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Ecological transition and green growth

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ECOLOGICAL TRANSITION AND GREEN GROWTH

The ecological transition and environmental protection are among the main challenges of the 21st century. Green energy generation has become one of the essential challenges of any production activity, even more so as the Russian-Ukrainian conflict weighs on energy rates.

The ability to secure reliable and inexpensive energy sources, as well as the development of renewable energies, are key elements of economic attractiveness.

Beyond the environmental issue, green growth also represents a strong economic interest because it brings many opportunities for technological development and jobs.

With an energy mix dominated by nuclear power, France is able to guarantee businesses largely carbon-free electricity at attractive rates, while increasingly developing green energy sources.

1. Competitive energy rates

The ability of a country to guarantee businesses reliable and competitive access to energy sources is a guarantee of attractiveness.

The year 2022, affected by the Russian-Ukrainian conflict, is an exceptional period, marked by an imbalance in the energy market and an increase in costs that affects all countries.

Nevertheless, electricity rates in France have long been attractive and stable.[1] Differences in rates paid by high energy-consuming French and European businesses can be partly explained by tax breaks and low network costs.

French consumers benefit from access to part of nuclear-generated electricity at a capped rate, which limits the effect of an increase in electricity rates on the supply cost of French businesses.[2] Fluctuations of electricity rates in France are also regulated. Between 2018 and 2021, electricity rates for non-residential customers changed very little, with a fluctuation lower than that observed in Germany, irrespective of the level of consumption.

In the European Union, France stands out for the original nature of its energy mix. **The predominance of nuclear energy,** which accounted for 67% of the electricity produced in 2021, has enabled France to have **competitive, low-carbon electricity.**[3]

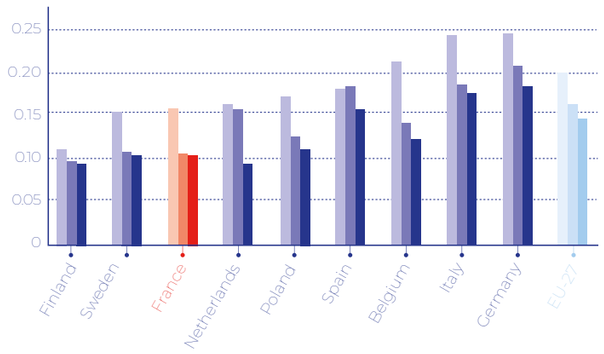
[1] In 2020, according to the Ministry for Ecological Transition (Key Energy Figures – 2020 Edition), electricity accounted for 36% of the energy consumed in the industry sector and 41% of that in the residential-tertiary sector.

[2] Regulated access to historical nuclear electricity (ARENH), introduced under the New Organization of the Electricity Market (NOME) Act of 2012, allows electricity suppliers to obtain nuclear electricity through Électricité de France (EDF) at a rate of €42/MWh, up to a limit of 100 TWh. Faced with the energy crisis in 2022, the French government announced that EDF would deliver an additional 20 TWh to businesses, at a rate of €46.2/MWh.

[3] International Energy Agency (IEA).

FIG. 1

ELECTRICITY RATES (H2, 2021)
NON-RESIDENTIAL CONSUMERS, BY LEVEL OF CONSUMPTION
RATE INC. VAT (€/KWH)

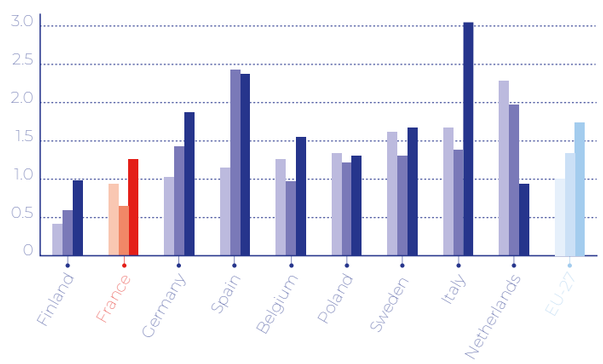


● 20 MWH-500 MWH ● 2,000 MWH-20,000 MWH ● 70,000 MWH-150,000 MWH

Source: Eurostat, 2022

FIG. 2

VARIABILITY OF ELECTRICITY RATES (H2, 2018 – H2, 2021)
NON-RESIDENTIAL CUSTOMERS, BY LEVEL OF CONSUMPTION,
STANDARD DEVIATION (%) OF RATES INC. VAT



● 20 MWH-500 MWH ● 2,000 MWH-20,000 MWH ● 70,000 MWH-150,000 MWH

Source: Eurostat, 2022

2. The quality of the environment in France

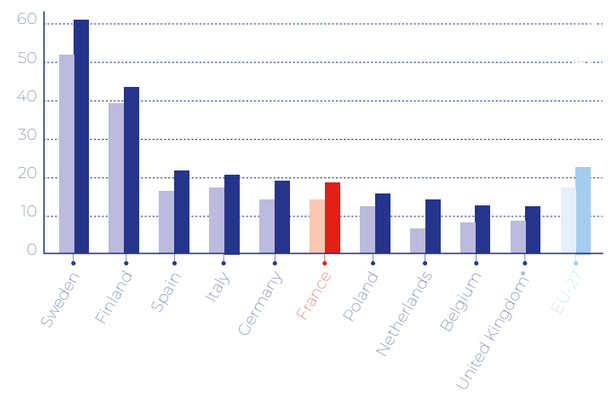
To limit greenhouse gas emissions, countries are all engaged in a process of replacing carbon sources with renewable energies.

In EU-27 countries, the share of renewable energies in gross final energy consumption reached 22.1% in 2020 (more than 4.3 percentage points higher in five years).

Sweden and Finland stood out from other countries in our sample, with renewable energy accounting for a very high proportion of their gross final energy consumption (60.1% and 43.8%, respectively, in 2020). In France, this contribution amounted to 19.1% in 2019, similar to that of Germany (19.3%), but higher than that of the United Kingdom (12.3%).

FIG. 3

SHARE OF RENEWABLE ENERGIES IN GROSS FINAL ENERGY CONSUMPTION
%



● 2015 ● 2020

** Data for 2019*

Source: Eurostat, 2022

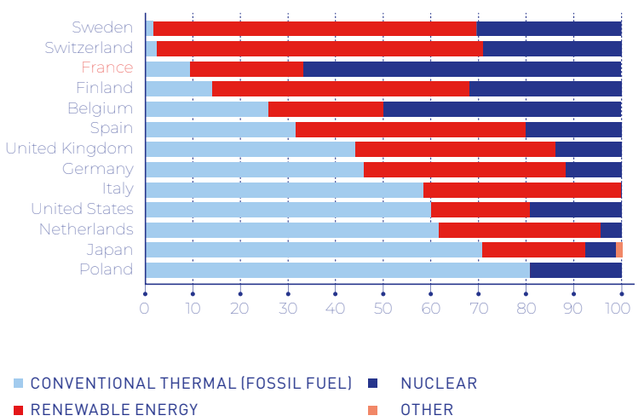
The structure of electricity generation by country reveals the specificity of each country's energy mix, as well as their dependence on fossil fuels.

France, like Sweden and Switzerland, has very low-carbon electricity generation due to the very low share of thermal production in its electricity mix. **In 2021, 9% of France's electricity generation came from carbon-based means of production.** This French peculiarity is explained by the predominance of nuclear energy that does not emit greenhouse gases.

Although significant efforts have been made in terms of the development of renewable energies, the electricity generation from the large economies in our sample remained highly dependent on fossil fuels in 2021. This is notably the case for the United Kingdom (44%), Germany (46%), Italy (58%), the United States (60%), the Netherlands (62%), Japan (71%) and Poland (81%).

FIG. 4

ELECTRICITY GENERATION BREAKDOWN (2021)
%



Source: International Energy Agency, 2022; Business France calculations

Hydraulic power is the leading renewable source of electricity generation in France, accounting for 50% of renewable electricity created, as it is in Switzerland (89%), Sweden (63%), Finland (42%), Japan (42%) and Italy (41%).

In 10 years, the structure of renewable energy generation in France has evolved towards a sharp increase in the share of wind and solar power. In 2011, 18% of renewable energy produced in France came from wind power, compared with 29% in 2021. The same is true for solar energy, the share of which has increased from 3% to 12% in ten years.

NUCLEAR POWER IN FRANCE

France will boast 70% of Europe's nuclear generation potential by 2030. In 2022, more than half of the European nuclear reactors built were located in France (56 out of 106). In 2021, they accounted for 67% of all French electricity generated.

As such, France is ranked second in the world in nuclear energy generation, after the United States, and is the leading European exporter of nuclear energy.

In addition to the €1 billion included in the "France 2030" plan aimed at producing innovative, clean and small reactors, "small modular reactors" (SMRs), French President Emmanuel Macron announced in 2022 that six new reactors would be built, with the possibility of eight additional reactors for 2050.

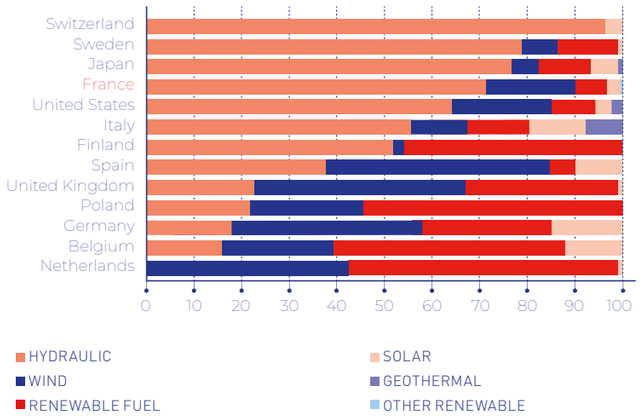
Safety being key, the French nuclear industry is supported by EDF's "Grand Carénage" program (2014-2025), which will invest €49.4 billion in the maintenance of the reactors and in their technical development. The aim is to extend the life of French nuclear reactors beyond 40 years (the current average age is 34).

France's energy mix therefore enables it to have one of the lowest levels of tonnes of CO_2 emissions per capita in the European Union.

Source: International Energy Agency, 2022, vie-publique.fr, 2022; World Energy Council Europe, 2021

FIG. 5

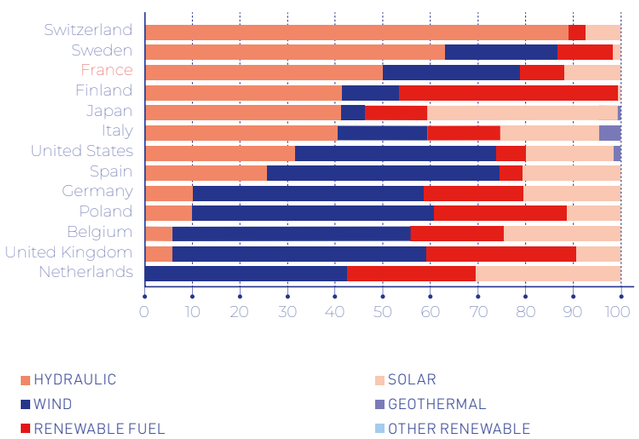
RENEWABLE ELECTRICITY GENERATION BREAKDOWN (2011)
%



Source: International Energy Agency, 2022; Business France calculations

FIG. 6

RENEWABLE ELECTRICITY GENERATION BREAKDOWN (2021)
%



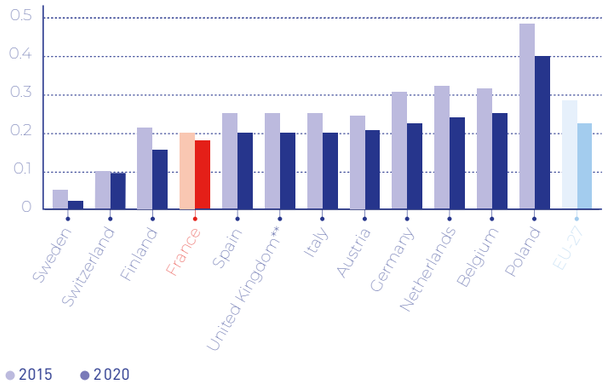
Source: International Energy Agency, 2022; Business France calculations

The environmental quality of the generation process and the functioning of the economy in general play a decisive role in the development of green and sustainable growth.

This environmental quality can be measured by the greenhouse gas emissions in each economy, relative to its size. As such, carbon intensity measures greenhouse gas emissions due to energy consumption, expressed in units of GDP. This indicator shows relatively low levels for the main European economies.

FIG. 7

CARBON INTENSITY
'000 TONNES GREENHOUSE GAS EMISSIONS* / GDP MILLION AT PPP



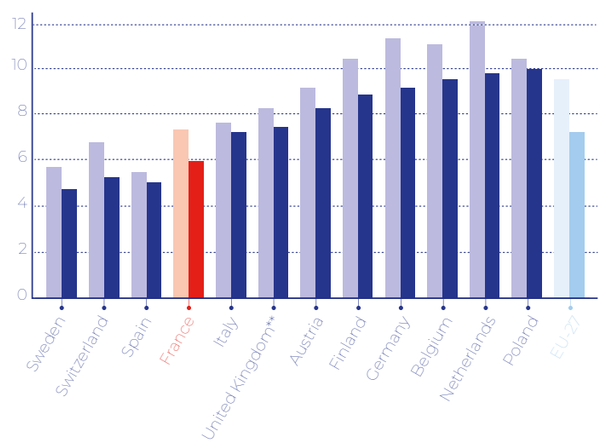
** Greenhouse gases: CO_2, N_2O in CO_2 equivalent, CH_4 in CO_2 equivalent, HFC in CO_2 equivalent, PFC in CO_2 equivalent, SF_6 in CO_2 equivalent, NF_3 in CO_2 equivalent.*
*** Data for 2019*
Source: Eurostat, 2021; Business France calculations

In relation to its GDP, France's greenhouse gas emissions are among the lowest in our sample. The country's carbon intensity is higher than that of Sweden, Switzerland and Finland but lower than that observed in the United Kingdom, Italy or Germany.

In relation to the number of inhabitants, France's environmental performance is also good, since it is equivalent to that of Spain and outstripped only by Sweden and Switzerland within our sample.

FIG. 8

GREENHOUSE GAS EMISSIONS*
'000 TONNES PER 1,000 INHABITANTS



** Greenhouse gases: CO_2, N_2O in CO_2 equivalent, CH_4 in CO_2 equivalent, HFC in CO_2 equivalent, PFC in CO_2 equivalent, SF_6 in CO_2 equivalent, NF_3 in CO_2 equivalent.*
*** Data for 2019*
Source: Eurostat, 2021; Business France calculations

3. Green growth, a lever for economic development

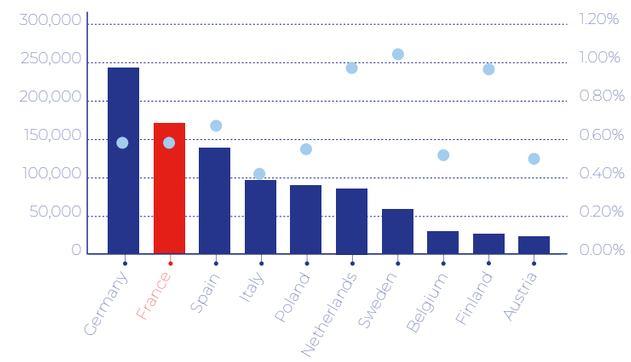
Green growth is also a lever for economic development, bringing opportunities and providing jobs, particularly in renewable energy. The most advanced countries in these sectors of the future are attracting international investors keen to position themselves in these fields.

The development of green technologies is one of the key issues for combining growth with the energy transition.

According to EurObserv'ER, France was the second largest employer in renewable energy in Europe in 2020, with 164,400 jobs (0.58% of its working population). The leading country in this area is Germany, with

FIG. 9

JOBS IN RENEWABLE ENERGY (2020)



● JOBS IN RENEWABLE ENERGY (LEFT AXIS)
● SHARE OF JOBS IN RENEWABLE ENERGY AMONG THE ACTIVE POPULATION

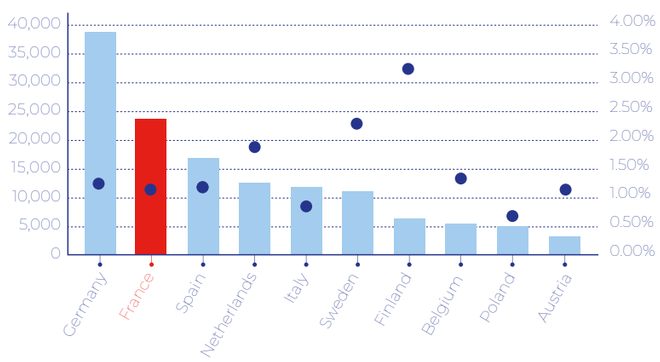
Source: EurObserv'ER, The state of renewable energies in Europe, 2021

242,100 jobs (0.58% of its working population), followed by Spain with 140,500 jobs (0.65%). Sweden, with 1.08% of its population working in renewable energies, has the highest employment rate in this field, with the EU average being 0.64%.

In 2020, 15% of the European Union's revenues from renewable energies was made in France. It is second among the countries in our sample, after Germany (23%) and ahead of Spain (10%). In terms of national wealth, the countries in Northern Europe have the highest rate of revenues in renewable energies when measured by their GDP.

FIG. 10

REVENUES IN THE RENEWABLE ENERGY SECTOR (2020)



● REVENUES € MILLIONS (LEFT AXIS)

● REVENUES IN RENEWABLE ENERGY (% OF GDP)

Source: EurObserv'ER, The state of renewable energies in Europe, 2021

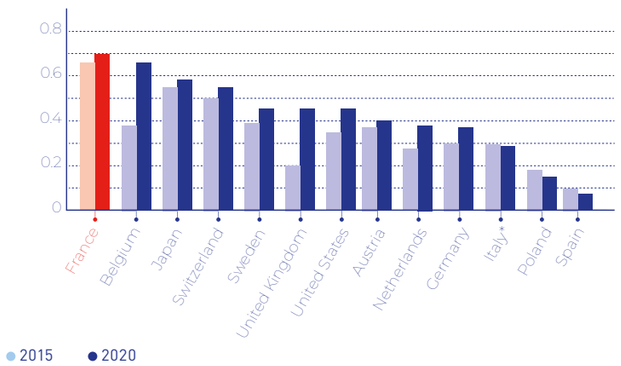
Investments in R&D and innovation form the basis of tomorrow's technological developments, which themselves will determine a country's competitiveness. R&D in green technologies are therefore engines of growth.

In 2020, France allocated the largest budget in our sample to research and development in energy technologies. This budget represented 0.68% of its GDP in 2020, more than the United Kingdom (0.44%), the United States (0.43%) and Germany (0.37%).

FIG. 11

R&D BUDGETS IN ENERGY TECHNOLOGIES

% OF GDP



Source: International Energy Agency, 2021
** Data for 2019*

ECOLOGY AT THE HEART OF THE "FRANCE 2030" PLAN

The ecological transition forms an important part of the "France 2030" plan, with six of the plan's 10 objectives being to reduce the impact of French manufacturing on the environment.

As part of the "France 2030" plan, more than €8 billion will be invested in the development of a carbon-free and resilient France in the following three ways:

- Through the construction of small nuclear reactors, which will better manage waste.

- Through the strengthening of innovation in carbon-free hydrogen, with at least two electrolysis gigafactories set to be built by 2030.

- Through the decarbonization of industry by up to 35% compared with 2015 levels.

Furthermore, €4 billion will be used to develop "future transport" with, in particular, the manufacturing of two million electric and hybrid vehicles and the first low-carbon aircraft.

Lastly, some €2 billion will be allocated to developing healthy eating, with food that is sustainably sourced and traceable.

Source: www.gouvernement.fr

METHODOLOGY

Economic attractiveness can be defined as the ability to attract new business and mobile factors of production (capital, skilled labor, etc.) to a specific destination. This ability is related to a wide range of macroeconomic criteria.

This booklet takes its place in a set of themes that address different determinants of attractiveness in the form of a comparison of the main European economies competing with France: Belgium, Finland, Germany, Italy, the Netherlands, Poland, Spain, Sweden, Switzerland and the United Kingdom, as well as Japan and the United States.

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