



Le réseau  
de transport  
d'électricité

# **ELECTRICITY REVIEW OF THE FIRST HALF OF 2025 AND OUTLOOK FOR THE SECURITY OF THE ELECTRICITY SUPPLY OVER THE SUMMER**

JULY 2025

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# Summary

## Electricity review of the first half of 2025

A number of trends already present in 2024 were confirmed in the first half of 2025.

- **Electricity consumption, which in 2023 ended a downward trajectory that had begun following the pandemic and the energy crisis, remained stable in the first half of 2025.** It remains below its pre-pandemic level (6 to 7% below the average for the years 2014 to 2019).
- **Low-carbon generation was very strong in the first half of the year.** Increases were seen in both nuclear generation (due to better availability) and solar generation. Wind and hydropower output declined, affected by less favourable weather conditions than in 2024. The volume of electricity generated in France in 2025 is thus very close to 2024's level.
- **France's electricity trade balance remained in surplus throughout the first half of the year,** amounting to 37.6 TWh over the period (the second-highest balance after the first half of 2024). Projections suggest the chances of surpassing the record exports achieved in 2024 by the end of 2025 are limited, due partly to lower hydropower generation.
- **Electricity prices on futures markets,** the best indicator of medium-term price trends in a given country, **have now fallen well below other European countries** (except Spain). Prices for delivery the following year are €24/MWh lower than in Germany. The trend is slightly down, suggesting a perception among market players that the abundance of low-carbon generation will continue.
- French spot prices, which reflect the current balance between supply and demand, proved highly volatile (363 hours with negative prices, i.e. around 8% of the time, compared with 235 hours in the first half of 2024). **Although these negative prices attract considerable media attention, spot prices actually increased in 2025** and remained at a relatively high level (€67/MWh on average) in the first half of 2025 due to higher gas prices and colder temperatures. Despite this high level, they were also among the lowest in Europe.

## Outlook for summer 2025

The situation for the summer of 2025 is very favourable in terms of the availability of generation and coverage of electricity needs:

- 1) Peak consumption during the summer is expected to reach a maximum of around 60 GW in the event of a heatwave.
- 2) The nuclear fleet availability forecast is similar to last year (around 40 GW in June and for the rest of the summer), even though a number of reactors traditionally undergo maintenance at this time of year.
- 3) Hydropower and gas stocks are at satisfactory levels for the season. The availability of thermal and hydroelectric power stations is similar to last year.
- 4) Growth in renewable energy is helping to increase the supply of low-carbon electricity in France and neighbouring countries.

**Based on the information currently available, therefore, there are no concerns for the availability of the electricity supply for the rest of the summer in 2025.** The level of generation is sufficient and the power system appears to be more than capable of meeting demand for electricity even if the summer brings intense heatwaves and drought.

The heatwave at the end of June and the beginning of July supports this analysis. During this episode, which saw record or near-record temperatures for the time of year, consumption reached just under 60 GW and several nuclear reactors were subject to output restrictions, but France continued to export overall throughout the period and still had significant headroom to ensure security of supply.

As has been the case since the spring of 2024, France will have to manage episodes of plentiful low-carbon electricity generation at low or zero cost over the summer (nuclear, hydro, wind and solar power), with electricity consumption remaining low until electrification projects materialise.

In these situations, all of France's low-carbon generation has to adjust its output downwards in response to market prices: the dispatchable hydropower fleet (lake reservoirs or PSH), the nuclear fleet – operated to modulate based on market prices, reducing its output in the afternoon and at weekends – and, increasingly, wind and solar power, which curtail their output during periods of negative prices.

These situations are not new, but they are growing in frequency and scale, which means there is a need to update the rules coordinating system balancing. With new provisions being introduced gradually in recent months and in the near future, RTE will have new tools at its disposal to facilitate and manage this system balancing process at all times: offshore wind farms participating directly in the balancing mechanism via amendments to their support scheme, the obligation for renewable energy suppliers to take part in the balancing mechanism from 1 January 2026, etc. The changes now being made to the rules need to continue so that the operation of the power system can be optimised and adapted to the new reality for electricity.

In this context, RTE re-emphasises the importance of immediately accelerating the development of demand flexibility, shifting consumption towards the periods of plentiful generation in the middle of the day in order to benefit from very low wholesale electricity prices during these periods and avoid losses of low-carbon electricity generation.

In addition, RTE is closely monitoring and contributing to the technical analysis carried out by the European Network of Transmission System Operators for Electricity (ENTSO-E) on the causes of the blackout on the Iberian peninsula on 28 April, and will learn the lessons from it once the results are known (see the FAQ published by RTE for more details<sup>1</sup>).

1. [Frequently asked questions: blackout on the Iberian peninsula on 28 April 2025 | RTE](#)

# 1.

## Consumption remained stable compared with the previous year

Electricity consumption, adjusted for weather and calendar effects, stopped falling in 2024 after the sharp drop in the winter of 2022-2023.

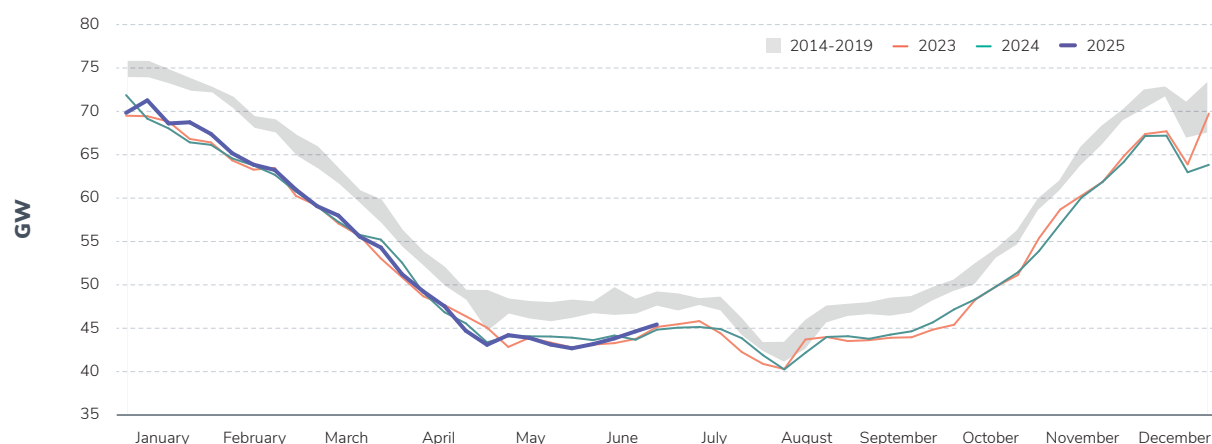
This trend continued in the first half of 2025, with consumption remaining stable compared with the same period in 2024. It reached 230.8 TWh (compared with 230.2 TWh<sup>2</sup> in the first six months of 2024).

Consumption is still much lower than it was in the second half of the 2010s, before the pandemic and the energy crisis (247.3 TWh on average in the first

six months of 2014 to 2019), a sign that at least some of the measures taken to reduce consumption and reorganise economic activity in response to these shocks have become established, and that the drive to electrify energy use is still insufficient to reverse the trend.

Electricity consumption by large industrial consumers connected to the transmission system rose by 2.4% in 2024 compared with the previous year thanks to business recovery, particularly in the power-hungry industries that had been most affected by the energy crisis.

**Figure 1 – Electricity consumption in 2025 (average weekly power) compared with previous years (working days)**



2. Consumption in the first half of 2025 is the sum of consolidated consumption data from January to May and provisional consumption data for June. To enable comparisons with previous years, consumption for the first half of 2024 is calculated in the same way, even though final data is available for June 2024.

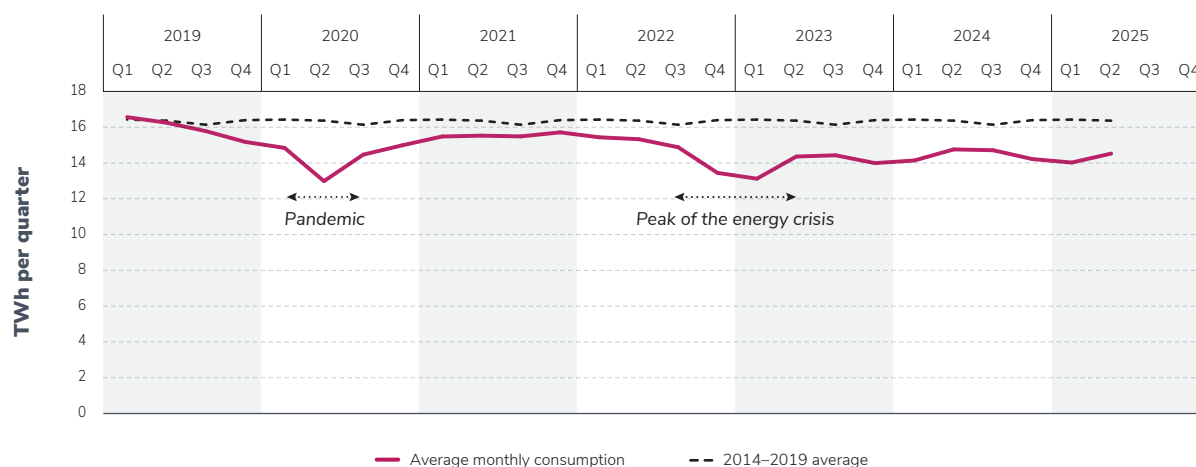
In the first half of 2025, their consumption remained stable compared with the same period the previous year, though the situation varies from one sector to another. For example, consumption in the chemical industry fell by around 10% compared with the first half of the previous year, whereas it had risen slightly during 2024. This decrease is offset by growth in several sectors that have continued the positive trend begun in 2024, including metallurgy (+1.5% or +100 GWh), rail transport (+2.1% or +75 GWh) and the food industry (+2.3% or +70 GWh for the share of consumption connected to the electricity transmission network, which represents 10% of the food industry's total electricity consumption).

National electricity consumption unadjusted for weather and calendar effects ("gross" consumption) was slightly higher in the first half of 2025 than in

the first half of 2024 due to lower temperatures (though they were still higher than the seasonal norm), which led to additional heating requirements this winter. However, gross consumption, like adjusted consumption, remains well below the levels typical of the 2014–2019 period. This relatively low level of consumption, combined with plentiful low-carbon generation, means that the rate at which consumption is covered by low-carbon generation (nuclear + renewables) reached 99.4% over the first six months of the year, a rate slightly higher than the same period the year before.

Peak consumption reached 88 GW, a level comparable with 2024 (86 GW), and is still relatively low compared to peak consumption levels in the previous decade, in line with the overall volume of consumption.

**Figure 2 – Quarterly consumption between 2020 and 2025 by major electricity consumers connected to the RTE network**



## Outlook for the summer

Under normal seasonal conditions, the weekly peak should be relatively stable at around 52 GW during the first part of the summer, with a drop of around 5 GW in August reflecting the effects of the summer holidays on household and business consumption. Consumption could reach a low of around 29 GW during the night-time trough in August.

The impact on consumption of air conditioning and ventilation, which becomes significant when the outdoor temperature rises above 25 °C, is estimated at 0.7 to 1 GW of additional consumption for every additional degree of temperature under heatwave conditions.

Exceptional weather conditions led to peak summer consumption of 59.6 GW on 22 June 2017 at 1 pm.



### FOCUS

#### **An accelerated connection process to promote the decarbonisation of industry and the development of new electricity uses has not yet translated into growth in electricity consumption**

With connection requirements increasing in order to decarbonise industry and develop new uses of electricity, including digital technologies, RTE has proposed changes to its connection procedures for high-power sites. Accelerated access to the network is available to consumers that wish to connect to the network in areas identified in advance by RTE as being favourable. These sites are located close to RTE infrastructure with capacity to accommodate new power connected to the network. The sites will be made public by RTE as and when they are identified.

At the beginning of July 2025, RTE had already signed contracts with around 160 projects and granted network access rights for a volume of 25 GW (in manufacturing industry, hydrogen production, electro-fuel production and the development of digital uses). Fewer than 15% of these projects have so far reached the second stage of the connection process, when a contract is signed to complete the work (known as a connection agreement). If even a small proportion of these projects become a reality, it would result in a significant increase in French electricity consumption and mark the beginning of a real drive to electrify the country.

# 2.

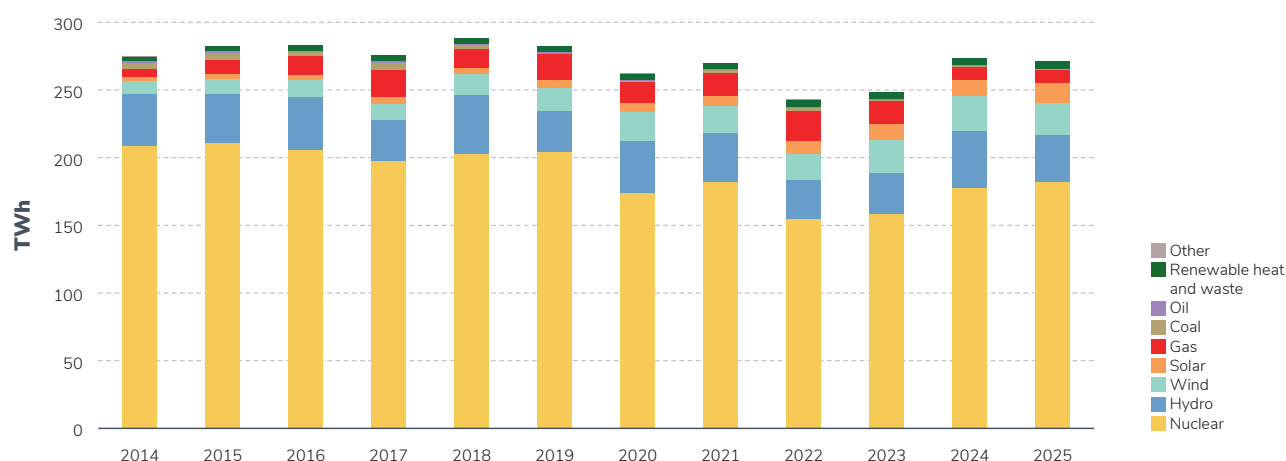
## Low-carbon generation remained plentiful thanks to growth in nuclear and solar power, offsetting the decline in hydro and wind power

After increasing by almost 10% in 2024 compared with 2023, French electricity generation remained relatively stable in the first half of 2025 (–0.9% compared with the first half of 2024). The proportion of low-carbon generation also remained at the historically high level reached in 2024 (95.0% in the first half of 2025, up 0.4 points on the same period the year before).

This relative stability in electricity generation in France is the result of contrasting trends across the production mix.

In the first half of 2025, hydro and wind power declined (by 17.4% and 8.6% respectively compared to the first half of 2024), mainly due to less favourable weather conditions – following high rainfall, hydropower production in 2024 had reached its highest level since 2013. On average, cumulative precipitation and wind speed in mainland France were 30% and 6% lower respectively in the first five months of 2025 than in the same period in 2024<sup>3</sup>.

**Figure 3 – Electricity generation in France by type, during the first half of the year, between 2014 and 2025**



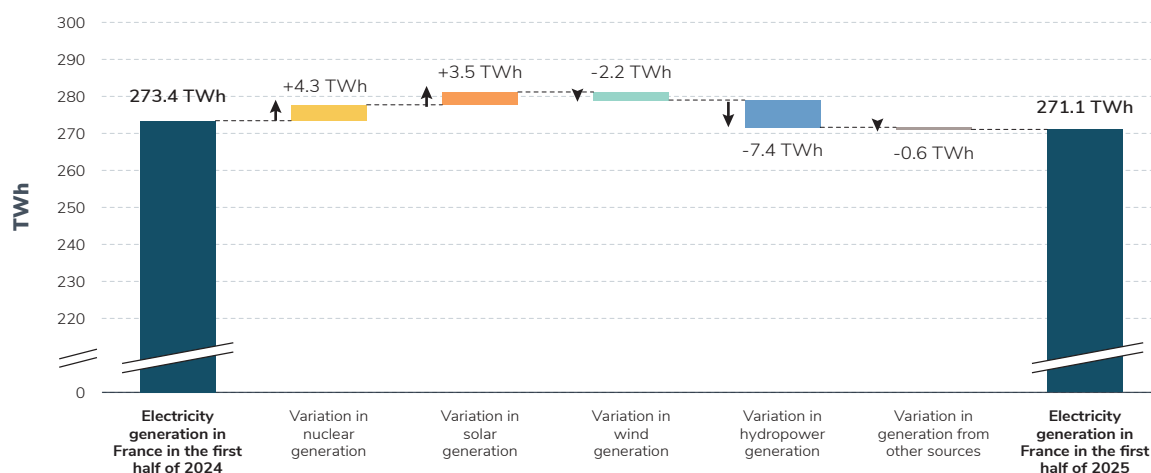
3. Source: Copernicus Climate Change Service (2020): Climate and energy indicators for Europe from 1979 to present derived from reanalysis. Copernicus Climate Change Service (C3S) Climate Data Store (CDS).

These reductions in output were offset by higher nuclear and, to a lesser extent, solar generation. After the peak of the stress corrosion crisis in 2022, the increase in nuclear power generation seen since 2023 continued into 2025. It reached +2.4% (or +4.3 TWh) in the first half of 2025 compared with the same period the previous year thanks to higher availability of the existing fleet (72.9% compared with 70.4% in the first half of 2024<sup>4</sup>). The ramp-up of the Flamanville EPR, where test phases began in December 2024, led to around 0.6 TWh of generation in the first half of 2025.

Solar generation also increased in the first half-year (+28.8% compared with the first half of 2024, a rise of +3.5 TWh) thanks to significantly better sunshine conditions at the start of 2025 than in the first half of 2024 and to the continued development of the installed base.

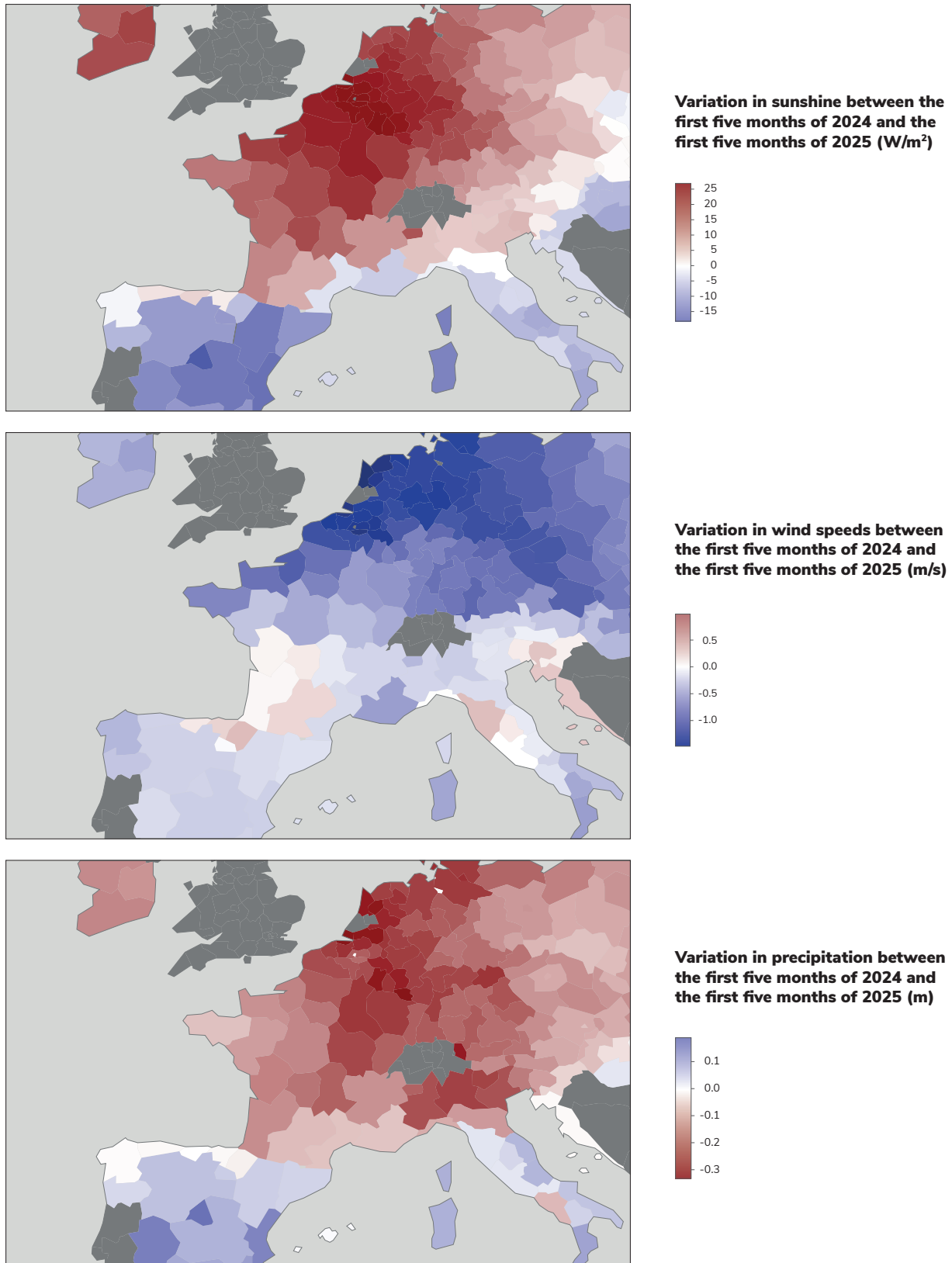
Thermal generation, which had already reached its lowest level since 1950 in 2024, continued to fall in 2025 (-7.8% in the first half of 2025 compared with the first half of 2024).

**Figure 4 – Breakdown of changes in electricity generation in France between the first half of 2024 and the first half of 2025**



4. Both figures excluding Flamanville 3.

**Figure 5 – Changes in wind, sunshine and precipitation conditions between the first half of 2024 and the first half of 2025**



## The renewable energy fleet continues to grow

The wind and photovoltaic capacity installed in mainland France continues to grow as new facilities are connected. In 2024, renewable energy generation increased by 6.7 GW (5.0 GW of solar, 1.1 GW of onshore wind and 0.6 GW of offshore wind)<sup>5</sup>. This growth continued in the first few months of 2025, with 2.1 GW of solar and 0.2 GW of wind capacity (onshore and offshore) installed between January and May, taking solar capacity at the end of May 2025 to 26.4 GW, now exceeding total wind capacity (24.6 GW). Offshore wind farms

continued to expand: the Yeu–Noirmoutier wind farm (488 MW) is currently under construction and will be commissioned in the coming months (it already has an operational grid connection).

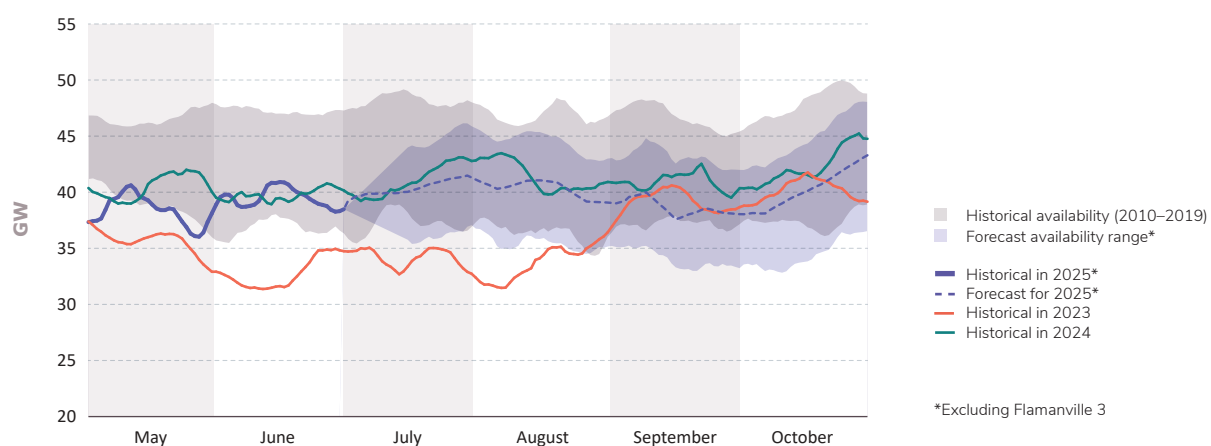
Wind and solar generation accounted for 14.3% of total generation in France in the first half-year (compared with 13.7% in the first half of 2024), making a significant contribution to the country's electricity supply.

## Outlook for the summer

Over the summer of 2025, the availability of the nuclear fleet, the main determinant of the country's security of supply, should be close to the level seen last year until the beginning of September.

Hydropower stocks<sup>6</sup> are satisfactory, in line with the average for the same period in recent years. They are slightly lower than last year, when they were very high due to abundant rainfall.

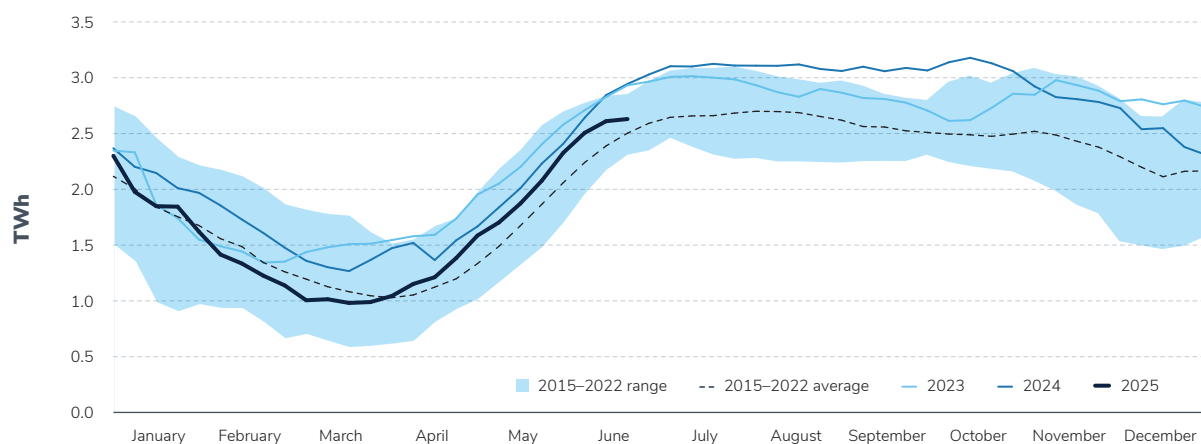
**Figure 6 – Forecast and actual availability of the nuclear fleet from May to October**



5. See RTE's [2024 Electricity Report](#).

6. [Hydropower stocks – RTE Service Portal \(services-rte.com\)](#)

**Figure 7 – Weekly changes in hydropower stocks in 2025 and comparison with previous years**



Gas stocks have also reached satisfactory levels compared with previous years, both in France and (to a lesser extent) in Europe.

The availability of fossil-fired generation<sup>7</sup> over the entire summer period should also be close to 2024 levels.

7. The unavailability of generating facilities is published continuously by power companies, in accordance with legislation, and can be consulted on the RTE website at the following address: [Unavailability of generating resources – RTE Service Portal \(services-rte.com\)](https://services-rte.com)

# 3.

## The balance of trade was significantly in surplus with all countries except Spain

Thanks to the abundance of low-carbon generation, **France had a net positive balance of trade in electricity with neighbouring countries every month in the first half of 2025, amounting to 37.6 TWh over the whole period.**

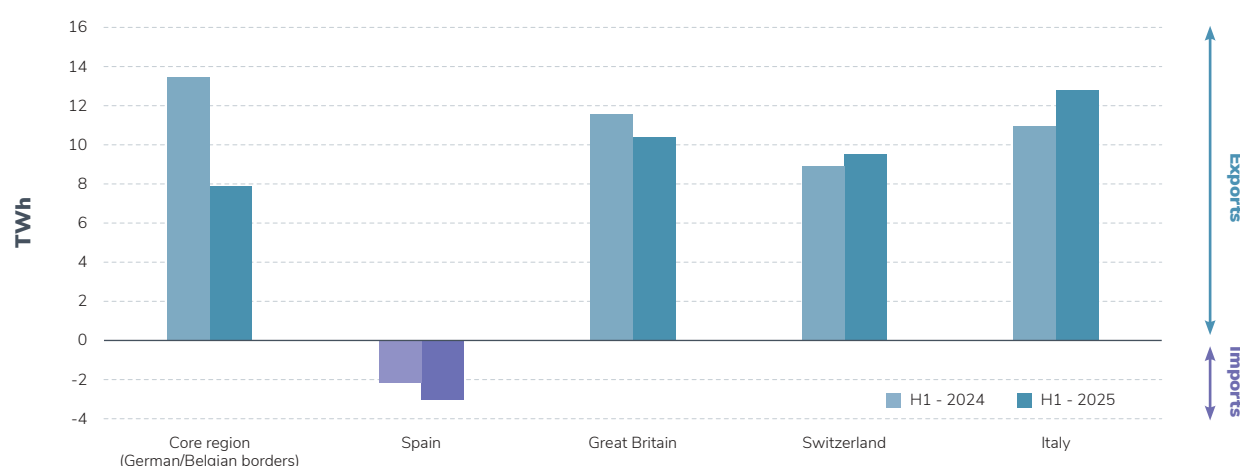
This is the second-highest export balance ever achieved for a first half-year, only beaten by the previous year (42.7 TWh).

The difference compared with the first half of 2024 is mainly due to a slightly lower export balance to the Core region (borders with Germany and Belgium). The balance was positive across all borders except

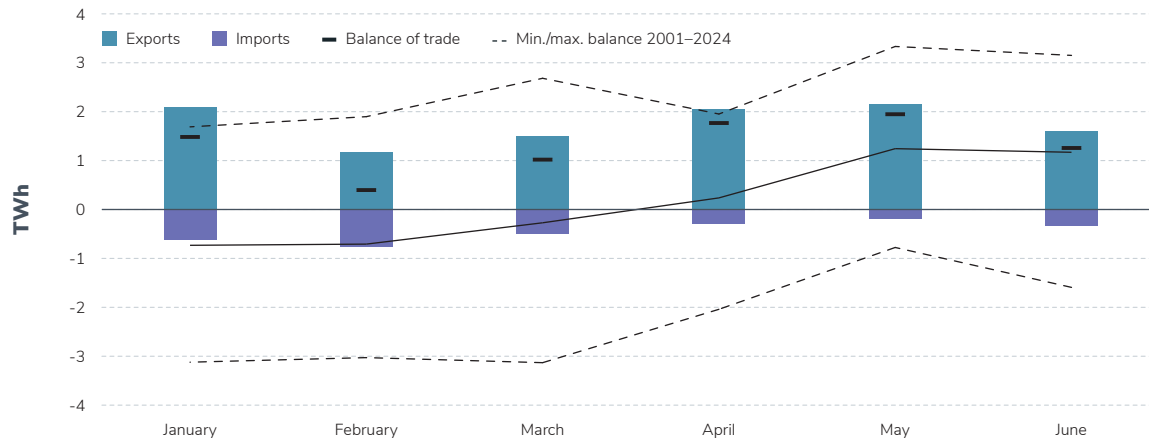
to Spain, as in the first half of 2024, due to the abundance of low-carbon generation (nuclear and renewable) on the Iberian peninsula.

On the border with Germany and Belgium (Core region), trade consisted mainly of exports. The net balance for the half-year as a whole was 7.9 TWh, high by historical standards but well below the figure achieved in the first half of 2024 (13.5 TWh). This is the second winter in a row when France has been a net exporter across this border, which also marks a break from the past – previously, France has usually been a net exporter in summer, but a net importer in winter.

**Figure 8 – Comparison of the trade balance (positive when in surplus) in the first half of 2024 and the first half of 2025, by border**



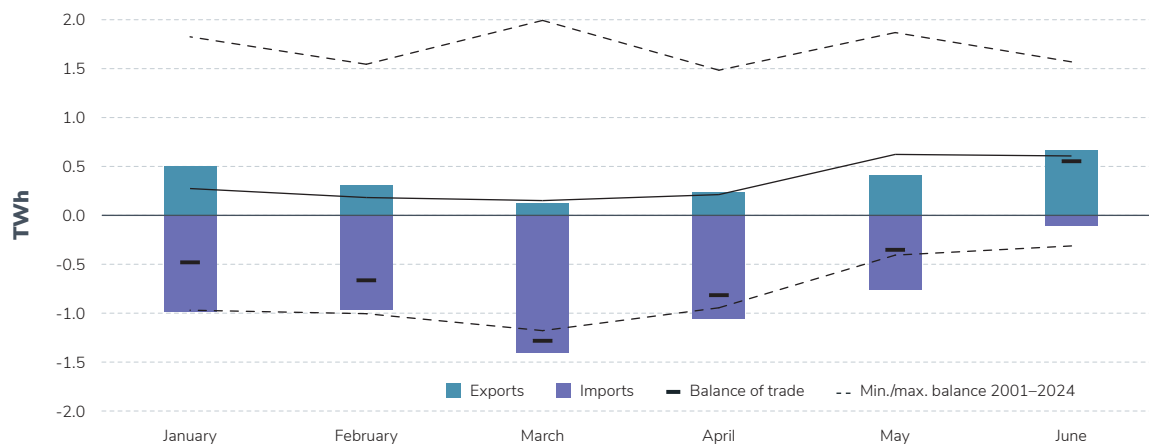
**Figure 9 – Trade between France and the countries of the Core region (borders with Germany and Belgium) in the first half of 2025**



Trade across the Spanish border was mainly in the import direction. The trade balance was negative in every month except June, amounting to 3 TWh (of imports) for the first half-year as a whole. This marked trend over the last three years is a direct consequence of changes in the European generation mix. While France has historically been a net

exporter to Spain, the growth in Spanish low-carbon generation (particularly wind power<sup>8</sup>) is now having a structural impact on the direction of trade across this border, which is also marked by contrasting seasonal consumption patterns (consumption peaks in summer in Spain, and in winter in France).

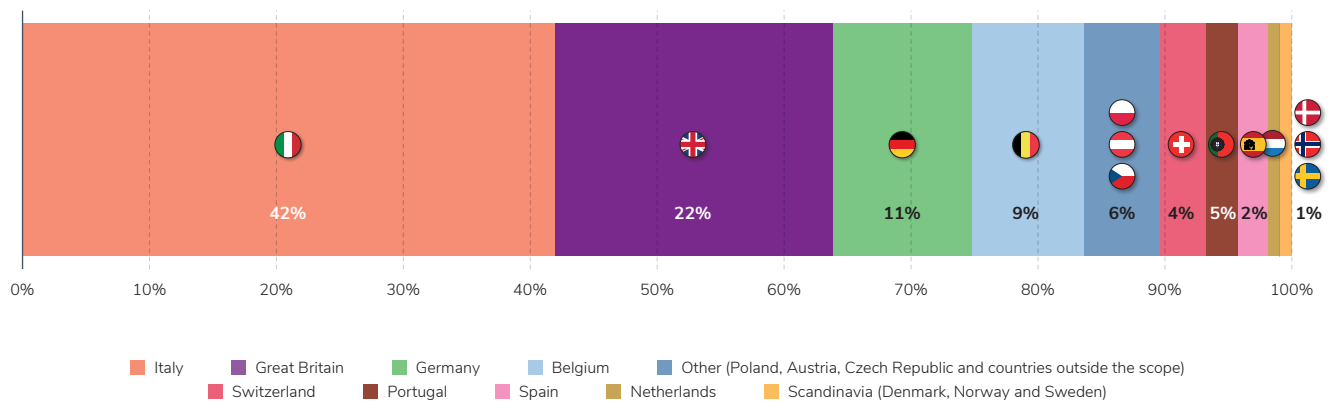
**Figure 10 – Trade between France and Spain in the first half of 2025**



8. See the detailed analysis in the 2024 Electricity Report, [Trade chapter – details by border](#).

**Figure 11 – French exports to the extended scope in the first half of the year\***

Total export volume: 37.4 TWh



\* Exports reconstructed by RTE based on trade flows between the various European countries

Trade with Switzerland and Italy was almost entirely export-oriented throughout the half-year (net balances of 12.8 TWh and 9.5 TWh respectively), as in previous years.

The balance of trade with Great Britain was also strongly in surplus at 10.4 TWh. Once again, this is the second-highest level of exports ever recorded, after the first half of 2024 (11.6 TWh).

A trade analysis with broader scope, taking into account trade between neighbouring countries and their own neighbours, and so on, reveals that two-thirds of French exports were ultimately destined for Italy (42%) and the UK (22%). Trade passing through France remained stable compared with the first half of 2024.

In general, these trends make it unlikely that France's exports in 2025 will exceed the record totals and net export balance recorded in 2024, due partly to hydroelectric generation that is lower than last year (see section 2).

# 4.

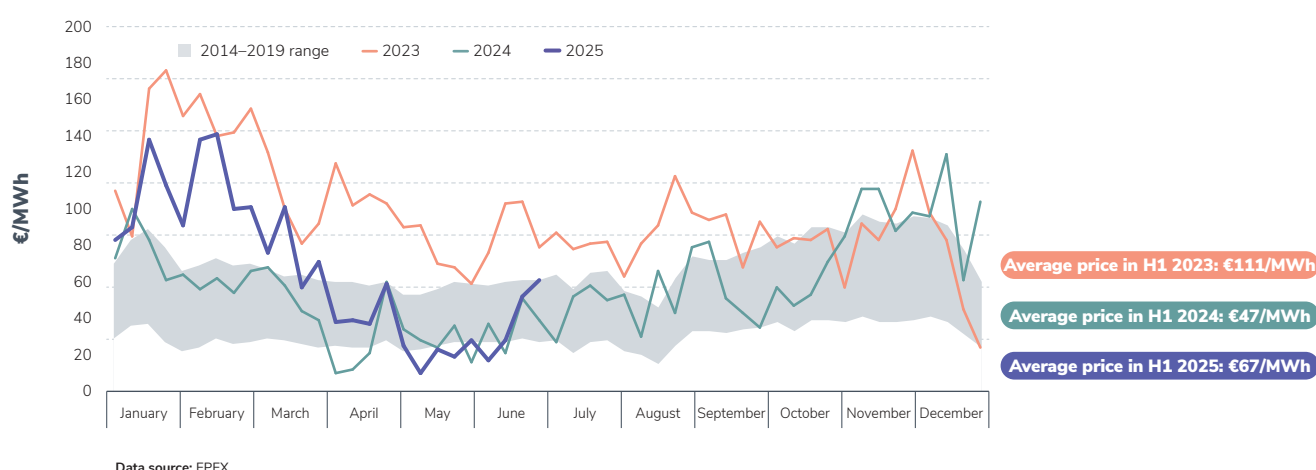
## Prices rose on the spot market but fell on the futures markets, and remain among the lowest in Europe

Electricity prices on the European spot markets rose quite significantly between the first half of 2024 and the first half of 2025.

The French price averaged €66.7/MWh over the period (+44% compared with the average price in H1 2024), returning to values similar to 2023. In neighbouring countries, the German price rose by 34%, the Spanish price by 58% and the British price by 37%. Against this backdrop, the French spot price still remained one of the lowest in Europe, alongside the Spanish price.

This increase, an interruption to the downward trend seen since the peak of the energy crisis in 2022, reached a maximum in the middle of winter (January and February). This was partly due to several cold spells, but mainly to high prices for gas and CO<sub>2</sub> allowances as a result of the rapid decline in gas stocks in Europe, the drop in renewable energy generation and geopolitical tensions<sup>9</sup>. Gas traded on the French hub (PEG) averaged €40.5/MWh in the first half of 2025, compared with €29/MWh over the same period in 2024. Similarly, the price of CO<sub>2</sub> allowances averaged €72.6/t in the first half-year

**Figure 12 – Weekly average spot prices in France in 2025 and comparison with previous years**



<sup>9</sup>. See the [Quarterly report on European gas markets, Volume 18](#), published by the European Commission in early July, covering the first quarter of 2025.

(compared with €66.4/t in 2024), a return to its 2023 level. From March onwards, electricity spot prices returned to pre-crisis levels, thanks to warmer temperatures and increased solar generation.

Hourly price patterns during the day confirm the observations already made by RTE in several publications (*Energy Pathways 2050*, the 2023 Generation Adequacy Report) about the challenges of flexibility for the power system. Prices tend to be higher during the morning and evening peaks and ever-lower during the afternoon troughs, with episodes of negative spot prices, particularly in the spring.

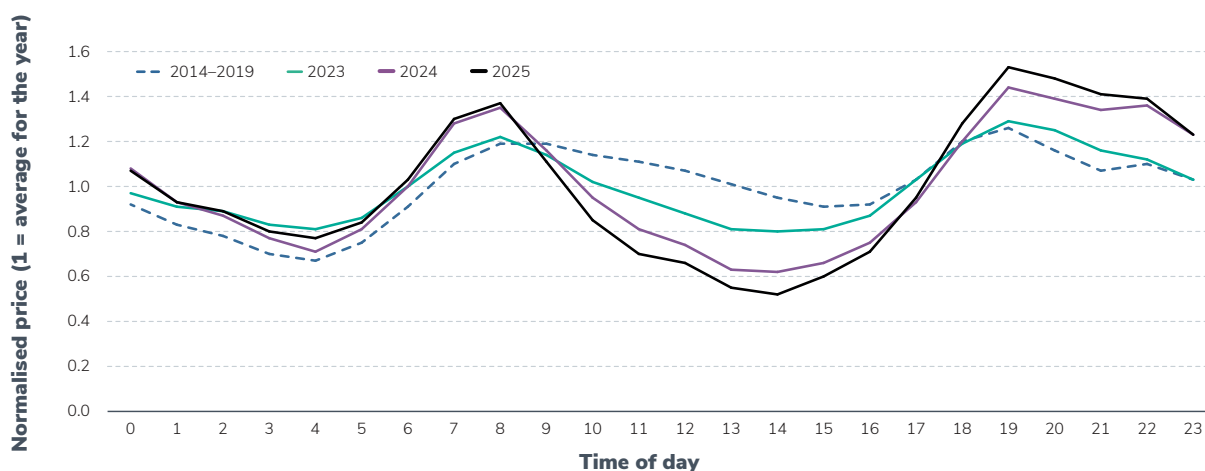
As a result, “base” prices, which cover a 24-hour period, are now higher on average (€66.7/MWh in the first half of the year) than “peak” prices, which only cover the period from 8 am to 8 pm (€63.3/MWh). The same applies to neighbouring countries such as Germany, Belgium and Spain.

**Contrary to the spot market trend, the French price fell on the futures markets**, which are the best indicator of medium-term price trends in a given country. The reduction concerns products for delivery both the following year (€64.6/MWh in

2025 compared with €77.7/MWh in the first half of 2024) and in the first quarter of the following year (€89.3/MWh in 2025 compared with €98.4/MWh in 2024). This development is a sign that French market players anticipate that the trend towards abundant low-carbon domestic production will continue.

**French forward prices have now fallen well below those of other European countries (except Spain), where trends have been slightly upwards.** Prices for delivery the following year have risen by 8% in Italy (reaching €108.3/MWh in the first half of 2025), 4% in Belgium (€87.1/MWh), 3% in Germany (€88.2/MWh) and the Netherlands (€84.3/MWh) and 2% in the UK (€90.4/MWh), compared with a 17% fall in France (€64.6/MWh). Only the Spanish price (€62.7/MWh) remains slightly lower than the French price, despite a 3% increase on the previous year, thanks to the abundance of low-carbon generation on the Iberian peninsula. In particular, the French price for delivery the following year, which was higher than the German price in 2022 and 2023 because of the energy crisis, fell back below it in 2024 (by €8/MWh) and is now significantly lower (by €24/MWh). This drop in French forward prices results from the combination of plentiful French generation, which has returned close to pre-crisis levels, with a low level

**Figure 13 – Daily spot price profiles (hourly averages over the first six months of each year) normalised to the average for the first six months of each year**



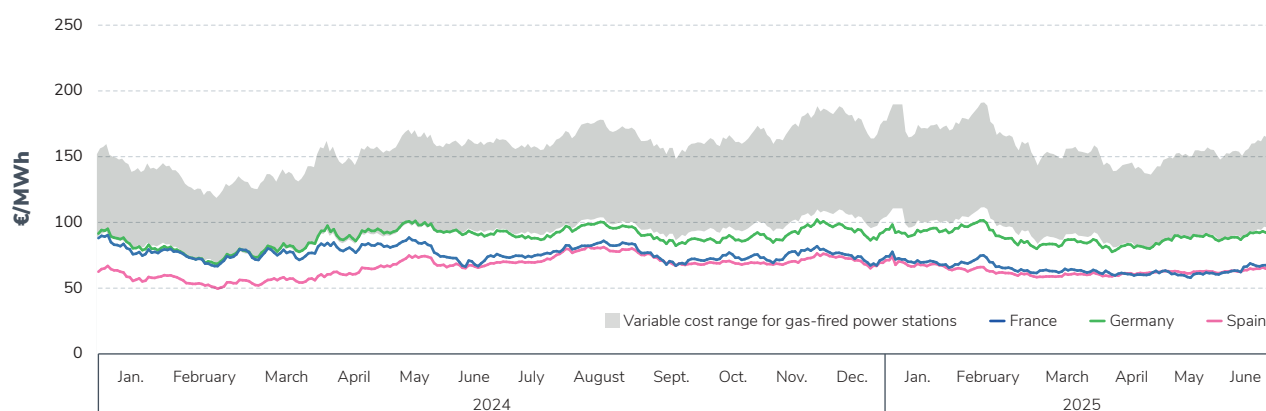
Data source: RTE calculations based on EPEX data

of consumption. The situation is similar in Spain, but contrasts with Germany, where production in the first half of 2025 was well below the same period before the crisis (around –15% compared to the 2016–2019 average).

PEG gas forward prices have also fallen very slightly (€35.6/MWh in 2025 compared with €36.2/MWh in

2024), less affected by disruptions in the gas spot market. Supplies are not under strain and European stockpiles continue to fill up, with the forthcoming adoption of more flexible rules on reaching target levels as winter approaches. For gas too, as in 2024, French prices are among the lowest, along with Spanish prices.

**Figure 14 – Trend in 2024 and 2025 of forward prices for delivery the following year, in France, Germany and Spain, and comparison with the variable costs of gas-fired power plants**



Data source: RTE calculations based on EEX Group data

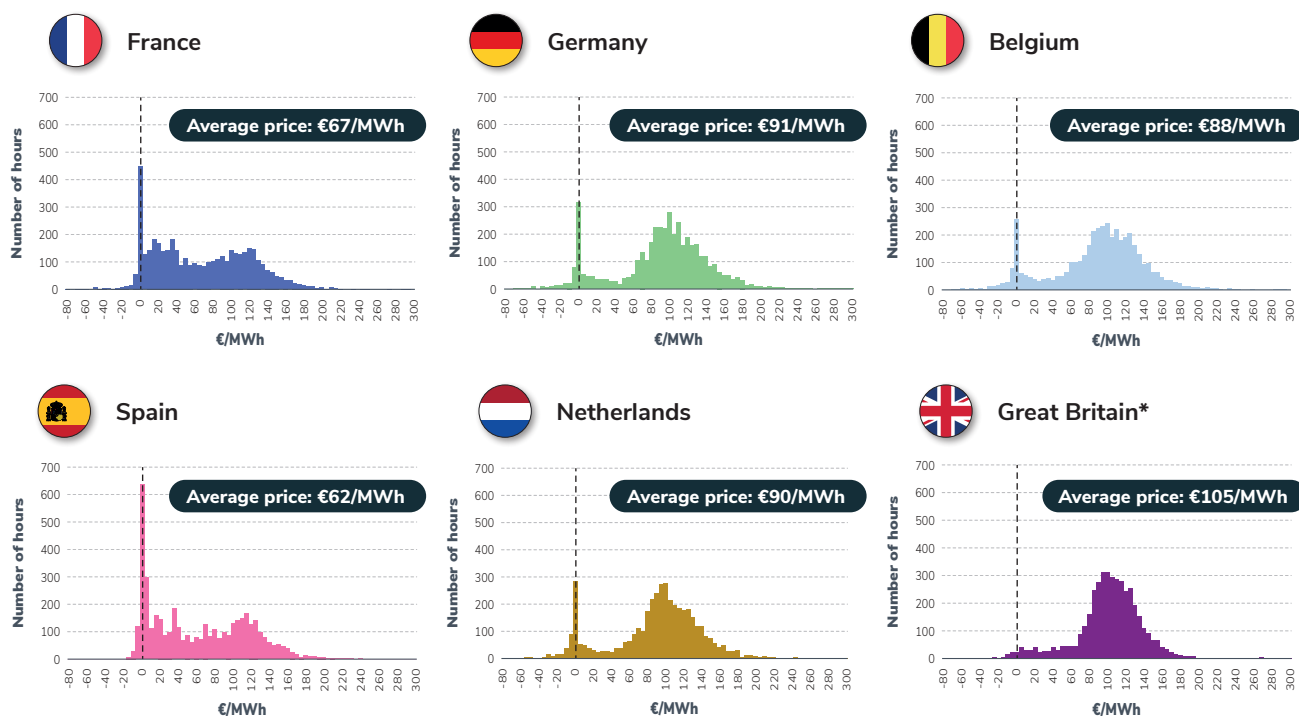
# 5.

## Negative price episodes are becoming more frequent, but mostly remain shallow

The number of negative price episodes continued to rise in France in the first half of 2025, with 363 hours (i.e. around 8% of the time), compared with 235 hours in the first half of 2024 and just 53 hours in the first half of 2023. For comparison, there were 361 negative-price hours in all of 2024.

The trend is similar in other European countries, with 459 hours in Spain, 389 in Germany and 402 in the Netherlands. This is the first time since negative prices were authorised on the Spanish market that Spain has had the highest number of hours with negative prices of any of France's neighbouring countries.

**Figure 15 – Distribution of hourly spot prices for various European countries in the first half of 2025 (the bar corresponding to the €0/MWh price indicates the number of hours when the price was between €-2.5 and €2.5/MWh, etc.)**



\* The price shown does not apply to Northern Ireland, which is part of a different market zone with the Republic of Ireland.  
Prices between €-80 and €300/MWh are shown

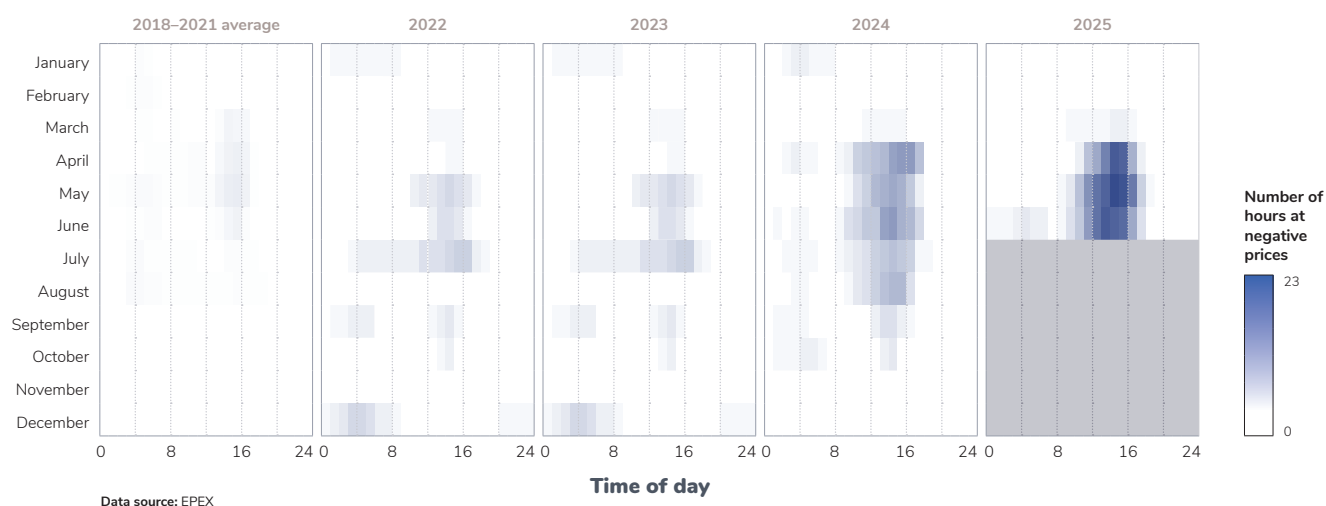
Sources: EPEX, OMIE

The characteristics of negative-price episodes remained similar to previous years: they mainly occur in spring, during the afternoon and at weekends. However, these episodes are now also extending into working days: 43 working days showed at least

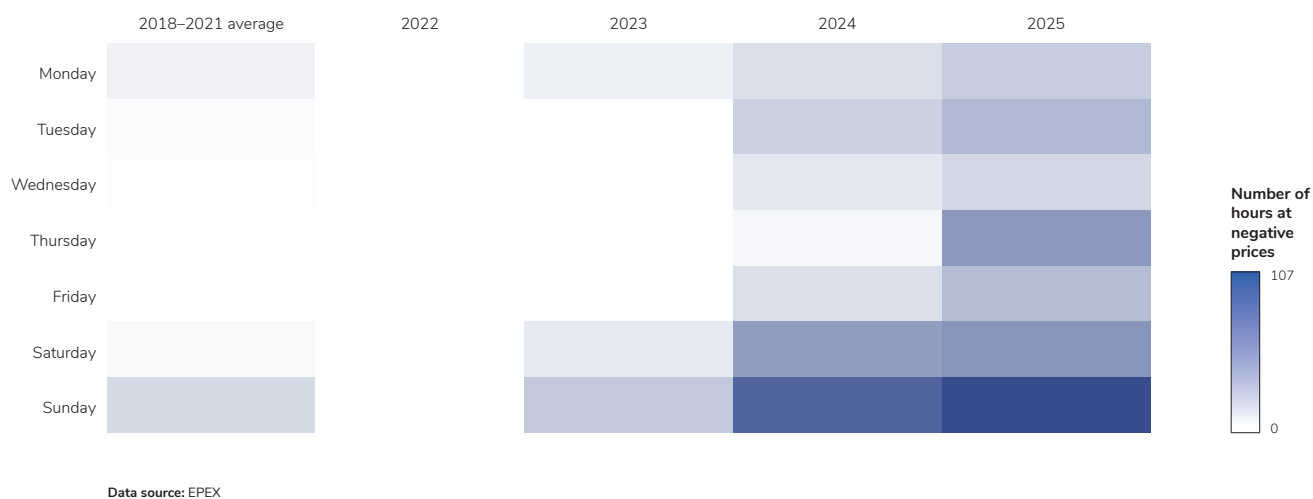
one negative-price hour in the first half of 2025, compared with 21 in the first half of 2024.

When prices were negative, they generally remained very slightly below zero, as in previous years.

**Figure 16 – Monthly and hourly breakdown of negative prices, between 2018 and 2025**



**Figure 17 – Weekly distribution of negative prices in the first half of the year between 2018 and 2025**



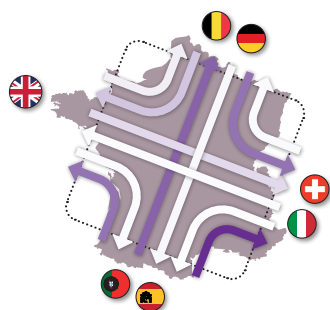
The majority of occurrences were in the range between €-1/MWh and €-0.01/MWh (58% of occurrences in the first half of 2025 compared with 49% in the first half of 2024).

The increase in occurrences of negative prices results from the abundance of low-carbon generation in France and the stability of electricity consumption, which remains lower than between 2014 and 2019. While the volume of low-carbon generation was similar in the first half of 2025 to the first half of 2024, the share of nuclear and especially solar generation was higher (see above). As this solar generation becomes abundant in the middle of the day, outside the daily morning and evening consumption peaks, it leads to a higher number of negative prices.

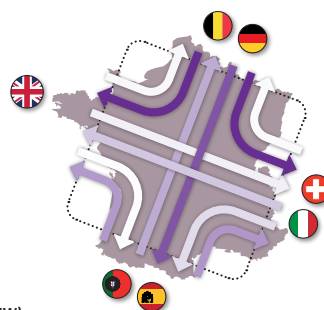
Analysing French electricity trading during episodes of negative prices shows that France was a net exporter 83% of the time in the first half of 2025 in these situations, as it was in 2024 over the same period. During these hours, France most often “re-exported” negative prices that it had “imported” from neighbouring countries (68% of the time). The negative prices most frequently “imported” and then “re-exported” came mainly from Germany and Belgium, from where the balance was most often towards imports. On the other hand, France “exported” its negative prices to all its neighbours around 15% of the time, as in 2024. At times of net imports when prices were negative, trade was always tilted towards imports from Germany and Belgium, often from Switzerland, and was balanced with Spain.

**Figure 18 – Flows through the French power system in the first half of 2025 according to the spot electricity price (D-1)**

**When French prices are positive or zero**



**When French prices are negative**



Average flow over the period (MW)

0 MW 500 MW

# 6.

## Volumes of solar energy curtailed during negative price episodes have increased significantly in 2025

During periods of negative or zero prices, the normal functioning of the electricity market incentivises producers not to schedule generation, or to reduce output. This applies to all generating units, including the dispatchable hydropower fleet (lake reservoirs or PSH), the nuclear fleet – operated to modulate based on market prices, reducing its output in the afternoon and at weekends – and, increasingly, wind and solar power, which curtail their output rather than operating during periods of negative prices.

In particular, this is the case for the most recent large-scale onshore wind and solar farms developed under the premium (“*complément de rémunération*”) scheme. This system allows the generating fleet to operate in an optimised way: facilities offer their output at their variable cost (close to zero), and do not operate when they are not required on the markets (negative-price episodes). However, some renewable generation facilities are still being developed under the feed-in tariff system, and therefore have no incentive to adjust their output according to need and the state of the power system. The volume of wind and solar installations covered by the feed-in tariff can currently be estimated at around 29 GW, compared with total capacity of around 51 GW (at the end of May 2025). The increasingly rapid changes in the way the power system operates, and projections for the coming years, argue in favour of (i) prioritising the premium scheme for new installations being developed and (ii) the largest installations currently under the feed-in tariff scheme

also being encouraged to modulate their production based on need. The requirement for renewable installations to be more dispatchable is now well-established, both to manage the balance between generation and consumption and to manage flows through the grid.

**Curtailment of renewable generation during periods of negative spot prices increased from 1.1 TWh in the first half of 2024 (for wind and solar combined) to 2 TWh in the first half of 2025.**

This represents a rise of more than 80%, largely consisting of solar generation curtailment in the context of increased output (due to higher levels of sunshine and the development of the installed base) and growth in the number of hours of negative prices, while the proportion of the installed base incentivised to modulate its production remained constant.

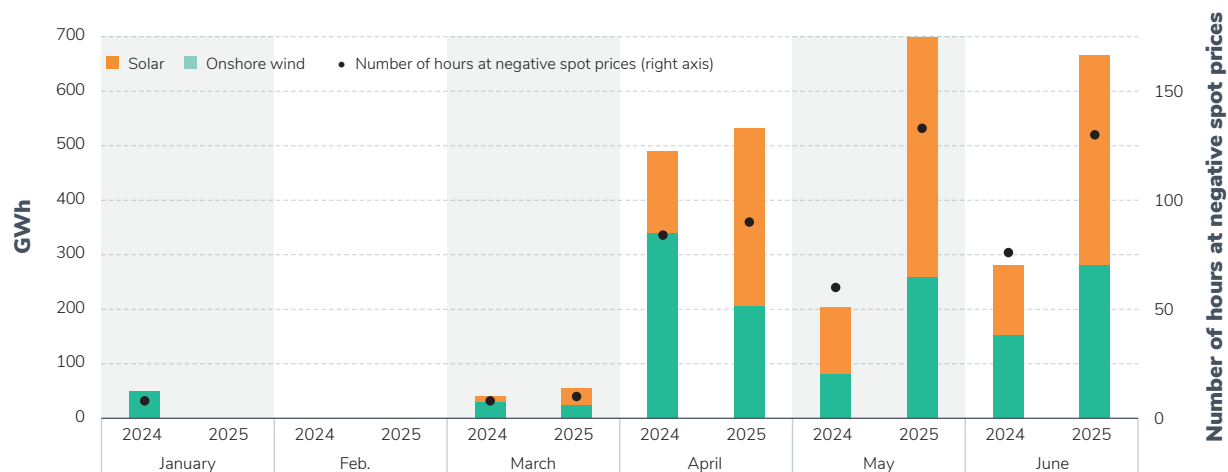
As a result, curtailment of solar generation tripled, rising from 0.4 TWh to 1.2 TWh over the period.

Curtailment of wind generation rose slightly from 0.7 TWh in the first half of 2024 to 0.8 TWh in the first half of 2025, due to the increase in negative-price occurrences, though this was offset by the slight decrease in wind generation.

The average curtailment of wind and solar capacity was 5.2 GW in 2025, compared with 4.3 GW in 2024 and 3.7 GW in 2023.

**Figure 19 – Volumes of renewable energy (wind and solar) curtailed per month at negative spot prices, in the first half of 2024 and 2025**

RTE estimates. Provisional figures for June 2025.

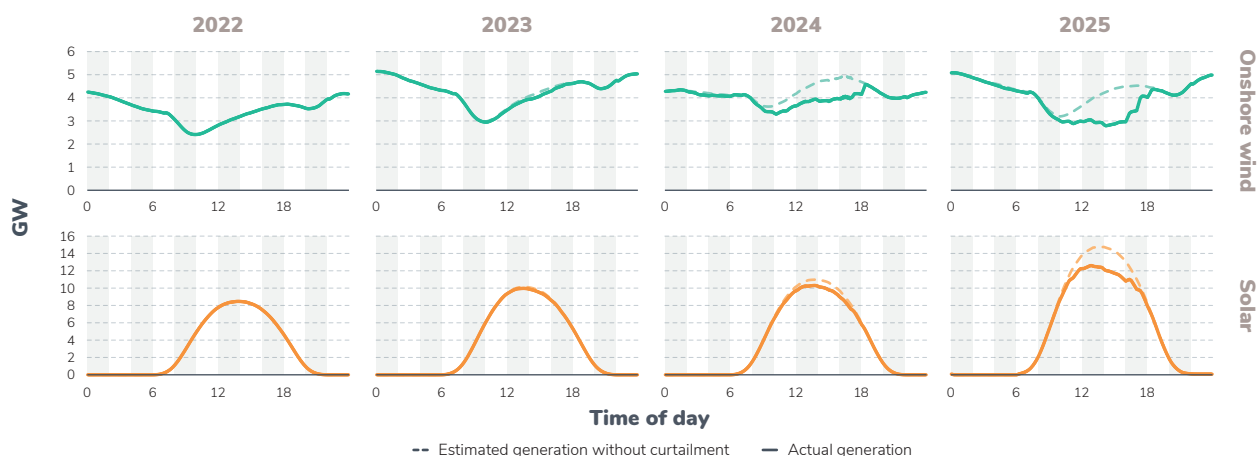


Between April and June, the average curtailed output corresponded to around 8% of the volume that could have been produced (without curtailment) by onshore wind (compared with 6% in 2024 and 1% in 2023)<sup>10</sup>, and around 10% of the volume theoretically

generated by solar (compared with 5% in 2024 and 1% in 2023)<sup>11</sup>. This is now having a visible impact on daily solar generation profiles in the spring months, particularly between 10 am and 4 pm, when negative spot prices are most common.

**Figure 20 – Average daily generating profile for onshore wind and solar power between April and June, with and without curtailment at negative prices, from 2022 to 2025**

Generation without curtailment is estimated by RTE.



<sup>10</sup>. Between April and June

<sup>11</sup>. Between April and June

The curtailment of renewable generation in the event of negative prices helps to balance the system, but it must be kept under close control to ensure that the supply–demand balance is properly managed as closely to real time as possible.

Suddenly shutting down or restarting too much power (up to 7 GW, equivalent to about seven nuclear reactors, in less than 20 minutes, either downwards or upwards) can lead to frequency disruptions due to the speed at which output is changing, causing

operating risks or requiring costly adjustment resources. In June 2025, RTE presented market players with an analysis of the situation and the various possible ways of smoothing these stoppages more effectively during periods of negative prices. The finance act for 2025<sup>12</sup> includes a number of measures designed to shut down and restart the generating facilities concerned more gradually. RTE's market rules will also need to be updated to address this point, in consultation with stakeholders.

<sup>12</sup>. In article 175

# 7.

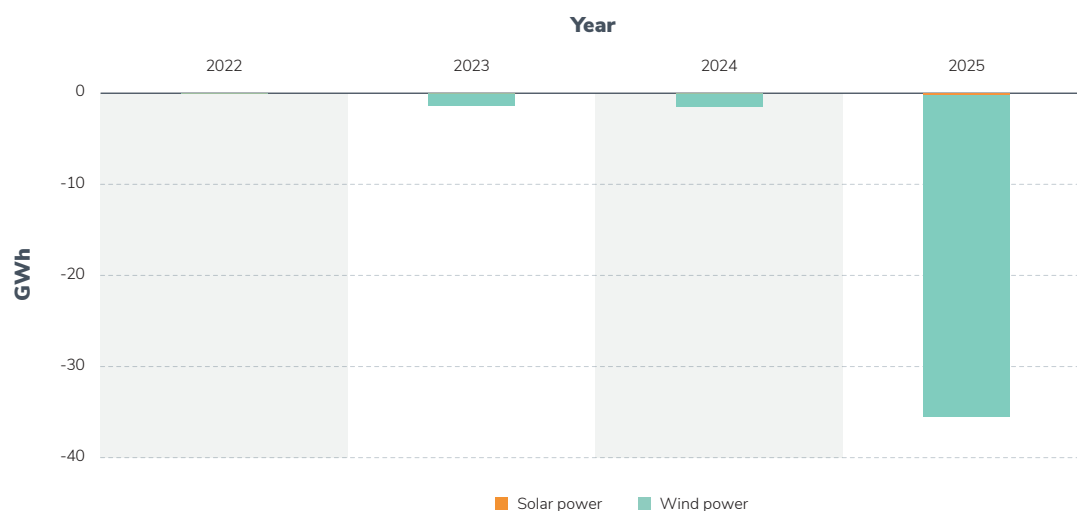
## Wind and solar capacity is playing a growing role in balancing the system

As the body responsible for managing the supply–demand balance in as near-real time as possible, RTE has the option of adjusting the scheduling of generation facilities to guarantee the reliability of the power system. In particular, at times of surplus generation, RTE can order output to be reduced if decisions taken on the basis of market results have not been sufficient. In these situations, wind and solar capacity is one of the levers that can be used to balance the power system.

These adjustments can be ordered for all generating units. The preferred (but not exclusive) channel for making these changes to the generation schedule is the balancing mechanism.

The wind and solar capacity available for use under the balancing mechanism has quadrupled over the past year, rising from less than 0.5 GW in mid-2024 to more than 2 GW at the end of the first half of 2025. This momentum is due partly to the Fécamp, Saint-Nazaire and Saint-Brieuc offshore wind farms recently joining the mechanism. The contribution

**Figure 21 – Volume of energy adjusted downwards under the balancing mechanism for wind and solar power, during the first half of the year, between 2022 and 2025**



of solar and wind capacity to RTE's balancing mechanism is set to increase, with the law of 30 April 2025 requiring installations with a capacity above a certain threshold to take part. During the first half of 2025, RTE activated 35.5 GWh<sup>13</sup> of downward adjustments to wind and solar generation capacity, approximately twice the adjustments made over the whole of 2024<sup>14</sup>.

These measures make it possible to develop the flexibility of the generating fleet, an essential means of guaranteeing balance in the system, alongside the development of flexibility based on consumption and storage.



## FOCUS

### The Iberian blackout

The first half of 2025 saw a major blackout on the Iberian peninsula on 28 April. This extremely rare event focused a great deal of attention on the technical operating conditions of the Iberian, French and European power systems.

Essentially, during the minute before the blackout, voltage fluctuations on the Spanish network led to a large number of generating facilities being disconnected from the Iberian power system. This disconnection caused disruption to the operation of the Iberian power system (disruptions to voltage and frequency). These resulted in (i) all the generating units in Spain and Portugal being disconnected and (ii) the Iberian peninsula being cut off from the French and European power systems on one hand, and from the Moroccan power system on the other. France then helped to re-supply the Iberian peninsula with electricity.

The causes and the precise series of events that led to this situation are currently being investigated by a panel of experts appointed under European legislation under the authority of the European Network of Transmission System Operators for Electricity (ENTSO-E).

A full account of the incident based on the information available to date can be found on the expert panel's website: <https://www.entsoe.eu/publications/blackout/28-april-2025-iberian-blackout/>. RTE is closely monitoring and contributing to this technical analysis and will learn the lessons from it once the full results are known (see the FAQ published by RTE and currently being updated for more details: <https://www.rte-france.com/actualites/foire-questions-black-out-28-avril-2025-sur-peninsule-iberique>).

<sup>13</sup>. Including 12 GWh under the balancing mechanism and 23.5 GWh under safeguard orders.

<sup>14</sup>. In 2024, RTE carried out 18 GWh of downward adjustments to solar and wind generation, including 10 GWh under the balancing mechanism and 8 GWh under safeguard orders

# 8.

## Short-term security of supply: no alerts from RTE for summer 2025

### More than enough generating capacity available to cover summer consumption

Given the strong availability of nuclear and thermal generating capacity, the high level of hydro and gas stocks and the growth in installed wind and solar capacity, France should not experience any particular difficulties with its electricity supply this summer.

The main determinants of the supply–demand balance appear to be more favourable than in previous years. Even taking a cautious view of the availability of the nuclear fleet and the level of electricity consumption, the analyses carried out by RTE do not show any risk of imbalance between supply and demand. France is likely to remain a net exporter on average over the summer, with available generation globally above projected consumption levels.

In addition to the probabilistic analysis carried out in the usual way (simulations based on a very large number of meteorological possibilities and hazards that could affect generating resources), RTE carries out deterministic analyses involving stress tests based on particularly unfavourable conditions, or conditions encountered in the past. Even in situations of severe heatwave and drought, which could lead to a reduction in nuclear and hydropower output, RTE does not foresee any particular difficulties, because more generating capacity is available and consumption remains low. The power system will thus continue to have sufficient margins, and import capacity and generation abroad will continue to be available, in addition to the power generated in France.

## Operating the power system during periods of low consumption requires new tools

Surplus electricity generation, particularly at night, at weekends, on public holidays and increasingly on weekday afternoons (when solar output is plentiful), is likely to be frequent and to result in exports of between 3 and 13 GW. It is highly likely that neighbouring countries will experience similar situations at the same time, meaning that these episodes need to be clearly anticipated over the summer.

These situations make it important to ensure that RTE has the technical leeway to adjust generation downwards when export capacity or outlets in other European countries are not sufficient to absorb the surplus of French low-carbon generation. In terms of the balancing mechanism, RTE has already observed that there are not enough downward adjustment offers to balance the power system. Extending the obligation to take part in the balancing mechanism, as mentioned above, will help to remedy this.

Under the French energy code, RTE also has the power to order any supplier to reduce its output in near-real time (including wind and solar farms, which have no injection priority in France). RTE has already used this option on several occasions and is likely to use it again in the summer of 2025.

Finally, episodes of low voltage are likely to arise due to the shutdown of nuclear power stations caused by a lack of economic outlets (low consumption and plentiful renewable generation). Over the past two years, the improved availability of nuclear and hydropower generating facilities and the growing role played by renewable installations in controlling the voltage profile have made it easier to manage these episodes. If necessary, RTE will have the option throughout the summer of requiring certain power plants located in favourable places on the network to operate, preventively limiting generation or reducing cross-border trade to ensure the voltage profile is controlled and the power system runs smoothly at all times.