reactors but not yet irradiated includes expenses for spent fuel management and long-term radioactive

waste management. The corresponding amounts are taken into account in the relevant provisions.

Nuclear fuel consumption is determined by component (natural uranium, fluorination, enrichment, fuel assembly production) as a proportion of the expected output when the fuel is loaded in the reactor. These quantities are valued at weighted average cost of inventories, applied to each component. Inventories are periodically corrected in view of forecast spent quantities, based on neutronic measurements and physical inventories.

1.8.2 Other operating inventories

Other operating inventories include:

- fossil fuels required for operation of fossil-fired power plants;
- operating materials and equipment such as spare parts supplied under a maintenance programme (excluding capitalised strategic safety spare parts);
- greenhouse gas emission rights and Energy Savings Certificates acquired for the generation cycle (see notes 1.19.1 and 1.19.2);
- gas stocks, valued at weighted average cost, including direct and indirect purchase costs, especially transport costs;
- capacities held under the capacity mechanisms (capacity guarantees in France) (see note 3.6).

Impairment of spare parts depends mainly on the turnover of these parts.

1.9 Accounts receivable and marketable securities

1.9.1 Trade receivables

Trade receivables are initially stated at nominal value.

They also include the value of unbilled receivables for energy already supplied.

A write-down is recorded when, based on the probability of recovery assessed according to the type of receivable, the recoverable amount of receivables falls below their book value. Depending on the nature of the receivable, the risk associated with doubtful receivables is assessed individually or by experience-based statistical methods. EDF does not bear the risks of non-payment for the delivery portion of these receivables, which is borne by Enedis.

1.9.2 Marketable securities

Marketable securities are initially recorded as assets at acquisition cost, and restated at the lower of historical cost or present value at year-end.

For listed securities, the present value is equal to the year-end stock market price. For unlisted securities, the market value is the probable trading value taking the Company's growth prospects into consideration.

Impairment is recorded to fully cover any unrealised losses, without netting against unrecorded unrealised gains.

Gains and losses on sales of marketable securities are valued using the FIFO (first in first out) method.

1.10 Bond issuance expenses and redemption premiums

Bond redemption premiums are amortised in equal portions prorated to the duration of the bond (straight-line method), regardless of the redemption pattern, applying the option allowed by Article 212-10 of the national chart of accounts.

Commissions and external costs paid by EDF upon issuance of borrowings and included in "Deferred charges" are spread on a straight-line basis over the term of the related instruments.

1.11 Unrealised foreign exchange gains and losses

Foreign currency receivables and payables are translated into Euros at the year-end exchange rates. The resulting translation differences are recorded in the balance sheet under "Unrealised foreign exchange gains" and "Unrealised foreign exchange losses". Provisions are recorded to cover all unrealised exchange losses on foreign currency borrowings not hedged for exchange risks. Unrealised gains are not recognised in the income statement.

Unrealised gains and losses on currency derivatives classified as hedging instruments are recorded in the balance sheet in the revaluation surplus accounts, and netted with the unrealised foreign exchange gains and losses booked in respect of the hedged items, in compliance with regulation 2015-05 of 2 July 2015 on forward financial instruments and hedging operations. Realised gains and losses on hedging derivatives are recognised in the income statement symmetrically to gains and losses on the hedged item.

Foreign exchange gains and losses on trade receivables and payables are recorded in operating income and expenses.

1.12 Tax-regulated provisions

This item mainly includes excess depreciation recorded for tax purposes and relates to:

- ordinary depreciation of generation and distribution facilities;
- exceptional depreciation of software developed in-house by the Company;
- amortisation of acquisition expenses for new investments by the Company.

1.13 Additional equity

Perpetual subordinated bonds issued by EDF in euros and other currencies are recorded in compliance with the French Chartered accountants' body *Ordre des experts comptables* opinion 28 of July 1994, taking their specific characteristics into consideration.

As a result, they are classified as additional equity, since redemption is exclusively controlled by EDF.

Issuance expenses and premiums are amortised through the income statement, on a pro rata basis.

Interest paid on these bonds is recorded in the financial result.

1.14 Special concession liabilities

These liabilities relate mostly to public electricity distribution concessions for the Island Energy Systems (SEI), and hydropower concessions.

1.14.1 Special public electricity distribution concession liabilities – SEI

These liabilities represent the contractual obligations specific to the concession rules for public electricity distribution concessions in France, and comprise the following:

- the concession-granting authority's rights in existing assets (its right to recover all the concession assets), consisting of the value in kind of the facilities (the net book value of assets operated under concessions), less any as yet unamortised financing provided by the operator;
- the concession-granting authority's rights in assets to be replaced (the operator's obligations relating to assets due for replacement). These non-financial liabilities comprise:
 - depreciation recorded on the portion of assets deemed financed by the concession-granting authority,
 - the provision for replacement, exclusively for assets due for replacement before the end of the concession. This is accrued over the asset's useful life,

based on the difference between the asset's replacement value for identical capacity and functions, and the original value. The replacement value is adjusted at each year-end based on indexes from official publications, and the impact of the adjustment is spread over the residual useful life of the assets concerned. This provision is included in provisions for expenses.

When assets are replaced, amortisation recognised on the portion of assets considered to be financed by the concession-granting authority, and the provision for replacement established for the relevant asset, are cancelled and transferred to rights in existing assets. Any excess provision is taken to income.

During the concession, the concession-granting authority's rights in assets to be replaced are thus transferred upon the asset's replacement to become the concession-granting authority's rights in existing assets, with no outflow of cash to the benefit of the concession-granting authority.

1.14.2 Special hydropower concession liabilities

These liabilities comprise:

- the value of assets remitted for nil consideration and contributions received;
- differences arising from revaluations in accordance with French legislation for fixed assets commissioned before 1 January 1959 and before 1 January 1977;
- additional depreciation to industrial depreciation for facilities that are to be returned for nil consideration at the end of the concession but whose useful life extends beyond the concession term.

Following the changes made to the accounting treatment of hydropower concessions at 1 January 2009, the 1959 revaluation reserve is transferred to equity when the assets concerned are retired.

The net revaluation reserve generated by the 1976 revaluation is taken to income over the residual useful life of the assets concerned.

The value of assets remitted for nil consideration and contributions received are transferred to the income statement over their useful lives.

1.15 Provisions other than employee benefit provisions

EDF recognises provisions when it has a present obligation (legal or constructive) arising from a past event, an outflow of resources will probably be required to settle the obligation, and the obligation amount can be estimated reliably.

If it is anticipated that all or part of the expenses covered by a provision will be reimbursed, the reimbursement is recognised under receivables if and only if EDF is virtually certain of receiving it.

Provisions are determined based on the Company's expectation of the cost necessary to settle the obligation. Estimates are based on management data from the information system, assumptions adopted by the Company, and if necessary experience of similar transactions, or in some cases based on independent expert reports or contractor quotes. The various assumptions are reviewed for each closing of the accounts.

The expected costs are estimated based on year-end economic conditions and spread over a forecast disbursement schedule. They are then adjusted to Euros of the year of payment through application of a forecast long-term inflation rate and discounted to present value using a nominal discount rate. The provisions are based on these discounted future cash flows.

The rate of inflation and the discount rate are based on the economic and regulatory parameters of France, considering the long operating cycle of EDF's assets and the maturities of commitments.

The discount effect generated at each closing to reflect the passage of time is recorded in financial expenses.

In extremely rare situations, a provision cannot be booked due to lack of a reliable estimate. In such cases, the obligation is mentioned in the notes as a contingent liability, unless there is little likelihood of an outflow of resources.

1.15.1 Provisions related to nuclear generation

These provisions mainly cover the following:

- back-end nuclear cycle expenses: provisions for spent fuel management, for waste removal and conditioning and long-term radioactive waste management;
- costs for decommissioning power plants and losses relating to fuel in the reactor when the reactor is shut down (provision for last cores).

Last core expenses correspond to the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints, and the cost of fuel processing, and removal and storage of the resulting waste.

Changes in provisions resulting from a change in discount rates, a change in the disbursement schedule or a change in contractor quote are recorded:

- as an increase or decrease in the corresponding assets, up to the net book value, if the provision was initially covered by balance sheet assets (decommissioning of plants still in operation, long-term management of the radioactive waste resulting from such decommissioning, and last cores);
- in the income statement in all other cases.

Detailed information on the principles for determining provisions related to nuclear generation is given in note 28.

1.15.2 Other provisions

These provisions mainly cover:

- losses relating to multi-year agreements for the purchase or sale of energy:
 - losses on energy purchase agreements are measured by comparing the acquisition cost under the contractual terms with the forecast market price,
 - losses on energy sale agreements are measured by comparing the estimated income under the contractual terms with the cost of the energy to be supplied,
 - losses on gas-related service agreements are measured by comparing the costs of fulfilling a contract with the resulting economic benefits, based on market and sales assumptions;
- losses on transportation, regasification, and gas storage contracts;
- unrealised foreign exchange losses;
- risks relating to subsidiaries and affiliates;
- tax risks;
- litigation;
- decommissioning costs for fossil-fired and hydropower plants;
- costs of replacing assets operated under public electricity distribution concessions;
- provisions related to environmental schemes (see note 1.19).

In extremely rare cases, description of a specific litigation covered by a provision may be omitted from the notes to the financial statements if such disclosure could cause serious prejudice to the Company.

1.16 Employee benefits

In accordance with the statutory regulations for companies in France's electricity and gas sector (IEG), EDF's employees are entitled to post-employment benefits (pension plans, retirement indemnities, etc.) and other long-term benefits (e.g. long-service awards).

1.16.1 Calculation and recognition of employee benefits

EDF recognises post-employment benefits granted to personnel as provisions.

Obligations under defined-benefit plans are calculated by the projected unit credit method, which determines the present value of entitlements earned by employees at year-end to post-employment benefits and long-term benefits, taking into consideration the prospects for wage increases and the country's specific economic conditions.

Post-employment benefit obligations are valued mainly using the following methods and assumptions:

- retirement age, determined on the basis of the applicable rules, and the requirements to qualify for a full pension;
- career-end salary levels, with reference to employee seniority, projected salary levels at the time of retirement based on the expected effects of career advancement, and estimated trends in pension levels;
- forecast numbers of pensioners, determined based on employee turnover rates and mortality data;
- reversion pensions where relevant, taking into account both the life expectancy of the employee and his/her spouse and the marriage rate for IEG sector employees;
- a discount rate that depends on the duration of the obligations, determined at the year-end date by reference to the market yield on high quality corporate bonds or the rate on government bonds whose duration is coherent with EDF's commitments to employees.

The amount of the provision takes into account the present value of the fund assets that cover these benefits, which is deducted from the benefit obligations.

Any actuarial gain or loss on post-employment benefit obligations in excess of 10% (the "corridor") of the obligations or fund assets, whichever is the highest, are recognised in the income statement progressively over the average residual working life of the Company's employees.

For other long-term benefits, actuarial gains and losses and the full past service cost are directly included in the provision, without application of the "corridor" rule.

The net expense booked during the year for employee benefit obligations includes:

- the current service cost, corresponding to additional benefit entitlements earned during the year;
- the net interest expense, corresponding to interest on obligations net of the return on fund assets;
- the income or expense corresponding to the actuarial gains and losses on long-term benefits and amortisation of actuarial gains or losses on post-employment benefits;
- the past service cost, including the income or expense related to amendments or settlements of benefit plans or introduction of new plans.

1.16.2 Post-employment benefit obligations

Since the financing reform for the IEG sector system took effect on 1 January 2005, the CNIEG (*Caisse nationale des IEG*, the sector's specific pension body) has managed not only the special IEG pension system, but also the industrial accident, invalidity and death insurance system for the sector.

The CNIEG is a social security body governed by private law, formed by the Law of 9 August 2004. It has legal entity status and reports to the French government, operating under the joint supervision of France's Ministers for the Budget, Social Security and Energy.

Under the funding arrangements introduced by the Law, EDF establishes pension provisions to cover entitlements not funded by France's standard systems (CNAV, AGIRC-ARRCO), to which the IEG system is affiliated, or by the CTA (contribution tarifaire d'acheminement) levy on gas and electricity transmission and distribution services.

As a result of this funding mechanism, any change (whether favourable or unfavourable to employees) in the standard French pension system that is not passed on to the IEG pension system is likely to cause a variation in the amount of the provisions recorded by EDF to cover its obligations.

The benefits covered by pension provisions include:

- specific benefits of employees in the deregulated or competitive activities;
- specific benefits earned by employees from 1 January 2005 for the regulated activities (island public electricity distribution) (benefits earned before that date are financed by the CTA levy).

CNIEG management expenses payable by EDF for the administration and payment of retired employees' pensions are also included.

In addition to pensions, other benefits are granted to IEG status former employees (not currently in active service), as detailed below:

- benefits in kind (energy): Article 28 of the IEG national statutes entitles such employees and current employees to benefits in kind in the form of supplies of electricity or gas at preferential prices. The obligation for supplies of energy to employees of EDF and Engie corresponds to the probable present value of kWh to be supplied to beneficiaries or their dependants during their retirement, valued on the basis of the unit cost. It also includes the payment made under the energy exchange agreement with Engie;
- retirement gratuities: these are paid upon retirement to employees due to receive the statutory old-age pension, or to their dependants if the employee dies before reaching retirement. These obligations are almost totally covered by an insurance policy;
- bereavement benefit: this is paid out upon the death of an inactive or disabled employee, in order to provide financial assistance for the expenses incurred at such a time (Article 26-§5 of the National Statutes). It is paid to the deceased's principal dependants (statutory indemnity equal to three months' pension, subject to a ceiling) or to a third party that has paid funeral costs (discretionary indemnity equal to the costs incurred);
- bonus pre-retirement paid leave: all employees eligible to benefit immediately from the statutory old-age pension and aged at least 55 at their retirement date are entitled to 18 days of bonus paid leave during the last twelve months of their employment;
- other benefits include help with the cost of studies, time banking for pre-retirement leave, and pensions for personnel sent on secondment to companies not covered by the IEG system.

1.16.3 Other long-term benefit obligations

These benefits concern employees currently in service, and include:

- annuities following incapacity, invalidity, industrial accident or work-related illness. Like their counterparts in the general national system, IEG employees are entitled to financial support in the event of industrial accident or work-related illness, and invalidity and incapacity annuities and benefits. The obligation is measured as the probable present value of future benefits payable to current beneficiaries, including any possible reversions;
- long-service awards;
- specific benefits for employees who have been in contact with asbestos.

1.17 Derivatives

EDF uses derivatives in order to minimise the impact of foreign exchange risks and interest rate risks.

These derivatives comprise interest rate and currency derivatives such as futures, forwards, swaps and options traded on the over-the-counter market.

The application at 1 January 2017 of regulation 2015-05 concerning forward financial instruments and hedging operations led to recognition of unrealised gains on the foreign exchange optimisation portfolio, and the unrealised gain or loss on currency derivatives classified as hedging instruments, in the balance sheet, in the revaluation surplus accounts created by the new regulation. These accounts are netted with the unrealised foreign exchange gains or losses booked in respect of the hedged items.

Hedging derivatives correct the foreign exchange result or interest income on the corresponding asset or liability. If the foreign exchange risk is fully hedged, no provision is recorded. If it is only partly hedged, a provision is recorded for the entire unhedged portion of the unrealised loss.

For other instruments, when there is no hedging relationship, a provision is recorded for unrealised losses and unrealised gains are not recognised.

Instruments in the portfolio at the year-end are included in off-balance sheet commitments at the nominal value of the contracts.

1.18 Commodity contracts

Forward financial instruments on commodities are traded for hedging purposes. Gains and losses on these operations are included in sales or in the cost of energy purchases, symmetrically to the hedged items, in accordance with regulation 2015-05 concerning forward financial instruments and hedging operations, which has been applicable since 1 January 2017.

Instruments in the portfolio at the year-end are included in off balance sheet commitments at the quantities to be delivered or to be received under the contracts.

1.19 Environment

1.19.1 Greenhouse gas emission rights

In ratifying the Kyoto Protocol, Europe made a commitment to reduce its greenhouse gas emissions. EU Directive 2003/87/EC set up a greenhouse gas emission quota system for the European Union which has been in operation since 1 January 2005.

This system was incorporated into national laws. Among other things it requires obligated actors, which is the case of EDF, to surrender to the State a number of greenhouse gas emission credits each year, corresponding to their emissions for the year. The rights and obligations associated with this system are periodically reviewed.

One of the main features of the third phase, running from 1 January 2013 to 31 December 2020, is the discontinuation of free allocation of emission rights in certain countries, including France.

EDF applies the accounting methods for greenhouse gas emission rights stipulated in ANC regulation 2012-03 of 4 October 2012, incorporated into Articles 615-1 to 615-22 of ANC regulation 2014-03.

The accounting treatment of emission rights depends on the holding intention. Two economic models coexist at EDF.

Emission rights held under the "Trading" model are included in inventories at acquisition cost. A write-down is recorded when the present value of emission rights is lower than the book value.

Emission rights held to comply with regulatory requirements on greenhouse gas emissions (the "Generation" model) are included in inventories at acquisition cost, and the FIFO (first in first out) method is applied. A write-down is recorded when the generation cost of the electricity that includes the cost of the rights is higher than the present value of that electricity. At year-end, a "net presentation" principle is applied as follows:

- an asset is recognised in raw materials inventories if the quantities of greenhouse gas emissions are lower than the number of emission rights held in the portfolio. This corresponds to the rights available to cover future greenhouse gas emissions;
- a tax liability is recorded in the opposite situation, equivalent to the rights still needed to cover emissions already produced, valued at contractualised acquisition price for forward purchases deliverable before surrender, and at market value for the balance.

The net reporting principle assumes that the emission rights held in the portfolio will be the rights used to offset emissions produced. However, there is a limit to the fungibility of rights at EDF, as there are no transfers of rights between the island and mainland activities. This can lead to concurrent recognition of an asset and a liability.

1.19.2 Energy savings certificates

EDF is engaged in a process to control energy consumption through various measures developed by national legislation, in application of European Union Directives.

In France, the Law of 13 July 2005 introduced a system of energy savings certificates. Suppliers of energy (electricity, gas, heat, cold, domestic fuel oil and fuel for vehicles) with sales above a certain level became subject to energy savings obligations, initially for a three-year period.

To meet this obligation, three sources are available to the EDF group: supporting consumers in their energy efficiency operations, funding ministry-approved energy savings certificate schemes, and purchasing certificates from eligible actors.

EDF accounts for energy savings certificates in compliance with Articles 616-1 to 616-25 of ANC regulation 2014-03 on the national chart of accounts.

EDF holds energy savings certificates in order to meet the requirements of the regulations on energy savings. Consequently, EDF applies the "Energy Savings" model defined by the ANC regulation.

Certificates obtained or receivable are recorded in inventories at production or acquisition cost, and are valued under the FIFO (first in first out) method.

At the year-end, only the net position is presented in the financial statements:

- an asset is recognised (in work-in-progress and other inventories) if the energy savings achieved are greater than the energy savings obligations. This inventory corresponds to the certificates purchased, obtained or receivable that cover future energy savings obligations. It is consumed as and when energy sales are completed that generate energy savings obligations; or
- a liability (provision for other expenses) is recognised if the energy savings achieved are lower than the energy savings obligations. The liability corresponds to the cost of action yet to be taken to cover the obligations associated with energy sales completed. It is subsequently extinguished by making energy savings expenditures that enable the Company to obtain certificates, or by purchasing certificates.

Note 2 Significant events and transactions

2.1 Nuclear developments

2.1.1 Flamanville 3 EPR

NB: The following information should be read in conjunction with note 2.7 to the 2018 financial statements.

On 11 April 2019⁽¹⁾, EDF announced that it was aware of the opinion of the Permanent Group of experts for nuclear pressure equipment (GP ESPN), made public on 11 April 2019, regarding the quality deviations affecting the welds located on the main steam transfer pipes covered by the break preclusion principle⁽²⁾ at the Flamanville EPR.

The Nuclear Safety Authority (ASN) had held a meeting of the GP ESPN on 9 April 2019 as part of its investigation into these quality deviations:

- on 3 December 2018, EDF submitted a technical file to the ASN presenting the procedures for repairing and upgrading the main secondary circuit welds, which had shown deficiencies with respect to the break preclusion requirements, as well as for the specific justification method for the 8 welds located in the reactor containment building structure;
- the file was examined by the ASN, with technical support from the Institute for Radiation Protection and Nuclear Safety (IRSN);
- based on this examination, discussions took place at a GP ESPN meeting attended by EDF, which presented the background facts, their analysis and the methods for dealing with the issue. EDF answered all the Permanent Group of experts' questions for the technical examination of this file.

EDF indicated at the time that the recommendations and solution avenues suggested by the Permanent Group of experts could have an impact on the commissioning schedule and construction cost, and that EDF would continue its discussions with the ASN, which was to issue its decision regarding action to be taken on this matter a few weeks later.

Consequently, EDF stated that a detailed update of the schedule and construction cost for the Flamanville EPR would be given after the ASN's decision had been published.

On 20 June 2019⁽³⁾, EDF announced that it was aware of the decision issued by the ASN in its letter of 19 June 2019 regarding the quality deviations affecting the welds located on the main steam transfer pipes covered by the break preclusion principle at the Flamanville EPR.

In that letter, the ASN asked EDF to repair the eight containment penetration welds at the Flamanville EPR that were not compliant with the break preclusion principle.

On 26 July 2019⁽⁴⁾, EDF announced that three scenarios for upgrading the penetration welds were under consideration, and that after a detailed examination of the three scenarios and discussions with the ASN, EDF would communicate the schedule and cost implications of the selected scenario in the next few months. EDF also stated that commissioning could not be expected before the end of 2022.

This work resulted in discussions with the ASN, which sent EDF⁽⁵⁾ a letter on 4 October concerning the technical feasibility of these three scenarios.

The penetration weld repair scenario preferred by EDF involves the use of remote-operated robots, designed to conduct high-precision operations inside the piping concerned. This technology has been developed for nuclear power plants in operation and must be qualified for penetration weld repairs. The aim is to qualify this scenario with validation by the ASN by the end of 2020, at which date EDF will be able to initiate the repair work. A second scenario involving extraction and realignment work in the Safeguard Auxiliary Buildings is held at this stage as a fall-back solution.

Based on this penetration weld repair strategy, the EDF Board of Directors approved continuation of the Flamanville EPR construction at a meeting held on 8 October 2019.

(1) Cf. press release of 11 April 2019.

(2) The break preclusion principle is a very high standard of quality with stricter requirements than nuclear pressure equipment regulations for the design, manufacturing and in-service monitoring of certain items of equipment. These stricter requirements must be sufficient to consider that rupture of this equipment is highly unlikely. (When this standard is applied, a comprehensive study of the consequences of breaks in this piping is not required in the plant safety case).

(3) Cf. press release of 20 June 2019.

(4) Cf. press release of 26 July 2019.

(5) Cf. press release of 9 October 2019.

This led EDF to adjust the schedule and the estimated construction cost for the Flamanville EPR ⁽¹⁾.

The provisional schedule for implementation of the preferred penetration weld repair scenario, if the objective of ASN validation is achieved, sets the date of fuel loading in late 2022 and the revised construction cost at €12.4 billion ⁽²⁾, an increase of €1.5 billion. Most of these additional costs will be treated as operating expenses, rather than being capitalised. These costs will affect the financial years 2020, 2021 and 2022. For 2020, the impact on net income is estimated at €(0.4) billion net of taxes, all other things being equal.

The process of realignment of the 58 welds on the secondary system that have quality deviations or are not in compliance with the break preclusion principle requirements defined by EDF is being continued on site. At the same time, the second hot functional test phase was started on 21 September 2019. Hot functional testing checks plant performance under simulated normal operating conditions.

2.1.2 Deviation from technical standards governing the manufacture of nuclear reactor components by Framatome

Framatome has informed EDF ⁽³⁾ of a deviation from technical standards governing the manufacture of nuclear reactor components. The deviation relates to the performance of the manufacturing process used, which did not respect temperature ranges in certain areas during manufacturing operations involving stress-relieving heat treatment on some steam generator welds. It concerns in-service components as well as new components which have not yet been put into operation or installed on any sites.

On 9 September 2019, EDF informed the ASN of its initial investigations concerning the deviation in a post-weld stress-relieving heat-treatment process applied to certain nuclear reactor components.

Work conducted since then by EDF and Framatome ⁽⁴⁾ to make an inventory of the equipment and reactors concerned and confirm that they are fit for operation has identified 18 steam generators installed on six reactors currently in operation: reactors no. 3 and 4 at Blayais, reactor no. 3 at Bugey, reactor no. 2 at Fessenheim, reactor no. 4 at Dampierre-en-Burly and reactor no. 2 at Paluel.

The components that are not yet in service are the four steam generators and the pressuriser at the Flamanville 3 EPR, as well as three new steam generators that have not yet been installed and were made to replace the steam generators on reactors no. 5 and 6 at Gravelines.

Following publication by the ASN on 24 October 2019 of the information notice entitled "Manufacturing deviation at Framatome stress-relieving heat treatment of welds", EDF took note ⁽⁵⁾ that the reactors involved can continue to function as they are, with no need to be shut down for the checks required to address the discrepancies. Physical checks were carried out on the relevant welds in the new steam generators when they were installed at Gravelines 5, the relevant welds of in-service steam generators when they were shut down for fuel reloading (Blayais 4, Paluel 2 and Dampierre 4) and the weld on the Fessenheim 2 steam generator. For the other steam generators in operation the same checks will be carried out on the relevant welds during their next scheduled shutdown for fuel reloading, before the end of the first half-year of 2020 (Bugey 3 and Blayais 3). It is not anticipated at this stage that these shutdowns will need to be extended.

2.1.3 Nuward, a joint Small Modular Reactor (SMR) project

On 17 September 2019, during the IAEA General Conference in Vienna, the French Alternative Energies and Atomic Energy Commission (CEA), EDF, Naval Group and TechnicAtome unveiled "NUWARD"TM, their jointly-developed small modular reactor (SMR) project. NUWARD is a PWR (pressurised water reactor)-based solution to meet the growing world demand for decarbonised, safe and competitive electricity generation in the 300-400MWe range.

The CEA and EDF have also initiated discussions with Westinghouse Electric Company to explore potential cooperation on SMR development.

2.1.4 Closure of Fessenheim nuclear power plant

EDF has submitted an application to the ASN and France's Ministry for the Ecological and Inclusive Transition for the termination of operations and a declaration of the permanent shutdown of both reactors at Fessenheim nuclear power plant. The shutdown of reactor no. 1 is planned for 22 February 2020, whilst the shutdown of reactor no. 2 is planned for 30 June 2020.

This submission followed the signature by the French State and EDF on 27 September 2019 of a protocol agreement whereby the State will compensate EDF for the early closure of Fessenheim, which results from the cap on nuclear power output set by the "energy transition for green growth" law of 17 August 2015.

The compensation paid under the terms of this protocol will comprise:

- initial instalments to compensate for expenses incurred after the closure of the plant (end-of-operations expenditure, BNI taxes, dismantling costs and staff redeployment costs), which will be paid over a 4-year period following the closure. These payments are expected to amount to a total of nearly €400 million.

This compensation will be recognised as income in profit and loss as and when the associated costs are incurred;

- subsequent payments corresponding to the lost income that would have been generated by future power generation up until 2041, based on Fessenheim's previous output figures and calculated "ex post" on the basis of nuclear power sale prices, particularly observed market prices.

2.2 Financing operations

2.2.1 Signature of three credit lines indexed on ESG criteria

Through these new agreements, which form a continuity with two other credit lines indexed on the Group's sustainability performance signed in 2017 and 2018, EDF is reaffirming the central role of sustainable financing instruments in its finance strategy. ESG-indexed renewable credit lines total more than €5 billion at 31 December 2019, accounting for around 48% of the EDF group's credit lines.

On 22 March 2019 EDF and BBVA signed a €300 million revolving credit facility.

On 22 July 2019 EDF signed two €300 million revolving credit facilities. One is with the Crédit Agricole Group, led by Crédit Agricole CIB and including LCL and Crédit Agricole d'Ile-de-France, and the other is with Société Générale CIB.

These three credit facilities incorporate an adjustment mechanism that links their cost to three of the Group's sustainability KPIs: direct CO₂ emissions, use of online consumption monitoring tools by its French residential customers (as a proxy for EDF's success in getting French residential customers actively engaged with their energy consumption), and electrification of its light vehicle fleet.

⁽¹⁾ The issue of deviation from the technical manufacturing standards for Framatome reactor components (stress-relieving heat treatment process for the welds with electrical resistance) which concerns the four steam generators and pressuriser of the Flamanville 3 EPR is explained in note 2.1.2.

⁽²⁾ In 2015 Euros, excluding interim interest.

⁽³⁾ Cf. press release of 10 September 2019.

⁽⁴⁾ Cf. press release of 18 September 2019.

⁽⁵⁾ Cf. press release of 25 October 2019.

2.2.2 Issuance of perpetual subordinated bonds

On 26 November 2019, EDF issued a euro-denominated 500 million hybrid bond, with a 3.00% coupon and an 8-year first call date.

This offering shows the Company's strong commitment to financing through hybrid securities, which are a permanent part of its capital structure. The Company pro-actively manages its stock of hybrid bonds: the funds resulting from this issue were mainly used to finance the partial repurchase of several outstanding series of hybrid bonds, and for general corporate purposes of the Company and the EDF Group.

2.2.3 Redemption of certain series of hybrid bonds

On 26 November 2019, EDF issued a cash tender offer for redemption of the following hybrid bonds:

- €1,000 million Reset Perpetual Subordinated Notes with a first redemption at the option of the Company on 22 January 2022, which are admitted to trading on Euronext Paris, of which €661.8 million was outstanding. The amount redeemed amounted to €394.9 million and settlement took place on 13 December 2019;
- \$3,000 million Reset Perpetual Subordinated Notes with a first redemption at the option of the Company on 29 January 2023, which are admitted to trading on the regulated market of the Luxembourg Stock Exchange, of which \$3,000 million was outstanding. The amount redeemed amounted to \$902.4 million and settlement took place on 31 December 2019.

The Company also exercised its option to fully redeem the €1.25 billion Reset Perpetual Subordinated Notes, of which €338.2 million was outstanding, on 29 January 2020. As the redemption was certain, EDF reclassified these items of additional equity as financial liabilities at 31 December 2019 in the amount of €338.2 million (see note 33).

Consequently, taking into account the issuance on 26 November 2019 of a €500 million hybrid bond with 3.00% coupon and an 8-year first call date (see note 2.2.2), these transactions reduced the total stock of hybrid instruments in EDF's balance sheet by approximately 8% to €9.8 billion while generating a saving net of interest estimated at around €44 million in 2020 and around €58 million from 2021.

2.2.4 Senior bond issues: EDF raises \$2 billion and €1.25 billion

On 27 November 2019, EDF raised \$2 billion through issuance of a senior bond with 50-year maturity and a fixed coupon of 4.50%. This transaction demonstrates the Group's capacity to attract a highly diversified investor base at the long end of the credit curve.

In addition, on 2 December 2019, EDF raised €1.25 billion through issuance of a senior bond, with 30-year maturity and a fixed coupon of 2.00%. This is the largest amount raised by a corporate issuer on this maturity in the Euro market.

2.3 "Ero 2019" employee reserved offer

On 4 April 2019 EDF's Board of Directors decided on the principle of an employee shareholding operation. This was carried out by the sale of 7,704,974 existing shares by the State to EDF, which immediately sold them to eligible employees, former employees and retired employees. Consequently this operation does not constitute a capital increase for EDF SA.

The offer included a "leveraged" formula guaranteeing personal contributions in euros, and a "classic" formula. It was carried out through a French employee savings fund (Fonds commun de placement d'entreprise, or FCPE). A matching employer's contribution was offered to employees under the "classic" formula.

The shares offered were ordinary shares, listed on Euronext Paris (Compartment A), with current dividend rights. Being acquired through the subscription of shares in a FCPE of the EDF Group savings plan (PEG), they are subject to a mandatory holding period of 5 years ending 16 July 2024, except in cases of early release provided for by the regulations. Voting rights will be exercised by the Supervisory Board of the FCPE.

The sale price for these shares was fixed on 20 June 2019. It included a discount of 20% on the reference price based on the volume-weighted average price of EDF shares traded on Euronext Paris for the twenty trading days preceding the day when the price was set.

The shares were delivered on 16 July 2019.

In the 2019 financial statements, this operation led to recognition in personnel expenses of an amount of €6 million corresponding to the matching employer's contribution and the *forfait social* corporate social contribution, and recognition in exceptional expenses of an amount of €11 million corresponding to the 20% discount.

Note 3 Regulatory changes in France

3.1 France's multi-year energy programme (PPE) and The Energy and Climate law

The multi-year energy programme (PPE) is a tool for the energy policy introduced by the French law on the energy transition for green growth adopted in 2015.

In principle, the PPE covers two successive five-year periods. The first PPE published in October 2016 departed from this rule by setting out two successive periods of three and five years respectively, 2016-2018 and 2019-2023. The revised PPE, which is not yet finalised, will cover the periods 2019-2023 and 2024-2028.

An initial draft PPE published on 25 January 2019 by the Ministry for the Ecological and Inclusive Transition

For nuclear electricity generation, the French government has now set the deadline of 2035 for reaching the objective of a 50% nuclear share in the national electricity mix.

To achieve this, 12 nuclear reactors will have to be shut down by 2035, in addition to the closure of the two Fessenheim reactors in the spring of 2020. The reactors concerned will be shut down when their fifth 10-year inspection is due, except for two reactors which will be shut down earlier in 2027 and 2028, provided the criterion of secure supply is respected. Two additional reactors could also be shut down in 2025-2026 if certain conditions relating to electricity prices, secure supply and European electricity market trends are fulfilled.

The draft PPE states that the French government will propose the terms of a new regulation system for existing nuclear plants that will protect consumers against rising market prices after 2025, while giving EDF the financial capacity to ensure economic sustainability of generation facilities and meet the requirements of the PPE in low-price scenarios.

It also states that “the Government, together with the industry, will conduct a programme of work by mid-2021 to examine the questions of the cost of new nuclear energy production and its advantages and disadvantages in relation to other low-carbon generation methods, the possible financing models, the project management modalities for new reactor projects and public consultation, and matters relating to the management of waste generated by the potential new nuclear fleet. Based on this information and depending on developments in the energy situation, the Government will make a decision regarding the suitability of launching a renewal programme for nuclear installations”.

For fossil-fired electricity generation, the objective is to close down the last entirely coal-fired plants by 2022, and stop granting authorisations for new power plants that produce electricity exclusively from fossil fuels.

This draft PPE also sets the objective of a significant step-up in the pace of development of renewable energies.

The draft went through various consultation processes in 2019 and 2020.

The Energy and Climate law

France’s Energy and Climate law of 8 November 2019 was published in the *Journal officiel* on 9 November 2019. Its principal measures affecting EDF’s business are the following:

Article 1 revises the objectives of France’s energy policy in the light of results of preparatory work for the national low-carbon strategy and the Multi-Year Energy Programme (PPE):

- the objective of “dividing greenhouse gas emissions by four between 1990 and 2050” is replaced by the objective of “achieving carbon neutrality by 2050, by reducing greenhouse gas emissions by a factor of more than six between 1990 and 2050”;
- the objective of “reducing primary fossil fuel energy consumption by 30%, compared to the reference year of 2012, by 2030” is replaced by the objective of “reducing primary fossil fuel energy consumption by 40% by 2030”;
- and finally, the time horizon for reducing the nuclear share of France’s electricity output to 50% is set at 2035.

Article 12 introduces a cap on greenhouse gas emissions, applicable from 1 January 2022 to installations generating energy from fossil fuel. This cap was set by decree 2019-1467 of 26 December 2019, and will lead to the closure of entirely coal-fired plants by 1 January 2022. State support measures will be provided for the employees and subcontractors concerned, and local projects are planned, as indicated in the press file on the closure of coal-fired power plants by 2022 released by the Ministry for the Ecological and Inclusive Transition.

Based on the proposed version of this law, EDF had previously announced that it intended to close down the Le Havre plant by the spring of 2021, and was still examining the possibilities of converting the Cordemais plant to a biomass plant. After a meeting held on 24 January 2019, EDF and the Ministry for the Ecological and Inclusive Transition approved a programme of work prior to making a decision about the Ecocombust project for production of an innovative, ecological fuel that could be used by heating facilities or electricity plants that currently run on coal. To guarantee a secure electricity supply, if the studies by RTE commissioned by the French government confirm the need, some or all of the biomass produced could be used to provide 80% of the fuel for the current Cordemais units until 2026, to keep the electricity network in the west of France secure at the highest peak consumption times.

As a result, the ends of the depreciation periods for the Le Havre and Cordemais plants were changed in the first half of 2019 and set at 2021 for Le Havre and 2026 for Cordemais. The closure date for Le Havre has been confirmed as 1 April 2021, but the dates for Cordemais could still change depending on final decisions yet to be made, particularly concerning the Ecocombust project.

The principal consequence of this prospective modification of the depreciation periods in the Company’s financial statements at 31 December 2019 is an increase of some €139 million in the depreciation expense (see note 11.1).

Article 62 of the Energy and Climate law aims to modify the calculation of the price supplements in the ARENH mechanism for Regulated access to historic nuclear power, to take account of the effect of the ceiling defined in Article L. 336-1 of the Energy Code. A key objective of these price supplements is to ensure that demand from suppliers for ARENH is commensurate with their requirements, and thus avoid effects that are detrimental to the public interest.

The ARENH ceiling was raised to 150TWh from 1 January 2020. However, the volume limit that determines the maximum total volume of ARENH deliveries allowed per year (up to the ceiling) has not been changed for 2020, and thus remains at 100TWh.

The Energy and Climate law also contains four articles concerning regulated sales tariffs, following the rejection of provisions initially proposed in the draft “PACTE” law for business growth and transformation:

- Article 63 sets out the terms for the discontinuation of regulated gas sales tariffs for all consumers, to bring French law into line with European Union law. Sales of regulated-tariff gas contracts were discontinued in the month following enactment of the law, and it is now impossible to subscribe or modify a new natural gas contract on regulated sales tariffs. The regulated tariffs will be discontinued for small businesses from 1 December 2020, and for all consumers from 1 July 2023. The necessary support measures for these tariff discontinuations are defined in the law;
- Articles 64 and following set out the terms for the discontinuation of regulated electricity sales tariffs for non-residential customers with more than 10 employees or annual sales, total income or balance sheet total of more than €2 million.

A new draft PPE taking account of comments and opinions expressed was published on 20 January 2020 by the Ministry for the Ecological and Inclusive Transition and is subject to a consultation process until 19 February 2020

Concerning nuclear electricity and the objective of having 50% nuclear power in France’s energy mix by 2035, which is now part of the Energy Code as a result of the Energy and Climate law of 8 November 2019, this revised draft PPE specifies the details and conditions for the reactor shutdowns. Priority will be given to shutdowns that minimise the economic and social impact, have the lowest impact on the electricity network, and do not entail closure of an entire site. At the request of the French government, based on these criteria, on 20 January 2020 EDF proposed to examine the possibility of shutting down pairs of reactors at the sites of Blayais, Bugey, Chinon, Cruas, Dampierre, Gravelines and Tricastin.

It is also now stipulated that early reactor shutdowns will be confirmed 3 years prior to implementation.

Finalisation and adoption of this PPE would result in reflection in EDF’s financial statements of the two early reactor shutdowns in 2027 and 2028, ahead of their fifth 10-year inspection. The change to their operating life would lead to prospective modification of the depreciation period, and a change in estimate for the nuclear provisions. As this situation would bring forward the shutdown of two reactors in the fleet by a few years, the various scenarios examined indicate that the potential effect on nuclear provisions, particularly the decommissioning provision, could be an increase of some tens of millions of euros, which would be recognised via an adjustment to the relevant balance sheet assets.

Public consultation on regulation of existing nuclear facilities

In January 2020, the French government launched a consultation process, to have the opinions of actors from the world of energy on the reform of regulation of existing nuclear facilities (ARENH).

This consultation has been undertaken in application of the draft Multi-Year Energy Programme (PPE), which states that “the Government will propose the terms of a new regulation system for existing nuclear plants that will protect consumers against rising market prices after 2025 by allowing them to benefit from the competitive advantage of investments made in the historical nuclear power plant fleet, while giving EDF the financial capacity to ensure economic sustainability of generation facilities and meet the requirements of the PPE in low-price scenarios”.

To achieve this objective, the French government intends to introduce economic regulations obliging EDF to provide a service of general economic interest (SGEI) to the benefit of all French consumers, in a transparent and non-discriminatory manner, with a focus on protection of the consumer and the climate.

This SGEI would be supported by economic regulation of the existing nuclear fleet, to reconcile and contribute to the following aims:

- long-term protection of all consumers located on French territory, regardless of their supplier and with respect to some of their non-peak power supplies, by enabling them to benefit from stable conditions for carbon-free, manageable production of electricity by the existing nuclear fleet they helped to finance;
- achievement of the climate targets France has set itself, and also of its objectives for a secure power supply and energy independence, by safeguarding the carbon-free electricity supply in France and more broadly in Europe, through secure long-term financing for operation of the existing nuclear installations that are necessary for that supply.

Like many other actors in the sector, EDF will take part in this consultation, which is to continue until 17 March 2020.

3.2 Regulated electricity sales tariffs in France – “Blue” tariffs

Modification of the legislative and regulatory framework

In response to matters submitted by ANODE (the national association of retail energy operators) and Engie, France’s Council of State ruled in decisions of 18 May and 3 October 2018 that the principle of regulated electricity sales tariffs is compatible with European Union law when such tariffs serve the objective of guaranteeing consumers an electricity price that is more stable than market prices. The Council of State confirmed that this objective cannot be achieved by softer State intervention and that regulation of sales tariffs guarantees electricity firms equal access to consumers and is not discriminatory.

However, the Council of State considered that the tariff regulation was disproportionate in its duration, which is permanent, and its scope of application, which covers large business sites with subscribed power levels below 36kVA. These facts were cited as justification for partial cancellation of the tariff decisions of 28 July 2016 and 27 July 2017.

Directive (EU) 2019/944 of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU was published in the OJEU on 14 June 2019. This directive requires continuation of regulated sales tariffs for residential customers and very small businesses.

France’s Energy and Climate law sets out the terms of the discontinuation of regulated electricity sales tariffs for non-residential customers, in compliance with this directive and the Council of State’s decision. These tariffs are now reserved for all consumers, whether residential or business customers, with subscribed power levels of 36kVA provided they have fewer than 10 employees and their annual sales, income or balance sheet total is below €2 million.

The discontinuation of regulated electricity sales tariffs for customers who are no longer eligible will take effect at 1 January 2021. In the meantime, the Energy and Climate law and the official decisions⁽¹⁾ made for application of that law define a process to be led by the historical suppliers. The steps in this process include identifying and informing the customers concerned, and making their data available to alternative suppliers, in compliance with the rules governing management of personal data. Consumers affected by discontinuation of the regulated sales tariffs will no longer be able to subscribe or modify a regulated-tariff contract from 1 January 2020. From 1 January 2021, any such consumers who have not subscribed a new contract will automatically be switched to a market-rate contract with their previous supplier.

(1) Decision of 12 December 2019 concerning identification and provision of the list of non-domestic customers no longer eligible for regulated electricity sales tariffs. Decision of 12 December 2019 concerning information of consumers on regulated electricity sales tariffs, by their supplier, about the discontinuation of their regulated-tariff contracts. Decision of 26 December 2019 listing the data suppliers offering regulated-tariff electricity sales contracts must make available to other electricity suppliers upon request.

Tariff changes

Since 8 December 2015, in accordance with the NOME Law on organisation of the French electricity market (Articles L. 337-4 and L. 337-13 of the French Energy Code), the French Energy Regulatory Commission (Commission de régulation de l’énergie or CRE) has been responsible for sending the Ministers for the Economy and Energy its reasoned proposals for regulated sales tariffs for electricity. If no objections are made within three months, the proposals are deemed to have been approved.

In a decision of 7 February 2019 published on 12 February 2019, the CRE proposed an increase of 7.7% (excluding taxes) in the “blue” regulated tariffs for residential and non-residential customers, or 5.9% including taxes. The government had announced in late 2018 that electricity tariffs would not increase during the winter period, and only approved the CRE’s proposal in early May 2019, within the three-month period allowed under the Energy Code. The tariff decisions of 28 May 2019 were published in the *Journal officiel* of 30 May 2019 and took effect on 1 June 2019.

The consumer associations *UFC Que Choisir* and *Consommation Cadre de Vie Logement* (CLCV) challenged these decisions through an ultra vires application to the Council of State requesting their cancellation, together with an urgent petition for suspension of execution of the decisions until a ruling on the merits of the case could be issued. In an ordinance of 12 July 2019, the urgent applications judge refused to grant the suspension since there was no urgency. The Council of State subsequently rejected the merits of the challenge in a decision of 6 November 2019, thus validating the tariff structure implemented by the CRE on the grounds of the Energy Code.

Also, given the change in the “TURPE” network access tariff applicable from 1 August 2019, and in application of the Energy Code, in a decision of 25 June 2019 published on 2 July 2019 the CRE proposed an increase of 1.47% excluding taxes (1.26% including taxes) in “blue” tariffs for residential customers and 1.34% excluding taxes (1.10% including taxes) in “blue” tariffs for non-residential customers. The CRE’s proposal was confirmed in a tariff decision of 30 July 2019, published in the *Journal officiel* of 31 July 2019, and implemented on 1 August 2019.

Finally, in a decision of 16 January 2020 the CRE proposed an increase of 2.4% (including taxes) in the “blue” tariffs for residential and non-residential customers (3.0% excluding taxes for residential customers and 3.1% excluding taxes for non-residential customers). This proposed increase takes account of the rise in prices on the wholesale energy markets, the level of ARENH curtailments for 2020, higher selling costs including the costs of purchasing energy savings certificates, and the adjustments made to narrow the gap between costs and revenues observed on regulated electricity sales tariffs during 2019, notably following application from 1 June 2019 of the CRE’s tariff proposal of 7 February 2019. This latest CRE proposal was confirmed by tariff decisions of 29 January 2020 that were published in the *Journal officiel* of 31 January 2020, and applied from 1 February 2020.

3.3 Supplier commissioning

After Law 2017-1839 of 30 December 2017 confirmed the CRE’s competence for supplier commissioning, the CRE issued a new decision on 18 January 2018, published in the *Journal officiel* of 25 January 2018. This decision reiterated the principles adopted in its previous decision of 26 October 2017 regarding remuneration payable by distribution network operators to suppliers for the service of managing single-contract customers on their behalf.

The content of these decisions upheld the principle of identical commissions for all suppliers selling single-contract market-price offers. Only regulated electricity tariffs were to give rise to slightly lower commissions (€4.50 instead of €6.80 per point of delivery until 1 August 2019), with progressive reduction of this difference to zero by 1 August 2022.

For remuneration of past customer management charges (prior to 1 January 2018), the CRE’s decision set an amount it considered as a cap that can be passed on through the TURPE tariff.

However, Law 2017-1839 of 30 December 2017 introduced a measure intended to rule out the possibility of suppliers receiving remuneration from network managers for past customer management services.

3.4 Electricity Equalisation Fund

On 22 March 2018, the CRE published its consultation on the levels of contribution due to the Electricity Equalisation Fund for EDF SEI and Électricité de Mayotte for the years 2018 to 2021. The annual average contribution to the Electricity Equalisation Fund for EDF SEI, including the planned smart metering system, is €185 million for the period 2018-2021.

3.5 Compensation for public energy service charges (CSPE)

Legal and regulatory framework

The compensation mechanism for public energy service charges (*compensation des charges de service public de l'énergie*) results from a reform introduced by France's amended finance law for 2015, published in the *Journal officiel* on 30 December 2015. Under the legislative and regulatory framework, the public energy service charges (electricity and gas) were to be compensated *via* two State budget items included in France's finance laws from 2016 onwards. The initial finance law for 2020 marks a continuation from 2019, defining the following measures for compensation of charges for 2020:

- a special "Energy Transition" budget item of €6.3 billion, principally to compensate for the additional costs associated with all contracts obliging the operators to purchase renewable energies and (to a much smaller degree) biogas, and covering the last annual contribution to repayment of the accumulated shortfall in compensation due to EDF;
- a "Public Energy Service" item of €2.7 billion in the general budget, notably to cover solidarity charges borne by gas and electricity suppliers, costs associated with purchase obligations excluding renewable energies (essentially cogeneration), and the cost of applying the standard national tariffs to zones that are not connected to France's mainland network. The interest on the accumulated shortfall to be repaid to EDF is also funded through the general budget.

Since 1 January 2018, the "basic necessity" rates for electricity and the "special solidarity" rates for gas have been replaced by an energy voucher system. The cost of this system is not borne by EDF, but has been budgeted by the State in the "Public Energy Service" programme. However, EDF bore solidarity charges in 2019 and will bear such charges in 2020 for the national housing solidarity fund and services for vulnerable customers.

In 2020, this mechanism of compensation for public service charges will be funded as follows:

- the costs linked to the energy transition, which correspond to the subsidy mechanisms for renewable energies, and the reimbursement of the past accumulated shortfall in compensation borne by EDF as measured at 31 December 2015, are registered in a special "energy transition" budget item created by the amended finance law for 2015. Law no. 2016-1917 of 29 December 2016 (the finance law for 2017) stipulated that the two sources of additional funding for this special budget item would be a portion of the domestic tax on coal, lignite and coke (TICC), and a portion of the domestic tax on energy products (TICPE), the latter providing most of the funding. The finance law for 2020 replaces the percentages of the TICC and TICPE by a set amount, to avoid the uncertainties of forecast income from these taxes, and broadens the sources of funding for the "Energy transition" budget item by including the proceeds of auctions of Guarantees of Origin as allowed by Article L. 314-14-1 of the Energy Code. The initial French finance law for 2020 also proposes to discontinue this budget item in 2021, with the costs concerned subsequently covered directly by the general budget;
- other public service charges excluding costs associated with the subsidy mechanisms for renewable energies (*i.e.* costs relating to fuel poverty, tariff equalisation in zones that are not connected to France's mainland network, cogeneration, the budget for the energy ombudsman, etc.) are registered directly in the general budget;

- income generated by the domestic tax on the final consumption of electricity, now renamed the Compensation for Public Electricity Charges (CSPE) goes directly into the general budget. The CSPE tax is collected directly from final consumers of electricity in the form of an additional levy on the electricity sale price (and collected from electricity suppliers), or directly from electricity producers that produce electricity for their own uses.

The level of the CSPE tax was set in 2016 at a full rate of €22.5/MWh, and eight reduced rates ranging from €12/MWh to €0.5/MWh depending on criteria of electro-intensiveness, business category and the risk of carbon leakage from installations (the risk of industries relocating to countries where greenhouse gas emissions are higher due to their electricity mix). The level remains unchanged in 2020.

The amended finance law for 2019 applied a downward adjustment to the amounts of compensation payable by the State for public service charges borne in 2019, which had decreased due to the smaller differential between the market price for electricity and the purchase obligation tariff payable to producers. For the same reason, the State adjusted the reduction in compensation levels paid in 2019, since the final expenses for 2018 were lower than the reforecasts on which compensation paid in 2018 had been based.

Public service charges borne by EDF

The amount of expenses (excluding the annual contribution to repayment and associated interest) to be compensated to EDF for 2019 is €7,662 million.

The amounts received in the year 2019 (excluding the annual contribution to repayment and associated interest) totalled €6,800 million (including €4,458 million for the dedicated "energy transition" budget account and €2,342 million for the general budget). EDF also paid the CRE an amount of €12.5 million in December 2019 as a first instalment of reimbursement of residual amounts from the former CSPE mechanism prior to 2016.

A repayment schedule for EDF's receivable corresponding to the accumulated shortfall in compensation, which amounted to €5,780 million at 31 December 2015, was set out in the ministerial decision of 13 May 2016, amended on 2 December 2016. Under this schedule the receivable will be fully repaid by 2020. On 22 December 2016 EDF securitised a portion of this receivable (€1.5 billion) through a State-approved "Daily law" assignment to two groups of assignees. Consequently, since 1 January 2017 EDF has received 73.6% of payments made by the State in reimbursement of the receivable as set out in the repayment schedule. The remainder is paid directly to the assignees.

During 2019, the State paid EDF €1,353 million of the principal amount of the financial receivable, equal to the annual contribution for 2019 as set out in the repayment schedule. At 31 December 2019, EDF's share of the outstanding financial receivable amounted to €660 million which is due to be paid to EDF by the State.

The operating receivable owed by the State to EDF still amounts to €1,647 million at 31 December 2019. The situation will be closely monitored in view of the Finance Law for 2020 adopted by vote in late 2019, which provides for discontinuation of the special "energy transition" budget item from 2021.

Finally, in accordance with decree 2016-158 of 18 February 2016 concerning compensation for public energy service charges, on 11 July 2019 the CRE published its decision 2019-172 recording the public service charges for 2018 (€6,656 million) and providing a revised forecast of charges for 2019 (€7,123 million) and a forecast of charges for 2020 (€7,206 million).

3.6 Capacity mechanism

The French capacity mechanism took effect on 1 January 2017. It was introduced by France's Energy Code to ensure secure national power supplies.

The market reference prices for 2017, 2018 and 2019 were established respectively at €10.00/kWh €9.34/kWh and €17.37/kWh. The first "rebalancing" auction for 2019 held on 16 May 2019 resulted in a price of €0.00/kWh.

Six auctions held in 2019 for energy deliveries in 2020 resulted in the following prices: €20/kWh, €20/kWh, €22.4/kWh, €20/kWh, €17.8/kWh and €16.6/kWh.

3.7 Energy savings certificates

Decree 2017-690 of 2 May 2017 issued by the French Ministry for the Environment, Energy and the Sea substantially raised the obligation levels for the fourth period of energy savings obligations running from 1 January 2018 to 31 December 2020, to 1,200TWhc for the "standard" obligations and 400TWhc for the obligations that are intended to benefit households in situations of energy poverty, compared to 700TWhc and 150TWhc respectively for the previous period.

This significant increase, combined with a shallow market for energy savings certificates and doubts over that market's future liquidity, exposed EDF in 2018 to the risk of a fine payable to the Treasury (under Article L2 21-4 of the Energy Code) of €15 per MWhc of shortfall in respect of its obligation, due to insufficient certificates for the fourth period of the scheme.

In order to meet these requirements, EDF is making every effort to gradually increase its number of energy savings certificates, taking advantage of the "*Coup de pouce*" operations launched in France early in 2019 (financial aid for replacing oil heating by heat pumps, 50% additional energy savings subsidy for heat pump users, special offers for heat pump maintenance contracts). The volume of certificates earned doubled between 2017 and 2019, with a particularly notable increase of 44% between 2018 and 2019.

The law no. 2019-1147 of 8 November 2019 relating to Energy and the Climate, as well as prolonging the fourth period of the energy savings certificates scheme, includes a chapter on measures against fraud concerning these certificates designed to make controls and sanctions more efficient.

Subsequently, decree 2019-1320 of 9 December 2019, published in the *Journal officiel* on 11 December 2019, extended the fourth period by one year to 31 December 2021 under identical annual obligations. Also, Article 143 of the "PACTE" law for business growth and transformation broadens the scope of energy savings certificates to include facilities classified for environmental protection that are subject to greenhouse gas emission trading systems, by modifying Article L. 221-7 of the Energy Code.

EDF currently considers that due to the combined effect of the increase in certificates held and the extension of the fourth period, there is no risk of a shortfall in energy savings certificates at 31 December 2021.

3.8 ARENH

For the ARENH applications of November 2018, demand from alternative suppliers totalled 132.98TWh excluding EDF subsidiaries, more than the maximum total volume of 100TWh. EDF thus delivered 100TWh in 2019 under the ARENH system for supply to competitors' final customers. Subscriptions to cover network losses amounted to 20.4TWh.

These applications were made at a time when the ARENH price (which includes a capacity guarantee in its €42/MWh) was competitive in comparison to forward baseload prices for 2019.

No modifications were made to ARENH applications during the May 2019 session, and consequently no changes were made to the ARENH deliveries for 2019 after that session.

In decisions no. 2018-222 of 25 October 2018, no. 2019-090 of 9 May 2019 and no. 2019-237 of 30 October 2019, as required by the Energy Code the CRE set out the method for allocating ARENH volumes when applications exceed the maximum total volume defined for the year concerned (2018 or 2019). These decisions stipulated that if the ARENH was oversubscribed in November 2018, May 2019 or November 2019, curtailment would only apply to new ARENH applications made in the session that exceeded the maximum, and that EDF-controlled subsidiaries' excess applications would be fully curtailed (this does not apply to network operators). Finally, the decisions stated that EDF-controlled subsidiaries could enter into contracts with the parent company replicating the ARENH system and the terms of supply, particularly the curtailment rate for alternative suppliers. In the method proposed by the CRE in decision no. 2019-028 on the calculation of regulated sales tariffs for electricity, this curtailment mechanism, when applied, makes reference to market prices more influential in determining regulated sales tariffs.

The Energy and Climate law introduced new measures. It raised the ceiling for the ARENH system, initially set at 100TWh, to 150TWh from 1 January 2020, allowing the French government to raise the maximum total volume above 100TWh, and to revise the ARENH price by ministerial decision during a transition period. However, the Ministry for the Ecological and Inclusive Transition announced that no change would be made to the ARENH price or volume for 2020.

Against this background, ARENH applications during the November 2019 session for delivery in 2020 totalled 147TWh (excluding applications from EDF subsidiaries). Since the maximum total volume has not been modified, only 100TWh will be supplied and as in the previous year the CRE will determine the curtailment of each supplier's application.

In January 2020, the French government launched a consultation process concerning the reform of regulation of existing nuclear facilities (ARENH), involving actors from the world of energy (ARENH) (see note 3.1).

Income statement

Note 4 Sales

Sales are comprised of:

<i>(in millions of euros)</i>	2019	2018
Sales of energy*	43,831	42,630
electricity	38,392	38,451
gas	5,439	4,178
Sales of services and other	2,324	2,244
SALES	46,155	44,874

* Including a share of delivery costs for sales of electricity and gas.

The increase in sales in 2019 is mainly due to favourable price effects reflecting the positive price movements on market-price offers and sales at regulated tariffs. For the regulated tariffs, the price effect results from indexing of tariffs from 1 June 2019 (+7.7% on "blue" tariffs for residential and non-residential customers) and 1 August 2019 (+1.47% on "blue" tariffs for residential customers and +1.34% on "blue" tariffs for non-residential customers). Regarding volumes,

the increase in ARENH deliveries (120.4TWh subscribed in 2019 compared to 96.4TWh in 2018) was more than offset by lower demand and a substantial decrease in sales on the markets, notably due to a decline in generation of nuclear power (-12.8TWh) and hydropower (-5.8TWh).

The increase in gas sales reflects a higher volume of sales with EDF Trading.

Note 5 Operating subsidies

<i>(in millions of euros)</i>	2019	2018
OPERATING SUBSIDIES	7,670	6,566

Operating subsidies mainly comprise the subsidy received or receivable by EDF in respect of the CSPE, reflected in the financial statements through recognition of income of €7,662 million for 2019 (€6,554 million for 2018). The increase is mainly explained by the higher subsidy for purchase obligations associated with the rise in

purchased volumes of photovoltaic power (+14%) and wind power (+13.8%), the lower market prices for electricity observed in late 2019, and the increase in additional costs for energy purchases and generation in the non-interconnected island zones.

Note 6 Reversals of provisions and impairment

<i>(in millions of euros)</i>	Notes	2019	2018
Reversals of provisions for risks*	27	552	174
Pensions and similar obligations	30	826	954
Spent fuel management	28	890	986
Long-term radioactive waste management	28	261	260
Decommissioning of nuclear power plants	28	141	138
Decommissioning of fossil-fired and hydropower plants		35	35
Other provisions for expenses		187	113
Reversals of provisions for expenses		2,340	2,486
Reversals of impairment		387	336
TOTAL REVERSALS OF PROVISIONS AND IMPAIRMENT		3,279	2,996

* Including in 2019 a reversal of €184 million corresponding to costs booked in 2018 on long-term regasification reservation contracts of GNL Dunkerque LNG.

Note 7 Other operating income and transfers of charges

<i>(in millions of euros)</i>	2019	2018
Other operating income	753	743
Transfers of charges	96	107
OTHER OPERATING INCOME AND TRANSFERS OF CHARGES	849	850

Note 8 Purchases and other external expenses

<i>(in millions of euros)</i>	2019	2018
Fuel purchases used ⁽¹⁾	3,498	3,172
Energy purchases ⁽²⁾	18,232	17,057
Services and other purchases used ⁽³⁾	16,360	17,181
PURCHASES AND OTHER EXTERNAL EXPENSES	38,090	37,410

- (1) Fuel purchases used include costs relating to raw materials for energy generation (nuclear fuels, fissile materials, coal, oil, and gas), and purchases of services related to the nuclear fuel cycle. Nuclear fuel and coal purchases used have decreased due to the lower level of nuclear power output, and the less extensive use of coal-fired plants. This decrease was more than counterbalanced by an increase in gas purchased and CO₂ quotas used and acquired.
Regarding greenhouse gas emission rights used (see note 1.19.1):
- At 31 December 2019, the volume of emissions was 6 million tonnes (7 million tonnes in 2018);
- In 2019 EDF surrendered 8 million tonnes in respect of emissions generated in 2018 (11 million tonnes were surrendered in 2018 in respect of emissions generated in 2017).
- (2) Energy purchases include electricity purchase obligations. The increase in energy purchases is principally explained by the €743 million rise in electricity purchase obligations and LNG purchase obligations, which was partly offset by the lower level of purchases on the markets.
- (3) Service purchases include distribution network access fees invoiced by the subsidiary Enedis. Excluding delivery, service purchases decreased by €320 million in 2019.

Note 9 Taxes other than income taxes

Details of taxes other than income taxes are as follows:

<i>(in millions of euros)</i>	2019	2018
Taxes on salaries and wages*	144	180
Energy-related taxes	1,246	1,240
Local Economic Contribution	524	505
Property taxes	453	433
Other taxes	307	304
TOTAL TAXES OTHER THAN INCOME TAXES	2,674	2,662

- * Under the reform of France's apprenticeship tax and training contribution system introduced by Law 2018-771 of 5 September 2018, no apprenticeship tax is due on employee compensation paid in 2019.

Note 10 Personnel expenses

(in millions of euros)	2019	2018
Salaries and wages	3,654	3,711
Social contributions	2,799	2,854
PERSONNEL EXPENSES	6,453	6,565

The decrease in personnel expenses mainly reflects the lower workforce numbers and the employer contribution reductions specifically for low salaries, which apply from 1 January 2019 following the discontinuation of the tax credit for competitiveness and employment (CICE) (see note 15.3).

	2019			2018
	Executives	Non executives	Total	Total
IEG status	27,308	32,041	59,349	60,759
Other	1,924	2,257	4,181	4,168
AVERAGE WORKFORCE	29,232	34,298	63,530	64,927

Average workforce numbers are reported on a full-time equivalent basis.

Note 11 Operating depreciation, amortisation and provisions

11.1 Depreciation and amortisation

(in millions of euros)	2019	2018
Amortisation of intangible assets	266	235
Depreciation on property, plant and equipment:		
■ owned by EDF ⁽¹⁾	3,401	2,991
■ operated under concessions ⁽²⁾	282	272
Total depreciation and amortisation on fixed assets	3,949	3,498
Other depreciation and amortisation and deferred expenses	26	33
TOTAL DEPRECIATION AND AMORTISATION	3,975	3,531

(1) Including €139 million of accelerated depreciation in 2019 relating to coal-fired plants (see note 3.1).

(2) This depreciation concerns the Island Energy Systems public electricity distribution concessions and hydropower concessions.

11.2 Provisions and impairment

(in millions of euros)	Notes	2019	2018
Provisions for risks*	27	656	1,125
Pensions and similar obligations	30	674	832
Management of spent nuclear fuel	28	535	488
Long-term management of radioactive waste	28	189	48
Decommissioning of nuclear power plants and last cores	28	105	52
Decommissioning of thermal and hydropower plants		2	22
Other provisions for expenses		112	120
Provisions for expenses		1,617	1,562
Impairment		342	253
TOTAL PROVISIONS AND IMPAIRMENT		2,615	2,940

* The increase at 31 December 2019 mainly concerns supply and sale contracts. In 2018 the increase included €737 million for the long-term contract with Dunkerque LNG and €163 million for other onerous contracts.

Note 12 Other operating expenses

Other operating expenses amount to €2,241 million in 2019 (€1,743 million in 2018) and notably include losses on non-recoverable receivables, royalties on software, costs relating to energy savings certificates used or consumed over the

year, and the net book value of assets demolished or scrapped. The change in other operating expenses in 2019 is attributable in particular to the rise in costs associated with energy savings certificates.

Note 13 Financial result

EDF has changed the presentation of its financial result to make it clearer and more intelligible. This change is applied retrospectively to the comparative figures for 2018, with the following consequences:

- unrealised and realised gains and losses are all reported on a single line "Foreign exchange result", to provide an overall view in line with the changes in ANC 2015 regulations on forward instruments and hedging operations;

- a breakdown of the "Interest and similar income and expenses" is provided to show the cost of debt;
- gains and losses on sales of marketable securities are reported as a net result, due to their relative financial importance;
- reversals from provisions, impairment and transfers of charges are included in the increases/decreases to provisions and transfers of charges due to their similar natures.

<i>(in millions of euros)</i>	2019	2018
Income from investments ⁽¹⁾	1,427	2,804
Income from other securities and receivables related to fixed assets ⁽²⁾	757	607
Interest and similar income and expenses:	(1,483)	(1,590)
■ Expenses on long-term financial liabilities after hedging	(1,822)	(1,887)
■ Other	339	297
Foreign exchange result	(145)	312
Gains and losses on sales of marketable securities	(70)	(135)
Increases/Decreases in provisions and transfers of charges:	(2,187)	(3,754)
■ Discount expense on employee benefits	(614)	(574)
■ Discount expense on nuclear provisions ⁽³⁾	(1,988)	(2,365)
■ Provision on investment securities ⁽⁴⁾	550	(604)
■ Reversals from provisions, impairment and transfers of charges:	485	301
FINANCIAL RESULT	(1,701)	(1,756)

(1) The change in dividends received principally concerns:

- Enedis (€556 million in 2019 and €513 million in 2018);
- C3 (the holding company which carries EDF Investissements Groupe) (€156 million in 2019 and €116 million in 2018);
- EDF Holding (the holding company which carries EDF Trading) (€581 million in 2018, no equivalent in 2019);
- PEI (€88 million in 2019 and €92 million in 2018);
- EDF Immo (€241 million in 2019 and €130 million in 2018);
- CTE (€157 million in 2019 and 2018);
- EDEV (€38 million in 2019 and €926 million in 2018 including €740 million from the sale of Dunkerque LNG);
- Dalkia (€90 million in 2018, no equivalent in 2019);
- Framatome (€36 million in 2019, no equivalent in 2018).

(2) In 2019, this item includes income of €24 million (€46 million in 2018) for the cost of bearing the CSPE financial receivable.

(3) In 2019, the discount expense on nuclear provisions decreased, because the year-on-year decrease in the real discount rate was smaller than the previous year (the rate was 2.3% at 31 December 2019, 2.4% at 31 December 2018 and 2.6% at 31 December 2017).

(4) The change is principally due to favourable financial market trends in 2019, compared to unfavourable trends in 2018, mainly at the end of the year.

Note 14 Exceptional result

At 31 December 2019, exceptional items result in net income of €547 million. The main items are the following:

- net gains of €619 million on sales of investment securities included in dedicated assets, undertaken as part of operational portfolio management;
- net reversals of €144 million from excess tax depreciation.

At 31 December 2018, exceptional items resulted in net income of €939 million. The main items were the following:

- net gains of €846 million on sales of investment securities included in dedicated assets, undertaken as part of operational portfolio management;
- net reversals of €65 million from excess tax depreciation.

Note 15 Income taxes

15.1 Tax group

Since 1 January 1988, EDF and certain subsidiaries have formed a group subject to the tax consolidation system existing under French tax legislation (Articles 223A to 223U of the French Tax Code). The tax consolidation group comprises 317 subsidiaries in 2019, including Enedis, EDF International, EDF Renouvelables and Dalkia.

15.2 Income tax payable

Under Article 223A of the French Tax Code, EDF, as the head of the tax consolidated group, is the sole entity responsible for payment of income taxes and additional related contributions.

The tax consolidation agreement between the members of the tax group stipulates that the arrangement must be neutral in effect. In application of this principle, each subsidiary pays the consolidating company a contribution to group income tax equivalent to the tax it would have paid had it been taxed separately.

The tax consolidation agreement between EDF and the subsidiaries included in the tax group requires EDF to reimburse loss-making subsidiaries for the tax saving generated by their losses, as and when the entities concerned make taxable profits, in compliance with the standard rules for use of taxable losses.

The Company at the head of the tax group, EDF, recorded an income tax charge of €(605) million for 2019 (income tax receivable of €756 million for 2018).

The breakdown is as follows:

- tax charge of €850 million on the 2019 taxable profit (before exceptional items);
- tax charge of €197 million on the exceptional result;
- income of €442 million corresponding to adjustments resulting from the tax consolidation.

(in millions of euros)

	31/12/2019	31/12/2018	Variation
1. Timing differences generating a deferred tax asset			
■ Non-deductible provisions ⁽¹⁾	(14,704)	(15,385)	681
■ Financial instruments and unrealised exchange gains	(2,624)	(1,067)	(1,557)
■ Other	(595)	(404)	(191)
Total deferred tax assets subject to the standard rate	(17,923)	(16,856)	(1,067)
2. Timing differences generating a deferred tax liability			
■ Financial instruments and unrealised exchange losses	2,256	3,758	(1,502)
■ Other	2,547	2,149	398
Total deferred tax liabilities subject to the standard rate	4,803	5,907	(1,104)
■ Capital gains not yet taxed	-	-	-
■ Provisions for losses taxable at 15%	(15)	-	(15)
Total deferred tax liabilities subject to reduced rate	(15)	-	(15)
BASIS FOR DEFERRED TAXES	(13,135)	(10,949)	(2,186)
Net future tax asset at standard rate ⁽²⁾	3,369	3,099	270
Net future tax liability at reduced rate	2	-	2

(1) Mainly concerning post-employment benefits for personnel.

(2) Applying a corporate income tax rate of 25.82% to long-term timing differences.

15.3 Tax credit for competitiveness and employment (CICE)

The amounts received in 2019 under the French CICE tax credit scheme for 2018 (€43 million) were to fund the Company's investment and recruitment efforts. As of 1 January 2019, the CICE is replaced by a reduction in long-term employer contributions specifically for low salaries, to increase the measure's effectiveness for low-skill jobs.

15.4 Deferred taxes

Deferred taxes are not recognised in EDF's individual financial statements. Deferred taxes result from differences between the accounting bases and tax bases of items. They generally arise as a result of timing differences in the recognition of income and expenses:

- deferred tax assets reflect expenses which will be tax deductible in future years or losses carried forward which will reduce taxable income in the future;
- deferred tax liabilities reflect either advance tax deduction of future accounting expenses or accounting revenues that will be taxable in future years and will increase taxable income in the future.

EDF SA, as head of the tax group, includes tax losses generated at group level in its deferred tax positions.

Changes in the basis for deferred taxes are as follows:

Balance sheet

Note 16 Gross values of intangible and tangible fixed assets

<i>(in millions of euros)</i>	Gross value at 31/12/2018	Increases	Decreases	Gross value at 31/12/2019
Software	1,832	309	32	2,109
Other	259	27	4	282
Intangible assets	2,091	336	36	2,391
Land	111	11	5	117
Buildings	10,875	784	46	11,613
Nuclear power plants	58,378	3,988	1,206	61,160
Machinery and plant other than networks	13,236	363	189	13,410
EDF-owned networks	1,052	19	-	1,071
Other	1,674	120	72	1,722
Property, plant and equipment owned by EDF ⁽¹⁾	85,326	5,285	1,518	89,093
Land	47	1	-	48
Buildings	10,166	93	11	10,248
Machinery and plant other than networks	1,612	71	14	1,669
Concession networks	2,866	170	17	3,019
Other	20	-	-	20
Property, plant and equipment operated under concessions ⁽²⁾	14,711	335	42	15,004
Tangible assets ⁽³⁾	17,265	5,867	5,376	17,756
Intangible assets ⁽³⁾	776	494	344	926
Advances and progress payments on orders	3,073	5	48	3,030
Assets in progress	21,114	6,366	5,768	21,712
TOTAL INTANGIBLE AND TANGIBLE FIXED ASSETS ⁽⁴⁾	123,242	12,322	7,364	128,200

(1) Property, plant and equipment owned by EDF include the €1,224 million impact of 35 newly-commissioned back-up diesel facilities, in line with the timetable approved by the ASN.

(2) Property, plant and equipment operated under concessions concern the Island Energy Systems public electricity distribution concessions and hydropower concessions.

(3) Investments during the year mainly concern equipment for existing power plants under the Grand Carénage programme, and construction of the Flamanville 3 EPR plant. Intangible assets in progress include studies currently in process for the EPR 2 project, amounting to €388 million at 31 December 2019.

(4) The capitalised value of the Flamanville 3 EPR project in the financial statements at 31 December 2019 is €11,373 million* (€11,122 million in tangible assets in progress in operation and €251 million in property, plant and equipment in operation). In addition to the construction cost, this amount includes an inventory of spare parts and capitalised amounts totalling €422 million for related projects (notably the initial comprehensive inspection and North Area development), and €611 million of pre-operating expenses and other property, plant and equipment related to the Flamanville project, giving a total construction cost at historical value of €10,340 million. Depreciation and amortisation recognised at 31 December 2019 in respect of assets in operation amounts to €64 million.

* Interest is not capitalised in the parent company financial statements.

Note 17 Depreciation, amortisation and impairment of intangible and tangible fixed assets

<i>(in millions of euros)</i>	Cumulative amount at 31/12/2018	Increases	Decreases	Cumulative amount at 31/12/2019
Software	950	257	32	1,175
Other	124	10	4	130
Intangible assets	1,074	267	36	1,305
Land and buildings	7,338	284	46	7,576
Nuclear power plants	40,379	2,549	1,394	41,534
Machinery and plant other than networks	8,641	537	181	8,997
EDF-owned networks	502	30	-	532
Other	1,061	135	63	1,133
Property, plant and equipment owned by EDF	57,921	3,535	1,684	59,772
Land and buildings	6,479	146	7	6,618
Machinery and plant other than networks	1,066	31	13	1,084
Concession networks	1,200	79	15	1,264
Other	10	-	-	10
Property, plant and equipment operated under concessions	8,755	256	35	8,976
Tangible assets in progress	177	25	108	94
TOTAL DEPRECIATION, AMORTISATION AND IMPAIRMENT	67,927	4,083	1,863	70,147

17.1 Impairment tests on assets

Due to the integrated management and interdependence of the different generation facilities that make up the French fleet (nuclear, thermal and hydropower plants), independently of their maximum technical capacities, EDF considers the entire fleet as a single CGU.

Even when there is no indication of any loss of value, an impairment test is performed due to the highly significant value of this CGU in the financial statements and its substantial exposure to market prices since discontinuation of the "yellow" and "green" regulated tariffs on 1 January 2016.

The recoverable value of the generation fleet is estimated by discounting future cash flows under EDF's usual methodology, described in note 1.6, over the assets' useful life, using an after-tax WACC of 5.1% at 31 December 2019. For nuclear assets currently in operation (except for Fessenheim), EDF's benchmark model assumes that the useful life is extended to 50 years, in line with its industrial strategy. The nuclear capacity remains subject to a ceiling of 63.2GW in the test, consistent with France's Energy Transition Law.

The capacity revenue assumptions used in the test are higher than the previous year, in line with the system fundamentals analysis in the benchmark scenario. The average auction price achieved in 2019 was €19.5/KW.

The impairment test takes into consideration the latest forecasts concerning Flamanville 3 (see note 2.1.1) which adjusted the schedule, setting the fuel loading date in late 2022, and revised the estimated cost of construction to €12.4 billion in 2015 euros, an increase of €1.5 billion from the previous estimate. The test takes into consideration the fact that most of these additional costs will be recorded as operating expenses.

The test results indicated a significant positive difference between the recoverable value and the book value of the generation fleet in France. The margin resulting from the test is higher than at 31 December 2018, as the higher costs and deferred commissioning of Flamanville 3 were outweighed by favourable effects, essentially concerning the lower discount rate and the positive effect of cash outflows in 2019.

The key assumptions used in the test include the useful life of nuclear assets, the long-term price scenario, the discount rate, developments in costs and investments, and the assumed capacity revenue. Each of these assumptions has been subjected to a sensitivity analysis, which does not call into question the existence of a positive difference between the recoverable value and book value. The test conducted at 31 December 2019 also takes into consideration the sensitivity associated with early closure proposals for certain nuclear units, as set out in the proposed multi-year energy programme. This did not affect the conclusions of the test.

Note 18 Financial assets

18.1 Change in financial assets

<i>(in millions of euros)</i>	Gross value at 31/12/2019	Gross value at 31/12/2018
Investments ⁽¹⁾	59,479	59,207
Receivables related to investments	53	51
Investment securities ⁽²⁾	22,350	20,790
Other investments	273	286
CSPE receivable ⁽³⁾	684	2,060
Loans to subsidiaries and other financial assets ⁽⁴⁾	12,026	10,485
Total financial assets, gross	94,865	92,879
Impairment of investments and related receivables	(578)	(307)
Impairment of investment securities ⁽⁵⁾	(220)	(716)
Total impairment	(798)	(1,023)
TOTAL FINANCIAL ASSETS, NET	94,067	91,856

(1) The change in investments essentially corresponds to:

- an additional €40 million in the valuation of the shares in Framatome. At 31 December 2019, the 75.5% investment in Framatome is stated at the value of €2,028 million including acquisition expenses;
- subscription to the capital increase by EDF Pulse Croissance Holding (€55 million during the first half of 2019);
- new investments by EDF Invest (see note 38.2.5), principally:
 - subscription to the capital increase by C73, which owns solar power plants in the United States (€143 million, totally allocated to dedicated assets),
 - subscription to the capital increase by C74, which owns wind farms in the United States (€123 million, partly allocated to dedicated assets);
- disposal by EDF of 50% plus one share of its investment in the subsidiary Dalkia Investissement, for the book value of €(137) million, in December 2019.

(2) Changes in investment securities correspond mainly to acquisitions and sales of dedicated assets over the period, which generated net gains of €619 million in 2019 (see note 14). These gains are reinvested in the dedicated asset portfolio.

(3) The receivable corresponding to the balance of the accumulated shortfall in the Contribution to the Public Electricity Service (CSPE) at 31 December 2015 and the costs of bearing that shortfall. Reimbursements received during 2019 amount to €1,399 million including interest (€1,281 million in 2018) (see note 3.5), in line with the repayment schedule.

(4) Loans to subsidiaries at 31 December 2019 total €11,984 million, including €7,737 million for EDF International, €1,343 million for Dalkia, €1,249 million for EDF Renewables, €717 million for PEI and €503 million for Enedis.

(5) The change in this item is mainly due to favourable developments on the financial markets in 2019 after unfavourable trends in 2018, principally at the end of the year, leading to reversals of impairment on investment securities during the year (see note 13).

18.2 Subsidiaries and investments of at least 50% of capital

<i>(in millions of euros)</i>	Gross book value of shares owned	Impairment recorded at 31/12/2019	% capital owned	Equity 2018	Net income 2018	Dividends received in 2019	Sales 2018
I. Subsidiaries							
■ Holding companies							
EDEV	6,891	-	100	6,328	823	38	n.m.
EDF International	25,930	-	100	18,696	(577)	-	1
EDF Production Électrique Insulaire SAS	561	-	100	973	125	88	762
EDF Holding SAS	1,950	-	100	2,111	622	n.m.	-
Société C3	11,196	-	100	11,482	164	156	-
EDF Immo	1,361	-	100	1,653	254	241	-
EDF Group Support Services	n.m.	-	100	1	n.m.	n.m.	155
CTE	2,705	-	50.1	5,298	171	157	-
C45	99	2	100	100	2	12	-
EDF Nam Theun Holding	437	-	100	436	(1)	23	-
C73	143	-	100	-	-	-	-
C74	123	-	100	-	-	-	-
Other companies	2,033	168	100	1,835	57	105	4
■ Industrial and commercial companies							
France							
Centrale Électrique Rhénane de Gamsheim	3	-	50	10	-	-	6
Dalkia France	967	140	100	502	(38)	n.m.	2,244
Enedis	2,700	-	100	5,265	596	556	14,396
Framatome	2,028	-	75.5	2,455	98	36	2,026
Edvance	12	-	80	22	13	5	335
Other countries							
Emosson	14	14	50	124	-	-	32
Rheinkraftwerk Iffezheim (RKI)	3	-	50	101	3	-	16
Forces Motrices du Chatelôt	n.m.	-	50	7	n.m.	n.m.	4
■ Other entities (GIE EIFER)	129	125	-	-	-	-	-
TOTAL I	59,285	449				1,417	

n.m.: not material (less than €500,000).

CTE is the company that owns 100% of RTE.

18.3 Subsidiaries and investments under 50%

<i>(in millions of euros)</i>	Gross book value of shares owned	Impairment recorded at 31/12/2019	% capital owned	Equity 2018	Net income 2018	Dividends received 2019
I. Subsidiaries						
Total I Carried forward	59,285	449				1,417
II Investments						
II.1 Companies in which EDF has an interest of between 10% and 50%						
■ Industrial and commercial companies						
France						
Trimet France	130	73	35	257	(14)	-
Dalkia Investissements	63	56	49.9	86	n.m.	-
Total II.1	193	129				-
II.2 Companies in which EDF has an interest of less than 10%:						
Other companies	-	-	-	-	-	-
Other countries						
Forces Motrices de Mauvoisin	1	-	10	107	5	n.m.
Total II.2	1	-				-
Total II	194	129				-
Total subsidiaries and investments, gross	59,479	578				1,417
TOTAL SUBSIDIARIES AND INVESTMENTS, NET	58,901					

n.m.: not material (less than €500,000).

18.4 Investment securities portfolio

<i>(in millions of euros)</i>	At start of year			At year-end		
	Gross book value	Net book value	Fair value	Gross book value	Net book value	Fair value
VALUE OF INVESTMENT SECURITIES	20,790	20,136	20,830	22,350	22,246	24,816

At 31 December 2019, the investment securities portfolio comprises €22,246 million of dedicated assets.

18.5 Variation in treasury shares

A share repurchase programme was authorised by the General Shareholders' Meeting of 16 May 2019 for a duration of 18 months. A liquidity contract exists for this programme, as required by the French market regulator AMF in decision AMF 2018-01 of 2 July 2018.

The Chairman and CEO, acting by delegation of the Board of Directors, decided on 23 December 2019 to proceed under the share repurchase programme authorised

by the General Shareholders' Meeting to reassignment of 3,646,913 EDF shares initially assigned to the liquidity contract, and 50,594 shares assigned to an Employee-reserved Offering of 2007, which is now an obsolete purpose. A total of 3,697,507 shares were thus assigned to the objective of a capital reduction by cancellation of those shares.

This operation led to recognition of impairment on treasury shares in the financial result, amounting to €14 million by reference to the share price at 23 December 2019. The 3,646,913 shares are therefore carried in the balance sheet under "Investment securities" at the net value of €36 million at 31 December 2019.

The 50,594 shares awaiting cancellation remain in the balance sheet under "Marketable securities" at the net value of €2 million at 31 December 2019. (see note 21)

<i>(in millions of euros)</i>	Gross value at 31/12/2018	Increases	Decreases	Gross value at 31/12/2019	Impairment at 31/12/2019	Net value at 31/12/2019
TREASURY SHARES	53	99	(91)	61	(14)	47

At 31 December 2019, a total 4,832,344 treasury shares are included in "investment securities" at the net value of €47 million, including €36 million for the 3,646,913 shares assigned to the objective of a capital reduction through cancellation of shares.

18.6 Financial loans and receivables related to investments

(in millions of euros)	Liquidity			Gross value at 31/12/2019	Gross value at 31/12/2018
	< 1 year	1-5 years	> 5 years		
Receivables related to investments	4	-	49	53	51
CSPE receivable	684	-	-	684	2,060
Loans to subsidiaries and other financial assets	8,319*	2,382	1,325	12,026	10,485
FINANCIAL LOANS AND RECEIVABLES RELATED TO INVESTMENTS	9,007	2,382	1,374	12,763	12,596

* Including €7.6 billion of loans to EDF International, notably corresponding to termination of two drawings on credit lines maturing in 2023 and 2026. These drawings will be renewed in 2020.

Note 19 Inventories and work-in-progress

(in millions of euros)	31/12/2019			31/12/2018		
	Gross value	Provisions	Net value	Gross value	Provisions	Net value
Nuclear fuel	8,332	(4)	8,328	8,486	(6)	8,480
Other raw materials	116	(20)	96	139	-	139
Other supplies	1,533	(221)	1,312	1,438	(183)	1,255
Work-in-progress and other inventories	50	-	50	33	-	33
TOTAL INVENTORIES	10,031	(245)	9,786	10,096	(189)	9,907

Note 20 Other current assets

(in millions of euros)	Liquidity			Gross value at 31/12/2019	Gross value at 31/12/2018
	< 1 year	1-5 years	> 5 years		
Advances on orders	334	114	246	694	690
■ Trade receivables					
Amounts billed	2,210	-	-	2,210	2,064
Unbilled receivables ⁽¹⁾	13,429	-	-	13,429	13,354
■ Other operating receivables ⁽²⁾	5,479	23	186	5,688	5,676
Operating receivables	21,118	23	186	21,327	21,094
Cash instruments ⁽³⁾	783	726	1,163	2,672	2,605
Prepaid expenses	295	260	532	1,087	1,449
TOTAL CURRENT ASSETS	22,530	1,123	2,127	25,780	25,838

(1) Mainly receivables for energy supplied and not billed in 2019.

(2) Including €3,344 million of receivables on the State related to taxes other than income taxes, and €1,647 million receivable in compensation for public energy service charges (CSPE) (€783 million in 2018). The rest of the CSPE receivable is recorded under "Financial assets" (see note 18.1).

(3) Unrealised gains on foreign exchange instruments.

Note 21 Marketable securities

<i>(in millions of euros)</i>	31/12/2019	31/12/2018	Variation
Treasury shares	2	3	(1)
Investment funds*	410	2,868	(2,458)
Negotiable debt instruments (Euros or other currencies) maturing within 3 months	-	175	(175)
Negotiable debt instruments (Euros or other currencies) maturing after 3 months	3,318	3,468	(150)
Bonds	8,206	7,969	237
Accrued interest and other marketable securities	2,757	2,430	327
Total gross value	14,693	16,913	(2,220)
Provisions	(3)	(52)	49
TOTAL NET VALUE	14,690	16,861	(2,171)

* In compliance with the Green Bond Framework, EDF used the amounts reserved for Socially Responsible Investment funds to finance the EDF group's eligible investments, and modified the allocation of the cash reserves, reducing the portion invested in investment funds in view of their lower returns.

Note 22 Variation in cash and cash equivalents reported in the cash flow statement

<i>(in millions of euros)</i>	31/12/2019	31/12/2018	Variation
Marketable securities	14,693	16,913	(2,220)
Cash and cash equivalents	4,714	4,619	95
Sub-total in balance sheet assets	19,407	21,532	(2,125)
Euro investment funds	(410)	(2,868)	2,458
Negotiable debt instruments (euro) maturing after 3 months	(1,068)	(2,202)	1,134
Negotiable debt instruments (non euro) maturing within 3 months	-	(175)	175
Negotiable debt instruments (non euro) maturing after 3 months	(2,250)	(1,266)	(984)
Bonds	(8,206)	(7,969)	(237)
Treasury shares	(2)	(3)	1
Accrued interest and other marketable securities	(2,757)	(2,430)	(327)
Marketable securities included in financial assets in the cash flow statement	(14,693)	(16,913)	2,220
Cash advances to subsidiaries (cash pooling agreements) included in "other operating receivables" in the balance sheet	-	-	-
Cash advances from subsidiaries (cash pooling agreements) included in "other operating liabilities" in the balance sheet	(4,794)	(6,182)	1,388
Cash and cash equivalents, closing balance in the cash flow statement*	(80)	(1,563)	1,483
Elimination of the effect of currency fluctuations			(15)
Elimination of net financial income on cash and cash equivalents			(31)
NET VARIATION IN CASH AND CASH EQUIVALENTS IN THE CASH FLOW STATEMENT*			1,437

* See the cash flow statement.

As of 2018, the cash positions of all subsidiaries in the cash flow statement are classified by reference to criteria of autonomy.

An entity is considered non-autonomous when it is a holding company, generates the majority of its sales with EDF Group entities, or does not have the status of employer.

The main subsidiaries classified as non-autonomous are C2,C3, EDF Holding et EDF International, and the main subsidiaries classified as autonomous are Enedis, PEI, Sofilo and GGF.

In the cash flow statement, the cash positions of autonomous subsidiaries are presented as a deduction from "Cash and cash equivalents". The cash positions of non-autonomous subsidiaries are included in the components of the changes in working capital.

Note 23 Unrealised foreign exchange losses

Unrealised foreign exchange losses amount to €1,305 million at 31 December 2019, principally reflecting:

- unrealised losses caused by currency movements (essentially by the US dollar and the pound sterling) amounting to €994 million at 31 December 2019 (€767 million at 31 December 2018) on liabilities and receivables in foreign currencies, and currency hedging instruments;

- the settlement in 2019 of internal currency derivatives with the subsidiary EDF International, through a payment of €311 million made by EDF during the period, while the hedged items (liabilities in foreign currencies) are still carried in the EDF SA balance sheet. In accordance with the national chart of accounts, in application of the symmetry principle set out in Article 628-11, realised gains and losses remain in unrealised foreign exchange losses and will be transferred to expenses over the residual life of the hedged item, symmetrically to the accounting treatment of gains and losses on the hedged items.

Note 24 Changes in equity

<i>(in millions of euros)</i>	Capital	Reserves and premiums	Retained earnings and interim dividends	Profit or loss for the financial year	Investment subsidies	Tax-regulated provisions	Total equity
At 31 December 2017	1,464	18,651	6,375	1,924	163	6,098	34,676
Allocation of 2017 net income	-	41	973	(1,014)	-	-	-
2018 profit	-	-	-	1,591	-	-	1,591
Capital increase of 19 June 2018	41	806	-	-	-	-	847
Dividend distribution	-	-	1	(910)	-	-	(909)
Interim dividend	-	-	(451)	-	-	-	(451)
Other changes	-	(4)	1	-	3	(42)	(42)
At 31 December 2018	1,505	19,494	6,900	1,591	166	6,056	35,712
Allocation of 2018 net income	-	5	1,103	(1,108)	-	-	-
2019 profit	-	-	-	1,593	-	-	1,593
Capital increase of 18 June 2019	20	431	-	-	-	-	451
Dividend distribution	-	-	1	(483)	-	-	(482)
Capital increase of 17 December 2019	27	403	-	-	-	-	430
Interim dividend	-	-	(458)	-	-	-	(458)
Other changes	-	1	1	-	(7)	(121)	(126)
AT 31 DECEMBER 2019	1,552	20,334	7,547	1,593	159	5,935	37,120

24.1 Share capital

EDF's share capital amounted to €1,551,810,543 at 31 December 2019, comprising 3,103,621,086 fully subscribed and paid-up shares with nominal value of €0.50 each, owned 83.58% by the French State, 14.92% by the public (institutional and private investors), 1.34% by current and retired Group employees, and 0.16% held by EDF as treasury shares.

In June 2019, payment of the balance of the dividend for 2018 in the form of a scrip dividend led to a €20 million increase in the share capital and an issue premium of €431 million following the issuance of 40,701,950 new shares. The formalities for this operation were completed in June 2019.

In December 2019, payment of part of the interim dividend for 2019 in the form of a scrip dividend led to a €27 million increase in the share capital and an issue premium of €403 million following the issuance of 52,651,460 new shares.

Under Article L. 111-67 of the French Energy Code, the French State must hold more than 70% of the capital of EDF at all times.

24.2 Dividends

The General Shareholders' Meeting of 16 May 2019 decided to distribute an ordinary dividend of €0.31 per share in respect of 2018, offering shareholders the choice of payment in cash or shares (scrip option).

In application of Article 24 of the Company's articles of association, shareholders who had held their shares continuously for at least 2 years at the year-end and still held them at the dividend distribution date benefit from a 10% bonus on their dividends. The number of shares carrying an entitlement to the bonus dividend cannot exceed 0.5% of the Company's capital per shareholder. The bonus dividend amounts to €0.341 per share.

As interim dividends of €0.15 per share had been paid in the form of cash on 10 December 2018, the balance payable for 2018 amounted to €0.16 per share benefiting from the ordinary dividend and €0.191 per share benefiting from the bonus dividend. The balance of the dividend was paid out on 18 June 2019.

The French government opted for the scrip dividend for the balance of 2018 dividends payable.

The balance of the cash dividend paid to shareholders who did not opt for the scrip dividend for 2018 amounted to €31 million.

On 19 November 2019, EDF's Board of Directors decided to distribute an interim dividend of €0.15 per share in respect of 2019. This interim dividend amounting to a total of €458 million was paid out in the form of new shares (scrip option) or cash on 17 December 2019.

The French government opted for the scrip interim dividend for 2019.

The amount of the cash dividend paid to shareholders who did not opt for the scrip interim dividend for 2019 amounted to €27 million.

Note 25 Additional equity

Additional equity at 31 December 2019 amounts to a net €9,781 million and consists of:

- perpetual subordinated bonds issued by EDF in January 2013 and January 2014 at the value of €4,569 million and €3,466 million respectively;
- perpetual subordinated bonds issued by EDF in September 2018, valued at €1,250 million;

- perpetual subordinated bonds issued by EDF in November 2019, valued at €496 million (€500 million nominal, net of a €4 million redemption premium) (see note 2.2.2).

This net amount includes the effects of foreign currency variations, redemption premiums and the related amortisation.

Payments to bearers of perpetual subordinated bonds amount to €549 million at 31 December 2019 (€551 million at 31 December 2018). This expense is recorded in "Expenses on long-term financial liabilities after hedging" (see note 13).

PERPETUAL SUBORDINATED BONDS

(in millions of currency units)

Issue date	Amount	Currency	Redemption option	Rate
01/2013	1,250	EUR	12 years	5.38%
01/2013	1,250	GBP	13 years	6.00%
01/2013	2,098	USD	10 years	5.25%
01/2014	1,500	USD	10 years	5.63%
01/2014	267	EUR	8 years	4.13%
01/2014	1,000	EUR	12 years	5.00%
01/2014	750	GBP	15 years	5.88%
10/2018	1,250	EUR	6 years	4.00%
11/2019	500	EUR	8 years	3.00%

Note 26 Special concession liabilities

(in millions of euros)

	31/12/2019	31/12/2018
Value in kind of assets	106	108
Revaluation difference	815	840
Additional depreciation	280	240
Rights in hydropower concession assets	1,201	1,188
Value in kind of assets	1,839	1,746
Unamortised financing by the operator	(1,157)	(1,073)
Amortisation of grantor financing	344	332
Contributions received for concessionary plant assets under construction	7	6
Rights in public distribution concession assets*	1,033	1,011
TOTAL SPECIAL CONCESSION LIABILITIES	2,234	2,199

* Rights in public distribution concession assets concern the Island Energy Systems (SEI) public electricity distribution concessions.

Note 27 Provisions for risks

(in millions of euros)	31/12/2018	Increases		Decreases			Other	31/12/2019
		Operating ⁽³⁾	Financial	Utilisations ^{(1) (3)}	Reversals ⁽³⁾	Financial		
Provisions for unrealised exchange losses ⁽²⁾	767		108		-	(107)	-	768
Provisions for losses on contracts	1,446	427	39	(285)	(11)	-	-	1,616
Provisions for other risks	331	229	-	(216)	(40)	-	-	304
PROVISIONS FOR RISKS	2,544	656	147	(501)	(51)	(107)	-	2,688

(1) The €285 million of reversals from provisions for losses on contracts mainly relate to the long-term contract with Dunkerque LNG (€184 million).

(2) The €768 million of provisions for unrealised exchange losses at 31 December 2019 mainly concern losses on hybrid bonds.

(3) See notes 6 and 11.2.

Note 28 Provisions related to nuclear generation – Back-end of the nuclear cycle, plant decommissioning and last cores

The provisions established by EDF for the nuclear generation fleet result from the Law of 28 June 2006 on long-term management of radioactive materials and waste, and the associated implementing provisions concerning secure financing of nuclear expenses.

In compliance with the accounting principles described in note 1.15:

- EDF books provisions to cover all obligations related to the nuclear facilities it operates;
- EDF holds dedicated assets for secure financing of long-term obligations (see note 38).

The calculation of provisions incorporates a level of risks and unknowns that depend on the operations concerned. The valuation of costs also carries uncertainty factors such as:

- changes in legislation, particularly regarding safety, security and environmental protection, and financing of long-term nuclear expenses;
- changes in the regulatory decommissioning process and the time necessary for issuance of administrative authorisations;
- future methods for storing long-lived radioactive waste and provision of storage facilities by the French agency for radioactive waste management ANDRA (Agence nationale pour la gestion des déchets radioactifs);
- changes in certain financial parameters such as discount rates, notably in view of the regulatory limits, inflation rates, or changes in the contractual terms of spent fuel management.

Details of changes in provisions for the back-end of the nuclear cycle, decommissioning and last cores are as follows:

(in millions of euros)	31/12/2018	Increases		Decreases		Other changes ⁽²⁾	31/12/2019
		Operating ⁽³⁾	Financial ⁽¹⁾	Utilisation ⁽³⁾	Reversals ⁽³⁾		
Provisions for spent fuel management	10,698	535	515	(823)	(67)	(35)	10,823
Provisions for removal and conditioning of waste	751	29	36	(29)	-	18	805
Provisions for long-term radioactive waste management	9,846	160	650	(232)	-	107	10,531
Provisions for the back-end of the nuclear cycle	21,295	724	1,201	(1,084)	(67)	90	22,159
Provisions for nuclear plant decommissioning	15,985	105	694	(141)	-	294	16,937
Provisions for last cores	2,526	-	97	-	-	1	2,624
Provisions for decommissioning and last cores	18,511	105	791	(141)	-	295	19,561
TOTAL PROVISIONS RELATED TO NUCLEAR GENERATION	39,806	829	1,992	(1,225)	(67)	385	41,720

(1) The discount effect comprises the €1,543 million cost of unwinding the discount, and the effects of the change of real discount rate in 2019, recognised via the income statement for provisions with no related assets (€449 million) (cost of unwinding the discount).

(2) Other changes mainly include the effects of the change of real discount rate at 31 December 2019 for provisions with related assets (€361 million).

(3) See notes 6 and 11.2.

Concerning non-EDF installations:

- EDF, COGEMA (now Orano Cycle) and the French Atomic Energy Commission (Commissariat à l'énergie atomique or CEA) signed an agreement in December 2004 which transferred the management and financing of final shutdown, decommissioning and waste recovery and reconditioning for the UP1 reprocessing facility at Marcoule to the CEA. In return, EDF paid the CEA a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs;
- EDF, AREVA and AREVA NC (now Orano Cycle) signed two agreements in December 2008 and July 2010 defining the legal and financial terms for the transfer to AREVA NC of EDF's contractual obligations regarding its financial contribution to the dismantling of La Hague installations and the recovery and conditioning of waste. In application of those agreements, EDF paid AREVA NC a one-time financial contribution covering its full share of the cost of outstanding operations, while remaining the owner of its final waste and bearing only the transport and storage costs.

28.1 Provisions for spent nuclear fuel management

EDF's currently adopted strategy with regards to the fuel cycle, in agreement with the French State, is to process spent fuel and to recycle the separated plutonium in the form of MOX fuel (Mixed OXide of plutonium and uranium).

The quantities processed by Orano at the request of EDF, totalling approximately 1,100 tonnes per year, are determined based on the quantity of recyclable plutonium in the reactors that are authorised to load MOX fuel.

Consequently, provisions for spent fuel cover services associated with the following:

- removal of spent fuel from EDF's generation centres, as well as reception and interim storage;
- processing, including conditioning and storage of recyclable matter.

The processing expenses included in these provisions exclusively concern spent fuel that can be recycled in existing facilities, including the portion in reactors but not yet irradiated.

Expenses are measured based on forecast physical flows at the year-end, with reference to the contracts with Orano which define the terms for implementation of the framework agreement for the period 2008-2040. The most recent contract, signed on 5 February 2016, covers the period 2016-2023. These contracts contain price indexes that are revised annually.

In 2018 the Board of Directors approved resumption of recycling of uranium from reprocessing (which had been suspended in 2013 pending availability of a new industrial schema), with loading of the first fuel assemblies scheduled for 2023, subject to technical adaptations and the necessary authorisations from the Nuclear Safety Authority. The objective is to start recycling in certain 900MW units, and later in certain 1300MW units. The corresponding contracts were signed with the respective suppliers in the second quarter of 2018. In 2019 EDF continued to monitor the plants' preparation trajectory with reference to those contracts.

The portion of the provision for spent fuel management relating to uranium from reprocessing (€759 million) will be recovered once all the industrial, regulatory and economic conditions for resumption of uranium recycling have been fulfilled, but

EDF has no control over fulfilment of some of these conditions (currently, no advance timetable has been set).

This provision also covers long-term storage of spent fuel that cannot currently be recycled in existing installations: plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis until fourth-generation reactors become available. Dedicated assets are held in association with this provision (see note 38.2.4).

28.2 Provision for waste removal and conditioning – Provision for long-term radioactive waste management

Provisions for waste removal and conditioning

The provisions for waste removal and conditioning are reported separately from 1 January 2017.

They cover the following future expenses for radioactive waste resulting from operations or decommissioning (apart from spent fuel):

- characterisation and conditioning of waste;
- interim storage of waste.

Equipment assembly for the conditioning and intermediate storage facility for radioactive waste (*installation de conditionnement et d'entreposage des déchets activés* – ICEDA) was completed in December 2018 and pre-service testing is currently in process. Information on the identification of EIP equipment (equipment that is important for protection of interests) has been added to the commissioning permit application (DAMS) and the documents required for examination of the commissioning authorisation application sent to the ASN. The ICEDA is expected to start operations in the first half of 2020.

Provisions for long-term radioactive waste management

These provisions concern future expenses for:

- removal and storage of radioactive waste resulting from decommissioning of nuclear installations operated by EDF;
- interim storage, removal and storage of radioactive waste packages resulting from spent fuel processing;
- direct storage, where relevant, of spent fuel that cannot be recycled in existing installations: specifically plutonium fuel (MOX) or uranium fuel derived from enriched processing, and fuel from Creys-Malville and Brennilis;
- EDF's share of the costs of studies, construction, operation and maintenance, shutdown and surveillance of existing and future storage centres.

The volumes of waste concerned by provisions include existing packages of waste and all waste to be conditioned, resulting from plant decommissioning or spent fuel processing at La Hague (comprising all fuel in reactors at 31 December, irradiated or otherwise). These volumes are regularly reviewed, in keeping with the data declared for the purposes of the national waste inventory undertaken by ANDRA.

The provisions for long-term radioactive waste management break down as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Very low-level and low and medium-level waste	1,561	1,278
Long-lived low-level waste	330	292
Long-lived medium and high-level waste	8,640	8,276
PROVISIONS FOR LONG-TERM RADIOACTIVE WASTE MANAGEMENT	10,531	9,846

Very low-level and low and medium-level waste

Very low-level waste mainly comes from nuclear plant decommissioning, and generally takes the form of rubble (concrete, scrap metal, insulating materials and piping). This type of waste is stored at surface level at the Morvilliers storage centre managed by ANDRA.

Low and medium-level waste comes from nuclear facilities (gloves, filters, resins). This type of waste is stored at surface level at the Soulaines storage centre managed by ANDRA.

The cost of removing and storing short-lived waste (very low-level and low and medium-level) is assessed on the basis of current contracts with transporters, Cyclife France (for waste processing) and ANDRA for operation of the existing storage centres. In 2019, the cost and inventory assumptions were updated by applying a long-term projection based on time series analysis of past waste removal and better characterisation of future volumes. The effects resulting from the work on updating cost estimates led to a €206 million increase in the provision (with an unfavourable effect of €131 million on the income statement, while the rest of the change was recognised *via* adjustments to fixed assets).

Long-lived low-level waste

Long-lived low-level waste belonging to EDF essentially consists of graphite waste from the ongoing decommissioning of the former UNGG (natural uranium graphite gas-cooled) reactors.

As this waste has a long lifetime but is lower-level than long-lived medium and high-level waste, specific subsurface storage requirements apply under the French Law of 28 June 2006.

Following the initial geological investigations, in July 2015 ANDRA remitted a report on the proposed storage centre for long-lived low-level waste on a site located in the Soulaines region (Aube) in France. This report was submitted to the ASN for its opinion. Uncertainties remain about the site's capacity to accommodate all of the waste included in the baseline inventory of the long-lived low-level waste storage facility. Further studies are planned under the 2016-2018 period of the National Plan for the Management of Radioactive Materials and Waste (PNGMDR), concerning both the feasibility of this storage centre and the search for additional waste management solutions. A general industrial strategy for management of all long-lived low-level radioactive waste is currently under examination prior to finalisation under the National Plan.

Long-lived medium and high-level waste

Long-lived medium and high-level waste essentially comes from processing of spent fuel, and to a lesser extent waste resulting from nuclear plant decommissioning (metallic components that have been inside the reactor).

The French Law of 28 June 2006 requires reversible storage in deep geological layers for this type of waste.

The provision established for long-lived medium and high-level waste is the largest component of provisions for long-term radioactive waste management

Until June 2015 the gross value and disbursement schedules for forecast expenses were based on a scenario of industrial geological waste storage, following conclusions presented in the first half of 2005 by a working group formed under supervision of the State involving representatives of the administrations concerned, ANDRA and the producers of waste (EDF, Orano, CEA). EDF applied a reasonable approach to information supplied by this working group, leading to a benchmark cost, for storage of waste from all producers, of €14.1 billion under the economic conditions of 2003 (€20.8 billion under 2011 economic conditions).

In 2012 ANDRA carried out preliminary conceptual studies for the Cigéo geological storage project, after discussing the technical optimisations proposed by the producers of waste.

On this basis, ANDRA drew up figures which, in compliance with the Law of 28 June 2006, were subjected to a consultation process with waste producers started in late 2014 by the French Department for Energy and Climate (Direction générale de l'énergie et du climat or DGEC). In April 2015 EDF and the other producers sent the DGEC their comments on ANDRA's report and a joint estimation of the target Cigéo storage cost due to divergent approaches. All this information was included, together with the ASN's opinion, in a report submitted to the Minister for Ecology, Sustainable Development and Energy.

On 15 January 2016 the Ministry of Ecology, Sustainable Development and Energy issued a Ministerial Order setting the target cost for the Cigéo storage project at

€25 billion under 2011 year-end economic conditions. The cost as defined constitutes an objective to be met by ANDRA, in compliance with safety standards set by the ASN, working in close liaison with the operators of nuclear installations.

Publication of this Order entailed an €820 million adjustment to the provision shown in EDF's financial statements at 31 December 2015. The cost of the Cigéo project defined in the Order has replaced the estimated benchmark cost of €20.8 billion previously used by EDF for its financial statements.

In application of this Ministerial Order, the cost of the Cigéo project will be regularly updated, at least at each key milestone in the course of the project's development (authorisation to create the facility, commissioning, end of the "pilot industrial phase", safety reviews) in accordance with the opinion of the ASN.

Design studies for future facilities are currently in process with ANDRA and stakeholders. They include technical and economic optimisation and the responses to the safety option report sent by ANDRA to the ASN in April 2016. The law of 11 July 2016 also clarified the concept of reversibility. In 2017 ANDRA opted for a new configuration to provide the basis for the preliminary project.

On 11 January 2018, the ASN issued its opinion on the Cigéo safety option file (DOS Cigéo). It considered that the project had reached satisfactory overall technological maturity at that stage. This opinion included a requirement for examination of alternatives to the proposals for storage of bituminous waste at Cigéo. A group of experts appointed by the DGEC in September 2018 to draw up a report on current bituminous waste management concluded in September 2019 that various options were feasible (storage or neutralisation) but stressed the importance of continuing the studies in order to identify the most appropriate option.

Under the schedule prepared by ANDRA, the application to develop Cigéo (classified as a basic nuclear facility) is now due to be made in 2020, with a corresponding extension for obtaining authorisation. After an industrial pilot phase extending to 2030, producers are still currently working on the hypothesis that the first waste packages would be received in 2031. The provision is therefore unaffected by this change to the schedule.

28.3 Decommissioning provisions for nuclear power plants

EDF bears full technical and financial responsibility for decommissioning of the nuclear plants it operates. The decommissioning process is governed by French Law of 13 June 2006, Decree 2007-1557 of 2 November 2007, and the French Environment Code (Articles L. 593-25 and following). It involves the following operations for each site:

- a shutdown declaration, to be made at least two years prior to the planned shutdown date;

Since the Energy Transition Law of 17 August 2015, the final shutdown, which takes place during the operating phase of the basic nuclear facility, is considered separately from dismantling, as a notable change of lesser importance (simply requiring a declaration by the operator to the Minister and the ASN);
- an application for decommissioning, which after examination by the authorities and a public inquiry, leads to a single decree authorising the decommissioning;
- key progress reviews with the ASN, included in a formal safety procedure specific to dismantling operations;
- an internal authorisation procedure for the operator, independent of operational personnel and audited by the ASN, allowing some specific work to be started ahead of the authorised safety procedure;
- finally, once these operations are complete, declassification of the facility to remove it from the legal regime governing basic nuclear facilities.

The decommissioning scenario adopted by EDF complies with France's Environmental Code, which requires as short a period as possible to elapse between final shutdown and dismantling in economically acceptable conditions and in compliance with the principles laid down in Article L. 1333-1 of the Public Health Code (radioprotection) and section II of Article L. 110-1 of the Environmental Code (protection of the environment). The intended end-state is industrial use: the sites will be restored to their original condition and will be reusable for industrial facilities.

The ongoing operations concern plants that were constructed and operated before the current nuclear fleet ("first-generation" plants), and the Superphenix plant and Irradiated Materials Workshop. These operations cover four different technologies: a heavy water reactor (Brennilis), a sodium-cooled fast-neutron reactor (the Superphenix at Creys-Malville), natural uranium graphite gas-cooled (UNGG) reactors (at Chinon, Saint Laurent and Bugey) and a pressurised water reactor (PWR at Chooz). Each of them is a first for EDF, and apart from the PWR, they concern reactor technologies for which there is little or no international experience. They therefore require development of new methods and technologies that are riskier than technologies for which feedback already exists. Decommissioning of the Chooz PWR is benefiting from past experience (essentially in the US and limited), but the reactor has the specificity of being located in a cave, making this a unique operation, generating experience that is not immediately transposable and involves specific risks.

The experience gained from dismantling the Chooz PWR will nonetheless make the studies and estimates of future decommissioning of the nuclear fleet currently in operation ("second-generation" plants) as robust as possible. But so far, neither EDF nor any other operator has begun a decommissioning programme on a scale

comparable to the current PWR fleet, and as a result the estimates include both opportunities and risks, especially the risks associated with the scale effect.

The decommissioning provisions cover future decommissioning expenses as described above (excluding the cost of removing and storing waste, which is covered by the provisions for long-term waste management).

The preliminary dismantling plan and the orientations for the fourth periodic review of Fessenheim (RP4) were sent to the ASN in July 2018. The Consolidated Preliminary Plan (*avant-projet consolidé* or APC) was finalised in late 2018, with more in-depth studies for derisking of the Summary Preliminary Plan (*avant-projet sommaire* or APS). Studies in 2019 focused on preparing the dismantling plan, with the objective of filing the dismantling and RP4 documents in mid-2020.

On 30 September 2019 EDF sent the Minister for the Ecological and Inclusive Transition and the ASN its application requesting approval for the termination of operations, and a declaration of the permanent shutdown of both reactors at Fessenheim nuclear power plant, scheduled for 22 February 2020 for reactor 1 and 30 June 2020 for reactor 2 (see note 2.1.4).

Details of changes in decommissioning provisions for nuclear power plants are as follows:

<i>(in millions of euros)</i>	Increases		Decreases		Other changes ⁽²⁾	2019
	2018	Operating	Financial ⁽¹⁾	Utilisation		
Provisions for decommissioning of nuclear plants in operation	12,480	2	488	(20)	294	13,244
Provisions for decommissioning of shut-down nuclear plants	3,505	103	206	(121)	-	3,693
TOTAL PROVISIONS FOR NUCLEAR PLANT DECOMMISSIONING	15,985	105	694	(141)	294	16,937

(1) Cost of unwinding the discount and effects of changes in the net discount rate for provisions without related assets.

(2) These are changes of estimate with a corresponding adjustment to property, plant and equipment (see note 1.15.1) or reclassifications of provisions.

For nuclear power plants currently in operation (PWR pressurized water reactor plants with 900MW, 1,300MW and N4 reactors)

Until 2013, provisions were estimated based on a 1991 study by the French Ministry of Trade and Industry, which set an estimated benchmark cost for decommissioning expressed in €/MW, confirming the assumptions defined in 1979 by the PEON commission. These estimates had been confirmed from 2009 by a detailed study of decommissioning costs conducted by EDF at the representative site of Dampierre (four 900MW units), and its results were corroborated by an intercomparison with the study carried out by consultants La Guardia, based mainly on the Maine Yankee reactor in the US.

In 2014 the Dampierre study was reviewed by EDF to make sure that the previous calculations were still valid in view of recent developments and experience, both internationally and internally. For this revision, the decommissioning provisions for plants in operation were based on costs resulting from the Dampierre study, in order to incorporate best estimates and feedback from inside and outside France. This change of estimate had no significant impact on the level of provisions at 31 December 2014.

Between June 2014 and July 2015, an audit of dismantling costs for EDF's nuclear fleet currently in operation was conducted by specialised consulting firms, at the request of the French Department for Energy and Climate (Direction générale de l'énergie et du climat or DGEC). On 15 January 2016 the DGEC published a summary of the audit report. It stated that although estimating the cost of decommissioning nuclear reactors is a demanding exercise due to relatively limited past experience, the prospects of changes in techniques, and the distant timing of the expenditure, overall, the audit confirmed EDF's estimate of decommissioning costs for its nuclear fleet currently in operation. The DGEC also made a number of recommendations to EDF following this audit.

In 2016, EDF revised the decommissioning estimate, in order to incorporate the audit recommendations and past experience gained from dismantling operations for first-generation reactors (particularly Chooz A).

A detailed analytical approach was used to revise this estimate, identifying all costs for the engineering, construction work, operation and waste processing involved in future decommissioning of reactors currently in operation. This led to figures based on detailed timetables for plant decommissioning. The approach adopted made it possible to explore more thoroughly the assessment of costs specific to the initial units of each series, estimated for each series based on transposition coefficients applied to the baseline costs for the initial 900MW unit, and the series and mutualisation effects, as these costs and effects are inherent to the fleet's size and configuration.

The natures of the principal mutualisation and series effects used to arrive at the estimate are explained below.

There are several types of mutualisation effects:

- some of them relate to the fact that several reactors may share common buildings and facilities on the same site, and these buildings and facilities will not have to be decommissioned twice. Structurally, decommissioning a pair of reactors on the same site costs less than decommissioning two standalone reactors on two different sites. In France, unlike other countries, there are no single reactors but sites with two or four, and in one case six reactors;
- certain costs are no higher when 2 or 4 reactors are decommissioned on the same site. This is usually the case for surveillance costs and cost of maintaining safe operating conditions on the site;
- waste processing in centralised facilities (for example for dismantling major components) costs less than having several waste processing facilities at the decommissioning location.

Series effects are mainly of two types:

- first, in a fleet using the same technology, many of the studies do not need to be repeated each time;
- second, in a fleet using the same technology, robots and tooling can be largely reused from one site to another.

Such series effects are comparable in nature to the effects observed during construction of the fleet, in terms of studies or component manufacturing plants.

For example, for the 900MW fleet, a series effect of approximately 20% is expected between the first-of-a-kind reactor with 2 units and an average 2-unit reactor.

Series and mutualisation effects in particular explain why it is not appropriate simply to compare the average decommissioning cost per reactor between the French fleet and other countries' nuclear fleets.

The figures only marginally reflect changes in productivity and the learning effect. The external audit of the decommissioning cost for the fleet currently in operation, ordered by the DGEC, considered that the learning effect incorporated into the estimate was conservative.

For reasons of prudence, the estimate also includes an assessment of risks, contingencies and uncertainties.

EDF considers that the work done to revise the estimate answers the recommendations issued after the audit. The approach adopted and its results have been presented to the administrative authority and gave rise to further questions and discussions.

EDF is also continuing to support its analyses through an international comparison, making it sure it takes into consideration a number of factors that could distort direct comparisons, for example differences in the scope concerned by costs estimate, or national and regulatory contexts.

The results of this detailed approach led to limited changes overall in the cost estimate and the associated provisions at 31 December 2016, apart from the consequences of the change in the depreciation period for 900MW series plants (excluding Fessenheim) at 1 January 2016, and the effect of changes in discount rates at 31 December 2016, i.e.:

- an increase of €321 million in the estimated decommissioning costs and an increase of €334 million in the estimated cost of long-term management of long-lived medium-level waste;
- a decrease of €(451) million in the provision for plant decommissioning, and an increase of €162 million in the provision for long-term management of long-lived medium-level waste, with corresponding changes in the underlying assets.

After its revision in 2016, it was decided that the estimate would be reviewed annually. Reviews since 2017 have led to non-significant adjustments.

The scope of the provision for very low-level and low and medium-level waste includes the cost of demolishing back-up diesel facilities and installations for processing control rod cluster guide tubes commissioned in 2019, and this resulted in a €43 million increase in the provision.

For permanently shut-down nuclear power plants

Unlike the PWR fleet currently in operation, the first-generation reactors now shut down used a range of different technologies: a PWR reactor at Chooz A, UNGG (natural uranium graphite gas-cooled) reactors at Bugey, St-Laurent and Chinon, a heavy water reactor at Brennilis, and a sodium-cooled fast neutron reactor at Creys-Malville.

The decommissioning costs are based on contractor quotes, which take account of accumulated industrial experience, unforeseen and regulatory developments, and the latest available figures.

In 2015 the industrial decommissioning strategy for UNGG plants was totally revised. The previously selected strategy was based on a scenario involving "underwater" dismantling of caissons (UNGG reactor buildings) for four of the reactors, with direct graphite storage in a centre currently under examination by

ANDRA (see Long-lived low-level waste, note 28.2). Several new technical developments showed that the alternative "in-air" dismantling solution for the caissons would improve industrial control of operations and was apparently more favourable in terms of safety, radioprotection and environmental impact. The Company therefore selected a new "in-air" dismantling scenario as the benchmark strategy for all six caissons. This scenario includes a consolidation phase, building on experience acquired from dismantling the first caisson before beginning work on the other five. The decommissioning phase will ultimately be longer than previously planned, leading to higher contractor quotes due to the induced operating costs.

Updating the industrial decommissioning scenario for first-generation power plants, particularly UNGG plants, led to a €590 million increase in the provision at 31 December 2015.

After the revision of the estimated cost in 2015, the decision was made that it should be reviewed annually. The 2016 review led to non-significant adjustments, apart from one increase of €125 million for a specific installation (the Irradiated Materials Workshop at Chinon). Since 2017, this annual review has given rise to non-significant adjustments.

The amended industrial scenario in 2015 was presented to the ASN's commissioners on 29 March 2016.

In 2018 the ASN issued its main questions and conclusions about the UNGG strategy file. A consensus was reached regarding "in-air" dismantling for all reactors, the usefulness of an industrial demonstrator, and the timetable for dismantling the first-of-a-kind reactor (Chinon A2), but discussions continued regarding the dismantling timetable for the other 5 reactors. EDF's proposed schedule allows for significant experience-based adjustments (after dismantling the first reactor) before beginning almost simultaneous dismantling of the other 5 reactors. On 12 February 2019, EDF presented all the information justifying EDF's chosen timetable to the ASN's commissioners. The ASN then issued draft decisions that were submitted to public consultation between July and November 2019, setting the deadline for filing regulatory applications for authorisation of dismantling work, and the dismantling schedule to be included in the applications. In those draft decisions, the ASN has acknowledged that the required operations are complex, and that EDF's proposed risk control strategy (industrial demonstrator, significant experience with a first reactor) is justified. However, it is asking for work on the five reactors after the first-of-a-kind reactor to be brought forward slightly and begin no later than 2055.

The results of this consultation, which is now closed, should not fundamentally call into question the draft decisions.

In view of the ASN's draft decisions, the nuclear provisions were increased in 2019 by a total €108 million (via profit and loss): €77 million for decommissioning provisions for permanently shut-down nuclear power plants and €31 million for provisions for long-term radioactive waste management (long-lived low-level waste, very low-level and low and medium-level waste). The final decisions are expected to be issued in 2020.

28.4 Provisions for last cores

These provisions cover the future expenses resulting from scrapping fuel that will only be partially irradiated when the reactor is shut down. They are measured based on:

- the cost of the loss on fuel in the reactor that is not totally spent at the time of final reactor shutdown and cannot be reused due to technical and regulatory constraints;
- the cost of fuel processing, and waste removal and storage operations. These costs are valued in a similar way to provisions for spent fuel management and long-term radioactive waste management.

These unavoidable costs are components of the cost of nuclear reactor shutdown and decommissioning. As such, they are fully covered by provision from the commissioning date and an asset associated with the provision is recognised.

28.5 Discounting of provisions related to nuclear generation and sensitivity analyses

28.5.1 Discount rate and inflation rate

Calculation of the discount rate and inflation rate

The discount rate is determined based on long-series data for a sample of bonds with maturities as close as possible to that of the liability. However, some expenses covered by these provisions will be disbursed over periods significantly longer than the duration of instruments generally traded on the financial markets.

The benchmark used to determine the discount rate is the sliding 10-year average of the return on French OAT 2055 treasury bonds which have a similar duration to the obligations, plus the spread of corporate bonds rated A to AA, which include EDF.

The methodology used to determine the discount rate, particularly the reference to sliding 10-year averages, is able to prioritise long-term trends in rates, in keeping with the long-term horizon for disbursements. The discount rate is therefore revised in response to structural developments in the economy leading to medium and long-term changes.

Until 31 December 2018, the assumed inflation rate used was determined in line with the consensus forecast and expected inflation based on the returns on inflation-linked bonds. From 2019, as declining forecasts made short-term consensus forecast projections less appropriate, the inflation rate used was deduced from inflation swaps.

Considering the long durations of nuclear obligations for which the long-term inflation rate is needed, and the volatility according to the date of the swaps, the assumed average inflation rate at 31 December 2019 is thus 1.4% (1.5% at 31 December 2018).

The discount rate determined is thus 3.7% at 31 December 2019, assuming inflation of 1.4% (3.9% and 1.5% respectively at 31 December 2018), giving a real discount rate of 2.3% at 31 December 2019 (2.4% at 31 December 2018).

Regulatory discount rate limit

The discount rate applied must comply with two regulatory limits. Under the amended decree of 23 February 2007 and the ministerial order of 21 March 2007,

itself modified by the order of 29 December 2017, the discount rate must be lower than:

- a regulatory maximum, set until 31 December 2026 as the weighted average of two terms, the first set at 4.3%, and the second corresponding to the arithmetic average over the 48 most recent months of the TEC 30-year rate plus 100 points. The weighting given to the first constant term of 4.3% reduces on a straight-line basis from 100% at 31 December 2016 to 0% at 31 December 2026;
- and the expected rate of return on assets covering the liability (dedicated assets). The ceiling rate based on the TEC 30-year rate is 3.8% (3.75% rounded up to 3.8%) at 31 December 2019 (4.0% at 31 December 2018).

The discount rate used at 31 December 2019 is 3.7%.

By a letter dated 12 February 2020, the Minister of Energy and the Minister of the Economy informed EDF of their decisions to change certain regulations regarding secure financing of nuclear expenses:

- the regulatory discount rate limit will be expressed in real value, and will correspond to the Ultimate Forward Rate applicable at the date concerned, published by the European Insurance and Occupational Pensions Authority, plus 150 base points. This change will be introduced gradually on a straight-line basis over 5 years from 1 January 2020, starting from a real rate of 2.3%;
- the obligation to hold assets providing a coverage rate between 100% and 110%, to offset the impact on provisions of changes in assumptions, will be cancelled and the threshold above which withdrawals can be made from those assets will be raised from 110% to 120%. The remaining obligation in respect of 2018 (€797 million) will nonetheless remain applicable. No allocation is required in respect of 2019;
- the limitation period for necessary measures by the administrative authorities in the event of a shortfall in coverage will be increased from 3 to 5 years from the end of the accounting year in which that shortfall was recorded.

28.5.2 Analyses of sensitivity to macro-economic assumptions

Sensitivity to assumptions concerning costs, inflation rate, discount rate, and disbursement schedules can be estimated through comparison of the gross amount estimated under year-end economic conditions with the present value of the amount.

	2019		2018	
	Costs based on year-end economic conditions	Amounts in provisions at present value	Costs based on year-end economic conditions	Amounts in provisions at present value
<i>(in millions of euros)</i>				
Spent fuel management	19,455	10,823	18,737	10,698
Waste removal and conditioning	1,243	805	1,194	751
Long-term radioactive waste management	32,372	10,531	30,970	9,846
BACK-END NUCLEAR CYCLE EXPENSES	53,070	22,159	50,901	21,295
Decommissioning of nuclear power plants in operation	21,134	13,244	20,755	12,480
Decommissioning of shut-down nuclear power plants	6,428	3,693	6,576	3,505
Last cores	4,331	2,624	4,346	2,526
DECOMMISSIONING AND LAST CORE EXPENSES	31,893	19,561	31,677	18,511

This approach can be complemented by estimating the impact of a change in the discount rate on the discounted value.

In application of Article 11 of the decree of 23 February 2007, the following table reports these details for the main components of provisions for the back-end of the nuclear cycle, decommissioning of nuclear plants and last cores for EDF:

(in millions of euros)	Amounts in provisions at present value	Sensitivity to discount rate			
		Balance sheet provision		Pre-tax net income	
	31/12/2019	0.20%	-0.20%	0.20%	-0.20%
BACK-END NUCLEAR CYCLE EXPENSES					
■ spent fuel management	10,823	(228)	249	196	(215)
■ waste removal and conditioning	805	(25)	27	16	(17)
■ long-term radioactive waste management	10,531	(659)	750	554	(636)
DECOMMISSIONING AND LAST CORE EXPENSES					
■ decommissioning of nuclear power plants in operation	13,244	(506)	529	7	(7)
■ decommissioning of shut-down nuclear power plants	3,693	(139)	150	139	(150)
■ last cores	2,624	(88)	94	-	-
TOTAL	41,720	(1,645)	1,799	912	(1,025)

Note 29 Other provisions for decommissioning

Other provisions for decommissioning principally concern fossil-fired power plants.

The costs of decommissioning fossil-fired power plants are calculated using regularly updated studies based on estimated future costs, measured by reference to the charges recorded on past operations and the most recent estimates for plants still in operation.

The provision recorded at 31 December 2019 reflects the most recent known cost estimates and includes rehabilitation costs for generation sites.

Note 30 Provisions for employee benefits

Changes in provisions for employee benefits were as follows:

(in millions of euros)	31/12/2018	Increases		Decreases		31/12/2019
		Operating ^{(1) (4)}	Financial	Operating ^{(2) (4)}	Financial ⁽³⁾	
Provisions for post-employment benefits	10,304	534	592	(748)	(271)	10,411
Provisions for long-term benefits	936	140	21	(78)	-	1,019
PROVISIONS FOR EMPLOYEE BENEFITS	11,240	674	613	(826)	(271)	11,430

(1) Including a past service cost of €409 million, amortisation of actuarial losses amounting to €255 million, and unvested benefits of €10 million.

(2) Including €(802) million for employers' contributions and €(23) million for actuarial gains.

(3) For the expected return on fund assets.

(4) See notes 6 and 11.2.

DETAILS OF CHANGES IN THE PROVISIONS:

(in millions of euros)	Obligations	Fund assets	Obligations net of fund assets	Unrecognised past service cost	Unrecognised actuarial gains and losses	Provision in the balance sheet
BALANCE AT 31/12/2018	26,897	(10,913)	15,984	(39)	(4,705)	11,240
Net expense for 2019	1,023	(271)	752	10	231	993
Unrecognised actuarial gains and losses	3,887	(1,596)	2,291	-	(2,291)	-
Contributions to funds	-	-	-	-	-	-
Benefits paid	(1,268)	465	(803)	-	-	(803)
BALANCE AT 31/12/2019	30,539	(12,315)	18,224	(29)	(6,765)	11,430

6. Financial statements

Financial statements

The actuarial gains and losses on obligations generated over 2019 amount to €3,887 million, and are mainly associated with changes in the discount rate and inflation rate (€4,244 million), the impact of the law on social security system

funding for 2020 (€267 million), the updating of the wage law (€125 million) and experience adjustments of €16 million.

POST-EMPLOYMENT AND LONG-TERM EMPLOYEE BENEFIT EXPENSES:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
Current service cost ⁽¹⁾	409	529
Interest expenses (discount effect)	614	574
Expected return on fund assets	(271)	(267)
Amortisation of unrecognised actuarial gains and losses – post-employment benefits	99	241
Change in actuarial gains and losses – long-term benefits	132	(16)
Effect of plan curtailment or settlement	-	-
Past service cost – vested benefits	-	-
Past service cost – unvested benefits	10	10
NET CHARGES RELATED TO POST-EMPLOYMENT BENEFITS AND LONG-TERM BENEFITS	993	1,071
including:		
Operating expenses ⁽²⁾	651	764
Financial expenses	342	307

(1) The lower past service cost compared to 2018 essentially results from changes in actuarial assumptions, principally the decrease in the wage increase rate (-0.1%) and the rise in the discount rate (+0.4%).

(2) In 2019, this amount principally corresponds to operating increases of €674 million net of reversals for actuarial gains and losses (€23) million.

30.1 Provisions for post-employment benefits

Details of these provisions are shown below:

<i>(in millions of euros)</i>	31/12/2018	Increases		Decreases		31/12/2019
		Operating	Financial	Operating	Financial	
Provisions for post-employment benefits	10,304	534	592	(748)	(271)	10,411
comprising:						
Pensions	7,358	293	456	(590)	(260)	7,257
CNIEG expenses	453	7	10	(13)	-	457
Benefits in kind (energy)	1,888	157	95	(122)	-	2,018
Retirement gratuities	(5)	36	13	(1)	(11)	32
Other benefits	611	41	18	(22)	-	648

<i>(in millions of euros)</i>	Obligations	Fund assets	Unrecognised past service cost	Unrecognised actuarial gains and losses	Provision in the balance sheet
Provisions for post-employment benefits at 31/12/2019	29,519	(12,314)	(29)	(6,765)	10,411
comprising:					
Pensions	22,576	(11,764)	-	(3,556)	7,257
CNIEG expenses	457	-	-	-	457
Benefits in kind (energy)	4,847	-	-	(2,829)	2,018
Retirement gratuities	602	(534)	(13)	(23)	32
Other benefits	1,037	(16)	(16)	(357)	648

<i>(in millions of euros)</i>	Obligations	Fund assets	Unrecognised past service cost	Unrecognised actuarial gains and losses	Provision in the balance sheet
Provisions for post-employment benefits at 31/12/2018	25,961	(10,913)	(39)	(4,705)	10,304
comprising:					
Pensions	20,036	(10,402)	-	(2,277)	7,358
CNIEG expenses	431	-	-	22	453
Benefits in kind (energy)	4,110	-	-	(2,222)	1,888
Retirement gratuities	550	(496)	(20)	(39)	(5)
Other benefits	834	(15)	(19)	(189)	611

30.2 Provisions for other long-term benefits for current employees

The amount of obligations for other long-term benefits awarded to current employees is identical to the corresponding balance sheet provisions. Details are as follows:

<i>(in millions of euros)</i>	31/12/2018	Increases		Decreases		31/12/2019
		Operating	Financial	Operating		
Provisions for other long-term benefits for current employees	936	140	21	(78)		1,019
comprising:						
Annuities following work-related accident and illness	799	122	18	(69)		870
Long service awards	118	15	3	(7)		129
Other	19	3	-	(2)		20

30.3 Fund assets

Fund assets amount to €12,314 million at 31 December 2019 (€10,913 million at 31 December 2018) and are principally allocated to coverage of the past specific benefits earned under the special pension system (€11,764 million) and retirement gratuities (€534 million).

The value of fund assets increased during the year, mainly as a result of favourable changes on the financial markets, particularly the bond markets.

Investments under the contracts concerned break down as follows:

<i>(in millions of euros)</i>	31/12/2019	31/12/2018
TOTAL FUND ASSETS	12,314	10,913
Assets funding special pension benefits	11,764	10,402
(%)		
Equities	31%	27%
Bonds and monetary instruments	69%	73%
Assets funding retirement gratuities	534	496
(%)		
Equities	34%	27%
Bonds and monetary instruments	66%	73%
Assets funding other benefits	16	15

30.4 Actuarial assumptions

The main actuarial assumptions used for provisions for post-employment benefits and long-term employee benefits under the IEG system are summarised below:

- the discount rate is 1.30% at 31 December 2019 (2.30% at 31 December 2018);
- the inflation rate is estimated at 1.30% at 31 December 2019 (1.50% at 31 December 2018);
- the average residual period of employment is 19.5 years;
- the staff turnover rate is considered non-significant;
- the *tarif agent* (special energy price for EDF employees) includes changes in taxes based on that tariff;
- the expected return on fund assets covering past specific benefits under the special pension system is 2.55% for 2019 (2.37% for 2018);
- the expected return on fund assets covering retirement gratuities is 2.21% for 2019 (1.99% for 2018).

In France, the discount rate used for employee benefit obligations is determined by applying the yield rate on high-quality corporate bonds of appropriate duration to maturities corresponding to the future disbursements resulting from these

obligations. For longer durations, the calculation also takes into consideration data from a wider selection of corporate bonds adjusted for comparability with the high-quality bonds, given the smaller panel of bonds with these durations since 2017. The substantial decrease in the discount rate (100 bp) essentially relates to the decrease in risk-free rates observed over 2019.

Until 31 December 2018, the assumed inflation rate used was determined in line with the consensus forecast and expected inflation based on the returns on inflation-linked bonds. From 2019, as declining forecasts made short-term consensus forecast projections less appropriate, the inflation rate used was deduced from inflation swaps.

The obligations are based on wage increase assumptions that are differentiated by age group and employee category, with an average annual rise of 2.4% including inflation for a projected full career.

The wage law used to calculate obligations was updated in 2019 by applying wage increase rates observed over the period 2015-2018 (adjusted for non-recurring effects), instead of the changes observed over the period 2010-2012 adjusted by a coefficient to reflect the lower expected long-term wage increases. This update had no significant impact on the valuation of the obligations.

The mortality table used to calculate obligations is based on the INSEE 2013-2070 generation table (produced by the French statistics office), adjusted for specificities of the IEG (gas and electricity sector) system.

Note 31 Provisions for other expenses

<i>(in millions of euros)</i>	31/12/2018	Operating increases		Decreases		31/12/2019
				Utilisations	Reversals	
Provisions for:						
■ Personnel expenses	83	69	(66)	(2)	-	84
■ Replacement of assets operated under concessions	268	11		(1)	(6)	272
■ Other expenses	515	193	(178)	(14)		516
PROVISIONS FOR OTHER EXPENSES	866	273	(244)	(17)	(6)	872

Note 32 Liabilities

(in millions of euros)	Maturity			Gross value at 31/12/2019	Gross value at 31/12/2018
	< 1 year	1–5 years	> 5 years		
Liabilities					
Bonds	3,781	11,081	35,710	50,572	50,068
Borrowings from financial institutions	-	-	1,289	1,289	1,154
Other borrowings	1,833	7	5	1,845	2,011
Other financial liabilities:				-	
■ Advances on consumption	1	5	20	26	26
■ Other	1,439	-	-	1,439	1,385
Financial liabilities (see Note 33)	7,054	11,093	37,024	55,171	54,644
Advances and progress payments received ⁽¹⁾	7,050	-	-	7,050	7,134
Trade payables and related accounts	7,572	108	40	7,720	7,447
Tax and social security liabilities ⁽²⁾	8,357	-	-	8,357	8,157
Liabilities related to fixed assets and related accounts	2,172	-	-	2,172	2,670
Other liabilities ⁽³⁾	14,072	1	-	14,073	14,955
Operating, investment and other liabilities	32,173	109	40	32,322	33,229
Cash instruments	3,136	640	611	4,387	3,462
Deferred income ⁽⁴⁾	610	915	1,587	3,112	3,116
TOTAL LIABILITIES	50,023	12,757	39,262	102,042	101,585

(1) Advances and progress payments received principally include monthly standing order payments by EDF's residential and business customers, amounting to €6,719 million at 31 December 2019 (€6,827 million at 31 December 2018).

(2) In 2019 this item includes an amount of €1,463 million for the CSPE to be collected by EDF on energy supplied but not yet billed (€1,521 million in 2018).

(3) Mainly the amount of current accounts, cash pooling and underwriting and cash management agreements with subsidiaries.

(4) Deferred income at 31 December 2019 comprises the partner advances made to EDF under nuclear plant financing plans and the associated long-term contracts, amounting to €1,710 million (€1,663 million in 2018). Deferred income on long-term contracts also includes the advance paid to EDF in 2010 under the agreement with the Exeltium consortium. This advance is transferred to the income statement progressively over the term of the contract.

Note 33 Financial liabilities

<i>(in millions of euros)</i>	Balance at 31/12/2018	New borrowings	Repayments	Translation adjustments	Other	Balance at 31/12/2019
Bonds <i>(in euros)</i>	1,013	-	(181)	-	-	832
Bonds <i>(in other currencies)</i>	16,329	-	(2,860)	295	-	13,764
Euro-Medium Term Notes (EMTN) <i>(in euros)</i> ⁽¹⁾	19,983	1,250	(300)	-	-	20,933
Euro-Medium Term Notes (EMTN) <i>(in other currencies)</i> ⁽²⁾	12,743	1,814	-	486	-	15,043
Bonds	50,068	3,064	(3,341)	781	-	50,572
Long-term loans <i>(in euros)</i>	1,154	250	(115)	-	-	1,289
Borrowings from financial institutions	1,154	250	(115)	-	-	1,289
Negotiable debt instruments <i>(in euros)</i> ⁽³⁾	955	-	(170)	-	-	785
Negotiable debt instruments (non euro) ⁽³⁾	1,041	5	-	-	-	1,046
Contractual financial borrowings	15	1	(2)	-	-	14
Other borrowings	2,011	6	(172)	-	-	1,845
Total borrowings	53,233	3,320	(3,628)	781	-	53,706
Advances on consumption	26	-	-	-	-	26
Miscellaneous advances ⁽⁴⁾	108	18	(11)	-	338	453
Bank overdrafts	184	-	-	-	(162)	22
Deferred bank debits	29	-	-	-	(13)	16
Interest payable	1,064	-	-	-	(116)	948
Total other financial liabilities	1,385	18	(11)	-	47	1,439
TOTAL FINANCIAL LIABILITIES	54,644	3,338	(3,639)	781	47	55,171

(1) On 2 December 2019, EDF launched a €1.25 billion senior bond issue (see note 2.2.4).

(2) On 27 November 2019, EDF launched a €2 billion senior bond issue (see note 2.2.4).

(3) Issues net of repayments.

(4) Including €338 million relating to the 2020 Reset Perpetual Subordinated Notes on which EDF exercised its redemption option on 29 January 2020 (as part of a tender offer concerning several existing hybrid bonds), which is classified in other financial liabilities at 31 December 2019.

Bond redemptions, totalling €3,341 million, concern bonds in euros and other currencies that have reached maturity.

33.1 Breakdown of loans by currency, before and after hedging instruments

<i>(in millions of euros)</i>	Debt structure in balance sheet				Impact of hedging instruments		Debt structure after hedging			
	Non-euro	In euros	% Non-euro	% of debt	Non-euro	In euros	Non-euro	In euros	% Non-euro	% of debt
Total I – Euros		23,853		44		24,699		48,552		90
CHF	550	507	2	1	(550)	(507)	-	-	-	-
GBP	7,385	8,680	29	16	(3,000)	(3,526)	4,385	5,154	100	10
HKD	2,416	276	1	1	(2,416)	(276)	-	-	-	-
JPY	137,000	1,124	4	2	(137,000)	(1,124)	-	-	-	-
NOK	1,000	101	-	-	(1,000)	(101)	-	-	-	-
USD	21,530	19,165	64	36	(21,530)	(19,165)	-	-	-	-
Total II - Non euro currencies		29,853	100	56		(24,699)		5,154	100	10
TOTAL I + II		53,706		100		-		53,706		100

The nominal value of hedging instruments included in off-balance sheet commitments (see note 35.1) has no effect on loans in the balance sheet.

33.2 Breakdown of loans by type of interest rate before and after hedging

<i>(in millions of euros)</i>	Debt structure in balance sheet			Impact of hedging instruments	Debt structure after hedging		
	Total	% 31/12/2019	% 31/12/2018		Total	% 31/12/2019	% 31/12/2018
Long-term borrowings and EMTN	51,312			(23,632)	27,680		
Short-term borrowings	1,845			-	1,845		
Borrowings at fixed rate	53,157	99	99	(23,632)	29,525	55	55
Long-term borrowings and EMTN	549			23,632	24,181		
Short-term borrowings	-			-	-		
Borrowings at floating rate	549	1	1	23,632	24,181	45	45
TOTAL	53,706	100	100	-	53,706	100	100

Note 34 Unrealised foreign exchange gains

Unrealised foreign exchange gains at 31 December 2019 amount to €219 million (€296 million at 31 December 2018), of which €26 million concern a perpetual

bond in pounds sterling and €128 million concern a bond in pounds sterling that is entirely hedged by cross-currency swaps.

Other information

Note 35 Financial instruments

35.1 Off-balance sheet commitments related to currency and interest rate derivatives

EDF uses financial instruments to limit the impact of foreign exchange rate risks and interest rate risks.

<i>(in millions of euros)</i>	31/12/2019		31/12/2018	
	To be received (notional)	To be given (notional)	To be received (notional)	To be given (notional)
1 – Interest rate transactions				
Short-term interest rate swaps				
EUR	-	-	-	-
Long-term interest rate swaps				
EUR	8,239	8,239	7,140	7,140
USD	3,294	3,294	2,795	2,795
GBP	3,661	3,661	4,845	4,845
JPY	-	-	-	-
Sub-total	15,194	15,194	14,780	14,780
2 – Exchange rate transactions				
Forward transactions				
EUR	29,756	24,095	22,438	22,982
CAD	205	305	325	190
USD	17,681	21,333	15,431	16,868
GBP	5,800	6,579	7,534	5,290
CHF	958	1,177	517	196
HUF	-	-	1	1
ILS	273	273	153	153
PLN	343	389	259	305
JPY	96	857	294	955
CNY	2	2	13	13
MXN	106	105	84	84
Other currencies	568	568	110	110
Long-term currency swaps				
BRL	-	19	-	-
EUR	5,308	35,013	8,578	38,230
JPY	1,124	65	1,089	-
USD	20,985	3,128	24,284	3,995
GBP	13,035	2,234	12,001	4,358
CHF	507	-	488	444
ILS	93	93	89	89
PLN	14	10	9	5
NOK	101	-	100	-
MXN	-	12	-	11
HKD	276	-	269	-
Sub-total	97,231	96,257	94,066	94,279
3 – Securitisation swaps	135	135	194	194
4 – Operations on market securities	-	-	1,136	1,280
Purchases and sales of options				
TOTAL FINANCIAL OFF-BALANCE SHEET COMMITMENTS	112,560	111,586	110,176	110,533
5 – Commodity swaps				
Coal <i>(in millions of tonnes)</i>	2	2	4	4
Oil products <i>(in thousands of barrels)</i>	6,767	6,767	7,252	7,252

The amounts shown in the above table are the nominal values of contracts, translated where necessary using 2019 year-end exchange rates (regardless of whether they are classified as hedges).

35.2 Impacts of financial instrument transactions on net income

<i>(in millions of euros)</i>	2019	2018
Instruments not classified as hedges		
Interest rate instruments*	160	114
Forex instruments	239	156
Instruments classified as hedges		
Interest rate instruments	735	647
Forex instruments	359	172

* Including interest on swaps.

35.3 Fair value of derivative financial instruments

The fair value of currency and interest rate swaps was calculated by discounting future cash flows using year-end market exchange and interest rates, over the remaining term of the contracts (market value includes accrued interest).

The book value of off-balance sheet derivatives includes accrued interest, equalisation payments and premiums paid or received, plus translation adjustments, which are already booked in EDF's accounts. The difference between book value and market value is the unrealised gain or loss.

The fair value of derivative financial instruments reported off-balance sheet at 31 December 2019 as calculated by EDF is as follows:

<i>(in millions of euros)</i>	Book value	Fair value
Interest rate hedges		
■ Interest rate swaps	146	2,241
Exchange rate hedges		
■ Forward exchange transactions and currency swaps	(20)	38
■ Cross-currency swaps	1,190	906
Commodity hedges		
■ Coal	-	39
■ Oil products	-	2
TOTAL	1,316	3,226

Note 36 Other off-balance sheet commitments and operations

At 31 December 2019, off-balance sheet commitments related to operations, financing and investments (other than electricity supply commitments and partnership agreements) comprise the following:

<i>(in millions of euros)</i>	Maturity				31/12/2019	31/12/2018
	< 1 year	1–5 years	5–10 years	> 10 years		
Off-balance sheet commitments given	12,807	18,845	11,904	11,169	54,725	53,865
Operating commitments	6,008	13,509	10,936	7,489	37,942	40,081
■ Commitments related to fuel and energy purchases	3,034	10,405	8,352	7,290	29,081	32,232
■ Other operating commitments	2,974	3,104	2,584	199	8,861	7,849
Investment commitments	3,049	3,959	459	173	7,640	6,902
Financing commitments	3,750	1,377	509	3,507	9,143	6,882
Off-balance sheet commitments received	2,238	9,955	602	258	13,053	13,268
Operating commitments	1,234	888	602	258	2,982	2,941
Investment commitments	-	-	-	-	-	31
Financing commitments	1,004	9,067	-	-	10,071	10,296

36.1 Commitments given

In almost all cases, commitments given are reciprocal, and the third parties concerned are under an obligation to supply EDF with assets or services related to operating, investing and financing transactions.

At 31 December 2019, these commitments mature as follows:

<i>(in millions of euros)</i>	Maturity				31/12/2019	31/12/2018
	< 1 year	1–5 years	5–10 years	> 10 years		
Electricity purchases and related services	1,346	3,607	3,353	4,363	12,669	14,492
Nuclear fuel purchases	1,688	6,798	4,999	2,927	16,412	17,740
FUEL AND ENERGY PURCHASE COMMITMENTS	3,034	10,405	8,352	7,290	29,081	32,232

Electricity purchases and related services

Electricity purchase commitments mainly concern:

- Island Energy Systems (SEI), which has given commitments to purchase electricity generated from bagasse and coal, and electricity generated by the plants of EDF's subsidiary PEI;
- hedging contracts: these are forward purchases, for which the volumes and prices are set in contracts with EDF Trading.

In addition to the obligations reported above and under Article 10 of the Law of 10 February 2000, in mainland France, EDF is obliged, at the producer's request and subject to compliance with certain technical features, to purchase the power produced by co-generation plants and renewable energy generation units (wind turbines, small hydro-electric plants, photovoltaic power, etc.).

The additional costs generated by this obligation are offset, after validation by the CRE, by the CSPE. These purchase obligations total 57TWh for 2019 (53TWh for 2018), including 7TWh for co-generation (7TWh for 2018), 30TWh for wind power (26TWh for 2018), 11TWh for photovoltaic power (9TWh for 2018) and 3TWh for hydropower (3TWh for 2018).

Nuclear fuel purchases

Commitments for purchases of nuclear fuel arise from supply contracts for the nuclear plants intended to cover EDF's needs for uranium and fluorination, enrichment and fuel assembly production services.

The decrease in nuclear fuel purchases in 2019 is mainly explained by the execution of existing contracts.

36.1.2 Other operating commitments

These are mostly commitments undertaken by EDF through signature of orders relating to operations or contracts in progress, related guarantees, and commitments as lessee under irrevocable operating lease contracts principally for premises, equipment and vehicles. The corresponding rents are subject to renegotiation at intervals defined in the contracts.

The increase in these commitments mainly relates to energy savings certificates and lease commitments.

36.1.3 Investment commitments

Investment commitments are mostly commitments for acquisitions of property, plant and equipment. The increase in EDF's commitments for acquisitions of intangible assets and property, plant and equipment mainly relates to the Flamanville 3 EPR.

36.1.1 Fuel and energy purchase commitments

In the course of its ordinary generation and supply activities, EDF has entered into long-term contracts for purchases of electricity, other energies and commodities and nuclear fuel, for periods of up to 20 years.

36.1.4 Financing commitments

These are commitments by EDF to its subsidiaries, in 2019 mainly €3,505 million to EDF International, €2,060 million to EDF Trading, €986 million to EDF Energy, €800 million to Enedis, €799 million to Edison and €481 million to EDF Renouvelables.

36.2 Commitments received

36.2.1 Operating commitments

These commitments mainly comprise:

- operating lease commitments received as lessor;
- operating guarantees received;
- operating sale commitments, essentially concerning engineering services for HPC;
- personnel secondment commitments to Edvance.

36.2.2 Financing commitments

These commitments correspond to the total value of credit lines available to EDF from various banks.

36.3 Other types of commitment

36.3.1 Electricity supply commitments

In the course of its business, EDF has signed long-term contracts to supply electricity as follows:

- long-term contracts with a number of European electricity operators, for a specific plant or for a defined group of plants in the French nuclear generation fleet, corresponding to installed power capacity of 3.5GW;
- in execution of France's Energy and Climate Law, EDF has a commitment to sell some of the energy generated by its existing nuclear power plants to other suppliers. This covers volumes of up to 150TWh (since 1 January 2020) each year until 31 December 2025. However, the Ministry for the Ecological and Inclusive Transition announced that no change would be made to the ARENH price or volume for 2020.

36.3.2 Gas purchases and related services

Gas purchase commitments are given by EDF in connection with its expanding gas supply business.

Gas purchases for supply, delivery and storage are mostly undertaken through long-term contracts and forward purchases from EDF Trading.

Note 37 Contingent liabilities

Tax inspections

For the period 2008 to 2017, EDF was notified of proposed tax adjustments, notably concerning the tax-deductibility of certain long-term liabilities. This recurrent reassessment, which is applied for each year, represents a cumulative financial risk of some €556 million in income taxes at 31 December 2019. In two rulings made in 2017 and another in 2019, Montreuil Administrative Court recognised the tax-deductibility of these liabilities and validated the position taken by the Company. The Minister appealed against two of these rulings. In January 2020, Versailles Administrative Court upheld EDF's position for the year 2008.

For the years 2012 to 2017, the French tax authorities notified the Company of certain recurrent tax reassessments concerning the *contribution sur la valeur ajoutée des entreprises* (tax on corporate value added) and questioned the deductibility of long-term provisions.

Note 38 Dedicated assets

38.1 Regulations

Article L. 594 of France's Environment Code and its implementing regulations require assets (dedicated assets) to be set aside for secure financing of nuclear plant decommissioning expenses and long-term storage expenses for radioactive waste. These regulations govern the way dedicated assets are built up, and the management and governance of the funds themselves. Dedicated assets are clearly identified and managed separately from the Company's other financial assets and investments. They are also subject to specific monitoring and control by the Board of Directors and the administrative authorities.

The law requires the realisable value of dedicated assets to be higher than the value of the provisions corresponding to the present value of the long-term nuclear expenses defined above.

The Decree of 24 March 2015 contains two measures concerning dedicated assets:

- the annual allocation to dedicated assets, net of any increases to provisions, must be positive or zero as long as their realisable value is below 110% of the amount of the provisions concerned;
- subject to certain conditions, real estate property owned by the operators of nuclear facilities may be allocated to coverage of these provisions.

The Decree of 29 December 2010 made RTE shares eligible for inclusion in dedicated assets subject to certain conditions and administrative authorisation. The Decree of 19 December 2016 authorised allocation of the shares of CTE, which holds 100% of the capital of RTE, to the portfolio of dedicated assets from 31 December 2017, subject to conditions (see note 38.2.2 below).

The Decree of 24 July 2013 revised the list of eligible assets by reference to the Insurance Code, making unlisted assets eligible subject to certain conditions.

EDF received ministerial authorisation on 31 May 2018 to increase the portion of unlisted assets in its dedicated assets from 10% to 15% subject to conditions (this does not apply to the shares of CTE or real estate assets).

Under the contract with the Dunkerque LNG methane terminal, EDF benefits from approximately 61% of the terminal's regasification capacities until 2037, in return for payment of an annual premium of approximately €150 million. A provision for onerous contracts is recorded in connection with this contract.

Labour litigation

EDF is party to a number of labour lawsuits, primarily regarding working hours. EDF estimates that none of these lawsuits, individually, is likely to have a significant impact on its financial results or financial position. However, because they relate to situations that could concern a large number of EDF's employees, any increase in such litigations could have a potentially negative impact on EDF's financial position (although the risk has been mitigated by the signature of the agreement on fixed numbers of working days in 2016).

38.2 Portfolio contents and measurement

Given the applicable regulations, these dedicated assets are a highly specific category of assets.

Dedicated assets are structured and managed according to a strategic allocation defined by the Board of Directors and reported to the administrative authorities. The strategic allocation is designed to meet the overall objective of long-term coverage of obligations, and determines the structure and management of the portfolio as a whole. It takes into account regulatory constraints concerning the nature and liquidity of the dedicated asset, the financial outlook for the equity and bond markets, and the diversifying contribution of unlisted assets.

As part of the strategic allocation review process and in order to pursue the diversification into unlisted assets begun in 2010 with the shares in RTE, in 2013 the Board of Directors approved the introduction of an unlisted asset portfolio alongside the diversified equity and bond investments. This portfolio is managed by the EDF SA Division "EDF Invest", which was formed following the Decree of 24 July 2013 on secure funding for nuclear expenses.

EDF Invest has the following target asset classes: infrastructures, real estate and debt or equity funds.

Following the French government's authorisation issued on 8 February 2013, and the approval of the Nuclear Commitments Monitoring Committee and the Board of Directors' decision of 13 February 2013, EDF allocated the entire receivable recognised by the French State, representing the accumulated shortfall in CSPE financing at 31 December 2012, to its dedicated assets.

This financial receivable was increased in the financial statements at 31 December 2015 by an additional amount estimated at €644 million that was not allocated to dedicated assets, corresponding to the shortfalls in compensation that arose between the beginning of 2013 and the end of 2015, as acknowledged by the State in a ministerial letter of 26 January 2016. In accordance with this letter, the total financial receivable bears interest at 1.72% and will be repaid under a revised schedule ending in late 2020. This schedule was laid down in a ministerial order of 2 December 2016, based on the CRE's confirmation of the shortfall for 2015.

On 22 December 2016, EDF assigned a 26.4% portion of this financial receivable, including the additional receivable corresponding to the shortfalls in compensation between 2013 and 2015, to a pool of investors.

Consequently, the realisable value of the non-assigned portion of the receivable, which is totally allocated to dedicated assets, is calculated based on the assignment value at that date.

The amount received for assignment of the portion of the CSPE receivable that was allocated to dedicated assets (€894 million) was reinvested in dedicated assets, in the same way as the reimbursements received (see note 3.5).

After receiving the ministerial letter of 31 May 2018 authorising EDF, subject to conditions, to increase the portion of unlisted assets in its dedicated assets, on 29 June 2018 the Board of Directors validated the following new strategic allocation for dedicated assets:

- yield assets (target: 30% of dedicated assets), consisting of infrastructure assets, including the shares of CTE, and real estate property;
- growth assets (target: 40% of dedicated assets), consisting of equity funds investing in listed or unlisted equities;
- fixed-income assets (target: 30% of dedicated assets), consisting of listed bonds or listed bond funds, unlisted debt funds, receivables and cash.

These targets should be reached gradually, mainly by reinvesting fixed-income assets in yield assets.

38.2.1 Growth assets and fixed-income assets

Certain growth and fixed-income assets take the form of bonds held directly by EDF. Others consist of specialised collective investment funds on leading international markets, managed by independent asset management companies. They take the form of open-end funds and “reserved” funds established for the Group (which does not participate in the fund management).

The listed equity funds consist of international equities (mainly in North America but also in Europe, Asia-Pacific and emerging countries). Listed bonds and listed bond funds consist of sovereign and corporate bonds.

These investments are structured and managed in line with the strategic allocation, which takes into consideration international stock market cycles, for which the statistical inversion generally observed between equity market cycles and bond market cycles – as well as between geographical areas – has led the Group to

Details of the portfolio at 31 December 2019 are as follows:

	31/12/2019		31/12/2018	
	Net book value	Realisable value	Net book value	Realisable value
<i>(in millions of euros)</i>				
Investment in CTE (the company that owns RTE) ⁽¹⁾	2,705	2,926	2,705	2,738
Other investment securities ⁽²⁾	22,246	24,816	20,136	20,830
Other financial investments	2,623	2,965	2,156	2,385
Dedicated assets – Investments	27,574	30,707	24,997	25,953
Marketable securities	192	192		
Dedicated assets – Marketable securities	192	192		
CSPE receivable ⁽³⁾	684	688	2,060	2,080
Total dedicated assets before hedging	28,450	31,587	27,057	28,033
Hedging instruments and other ⁽²⁾	(5)	37	(369)	(344)
TOTAL DEDICATED ASSETS AFTER HEDGING ⁽⁴⁾	28,445	31,624	26,688	27,689

(1) EDF's investment of 50.1% of CTE, the company that holds 100% of the shares in RTE. The realisable value of CTE at 31 December 2019 in the above table has been determined by an independent assessor, in the same way as for EDF Invest's other assets.

(2) Including €391 million of securities acquired in late December 2018 for which payment was made in early January 2019.

(3) The receivable consisting of accumulated shortfalls in compensation at 31 December 2015, less the portion assigned on 22 December 2016 and reimbursements received since then, in line with the repayment schedule. The realisable value of the CSPE receivable is estimated based on market rates.

(4) Limiting the value of certain investments in compliance with Article 16 of Decree 2007-243 concerning calculation of the regulatory realisable value of dedicated assets has no effect at 31 December 2018 or 2019.

Net book value and fair value include unmaturing accrued interest.

define a long-term investment policy with appropriate allocation between growth assets and fixed-income assets.

Under the new strategic allocation, growth assets also include a small portion of funds invested in unlisted equities, and fixed-income assets also include a small portion of funds invested in unlisted debt. These funds are managed by EDF Invest (see note 38.2.2).

In the course of operational asset monitoring, EDF applies long-term, specific management rules defined and supervised by its governance bodies (maximum investment ratios, volatility analyses and assessment of individual fund manager quality).

38.2.2 Yield assets

The yield assets managed by EDF Invest consist of assets related to investments in infrastructures and real estate.

Through investment funds, EDF Invest also manages growth assets and fixed-income assets (see note 38.2.1).

At 31 December 2019, the assets managed by EDF Invest represent a total realisable value of €6,498 million, including €6,080 million of yield assets. Yield assets particularly include:

- 50.1% of EDF's shares in CTE, the joint venture that owns RTE, in compliance with Decree 2016-1781 of 19 December 2016 amending the Decree of 23 February 2007. These shares amount to €2,926 million at 31 December 2019 (€2,738 million at 31 December 2018);
- EDF's investments in Terega, Porterbrook, Autostrade per l'Italia, Q-Park, Thyssengas, Aéroports de la Côte d'Azur, Madrileña Red de Gas (MRG), Géosel, Central Sicaf, Ecowest SCI A and B, Nam Theun Power Company, companies that own wind farms in the United Kingdom (Bicker Fen, Glass Moor II, Green Rigg, Rusholme, Fallago Rig and Fenland), and companies that own solar power plants (Catalina Solar, Switch) and wind farms (MiRose, Red Pine) in the United States.

38.2.3 Valuation of EDF's dedicated assets

Dedicated assets are classified in the balance sheet according to their accounting nature: investments, investment securities, and marketable securities. They are valued under the accounting principles presented in note 1.

38.2.4 Coverage of long-term nuclear obligations

At 31 December 2019, by the regulatory calculations provisions are 105.5% covered by dedicated assets. The regulatory limit on the realisable value of certain investments (decree 2007-243) has no effect at 31 December 2019.

At 31 December 2018, by the regulatory calculations provisions were 98.3% covered by dedicated assets. The regulatory limit on the realisable value of certain investments (decree 2007-243) also had no effect at 31 December 2018.

Withdrawals from dedicated assets in 2019 totalled €442 million, equivalent to payments made in respect of the long-term nuclear obligations to be covered during the year (€403 million in 2018).

Because of changes (other than regulatory modifications) in the assumptions used to calculate long-term nuclear provisions, the required allocation to dedicated assets for 2018 amounted to €1,337 million. The administrative authorities

authorised EDF to spread this allocation as follows: €540 million in 2019 and 2020, and €257 million in 2021. Allocations to dedicated assets in 2019 thus totalled €540 million in realisable value (€387 million in 2018) (see note 38.2.5), and took the form of shares rather than cash. At 1 January 2020, the outstanding required allocation for 2018 amounts to €797 million. In accordance with the letter received on 12 February 2020 (see note 28.5.1), this allocation must be made in 2020, but no allocation is required in respect of 2019.

Over a 10-year horizon, disbursements will be made to the following extent (at year-end economic conditions, *i.e.* in 2019 euros):

- 15% of provisions for long-term management of radioactive waste;
- 11% of provisions for decommissioning.

Over a 50-year horizon, disbursements will be made to the following extent (at year-end economic conditions, *i.e.* in 2019 euros):

- 37% of provisions for long-term management of radioactive waste;
- 93% of provisions for decommissioning.

The long-term nuclear obligations concerned by the regulations for dedicated assets related to nuclear generation are included in EDF's financial statements at the following values:

(in millions of euros)

	31/12/2019	31/12/2018
Provisions for spent fuel management – portion unrelated to the operating cycle as defined in the regulations	1,152	1,067
Provisions for long-term radioactive waste management	10,531	9,846
Provision for removal and conditioning of waste	805	751
Provisions for nuclear plant decommissioning	16,937	15,985
Provisions for last cores – portion for future long-term radioactive waste management	550	518
PRESENT COST OF LONG-TERM NUCLEAR OBLIGATIONS	29,975	28,167

38.2.5 Changes in dedicated assets in 2019

Under the new strategic allocation for dedicated assets which increased the portion of unlisted assets from one quarter to one third, in December 2018 EDF SA acquired EDF International's minority interest in Nam Theun Power Company (NTPC), a hydroelectric dam in Laos, part of which was allocated to dedicated assets at that date in the EDF Invest subgroup. The rest was allocated during 2019. In December 2019 EDF SA acquired an investment in solar power plants (Catalina Solar, Switch) and wind farms (MiRose, Red Pine) in the United States from

EDF Renewables US, and some of this investment was allocated to dedicated assets in the EDF Invest subgroup during 2019. The total realisable value of assets allocated to dedicated assets in 2019 is €540 million.

At 31 December 2019, dedicated assets registered an overall performance of €1,857 million, comprising €1,238 million in financial result and €619 million in exceptional result. This is principally explained by dividends and interest received (€823 million), reversals of provisions on bonds and investment funds due to favourable market trends (€433 million), and gains on sales of investment securities (€619 million).

Note 39 Related parties

39.1 Relations with subsidiaries

(in millions of euros)	EDF's receivables ⁽¹⁾		EDF's liabilities ⁽¹⁾			Financial income (excluding dividends)
	Loans	Trade receivables	Net liabilities included in current account	Trade liabilities	Financial expenses	
Companies						
ATMEA	133					
CTE (ex C25)		251		158		
Framatome		114		421		
EDF Energy		83		112		2
EDF Renouvelables	1,249					10
EDF International	7,737					142
EDF Trading		1,237		1,212		5
Edison						2
Enedis	503	111		1,796		5
Dalkia France	1,343			128		34
Groupe PEI	717			66		16
Luminus	56					1
Edvance		55				
EDF Pulse Croissance Holding	60					
Citelum	81					2
Current account ⁽²⁾				1,762		
Investment for agreement for liquidities of subsidiaries			1,091		(11)	
Group cash management agreement with subsidiaries ⁽³⁾			9,450		(3)	
Tax consolidation agreement				1,260		

(1) Receivables and payables of more than €50 million.

(2) Including €533 million concerning Sofilo and €443 million concerning Enedis.

(3) Including €3,614 million concerning C3, €1,629 million concerning EDF Trading and €837 million concerning EDF Développement Environnement.

39.2 Relations with the french state and state-owned entities

39.2.1 Relations with the french state

The French State holds 83.58% of the capital of EDF at 31 December 2019, and is thus entitled in the same way as any majority shareholder to control decisions that require approval by the shareholders.

In accordance with the legislation applicable to all companies having the French State as their majority shareholder, EDF is subject to certain inspection procedures, in particular economic and financial inspections by the State, audits by the French Court of Auditors (*Cour des Comptes*) or Parliament, and verifications by the French General Finance Inspectorate (*Inspection générale des finances*).

The public service contract between the French State and EDF was signed on 24 October 2005. This contract is intended to form the framework for public service missions assigned to EDF by the lawmaker for an unlimited period. The Law of 9 August 2004 does not stipulate the duration of the contract.

39.2.2 Relations with public sector entities

The EDF group's relations with public sector entities mainly concern the two entities belonging to the former AREVA group (Orano and AREVA SA).

Transactions with Orano concern:

- the front-end of the nuclear fuel cycle (uranium supplies, conversion and enrichment services);
- the back-end of the nuclear fuel cycle (transportation, storage, processing and recycling services for spent fuel).

Front-end of the cycle

Several important agreements were negotiated between EDF and Orano:

- for supplies of natural uranium: Orano Mining contracts;
- for fluorination: an Orano cycle contract;
- for enrichment of natural uranium into uranium 235: an Orano Cycle contract.

In connection with the plan to construct two EPRs at the Hinkley Point site, on 29 September 2016 EDF and Orano signed a uranium contract with Orano Mining, and a conversion contract and an enrichment contract with Orano Cycle.

Back-end of the cycle

Relations between EDF and Orano concerning transportation, processing and recycling of spent fuels are described in note 28.

Note 40 Management compensation

The Company's key management and governance personnel are the Chairman and CEO and the directors. In application of the law, directors representing the employees receive no remuneration for their services.

The total gross compensation (salaries and all types of benefits, excluding employer contributions) paid by EDF to the company's key management and governance personnel was as follows in 2018 and 2019:

<i>(in euros)</i>	2019	2018
Chairman and CEO ⁽¹⁾	453,660	452,868
Directors ⁽²⁾	440,000	429,248

(1) At its meeting of 14 February 2019 the Board of Directors decided to keep the fixed annual compensation of the Chairman and Chief Executive Officer at €450,000 for 2019, the same as in 2018.

(2) The General Shareholders' Meeting of 15 May 2018 approved the Board of Directors' proposal to set the annual budget for directors' compensation at €500,000 for 2018 and subsequent years, until a new decision is taken by the shareholders. At its meeting of 15 February 2018 the Board of Directors decided to pay the directors the sum of €440,000 in accordance with the applicable allocation rules.

Note 41 Subsequent events

No significant event has occurred since the year-end.

6. Financial statements

Statutory Auditors' report on the financial statements

6.4 Statutory Auditors' report on the financial statements

This is a translation into English of the Statutory Auditors' report on the financial statements of the Company issued in French and it is provided solely for the convenience of English speaking users.

This Statutory Auditors' report includes information required by European regulation and French law, such as information about the appointment of the Statutory Auditors or verification of the management report and other documents provided to shareholders.

This report should be read in conjunction with, and construed in accordance with, French law and professional auditing standards applicable in France.

For the year ended 31 December 2019

To the Shareholders,

Opinion

In compliance with the engagement entrusted to us by your General Meeting, we have audited the accompanying financial statements of Électricité de France SA ("EDF", or "the Company") for the year ended 31 December 2019.

In our opinion, the financial statements give a true and fair view of the assets and liabilities and of the financial position of the Company as at 31 December 2019 and of the results of its operations for the year then ended in accordance with French accounting principles.

The audit opinion expressed above is consistent with our report to the Audit Committee.

Basis for Opinion

Audit Framework

We conducted our audit in accordance with professional standards applicable in France. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Our responsibilities under those standards are further described in the *Statutory Auditors' Responsibilities for the Audit of the Financial Statements* section of our report.

Independence

We conducted our audit engagement in compliance with independence rules applicable to us, for the period from 1 January 2019 to the date of our report and specifically we did not provide any prohibited non-audit services referred to in Article 5 (1) of regulation (EU) no. 537/2014 or in the French code of ethics (*Code de déontologie*) for Statutory Auditors.

Justification of Assessments – Key Audit Matters

In accordance with the requirements of Articles L. 823-9 and R. 823-7 of the French Commercial Code (*Code de commerce*) relating to the justification of our assessments, we inform you of the key audit matters relating to risks of material misstatement that, in our professional judgement, were of most significance in our audit of the financial statements of the current period, as well as how we addressed those risks.

These matters were addressed in the context of our audit of the financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on specific items of the financial statements.

Valuation of provisions related to nuclear generation in France – back-end of the nuclear cycle, plant decommissioning and last cores – and dedicated assets

Notes 1.2.2, 1.7.2, 1.15.1, 3.1, 18, 28 and 38 to the financial statements

Key Audit Matter

As at 31 December 2019, the provisions recorded to cover obligations relating to nuclear power plants for which EDF is the operator in France total €41,720 million, including €22,159 million with respect to the back-end of the nuclear cycle (management of spent fuel and radioactive waste) and €19,561 million with respect to the decommissioning of nuclear power plants and last cores.

The valuation of these provisions is described in note 1.15.1 and 28. It requires defining technical and financial assumptions and using complex calculation models and falls within the scope of the regulatory context described in note 3.1 and 28.

They are updated and the assumptions taken into consideration in the models are reviewed at least once a year. These assumptions reflect management's best estimate at the reporting date of the impacts of the applicable regulation, the implementation of decommissioning and storage processes or changes in the main financial parameters.

Furthermore, the Company is required to allocate so-called "dedicated" assets to secure financing of certain categories of nuclear provisions in France. The realizable value of these assets should allow the Company's commitments relating to the decommissioning of nuclear power plants and long-term storage of radioactive waste in France to be covered (note 38). The realizable value of these dedicated assets, for an amount of €31,624 million (or a net carrying amount of €28,445 million) as of 31 December 2019, was determined based on the fair value of diversified equity and bonds investments, and the equity value of non-listed assets portfolio managed by the Division EDF Invest.

We considered the valuation of nuclear provisions and dedicated assets to be a key audit matter due to:

°the sensitivity of the assumptions on which the valuation of these provisions is based, notably in terms of cost, inflation and long-term discount rates, as well as the depreciation periods of nuclear power plants in operation, and forecast cash outflows; the modification of these parameters can lead to a material revision in the provisioned amounts;

°the negative impacts on the financial position of the Company (cash earmarked to increase the amount of dedicated assets) in the event of an increase in nuclear provisions in France, a change in the realisable values of dedicated assets or changes in the coverage rate of nuclear provisions for dedicated assets;

it being specified that the valuation of provisions covers and includes uncertainties related to the fact that certain scenarios and technical solutions have never been implemented.

Responses

We have analysed the measures for recognising provisions related to nuclear generation in France and gained an understanding of the industrial scenarios for decommissioning nuclear power plants and the solutions adopted in terms of management of spent fuel and radioactive waste. We have assessed the compliance of the provisions with regard to applicable accounting, legal and regulatory measures.

We have verified the calculation models used by the Company and assessed the sensitivity of the valuations to the assumptions adopted in terms of cost, forecast cash outflows and financial parameters (discount and inflation rates).

Our work also consisted in verifying the type of costs used to determine provisions, assessing the consistency of industrial scenarios adopted by the Company and verifying the reconciliation of forecast costs and forecast cash outflows with these scenarios as well as the available studies and quotes.

We have also assessed the reasonableness of:

- margins for uncertainties and risks included in the provisions, to take into account the degree of control over decommissioning techniques and the management of spent fuel and radioactive waste;
- the series and mutualisation effects adopted in the quotes for decommissioning nuclear power plants in operation, for which the nominal cost represents €21,134 million to economic conditions at the end of the period, for a provision of €13,244 million in discounted value (note 28).

Concerning the inflation and discount rates adopted by management, we have verified their compliance with applicable accounting standards and regulatory measures, notably the ministerial order of 21 March 2007, as amended. We have reconciled the data used for this purpose with market data and available historical information.

Concerning the securing of financing for certain of these provisions through dedicated assets, we have verified, by sampling, the portfolio movements and reconciled the realisable value of the dedicated assets in the portfolio at the reporting date with the available certificate of depository statements and available external data and valuations. We have also assessed the accounting treatment and their valuation, in particular, the compliance with the accounting standard of the impairment criteria described in note 1.7.2.

Finally, we have verified the appropriateness of the disclosures given for the provisions related to nuclear generation in France and the dedicated assets in the notes to the financial statements, notably regarding the sensitivity of the valuation of provisions to changes in macro-economic assumptions (note 28.5.2).

Specific Verifications

We have also performed, in accordance with professional standards applicable in France, the specific verifications required by laws and regulations.

Information given in the management report and in the other documents with respect to the financial position and the financial statements provided to the Shareholders

We have no matters to report as to the fair presentation and the consistency with the financial statements of the information given in the management report of the Board of Directors, and in the other documents with respect to the financial position and the financial statements provided to the Shareholders.

We attest the fair presentation and the consistency with the financial statements of the information relating to payment deadlines mentioned in Article D. 441-4 of the French Commercial Code (*Code de commerce*).

Information relating to corporate governance

We attest that the section of the management report devoted to corporate governance sets out the information required by Articles L. 225-37-3 and L. 225-37-4 of the French Commercial Code (*Code de commerce*).

Concerning the information given in accordance with the requirements of Article L. 225-37-3 of the French Commercial Code (*Code de commerce*) relating to remunerations and benefits received by the directors and any other commitments made in their favour, we have verified its consistency with the financial statements, or with the underlying information used to prepare these financial statements and, where applicable, with the information obtained by your company from controlling and controlled companies. Based on these procedures, we attest the accuracy and fair presentation of this information.

With respect to the information relating to items that your company considered likely to have an impact in the event of a public takeover bid or exchange offer, provided pursuant to Article L. 225-37-5 of the French Commercial Code (*Code de commerce*), we have agreed this information to the source documents communicated to us. Based on these procedures, we have no observations to make on this information.

6. Financial statements

Statutory Auditors' report on the financial statements

Other information

In accordance with French law, we have verified that the required information concerning the purchase of investments and controlling interests and the identity of the shareholders and holders of the voting rights has been properly disclosed in the management report.

Report on Other Legal and Regulatory Requirements

Appointment of the Statutory Auditors

We were appointed as Statutory Auditors of Électricité de France SA by the General Meeting of 6 June 2005 for KPMG SA and by decision of the Board of Directors of 25 April 2002 for Deloitte & Associés.

As at 31 December 2019, KPMG SA was in the 15th year of total uninterrupted engagement and Deloitte & Associés was in the 18th year of total uninterrupted engagement, which for both, 15 year since securities of the Company were admitted to trading on a regulated market.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with French accounting principles and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless it is expected to liquidate the Company or to cease operations.

The Audit Committee is responsible for monitoring the financial reporting process and the effectiveness of internal control and risks management systems and where applicable, its internal audit, regarding the accounting and financial reporting procedures.

The financial statements were approved by the Board of Directors.

Statutory Auditors' Responsibilities for the Audit of the Financial Statements

Objectives and audit approach

Our role is to issue a report on the financial statements. Our objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with professional standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As specified in Article L. 823-10-1 of the French Commercial Code (*Code de commerce*), our statutory audit does not include assurance on the viability of the Company or the quality of management of the affairs of the Company.

As part of an audit conducted in accordance with professional standards applicable in France, the Statutory Auditor exercises professional judgement throughout the audit and furthermore:

- identifies and assesses the risks of material misstatement of the financial statements, whether due to fraud or error, designs and performs audit procedures responsive to those risks, and obtains audit evidence considered to be sufficient and appropriate to provide a basis for his opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtains an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control;
- evaluates the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management in the financial statements;
- assesses the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. This assessment is based on the audit evidence obtained up to the date of his audit report. However, future events or conditions may cause the Company to cease to continue as a going concern. If the Statutory Auditor concludes that a material uncertainty exists, there is a requirement to draw attention in the audit report to the related disclosures in the financial statements or, if such disclosures are not provided or inadequate, to modify the opinion expressed therein;
- evaluates the overall presentation of the financial statements and assesses whether these statements represent the underlying transactions and events in a manner that achieves fair presentation.

Report to the Audit Committee

We submit a report to the Audit Committee which includes in particular a description of the scope of the audit and the audit program implemented, as well as the results of our audit. We also report, if any, significant deficiencies in internal control regarding the accounting and financial reporting procedures that we have identified.

Our report to the Audit Committee includes the risks of material misstatement that, in our professional judgement, were of most significance in the audit of the financial statements of the current period and which are therefore the key audit matters that we are required to describe in this report.

We also provide the Audit Committee with the declaration provided for in Article 6 of regulation (EU) no. 537/2014, confirming our independence within the meaning of the rules applicable in France such as they are set in particular by Articles L. 822-10 to L. 822-14 of the French Commercial Code (*Code de commerce*) and in the French code of ethics (*Code de déontologie*) for Statutory Auditors. Where appropriate, we discuss with the Audit Committee the risks that may reasonably be thought to bear on our independence, and the related safeguards.

Paris La Défense, on the 13 February 2020

The Statutory Auditors

French original signed by

KPMG SA

Jay Nirsimloo

Michel Piette

Deloitte & Associés

Damien Leurent

Christophe Patrier

6.5 Dividend policy

6.5.1 Dividends and interim dividends paid in the last three fiscal years

The amount of dividends and interim dividends paid in the last three fiscal years was as follows:

Fiscal year	Number of shares	Dividend per share (in euros)	Total dividends paid ⁽¹⁾ (in euros)	Dividend payment date
2016	2,741,877,687 ⁽²⁾	0.90 ⁽³⁾	2,105,349,378.42 ⁽⁴⁾	30 June 2017
2017	2,927,438,804	0.46 ⁽⁵⁾	1,341,187,189.41 ⁽⁶⁾	19 June 2018
2018	3,010,267,676	0.31 ⁽⁷⁾	933,556,364.41 ⁽⁸⁾	18 June 2019

(1) After deduction of treasury shares.

(2) When the remaining dividend was paid, i.e. after the capital increase of 30 March 2017 in which 632,741,004 new shares were issued.

(3) i.e. €0.99 in 2016 for shares benefiting from the increased dividend.

(4) Of which €1,005,552,797.00 in interim dividends paid on 31 October 2016 for that year comprising €922,416,509.04 in new shares, €82,548,293.00 in cash and a balancing payment of €587,994.96. The remaining €1,099,796,581.42 of the dividend for 2016, paid on 30 June 2017, comprised €1,024,155,172.48 in new shares, €74,454,959.22 in cash and a balancing payment of €1,186,449.72.

(5) i.e. €0.506 in 2017 for shares benefiting from the increased dividend.

(6) Of which €432,632,648.85 in interim dividends paid on 11 December 2017 for that year comprising €398,440,228.20 in new shares, €33,746,467.50 in cash and a balancing payment of €445,953.15. The remaining €908,554,540.56 of the dividend for 2017, paid on 19 June 2018, comprised €847,339,360.56 in new shares, €60,331,512.63 in cash and a balancing payment of €883,667.37.

(7) i.e. €0.341 in 2018 for shares benefiting from the increased dividend.

(8) Of which €451,000,397.55 in interim dividends paid entirely in cash on 10 December 2018 for that year. The remaining €482,555,966.86 of the dividend for 2018, paid on 18 June 2019, comprised €452,021,956.95 in new shares and €30,534,009.91 in cash.

On 19 November 2019, EDF's Board of Directors decided to pay an interim dividend of €0.15 per share.

The interim dividend for the 2019 fiscal year came to €456,888,323.70 and was paid on 17 December 2019:

- payment in shares was effected via a share capital increase of €26,325,730.00 corresponding to the issue of 52,651,460 shares with a par value of €0.50 each, accompanied by a share premium of €403,310,183.60 and a balancing payment of €63.90;
- payment in cash totalled €27,252,346.20.

At its meeting of 13 February 2020, the Board of Directors decided to propose to the Shareholders' Meeting that will be summoned to approve the financial statements for the year ended 31 December 2019 and will be held on 7 May 2020, the payment of a dividend of €0.48 per share (excluding increased dividend) for the 2019 fiscal year. In view of the interim dividend of €0.15 per share paid on

17 December 2019, the remaining dividend payable for that year comes to €0.33 per share for shares benefiting from the ordinary dividend and €0.38 per share for shares benefiting from the increased dividend.

Shareholders will be offered the option of having the remaining dividend paid out in new Company shares. This option will be available between 18 May and 4 June 2020 inclusive. For shareholders who have not exercised their option by 4 June 2020 at the latest, all remaining dividend payments will be made in cash. The French State has undertaken to have its dividend paid out in the form of new shares.

New common shares issued to pay for the share capital increase will only entitle their holders to payment of the balance of the dividend for 2019.

Subject to the approval of the Shareholders' Meeting the dividend will be paid on 10 June 2020 with the ex-dividend date set at 14 May 2020.

6.5.2 Distribution policy, increased dividend

The dividend policy formulated by the Board of Directors takes the Group's investment needs, the economic context and any other relevant factor into account.

In accordance with the amendment to the articles of association passed by the Shareholders' Meeting of 24 May 2011, the first increased dividend was paid in 2014 for the previous year. Shareholders holding their shares in registered form for at least two years are entitled to an increased dividend. The number of shares

eligible for the 10% increased dividend may not exceed 0.5% of the share capital for a single shareholder.

On 21 November 2014, the Shareholders' Meeting amended the articles of association to the effect of authorising it to approve the payment of any dividend, interim dividend, reserves or premium that is distributed or any reduction in capital, through delivery of the Company's assets, including financial securities.

6.5.3 Unclaimed dividends

Dividends not claimed within five years of their payment date lapse in favour of the French State.

6.6 Other items

6.6.1 Table of results for the last five fiscal years

(taken from EDF's corporate financial statements):

	2019	2018	2017	2016	2015
Capital at year end					
Share capital <i>(in millions of euros)</i>	1,552	1,505	1,464	1,055	960
Capital contributions <i>(in millions of euros)</i>					
Number of common shares in existence	3,103,621,086	3,010,267,676	2,927,438,804	2,109,136,683	1,920,139,027
Number of priority dividend shares (with no voting rights) in existence					
Maximum number of future shares to be created by conversion of bonds by exercise of subscription rights					
Operating results for the year <i>(in millions of euros)</i>					
Sales excluding taxes	46,155	44,874	42,371	40,857	41,553
Income before tax, employee profit-sharing, depreciation, amortisation and provisions	7,639	7,925	5,091	9,495	7,224
Income tax	605	(756) ⁽²⁾	(687) ⁽²⁾	680	(63) ⁽²⁾
Employee profit-sharing for the year					
Income after tax, employee profit-sharing, depreciation, amortisation and provisions	1,593	1,591	1,924	5,517	271
Dividends		934 ⁽¹⁾	1,341 ⁽¹⁾	2,105 ⁽¹⁾	2,079 ⁽¹⁾
Interim dividends	457	451	433	1,006	1,059
Earnings per share <i>(euros/share)</i>					
Income after tax and employee profit-sharing but before depreciation, amortisation and provisions	2.27	2.88	1.97	4.18	3.79
Income after tax, employee profit-sharing, depreciation, amortisation and provisions	0.51	0.53	0.66	2.62	0.14
Dividend per share		0.31 ^{(1) (6)}	0.46 ^{(1) (5)}	0.90 ^{(1) (4)}	1.10 ^{(1) (3)}
Interim dividend per share	0.15	0.15	0.15	0.50	0.57
Employees					
Average number of employees over the year	63,530	64,927	66,577	69,494	70,769
Total payroll expense for the year <i>(in millions of euros)</i>	3,654	3,711	3,831	4,001	3,964
Amounts paid for employee fringe benefits for the year (social security, Company benefit schemes, etc.) <i>(in millions of euros)</i>	2,799	2,854	2,923	2,873	2,848

(1) Including advance payment.

(2) Amount corresponding to tax revenue.

(3) i.e. €1.21 for shares benefiting from the increased dividend.

(4) i.e. €0.99 for the shares benefiting from the increased dividend.

(5) i.e. €0.506 for the shares benefiting from the increased dividend.

(6) i.e. €0.341 for the shares benefiting from the increased dividend.

6.6.2 Significant change in the financial or trading position

Significant events occurring between the last day of the 2019 fiscal year and the date of the filing of this Universal Registration Document are mentioned in note 52 of the appendix to the consolidated financial statements of the year ended 31 December 2019 for events which occurred before 13 February 2020, when the

Board of Directors approved the financial statements and, for events which occurred after 13 February 2020, in section 5.2 "Subsequent events" of this Universal Registration Document.

6.6.3 Information on invoice settlement times (accounts payable and receivable required by Article L. 441-6-1 of the French Commercial Code)

Within the framework of the LME Act as amended by Act no. 2015-990 promoting growth, activity and equal economic opportunities, EDF publishes the amounts, including VAT, of debts and receivables due at the end of the fiscal year. These amounts are broken down by tranche of overdue payments and posted respectively to the amount including VAT of purchases and sales for the fiscal year.

	Article D. 441 I.-1 ^o : overdue invoices which have been received but not paid					Article D. 441 I.-2 ^o : overdue invoices which have been issued but not paid at the closing date of the fiscal year						
	0 day	1-30 days	31-60 days	61-90 days	91 days and more	Total (1 day and more)	0 day	1-30 days	31-60 days	61-90 days	91 days and more	Total (1 day and more)
<i>(in millions of euros)</i>												
(A) Period overdue												
Number of invoices	80,665					4,602	3,588	764				6,857,033
Total amount of invoices (including VAT)	2,375	28	6	1	0	35	1,257	241	70	50	592	953
% of the total amount of purchases of the year	4.7	0.1	0	0	0	0.1						
% of total amount of sales of the year (including VAT)							2.1	0.4	0.1	0.1	1	1.6
(B) Invoices excluded from (A) relating to payables and receivables in dispute or unrecognised												
Number of invoices excluded						0						0
Number of invoices excluded						0						0
(C) Reference payment terms applied (contractual or statutory – Article I. 441-6 or Article L. 43-1 of the French Commercial Code)												
Payment terms used for calculating periods overdue												Legal deadlines

In August 2019, EDF was sanctioned following an audit by the DGCCRF, which found late payments for over 10% of the invoices in the sample audited in 2017. The Company has put in place a very proactive action plan that reinforces the

end-to-end management of the purchasing process, in particular the invoice processing process, and improves the quality of the stakeholders' actions at each stage. This plan also accelerates the digitalisation of exchanges with suppliers.

6.6.4 Information on existing branches required by Article L. 231-1 of the Commercial Code

At 31 December 2019, the Group had 195 secondary establishments registered with the French Trade and Companies Registers stated in the Company's "K-bis" document, and operated on French territory through several thousand different offices which do not fulfil the independent management criterion to qualify as a branch.

EDF's branches ⁽¹⁾ outside mainland France are listed below:

- Saint-Barthélemy;
- Saint-Pierre-et-Miquelon;
- Saint Martin;
- United Arab Emirates: Abu Dhabi;

- Bahrain;
- Benin;
- Cambodia;
- China: Taishan;
- South Africa;
- Cape Verde;
- Qatar;
- New Caledonia.

(1) In fiscal terms, this is a list of permanent establishments located outside France.

6.7 Information relating to the allocation of proceeds raised through Green Bonds issued by EDF

Since 2013 the Group has conducted four Green Bond issues for a total of around €4.5 billion in order to support its development in renewable energies.

After two bond issues chiefly meant to finance the building of new wind and solar projects by its subsidiary EDF Renewables (€1.4 billion in November 2013 and \$1.25 billion in October 2015), the Group expanded its Green Bond Framework to finance investments in the renovation and modernisation of its hydropower assets in mainland France. The new Framework was first applied to a €1.75 billion issue in October 2016 and then to a JPY 26 billion issue in two tranches in January 2017. The Group further extended the scope of its Green Bond Framework at the beginning of 2020 by opening it up to international hydropower assets, energy efficiency projects and biodiversity conservation projects.

The commitments made by EDF in the context of these two bond issues follow the four Green Bond Principles⁽¹⁾ guiding (i) the use of proceeds, (ii) existing processes for evaluating and selecting eligible projects, (iii) the management of proceeds, and (iv) reporting procedures. A detailed description of these investments can be found in the EDF Green Bond Framework of September 2016 available on the Green Bonds page of the Company's website.

This section provides a summary of these commitments and how EDF has fulfilled them as at the end of 2019.

Use of proceeds

EDF has committed itself to allocate the proceeds from its Green Bonds programme to finance new investments in renewable energy projects. Projects eligible for⁽²⁾ Green Bond ("Eligible Projects") financing are:

- projects built by EDF Renewables to generate electricity from renewable sources and to a lower extent by Luminus in Belgium;
- investments in existing hydropower facilities in mainland France within the following categories: renovation and heavy maintenance, modernisation and automation, and works on existing plants (including, in particular, capacity increases).

There are no plans to use the proceeds raised to refinance existing projects or acquire operational businesses or facilities.

Assessment and selection of financed eligible projects

Each Eligible Project to be funded is assessed against the environmental and social eligibility criteria⁽³⁾ ("E&S criteria") specific to EDF Renewables' or Luminus' investments, on the one hand, and to hydroelectric investments, on the other, by the Financial Department of EDF Renewables, Luminus, and the Financial

Department of EDF Hydro. Assessments are based on information provided by the teams in charge of development, purchasing and sustainable development matters.

Only projects meeting the E&S criteria qualify for Green Bond financing. Those projects over which EDF Renewables has direct control are financed as a priority.

The entire project assessment process is documented so as to be able to show an independent auditor that projects financed meet the eligibility criteria.

On this basis, the Finance Departments of EDF Renewables, Luminus and EDF Hydro select which Eligible Projects are financed.

Management of proceeds

Proceeds raised are managed according to a strict ring-fencing principle in order to ensure that their use is exclusively and effectively reserved for financing Eligible Projects.

Once received by EDF's Finance and Investment Department, proceeds from each bond issue are invested and tracked in a dedicated sub-portfolio of treasury assets until allocated to Eligible Projects. Proceeds are invested in priority in treasury assets identified as Socially Responsible Investments (SRI).

The finance departments of EDF Renewables, Luminus and EDF Hydro notify EDF's Treasury Department, on an ongoing basis or at regular intervals, of the proceeds needed to cover investments related to the selected projects. Based on this information the Treasury Department adjusts the amounts available in the dedicated treasury asset sub-portfolios.

EDF aims to allocate the entirety of proceeds raised within 36 months of a bond issue.

Reporting

Effective use of proceeds

All the proceeds raised in November 2013 under the first Green Bond issued by EDF for €1.4 billion were allocated by June 2015. All the proceeds raised in October 2015 under the second Green Bond issued for \$1.25 billion were allocated by the end of 2017. The funds raised as part of the €1.75 billion third Green Bond issued in October 2016 were allocated at the end of 2019.

At 31 December 2019, of the 26 billion yen raised in two tranches in January 2017 under the fourth Green Bond issued by EDF, 17.1 billion yen had been allocated to Eligible Projects. The balance of proceeds raised under the Green Bonds issued in January 2017 was invested in a dedicated treasury asset portfolio, as indicated above, where it will remain until allocated to Eligible Projects.

(1) The Green Bond Principles, updated in June 2018, are voluntary guidelines for issuance of Green Bonds. They recommend transparency and disclosure and promote integrity to support development of the Green Bond market. For more information, see

<http://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/green-bonds/green-bond-principles>.

(2) Only projects from category (i) are eligible for financing using proceeds raised by the bond issues of November 2013 and October 2015.

(3) The E&S criteria for each project type are presented in the appendix to the EDF Green Bond Framework of September 2016.

ALLOCATION OF PROCEEDS AT 31 DECEMBER 2019

	Funds raised		Funds allocated to Eligible Projects		Number of Green Bond funded projects	Share of investment financed via Green Bonds proceeds
Green Bond no. 1 – November 2013	€1.4 billion		€1.4 billion		13 ⁽¹⁾	59%
Green Bond no. 2 – November 2015	\$1.25 billion		\$1.25 billion		7 ^{(1) (2)}	58%
Green Bond no. 3 – October 2016	€1.75 billion	€1.75 billion	<i>Of which EDF Renewables: €1,248 million</i>		10 ⁽²⁾	68%
			<i>Of which EDF Hydro: €502 million</i>		600 operations	100% ⁽³⁾
Green Bond no. 4 – January 2017 (1 st tranche)	¥19,6 million	¥17,141 million	<i>Of which renewable capacities: ¥5,690 million</i>		3	41%
			<i>Of which hydropower projects: ¥11,451 million</i>		206 operations	83% ⁽³⁾

(1) Including the Roosevelt Project, financed by Green Bonds 1 and 2.

(2) Including the Red Pine Project, financed by Green Bonds 2 and 3.

(3) Share of total investments financed by EDF, including half of the investment in the Romanche-Gavet project.

■ At 31 December 2019, the following Eligible Projects had been chosen by EDF Renewables for financing under the first three Green Bonds issued in November 2013 (GB1), October 2015 (GB2) and October 2016 (GB3):

Projects	Type and Capacity	Location	Year come into service	Green Bond Financing
CID Solar	PV Solar, 27MWp	US (California)	In service	GB1
Cottonwood	PV Solar, 33MWp	US (California)	In service	GB1
Catalan wind farm	Onshore wind, 96MW	France (Pyrénées-Orientales)	In service	GB1
Heartland	Biogas, 20MW	US (Colorado)	In service	GB1
Hereford	Onshore wind, 200MW	US (Texas)	In service	GB1
La Mitis	Onshore wind, 25MW	Canada (Quebec)	In service	GB1
Le Granit	Onshore wind, 25MW	Canada (Quebec)	In service	GB1
Longhorn North	Onshore wind, 200MW	US (Texas)	In service	GB1
Pilot Hill	Onshore wind, 175MW	US (Illinois)	In service	GB1
Rivière du Moulin	Onshore wind, 350MW	Canada (Quebec)	In service	GB1
Spinning Spur 2	Onshore wind, 161MW	US (Texas)	In service	GB1
Spinning Spur 3	Onshore wind, 194MW	US (Texas)	In service	GB1
Roosevelt	Onshore wind, 250MW	US (New Mexico)	In service	GB1 and GB2
Great Western	Onshore wind, 225MW	US (Oklahoma)	In service	GB2
Kelly Creek	Onshore wind, 184MW	US (Illinois)	In service	GB2
Salt Fork	Onshore wind, 174MW	US (Texas)	In service	GB2
Slate Creek	Onshore wind, 150MW	US (Texas)	In service	GB2
Tyler Bluff	Onshore wind, 126MW	US (Texas)	In service	GB2
Red Pine	Onshore wind, 200MW	US (Minnesota)	In service	GB2 and GB3
Bluemex Power 1	PV Solar, 120MWp	Mexico (Sonora)	In service	GB3
Copenhagen Wind Farm	Onshore wind, 80MW	US (New York)	In service	GB3
Nicolas Riou	Onshore wind, 112MW	Canada (Quebec)	In service	GB3
Rock Falls	Onshore wind, 154MW	US (Oklahoma)	In service	GB3
Stoneray Power Partners	Onshore wind, 100MW	US (Minnesota)	In service	GB3
Valentine Solar	PV Solar, 135MWp	US (California)	In service	GB3
Glaciers Edge	Onshore wind, 203MW	US (Iowa)	In service	GB3
Milligan	Onshore wind, 300MW	US (Nebraska)	2020	GB3
Las Majadas	Onshore wind, 273MW	US (Texas)	2020	GB3

6. Financial statements

Information relating to the allocation of proceeds raised through Green Bonds issued by EDF

- The Eligible Projects selected by Luminus for financing as at 31 December 2019 as part of the January 2017 Green Bond issue in yen (GB4) for the first tranche can be broken down as follows:

Projects	Type and Capacity	Location	Year come into service	Green Bond Financing
Geel-West	Onshore wind, 11MW	Belgium	In service	GB4
Villers 4	Onshore wind, 45MW	Belgium	In service	GB4
Turnhout	Onshore wind, 12MW	Belgium	In service	GB4
Monsin	Hydropower	Belgium	In service	GB4

- The Eligible Projects selected by EDF Hydro for financing as at 31 December 2019 as part of the October 2016 Green Bond issue can be broken down as follows:

	Number of operations by type	Capacity in question (MW)	Average generation (2011-2018)* (TWh)	Amount (in millions of euros)
Renovation and heavy maintenance	474	9.6	20.6	269
Modernisation and automation	302	15.9	31.7	72
Development of existing structures	30	1.2	2.4	247
TOTAL (EXCL. DUPLICATION)	806	17.1	34.0	588

* 2018 data, 2019 data are not available.

As part of managing its portfolio of renewable energy assets, the Group may sell stakes in the assets it develops. At 31 December 2019 the Group held 39%, 14% and 91% and 100% of generation capacity financed under Green Bonds no. 1, 2, 3 and 4, respectively.

Impact of financed Eligible Projects

The table below shows three main impacts associated with the renewable energy projects that received Green Bond financing:

- the electricity generation capacity built under each EDF Renewables or Luminus project or renovated, modernised or developed as part of the hydropower investments;
- the additional electricity generation expected from each project; and
- the estimated CO₂ emissions avoided as a result of injecting this additional electricity generation into the electricity grid.

These impacts are presented in aggregate: gross data correspond to the aggregate impact of every project that received financing from the Green Bond in question; while the net values correspond to the sum total of the impact of each Eligible Project weighted by the share of project investment amount financed by the Green Bond in question.

	Total capacity of projects financed at 31 December 2019 (in MW)		Expected output (in TWh/year)		Estimated CO ₂ emissions avoided (in megatonnes/year)		
	Gross ⁽¹⁾	Net ⁽²⁾	Gross ⁽¹⁾	Net ⁽²⁾	Gross ⁽¹⁾	Net ⁽²⁾	
Green Bond no. 1 – November 2013	1,755	976	6.0	4.1	2.21	1.55	
Green Bond no. 2 – October 2015	1,306	815	4.6	3.3	2.53	1.83	
Green Bond no. 3 – October 2016	EDF Renewables	1,788	1,354	6.7	5.2	3.19	2.54
	EDF Hydro	14,596	1,011	0.2 ⁽³⁾	0.2 ⁽³⁾	0.01 ⁽³⁾	0,01 ⁽³⁾
Green Bond no. 4 – January 2017	Luminus	67	29	0.1	0.06	0.03	0.01
	EDF Hydro + Luminus	2,468	145	0.1	0.05	0.01	0.01

(1) Sum of the gross impacts of each project that received Green Bonds financing.

(2) Sum of the impacts of each project weighted by the project investment amount financed by the Green Bond in question.

(3) Only related to the expected additional generation resulting from development investments, including half of the expected additional generation of the Romanche-Gavet project.

The above impacts are established using the methodological principles below:

- generation capacity of financed projects: installed capacity at the end of the construction of each Eligible Project as defined in the project's investment memorandum and updated as appropriate during the construction phase or at project commissioning;
- expected output: generation forecast (the "P50") taken into account when the investment decision of each Eligible Project is made;
- avoided CO₂ emissions: the average emission factor per kWh of the electric system is estimated on the basis of the energy mix of the electric system and LCA emission factors of each generation technology. The emission factor of the

project corresponds to the LCA emission factor of the project's production chain. The energy mixes are those published by the Energy Information Administration (EIA, 2018) for large power networks in the United States, Statistics Canada (2018) for the networks and provinces of Canada, and the International Energy Agency (2018) for other countries. LCA emission factors of each technology correspond to the median values established by the Intergovernmental Panel on Climate Change (IPCC) and published in its fifth assessment report (2014). The detailed methodology is available on request at the EDF group head office. It is important to note that (i) there is no single standard defining a methodology for calculating avoided CO₂ emissions and (ii) the expected output and, therefore avoided, CO₂ emissions are estimated forecast data and not actual data.

This is a free translation into English of the attestation from one of the statutory auditors of EDF SA on the information related to the allocation, as of 31 December 2019, of funds raised for the "Green Bonds" issued by EDF on 25 November 2013, 8 October 2015, 11 October 2016 and 26 January 2017 originally issued in French and is provided solely for the convenience of English speaking readers.

This attestation should be read in conjunction with, and is construed in accordance with, French law and professional standards applicable in France.

Attestation from one of the statutory auditors of EDF SA on the information related to the allocation, as of 31 December 2019, of funds raised for the "Green Bonds" issued by EDF on 25 November 2013, 8 October 2015, 11 October 2016 and 26 January 2017

To the Chairman and Chief Executive Officer,

In our capacity as statutory auditor of Electricité de France S.A. (the "**Company**") and in accordance with your request, we have prepared this attestation on the information related to the allocation, as of 31 December 2019, of funds raised for the "Green Bonds" issued by EDF on 25 November 2013 (the "**GB 2013 Offering**"), 8 October 2015 (the "**GB 2015 Offering**"), 11 October 2016 (the "**GB 2016 Offering**") and 26 January 2017, (the "**GB 2017 Offering**"), which amounts to €1.4 billion, US\$1.25 billion, €1.75 billion and ¥26.0 billion, respectively, contained in the attached document "*Information relating to the allocation of funds raised through Green Bonds issued by EDF*", and prepared pursuant to the terms and conditions of the final terms of the Green Bond Offerings dated 25 November 2013, 8 October 2015, 11 October 2016 and 26 January 2017 (the "**Final Terms**").

This document, prepared under your responsibility for the purposes of the information of the "Green Bond" debt securities holders, presents an allocation of the funds raised from the Green Bond Offerings to eligible projects (the "**Eligible Projects**") for the period beginning as of the receipt of the funds raised from the Green Bond Offerings to 31 December 2019 (the "**Allocation of Proceeds**"):

- For an amount of €1.4 billion in relation to the GB 2013 Offering, from 27 November 2013 to 31 December 2015, noting that the allocation of proceeds has been completed in full in June 2015;
- For an amount of US\$1.25 billion in relation to the GB 2015 Offering, from 13 October 2015 to 31 December 2017, noting that the allocation of proceeds has been completed in full by the end of 2017;
- For an amount of €1.75 billion in relation to the GB 2016 Offering, from 11 October 2016 to 31 December 2019, noting that the allocation of proceeds has been completed in full by the end of 2019;
- For an amount of ¥26.0 billion in relation to the GB 2017 Offering, from 26 January 2017 to 31 December 2019.

This information was prepared based on the accounting records used for the preparation of the consolidated financial statements for the year ended 31 December 2019.

Our role is to report on:

- the compliance with the four components of the *Green Bond Principles* defined by the *International Capital Market Association*⁽¹⁾ being (i) Use of proceeds (ii) Existing processes for project evaluation and selection of the Eligible Projects (iii) Management of proceeds and (iv) Reporting;
- the compliance, in all material respects, of the Eligible Projects referred to in the attached document, with the eligibility criteria defined in the Final Terms;
- the tracking of the funds raised from the Green Bond Offerings, in a dedicated portfolio of financial assets, to the allocation of such funds to Eligible Projects and on the reconciliation of the amount of funds allocated to Eligible Projects as at 31 December 2019 as part of the Green Bond Offerings, with the accounting records and data underlying the accounting records;
- the compliance, in all material respects, of the methods used by the Company to estimate the CO₂ emissions avoided by the Eligible Projects financed as at 31 December 2019 with the methodology described in the section "Impact of financed Eligible Projects" of the attached document.

However, we have no responsibility:

- for challenging the eligibility criteria defined as an appendix to the Final Terms and, in particular, we give no interpretation on the terms of the Final Terms;
- for forming an opinion on the use of the allocated funds to Eligible Projects after such funds have been allocated;
- for concluding on whether the methodology used by the Company to estimate the CO₂ emissions avoided is appropriate.

In the context of our role as statutory auditor, we have audited, jointly with the other statutory auditor, the consolidated financial statements of the Company for the year ended 31 December 2019. Our audit was conducted in accordance with professional standards applicable in France, and was planned and performed for the purpose of forming an opinion on the consolidated financial statements taken as a whole and not on any individual component of the accounts used to determine the information. Accordingly, our audit tests and samples were not carried out with this objective and we do not express any opinion on any components of the accounts taken individually. These consolidated financial statements, which have not yet been approved by the Shareholders' meeting, have been audited and our report thereon is dated 13 February 2020.

Furthermore, we have not performed any procedures to identify events that may have occurred after the date of our report on the consolidated financial statements of the Company which was issued on 13 February 2020.

Our engagement, which constitutes neither an audit nor a review, was performed in accordance with the professional guidance issued by the French Institute of Statutory Auditors (*Compagnie nationale des Commissaires aux comptes*). For the purpose of this attestation, our work consisted, using sampling techniques or other methods of selection, in:

For the information related to the Allocation of Proceeds and the compliance with the four components of the Green Bond Principles

- verifying the appropriate consideration of the four components of the *Green Bond Principles* of the *International Capital Market Association* being (i) the use of proceeds (ii) the existing processes for evaluation and selection of the Eligible Projects (iii) the management of proceeds and (iv) the reporting;
- understanding the procedures implemented by the Company for producing the information contained in the attached document;
- verifying the compliance, in all material respects, of the Eligible Projects referred to in the attached document, with the eligible criteria, as defined in the appendix to Final Terms;
- verifying the appropriate segregation of the funds raised from the Green Bond Offerings and their exclusive allocation to Eligible Projects;
- verifying the global allocation of the capital expenditures incurred in relation to the Eligible Projects financed by each of the Green Bond Offerings;
- performing the necessary reconciliations between this information and the accounting records from which it is derived and verifying that the information agrees with the data used to prepare the consolidated financial statements for the year ended 31 December 2019.

For the estimation of the CO₂ emissions avoided

- understanding and considering the methodology used to estimate the avoided CO₂ emissions;
- verifying the compliance, in all material respects, of the methods used to estimate the CO₂ emissions avoided by the Eligible Projects financed during the period with the methodology described in the section "Impact of Eligible Projects financed" of the attached document;

(1) International Capital Market Association - Green Bond Principles, 2015 – Voluntary Process Guidelines for Issuing Green Bonds, 27 March 2015

6. Financial statements

Information relating to the allocation of proceeds raised through Green Bonds issued by EDF

- verifying the consistency of the information related to the estimation of the electricity output as well as the choice of emission factors used (based on the calculation of the emission factors of the applicable electrical grids where the projects are located and the choice of emission factors by technology), should it be noted that there is no single framework defining a methodology for the calculation of CO₂ emissions avoided.
- the compliance, in all material respects, of the Eligible Projects referred to in the attached document, with the eligible criteria, as defined in the Final Terms;

On the basis of our work, we have no matters to report on:

- the compliance with the four components of the *Green Bond Principles* of the *International Capital Market Association*;
- the tracking of the funds raised from the Green Bond Offerings, in a dedicated portfolio of financial assets, to the allocation of such proceeds to Eligible Projects and the consistency of the amount of allocated funds to Eligible Projects as at 31 December 2019 in the context of the Green Bond Offerings, with the accounting records and data underlying the accounting records;
- the compliance, in all material respects, of the methods used by the Company to estimate the avoided CO₂ emissions by the Eligible Projects financed as at 31 December 2019 with the methodology described in the section "Impact of financed Eligible Projects" of the attached document.

This attestation has been prepared solely for your attention within the context described above and may not be used, distributed or referred to for any other purpose.

Paris-La Défense, 13 March 2020

One of the statutory auditors

Deloitte & Associés

Christophe Patrier

Partner



7.

General information about the Company and its capital

CONTENTS

7.1 General information about the Company	466	7.3 Information regarding capital and share ownership	470
7.1.1 Company name, address and telephone number of the registered office	466	7.3.1 Amount of share capital and changes in share capital	470
7.1.2 Trade and companies registry, APE Code	466	7.3.2 Treasury shares and share buyback programme	471
7.1.3 Date of incorporation and term of the Company	466	7.3.3 Capital authorised but not issued	473
7.1.4 Legal form and applicable legislation	466	7.3.4 Other equity securities	475
7.1.5 Disputes	466	7.3.5 Non-equity securities	475
7.2 Incorporation documents and articles of association	467	7.3.6 Information on the share capital of any member of the Group subject to a conditional or unconditional agreement	475
7.2.1 Corporate purpose	467	7.3.7 Pledge of the Company's shares	475
7.2.2 Financial year	467	7.3.8 Ownership of the Company's capital and voting rights	476
7.2.3 Statutory distribution of profits	467	7.3.9 Agreements whose implementation could lead to a change of control	476
7.2.4 Rights attached to shares	467	7.4 Market for the Company's shares	477
7.2.5 Assignment and transfer of shares	468	7.5 Related-party transactions	478
7.2.6 Changes to the articles of association, the capital and voting rights	468	7.5.1 Related-party transactions	478
7.2.7 Members and functioning of the Board of Directors	468	7.5.2 Statutory Auditors' special report on regulated agreements	479
7.2.8 Shareholder's Meetings	468	7.5.3 Routine agreements procedure	481
7.2.9 By-law or statutory provisions that delay acquisition of control over the Company	469	7.6 Material contracts	482
7.2.10 Threshold crossings	469	7.6.1 Material contracts entered into in 2019	482
		7.6.2 Material contracts entered into in 2018	482
		7.6.3 Material contracts entered into in 2017	482

7.1 General information about the Company

7.1.1 Company name, address and telephone number of the registered office

The name of the Company is: "Électricité de France". The Company may also be legally designated by the acronym "EDF".

The Company's registered office is at 22-30 Avenue de Wagram in the 8th arrondissement of Paris.

The telephone number is +33(0) 1 40 42 22 22.

7.1.2 Trade and companies registry, APE Code

The Company is registered with the Paris Trade and Companies Registry under number 552 081 317. Its APE code is 401E.

7.1.3 Date of incorporation and term of the Company

EDF was incorporated pursuant to Act no. 46-628 of 8 April 1946 as a French public industrial and commercial establishment (EPIC). It was converted into a French société anonyme (public limited company) by the Act of 9 August 2004 and the Decree of 17 November 2004.

The Company was incorporated for a term of 99 years as from 19 November 2004, unless the Company is dissolved before such date or unless its term is extended.

7.1.4 Legal form and applicable legislation

Since 20 November 2004, EDF is a French société anonyme with a Board of Directors. It is governed by the laws and regulations applicable to commercial companies, in particular the French Commercial Code (*Code de commerce*), except in the event of specific exceptions stipulated in the French Energy Code or Order no. 2014-948 of 20 August 2014 on the governance and capital transactions of companies with State holdings and by its articles of association.

7.1.5 Disputes

This section describes the main legal proceedings except the one covered in note 50 to the consolidated financial statements and any material developments in those proceedings that have occurred between the approval of the financial statements and the filing date of this document.

To the knowledge of the Company, there are no administrative, legal or arbitration proceedings (including any pending or threatened proceedings of which the Company

is aware) likely to have or having had in the past 12 months a material impact on the financial situation or the profitability of the Company and/or the Group with the exception of those described below and those described in the notes to the appendix 2019 consolidated financial statements.

Investigations by France's Competition Authority ("ADLC")

France's Competition Authority is currently investigating EDF in relation to two separate matters. The first investigation follows a complaint filed on 17 October 2016 by Xélan, which alleges, in particular, that EDF's decision not to provide it with the energy use figures for customers charged regulated tariffs prevents it from issuing its own electricity supply proposals based on energy use management levels. Following this complaint, France's Competition Authority conducted search and seizure operations at the premises of EDF and several of its subsidiaries on 22 and 23 November 2016. EDF and its subsidiaries lodged appeals with the Court of Appeal in Versailles challenging the procedures. In orders issued on 12 April 2018 and 10 January 2019, the President of the Court of Appeal in Versailles dismissed the appeals against the order authorising the raids and against the manner in which the raids were conducted. EDF and its subsidiaries have lodged an appeal to the Court of Cassation, which is still pending. The second investigation, relating to EDF's commercial practices in the retail energy supply markets, following a complaint filed by Engie relating, in particular, to the circumstances in which EDF gave access to customer data to electricity suppliers that requested access from the end of 2015, relating to customers supplied energy under the regulated Green and Yellow tariffs, as part of the discontinuation of the tariffs.

AMF investigation

Since 21 July 2016, EDF has been the subject of an investigation by the AMF into the financial information provided to the markets since July 2013. As part of this investigation, EDF has provided the AMF with certain information and a number of documents and responded to its questions. To the best of EDF's knowledge, this investigation is still ongoing and there is no indication as to the outcome of the proceedings.

CRE/REMIT investigation

On 1 December 2016, the CRE (French Energy Regulation Commission) launched an investigation into whether EDF and its subsidiaries EDF Trading Limited and EDFT Markets Limited were guilty of engaging, since 1 April 2016, in practices that could constitute breaches of the provisions of regulation (EU) no. 1227/2011 of 25 October 2011 on wholesale energy market integrity and transparency (REMIT). The CRE informed EDF by letter dated 5 July 2018 that it had referred the matter to the CoRDIs (Settlement of Disputes and Sanctions Committee). there is no indication as to the outcome of the proceedings.

Appeals by NGOs and associations against administrative authorisations relating to the means of production

A certain number of authorisations and licences related to the Group's means of production (ASN (Nuclear Safety Authority), decisions by the Prefecture, decrees, orders, etc.) have been challenged before the courts, mainly by environmental associations.

7.2 Incorporation documents and articles of association

In this Universal Registration Document, a reference to the articles of association means the Company's articles of association as approved by French Decree no. 2004-1224 of 17 November 2004 adopted under French Act no. 2004-803 of 9 August 2004 relating to the public electricity and gas service and electricity and gas companies (the "9 August 2004 law"), which have subsequently been amended on various occasions.

7.2.1 Corporate purpose

EDF's purpose, both in France and abroad and in compliance with the laws set out in the first Article of its articles of association, is:

- to ensure the generation, transmission, distribution, supply and trading of electrical energy, and the import and export of said energy;
- to carry out the public service missions assigned to EDF by the laws and regulations, in particular by the French Energy Code, and Article L. 2224-31 of the French Local Authorities Code (Code général des collectivités territoriales), as well as by concession agreements, and in particular the mission to develop and operate public electricity grids and to supply energy at regulated rates, and to supply back-up power to electricity producers and customers with the aim of compensating for unforeseen supply failures, and to supply electricity to eligible customers who cannot find a supplier, while contributing to the balanced development of electricity supply by reaching the goals defined by the multi-year generation investments programme defined by the Minister for Energy;
- more generally, to engage in any industrial, commercial or service activity, including research and engineering activities, in the field of energy, for all categories of customer;
- to enhance the value of all the personal and real property assets it holds or uses;
- to create, acquire, rent or lease under a business lease, all personal property, real property, businesses and clientele, to lease, install and operate all establishments, businesses and clientele, plants and workshops relating to any one of the aforementioned purposes;
- to obtain, acquire, operate or sell all processes and patents concerning the activities that are related to any of the aforementioned purposes;
- to take part, directly or indirectly, in all transactions that may be connected to any of the aforementioned purposes, by creating new companies or undertakings, by contributing, subscribing for or purchasing equity or ownership interests, stakes, or through mergers, partnerships or in any other way whatsoever;
- more generally, to engage in all industrial, commercial, financial transactions, whether in personal or real property, that are directly or indirectly connected, in whole or in part, to any similar or related purposes or even to any purposes that may favour or develop the Company's business.

7.2.2 Financial year

Each financial year lasts for 12 months, starting on 1 January and ending on 31 December of each year.

7.2.3 Statutory distribution of profits

The distributable profit consists of the net profit for the financial year, less prior losses carried forward and the various deductions provided for by the law or the articles of association, plus any retained earnings carried forward.

The Shareholders' Meeting may decide to distribute amounts deducted from the reserves that are freely available to it, but must expressly state the reserve items from which the deductions are made.

After approving the financial statements and confirming the existence of distributable amounts (which include the distributable profit and any amounts deducted from the reserves mentioned above), the Shareholders' Meeting can decide to distribute all or part of such amounts to the shareholders in the form of a dividend, allocate them to reserve items or carry them forward. The Board of Directors may also distribute

interim dividends prior to the approval of the financial statements for the financial year, under the conditions laid down by law.

The Shareholders' Meeting has the option of granting the shareholders a choice, for all or part of the dividend or interim dividend paid out, between payment in cash and payment in shares. Moreover, the Shareholders' Meeting may decide to pay any dividend, interim dividend, reserve or premium that is distributed or any reduction in capital, through remittance of the Company's assets, including financial securities.

Any shareholder who can prove, at the close of a financial year, that he has held registered shares for at least two years and still holds such shares on the date of payment of the dividend declared for the said financial year, will be entitled to an increased dividend for the said registered shares, equal to 10% of the dividend paid for the other shares, including in cases where the dividend is paid in shares. The number of shares eligible for the 10% increased dividend may not exceed 0.5% of the share capital at the close of the previous financial year, for any one shareholder. The first increased dividend was paid in 2014 for the 2013 financial year (see section 6.5.2 "Distribution policy, increased dividend").

The terms governing the payment of distributions decided by the Shareholders' Meeting, and the ex-dividend date of the distributed shares are fixed by the Shareholders' Meeting or, failing this, by the Board of Directors, in accordance with the applicable statutory provisions. If the amount of the non-cash distributions to which a shareholder is entitled does not correspond to a whole number of shares, the said number will be rounded down to the next whole number and a balancing cash payment made to the shareholder or, if requested by the Shareholders' Meeting, rounded up to the next whole number, with the difference being paid in cash by the relevant shareholder.

7.2.4 Rights attached to shares

Each share entitles its holder to a portion of the Company's profit and corporate assets that is proportional to the percentage of the capital that the share represents. Moreover, each share confers a voting right and the right to be represented at Shareholders' Meetings in accordance with legislative, regulatory and bylaw restrictions.

On the filing date of this Universal Registration Document, EDF has only issued a single class of shares.

Ownership of a share automatically entails acceptance of the articles of association and decisions adopted by Shareholders' Meetings.

Pursuant to Article L. 225-123 of the French Commercial Code (*Code de commerce*), as amended by Act no. 2014-384 of 29 March 2014, all fully paid-up shares that have been registered for at least two years in the name of the same shareholder will automatically entitle their holder to voting rights that are double that of the other shares. These provisions took effect on 3 April 2016. EDF's Board of Directors had decided not to submit an amendment to the articles of association to the Shareholders' Meeting, preventing the application of the double voting right set out in Article L. 225-123 of the French Commercial Code.

Shareholders are only liable for losses within the limit of their contributions.

Whenever it is necessary to hold more than one share in order to exercise any right whatsoever, in the event of an exchange, reverse stock split or allocation of shares, or due to a capital increase or reduction, a merger or any other corporate transaction, owners of single shares or numbers of shares below that required may only exercise such right if they take personal responsibility for consolidating or, if necessary, purchasing or selling the requisite number of shares.

Shareholders can choose to hold shares in registered or bearer form, subject to compliance with the laws and regulations.

Shares may be registered with an intermediary under the conditions provided for in Articles L. 228-1 *et seq.* of the French Commercial Code. Intermediaries must declare their status as intermediaries who hold shares for a third party, under the conditions provided for by the laws and regulations. These provisions are also applicable to the other securities issued by the Company.

Under the conditions provided for by the laws and regulations in force, the Company is entitled to request from the central custodian of financial instruments, at any time and provided that it pays the required consideration, as applicable, the name or corporate name, the nationality, the year of birth or the year of incorporation, and the address of the holders of bearer shares that grant an immediate or deferred right

7. General information about the Company and its capital

Incorporation documents and articles of association

to vote at its own Shareholders' Meetings, as well as the quantity of securities held by each of these shareholders and, where applicable, any restrictions to which the securities may be subject. The Company, in view of the list provided by the aforementioned body, has the right to ask the persons appearing on this list and whom the Company considers could be registered on behalf of third parties for the above information concerning the owners of the shares.

For registered shares that grant immediate or deferred access to the capital, intermediaries that are registered under the conditions provided for in Article L. 228-1 of the French Commercial Code mentioned above, are required, within ten business days as from the request made by the Company or its agent, which may be made at any time, to disclose the identity of the owners of said securities.

7.2.5 Assignment and transfer of shares

Shares can be traded without restriction, subject to compliance with the provisions of the laws and regulations. They are registered in an account and are passed on by transfer from one account to another.

7.2.6 Changes to the articles of association, the capital and voting rights

All changes to the articles of association, to the capital or to the voting rights attached to the securities that make up the capital are subject to the requirements of law, as the articles of association contain no specific provisions regarding such matters.

7.2.7 Members and functioning of the Board of Directors

The Board of Directors adopted internal rules of procedure, which are regularly updated, defining the operating procedures of the Board of Directors in addition to applicable legal and regulatory requirements and the provisions of the Company's articles of association.

These procedures are described in section 4.2. "Members and functioning of the Board of Directors".

The Group's internal rules of procedure are accessible on the Group's website (www.edf.fr).

7.2.8 Shareholder's Meetings

7.2.8.1 Convening notices to meetings

Shareholders' Meetings are convened by the Board of Directors or, in the last resort, by the Statutory Auditors or by any person empowered to do so. Meetings are held at the registered office or at any other place stated in the convening notice.

7.2.8.2 Participation in meetings and exercise of voting rights

Shareholders' Meetings may be held by video conference or any telecommunication means that allow shareholders to be identified. The conditions governing the type and use of such means are specified in Articles R. 225-97 to R. 225-99 of the French Commercial Code. In such cases, shareholders who participate in the meeting by such means are deemed to be present for the calculation of the quorum and majority, under the conditions specified by law.

All shareholders can attend Shareholders' Meetings, regardless of the number of shares they own.

Shareholders can choose between one of the three following methods of participation: attend the meeting in person by requesting an admission card, grant authorisation (a proxy) to the Chairman of the Shareholders' Meeting or to any individual or legal entity of their choice (Article L. 225-106 of the French Commercial Code), or vote remotely.

In accordance with Article R. 225-85 of the French Commercial Code, proof of the right to participate in a Shareholders' Meeting is obtained by the registration of the securities in an account in the name of the shareholder or of the intermediary that is registered on the shareholder's behalf (pursuant to paragraph 7 of Article L. 228-1 of the French Commercial Code), on the second day prior to the meeting, *i.e.* at midnight, Paris time, either in the registered share accounts held by the Company (or its authorised representative), or in the bearer share accounts held by the accredited intermediary.

In accordance with Article R. 225-85 of the French Commercial Code, the registration of the securities in the bearer share accounts held by financial intermediaries is evidenced by a shareholding certificate issued by these intermediaries, where applicable by electronic means under the conditions provided for in Article R. 225-61 of the French Commercial Code, as an appendix to the postal voting form, the voting proxy or admission card request made on behalf of a shareholder or on behalf of a shareholder who is represented by the registered intermediary.

All shareholders may grant a proxy to any individual or legal entity of their choice in order to be represented at a Shareholders' Meeting. Proxies, as well as any proxy revocations, must be evidenced in writing and notified to the Company. Proxies may be revoked in the same forms as those required for the designation of the proxy holder, including by electronic means if need be. The owners of shares that are properly registered in the name of an intermediary under the conditions provided for in Article L. 228-1 of the French Commercial Code may be represented by a registered intermediary under the conditions provided for in said article.

EDF gives its shareholders the possibility of voting online, prior to the Shareholders' Meeting.

Certain shares may carry double voting rights in accordance with the conditions laid down in Act no. 2014-384 of 29 March 2014 (see section 7.2.4 "Rights attached to shares").

7.2.8.3 Requests for the inclusion of items or draft resolutions on the agenda and written questions to the Board of Directors

Requests for the inclusion of items or draft resolutions on the Shareholders' Meeting agenda made by shareholders who meet the conditions provided for in Article R. 225-71 of the French Commercial Code must be received by the Company no later than twenty-five day prior to the date of the Shareholders' Meeting, but may not be sent more than 20 calendar days after the publication of the prior meeting notice, in accordance with Article R. 225-73 of the French Commercial Code.

Requests for the inclusion of items on the agenda must be substantiated. The wording of the draft resolutions must accompany requests for the inclusion of such resolutions, and a brief explanation of the reasons may also be given.

On the date of the request, the authors must provide proof of owning or representing the percentage of the capital required by Article R. 225-71 of the French Commercial Code. Requests must be accompanied by proof of entry in an account. Agenda items or draft resolutions that are proposed for inclusion are only reviewed if the authors of the request submit a new certificate proving the registration of the securities in the same accounts on the second day prior to the meeting.

Each shareholder also has the option of sending the Board of Directors written questions of his or her choice. The Board of Directors will answer the questions during the meeting, or, in accordance with Article L. 225-108 of the French Commercial Code, the answer is deemed to have been given provided that it is published on the Company's website.

Written questions must be sent to the Company by registered letter with return receipt or by electronic telecommunication at the latest on the fourth business day prior to the date of the Shareholders' Meeting. In accordance with Article R. 225-84 of the French Commercial Code, these questions must be accompanied by a shareholding certificate, in order to be taken into account.

7.2.8.4 Temporary disposals during meeting periods

In accordance with the provisions of Article L. 225-126 of the French Commercial Code, any person, alone or together with other persons, by way of one or more temporary disposals or any transaction that grants the right to or requires the resale or return of said shares to the assignor, who holds a number of shares that represents more than 0.5% of the voting rights in a listed company, must notify the Company and the French Market Authority no later than midnight, Paris time, on the second business day prior to the Shareholders' Meeting, and when the contract that arranges this transaction remains in force on this date, of the total number of shares held on a temporary basis. In addition to the number of shares acquired, this notification must contain the identity of the assignor, the date and the expiration of the contract that organises the transaction and, as applicable, the voting agreement.

If no information is provided to the Company and the French Market Authority, the shares thus acquired are automatically stripped of voting rights for the Shareholders' Meeting concerned and for all Shareholder's Meetings that are held until such shares are resold or returned.

Moreover, the Company representative, a shareholder or the French Market Authority may petition the Commercial Court to order the complete or partial suspension, for a maximum of five years, of the voting rights of any shareholder who fails to provide such information, regardless of whether or not the voting borrowing shareholder has exercised his or her voting rights.

7.2.9 By-law or statutory provisions that delay acquisition of control over the Company

Pursuant to Article L. 111-67 of the French Energy Code and the EDF articles of association, changes in share capital cannot result in the French State's shareholding falling below the statutory 70% threshold.

Certain shares may carry double voting rights in accordance with the conditions laid down in Act no. 2014-384 of 29 March 2014 (see section 7.2.4 "Rights attached to shares").

With the exception of the foregoing, no other provision specifically aims to prevent or delay the takeover of the Company by a third party

7.2.10 Threshold crossings

Pursuant to the provisions of the French Commercial Code, any individual or legal entity, acting alone or together with other persons or entities, that acquires a number of shares that represents more than 5%, 10%, 15%, 20%, 25%, 30%, 33.3%, 50%, 66.6%, 90% or 95% of the capital or voting rights must inform the Company, no later than prior to the close of business on the fourth trading day following the day on which the shareholding threshold is exceeded, of the total number of shares or voting rights owned (Article R. 233-1 of the French Commercial Code). Moreover, such individuals or legal entities must also inform the AMF of these acquisitions no later than prior to the close of business on the fourth trading day following the day on which the shareholding threshold is exceeded (Article 223-14 of the AMF general regulation). The AMF publishes threshold crossings that are notified to it.

Since 2012, cash payoff or physically-settled derivatives having a similar economic effect to detention of underlying shares, are taken into account for this calculation of threshold crossing (Article L. 233-9(I) 4 bis of the French Commercial Code). Pursuant to AMF general regulations, holders of these financial instruments must take into account the number of shares that carry this type of agreement and financial instruments for the calculation of their participation in the framework of their reporting obligation, and must precise, when they declare threshold crossing, their intention as to the outcome of this type of agreements and financial instruments.

Within the same timeframes and under the same conditions, this information must also be disclosed when the capital or voting rights fall below the thresholds stated above.

Absent a proper declaration, the shares that exceed the fraction which should have been declared in accordance with the provisions of law mentioned above will be stripped of voting rights for all Shareholders' Meetings that are held during a two-year period following the date on which the effective disclosure is made.

Moreover, the Company's articles of association provide that any individual or legal entity, acting alone or jointly, who acquires or ceases to hold, directly or indirectly, a number of shares that corresponds to 0.5% of the Company's capital or voting rights, or a multiple of said fraction, is required to inform the Company, by registered letter with return receipt requested, at the latest before the close of business on the fourth trading day following the day on which the shareholding threshold is exceeded, of the total number of shares, voting rights or equity interests held. The Company's articles of association state that the rules for the calculation and assimilation of shareholdings applicable to the statutory thresholds, as well as the obligations to provide information on financial instruments that are not assimilated to shares, apply to the disclosure requirements set out in the articles of association for bylaw thresholds.

Failure to comply with the above provisions is punishable by the loss of voting rights for the shares that exceed the fraction that should have been declared, for all Shareholders' Meetings that are held until the expiration of a two-year period following the date of the effective threshold disclosure provided for above, if the application of this penalty is requested by one or more shareholders who hold at least 1% of the Company's capital. Such requests are recorded in the minutes of Shareholders' Meetings.

7.3 Information regarding capital and share ownership

7.3.1 Amount of share capital and changes in share capital

On the filing date of this Universal Registration Document, the details of the Company's share capital are as follows:

<i>Number of shares issued</i>	3,103,621,086
Par value	€0.50 per share
Type of shares issued	common shares
Share capital amount	€1,551,810,543

The share capital issued by the Company has been paid up in full. The Company has not issued or authorised any preference shares.

Pursuant to the law of 9 August 2004, EDF was converted into a société anonyme (public limited company) on 20 November 2004 and its capital set at €8,129,000,000, divided into 1,625,800,000 shares with a par value of €5.

The EDF Shareholders' Meeting of 31 August 2005 granted full powers to the EDF Board of Directors with a view to reducing the capital by a maximum amount of €7,316,100,000, *via* a reduction in the par value of shares from €5 to a minimum of €0.5. During its meeting of 27 October 2005, the Board of Directors decided to reduce the share capital by €7,316,100,000, *via* a €4.50 reduction in the par value of shares, which therefore decreased from €5 to €0.50. The share capital was thus reduced to €812,900,000.

During its 18 November 2005 meeting, the Board of Directors used the authority granted to it by the Combined Shareholders' Meeting of 10 October 2005, and approved the increases in the Company's share capital in connection with the Open Price Offering and the Guaranteed Global Placement that were performed when the Group was first listed on the stock market. As a result, the Board of Directors increased the share capital to €906,834,514.

On 20 December 2005, Calyon (now Crédit Agricole-CIB) paid EDF the price that corresponded to the exercise of 8,502,062 warrants that the EDF Board issued to Calyon by decision taken on 18 November 2005. Consequently, the share capital was increased to €911,085,545 divided into 1,822,171,090 common shares.

The payment of dividends in shares on 17 December 2009 resulted in an increase in the share capital of €13,347,786 following the issue of 26,695,572 shares. On 21 January 2010, the share capital was thus increased to €924,433,331 divided into 1,848,866,662 common shares.

On 24 June 2011, the capital was increased to €930,406,055 divided into 1,860,812,110 common shares, *via* the issue of new shares as consideration for the EDF Énergies Nouvelles shares contributed to EDF in exchange for the EDF shares tendered as part of the alternative simplified public purchase or exchange offer involving EDF Énergies Nouvelles shares, which was initiated by EDF (see section 1.4.1.5.3 "Other renewable energies"). Then, on 28 September 2011, the capital was reduced to €924,433,331 divided into 1,848,866,662 common shares, *via* the cancellation of the shares purchased as part of the share buyback programme with a view to cancellation, in order to offset the dilution caused by the aforementioned offer.

On 29 July 2013, the capital was increased to €930,004,234, divided into 1,860,008,468 common shares. This increase of capital followed the decision of the EDF Shareholders' Meeting of 30 May 2013 to offer each shareholder in the Company the possibility to opt for the payment in new shares of a fraction of the remaining dividend to be distributed for the financial year ending 31 December 2012.

The payment of interim dividends in shares on 18 December 2015 resulted in an increase in the capital of €30,065,279.50 following the issue of 60,130,559 shares. The share capital was thus increased from €930,004,234 to €960,069,513.50 divided into 1,920,139,027 common shares.

On 31 October 2016, the capital was increased to €1,054,568,341.50, divided into 2,109,136,683 common shares. This increase of capital followed the decision of the EDF Shareholders' Meeting of 12 May 2016 to offer each shareholder in the Company the possibility to opt for the payment in new shares of the remaining dividend to be distributed for the financial year ending 31 December 2016.

The payment of interim dividends in shares on 31 October 2016 resulted in an increase in the capital of €47,942,646 following the issue of 95,885,292 shares. The capital was thus increased from €1,006,625,695.50 to €1,054,568,341.50, divided into 2,109,136,683 common shares.

At its meeting of 3 March 2017, the Board of Directors, making use of the delegation of authority given by the Combined Shareholders' Meeting of 26 July 2016 in its second resolution, decided to increase the capital with maintenance of the shareholders' preferential subscription right. The capital was increased to €1,370,938,843.50, divided into 2,741,877,687 common shares. The final gross capital increase, including the issue premium, stood at €4,017,905,375.40 and resulted in the issue of 632,741,004 new shares. It was launched on 6 March 2017 and was completed on 30 March 2017.

On 12 July 2017, the capital was increased to €1,443,677,137, divided into 2,887,354,274 common shares. This increase of capital followed the decision of the EDF Shareholders' Meeting of 18 May 2017 to offer each shareholder in the Company the possibility to opt for the payment in new shares of the remaining dividend to be distributed for the financial year ending 31 December 2016.

The payment of interim dividends in shares on 14 December 2017 resulted in an increase in the share capital of €398,440,228.20 following the issue of 40,084,530 shares. The capital was thus increased from €1,443,677,137 to €1,463,719,402, divided into 2,927,438,804 common shares.

On 29 June 2018, the capital was increased to €1,505,133,838, divided into 3,010,267,676 common shares. This increase of capital followed the decision of the EDF Shareholders' Meeting of 15 May 2018 to offer each shareholder in the Company the possibility to opt for the payment in new shares of the remaining dividend to be distributed for the financial year ending 31 December 2017.

At the Board meeting held on 19 November 2019, the directors decided to distribute an interim dividend of €0.15 per share for the 2019 fiscal year and resolved, in accordance with the terms of the fourth resolution adopted at the Combined Shareholders' Meeting held on 16 May 2019, that it could be paid in new shares issued by the Company.

The payment of interim dividends in shares on 17 December 2019 resulted in an increase in the share capital of €429,635,913.60 following the issue of 52,651,460 shares. The capital was thus increased from €1,525,484,813 to €1,551,810,543, divided into 3,103,621,086 common shares.

On the filing date of this Universal Registration Document, other than the common shares of Company stock, there are no other securities that grant access to EDF's share capital, either directly or indirectly

7.3.2 Treasury shares and share buyback programme

A share buyback programme initially authorised by the Shareholders' Meeting held on 9 June 2006, has been used by the Board of Directors within a limit of 10% of the Company's share capital and for an initial period of 15 months. This programme was continued for 18 months by the following Shareholders' Meetings held since 2006, including by the Shareholders' Meeting held on 15 May 2018 which approved it.

7.3.2.1 Share buyback programme in force as of the filing date of the Universal Registration Document (programme authorised by the Shareholders' Meeting of 16 May 2019)

After consulting the Board of Directors' report, and in accordance with the provisions of Articles L. 225-209 *et seq.* of the French Commercial Code (*Code de commerce*), the eighteenth resolution adopted by the Shareholders' Meeting held on 16 May 2019 authorised the Board of Directors to implement a programme to buy back Company shares, capped at a maximum of 10% of the Company's capital.

This resolution immediately terminated the unused portion of the authorisation to purchase Company shares, which was granted by the seventh resolution adopted by the Shareholders' Meeting held on 15 May 2018.

The main aims of the share buyback programme are as follows: to cancel shares; to allot or transfer shares to employees or former employees of the Company, on the terms and conditions provided for by law, in particular as their share of the Company's profits, or by way of bonus shares or offers reserved for employees; to deliver shares following the exercise of rights attached to securities granting access to the capital by redemption, conversion, exchange, presentation of a warrant or otherwise; to provide liquidity through a liquidity contract in accordance with accepted market practice established by the AMF; to deliver shares following the exercise of rights attached to securities granting access to the Company's capital and implement all hedging transactions for the obligations of the Company or one of its

subsidiaries; to retain and subsequently deliver shares in connection with external growth transactions, contributions, mergers or demergers; more generally, to carry out any transaction that is or may become authorised under the regulations in force, or falling within the scope of market practice accepted by the AMF.

The maximum percentage of capital that may be bought back under this programme is 10% of the total number of shares making up the share capital (or 5% for shares acquired with a view to their retention and subsequent delivery in payment or in exchange as part of an external growth transaction), it being noted that whenever shares are bought back to provide liquidity under a liquidity contract, the 10% threshold will be calculated using the number of shares purchased, as reduced by the number of shares resold during the validity period of the authorisation.

Under no circumstances may the Company hold, directly or indirectly, more than 10% of its capital.

These shares may be acquired or transferred, under the conditions and within the limits, in particular in terms of volumes and price, provided for by the laws and regulations in force on the date of the relevant transactions, by any means, such as on the market or over the counter, including *via* block trades (purchases or sales), by the use of derivative financial instruments or notes or securities that grant access to Company shares, or by implementing option strategies, under the conditions stipulated by the market authorities and at such times as determined by the Board of Directors or any person who is acting on the Board's behalf. This authorisation may be used during public takeover bids, within the limits permitted by the applicable regulations.

The Shareholders' Meeting set at €30 the maximum purchase price per share ⁽¹⁾ and at €2 billion the maximum amount of funds allocated to the implementation of the programme, and granted the Board of Directors full powers, with the right of delegation, to use this authorisation.

The authorisation was granted for a maximum of 18 months as from the Shareholders' Meeting of 16 May 2019, and will therefore end on 16 November 2020, unless the Shareholders' Meeting of 7 May 2020 adopts the new programme described in section 7.3.2.3 "Description of the new share buyback programme to be submitted for approval at the Combined Shareholders' Meeting to be held on 7 May 2020" below.

7.3.2.2 Summary of the Company's trading in its own shares during the 2019 financial year

Number of treasury shares held at 31 December 2019	4,882,938.00
Percentage of capital held through treasury shares at 31 December 2019	0.1573%
Carrying value of the portfolio at 31 December 2019 ⁽¹⁾ (in euros)	63,890,493.70
Market value of the portfolio at 31 December 2019 ⁽²⁾ (in euros)	48,477,808.46
Number of shares cancelled over the past 24 months	0

(1) Valued at the purchase price.

(2) Based on the closing price at 31 December 2019, i.e. €9.9280.

Liquidity contract

Following changes to the regulations governing liquidity contracts and in accordance with AMF decision no. 2018-01 of 2 July 2018, a new liquidity contract was signed with Oddo BHF and as at 28 March 2019, the liquidity account comprised €10,120,161 and 738,882 shares.

Number of shares purchased and sold during the 2019 financial year

During the 2019 financial year, EDF acquired 8,364,873 of its own shares and sold 10,856,867 shares under the liquidity contract. The average share purchase price was €11.8013 and the average share sale price was €7.7702.

Portfolio breakdown at 31 December 2019

At 31 December 2019, the Company held a total of 4,882,938 treasury shares. 1,185,431 of these shares (0.0382% of its share capital) are held under the liquidity contract, and the remaining 3,697,507 shares (0.1191% of its share capital) have been earmarked for cancellation *via* a reduction of capital.

On 19 December 2019, the Chairman and Chief Executive Officer, using the powers delegated by the Board of Directors, decided to reallocate 3,646,913 EDF shares initially allocated to the liquidity contract and 50,594 shares allocated to a 2007 offer reserved for employees that had lapsed, i.e. a total of 3,697,507 shares, to the objective of reducing the capital by cancelling the said shares.

On this date, EDF's subsidiaries did not hold any shares, either directly or indirectly.

(1) The Board of Directors may, however, adjust the aforementioned purchase price if premiums, reserves or profits are capitalised, which results either in an increase in the par value of the shares or in the creation and award of bonus shares, and in the event of a stock split or reverse stock split, or any other transaction involving the shareholders' equity, in order to take into account the impact of these operations on share value.

7. General information about the Company and its capital

Information regarding capital and share ownership

Post-closing transactions

Between 1 January 2020 and 28 February 2020, the Company acquired 1,165,271 treasury shares for an average unit value of €11.6703, and sold 1,527,180 shares for an average unit value of €11.5366.

7.3.2.3 Description of the new share buyback programme to be submitted for approval at the Combined Shareholders' Meeting to be held on 7 May 2020

Pursuant to Article 241-2 *et seq.* of the AMF general regulations and Article L. 451-3 of the French Monetary and Financial Code, and in accordance with EU regulations, the following is a description of the share buyback programme that will be submitted to the Ordinary and Extraordinary Shareholders' Meeting to be held on 7 May 2020 for approval.

Objectives of the new share buyback programme

Under the share buyback programme, shares will be bought back for the following purposes:

- to allow them to be delivered when exercising rights attached to securities granting access to the capital by redemption, conversion, exchange, presentation of a warrant or otherwise and to implement all hedging transactions for the obligations of the Company or one of its subsidiaries related to those securities;
- to allow them to be allotted or transferred to employees or former employees of the Company, on the terms and conditions provided for by law, in particular as their share of the Company's profits, or by way of bonus shares or any offers reserved for employees;
- to provide liquidity under a liquidity contract;
- to allow them to be delivered following the exercise of rights attached to securities granting access to the Company's capital and to implement all hedging transactions for the obligations of the Company or one of its subsidiaries;
- to allow them to be cancelled, provided that the shareholders adopt the 19th extraordinary resolution submitted to them at the Shareholders' Meeting of 16 May 2019;
- to allow them to be retained and subsequently delivered in connection with external growth transactions, contributions, mergers or demergers;
- more generally, to carry out any transaction that is or may become authorised under the regulations in force, or falling within the scope of market practice accepted by the AMF;

- to reduce the capital by cancelling them.

Duration of the share buyback programme

The share buyback programme may be implemented for a period of 18 months, as of the Shareholders' Meeting of 7 May 2020.

Maximum percentage of capital, maximum number and characteristics of the shares that the Company wishes to buy back and maximum purchase price

The maximum percentage of capital that may be bought back under this programme is 10% of the total number of shares making up the capital (or 5% for shares acquired with a view to their retention and subsequent delivery in payment or in exchange as part of an external growth transaction), it being noted that whenever shares are bought back to provide liquidity under a liquidity contract, the 10% threshold will be calculated using the number of shares purchased, as reduced by the number of shares resold during the validity period of the authorisation.

Under no circumstances may the Company hold, directly or indirectly, more than 10% of its capital.

The maximum purchase price of shares under this resolution is €20 per share and the total amount of funds that may be allocated to the implementation of this share buyback programme may not exceed €2 billion.

7.3.3 Capital authorised but not issued

The following table presents a summary of the delegations of authority and authorisations to increase or reduce the share capital that were in force on the filing date of this Universal Registration Document which the Board of Directors was granted by the Combined Shareholders' Meetings of 15 May 2018 and 16 May 2019, and the extent to which they have been used at 31 December 2019:

STATUS OF THE AUTHORISATIONS ADOPTED BY THE COMBINED SHAREHOLDERS' MEETINGS OF 15 MAY 2018 AND 16 MAY 2019

Securities concerned/type of issue	Term of the authorisation and expiration	Maximum nominal increase or reduction in capital (in millions of euros)	Use of authorisations (in millions of euros)
Delegation of authority to the Board to increase the capital with maintenance of the shareholders' preferential subscription right Capital increase, all securities	26 months 15 July 2020	365 ⁽¹⁾	None
Delegation of authority to the Board to increase the capital, by way of a public offering, with cancellation of the shareholders' preferential subscription right Capital increase, all securities	26 months 15 July 2020	290 ⁽¹⁾	None
Delegation of authority to the Board to make offers for private placements ⁽²⁾ with cancellation of the shareholders' preferential subscription right Capital increase, all securities	26 months 15 July 2020	290 ⁽¹⁾ and 20% of the share capital per year	None
Authorisation for the Board, in the event of an increase of capital, via private placements, with cancellation of the shareholders' preferential subscription right, to decide the issue price at its discretion	26 months 15 July 2020	10% of the capital by 12-month periods	None
Authorisation for the Board to increase the number of securities to be issued in the event of a capital increase, with or without preferential subscription rights Capital increase, all securities	26 months 15 July 2020	15% of the amount of the initial issue ⁽¹⁾	None
Delegation of authority to the Board to increase the capital through the capitalisation of reserves, profits, premiums or otherwise	26 months 15 July 2020	1,000	None
Delegation of authority to the Board to increase the capital as consideration for a public exchange bid initiated by the Company	26 months 15 July 2020	145 ⁽¹⁾	None
Delegation of authority to the Board to increase the capital to remunerate in-kind contributions ⁽³⁾	26 months 15 July 2020	10% of the Company's capital up to a maximum of 95 ⁽¹⁾	None
Delegation of authority to the Board to increase the capital for the benefit of savings plan members Issues reserved for the personnel	26 months 15 July 2020	15	None
Delegation of authority to the Board to carry out increases of capital reserved for a category of beneficiaries, with cancellation of the shareholders' preferential subscription right	18 months 15 November 2019	10	None
Authorisation for the Board to reduce the capital by cancelling treasury shares	18 months 16 November 2020	10% of the capital by 24-month periods	None

(1) The nominal aggregate limit on the share capital increase of €365 million provided for in the thirteenth resolution submitted to the General Meeting of 15 May 2018, applies to all capital increases, with the exception of capital increases through capitalisation of reserves, premiums, profits or otherwise and capital increases that are reserved for savings plan members.

(2) Offers governed by Article L. 411-2 II of the French Monetary and Financial Code, in that they are exclusively intended for persons who provide investment portfolio management services on behalf of third parties or qualified investors or a restricted circle of investors acting on their own behalf.

(3) Article L. 225-147 of the French Commercial Code (Code de commerce).

7. General information about the Company and its capital

Information regarding capital and share ownership

STATUS OF THE AUTHORISATIONS TO BE SUBMITTED TO THE COMBINED SHAREHOLDERS' MEETING OF 7 MAY 2020 FOR ADOPTION

Securities concerned/type of issue	Term of the authorisation and expiration	Maximum nominal increase or reduction in capital (in millions of euros)	Use of authorisations (in millions of euros)
Delegation of authority to the Board to increase the capital with maintenance of the shareholders' preferential subscription right Capital increase, all securities	26 months 07 July 2022	365 ⁽¹⁾	None
Delegation of authority to the Board to increase the capital, by way of a public offering, with cancellation of the shareholders' preferential subscription right Capital increase, all securities	26 months 07 July 2022	290 ⁽¹⁾	None
Delegation of authority to the Board to make offers for private placements ⁽²⁾ with cancellation of the shareholders' preferential subscription right Capital increase, all securities	26 months 07 July 2022	290 ⁽¹⁾ and 20% of the share capital per year	None
Authorisation for the Board to increase the number of securities to be issued in the event of a capital increase, with or without preferential subscription rights Capital increase, all securities	26 months 07 July 2022	15% of the amount of the initial issue ⁽¹⁾	None
Delegation of authority to the Board to increase the capital through the capitalisation of reserves, profits, premiums or otherwise	26 months 07 July 2022	1,000	None
Delegation of authority to the Board to increase the capital as consideration for a public exchange bid initiated by the Company	26 months 07 July 2022	145 ⁽¹⁾	None
Delegation of authority to the Board to increase the capital to remunerate in-kind contributions ⁽³⁾	26 months 07 July 2022	10% of the Company's capital up to a maximum of 95 ⁽¹⁾	None
Delegation of authority to the Board to increase the capital for the benefit of savings plan members Issues reserved for the personnel	26 months 07 July 2022	15	None
Delegation of authority to the Board to carry out increases of capital reserved for a category of beneficiaries, with cancellation of the shareholders' preferential subscription right	18 months 07 November 2022	10	None
Authorisation for the Board to reduce the capital by cancelling treasury shares	18 months 07 November 2022	10% of the capital by 24-month periods	None

(1) The nominal aggregate limit on the share capital increase of €365 million provided for in the thirteenth resolution submitted to the General Meeting of 07/05/2020, applies to all capital increases, with the exception of capital increases through capitalisation of reserves, premiums, profits or otherwise and capital increases that are reserved for savings plan members.

(2) Offers governed by Article L. 411-2 II of the French Monetary and Financial Code, in that they are exclusively intended for persons who provide investment portfolio management services on behalf of third parties or qualified investors or a restricted circle of investors acting on their own behalf.

(3) Article L. 225-147 of the French Commercial Code (Code de commerce).

7.3.4 Other equity securities

On the date of this Universal Registration Document, other than the common shares of Company stock, there are no other securities that grant access to EDF's share capital, either directly or indirectly.

7.3.5 Non-equity securities

On 18 April 1996, EDF set up a programme to issue debt securities in the form of Euro Medium Term Notes (the "EMTN" programme). Since this date, this programme has been regularly renewed.

On 6 October 2016, EDF successfully raised \$2.655 billion from 2 senior bonds subscribed for by twenty or so investors on the Taiwanese market ("Formosa bonds"):

- \$491 million, with a fixed coupon of 4.65%, 30-year bond;
- \$2.164 billion, with a fixed coupon of 4.99%, 40-year bond.

On 6 October 2016, EDF also successfully launched a senior multi-currency bond issue of approximately €3 billion in four tranches:

- €1.75 billion, with a fixed coupon of 1%, 10-year green bond;
- €750 million, with a fixed coupon of 1.875%, 20-year bond;
- CHF400 million, with a fixed coupon of 0.3%, 8-year bond;
- CHF150 million, with a fixed coupon of 0.65%, 12-year bond.

This third Green Bond issue, in an amount of €1.75 billion, is the largest tranche of Green Bonds issued to date and means that EDF has already issued the equivalent of more than €4 billion in Green Bonds over a three-year period to support its expansion in the renewable energies field.

On 20 January 2017, EDF successfully raised 137 billion yen, corresponding to approximately €1.1 billion⁽¹⁾, through 4 senior bonds issued on the Japanese market ("Samurai bonds"):

- JPY107.9 billion, with a fixed coupon of 1.088%, 10-year bond;
- JPY19.6 billion, with a fixed coupon of 1.278%, 12-year green bond;
- JPY6.4 billion, with a fixed coupon of 1.569%, 15-year green bond;
- JPY3.1 billion, with a fixed coupon of 1.870%, 20-year bond, which is the longest bond maturity ever issued on the Samurai market.

With the issue of two green tranches, in a total amount of 26 billion yen to be used to finance its renewable investments, EDF opens the Samurai Green market and thus continues to actively participate in the development of Green Bonds as tools to finance the energy transition.

On 19 September 2018, EDF successfully raised US\$3.75 billion on 3 tranches of senior bonds:

- \$1.8 billion, with a fixed coupon of 4.500%, 10-year bond;
- \$650 million, with a fixed coupon of 4.875%, 20-year bond;
- \$1.3 billion, with a fixed coupon of 5.000%, 30-year bond.

In addition, on 25 September 2018, EDF successfully launched a €1 billion senior bond issue with a 12-year maturity and a fixed coupon of 2%.

On 25 September 2018, EDF launched a €1.25 billion super-subordinated bond issue with a 4% coupon and a redemption option exercisable at EDF's discretion, initially between 4 July 2024 (inclusive) and 4 October 2024 (inclusive). It also

launched a contractual cash buyback offer for four existing hybrid bond issues for €1.25 billion. The total amount of EDF hybrid shares remains unchanged following these issue/redemption operations.

On 26 November 2019, EDF launched a €500 million euro-denominated hybrid bond issue with a 3% coupon and a redemption option including a first option for early redemption at the Company's call in December 2027. The Company also launched contractual buyback offers for the following securities:

- perpetual super-subordinated bonds of €1,000 million with a first early redemption date at the Company's call falling on 22 January 2022, with a current outstanding amount of €661.8 million, admitted for trading on Euronext Paris;
- perpetual super-subordinated bonds of US\$3,000 million with a first early redemption date at the Company's call falling on 29 January 2023, with a current outstanding amount of US\$3,000 million admitted for trading on the regulated market of the Luxembourg Stock Exchange.

On 28 November 2019, EDF raised US\$2 billion with a 50-year maturity and a fixed coupon of 4.5% under its EMTN program.

As part of the same programme, on 2 December 2019, EDF raised €1.25 billion with a 30-year maturity and a fixed coupon of 2%. On 12 December 2019, EDF announced the final result of its buyback offer for euro-denominated hybrid bonds and the results of early participation in its buyback offer for US dollar-denominated hybrid bonds.

On 30 December 2019, EDF announced the final result of its buyback offer for US dollar-denominated hybrid bonds. The Company also exercised its option to buy back on 29 January 2020 all of the perpetual subordinated bonds totalling €1.250 billion, with a current outstanding amount of €338.2 million.

7.3.6 Information on the share capital of any member of the Group subject to a conditional or unconditional agreement

Acquisition and disposal commitments involving securities in subsidiaries are described in note 46 to the consolidated financial statements for the fiscal year ended 31 December 2019.

With the exception of these commitments to acquire and dispose of securities and any other commitments that are described in chapter 1 ("The Group, its strategy and activities") of this Universal Registration Document, EDF has not made any promises to purchase or sell that would make it possible to acquire or dispose of, as applicable, all or part of the capital of the Company or of any of its subsidiaries, as defined in Article L. 233-1 of the French Commercial Code (*Code de commerce*).

7.3.7 Pledge of the Company's shares

To the Company's knowledge, none of the Company's common shares that make up its share capital have been pledged.

(1) According to the exchange rate on 20 January 2017.

7. General information about the Company and its capital

Information regarding capital and share ownership

7.3.8 Ownership of the Company's capital and voting rights

For the past three financial years, EDF's share capital has been owned as follows as at 31 December of each year:

	At 31/12/2019		At 31/12/2018		At 31/12/2017	
	Number of shares	% of capital	Number of shares	% of capital	Number of shares	% of capital
State ⁽¹⁾	2,593,960,583	83.58	2,518,498,450	83.67	2,444,361,086	83.50
Institutional and private investors	463,147,431	14.92	453,361,661	15.06	444,381,189	15.18
Employee shareholdings	41,630,134 ⁽¹⁾	1.34	34,679,546 ⁽²⁾	1.15	35,266,513	1.20
Treasury shares	4,882,938	0.16	3,728,019	0.12	3,430,016	0.12
TOTAL	3,103,621,086	100.00	3,010,267,676	100.00	2,927,438,804	100.00

(1) This number includes 37,527,237 shares (representing 1.21% of the capital) based on the definition of employee shareholdings under Article L. 225-102 of the French Commercial Code (shares held by EDF's employees and former employees through the "Actions EDF" FCPE of the EDF group's savings plan). This number also includes almost 4.1 million shares, representing 0.13% of the capital, held as directly or administered registered shares, with no lock-in periods or whose lock-in periods have expired, by employees or former employees.

(2) This number includes 30,453,101 shares (representing 1.01% of the capital) based on the definition of employee shareholdings under Article L. 225-102 of the French Commercial Code (shares held by EDF's employees and former employees through the "Actions EDF" FCPE of the EDF group's savings plan). This number also includes almost 4.2 million shares, representing 0.14% of the capital, held as directly or administered registered shares, with no lock-in periods or whose lock-in periods have expired, by employees or former employees.

Following a French state allotment of 389,349,361 EDF shares to EPIC Bpifrance, on 29 January 2018, Bpifrance and the French State combined crossed the statutory thresholds of 5%, 10%, 15%, 20%, 30%, one third, 50% and two-thirds of the Company's capital and voting rights. The French state and Bpifrance act together and have to consult each other before every Shareholders' Meeting of EDF. Bpifrance undertook to not transfer, pledge or otherwise dispose of the EDF shares.

To the Company's knowledge, no shareholder other than the French State and Bpifrance directly or indirectly holds more than 5% of the capital and voting rights.

The Company conducted a study on identifiable bearer shares as at 31 December 2018, which allowed it to examine the ownership of its capital and the geographical location of its shareholders on this date. The table set out below summarises this information as at 31 December 2018 and 31 December 2019:

	At 31 December 2019		At 31 December 2018	
	Number of shares held	% of capital	Number of shares held	% of capital
State*	2,593,960,583	83.58	2,518,498,450	83.67
Institutional investors in Europe (other than France)	128,064,805	4.13	124,602,395	4.14
Institutional investors in the rest of the world	196,362,093	6.33	201,203,349	6.68
Institutional investors in France	74,924,143	2.41	68,798,317	2.29
Private shareholders	63,796,390	2.05	58,752,599	1.95
Employee shareholdings	41,630,134	1.34	34,679,546	1.15
Treasury shares	4,882,938	0.16	3,728,019	0.12
TOTAL	3,103,621,086	100.00	3,010,267,676	100.00

* The French State's investment in EDF's share capital includes the allocation of 389,349,361 EDF shares in EPIC Bpifrance since January 2018.

The State ⁽¹⁾ indicated that it held 2,593,960,583 EDF shares and 4,648,972,308 voting rights as at 31 December 2019 (or 83.58% of the capital and 88.89% of the voting rights of EDF ⁽²⁾). The state has committed to choosing a payment in shares for the remaining dividend for 2018 as well as 2019 and 2020.

7.3.9 Agreements whose implementation could lead to a change of control

To EDF's knowledge, there are no agreements whose implementation could subsequently lead to a change in the Company's control.

Moreover, pursuant to Article L. 111-67 of the French Energy Code, the State may not hold less than 70% of EDF's capital.

(1) The French State's investment in EDF's share capital includes the allocation of 389,349,361 EDF shares in EPIC Bpifrance since January 2018.

(2) This percentage was calculated based on the number of theoretical voting rights for all shares carrying voting rights, including those stripped of voting rights.

7.4 Market for the Company's shares

The Company's shares have been listed for trading by Euronext Paris (Compartment A) since 21 November 2005, under ISIN code FR 0010242511, Reuters code (EDF: PA) and Bloomberg code (EDF: FP).

The following graph shows the changes in the Company's share price between 21 November 2005 and 31 December 2019 (base index 100 as at 21 November 2005):



(Source: Bloomberg)

The following table shows the share price and volume of EDF shares traded between 1 January 2019 and 31 January 2020 on the Euronext Paris stock market:

	Transactions		Closing price (in euros)	
	(in number of shares)	(in euros*)	Highest	Lowest
2020				
January 2020	50,834,398	550,759,263	11.49	9.83
2019				
December 2019	41,577,175	401,051,660	10.03	9.28
November 2019	44,003,263	405,721,014	9.35	9.12
October 2019	47,089,423	444,883,784	10.30	9.12
September 2019	57,656,904	602,812,760	11.20	10.00
August 2019	39,190,936	416,497,966	11.17	10.31
July 2019	44,146,084	490,362,602	11.35	10.95
June 2019	52,363,054	617,466,763	12.71	10.85
May 2019	46,370,276	574,156,903	12.75	12.02
April 2019	46,714,865	580,718,595	12.85	11.92
March 2019	47,816,599	601,153,153	12.97	12.07
February 2019	56,867,688	785,946,487	15.01	12.72
January 2019	43,514,111	607,602,873	14.43	13.57

* Transactions in euros correspond to the monthly sum of the proceeds of the daily number of shares traded by the closing price on the same day (Source: Euronext).

7. General information about the Company and its capital

Related-party transactions

2019

In 2019, EDF's share price decreased by 28.0%, the French CAC 40 index increased by +26.4%, while the Euro Stoxx Utility sector index (SX6P) increased by +24.6%.

At 31 December 2019, the closing price of the EDF share was €9.93 (€13.80 at 31 December 2018). Its highest closing price in 2019 was €15.01 on 6 February 2019, and its lowest closing price was €9.12 on 30 October 2019.

At 31 December 2019, EDF's market capitalisation totalled €30.82 billion (compared to €41.54 billion at 31 December 2018).

2020

From the beginning of 2020 to 31 January 2020 inclusive, EDF's share price rose by 12.36%, the CAC 40 index decreased by -2.9% and the Euro Stoxx Utility (SX6P) sector index increased by +7.9%.

At 31 January 2020, the closing price of the EDF share was €11.15. Its lowest closing price in 2020, up to 31 January 2020 inclusive, was €9.83 on 10 January 2020, and its highest closing price was €11.48 on 27 January 2020.

At 31 January 2020, EDF's market capitalisation totalled €34.61 billion.

7.5 Related-party transactions

7.5.1 Related-party transactions

The information regarding the details of the transactions concluded by the Company with related parties, as defined by the IFRS, in respect of the 2019 financial year, are contained in notes 26 and 51 to the consolidated financial statements for the financial year ended 31 December 2019.

They describe:

- relations with the French state;
- relations with Engie;

- relations with Orano and public sector companies;
- the main intra-group relations.

The information on the regulated agreements and commitments referred to in Article L. 225-38 of the French Commercial Code (*Code de commerce*) is stated in the Statutory Auditors' special report, which is reproduced below in section 7.5.2 "Statutory Auditor's special report on regulated agreements and commitments" of this Universal Registration Document.

7.5.2 Statutory Auditors' special report on regulated agreements

Shareholders' meeting held to approve the financial statements for the year ended 31 December 2019

This is a free translation into English of the Statutory Auditors' special report on regulated agreements that is issued in the French language and is provided solely for the convenience of English speaking readers. This report on regulated agreements should be read in conjunction with, and construed in accordance with, French law and professional auditing standards applicable in France. It should be understood that the agreements reported on are only those provided by the French Commercial Code and that the report does not apply to those related party transactions described in IAS 24 or other equivalent accounting standards.

To the Shareholders' Meeting of Électricité de France SA,

In our capacity as Statutory Auditors of Électricité de France SA (the "Company"), we hereby report to you on regulated agreements.

The terms of our engagement require us to communicate to you, based on information provided to us, the principal terms and conditions of those agreements brought to our attention or which we may have discovered during the course of our audit, without expressing an opinion on their usefulness and appropriateness or identifying such other agreements, if any. It is your responsibility, pursuant to Article R. 225-31 of the French Commercial Code (*Code de Commerce*), to assess the interest involved in respect of the conclusion of these agreements for the purpose of approving them.

Our role is also to provide you with the information stipulated in Article R. 225-31 of the French Commercial Code relating to the implementation during the past year of agreements previously approved by the Shareholders' Meeting, if any.

We conducted the procedures we deemed necessary in accordance with the professional guidelines of the French National Institute of Statutory Auditors (*Compagnie Nationale des Commissaires aux Comptes*) relating to this engagement. These procedures consisted in agreeing the information provided to us with the relevant source documents.

Agreements submitted to the approval of the Shareholders' Meeting

Agreements authorized and concluded during the year

Pursuant to Article L. 225-40 of the French Commercial Code, we have been advised of the following agreements which were previously authorized by your Board of Directors.

1. Agreement for the sale of EDF shares previously held by the French State to EDF which will be subsequently resold to beneficiaries of the employee reserved share offering

Persons concerned: the French State, represented by Mr Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF.

Nature, purpose and terms & conditions: as part of the offer reserved for eligible EDF group employees resulting from the sale of preferential subscription rights by the French State during the EDF share capital increase in 2017, the agreement provided that the number of EDF shares sold by the French State should be equal to the lower of:

- a) the number of EDF shares requested by the beneficiaries;
- b) the number of shares to be offered under Article 31-2 of Order 2014-948 of 20 August 2014, as amended by Law 2015-990 of 6 August 2015, *i.e.* 7,704,974 shares.

The agreement also provided that the agreed price would be identical to the reference price under the offer, *i.e.* the volume-weighted average price over the last 20 trading days prior to the decision determining the withdrawal period dates in connection with the offering.

On 4 April 2019, your Board of Directors authorized the execution of the agreement signed on 24 June 2019, considering that it was in EDF's interest to control the process of allocating EDF shares to the offering's beneficiaries and to not be exposed to any volume or price risk, considering the terms of the sale agreement.

On 10 July 2019, EDF purchased 7,704,974 EDF shares from the French State at a unit price of €12.26 per share, *i.e.* the maximum number of shares, in order to resell them immediately to the offering's beneficiaries.

2. Implementation of the sale agreement between EDF, AREVA SA and AREVA NP for the acquisition of 75.5% of NEW NP's (now called Framatome) capital.

Persons concerned: the French State, represented by Mr Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF and AREVA SA, and Mr Maurice Gourdault-Montagne (until 28 June 2019), Director of EDF and AREVA SA.

Nature, purpose and terms & conditions: following the memorandum of understanding signed on 28 July 2016, the Board of Directors, which met on 15 November 2016, had previously authorized the agreement, signed the same day, setting the terms of the sale of the interest conferring to EDF exclusive control of an entity ("NEW NP which has become Framatome"), 100%-held by AREVA NP, a subsidiary of AREVA SA, regrouping the activities relating to the design and manufacturing of nuclear reactors and equipment, fuel assemblies and services to the nuclear installed base within the Group.

The final acquisition agreement covering 75.5% of the capital of Framatome was authorized by your Board of Directors on 14 December 2017 and signed on 22 December 2017. The acquisition was carried out on 31 December 2017 for €1,868 million, excluding acquisition costs.

In 2019, the following two agreements were entered into with regard to price adjustments and/or earn-outs as provided for under the acquisition agreement:

7. General information about the Company and its capital

Related-party transactions

a. Settlement agreement signed on 4 April 2019 for the implementation of the sale agreement

Nature, purpose and terms & conditions: the settlement agreement dated 4 April 2019 for the implementation of the sale agreement was entered into to resolve certain disagreements between EDF, AREVA SA and AREVA NP with respect to the application of the share sale agreement entered into in 2017, in particular with respect to certain price adjustment or earn-out provisions. EDF and Framatome formalized a number of reciprocal and limited concessions on the methods used to calculate the price adjustment related to the working capital requirement and on an increase in provisions for end-of-cycle operations. Due to persistent disagreements on certain items, particularly the consequences on the final sale price of the level of capital expenditure over the 2015-2017 period, the parties also agreed to a partial payment of the net cash delivered on the transaction completion date, which will be deferred to a pending arbitration procedure.

The repayment of the Framatome cash due by EDF (difference between net cash and the price adjustment that was revised downwards and not challenged under the settlement agreement, multiplied by the percentage acquired) was set at a partial amount of €48.3 million. The additional tax price was set at €95 million, *i.e.* €71.7 million payable by EDF.

On 4 April 2019, your Board of Directors authorized the execution of the settlement agreement, considering that it was in EDF's interest to enter into this agreement in order to facilitate the assessment of the final sale price for the Framatome shares.

b. Side-letter to the share sale agreement signed on 16 May 2019

Nature, purpose and terms & conditions: the side-letter of 16 May 2019 amended certain components of the procedure used to determine the conditional earn-out related to EBITDA, as initially provided for in the Framatome share sale agreement of 22 December 2017. Under the new provisions, an earn-out of €90 million, *i.e.* €67.9 million payable by EDF, was notified to AREVA SA and AREVA NP on 1 July 2019.

On 15 May 2019, your Board of Directors authorized the execution of the side-letter, considering that it was in EDF's interest to enter into such side-letter in order to allow the determination of the EBITDA earn-out, in the absence of the Framatome consolidated financial statements for the years ended 31 December 2017 and 2018.

3. Protocol agreement relating to the French State's compensation for the closure of the Fessenheim nuclear plant, signed on 27 September 2019

Persons concerned: the French State, represented by Mr Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF.

Nature, purpose and terms & conditions: the protocol agreement was entered into to determine the heads of damages and the terms and conditions for the calculation of compensation payable by the French State to EDF in connection with the early closure of the Fessenheim nuclear power plant.

The compensation breaks down as follows:

- initial payments corresponding to the plant's anticipated closure costs. The total payments will amount to between €370 million and €443 million depending on the schedule of payments decided by the French State;

- further payments corresponding to lost profits that would have been generated by future production volumes, determined on the basis of the past production of the Fessenheim power plant, up to 2041, calculated *ex post* in accordance with the sales prices of nuclear production, and in particular observed market prices.

This agreement had no financial impact on pre-tax income for EDF in 2019.

On 4 April and 20 September 2019, your Board of Directors authorized the execution of the protocol agreement, considering that it was in EDF's interest to sign the agreement to acknowledge the right to compensate EDF for the damage caused by the closure of the Fessenheim nuclear plant.

Agreements already approved by the Shareholders' Meeting

Agreements approved during previous financial years that remained in force during the past financial year.

Pursuant to Article 225-30 of the French Commercial Code, we have been advised that the following agreements, previously approved by Shareholders' Meetings of prior years, have remained in force during the year.

Other agreements signed by EDF as part of the sale by AREVA SA of its entire interest in NEW NP (now called Framatome)

Persons concerned: the French State, represented by Mr Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF and AREVA SA, and Messrs. Maurice Gourdault-Montagne (until 28 June 2019) and François Delattre (as from 28 June 2019), Directors of EDF and AREVA SA.

In addition to the agreement signed by EDF, AREVA SA and AREVA NP for the acquisition of 75.5% of Framatome mentioned in the first part of this report, your Board of Directors authorized the following agreements on 23 June 2017 and 14 December 2017, which were approved by the Combined Shareholders' Meeting of 15 May 2018 held to approve the financial statements for the year ended 31 December 2017.

a) Agreement signed by EDF relating to the acquisition of 19.5% of the Framatome shares by Mitsubishi Heavy Industries (MHI)

Nature, purpose and terms & conditions: the final acquisition agreement was signed on 14 December 2017, concomitantly with the acquisition by EDF of 75.5% of the Framatome shares. It allows MHI to acquire 19.5% of Framatome from AREVA SA and AREVA NP, in the presence of EDF and under financial conditions similar to those of EDF.

The negotiations for setting the earn-outs were conducted by EDF on behalf of MHI in 2019. They led to the signing by EDF of the contract for the implementation of the sale agreement on 4 April 2019, and the amendment letter on 16 May 2019, mentioned in the first part of this report.

The negotiations regarding the valuation of certain items of the vendor warranties granted by AREVA NP and exercised by EDF and MHI are still ongoing between the parties.

b) Agreement signed by EDF relating to the acquisition of 5% of the Framatome shares by Assystem

Nature, purpose and terms & conditions: the final acquisition agreement was signed on 14 December 2017, concomitantly with the acquisition by EDF of 75.5% of the Framatome shares. It allows Assystem to acquire 5% of Framatome from AREVA SA and AREVA NP, in the presence of EDF and under financial conditions similar to those of EDF.

The negotiations for setting the earn-outs were conducted by EDF on behalf of MHI in 2019. They led to the signing by EDF of the contract for the implementation of the sale agreement on 4 April 2019, and the amendment letter on 16 May 2019, mentioned in the first part of this report.

The negotiations regarding the valuation of certain items of the vendor warranties granted by AREVA NP and exercised by EDF and Assystem regarding are still ongoing between the parties.

Agreements authorized during prior years but not approved by the shareholders' Meeting

In accordance with the terms of Article R. 225-30 of the French Commercial Code, we have been advised of the following agreements, which were described in our special report on regulated agreements and commitments for fiscal years 2016, 2017 and 2018, and which were not approved by the Combined Shareholders' Meeting of 18 May 2017 held to approve the financial statements for the year ended 31 December 2016, which were continued during the period.

1. Shareholders' agreement between EDF on the one hand, and Caisse des dépôts, Consignation and CNP Assurances on the other hand, regarding Coentreprise de Transport d'Électricité – CTE, parent company of RTE

Person concerned: the French State, represented by Mr Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF SA, and having a representative on the Board of Directors of CNP Assurances.

Nature, purpose, and terms & conditions: this agreement, signed on 14 December 2016 and implemented on 31 March 2017 between EDF Caisse des dépôts et consignation and CNP Assurances, enabled Caisse des dépôts et consignation and CNP Assurances to acquire an indirect interest of 49.9% in the capital of RTE, *via* CTE, and the set-up of the terms and conditions of a long-term partnership to encourage the development of RTE, notably by the conclusion of a shareholders' agreement.

This shareholders' agreement remained in force in fiscal 2019.

2. Agreement entered into between the French State, EDF, the Caisse des dépôts, CNP Assurances and CTE relating to the governance of CTE and RTE

Person concerned: the French State, represented by Mr Martin Vial on the Board of Directors, a shareholder owning more than 10% of the voting rights of EDF, a party to the agreement and having a representative on the Board of Directors of CNP Assurances.

Nature, purpose and terms & conditions: the purpose of this agreement, entered into between EDF, Caisse des Dépôts and CNP Assurances, CTE and the French State, is to set forth the commitment of the French State to limit its representatives to two on the Supervisory Board of RTE.

Paris La Défense, 12 March 2020,

The Statutory Auditors

KPMG S.A.

Jay Nirsimloo Michel Piette

Deloitte & Associés

Damien Leurent Christophe Patrier

7.5.3 Routine agreements procedure

On 13 February 2020, the Board of Directors approved an internal procedure, meeting the requirements of the AMF recommendation⁽¹⁾, that is primarily designed to implement the procedure required under Article L. 225-39 of the French Commercial Code (*Code de commerce*), to regularly assess unregulated agreements (*i.e.* agreements relating to routine transactions concluded under normal conditions).

Given the high number of routine agreements concluded under normal conditions that EDF may enter into, the procedure involves:

- drawing up a list of routine agreements "by type", that do not require an assessment; this category includes agreements entered into in the normal course of EDF's business and a list of intra-group agreements;

- defining which routine agreements concluded under normal conditions require an annual assessment by the Board; this category includes agreements deemed sufficiently material for at least one of the parties to the contract; it specifically includes agreements that have been approved by the Group Executive Committee's Commitments Committee (CECEG), agreements involving material commitments for EDF SA and agreements entered into with the French state or a public company.

The Board of Directors will assess them once a year at the Board meeting called to approve the annual financial statements, when reviewing the regulated agreements concluded over the fiscal year or agreements concluded and authorised during previous fiscal years that have been performed over the past fiscal year.

(1) AMF no. 2012-05 of 2 July 2012 – amended on 5 October 2018.

7.6 Material contracts

The information on the regulated agreements and commitments referred to in Article L. 225-38 of the French Commercial Code is contained in the Statutory Auditors' special report, which is reproduced in section 7.5.2 "Statutory Auditor's special report on regulated agreements and commitments" of this Universal Registration Document, section 7.5.5 of the 2018 Reference Document and section 7.5.4 of the 2017 Reference Document.

Except for the contracts which may be described in chapters 1 and 5 of this Universal Registration Document or in the notes to the consolidated statements for the financial year ended 31 December 2019, in chapters 1 and 5 of the 2017 and 2018 Reference Document or in the notes to the consolidated statements for the financial years ended 31 December 2017 and 2018, including the contracts described hereunder, EDF signed no material contracts other than those concluded in the normal course of business over the last two years preceding the filing of this Universal Registration Document, the 2018 Reference Document and the 2017 Reference Document.

7.6.1 Material contracts entered into in 2019

Material contracts entered into in 2019, other than those conducted in the normal course of business, by the Group, are the followings:

- In Switzerland, EDF sold its 25.04% stake in the Swiss energy company Alpiq (May 2019);
- In France, signature of a compensation agreement by the French state for the early closure of the Fessenheim power plant (September 2019);
- In Italy, Edison signed a binding memorandum to sell its gas operating and production assets to Energean Oil and Gas (July 2019).

7.6.2 Material contracts entered into in 2018

Material contracts entered into in 2018, other than those conducted in the normal course of business, by the Group, are the followings:

- concession agreement for the stake in Dunkerque LNG (30 October 2018);
- concession agreement for the 49% minority share in 24 wind power farms in the UK, representing 550MW in Dalmore Capital Limited and Pensions Infrastructure Platform (June 2018);
- sale contract for a 450MW offshore Scottish wind farm project named "Nearnt na Gaoithe" (May 2018).

7.6.3 Material contracts entered into in 2017

Material contracts entered into in 2017, other than those conducted in the normal course of business, by the Group, are the followings:

- on 19 May 2017, EDF signed an agreement with PGE for the disposal of the assets of EDF Polska;
- EDF signed an agreement on 31 March 2017 for the transfer of a 49.9% indirect equity interest in RTE to Caisse des dépôts and CNP Assurances;
- in accordance with the non-binding memorandum of understanding signed between EDF and AREVA on 30 July 2015 and updated on 28 July 2016, on 31 December 2017 EDF acquired 75.5% of the capital of New NP, an entity spun out of the AREVA group combining industrial activities relating to nuclear reactor and equipment design and manufacturing, fuel assemblies and installed base services, authorised by the Board of Directors on 14 December 2017.



8.

Additional information

CONTENTS

8.1 Person responsible for the Universal Registration Document and the Certification	484	8.4 Appendices – remuneration policy	485
8.1.1 Person responsible for the Universal Registration Document	484	8.4.1 Process for determining the remuneration policy for corporate officers	485
8.1.2 Certification from the person responsible for the 2019 Universal Registration Document containing the annual financial report	484	8.4.2 Remuneration policy applicable to the Chairman and Chief Executive Officer	486
8.2 Auditors – Statutory Auditors	484	8.4.3 Remuneration policy applicable to Directors	487
Deloitte & Associés	484	8.5 Concordance tables	490
KPMG SA	484	8.5.1 Concordance table with Appendix I of (EC) regulation no. 2019/980	490
8.3 Publicly available documents and financial reporting calendar	485	8.5.2 Concordance table with the management report	493
		8.5.3 Concordance table with the elements of the EDF Board of Directors’ report on corporate governance	495
		8.5.4 Table de concordance avec la déclaration de performance extra-financière	496
		8.5.5 Concordance table with the annual financial report	497
		Glossary	498

8. Additional information

Person responsible for the Universal Registration Document and the Certification

8.1 Person responsible for the Universal Registration Document and the Certification

8.1.1 Person responsible for the Universal Registration Document

Jean-Bernard Lévy, Chairman and Chief Executive Officer of EDF.

8.1.2 Certification from the person responsible for the 2019 Universal Registration Document containing the annual financial report

Having taken all reasonable care to ensure that such is the case, I certify that, to the best of my knowledge, the information contained in this Universal Registration Document accurately reflects the facts and contains no omission likely to affect its meaning.

I certify that, to the best of my knowledge, the financial statements are prepared in accordance with accounting standards and that they give a true and fair view of the assets and liabilities, financial position and the income of the Company and of all the companies included in the consolidation, and that the management report included in this document presents a true and fair view of the business trends, income and financial position of the Company and of all the companies included in the consolidation and a description of the main risks and uncertainties they face.

Jean-Bernard Lévy,
Chairman and Chief Executive Officer of EDF

8.2 Auditors – Statutory Auditors

Deloitte & Associés

6, Place de la Pyramide, 92908 Paris – La Défense Cedex, represented by Damien Leurent and Christophe Patrier.

KPMG SA

Tour EQHO, 2, avenue Gambetta, CS 60055, 92066 Paris – La Défense Cedex, represented by Jay Nirsimloo and Michel Piette.

The Statutory Auditors were initially appointed by decision of the Shareholders' Meeting of 6 June 2005 for a period of six fiscal years expiring at the end of the

Shareholders' Meeting ruling on the financial statements covering the fiscal year closing 31 December 2010.

Their terms of office were renewed by a decision of the Combined Shareholders' Meeting of 24 May 2011 until the Shareholders' Meeting ruling on the financial statements for the fiscal year ended 31 December 2016 then again by the Combined Shareholders' Meeting of 18 May 2017 for a further period of six fiscal years expiring at the end of the Shareholders' Meeting ruling on the financial statements covering the fiscal year closing 31 December 2022.

The aforementioned Statutory Auditors consequently certified the financial statements reproduced in this Universal Registration Document

8.3 Publicly available documents and financial reporting calendar

The Company's press releases, annual reports, including historical financial information relating to the Company and any related updates filed with the AMF, are available on the Company's website:

<https://www.edf.fr/en/the-edf-group/dedicated-sections/investors-shareholders>

and a copy may also be obtained at the Company's registered office at 22-30, avenue de Wagram, 75382 Paris Cedex 08 (France).

EDF's LEI number is 549300X3UK4GG3FNM006

2019 Annual Results	14 February 2020
First quarter 2020 revenue	14 May 2020
Annual Shareholders' Meeting	7 May 2020
Half year 2020 Results	30 July 2020

The Company has imposed a 15 days embargo period prior to the announcement of the annual and half-year results and before the quarterly results ("quiet period") during which no new information regarding the business development and EDF's results have to be issued to financial analysts and investors so as to avoid the release of incomplete financial information enabling the recipients to anticipate EDF's results prior to their official publication.

In accordance with regulation (EU) No 2017/1129 Article 19 of the European Parliament and of the Council of 14 June 2017, the following information is included by reference in this document:

- the main headings provided for in Annexes 1 and 2 of the delegated regulation (EU) 2019/980 of 14 March 2019 supplementing the provisions of regulation (EU) 2017/1129 of 14 June 2017;
- the information which constitutes the annual financial report provided for in Articles L. 451-1-2 of the Monetary and Financial Code and 222 -3 of the AMF general regulation;
- the information constituting the management report of the Board of Directors; the information constituting the management report of the Board of Directors provided for by the French Commercial Code; the information that constitutes the declaration of extra-financial performance (DPEF) provided for by the French Commercial Code;
- the EDF group's 2018 Reference Document filed with the AMF (French Financial Markets Authority) 15 March 2019 under number D-19-157 (the 2018 Registration Document) [https://www.edf.fr/sites/default/files/contrib/groupe-edf/espaces-dedies/espace-](https://www.edf.fr/sites/default/files/contrib/groupe-edf/espaces-dedies/espace-finance-en/financial-information/regulated-information/reference-document/edf-ddr-2018-en.pdf)

All of the regulated information published by the Company, pursuant to Article 221-1 *et seq.*, in the AMF's general regulation, is available at the following address:

<https://www.edf.fr/en/the-edf-group/dedicated-sections/investors-shareholders/regulated-information>

Finally, the documents and information referred to in Article R. 225-73-1 of the French Commercial Code (*Code de commerce*), are available on the Company's website in the section dedicated to Shareholders' Meetings.

[finance-en/financial-information/regulated-information/reference-document/edf-ddr-2017-en.pdf](https://www.edf.fr/sites/default/files/contrib/groupe-edf/espaces-dedies/espace-finance-en/financial-information/regulated-information/reference-document/edf-ddr-2017-en.pdf);

- the EDF group's 2017 Reference Document filed with the AMF (French Financial Markets Authority) 15 March 2018 under number D18-0133 (the 2017 Registration Document) <https://www.edf.fr/sites/default/files/contrib/groupe-edf/espaces-dedies/espace-finance-en/financial-information/regulated-information/reference-document/edf-ddr-2017-en.pdf>;
- the EDF group's consolidated financial statements for the year ended 31 December 2018 (prepared in accordance with international accounting standards) and the report of the related Statutory Auditors in chapter 6, sections 6.1 and 6.2 respectively. (pages [314 to 429]) and 6.2 (pages [430 to 432]) of the EDF group's 2018 Reference Document;
- the EDF group's consolidated financial statements for the year ended 31 December 2017 (prepared in accordance with international accounting standards) and the report of the related Statutory Auditors in chapter 6, sections 6.1 and 6.2 respectively. (pages [296 to 408]) and 6.2 (pages [409 to 412]) of the EDF group's 2017 Reference Document;
- the review of the EDF group's financial position and results for the year ended 31 December 2018, set out in chapter 5 (pages [278 to 312]) of the EDF group's 2018 reference document;
- the review of the EDF group's financial position and results for the year ended 31 December 2017, set out in chapter 5 (pages [260 to 293]) of the EDF group's 2017 reference document.

8.4 Appendices – remuneration policy

Remuneration policy for corporate officers (Article L. 225-37-2 of the French Commercial Code)

8.4.1 Process for determining the remuneration policy for corporate officers

Pursuant to Article L. 225-37-2 of the French Commercial Code, the Board of Directors establishes the remuneration policy for corporate officers.

In accordance with the provisions of the internal rules of procedure of the Board of Directors, the Board's decisions are subject to prior review by the Appointments, Remuneration and Governance Committee, which advises the Board on the remuneration policy for corporate officers and the setting of such remuneration. After deliberation by the Board, the Chairman of the Committee refers the matter to the Minister in charge of the Economy for approval, after consulting the ministers concerned, pursuant to Article 3 of Decree no. 53-707 of 9 August 1953.

With regard to the remuneration of the Chairman and Chief Executive Officer, the Appointments, Remuneration and Governance Committee prepares its proposals,

prior to a decision by the Board pursuant to Articles L. 225-47 and L. 225-53 of the French Commercial Code, within the limits provided for by Decree no. 2012-915 of 26 July 2012 relating to State control over the remuneration of executives of public companies, which amended the Decree of 9 August 1953. Pursuant to said texts, the annual remuneration of the Chairman and Chief Executive Officer must not exceed a gross ceiling of 450,000 euros.

The Committee also advises the Board on the rules and procedures for distributing the amount set by the General Meeting of Shareholders to be allocated to the Directors as remuneration for their work pursuant to Article L. 225-45 of the French Commercial Code

8. Additional information

Appendices – remuneration policy

8.4.2 Remuneration policy applicable to the Chairman and Chief Executive Officer

After consulting the Appointments, Remuneration and Governance Committee which met on 7 February 2020, the Board of Directors approved at its meeting on 13 February 2020 the remuneration policy described below for the Chairman and Chief Executive Officer:

Components of the remuneration	Amounts paid during the 2019 fiscal year	Amounts allocated for the 2019 fiscal year	Observation
Fixed remuneration	€450,000	€450,000	On recommendation of the Appointments, Remuneration and Governance Committee, the Board of Directors, which met on 14 February 2019, decided to maintain the annual fixed gross remuneration of the Chairman and Chief Executive Officer at €450,000 for fiscal year 2019. This fixed annual remuneration, which corresponds to the ceiling provided for by the Decree of 9 August 1953, has remained unchanged since Mr. Lévy's appointment as Chairman and Chief Executive Officer of EDF in 2014. On recommendation from the Committee, the Board which met on 13 February 2020 decided to maintain the fixed annual remuneration of the Chairman and Chief Executive Officer for the 2020 fiscal year at €450,000 gross.
Variable remuneration	None	None	
Multi-year variable remuneration	None	None	
Possibility of deferring or repaying the variable remuneration	n/a	n/a	
Exceptional remuneration	None	None	
Stock options, performance shares or other long-term benefits	None	None	The Company does not have any stock option plans, performance shares or other long-term benefits.
Remuneration for serving as a Director	n/a	n/a	The Chairman and Chief Executive Officer does not receive any remuneration for his position as Director (see section III "Remuneration policy applicable to Directors").
All types of benefits	€ 3,660	€ 3,660	This benefit corresponds to the provision of a company car. On recommendation of the Committee, the Board of Directors, which met on 13 February 2020, decided to maintain this benefit in kind for the Chairman and Chief Executive Officer for fiscal year 2020.
Signing allowance	None	None	
Severance pay or end-of-service allowance	None	None	
Non-compete clause	None	None	
Supplementary pension scheme	None	None	
Remuneration paid or granted by a company included in the scope of consolidation within the meaning of Article L. 233-16 of the French Commercial Code	None	None	

n/a: not applicable.

Ratio of equity⁽¹⁾ and changes in remuneration 2015-2019

In accordance with Article L. 225-37-3 of the French Commercial Code, the table below shows the change over the past five years in the ratio between the level of remuneration of the Chairman and Chief Executive Officer and the average remuneration on a full-time equivalent basis of EDF employees other than

corporate officers, and the ratio between the level of remuneration of the Chairman and Chief Executive Officer and the median remuneration on a full-time equivalent basis of EDF employees other than corporate officers, as well as the organic changes in Group EBITDA over the same period.

	2015	2016	2017	2018	2019
Ratio of equity to average remuneration	7.5	7.2	7.1	7.1	6.8
Ratio of equity to median remuneration	8.3	8.0	7.9	7.7	7.4
Changes in average salary*	-	3.37%	1.43%	0.98%	3.66%
Changes in median salary*	-	3.27%	2.07%	1.81%	4.16%
Organic changes in Group EBITDA*	-0.30%	-4.80%	-14.80%	11.30%	8.40%

* Change observed in year N compared to year N-1.

8.4.3 Remuneration policy applicable to Directors

After receiving the advice of the Appointments, Remuneration and Governance Committee at its meeting held on 7 February 2020, the Board of Directors, at its meeting held on 13 February 2020, approved the remuneration policy described below concerning the amount and distribution among the Directors of the sums paid to them in respect of their office pursuant to Article L. 225-45 of the French Commercial Code (*Code de commerce*).

Budget and breakdown of remuneration paid to Directors in respect of their office

The Directors representing the employees perform their duties free of charge pursuant to Act no. 83-675 of 26 July 1983 relating to the democratisation of the public sector, and the Chairman and Chief Executive Officer does not receive any remuneration in respect of his office as Director.

Pursuant to Order no. 2014-948 of 20 August 2014, the remuneration granted, in respect of their office, to Directors appointed by the General Meeting on a proposal from the French State in accordance with Article 6 of the Order, and who are public officials of the State, shall be paid in full to the State budget.

With regard to the other Directors appointed by the General Meeting on a proposal from the French State and who are not public officials, an order issued by the French Minister of the Economy and Finance on 5 January 2018⁽²⁾ specifies that the Company shall pay 15% of the remuneration granted to them for their office to the State budget, with the remaining 85% being paid to the Director.

Regarding the Representative of the French State appointed in accordance with Article 4 of the Order of 20 August 2014, any remuneration that he/she is entitled to receive for the performance of his/her duties is paid to the State budget.

Remuneration paid to Directors in 2019

The table below shows the gross amounts of remuneration paid during fiscal year 2019 to the members of the Board of Directors in respect of their offices, pursuant to Article L. 225-45 of the French Commercial Code.

Directors elected by employees also receive fixed and/or variable remuneration under their employment contract with the Company or a company included in the Company's scope of consolidation within the meaning of Article L. 233-16 of the French Commercial Code.

No exceptional remuneration or other remuneration was paid to the Directors during fiscal year 2019 by the Company or by a company included in the Company's scope of consolidation within the meaning of Article L. 233-16 of the French Commercial Code.

After receiving the advice of the Appointments, Remuneration and Governance Committee, the Board of Directors submits to the General Meeting of Shareholders for approval a fixed annual sum to be allocated to the Directors in accordance with the allocation rules defined by the Board and presented in this remuneration policy. The Board met on 13 February 2020 and decided to submit to the General Meeting to be convened on 7 May 2020 an annual budget of 440,000 euros for fiscal year 2020.

The procedures for allocating this annual budget, applicable as from the 2011 fiscal year, were re-examined and confirmed by the Board of Directors on 13 February 2020. The total budget is distributed between a fixed portion and a variable portion, each representing half of the budget, distributed as follows:

the fixed portion is shared equally among the Directors in question; 50% of the fixed annual portion is paid during the fiscal year it is awarded and the remaining 50% at the beginning of the following fiscal year;

the distribution of the variable portion among the Directors is established through the application of a variable coefficient depending on the type of meetings (Board or Committee) and depending on the particular positions held by each Director (Committee member or Chairman): a coefficient of 2 for the presence of a Director at a meeting of the Board of Directors, a coefficient of 1 for the presence of a Director as a member at a Committee meeting and a coefficient of 2 for chairmanship of a Committee. The variable portion is divided by the total of the coefficients for the fiscal year in order to set the unit value of the coefficient; the variable portion for a fiscal year is fully paid at the start of the following fiscal year.

(1) Les ratios ont été établis aux lignes directrices publiées par l'AFEP.

(2) The provisions of the Order of 5 January 2018, amending the order of 18 December 2014 in accordance with Article 6-V of the Order dated 20 August 2014, have been applicable since 1 February 2018. Prior to that, the Order of 18 December 2014 provided that the remuneration to be earned by these Directors was paid to the tune of 30% to the Directors in question, with the remaining 70% paid into the French state budget.

8. Additional information

Appendices – remuneration policy

Directors whose terms of office are ongoing on 31 December 2019	Remuneration paid in 2019 ⁽¹⁾
Bruno Crémel ⁽²⁾	2,514
François Delattre ⁽²⁾	138
Gilles Denoyel ⁽²⁾	2,514
Marie-Christine Lepetit	46,258
Jean-Bernard Lévy	n/a
Colette Lewiner	49,806
Laurence Parisot	37,742
Claire Pedini	41,290
Philippe Petitcolin ⁽²⁾	2,514
Michèle Rousseau	36,323
Martin Vial	39,161
TOTAL (IN EUROS)	258,260

n/a: not applicable.

(1) The payments made during a fiscal year include 50% of the fixed portion and the entirety of the variable portion for the preceding fiscal year and 50% of the fixed portion for the current fiscal year.

(2) Directors whose term of office began in fiscal year 2019.

Directors whose terms of office expired during the 2019 fiscal year	Remuneration paid in 2019 ⁽¹⁾
Olivier Appert	34,518
Philippe Crouzet	40,196
Maurice Gourdault-Montagne	31,926
Bruno Lafont	38,067
Bruno Léchevin	34,518
Anne Rigail ⁽²⁾	2,514
TOTAL (IN EUROS)	181,739

(1) The payments made during a fiscal year include 50% of the fixed portion and the entirety of the variable portion for the preceding fiscal year and 50% of the fixed portion for the current fiscal year.

(2) Director whose term of office expired during the 2019 fiscal year

Remuneration granted to the Directors for fiscal year 2019

The table below shows the gross amounts of remuneration paid during fiscal year 2019 to the members of the Board of Directors in respect of their offices, pursuant to Article L. 225-45 of the French Commercial Code.

No exceptional remuneration or other remuneration was paid to the Directors during fiscal year 2019 by the Company or by a company included in the Company's scope of consolidation within the meaning of Article L. 233-16 of the French Commercial Code.

Directors whose terms of office are ongoing on 31 December 2019	Remuneration granted for fiscal year 2019 ⁽¹⁾
Véronique Bédague-Hamilius	761
Bruno Crémel ⁽²⁾	27,141
François Delattre ⁽²⁾	18,330
Gilles Denoyel ⁽²⁾	27,141
Marie-Christine Lepetit	45,745
Jean-Bernard Lévy	n/a
Colette Lewiner	51,011
Laurence Parisot	35,213
Claire Pedini	44,574
Philippe Petitcolin ⁽²⁾	20,705
Michèle Rousseau	37,553
Martin Vial	39,309
TOTAL (IN EUROS)	347,483

n/a: not applicable.

(1) Total of the fixed and variable components granted for the 2019 fiscal year

(2) Director whose term of office began during the 2019 fiscal year

Directors whose terms of office expired during the 2019 fiscal year	Remuneration granted for fiscal year 2019 ⁽¹⁾
Olivier Appert	12,752
Philippe Crouzet	14,507
Maurice Gourdault-Montagne	16,298
Bruno Lafont	18,018
Bruno Léchevin	15,093
Anne Rigail ⁽²⁾	15,794
TOTAL (IN EUROS)	92,462

(1) Total of the fixed and variable components granted for the 2019 fiscal year

(2) Director whose term of office began during the 2019 fiscal year

8.5 Concordance tables

8.5.1 Concordance table with Appendix I of (EC) regulation no. 2019/980

The concordance table below identifies the information required by Appendices 1 and 2 of the delegated regulation (EC) no. 2019/980 of 14 March 2019 in accordance with the URD scheme.

Appendices 1 and 2 of the delegated regulation (EC) no. 2019/980 of 14 March 2019.	Sections of the 2019 URD
1. Persons responsible, information from third parties, expert report and approval by the competent authority	
1.1. Name and address of the persons responsible	8.1
1.2. Declaration by the persons responsible	8.1
1.3. Name, address, qualifications and potential interests of persons acting as experts	n/a
1.4. Certification of third party information	n/a
1.5 Declaration without prior approval of the competent authority	page 3
2. Statutory Auditors	
2.1. Name and address of the Statutory Auditors	Section 8.2
2.2. Changes where applicable	n/a
3. Risk factors	
	Section 2.2
4. Information about the issuer	
4.1. Legal and commercial name of the issuer	Section 7.1.1
4.2. Location, registration number and LEI of the issuer	Sections 7.1.2 and 8.3
4.3. Date of incorporation and length of life of the issuer	Section 7.1.3
4.4. Registered office and legal form of the issuer, legislation governing the activities, country of origin, address and telephone number of the registered office, website with a disclaimer	Section 7.1.1 and 7.1.4
5. Business overview	
5.1. Principal activities	
5.1.1. Nature of the operations	Section 1.4
5.1.2. Important new products and services	n/a
5.2. Principal markets	Section 1.4
5.3. Important events	Section 5.1.2 and 5.1.3
5.4. Strategy and objectives	Sections 1.3 and 5.4
5.5. Dependency of the issuer on patents, licenses, contracts and manufacturing processes	Section 2.3
5.6. Competitive position declaration	Sections 1.4.2.1.2 and 1.4.5.1.2.3
5.7. Investments	
5.7.1. Major investments made	Section 1.3.3.1
5.7.2. Principal ongoing or future investments of the issuer for which the latter's management bodies have already made firm commitments and adopted financing methods	Sections 1.3.3.2 and 5.1.3.5
5.7.3. Joint ventures and commitments in which the issuer holds a significant proportion of the capital	Section 4.5.1 and Section 6.1- Appendix to the consolidated financial statements – Note 26
5.7.4. Environmental issues	Sections 1.7, 3.2 and 3.4.2
6. Organisational structure	
6.1. Brief description of the Group	Section 1.2.1 and 1.2.2
6.2. List of significant subsidiaries	Section 1.2.3
7. Operating and financial review	
7.1. Financial position	
7.1.1. Changes in results and financial position including key performance indicators of a financial and, where applicable, non-financial nature	Sections 5 and 6 Sections 3 and 8.5.4
7.1.2. Forecasts for future development and research and development activities	Section 1.6
7.2. Operating results	Section 6.1
7.2.1. Important factors, unusual or infrequent events or new developments	Section 5.1.2 and 5.1.3
7.2.2. Explanation of material changes in net sales or revenue	Section 6.7

Appendices 1 and 2 of the delegated regulation (EC) no. 2019/980 of 14 March 2019.

Sections of the 2019 URD

8. Cash and capital resources

8.1. Capital Information	Sections 7.2 and 7.3 Section 6.1- Appendix to the consolidated financial statements – Note 47
8.2. Cash flows	Section 6.1- Appendix to the consolidated financial statements – Note 41
8.3. Financing needs and structure	n/a
8.4. Restrictions on the use of capital resources	n/a
8.5. Expected sources of financing	n/a

9. Regulatory environment

9.1. Description of the regulatory environment and any measures or factors of an administrative, economic, budgetary, monetary, or political nature	Sections 1.5, 1.3.1 and 1.3.2
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10. Trend information

10.1. Description of major trends and any significant changes in the Group's financial performance since the end of the last fiscal year	Sections 5.2 and 6.7
10.2. Events that are reasonably likely to have a material effect on prospects	Section 5.4

11. Profit forecasts or estimates

11.1. Published profit forecasts or estimates	Section 5.4
11.2. Declaration outlining key forecasting assumptions	Section 5.1.2 and 5.1.3
11.3. Declaration regarding comparability with historical financial information and compliance of accounting methods	Section 5.4

12. Administrative, management, and supervisory bodies and Executive Management

12.1. Information regarding members	
Name, professional address and functions	Sections 4.2.1 and 4.3.1
Nature of any family relationship	Section 4.4
Expertise and experience	Sections 4.2.1 and 4.3.1
Absence of conviction	Section 4.4.2
12.2. Conflict of interest	Section 4.4.1

13. Remuneration and benefits

13.1. Remuneration paid and benefits in kind	Sections 4.6.1 and 4.6.2
13.2. Amounts set aside or accrued to provide pension, retirement	Section 4.6.1.1.3

14. Practices of administrative and management bodies

14.1. Date of expiration of the current terms of office	Section 4.2.2.1
14.2. Members of the administrative or management bodies' service contracts with the issuer	Section 4.4.3
14.3. Information about Audit and Remuneration Committees	Section 4.2.3
14.4. Statement of compliance with the corporate governance regime in force	Section 4.1
14.5. Potential significant impacts on corporate governance	Section 4.2.2

15. Employees

15.1. Number of employees	Section 3.4.4.1
15.2. Shareholdings and stock options	n/a
15.3. Agreement providing for employee shareholding	n/a

16. Major shareholders

16.1. Shareholders holding more than 5% of the capital on the date of the registration document	Section 7.3.8
16.2. Breakdown of voting rights	Section 7.2.4
16.3. Direct or indirect control	Section 7.3
16.4. Agreement whose implementation could lead to a change of control	Section 7.3.9

17. Transactions with related parties

Section 7.5

8. Additional information
Concordance tables

Appendices 1 and 2 of the delegated regulation (EC) no. 2019/980 of 14 March 2019.

Sections of the 2019 URD

18. Financial information concerning the issuer's assets and liabilities, financial position and results

18.1. Historical financial information	
18.1.1. Audited historical financial information for the last three fiscal years and the audit report	Section 6.1
18.1.2. Change of accounting reference date	n/a
18.1.3. Accounting standards	Section 6.1
18.1.4. Change in accounting principles	n/a
18.1.5. Financial information under French accounting standards	Section 6.1
18.1.6. Consolidated financial statements	Section 6.1
18.1.7. Date of the latest financial information	n/a
18.2. Interim and other financial information	n/a
18.2.1. Quarterly or half-yearly financial information	
18.3. Audit of historical annual financial information	
18.3.1. Independent audit of historical annual financial information	Section 6.2
18.3.2. Other audited information	n/a
18.3.3. Sources and reasons for unaudited information	n/a
18.4. Pro forma financial information	n/a
18.5. Dividend policy	
18.5.1. Description of the dividend policy and any applicable restrictions	Section 6.5
18.5.2. Amount of dividend per share	Section 6.5.1
18.6. Administrative, judicial and arbitration proceedings	Section 2.4
18.7. Significant change in the financial position	Section 6.7

19. Additional information

19.1. Share capital	
	Section 7.3.1, 7.3.3 and Section 6.1- Appendix to the consolidated financial statements – Note 30
19.1.1. Amount of subscribed capital, number of shares issued and fully paid up and par value per share, number of shares authorised	
19.1.2. Information on shares not representing the share capital	Section 7.3.5
19.1.3. Number, book value and par value of the shares held by the issuer	Section 7.3.2
19.1.4. Information on convertible or exchangeable securities or securities with subscription warrants,	n/a
19.1.5. Information on conditions governing any right of acquisition and/or obligation attached to authorised but unissued share capital or any endeavour to increase the share capital	Sections 7.2.4, 7.2.5 and 7.3.3
19.1.6. Information about the share capital owned by any member of the Group which is under option or subject to a conditional or unconditional agreement to be put under option and characteristics of such options	Section 7.3.6
19.1.7. History of the Company's share capital	Section 7.3.1
19.2. Incorporation documents and articles of association	
19.2.1. Register and company purpose	Sections 7.1.2 and 7.2.1
19.2.2. Rights, privileges and restrictions attached to each class of shares	Section 7.2.4
19.2.3. Provision delaying, deferring or preventing a change of control	Section 7.2.9

20. Material contracts Section 7.6

21. Available documents Section 8.3

8.5.2 Concordance table with the management report

This Universal Registration Document includes the elements of the Board of Directors' management report relating to the 2019 fiscal year as provided for in Articles L. 225-100 *et seq.* of the French Commercial Code (*Code de commerce*). The management report is composed of the sections of the Universal Registration Document referred to in the following table:

Required topics	Reference texts	Chapter of the Universal Registration Document
Situation and activity of the Group		
Objective and exhaustive analysis of the Company's and Group's business, results and financial situation	L. 225-100-1, L. 232-1 L. 233-6 and L. 233-26 of the French Commercial Code	Chapter 5
Key events arising between the end of the fiscal year and the date the management report was written	L. 232-1 and L. 233-26 of the French Commercial Code	Section 5.2
Foreseeable development and future prospects of the situation of the Company and the Group	L. 232-1 and L. 233-26 of the French Commercial Code	Section 5.4
Key indicators of financial and non-financial performance relevant to the particular business of the Company and the Group	L. 225-100-1 of the French Commercial Code	Chapter 3 and Section 8.5.4
Description of the major risks and uncertainties and indication on the use of financial instruments for the Company and the Group	L. 225-100-1 of the French Commercial Code	Sections 2.2 and 5.1
Acquisition of significant equity holdings during the fiscal year in companies having their registered office on the French territory	L. 233-6 al.1 of the French Commercial Code	Section 5.1.3 and note 5 of the Appendix to the consolidated financial statements
Internal control and risk management procedures implemented by the Group relating to the preparation and processing of accounting and financial information	L. 225-100-1 of the French Commercial Code	Section 2.2
Financial risks associated with the effects of climate change and the Group's low-carbon strategy.	L. 225-100-1 of the French Commercial Code	Section 2.2.3 Section 3.2
Research and development activities	L. 232-1 and L. 233-26 of the French Commercial Code	Section 1.6
Corporate Government/Corporate Officers		
Section including elements contained in the report on corporate governance		
Reference to the Corporate Governance Code	L. 225-37-4 of the French Commercial Code	Section 4.1
List of all mandates and positions held in all companies by each officer during the fiscal year	L. 225-37-4 of the French Commercial Code	Sections 4.2 and 4.3
Conditions for the preparation and organisation of the Board of Directors' work	L. 225-37-4 of the French Commercial Code	Section 4.2
Members of the Board of Directors and description of the diversity policy applied to members of the Board of Directors, description of its objectives, its implementation procedures and the results obtained	L. 225-37-4 of the French Commercial Code	Section 4.2
Information on the balanced representation of women and men in the Executive Committee and gender balance index in the 10% of functions with highest responsibility	L. 225-37-4 of the French Commercial Code	Section 3.3.3.1
Remuneration and benefits of all kinds paid by the Company during the fiscal year to each corporate officer	L. 225-37-3 of the French Commercial Code	Section 4.6
Guidelines and rules approved by the Board of Directors for the determination of the corporate officers' compensation and benefits	L. 225-37-4 of the French Commercial Code	Section 4.6
Remuneration policy	L. 225-37-3 of the French Commercial Code	Section 4.6 and 8.5.4 appendices
Evolution of executive remuneration in relation to that of employees and to the Company's performance over the last 5 years	L. 225-37-3 of the French Commercial Code	Section 4.6
Agreements entered into between a significant executive or shareholder and a controlled company within the meaning of Article L. 233-3	L. 225-37-4 of the French Commercial Code	Sections 7.5 and 7.6 Notes 26 and 51 of the Appendix to the consolidated financial statements
Limitation of powers of the Chairman and Chief Executive Officer	L. 225-37-4 of the French Commercial Code	Sections 4.2.2 and 7.2.9
Information likely to impact a public offer	L. 225-37-5 of the French Commercial Code	Sections 7.2 and 7.3

8. Additional information

Concordance tables

Required topics	Reference texts	Chapter of the Universal Registration Document
Specific procedures relating to the participation of shareholders in the Shareholders' Meeting	L. 225-37-4 of the French Commercial Code	Section 7.2.8
Summary table of the outstanding delegations given by the Shareholders' Meeting to perform capital increases	L. 225-37-4 of the French Commercial Code	Section 7.3.3
Share ownership and capital		
Structure and change of the Company's share capital	L. 233-13 of the French Commercial Code	Section 7.3
Acquisition and disposal by the Company of its own shares	L. 225-211 of the French Commercial Code	Section 7.3.2
Status of employee share ownership	L. 225-102 al 1 of the French Commercial Code	Section 3.4.3.1 Section 7.3.8
Shares acquired by employees in the context of employee buyout	L. 225-102 al 2 of the French Commercial Code	n/a
References to potential adjustments for the securities giving access to the share capital in the case of share repurchases or financial operations	R. 228-90 and R. 228-91 of the French Commercial Code	n/a
Amount of dividend paid out over the past three fiscal years	243 bis of the French General Tax Code	Section 6.6.1
Environmental, labour and social information		
Declaration of non-financial performance	L. 225-102-1 al 5 and 6 and R. 225-105 of the French Commercial Code	Chapter 3 and Section 8.5.4
Specific information concerning companies using at least one site filed as Seveso "high threshold"	L. 225-102-2 of the French Commercial Code	Section 1.5.6.2
Vigilance plan	Article L. 225-102-4 l al 1 of the French Commercial Code	Section 3.6.1
Other information		
Additional tax information	223 quater and 223 quinquies of the French General Tax Code	n/a
Injunctions or fines as a result of anti-competitive practices	L. 464-2 of the French Commercial Code	n/a
Information concerning supplier and customer payment periods	L. 441-6-1 of the French Commercial Code	Section 6.6.3
Table showing the Company's results over each of the last five fiscal years	R. 225-102 of the French Commercial Code	Section 6.6.1
List of the existing subsidiaries	L. 232-1 of the French Commercial Code	Section 6.6.4
Amount of intercompany loans granted	L. 511-6 of the French Monetary and Financial Code	N/A
Information on operations made on the Company's shares by managers and related persons transactions	L. 621-18-2 of the French Monetary and Financial Code	Section 4.5.2
Attribution and conservation of stock-options by the corporate officers	L. 225-185 of the French Commercial Code	n/a
Attribution and conservation of free shares to corporate officers	L. 225-197-1 of the French Commercial Code	Section 4.6.2

8.5.3 Concordance table with the elements of the EDF Board of Directors' report on corporate governance

This Universal Registration Document includes all the elements of the Company's Board of Directors' report pursuant to Article L. 225-37 of the French Commercial Code (*Code de commerce*). The Board's report on corporate governance is composed of the sections of the Universal Registration Document referred to in the following table and is included in the management report in a section on Corporate governance:

Corporate governance/Corporate Officers

Section including elements contained in the report on corporate governance

	Reference texts	URD sections
Reference to the Corporate Governance Code	L. 225-37-4 of the French Commercial Code	Section 4.1
List of all mandates and positions held in all companies by each corporate officer during fiscal year	L. 225-37-4 of the French Commercial Code	Sections 4.2 and 4.3
Conditions for the preparation and organisation of the Board of Directors' work	L. 225-37-4 of the French Commercial Code	Section 4.2
Members of the Board of Directors and description of the diversity policy applied to members of the Board of Directors, description of its objectives, its implementation procedures and the results obtained	L. 225-37-4 of the French Commercial Code	Section 4.2
Information on the balanced representation of women and men in the Executive Committee and gender balance index in the 10% of functions with highest responsibility	L. 225-37-4 of the French Commercial Code	Section 3.3.3.1
Remuneration and benefits of all kinds paid by the Company during the fiscal year to each corporate officer	L. 225-37-3 of the French Commercial Code	Section 4.6
Guidelines and rules approved by the Board of Directors for the determination of the corporate officers' remuneration and benefits	L. 225-37-4 of the French Commercial Code	Section 4.6
Remuneration policy	L. 225-37-3 of the French Commercial Code	Sections 4.6 and 8.5.4 appendices
Evolution of executive remuneration in relation to that of employees and to the Company's performance over the last 5 years	L. 225-37-3 of the French Commercial Code	Section 4.6
Agreements entered into between a significant executive or shareholder and a controlled company within the meaning of Article L. 233-3	L. 225-37-4 of the French Commercial Code	Sections 7.5 and 7.6 Notes 26 and 51 of the Appendix to the consolidated financial statements
Limitation of powers of the Chairman and Chief Executive Officer	L. 225-37-4 of the French Commercial Code	Sections 4.2.2 and 7.2.9
Information likely to impact a public offer	L. 225-37-5 of the French Commercial Code	Sections 7.2 and 7.3
Specific procedures relating to the participation of shareholders in the Shareholders' Meeting	L. 225-37-4 of the French Commercial Code	Section 7.2.8

8.5.4 Concordance table with the non-financial performance statement

This Universal Registration Document includes the non-financial performance statement for the 2019 fiscal year prepared in accordance with Articles L. 225-102-1 and R. 225-105 of the French Commercial Code (*Code de commerce*).

Thus, to the extent necessary to understand the Company's position, the evolution of its business, its economic and financial results and the impact of its activity, the

Extra-financial Performance Statement (EFPS) presents information on how the Company and the Group take into account the social and environmental consequences of their activities, as well as the effects of these activities on respect for human rights and the fight against corruption and tax evasion.

The EFPS is hence made up of the sections of the Universal Registration Document identified in the table below:

Topics	URD Sections	Topics	URD Sections
Business models			Sections 1.1 and 1.4
Risk factors			Chapter 3 and section 2.2
Challenges/Risks of non-financial performance of the Group		Key policy performance indicators of the Group	
Climate issues	Section 3.2.1	EDF group direct greenhouse gas emissions (Scope 1) (<i>MtCO₂eq</i>) ✓	Sections 3.2.1.1.1 and 3.4.1
	Section 3.2.1	Carbon intensity: specific CO ₂ emissions from electricity and heat generation (<i>gCO₂/kWh</i>)	Sections 5.4 and 3.4.1
Energy mix issue	Section 1.6.2	Net Installed Renewable Electricity Generation Capacities (<i>GW</i>)	Sections 3.2.1.2 and 3.4.1
Energy efficiency issues	Sections 1.4.6, 1.4.2 and 3.2.4	Number of customer visits on digital consumption monitoring platforms (<i>millions</i>)	Sections 3.2.2.1.1 and 3.4.1
Issues relating to innovation, sustainable cities and diversification of solutions	Sections 3.2.2.1.1	Number of smart meters installed (<i>millions</i>)	Sections 3.2.2.2.2. and 3.4.1
	Sections 3.2.2.2	Electric vehicles rate in the fleet of light vehicles (%)	Sections 3.2.2.2.1 and 3.4.1
The issue of biodiversity and environmental heritage	Section 3.3.2.1	Rate of assessment of ecological knowledge of the land (%)	Sections 3.3.2.1 and 3.4.1
	Section 3.3.2.2.1.1	Water intensity: water consumed/electricity generation of the fleet (<i>l/kWh</i>)	Sections 3.3.2.2.1.1 and 3.4.1
Nuclear fleet safety issues	Section 3.3.1.2.1	Nuclear safety: number of significant events with a level equal to 2 on the INES scale	Sections 3.3.1.2.1 and 3.4.1
Radioactive waste and spent fuel management issues	Section 3.3.2.2.5	France: volume of High-Level and Intermediate-Level Long-Lived solid radioactive waste (<i>m³</i>) UK: volume of solid low-level radioactive waste which have been disposed of (<i>m³</i>)	Sections 3.3.2.2.5 and 3.4.1
Issues relating to energy insecurity for individual customers	Section 3.3.1.1.3	Number of energy support	Sections 3.3.1.1.3 and 3.4.1
	Section 3.3.1.2.5	Rate of projects subject to consultation in accordance with the Equator Principles (%)	Sections 3.3.1.2.5 and 3.4.1
Ethical issues and Compliance	Section 3.3.1.1.1	Rate of executives trained in the anti-corruption programme (%)	Sections 3.3.1.1.1 and 3.4.1
Responsible subcontracting issues	Section 3.3.16	Annual rate of purchases from SMEs in France (%)	Sections 3.3.1.6 and 3.4.1
Health and safety issues	Section 3.3.3.1.4	Global LTIR (Employees and service providers)	Sections 3.3.3.1.4 and 3.4.1
		Number of fatal accidents related to business risks (employees and service providers)	Sections 3.3.3.1.4 and 3.4.1
The challenge of adapting skills	Sections 3.3.3.1.1	Percentage of employees who attended a training during the year	Sections 3.3.3.1.1 and 3.1.4
The challenge of equal opportunity	Sections 3.3.3.1.5	Ratio of women to men: presence of women in the Management Committees of Group entities (%)	Sections 3.3.3.1.5 and 3.1.4

Specific information

Corporate information: information on subcontracting, suppliers and fair practices	Sections 3.3 and 3
Respect for human rights	Sections 3.3.1.1 and 3.3.3
Fight against corruption	Section 3.3.1.1
Fight against tax evasion	Section 3.3.1.2
Consequences of the Group's activity and of the use of the goods and services it produces on climate change	Sections 3.1.3, 3.2.1 and 3.3.1
Commitments to sustainable development and the circular economy	Sections 3.3 and 3
Commitments to fight food waste and food insecurity, respect for animal welfare and responsible, equitable and sustainable food	Section 3.3.3
Social consequences: information on employment, work organisation, social relations, training and equal treatment	Section 3.3.3.1
Collective agreements concluded within the Group and their impact on the economic performance and working conditions of employees	Section 3.3.3.1
Actions to combat discrimination and promote diversity	Section 3.3
Measures taken in favour of people with disabilities	Section 3.3

√ 2019 indicator subject to reasonable assurance check by KPMG SA.

8.5.5 Concordance table with the annual financial report

This Universal Registration Document includes the annual financial report for the 2019 fiscal year. It has been prepared in application of Articles L. 451-1-2 of the French Monetary and Financial Code and Article 222-3 of the AMF general regulation. The annual financial report is composed of the sections of the Universal Registration Document referred to in the following table:

Topics	Sections of the Universal Registration Document
Certification from the person responsible of the annual financial report	Section 8.1.2
EDF annual financial statements	Section 6.3
Statutory Auditors' report on EDF's annual financial statements	Section 6.4
EDF group consolidated financial statements	Section 6.1
Statutory Auditors' report on the consolidated financial statements of the EDF group	Section 6.2
Management report	Section 8.5.2
Fees paid to Statutory Auditors	Note 54 to appendix of the consolidated financial statements

Glossary

IAEA	International Atomic Energy Agency based in Vienna (Austria).
ANDRA	National agency for radioactive waste. In France, radioactive waste is managed by the National Agency for Radioactive Waste Management (ANDRA), a public industrial and commercial institution created under the French law of 30 December 1991.
ASN	Nuclear safety authority. On behalf of the Government, the Nuclear Safety Authority (ASN) supervises nuclear safety and radiation protection in France to protect workers, patients, the public and the environment from the risks related to the use of nuclear power. It is responsible in particular for the external oversight of nuclear facilities in France. The ASN is an independent administrative authority comprised of over 300 people. At the national level, the ASN is represented by the Directorate-General for Nuclear Safety and Radiation Protection (DGSNR).
Assembly/Fuel	Nuclear fuel is in the form of an assembly made up of an array of 264 fuel rods, bound together by a rigid structure made of tubes and grids. Each fuel rod consists of a water-tight zirconium tube into which uranium oxide pellets are piled, constituting the fuel. The assemblies are loaded side by side into the reactor vessel – 205 assemblies are required for a 1,500MW reactor – to make up the core of the reactor. During operation, these assemblies are crossed by bottom to top with primary water which heats on contact and carries this energy to the steam generators.
Becquerel (Bq)	International legal unit for measuring radioactivity. The Becquerel (Bq) is equal to one disintegration per second. The activity represented by this unit is so low that multiples of it are used: the MBq (megabecquerel or million Becquerels) and the GBq (gigabecquerel or billion Becquerels).
Cogeneration	Generation technique for combined electricity and heat generation. The advantage of cogeneration is the ability to capture the heat produced by the fuel whereas in traditional electricity generation this heat is lost. This process also allows the same facility to meet the heating (hot water or steam) and electricity needs of both industrial and local authority customers. This system improves the energy efficiency of the generation process and reduces fuel use by an average of 20%.
Metering	A system allowing for the recording, at a given network connection point, of the volumes of electricity transmitted or distributed (power, frequency, active and reactive energy).
Congestion	Situation in which an interconnection linking the national transmission grids cannot absorb all of the physical flows resulting from international exchanges required by market operators due to a shortage of capacity in the interconnection and/or the national transmission grids involved.
CRE	French energy regulatory Commission. CRE was created on 30 March 2000 to ensure the proper functioning of the electricity and gas market. The CRE, an independent body, regulates the opening of the French energy market. It ensures that all of the generators and eligible customers have non-discriminatory access to the network. Within its jurisdiction, this body supervises and authorises, settles any disputes and, if required, imposes sanctions. For a detailed description of its powers, see section 1.5.2.1.2 ("French legislation: the Energy Code").
Combined-Cycle Gas	The most recent technology for generating electricity in a natural gas-fired plant. A combined cycle is made up of one or more combustion turbines and a steam turbine allowing for an improved yield. The syngas is routed to the combustion turbine, which generates electricity and very hot exhaust gases (effluents). The heat from the exhaust gases is recovered by a boiler, thus producing steam. Part of the steam is then recovered by the steam turbine to generate electricity.
Fuel Cycle	The nuclear fuel cycle encompasses all industrial operations in France and abroad which enable the supply of the fuel to generate energy in a reactor, then to unload and process it. The cycle can be broken down into three stages: <ul style="list-style-type: none"> ■ upstream: the processing of concentrates from uranium ore, the conversion, enrichment and production of fuel (which takes more than two years); ■ the core of the cycle corresponding to the use of fuel in the reactor: receipt, loading, operation and discharging (which takes three to five years); ■ downstream: pool storage, reprocessing of spent fuel in reactors of recoverable material, vitrification of highly radioactive waste, then temporary storage of the waste before storage.
Waste	The nuclear generation of 1MWh of electricity (equivalent to the monthly consumption of two households) produces around 11g of total waste across all categories. Short-lived waste represents more than 90% of the total, but contains only 0.1% of the radioactivity of waste. Accordingly, based on their level of radioactivity, they are separated into two sub-categories: Low-Level waste and Very-Low-Level waste. Long-Lived Medium and High-Level waste are produced in low quantity (less than 10% of the total quantity), but they contain almost all of the radioactivity of the waste (99.9%).

Plant availability	Fraction of power available, out of theoretical maximum energy, counting only technical non-availability. The availability coefficient (Kd) is defined as the ratio between annual actual generation capacity (or amount producible annually) and maximum theoretical generation capacity, where maximum theoretical generation capacity = installed capacity × 8,760 hours. The Kd, which counts only technical non-availability, <i>i.e.</i> , scheduled shutdowns, unplanned outages and testing periods, characterises a plant's industrial performance.
Disruption	Voluntary reduction of electrical power by a customer, in exchange for remuneration. It is called "diffused" when it is due to the aggregation of small consumption sites.
ELD	French Local Distribution Companies. ELDs sell and deliver electrical energy to end users located in their exclusive service area.
Renewable energies	Energies for which production does not require extinction of the initial resource. They include hydro, wind, solar, marine (the energy produced by marine waves and currents), geothermal (energy derived from the heat below the earth's magma) energies, and bio-mass (energy derived from living matter, particularly wood and organic waste). They often include energy from the incineration of household or industrial waste.
Enrichment	Process to increase the fissile content of an element. In its natural state, uranium is 0.7% uranium 235 (fissile) and 99.3% uranium 238 (non fissile). To enable its efficient use in a pressurised water reactor, it is enriched with uranium 235 whose proportion is increased to around 4%.
Intermediate Storage	Intermediate stage in the process of managing nuclear waste. It involves placing waste packages in a facility to ensure, for a given period of time, their isolation from contact with man and the environment with the intention of retrieving them for a further stage in the waste management process. Intermediate storage facilities are designed, built and managed by the producers of such waste (EDF, AREVA NC (ex-COGEMA) and CEA) and are close to areas where waste is conditioned.
EPR	European Pressurised water Reactor. The latest generation of reactors currently under construction (known as "generation 3"), it is the result of Franco-German cooperation, and offers advanced safety, environmental and technical performance.
Fluorination (conversion)	Also called "conversion", fluorination allows for the purification of uranium compounds and their transformation into uranium hexafluoride (UF ₆), allowing their enrichment using current techniques.
Electricity supply	Electricity demand can be broken down into four types of consumption: <ul style="list-style-type: none"> ■ the "basic" (or "ribbon") supply of electricity, which is generated and consumed throughout the year; ■ "semi-basic" supply is the electricity generated and consumed over the winter period; ■ "peak" supply corresponds to periods of the year when electricity generation or supply is in heavy demand; ■ "lace" supply is a complement to "ribbon" supply.
Greenhouse gases	Gas that retains a portion of the solar radiation in the atmosphere and for which an increase in emissions due to human activity (man-made emissions) causes an increase in the earth's average temperature and plays an important role in climate change. The Kyoto Protocol covers the seven following principal greenhouse gases: carbon dioxide (CO ₂), methane (CH ₄), nitrogen protoxide (N ₂ O), hydrofluorocarbons (HFC), perfluorated hydrocarbons (PFC), sulfurhexafluoride (SF ₆) and, since 2013, nitrogen trifluoride (NF ₃).
LNG (Liquefied Natural Gas)	Natural gas turned into liquid form by reducing its temperature to -162°C allowing for a reduction by 600 in its volume.
Man-sievert	Unit expressing the collective equivalent dose. A man-sievert is the collective dose from exposure of 1,000 men to 1mSv (millisievert).
Interconnection	Electricity transmission infrastructure that allows for exchanges of energy between different countries, by connecting the transmission network of one country to that of a neighbouring country.
Balancing Mechanism	Created by RTE on 1 April 2003, the balancing mechanism allows it to use power reserves that can be mobilised in the event of an imbalance between supply and demand.
MW – MWh	The megawatt-hour (MWh) is the energy unit generated by a facility and is equal to the facilities' power, expressed in megawatts (MW), multiplied by the duration of operations in hours. 1MW = 1,000 kilowatts = 1 million watts 1MWh = 1MW produced for 1 hour = 1 megawatt-hour 1GW = 1,000MW = 1 billion watts 1TW = 1,000GW
MWh cumac	The MWh cumac is the certificate energy unit of counting which corresponds to the cumulative energy savings aggregated on the operations' lifetime.
Series	In the nuclear field, a series of plants means a set of nuclear plants with identical generation capacity. EDF's PWR model is divided into three series of available electrical power: the 900-MW series (34 tranches of approximately 900MW each), the 1,300-MW series (20 tranches) and the 1,450-MW series (4 tranches).
Plutonium (Pu)	Element with the atomic number of 94 (number of protons) and no naturally occurring isotopes (elements whose atoms possess the same number of electrons and protons – thus the same chemical properties – but a different number of neutrons). Plutonium 239, a fissile isotope, is produced in nuclear reactors from uranium 238.

Producible hydropower generation	Maximum energy that hydropower facilities may produce using contributions under normal hydraulicity conditions. However, generation from hydroelectric facilities does vary, sometimes markedly, from one year to the next depending on hydraulicity (rainfall and snowfall). In dry years, the generation index may vary by 20% or more from the standard level.
Radiation protection	At a power plant, ionising radiation sources are numerous: the fuel itself, equipment activated by neutron flux (particularly that which is close to the core, such as tanks or lids) and particles from corrosion of the primary circuit of reactors and carried by the primary fluid. The level of exposure of a person is quantified by the dose equivalent in Sieverts (Sv). The total dose equivalents, called "collective dosimetry" and expressed in man-sieverts, is used as an indicator of dose received by all participating persons. The mobilisation of ground players has allowed a continuous improvement of performance on the protection of employees against the effects of ionising radiation.
Distribution network	Downstream of the transmission network, medium- and low-voltage distribution networks serve end-users (residential, local authorities, SMEs, SMLs, etc.).
Transmission network	Network providing for the transmission of electrical power at High and Very High Voltages from the generating sites to the distribution networks or industrial sites directly connected to it; this includes the major interconnection transmission network (400,000 volts and 225,000 volts) and the regional distribution networks (225,000 volts, 150,000 volts, 90,000 volts and 63,000 volts).
Entity Responsible for Balance	Entities with which RTE signs a contract for the financing of shortfalls between forecast and actual consumption and the production of a portfolio of users brought together by the entity responsible for balance which plays a role of insurer covering the potential losses arising from the many differences between over- and under-supply.
Reprocessing	Reactor burnt fuel reprocessing aimed at separating materials that can be recycled (uranium and plutonium) from final waste.
Systems services	Systems services are services provided to users (consumers or electricity producers) through the joint action of the electricity transmission network operator RTE and the producers. They are intended to regulate frequency and voltage in order to maintain the balance between electric consumption and generation at all times. They are created by RTE from elementary contributions from producers, <i>i.e.</i> primary and secondary reserves provided to RTE. RTE remunerates the producers for these auxiliary services before re-invoicing these services <i>via</i> the tariff to use the network under the rules defined by the Union for the Coordination of Transmission of Electricity (UCTE).
STEP	Pumped-storage hydropower plant. Power plant with two tanks, an upper and a lower one, connected by pumps that allow the water to be pumped up once turbined and located in the lower tank, towards the upper tank.
Storage	Storage consists in placing packages of radioactive waste in a facility, ensuring their long-term management, <i>i.e.</i> , under safe conditions allowing for long-term risk control.
Nuclear safety	Nuclear safety includes all of the technical, organisational and human measures which are intended to prevent accident risks and to limit the effects of an accident, and which are taken at every stage of the life of a nuclear power plant (from design to operation and finally to decommissioning).
Therms (th)	One therm (th) is equivalent to 1,163kWh or 4,186 million joules.
Nuclear tranche	Electrical generation unit consisting of a nuclear boiler and a turbo-alternator generator. A nuclear tranche essentially consists of its reactor type and the power of its turbo-alternator generator. EDF nuclear plants include two or four tranches, and occasionally six.
Uranium	In its natural state, uranium is a mix containing three main isotopes (elements whose atoms have the same number of electrons and protons, thus the same chemical properties, but a different number of neutrons): <ul style="list-style-type: none"> ■ uranium 238, 99.3% fertile; ■ uranium 235, 0.7% fissile; ■ uranium 234. Uranium 235 is the only natural fissile isotope, a quality which justifies its use as an energy source.
Enriched uranium	Uranium, whose isotope 235 content, the only fissile material, has been increased from its low natural level (0.7%) to approximately 4% for pressurised water reactor fuel.
ERU (enriched reprocessed uranium)	To be used in a reactor, reprocessed uranium (RepU), even if containing more fissile uranium than in its natural state, must be further enriched. It is therefore called enriched reprocessed uranium (ERU).
RepU (reprocessed uranium)	Reprocessed uranium ("RepU"), uranium derived from spent fuel reprocessing, differs from natural uranium as it contains slightly more uranium 235 and other uranium isotopes. It is recyclable and RepU fuel assembly refuelling is commonly used in reactors.
Vitrification	Process of immobilisation in a glass structure of concentrated solutions of high-level radioactive waste by mixing at high temperature with glass paste.
Non-interconnected zones	Zones in France which are not connected (by power lines) to metropolitan France (Corsica and overseas departments).

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