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CRE COMMISSION DE RÉGULATION DE L'ÉNERGIE

REPORT

July 2025

The monitoring and functioning of wholesale electricity and natural gas markets in 2024

SUMMARY

The CRE publishes an annual report on the monitoring and functioning of the wholesale electricity and gas markets, aiming firstly to account for its market monitoring activities, and secondly to provide insights on their functioning and developments. This 18th edition covers the year 2024, which saw a continued decrease in gas and electricity prices in France and Europe following the energy supply crisis of 2022-2023.

The year 2024 marked a confirmation of the crisis exit and easing in the French wholesale gas and electricity markets, as well as in supply to these markets.

For gas, European wholesale prices decreased on average in 2024 compared to 2023, though not returning to pre-crisis levels. In this context, French prices remained lower than those in the majority of neighboring countries, with a difference of about 2 €/MWh compared to Germany and Italy. This reflects the good functioning of the French gas system and the attractiveness of its LNG terminals, which allow our country to play a major role in European LNG supply. Despite unfavorable price differences between summer and winter, all French storage capacities were sold during the 2024-2025 auction campaign for the 2025-2026 storage year, thanks to the flexibility of the regulatory framework and the efficiency of storage operators.

For electricity, 2024 saw electricity production in France return to high levels, resulting in an exceptional net export balance of 89 TWh or approximately 5 billion euros. Wholesale forward prices in France fell more sharply than in other European countries, though not returning to pre-crisis levels. For the first time since 2013, the price in France for the following year was lower than the German price in 2024, with a spread of around 20 €/MWh at the end of 2024, which persists through the first half of 2025. Liquidity on forward markets up to year Y+4 significantly increased with the end of the regulated access to historic nuclear electricity (ARENH) as of January 1, 2026. Finally, the opening of balancing markets and the high variability of hourly prices are strong signals for the development of short-term flexibility solutions: firstly batteries and demand-side management, but also the development of supply offers that allow consumers to capitalize on their flexibility.

The CRE's market monitoring missions are governed by the provisions of the French Energy Code and European regulation No. 1227/2011 on wholesale energy market integrity and transparency ("REMIT"). The revised REMIT, effective from May 2024, introduced significant changes concerning, on one hand, the obligations and prohibitions for various market participants, and on the other hand, the expansion of the competence scope for national energy regulators and ACER[1].

New trading practices and the number and diversity of market participants continued to develop, resulting in a sharp increase in order and transaction volumes and hence, market data processed by CRE. The electricity balancing markets underwent significant transformations with the opening of new markets and the strengthening of European integration.

In this context, where the role of wholesale markets is expanding and their functioning is becoming increasingly sophisticated, market monitoring carried out by CRE bears particular importance and must adapt to face these new challenges. In 2024, the CRE reorganized and strengthened its wholesale market monitoring activities to gain in efficiency and flexibility.

CRE also strives to contribute to a better understanding of wholesale market functioning, a goal to which this report aims to contribute. To this end, since early 2025, CRE has been publishing a quarterly bulletin dedicated to the activity of the wholesale electricity markets and the development of liquidity across all maturities. Indeed, with the end of ARENH, the wholesale electricity market now plays a predominant role in the electricity pricing for consumers. A liquid market, offering sufficient offers and volumes, is essential for good wholesale price formation. The first edition of this quarterly bulletin was published on April 30, 2025.

The CRE is strengthening its monitoring of the wholesale markets, in collaboration with ACER and other European regulators.

In 2024, the scope monitored by the CRE under REMIT represented 15.1 million transactions conducted on the wholesale electricity and gas markets, amounting to over 3,704 TWh exchanged and valued at €181 billion. The number of transactions continues to increase (+30% between 2023 and 2024), posing

a challenge for the effective monitoring of these markets. The daily volume of market data collected by ACER and received by the CRE in 2024 was approximately 10 times higher than in 2022, particularly due to the surge in the number of orders. In 2024, this situation required significant adaptations to the data processing tools used by the CRE, highlighting their critical importance for effective monitoring of wholesale markets.

The CRE's surveillance relies on the internal detection of suspicious behaviours and the analysis of external reports. Internal detection is based on internal monitoring and detection tools, which include automatic alerts based on data collected by ACER. This approach is complemented by external reports from various sources, notably Persons Professionally Arranging Transactions (PPAT), which remain one of the main sources of information for the CRE. As organizers of trading operations on their platforms, PPATs have a comprehensive view and knowledge of the wholesale markets and are obliged, under Article 15 of REMIT, to promptly notify the relevant national regulatory authority and ACER of any suspected breaches of the prohibition on insider trading and market manipulation (Articles 3 or 5 of REMIT) or non-compliance with the obligation to publish inside information (Article 4 of REMIT). The CRE ensures active collaboration with PPATs and remains vigilant about their surveillance responsibilities.

More than 600 alerts and 8 reports were analysed by the CRE in 2024. The number of reports received is expected to increase in the coming years due to the expansion of REMIT's scope to include wholesale energy products that are also financial instruments. Furthermore, the CRE closely monitors the new electricity balancing markets. In 2024, the CRE held regular discussions with market participants and RTE to assist in the evolution of these markets and remind them of their REMIT obligations.

Six investigations were launched in 2024, and at the end of the year, nine investigations were being analysed by CRE's investigating officers, with two sanction procedures underway by the Dispute Resolution and Sanctions Committee (CoRDiS).

No sanction decision was made by CoRDiS in 2024. However, it's worth noting the recent CoRDiS sanction decisions in early 2025, which were based on investigative work conducted in prior years:

- On January 20, 2025, CoRDiS sanctioned Danske Commodities A/S and Equinor ASA with €8 million and €4 million respectively for violating Article 5 of REMIT regarding market manipulation in the gas sector in 2019 and 2020, concerning transport capacities between France and Spain. This is the first decision where CoRDiS addressed collusion for market manipulation purposes. Both companies have appealed against CoRDiS's decision.
- On April 22, 2025, CoRDiS sanctioned J.P. Morgan SE with €500,000 for failing to comply with the obligation to communicate crucial information essential for the CRE's missions under Article L. 134-18 of the French Energy Code. This is the first such decision by CoRDiS, affirming that access to information is fundamental for the CRE's monitoring, ensuring transparency and bolstering market confidence. The company has appealed against CoRDiS's decision.

Finally, in response to the appeal lodged by ENGIE in 2024, the French Council of State upheld, by its decision on June 18, 2025, the CoRDiS sanction decision of December 26, 2023, for the most part, though it reduced the financial penalty from €500,000 to €490,000.

At a European level, 2024 was notably marked by the implementation of the revised REMIT, effective from May 2024, which notably expanded the application of its Articles 3 and 5 (prohibition of insider trading and market manipulation) to wholesale energy products that are also financial instruments, while maintaining and enhancing cooperation modalities among the various concerned authorities. Although several implementing texts are awaited, the revision of REMIT has already had significant effects in 2024 and early 2025, particularly on cooperation between ACER, national energy regulators, competent financial authorities, and ESMA[2].

The CRE is deeply involved in the working groups dedicated to wholesale market monitoring within ACER and the Council of European Energy Regulators (CEER), which contribute to the coordinated and coherent operational implementation of REMIT by national authorities, the development of guidelines on REMIT application published by ACER, as well as the improvement of the quality of transactional and fundamental data reported by market participants. Notably, the director of the CRE's Wholesale Market Directorate was appointed co-chair of ACER's REMIT Steering Committee for a two-year term.

Natural gas wholesale prices decreased on average over the year, but supply tensions persist

It is worth noting that 2023 was marked by a return to a certain level of stability, with a widespread decline in prices and a reduction in the spreads between European hubs. This was facilitated in particular by the development of liquefied natural gas (LNG) import capacities in Europe and a significant decrease in consumption for the second consecutive year.

In 2024, the European gas market entered a phase of consolidation following the crisis. Average prices were significantly lower in 2024 compared to 2023, and even more so compared to the levels reached during the 2022 crisis (average prices at the Dutch TTF, Europe's benchmark hub, for next-month delivery stood at €133/MWh in 2022, €41/MWh in 2023, and €35/MWh in 2024). However, they remained higher than pre-crisis prices (€18/MWh on average between 2014 and 2019). Price volatility also continued to decline. A significant expansion of global LNG supply is expected in the coming years, leading to a noticeable decrease in forward prices for the next few years (forward prices for 2027 at the PEG remained below €30/MWh for almost the entire year 2024).

In this context of expected growth in supply and falling prices, the price of the front-month product at the PEG began 2024 at €29/MWh, reaching a low of €23/MWh at the end of February. Some tensions arose regarding winter supply, notably due to delays in LNG production projects. Consequently, the price of the M+1 product at the PEG ended the year above €47/MWh, still far from the 2022 levels.

French gas consumption reached 361 TWh in 2024, down 5.5% compared to 2023, and 24% compared to 2021 (474 TWh). This substantial decline contributes to controlling wholesale prices, reducing greenhouse gas emissions and the trade deficit. The production of biomethane injected into the network increased by 26% in 2024 to 11.8 TWh, accounting for 3.2% of French consumption.

Gas storages were heavily used in 2024, with very high withdrawals in November and December, leading to an end-of-year stock of 80 TWh compared to 112 TWh at the end of 2023. Pipeline imports decreased from 234 TWh in 2023 to 215 TWh in 2024, including an increase of 23 TWh in imports from Norway to Dunkirk due to arbitrage decisions favoring deliveries to France, partially offsetting a 28 TWh decrease in imports from Spain in a context of declining LNG arrivals in Europe.

LNG imports fell in France as well as in Europe, with the utilization rate of French terminals relative to their maximum capacity dropping from 65% in 2023 to 50% in 2024. In 2024, for the third consecutive year, France remained the leading entry point for LNG in Europe: its five terminals accounted for 24% of European LNG imports over the year, and its exports remained high at 123 TWh in 2024.

Congestion events on the French gas transmission network were less frequent in 2024 than in previous years, although their characteristics persisted. Since the 2022-2023 winter, the new configuration of European flows has generated south-to-north congestion situations, with a gas deficit in the north of the country and a surplus in the south. French network operators NaTran and Teréga use the locational spread mechanism to address this issue. This situation recurred to a lesser extent during the 2024-2025 winter, with the mechanism costing approximately €1.5 million, compared to €9.6 million during the 2023-2024 winter.

The general decline in gas prices in Europe and the reduction in LNG flows supported convergence between European hubs, with the corresponding spreads narrowing in 2024 for all maturities. This phenomenon is also linked to the development of regasification infrastructure across the continent, allowing European countries to access the global LNG market. French prices remained among the lowest in Europe due to the TRF’s position as an entry point for LNG in Europe and the competitiveness of French LNG terminals.

Volumes traded in the forward markets for delivery in France continued to grow, rising by 2% in 2024 compared with 2023, while volumes traded in the spot market fell by 11%, mainly due to lower LNG imports. Overall, the volumes traded in 2024 were stable compared to 2023, while maintaining an upward trend since 2021 due to the rise of LNG.

Finally, the French gas storage regulatory framework proved effective in 2024 and early 2025. The high utilization of European and French storage facilities during the winter of 2024-2025 left them at a low level by the end of the winter: they contained 27% of their maximum capacity on April 1, 2025, compared to 39% on April 1, 2024. This led to anticipation of increased European demand for their replenishment in the summer of 2025, resulting in forward prices for this season exceeding prices for delivery in winter 2025-2026 and thus causing a price spread unfavorable to the subscription of storage capacity.

Nevertheless, all this capacity was booked in France, without state intervention, thanks to the sales strategy of storage operators and the flexibility of the French regulation.

At the beginning of 2025, gas prices returned to levels close to their 2024 average, following an increase at the start of the year, peaking in February, and then declining, despite several episodes of volatility related to the global geopolitical and commercial context. The first quarter of 2025 was also marked by a significant rebound in LNG imports to France, reaching 79 TWh compared to 54 TWh in the first quarter of 2024.

In 2024, French nuclear generation returned to pre-crisis levels, setting a record for net exports and contributing to a general price decline

In 2024, the supply-demand balance in France improved significantly. Generation reached 539 TWh, surpassing the 2014-2019 average of 538 TWh. Nuclear generation was 362 TWh, 1 TWh more than in 2021. Hydropower generation achieved its highest level since 2013, thanks to abundant rainfall. Despite newly installed solar and wind capacities, their generation was affected by unfavorable weather conditions totaling 72 TWh, resulting in a slight decrease compared to 2023. Fossil thermal electricity generation stood at 20 TWh, the lowest level since 1952.

Temperature-adjusted consumption was 441 TWh in 2024, a slight increase of 0.7% compared to 2023. Although this remains about 8% lower than the 2014-2019 consumption levels, it's the first increase since 2021. This stagnation at a relatively low level results from upward factors like the development of new electricity uses and downward factors such as efforts in energy conservation and reduced industrial consumption due to decreased activity. The electrification of uses, necessary to meet decarbonization goals, appears to be progressing slowly in 2024 and early 2025.

In the context of abundant generation, wholesale electricity prices in France fell sharply. In 2024, daily electricity prices dropped significantly compared to the previous two years, averaging €57.8/MWh, down 40% from 2023 (€96.9/MWh) and 79% from 2022 (€275.8/MWh). This decline was particularly pronounced in France compared to other European countries. However, pre-crisis price levels remain lower, with the 2014-2019 average at €47.8/MWh.

This average decline in daily prices is accompanied by a significant increase in the variability of hourly prices throughout the day. In 2024, there was a record 352 hours of strictly negative prices (with slightly less than half between -€0.1 and €0/MWh). Beyond negative prices, the number of hours at zero or near-zero prices also increased significantly, with 314 hours priced between €0 and €0.1/MWh, primarily in spring and summer. Meanwhile, price spikes above €200/MWh (25 hours) were relatively frequent in December, and hourly prices above €100/MWh were very common (1,360 hours in 2024).

Very low and very high prices frequently coexist within the same day: in 2024, there were 35 days with at least 2 hours under €10/MWh and 2 hours over €100/MWh. Thus, the wholesale market sends a strong economic signal in favor of developing short-term flexibility options such as battery storage, consumption management, and supply offers allowing consumers to capitalize on their flexibility.

The significant easing of the supply-demand balance in France led to a record net export surplus of 89 TWh in 2024, surpassing the previous record of 77 TWh set in 2002. France was a net exporter across all borders, particularly to Germany, Belgium, Switzerland, and Italy. Trade with Spain was nearly balanced, with significant export increases during the third and fourth quarters of the year.

In forward markets, prices also fell sharply and were more stable. The calendar product price for France Y+1 base averaged €76.6/MWh, more than half of what it was in 2023 (€162.6/MWh), though still higher than historical levels (€42/MWh on average from 2014-2019). At the start of 2024, electricity prices in France remained strongly correlated with gas prices, showing a very small difference compared to German prices. However, starting in April, French prices began to fall rapidly and approach Spanish prices. For the rest of the year, Y+1 prices fluctuated between €70 and €80/MWh. In 2024, the spread with Germany was €12/MWh on average, widening to €23.1/MWh in the first half of 2025.

Wholesale market trading volumes in 2024 significantly increased compared to 2023 (1,434 TWh versus 673 TWh, up 118%), setting a new record. This was partly due to improved market conditions and the end of the ARENH, leading suppliers to fully source from the markets from 2026, and EDF to sell its generation exceeding its customers' consumption. In forward markets, the use of physically delivered

contracts, previously abandoned in favor of financially settled contracts during the crisis, also increased (+120% between 2023 and 2024).

For longer maturities, trading was particularly dynamic in 2024. A strong increase in liquidity for maturities up to 2028 (Y+4) was observed, particularly for delivery years 2026 (Y+2) and 2027 (Y+3). Conversely, liquidity remains very low for the year 2029 (Y+5).

The evolution towards market-based mechanisms continued for the electricity system's balancing in 2024, with the restart of daily auctions for automatic frequency restoration reserve (aFRR) capacity based on economic merit order in June 2024, complementing the aFRR energy market opened in November 2023. At this stage, aFRR markets remain in their early stages and feature high prices and volatility. Expected developments in 2025, notably through European integration, will improve their functioning. The gradual deployment of new assets well-suited to providing aFRR, such as battery storage, will also contribute to lowering prices and volatility. Finally, balancing markets are considered wholesale energy products under REMIT and are therefore monitored by the CRE.

Integration of balancing markets at the European level continues, with RTE's connection to the European platform for aFRR activation (PICASSO platform[3]) in April 2025, and the planned connection to the European manual frequency restoration reserve (mFRR) activation platform (MARI platform[4]) in the first quarter of 2026.

Capacity mechanism prices in 2024 for the 2025 delivery year reflected a new improvement in electricity system margins, averaging €14.7k/MW in 2023, compared to €27.1k/MW for the 2024 delivery year in 2023. The latest auction price for the 2025 delivery year dropped to €0/MW, explained notably by a decrease in peak consumption and an increase in capacity guarantees from regulated interconnections.

The notable trends of 2024 continue into early 2025. Market fundamentals still support the ongoing relaxation observed in 2024, with EDF projecting annual nuclear generation between 350 and 370 TWh, and consumption remaining at levels similar to 2024. Daily prices for winter 2024-2025 remained highly variable and elevated but comparable to winter 2023-2024, while forward prices decreased and ranged between €60 and €65/MWh for the Y+1 base calendar product. Spring and early summer were marked by a record number of hours with negative prices on the daily market. Lastly, activity in wholesale markets remains steady with similar trading volumes to the end of 2024.

CONTENT

THE CRE AND THE REMIT: WHOLESALE MARKET MONITORING, A EUROPEAN CHALLENGE

Since 2006, the French Energy Regulatory Commission (CRE) has been responsible for monitoring the French wholesale electricity and natural gas markets. Each year, it publishes a monitoring report on the functioning of the French wholesale electricity and natural gas markets.

Since December 28, 2011, the CRE's wholesale energy market monitoring mission has been part of European regulation no. 1227/2011 of the European Parliament and of the Council of October 25, 2011 concerning the integrity and transparency of the wholesale energy market (REMIT). This regulation was amended by European Regulation No. 2024/1106 of the European Parliament and of the Council of April 11, 2024, amending Regulations No. 1227/2011 and No. 2019/942 to enhance the Union's protection against market manipulation on wholesale energy markets. The revised REMIT entered into force on May 7, 2024.

Pursuant to the provisions of Article L. 131-2 of the French Energy Code, CRE monitors wholesale electricity and natural gas markets and ensures compliance with Articles 3, 4, 5, 7 quarter, 7 quinquies, 8, 9 and 15 of REMIT.

In this regard, the CRE pays particular attention to provisions aimed at ensuring the integrity and transparency of wholesale energy markets by:

- prohibiting market manipulation and insider trading (Articles 3 and 5);
- requiring market participants to publish any inside information they hold (Article 4).

The CRE is also committed to ensuring that persons professionally arranging or executing transactions (PPAET)[1] comply with their obligations under Article 15 of REMIT to detect and report suspicions of insider trading or market manipulation, as well as suspicions of non-disclosure of inside information.

REMIT is implemented at European level under the provisions of Article 16, which provides in particular for cooperation between ACER, ESMA[2] , the energy regulators of the Member States of the European Union and the financial and competition authorities.

[1] *Persons Professionally Arranging or Executing Transactions* or PPAET, mainly exchanges, brokers, certain network operators and certain market participants.

[2] *European Securities and Markets Authority (ESMA*).

CRE ACTIVITY IN 2024 AS PART OF ITS MONITORING MISSION

15.1 million transactions monitored (+31%*)

3,704 TWh traded (+36%*)

More than €181 billion traded (-14%*)

2,029 market participants registered with the CRE (+7%*)

Around 50 cases currently under review as part of monitoring activities

9 investigations underway

2 sanction procedures under investigation by CoRDiS

* Compared to 2023

Wholesale market in France in 2024

Electricity prices

€57.8/MWh average *day-ahead* prices, **down 40%** compared to 2023

€76.6/MWh on average for calendar year forward prices for the first year (CAL+1), representing a decrease of **-53%** compared to 2023

Natural gas prices

€34.0/MWh average *day-ahead* prices, **down 15%** compared to 2023

€36.2/MWh average calendar futures prices for the first year (CAL+1), i.e. **-28%** compared to 2023

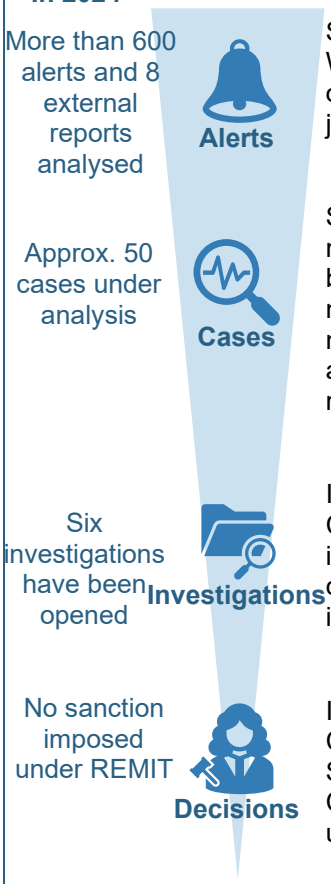
SECTION 1: MONITORING OF WHOLESALE MARKETS BY THE CRE

1. CRE's monitoring of wholesale energy markets under REMIT in 2024

CRE actively monitors wholesale electricity and gas markets, relying on internal detection of potentially suspicious behaviours and analysis of declarations submitted by external parties. Analysis of these behaviours may lead to the opening of investigations and referral of a sanction request to the Dispute Settlement and Sanctions Committee (CoRDiS).

Monitoring stages and key figures for 2024

In 2024



Suspicious behaviours are detected through internal or external reports. When different individual reports concern the same or similar behaviours over different periods, they may be grouped together in a single case for joint analysis.

Suspicious behaviour detected internally by CRE or through an external report is first subject to verification to determine whether the suspected breach is reasonable. A case may correspond to one or more reports and may be more or less complex, depending on the markets concerned, the number of market participants involved and the duration of the period analysed. Thus, the change in the number of cases alone does not directly reflect the underlying analysis activity.

In the event of reasonable suspicion of a breach of REMIT provisions, the CRE's Chairwoman may appoint an investigating officer to conduct an investigation to establish whether or not a breach under REMIT have been committed. Any such breaches shall be investigated and recorded by the investigating officers in a report.

If the investigation finds that REMIT has been breached, the CRE's Chairwoman may decide to refer the matter to the CRE's Dispute Settlement and Sanctions Committee (CoRDiS) with a request for sanction. CoRDiS, which is the CRE's independent sanctioning body, may also take up the matter on its own initiative or be referred to it by another person.

In 2024, the CRE reorganized its wholesale market monitoring activities to increase efficiency and flexibility, on the one hand by strengthening market data processing activities and, on the other hand, by enhancing synergies between monitoring analyses and investigations.

The CRE directorate responsible for wholesale market monitoring, formerly known as the Wholesale Market Monitoring Directorate, was composed of two departments: the *Market Analysis and Monitoring Tools Department,* responsible for receiving and managing data necessary for market monitoring, developing the tools needed to understand and analyse these data, monitoring markets, and detecting and conducting preliminary analyses of suspicious behaviour potentially constituting a REMIT breach; and the *In-Depth Monitoring and Investigations Department,* responsible for in-depth case analysis and conducting investigations.

This directorate, now called the "Wholesale Markets Directorate", currently consists of three departments:

- the *Data and Operations Department*, responsible for developing and operating the market data processing chain and managing automatic detection tools;
- the *Market Analysis Department*, responsible for thematic analysis of wholesale markets, developing the monitoring strategy and developing detection and analysis tools, and
- the *Monitoring and Investigation Department*, which is responsible for analysing suspicious behaviour according to REMIT that has been detected internally or reported externally, and for conducting investigations.

1.1. Overview of sources detecting potentially suspicious behaviours in 2024

The CRE's monitoring activities are based on the *ex-post* detection of suspicious behaviour, either through internal detection tools or following reports from external parties.

Internal detection relies on automated tools designed to monitor market segments in order to detect specific scenarios and behaviours of market participants, based on market data collected by ACER under REMIT and data collected directly by CRE from certain market participants. Analyses may also be conducted based on monitoring market conditions (periods of high prices, etc.) and fundamentals.

External detection is based on notifications of suspicious behaviour received from various sources, primarily *Persons Professionally Arranging or Executing Transactions* (PPAET)[3] . In particular, exchanges, brokers, and certain network operators, as organizers of trading operations on their platforms, are a valuable source of information for the CRE.

ACER also transmits any suspicious behaviour it detects, accompanied by its preliminary analysis, as well as alerts from its automatic detection systems, without any associated qualitative analysis. Some of these alerts relate exclusively to the French market, which is the responsibility of CRE, while others involve cross-border exchanges and therefore also concern other regulators. ACER is gradually introducing new types of alerts targeting new types of behaviour.

Similarly, other regulatory authorities and market participants, both in France and abroad, send CRE information on suspicious behaviour to CRE.

CRE encourages PPAETs and all market participants to exercise the utmost vigilance and reminds them that anyone with knowledge of behaviour that may constitute a REMIT breach can report it, including anonymously, to surveillance@cre.fr or on the European reporting platform (https://www.acer-remit.eu/np/home) set up for this purpose.

[3] Pursuant to Article 15 of the REMIT, PPAETs are required to notify ACER and the relevant national regulatory authorities of any suspected breach of Articles 3, 4 or 5 of REMIT without delay and, in any event, no later than four weeks after the PPAET becomes aware of the suspicious event. Breaches of this obligation may be sanctioned by CoRDiS pursuant to Article L. 134-25 of the French Energy Code.

Key elements for 2024

Internal detection

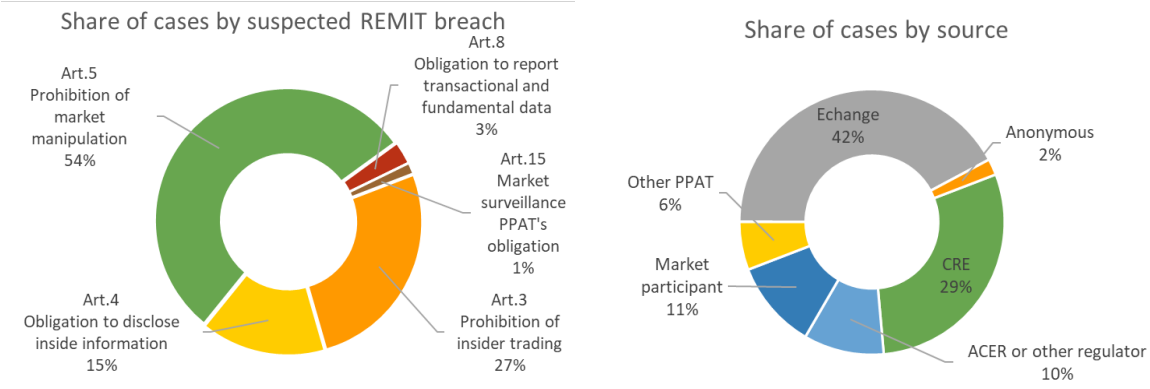
- CRE's tools are designed to detect behaviour that may constitute a breach of the obligation to disclose inside information or of the prohibition of insider trading or market manipulation.
- Approximately 630 alerts concerning 2024 were analysed by the CRE; 12% of these required further action, including requests for information from the parties concerned.
- Specific analyses were carried out following the opening of new balancing markets.

External detection

- The CRE was responsible for the analysis of six reports from PPAT and two reports from other players received in 2024[4] .
- The CRE is involved in following up on other reports for which another European regulator is responsible for conducting the analyses.
- Seven PPATs are being closely monitored by the CRE to ensure the proper implementation of market monitoring mechanisms in accordance with Article 15 of REMIT.
- 60 automatic alerts were received from ACER for 2024[5] .

Depending on their complexity, cases may take more or less time to analyse. Thus, over the course of a year, CRE examines new reports while continuing to analyse previous detections. Figure 1 presents an overview of all cases analysed since 2012 and shows that suspected breaches of REMIT most often concern Articles 3 and 5 (prohibition of insider trading and market manipulation), in 25% and 56% of cases respectively, and are most often opened following a report from an exchange.

Figure 1 : Cases analysed by type of breach and source of detection



[4] Given that the obligations of PPETs under Article 15 of the amended REMIT did not enter into force until November 2024, the CRE does not provide specific statistics on them in this report.

[5] ACER encountered operational difficulties in 2024, which delayed the availability of data in ACER's main market monitoring tool. This resulted in a delay that should be resolved in 2025.

1.2. Internal monitoring and detection system

In 2023, CRE set up an internal process for generating automatic alerts, which are analysed in near real time and may give rise to requests for information to the market participants involved, more in-depth analyses or, when necessary, investigations. This process is supplemented by active monitoring of market conditions, which may lead to in-depth analyses of market participants' behaviour in order to identify those that may constitute potential breaches of REMIT (e.g., episodes of high prices in specific market segments, selected sequences of information disclosure to the markets, ...).

This entire system is based on the use of data collected by ACER under REMIT and shared with CRE, as well as data collected directly by CRE from exchanges, brokers, transmission system operators (TSOs) or market participants. In recent years, there has been a sharp increase in the volume of data generated, particularly with regard to orders submitted on wholesale markets. The number of orders and transactions processed by CRE increased fivefold between Q4 2022 and Q4 2024 (and more than doubled between Q4 2024 and Q1 2025, see section 3.3). The processing of REMIT data therefore represents a new challenge due to the sharp increase in its volume, while the diversity of data sources used by CRE is a constant challenge for the detection and analysis of potentially suspicious behaviour.

The automatic alerts set up by CRE focus, on the one hand, on generic and statistical criteria, enabling the detection of values that differ significantly from price and transaction volume trends, positions, etc., and, on the other hand, on specific scenarios monitored on different market segments. The alerts are designed to detect insider trading or market manipulation prohibited by Articles 3 and 5 of REMIT, but also to monitor the effectiveness of publications concerning the availability of production facilities, pursuant to Article 4 of REMIT.

The alerts generated are then analysed by CRE using visualization tools, drawing on the expertise of analysts and, where necessary, additional data to determine whether or not the behaviour is likely to constitute a breach. In cases where a data reporting error is suspected, or in order to attempt to explain a behaviour, requests for information may be sent to the concerned market participants.

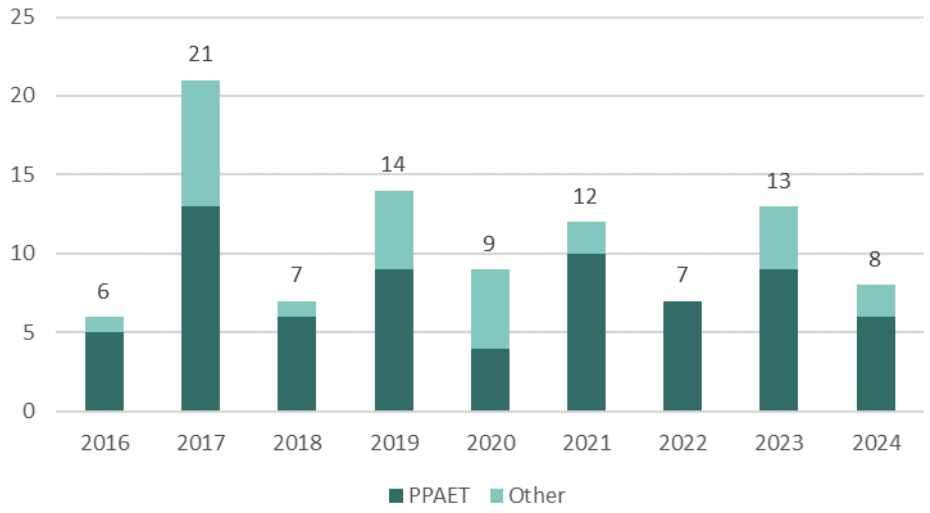
If the analysis confirms the suspected REMIT breach, more detailed analyses are carried out, which may lead to the opening of an investigation.

CRE has strengthened the effectiveness of internally generated alerts analysis in 2024. Approximately 630 alerts relating to 2024 were analysed by CRE. 12 % of them required further action, including requests for information to relevant market participants. The latter generally demonstrated a good level of responsiveness, particularly in correcting reported data when necessary.

1.3. External reports and support for participants organizing and executing transactions in their monitoring role

Figure 2 shows the number of notifications of suspicious behaviour according to REMIT notified to CRE by PPAETs or other stakeholders in recent years.

Figure 2 : External reports by source of detection



The revised REMIT extended the obligations under Article 15, which initially applied to persons professionally arranging transactions in wholesale energy products (PPATs), to persons professionally executing transactions in wholesale energy products (PPETs). Article 15 of REMIT now requires PPAETs to establish and maintain effective arrangements, systems, and procedures to detect potential violations of Articles 3 (prohibition of insider trading), 4 (obligation to disclose inside information) or 5 (prohibition of market manipulation) of REMIT, and to notify ACER and the relevant national regulatory authority if they have reason to suspect that a transaction may infringe these provisions.

Among the main evolutions of wholesale market monitoring obligations of PPAETs are:

- the extension of the market monitoring obligation imposed on PPAETs to breaches of Article 4 (obligation to publish inside information),
- the extension of the application of Articles 3 and 5 to wholesale energy products that are also financial instruments,
- the obligation to notify ACER and the relevant national regulatory authority (NRA) in the event of a suspected breach of Articles 3, 4 or 5 of REMIT without further delay and, in any event, no later than four weeks from the day on which that person becomes aware of the suspicious event.

The entry into force of the amended REMIT had an impact on the reports received by the CRE under Article 15 from the end of 2024. The CRE is receiving new types of reports from players related to the extension of the obligation imposed on PPATs to PPETs and the extension of the scope of REMIT to wholesale energy products that are also financial instruments.

CRE considers the monitoring activities carried out by the PPATs – mainly exchanges, brokers and certain GRTs ([6]) – to be essential and maintains regular contact with them, reminding them of their monitoring duties and providing a critical review of the implemented measures. These interactions enable CRE not only to strengthen the monitoring of wholesale energy markets in France, but also to benefit from the expertise PPATs in the market segments in which they operate. These discussions also enable to monitor the development and evolution of monitoring tools and procedures implemented by PPATs and to share analyses of suspicious cases detected within their scope.

CRE ensures that PPATs comply with their obligations under Article 15 of the amended REMIT, which only came into force in November 2024 for the PPETs.

[6] Prior to the REMIT reform, RTE was the only transmission system operator qualified as a PPAT in France. The entry into force of the amended REMIT requires a reassessment of the qualification of TSOs, which were not previously recognized as PPATs. This process is currently underway.

CRE notes that some PPAETs report a low number of notifications. The CRE reiterates that it is its responsability, as provided by law, to initiate investigations against PPAETs that do not properly perform their wholesale market monitoring duties, and that these investigations may result in sanctions. The CRE also notes that the number of reports received is likely to continue to grow due to the extension of REMIT's scope to wholesale energy products that are also financial instruments.

1.4. Main developments in CRE's market monitoring tasks following the REMIT revision

Following the revision of REMIT, which came into force on May 7, 2024, the scope of prohibitions on insider trading (Article 3) and market manipulation (Article 5) has been extended to wholesale energy products that are also financial instruments. This amendment had been long expected by CRE, as financial and physical products jointly contribute to wholesale price formation and must therefore be subject to the same monitoring framework. As such, certain market participant behaviours could fall under both REMIT and the Market Abuse Regulation (MAR)[7], leading to close cooperation and the possible intervention of several competent authorities in market monitoring when necessary: CRE, other national regulators, ACER, the competent financial authorities, and the European Securities and Markets Authority (ESMA).

The definition of wholesale energy products under REMIT, whose trade is monitored by the CRE, now includes LNG, contracts and derivatives relating to electricity or gas storage, and contracts and derivatives that can be delivered in the European Union during daily and intraday coupling.

The revision of Article 9 of REMIT, relating to the registration of actors, requires actors who are neither resident nor established in the European Union to appoint a representative in a Member State in which they carry out activities on wholesale energy markets and to register with the NRA of the Member State where the representative is designated.

Article 5a of the amended REMIT provides that market participants using algorithmic trading or providing direct electronic access to an organized market place (OMP) shall notify the NRA of the Member State in which they are registered in accordance with Article 9(1) and ACER. Under the same Article 5a of REMIT, the CRE may request registered market participants in France to provide, on a regular or ad hoc basis, a description of the nature of their algorithmic trading strategies.

[7] Regulation (EU) No 596/2014 of the European Parliament and of the Council of April 16, 2014

2. Investigations and penalties for breaches of REMIT

Pursuant to Article L.135-3 of the French Energy Code, investigating officers among CRE staff authorized by the CRE's Chairwoman conduct the necessary investigations to fulfill CRE's missions. Thus, in case of a suspected breach of REMIT provisions, the CRE's Chairwoman may appoint an investigating officer to conduct an investigation.

Any breaches of REMIT identified by the investigating officers shall be recorded in a report which must be notified to the person(s) concerned. At the end of an investigation, pursuant to Article L.134-25 of the French Energy Code, the President of the CRE may, where appropriate, refer the matter to the CoRDiS for sanctions.

2.1. Investigations conducted by CRE

Between 2014 and 2024, CRE opened twenty-three REMIT investigations: two investigations in 2014, three in 2016, two in 2017, one in 2018, one in 2019, four in 2021, two in 2022, two in 2023 and six in 2024. Among these investigations, 13 relate to the electricity market and 10 to the gas market.

All of these investigations were opened following suspicions of insider trading, market manipulation (Articles 3 and 5 of the REMIT) or breaches of the obligation to disclose inside information (Article 4 of the REMIT).

At the end of 2024, among these investigations:

- one was closed because the analysed behaviour occurred before the entry into force of Law No. 2013-312 of April 15, 2013, which entrusted CoRDiS with the power to sanction such breaches;
- one was closed in 2020 due to prescription;
- two were closed as no breach was found;
- one was closed, followed by the sending of a letter of observations;
- seven were closed by a CoRDiS decision;
- two were being analysed by CoRDiS;
- for the remaining nine investigations at the end of 2024, the investigating officers' analyses were still ongoing.

As part of these investigations, the power to request information (accounting documents, invoices and any relevant documents or records, including telephone recordings and exchanged data) was applied in accordance with Article L.135-4 of the French Energy Code and Article 13(2) of REMIT.

2.2. Summary of the main decisions sanctioning REMIT breaches issued by CoRDiS and regulators in the European Union

CRE presents here the recent sanction decisions in France and in other Member States. ACER maintains an up-to-date summary on its website[8] of public enforcement decisions of REMIT breaches at European level. It should be noted that several sanction decisions may relate to the same case.

[8] *Publication ACER Enforcement decisions – Overview of the sanction:* https://www.acer.europa.eu/remit/coordination-on-cases/enforcement-decisions

The amended REMIT introduces minimum penalty thresholds, consisting of percentages of the total annual turnover for legal entities and fixed amounts for natural persons, depending on the type of infringement sanctioned. Article L. 134-27 of the French Energy Code was amended by Law No. 2025-391 of April 30, 2025, in line with these thresholds. It is important to note that the amount of each sanction decided by CoRDiS is determined individually for each case, taking into account the circumstances of the case under consideration. Thus, Article L. 134-27(2) of the French Energy Code states that the amount of the pecuniary sanction shall be *"proportionate to the seriousness of the breach, the situation of the person concerned, the extent of the damage and the advantages gained."* The amounts of the pecuniary sanctions are therefore difficult to compare from one decision to another. Law No. 2025-391 of April 30, 2025 also introduced into Article L. 134-27 of the French Energy Code the possibility for the CoRDiS to impose other measures provided for in Article 18 of the amended REMIT relating to penalties.

Table 1 : Sanction decisions in 2024 at European level related to breaches of Articles 3, 4 and 5 of REMIT[9]

Date of decision	Authority, Member State	Market participant	Type of REMIT violation	Amount of sanction	Status of the decision
19/01/2024	ANRE (RO)	EFT Furnizare SRL	Article 5	50,497,126 RON (approx. €10.1 million)	Under appeal
19/01/2024	ANRE (RO)	Freepoint Commodities Europe LLP	Article 5	22,917,465 RON (approx. €4.6 million)	Under appeal
19/01/2024	ANRE (RO)	Nova Power&Gas SRL	Article 5	100,106,676 RON (approx. €20.1 million)	Under appeal
19/01/2024	ANRE (RO)	Tinmar Energy SA	Article 5	363,982,052 RON (approx. €73.1 million)	Under appeal
29/03/2024	ANRE (RO)	Energy Republic Trading S.R.L.	Article 5	RON 6,336,705 (approx. €1.3 million)	Under appeal
29/03/2024	ANRE (RO)	Qmb Energ S.R.L.	Article 5	RON 3,933,082 (approx. €798,810)	Under appeal
29/03/2024	ANRE (RO)	Land Power S.R.L.	Article 5	7,736,057 RON (approx. €1.6 million)	Under appeal
20/02/2024	ARERA (IT)	ENET Energy S.A.	Article 5	940,000 €	Under appeal
05/03/2024	ARERA (IT)	EC Energy Clean SA	Articles 8 and 9	25,000 €	Final
17/06/2024	BNETZA (DE)	Gascade Gastransport GmbH	Article 4	€75,000	Final
05/07/2024	CNMC (ES)	Enérgya VM Gestión de Energía	Article 5	€1.0 million	Appeal possible
24/07/2024	CNMC (ES)	Neuro Energía y Gestión	Article 5	€1.1 million	Appeal possible
03/10/2024	CNMC (ES)	Gesternova S.A.	Article 5	€6.0 million	Appeal possible
03/10/2024	CNMC (ES)	Axpo Iberia S.L.	Article 5	€1.5 million	Appeal possible

[9] Status as of the date of publication of this report.

16/04/2024	DKER (BG)	Kozloduy NPP	Article 3	604,064 BGN (approx. €300,000)	Appeal possible
29/05/2024	DKER (BG)	Aes-3c Maritza East 1 EOOD	Article 4	10,000 BGN (approx. €5,000)	Final
03/12/2024	DKER (BG)	TPP Bobov dol	Article 4	BGN 80,000 (approx. €40,000)	Under appeal
03/12/2024	DKER (BG)	TPP Contour Global Maritsa East 3	Article 4	BGN 10,000 (approx. €5,000)	Under appeal
03/12/2024	DKER (BG)	AES 3C Maritza East 1	Article 4	BGN 20,000 (approx. €10,000)	Final

It should be noted that in 2024, ENGIE appealed against the CoRDiS decision of December 26, 2023, which fined the company €500,000 for breaches of Articles 3 (prohibition of insider trading) and 4 (obligation to disclose inside information) of REMIT. CRE notes that the CoRDiS decision was confirmed, in essence, by the decision of the Council of State on June 18, 2025[10]. However, the latter considered that 45 market transactions (out of 234 that were in dispute) did not involve the use of the inside information in question. The Council of State therefore ruled that *"given (...) the limited reduction in the number of market transactions carried out (...) on the basis of unpublished inside information, there is only reason to reduce the financial penalty from €500,000 to €490,000*."

No sanction decisions were issued by CoRDiS in 2024. However, it is worth mentioning the CoRDiS sanction decision dated January 20, 2025, issued following a camera session held on December 18, 2024. In this decision, CoRDiS sanctioned two companies for infringements of Article 5 of REMIT (prohibition of market manipulation) on the wholesale gas market in 2019 and 2020 in relation to natural gas transmission capacities between France and Spain, following an investigation conducted by CRE: the penalty for Danske Commodities A/S was €8 million and the penalty for Equinor ASA was €4 million[11] . Both companies have appealed against the CoRDiS decision.

Finally, CRE considers it relevant to highlight the recent decision of the CoRDiS dated April 22, 2025, in which the CoRDiS found that J.P. Morgan SE did not comply with the obligation to disclose information provided for in Article L. 134-29 of the French Energy Code, as referred to in Article L. 134-18 of the French Energy Code. J.P. Morgan SE was fined €500,000[12] . This is the CoRDiS's first decision relating to this type of breach. Access to information is essential for the CRE to carry out its monitoring tasks, not only to ensure market transparency, but also to strengthen confidence in the market. The company has appealed against the CoRDiS decision.

2.3. Cooperation with other authorities and improving the effectiveness of investigation and sanctioning procedures

Cooperation with French independent administrative authorities (IAA), initiated in 2019, constitutes a privileged means of exchange with other French independent administrative authorities (ACPR, ADLC, AMF, ART, ARCEP, CNIL, HATVP)[13] .

The inter-IAA working group is a lever for innovation and exchange of expertise and experience, allowing CRE to question and enrich its monitoring and investigation methods. As an illustration, CRE exchanged views with the various IAAs on the challenges and advantages that new technologies, including artificial intelligence, could bring to methods and analyses used for monitoring and investigations.

[10] http://www.conseil-etat.fr/fr/arianeweb/CE/decision/2025-06-18/492318

[11] https://www.cre.fr/fileadmin/Documents/Decisions_du_CoRDIS/2025/08-40-23_CORDIS.pdf

[12] https://www.cre.fr/fileadmin/Documents/Decisions_du_CoRDIS/2025/03-40-24_Decision_CoRDiS.pdf

[13] ACPR - Autorité de contrôle prudentiel et de résolution, ADLC - Autorité de la concurrence, AMF - Autorité des marchés financiers, ART - Autorité de régulation des transports (anciennement ARAFER), ARCEP - Autorité de régulation des communications électroniques et des Postes, CNIL - Commission nationale de l'informatique et des libertés, HATVP – Haute autorité pour la transparence de la vie publique

In particular, CRE has been working for a long time with the French Financial Markets Authority (AMF), based in particular on the memorandum of understanding signed in 2010[14] , which aims to enable the two authorities to benefit from each other's information and expertise in order to ensure the full effectiveness of their respective missions, in accordance with the provisions of Article L. 621-21 of the Monetary and Financial Code and Article L. 134-17 of the French Energy Code[15] .

By way of illustration, during 2024, CRE and AMF regularly exchanged views on the robustness of investigation procedures and on the various actions that could be taken following investigations. CRE and AMF regularly exchange views on topics concerning both wholesale energy and financial markets, in particular the work of the European Commission based on the Draghi report and the Letta report, and on the implications of the amended REMIT. The entry into force of the amended REMIT and the extension of its scope to wholesale energy products that are also financial instruments further increase the importance of cooperation between the CRE and the AMF.

Finally, CRE's Chairwoman and Board, together with CoRDiS's the Chairman and Board, have jointly decided to propose a reform of investigation, inquiry, and sanction[16] procedures, with the aim of increasing speed and efficiency, in particular through the introduction of a negotiated sanction procedure. This reform project requires, in particular, the introduction and amendment of certain legislative and regulatory provisions of the French Energy Code. These legislative changes have been incorporated into the draft law on "simplifying economic life."

3. Monitoring wholesale markets at European level

3.1. Activities carried out or coordinated by ACER on wholesale market monitoring

Several working groups dedicated to market monitoring exist within ACER and the Council of European Energy Regulators (CEER). They contribute to the operational implementation of REMIT by national authorities in a coordinated and consistent manner, notably through regular exchanges of experience on the handling of monitoring cases and market abuse scenarios. The ACER working groups also participate in the development of non-binding *guidance* on the application of REMIT published by ACER.

CRE attaches great importance to the progress of work on REMIT within the framework of cooperation between European regulators. In 2024, Kseniya Khromova, Director of Wholesale Energy Markets at CRE, was appointed co-chair of the ACER REMIT Committee for a two-year mandate.

In addition, cooperation with financial authorities is set to intensify with the entry into force of the amended REMIT, whose scope has been extended to wholesale energy products that are also financial instruments.

3.2. ACER's non-binding guidance

The non-binding guidance published by ACER currently consist of four main documents:

- general guidance on the application of REMIT, whose sixth edition published in July 2021, was amended by ACER on December 18, 2024[17], to take into account developments related to the amendment of REMIT, and
- three thematic guidelines focusing on practices likely to constitute market manipulation under Article 5 of REMIT:

[14] For more information: https://www.cre.fr/fileadmin/Documents/Communiques_de_presse/import/101210_MOU_CRE-AMF_101210105039_0001.pdf

[15] Previously Articles 28 and 29 of Law No. 2000-108 of February 10, 2000.

[16] This desire for reform was identified as one of the objectives of the CRE's 2023-2024 roadmap: https://www.cre.fr/Documents/Publications/Rapports-thematiques/feuille-de-route-2023-2024-de-la-cre and was reiterated in the strategic guidelines for 2025-2030: https://www.cre.fr/documents/rapports-et-etudes/orientations-strategiques-2025-2030-de-la-cre.html

[17] https://www.acer.europa.eu/sites/default/files/documents/Other%20Documents/6.1st_Edition_ACER_Guidance.pdf

- guidance on "*wash trade*" defined as entering into arrangements for the sale or purchase of a wholesale energy product without involving a change in the ownership of the value concerned or in the market risk, or involving the transfer of ownership or market risk between participants acting in concert or in collusion, published in June 2017[18];
- guidance on "*capacity hoarding*" in the intraday electricity market, defined as acquiring all or part of the available transport capacity without using it or without using it effectively, published in March 2018[19];
- guidance on "*layering*" and "*spoofing*" on continuous wholesale markets, defined as the submission by a market participant of one large order or of multiple non-genuine orders to trade on one side of the order book, in order to enter into one or multiple transactions on the other side of the order book, published in March 2019[20].

ACER also publishes a list of questions and answers ("Q&A") concerning the implementation of REMIT. The latest update of this document was published on March 12, 2025[21]. This update aims at aligning the Q&A with the amended version of REMIT.

Finally, ACER publishes open letters to clarify some guidelines with more flexibility than through the process implemented to revise its general guidance documents. In 2024, ACER published three open letters related to the amendment of REMIT:

- an open letter dated April 17, 2024[22], on the impacts of the REMIT revision on data reporting and notification obligations;
- an open letter dated July 30, 2024[23] on the obligation to report the use of algorithmic trading and the provision of direct electronic access to the market;
- an open letter dated September 25, 2024[24] on the declaration of a representative in the European Union for entities established outside the EU, as well as on new obligations relating to PPAETs.

CRE contributes to the coordinated operational implementation of REMIT by national authorities and ACER and to the development of common positions on the definition and regulation of wholesale market abuse practices under REMIT.

[18] For more information:
https://www.acer.europa.eu/sites/default/files/REMIT/Guidance%20on%20REMIT%20Application/ACER%20Guidance%20on%20REMIT/Guidance%20Note%20v6.0._published%20on%2019_06_2017.pdf

[19] For more information:
https://www.acer.europa.eu/sites/default/files/REMIT/Guidance%20on%20REMIT%20Application/ACER%20Guidance%20on%20REMIT/Guidance%20Note%20-%20Transmission%20Capacity%20Hoarding.pdf

[20] For more information:
https://www.acer.europa.eu/sites/default/files/REMIT/Guidance%20on%20REMIT%20Application/ACER%20Guidance%20on%20REMIT/Guidance%20Note_Layering%20v7.0%20-%20Final%20published.pdf

[21] For more information:
https://www.acer.europa.eu/sites/default/files/REMIT/Guidance%20on%20REMIT%20Application/Q%26As%20on%20REMIT/REMIT-30th-edition-QAs.pdf

[22] For more information:
https://www.acer.europa.eu/sites/default/files/REMIT/Guidance%20on%20REMIT%20Application/Open%20Letters%20on%20REMIT%20Policy/Open-letter-on-REMIT-revision-implications.pdf

[23] For more information:
https://www.acer.europa.eu/sites/default/files/REMIT/Guidance%20on%20REMIT%20Application/Open%20Letters%20on%20REMIT%20Policy/Open-letter-on-algorithmic-trading.pdf

[24] For more information:
https://www.acer.europa.eu/sites/default/files/REMIT/Guidance%20on%20REMIT%20Application/Open%20Letters%20on%20REMIT%20Policy/25092024_3rd_Open_Letter_Third_Countries_PPAETs.pdf

3.3. REMIT data exchanges with ACER

The centralized data collection by ACER under REMIT began in 2015. The CRE has been receiving data on the French market since 2016. As the quality of transactional and fundamental data is essential for the performance of its tasks, CRE is actively involved in ACER's work on this subject.

ACER publishes documents clarifying the reporting requirements for transactional and fundamental data. Discussions between ACER, reporting parties, regulators and other stakeholders focus on updates to these documents. The main documents are the procedures manual for data reporting[25] and the *Transaction Reporting User Manual* (TRUM), with the latest versions published on April 17, 2023, and December 17, 2024, respectively. They are complemented by a *frequently asked questions* (FAQs) document on transaction data reporting, updated on September 30, 2024, as well as another FAQ document on the reporting of inside information and fundamental data, with the latest version published on April 30, 2021. The latest updates relate in particular to the reporting to ACER of contracts concerning LNG and long-term contracts with renewable energy producers (PPAs[26]).

As part of the REMIT revision, the European Commission is responsible for amending the REMIT implementing regulation[27] in order to define new data reporting requirements and adopt delegated acts concerning, on the one hand, data reporting mechanisms (*Registered Reporting Mechanism* – RRM) and, on the other hand, platforms for the publication of inside information (*Inside Information Platforms* – IIP). This process should be completed in 2025 and will lead to the updating of the documents mentioned above.

The work carried out by ACER, but also by regulators, on improving data collection under Article 8 of the REMIT and its use for monitoring activities continued in 2024.

In 2024, CRE continued to improve its data processing from REMIT collection and requested reporting parties to clarify or correct the transaction data reported to ACER when necessary. One of the challenges is adapting CRE's systems and processes to the significant increase in the volume of data since the end of 2022, as shown in Figure 3, particularly related to the growth of market making and algorithmic trading on French and European markets. CRE had to significantly adapt its data processing tools in 2024 in order to cope with the approximately tenfold increase in the daily volume received from ACER between 2022 and 2025.

CRE is maintaining the national data collection system from certain players (exchanges, brokers, TSOs, market players) to have a basis for comparison to continue improving the quality of reported data and to complete data that are not subject to REMIT reporting requirements, thereby avoiding any discontinuity or interruption in market monitoring.

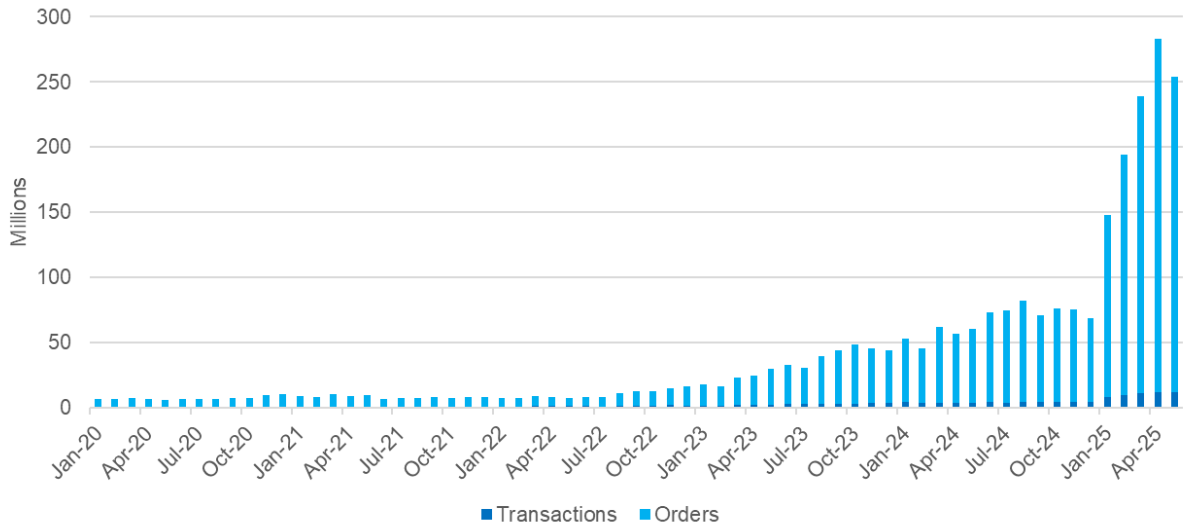
The CRE specifically calls on market participants to be vigilant regarding the correct reporting of transaction beneficiaries, which are often poorly recorded or inaccurate, as well as the proper identification of bilateral transactions, ensuring that the unique transaction identifier reported by both counterparties is identical.

[25] *Manual of Procedures on transaction data, fundamental data and inside information reporting:* https://www.acer.europa.eu/sites/default/files/REMIT/REMIT%20Reporting%20Guidance/Manual%20of%20Procedures%20(MoP)%20on%20Data%20Reporting/ACER_REMIT_MoP-on-data-reporting.pdf

[26] In English: *Power Purchase Agreement* (PPA).

[27] Commission Implementing Regulation (EU) No 1348/2014 of 17 December 2014

Figure 3 : Number of orders and transactions processed monthly by CRE through REMIT data collection (standard contracts "Table 1", all markets combined, electricity and natural gas)



Source: REMIT data – Analysis: CRE

USEFUL REFERENCES

Regarding suspicions of market abuse

To ensure the most rigorous possible wholesale energy markets monitoring, anyone who suspects market abuse is asked to alert:

- CRE's wholesale energy market monitoring services at : surveillance@cre.fr;
- or the ACER's wholesale energy market monitoring services by visiting the Agency's dedicated notification platform: https://www.acer-remit.eu/np/home.

Regarding the registration of market participants

For any questions relating to registration, market participants may contact CRE's services at: enregistrement.remit@cre.fr .

Regarding REMIT

All public documentation related to the implementation of REMIT is available on the REMIT portal provided by ACER: https://www.acer-remit.eu/portal/home.

SECTION 2: WHOLESALE GAS MARKETS

1. European and international context

In 2023, European natural gas markets experienced a sharp drop in prices, mainly due to abundant liquefied natural gas (LNG) supplies, good storage levels and favorable weather conditions. The TTF, the main index for the European wholesale gas market, reached one of its lowest levels since the start of the 2022 energy crisis at the end of February 2024. The trend then reversed, marking the beginning of a gradual and continuous rise in prices throughout 2024, although they remained well below those of 2022. Despite bearish fundamentals at the beginning of the year, several events disrupted the global supply of natural gas, including outages at the Freeport terminal in the US and at Norwegian gas fields. Rising coal prices also suggested an increase in demand for gas for power generation. As European prices began to rise again, the disruptions continued. In the second and third quarters of 2024, for example, outages occurred in Australia, the world's second-largest producer of LNG after the United States. In addition, dynamics in the global LNG market and expectations that Russian gas transit through Ukraine would end by the end of the year gradually heightened supply tensions throughout the year.

Stronger-than-expected Asian demand pushed LNG prices to high levels in the region. They remained significantly above the TTF until October 2024, reflecting strong competition for LNG cargoes. As a result, deliveries to European LNG terminals remained very low during the summer. In October, however, prices in Europe caught up with and then exceeded Asian prices, leading to a redirection of flows, particularly due to high European demand for power generation. Delays in global LNG production projects also slowed the development of global supply and, consequently, sustained regional competition. While a sharp increase in LNG production capacity was expected internationally in 2024, the commissioning of numerous liquefaction facilities has been postponed due to technical problems and regulatory constraints, particularly in the United States (Golden Pass project) and on the border between Senegal and Mauritania (Greater Tortue Ahmeyim project). The operation of other production units already in service was also hampered by breakdowns, such as in Australia and the United States, and Western sanctions against Russia (Arctic LNG 2 project). Ultimately, LNG imports into the European Union fell by 15% in 2024 compared with 2023.

Geopolitical uncertainties also continued to affect the market, particularly in the context of Russia's war in Ukraine. Attacks on Ukrainian energy infrastructure at the beginning of the year and the prospect of a halt to Russian gas transit through its territory, which is now effective, exacerbated price volatility. For example, the price of the M+1 product at the TTF doubled between February 23 and December 31, 2024, from €23/MWh to €48/MWh (Figure 4).

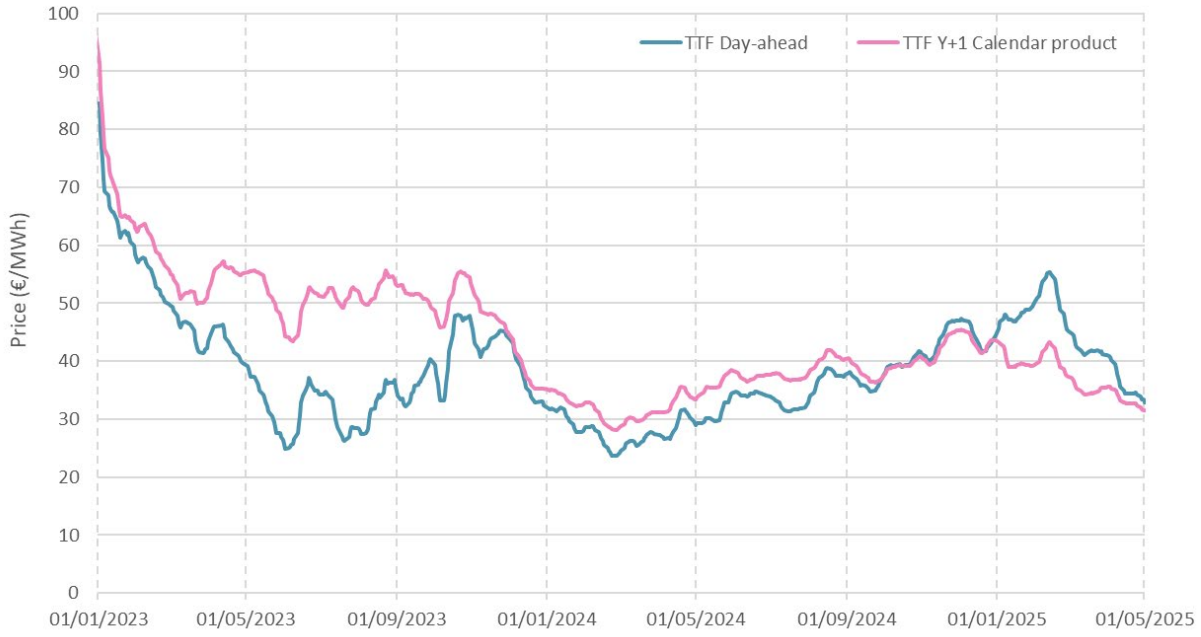
From the demand side, the end of 2024 was marked by a phenomenon known as *Dunkelflaute*, a German term referring to a prolonged period of low renewable energy production due to unfavorable weather conditions. This situation put additional pressure on the European energy system, increasing dependence on natural gas to compensate for the shortfall in renewable energy production. In the last quarter, fundamentals therefore explained the clear upward trend.

In the short and medium term, the European gas market remains tight. While European storage levels were very high at the beginning of 2024, withdrawals were significant during the 2024/2025 gas winter due to more challenging weather conditions than the previous year. As a result, stocks reached 34% of their maximum level across Europe on April 1, 2025 compared with 59% a year earlier. The use of storage facilities notably helped offset the decline in LNG imports combined with the increase in consumption within the EU at the end of the year, although consumption remained significantly below its pre-crisis level. The additional demand linked to the replenishment of stocks by November 1, 2025 therefore contributes to supply tensions and could fuel a rebound in LNG imports.

Figure 4 : Global month-ahead gas prices

Sources: EEX, Argus

Figure 5 : Day-ahead and year-ahead gas prices at the TTF



Source: EEX

Finally, the structure of the forward curve on European natural gas markets has changed. In particular, 2024 saw spot and forward prices at the TTF converge. Whereas in 2023, following the crisis, the day-ahead product at the Dutch virtual point was trading at a significantly lower price than the Y+1 calendar product, it caught up with and then surpassed the latter at the end of 2024. This situation, in which spot prices exceed forward prices, known as *backwardation,* is generally associated in commodity markets with temporary supply difficulties. It therefore reflects expectations of a tight market in the short term, although participants anticipate a gradual easing in the medium to long term, as new supply projects are expected to come online and the geopolitical situation might stabilize.

2. Trends in supply and demand in France in 2024

2.1. Overview of commercial flows in the French system

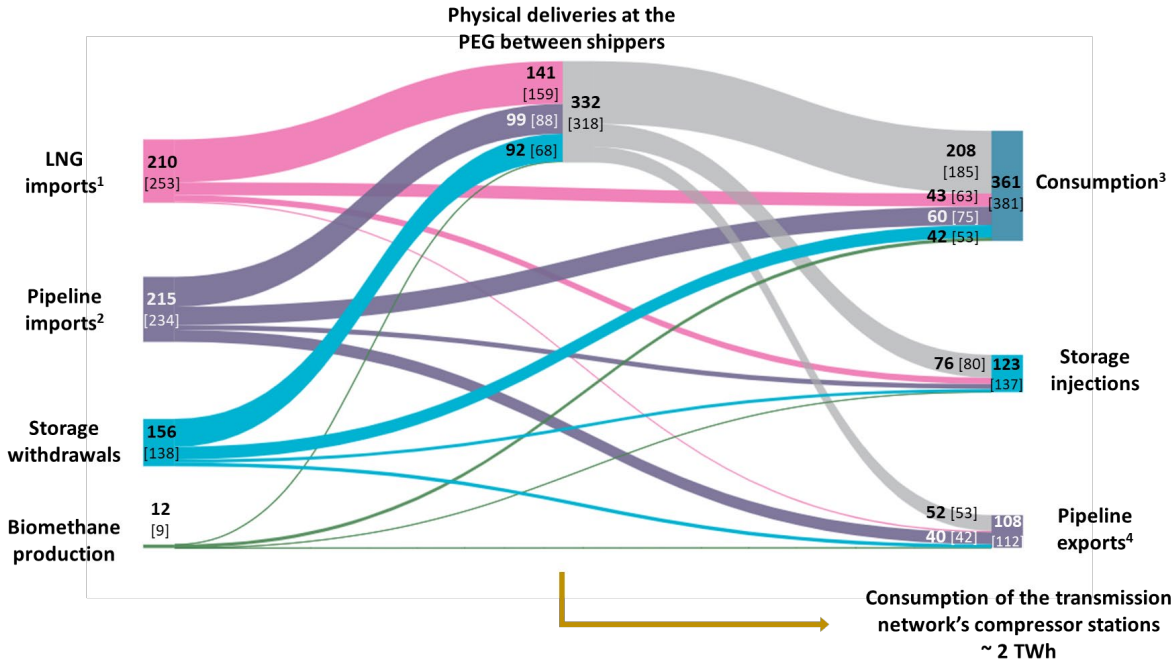
Continuing the change in the structure of French supply observed in 2022, the share of LNG in total imports remained high in 2024. However, it fell for the first time since the energy crisis, standing at 49% (compared with 44% in 2022 and 52% in 2023), while imports via gas pipelines accounted for 51% of the total (compared with 56% in 2022 and 48% in 2023).

Unlike the previous two years, withdrawals from storage significantly exceeded injections in 2024 (by 33 TWh). They thus accounted for 26% of total French supplies in 2024 (compared with 22% in 2023).

Biomethane production injected into the network continued to increase in 2024, reaching 11.8 TWh (+26% compared to 2023), amounting to 3.2% of French consumption.

Through its significant exports, France confirmed its role as a hub for LNG arrivals in Europe. In 2024, for the third consecutive year, it was the leading entry point for LNG on the continent. Despite the decline in domestic deliveries, the five terminals on French territory covered 24% of European LNG imports, compared with 22% last year.

Figure 6 : Balance of injections and withdrawals in the French gas system in 2024 [2023] (commercial flows)



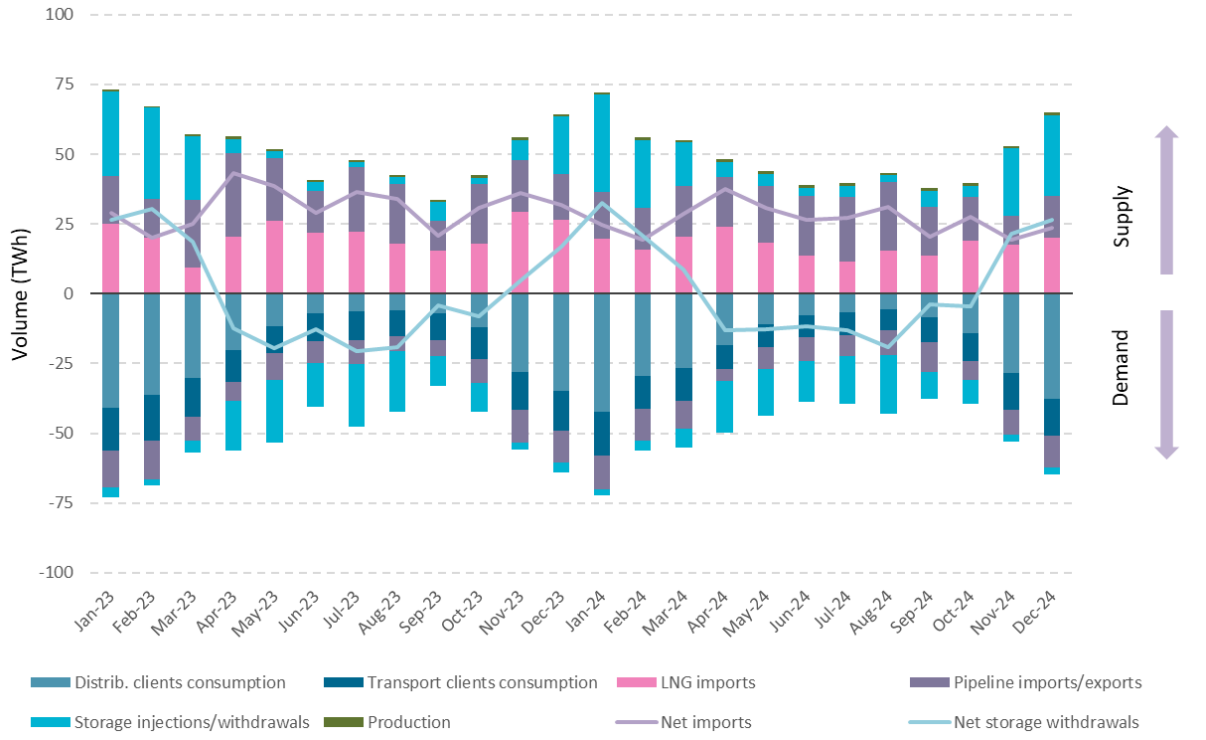
Sources: NaTran, Teréga, ODRE – Analysis: CRE

For a clear understanding of this graph, certain conventions should be clarified:

- LNG imports (1) do not include LNG received at the Dunkirk regasification terminal for direct delivery to the Belgian network [approximately 60 TWh in 2024];
- imports via gas pipelines (2) include imports of L-gas via the Taisnières B interconnection point [15 TWh in 2024];
- gas exports via pipeline (4) include exports at the PIRRs (interconnection points on the regional transmission network) [10 TWh in 2024].

When considering the physical flows, as organized by the transmission system operators (TSOs), along with LNG for direct delivery to the Belgian market, some commercial flows offset each other, resulting in withdrawals from storage reaching 133 TWh, injections totalling 101 TWh, imports amounting to 443 TWh, and exports standing at 125 TWh.

Figure 7 : Monthly balance of the French system in 2023 and 2024 (commercial flows)



Sources: NaTran, Teréga, ODRE – Analysis: CRE

2.2. French consumption down for the third consecutive year due to reduced use of gas-fired power plants

As every year since 2022, France's annual natural gas consumption fell in 2024. It stood at 361 TWh, compared to 479 TWh before the energy crisis in 2019, 430 TWh in 2022 and 381 TWh in 2023. The decline compared to 2023 is mainly attributable to the lower share of gas-fired power plants in electricity generation.

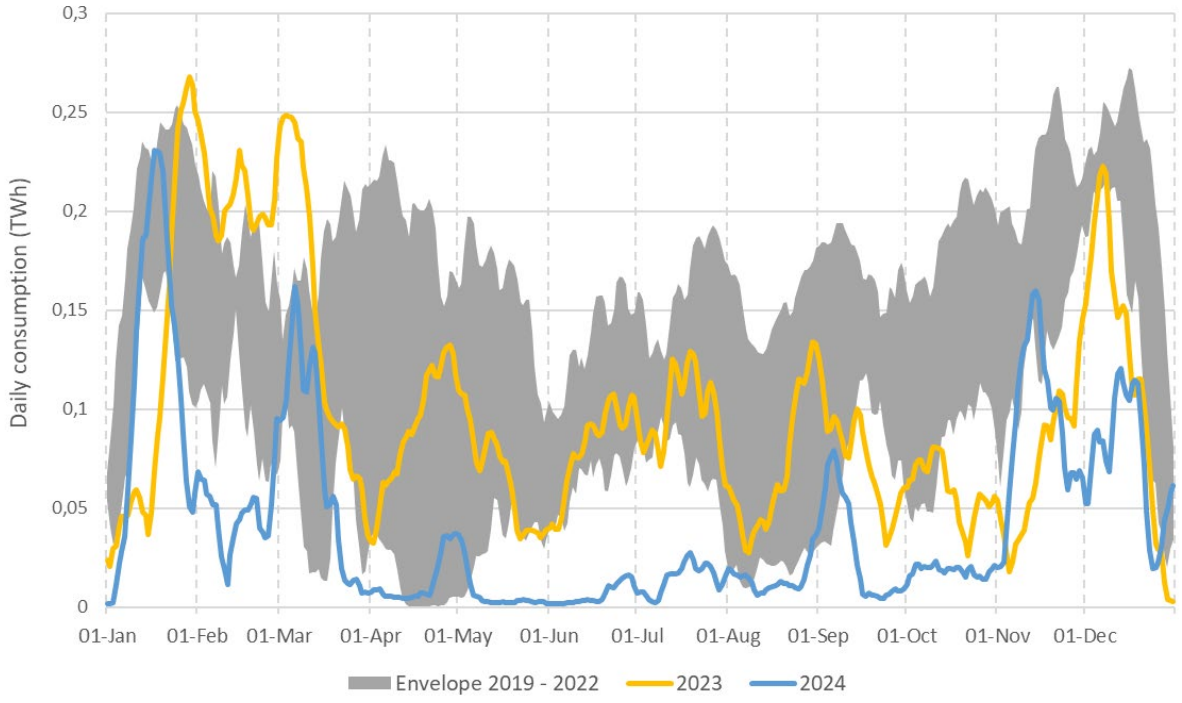
Despite less favorable weather conditions, the annual consumption of customers connected to the distribution network (residential/commercial sector) as well as the consumption of those directly connected to the transmission network (industrial sector) remained stable in 2024. After adjusting for climate, the consumption of customers connected to the distribution network decreased by 1.4% between 2023 and 2024.

Table 2 : Evolution of French natural gas consumption between 2023 and 2024 [TWh]

	2023	2024	%
Distribution networks[28]	237	235	**-0.6%**
Customers directly connected to the transmission network (excluding gas-fired power plants)	109	109	**+0.8%**
Gas-fired power plants	36	16	**-56%**
Total consumption	**381**	**361**	**-5.5%**

Source: NaTran – Analysis: CRE

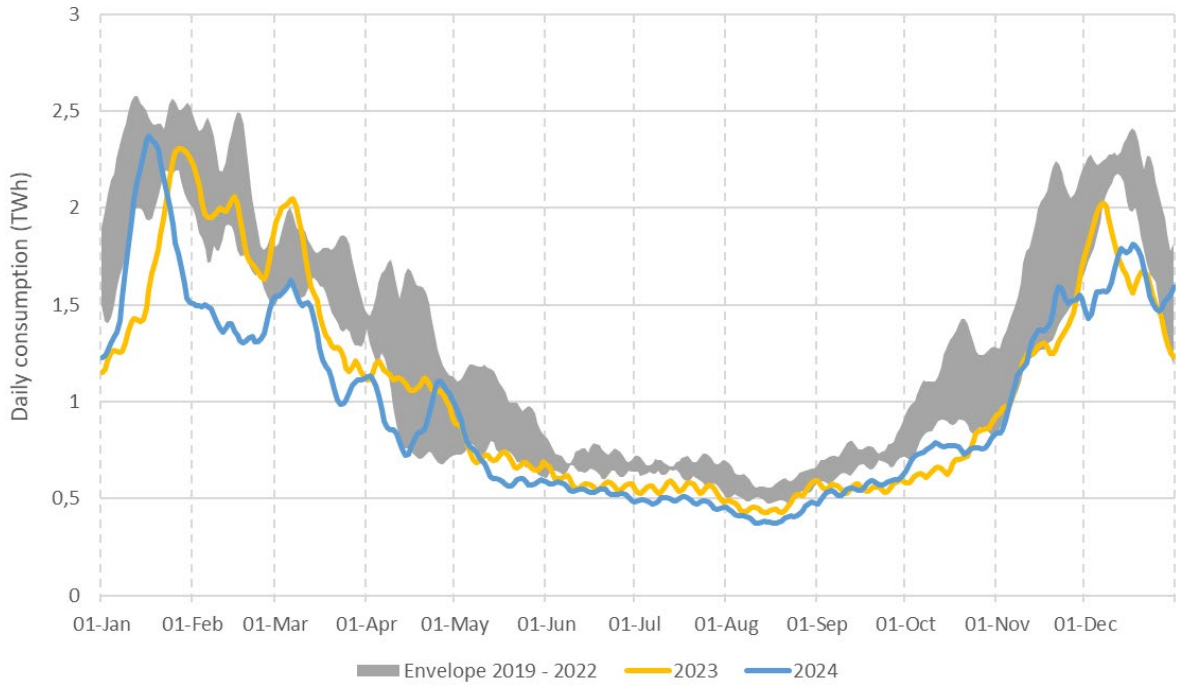
Figure 8 : Daily consumption of gas-fired power plants connected to the transmission network in France



Source: ODRE – Analysis: CRE

[28] Includes biomethane production directly injected into the distribution network and excludes deliveries to PIRRs (interconnection points on the regional transmission network), which are counted as exports by pipeline.

Figure 9 : Total daily natural gas consumption in France



Sources: NaTran, Teréga, ODRE – Analysis: CRE

The high temperatures at the end of the 2023/2024 winter brought French gas consumption to historically low levels for this period. It then returned to levels similar to those of 2023, while remaining most of the time well below the average of recent years. The effects of energy efficiency measures and efforts by all consumers to reduce their consumption in the wake of the energy crisis therefore appear to be persistent.

Consumption by gas-fired power plants remained low throughout most of the year, with the exception of occasional and moderate peaks. This situation can be explained by the very low share of thermal power plants in power generation in France in 2024. Nuclear and hydroelectric production was abundant and sufficiently inexpensive, while gas prices remained above the break-even point for thermal power plants, as dictated by daily electricity prices, for most of the spring and summer.

2.3. Gas entries to the TRF: LNG deliveries fell more than pipeline imports

The year 2022 was marked by a gradual decline in pipeline imports of Russian gas to Europe following the invasion of Ukraine. The disruption of this major supply source led to a structural reconfiguration of flows across the continent. Much of the Russian gas transported by pipeline was replaced by LNG, with a reversal of flows from west to east and from south to north. France then played an important transit role thanks to its regasification and transport infrastructure. This situation continued in 2023 and 2024.

However, for the second consecutive year, send-out from French LNG terminals fell sharply in 2024 (-17%), in line with lower demand and strong competition with Asia for LNG cargoes. In addition, the share of LNG in French imports fell to 49% in 2024, after peaking at 52% in 2023.

Total imports via pipeline also declined, but to a lesser extent, falling from 234 TWh to 215 TWh between 2023 and 2024 (-8%)[29]. The decline in imports from Spain was partially offset by an increase in imports from Norway. Exports also fell slightly, from 112 TWh in 2023 to 108 TWh in 2024 (-3%). In this context,

[29] These figures reflect commercial flows and exclude exports corresponding to LNG received at Dunkirk for direct delivery to the Belgian network (approximately 60 TWh in 2024).

the pattern of flows between France and its neighboring countries continued to evolve. However, the bidirectionality of flows with Spain and Belgium persisted in 2024, providing favorable conditions for price convergence between the different market areas.

Germany, which exported 71 TWh of natural gas to France in 2021, has been a net importer at the Obergailbach interconnection point since October 2022. However, the volumes involved fell by two-thirds compared with 2023, from 9 TWh to 3 TWh in 2024. This decline occurred in the context of a general reduction in flows at the German borders, offset by significant withdrawals from storage throughout the year.

Belgium reduced its net exports to France in 2024, from 38 TWh in 2023 to 28 TWh[30]. L-gas exchanges accounted for 54% of these net flows.

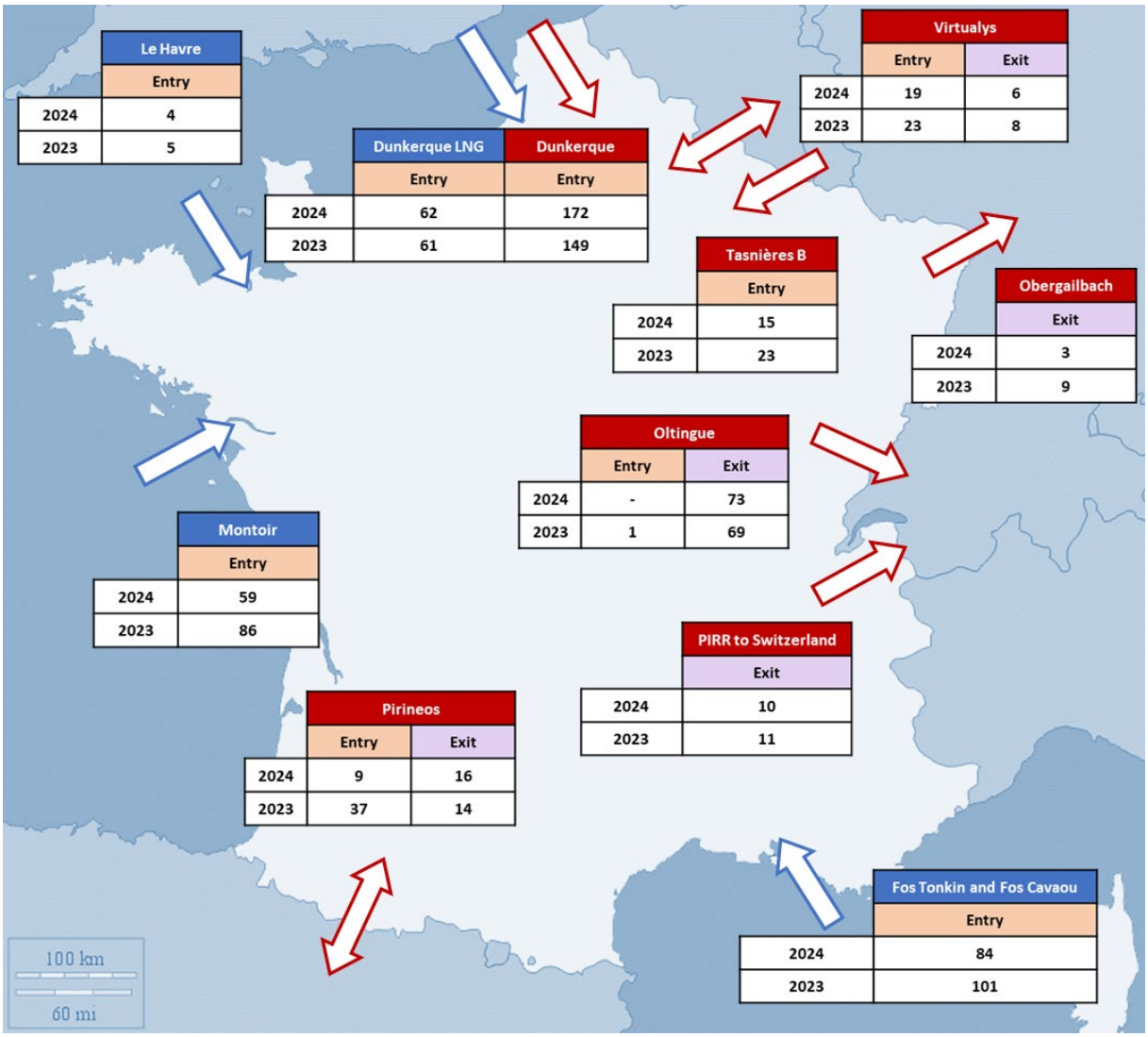
While Spain was a net exporter to France in 2023, with 23 TWh, it imported a total of 7 TWh at the Pirineos interconnection point in 2024. This reversal coincides with a sharp decline in LNG deliveries to the Iberian Peninsula. Its substantial regasification capacity had transformed it into an entry point for LNG in Europe in 2022, but the development of infrastructure in other countries on the continent and competition with Asia limited inflows to its LNG terminals in 2024.

Switzerland, which also acts as a transit point to Italy, with which the French network has no interconnection, continued to import massively from France, reaching 83 TWh in 2024.

Finally, Norwegian gas imports at the Dunkirk interconnection point rose by 15% between 2023 and 2024, from 149 TWh to 172 TWh. This increase participated in offsetting the decline in LNG inflows and imports from France's neighboring countries.

[30] *Same as the above footnote.*

Figure 10 : Use of interconnections and LNG terminals (commercial flows) [TWh]

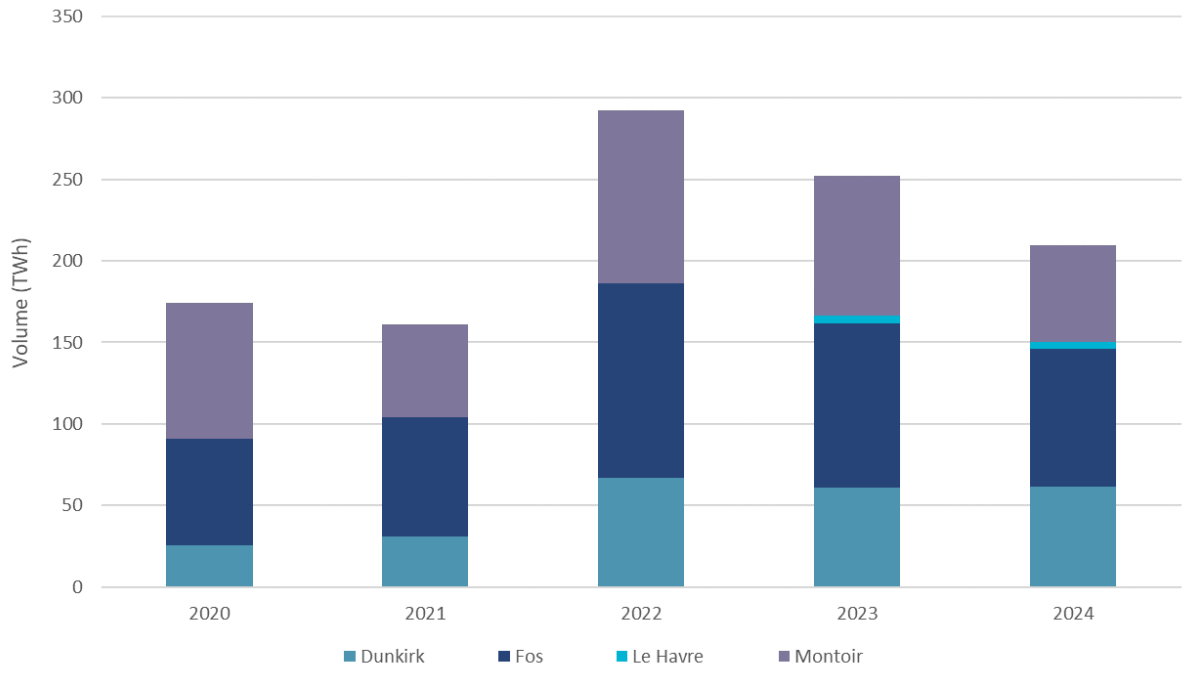


Sources: NaTran, Teréga – Analysis: CRE

The decline in LNG imports also led to lower utilization levels on French LNG terminals compared to 2023 (Figure 10 and Figure 11), as in the rest of Europe. These terminals injected 50% of their aggregate theoretical maximum capacity into the TRF network in 2024, compared with 65% in 2023 and 80% in 2022. The utilization rates for 2024, 2023, and 2022 stand at 50%, 68% and 84%, respectively, when considering only the three regulated LNG terminals of Fos Tonkin, Fos Cavaou, and Montoir-de-Bretagne. The FSRU in Le Havre, which came into service in 2023, has not received a single shipment since July 2024. However, these utilization rates remain higher than their pre-crisis level, when they were around 40%.

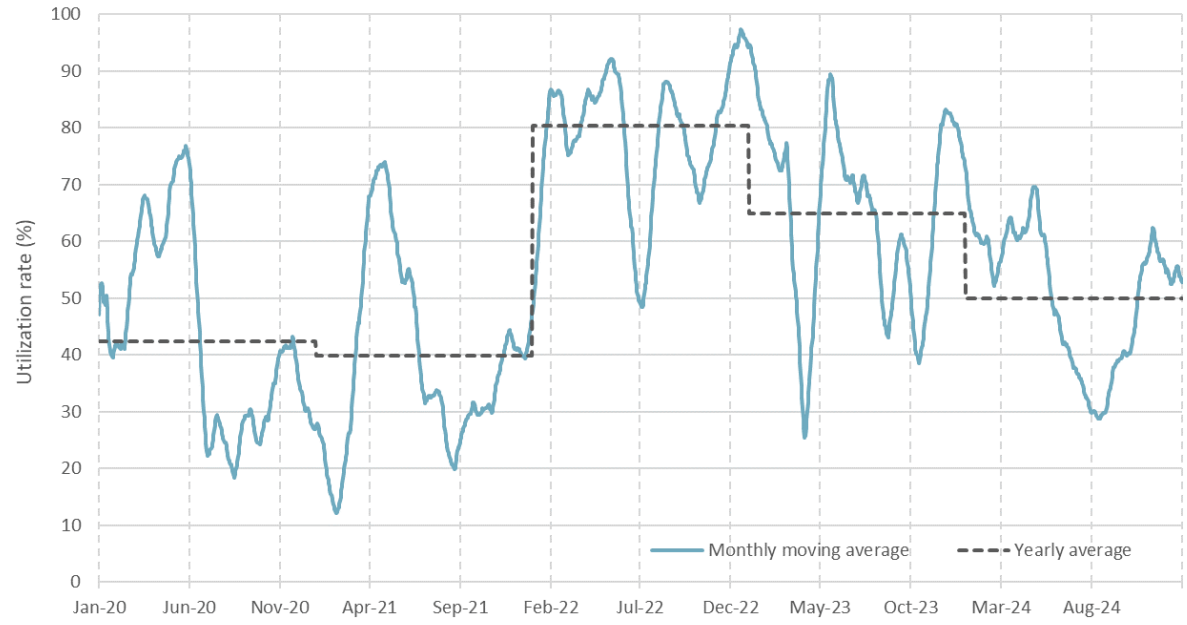
The very low freight costs in 2024 also facilitated the redirection of cargoes, particularly from the US to Asia, thereby contributing to the decline in LNG imports to France. As the increase in LNG shipping capacity exceeded the increase in export capacity, LNG carriers operated at very low prices in 2024, especially at the end of the year.

Figure 11 : Send-out from French LNG terminals



Sources: NaTran, Teréga, ALSI – Analysis: CRE

Figure 12 : Utilization of French LNG terminals compared to their regasification capacity[31]



Source: ALSI – Analysis: CRE

[31] The theoretical maximum capacity considered here corresponds to the aggregated regasification capacity of French LNG terminals. However, other limiting factors (unloading and storage capacities) may restrict send-out, leading to a lower maximum capacity in practice.

2.4. Storage facilities were heavily used during the 2024/2025 winter

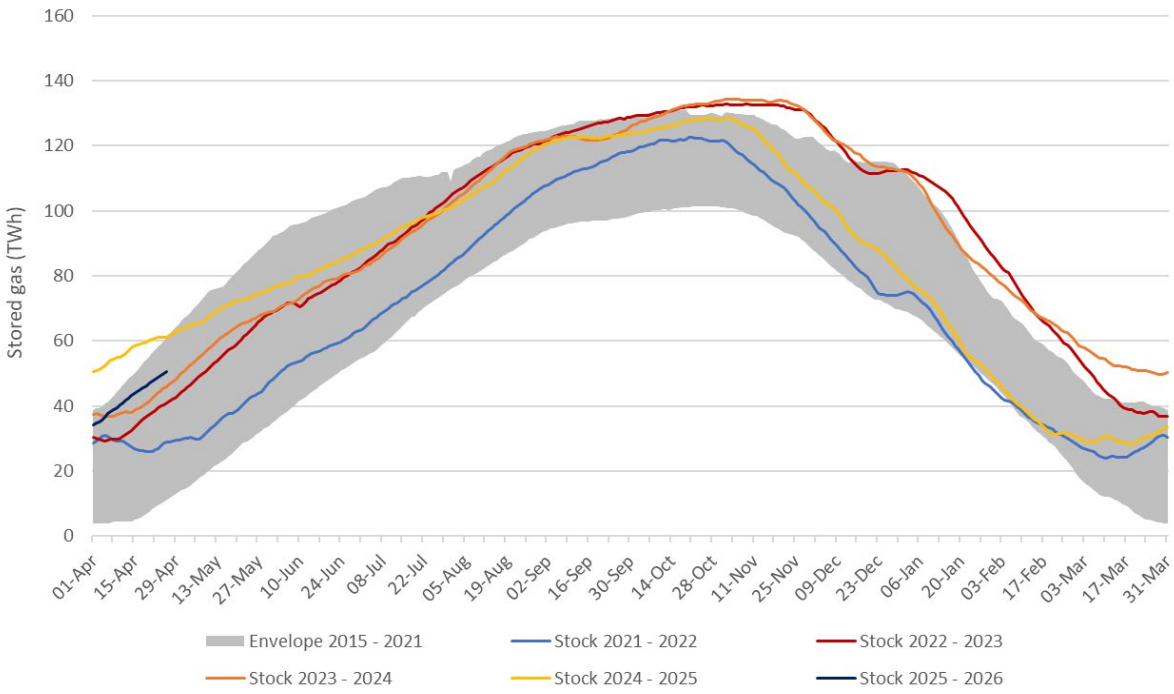
As a result of the very high temperatures at the end of the 2023/2024 winter, French storage facilities entered spring at a historically high level: on April 1, 2024, French stocks stood at 51 TWh of natural gas, or 39% of their maximum capacity, compared with 28% on the same date in 2023 and 20% on average between 2015 and 2022.

Their filling over the summer of 2024 progressed at a slightly slower pace than in previous years, reaching 95% on November 1, 2024, namely 5 percentage points above the regulatory threshold of 90%. In 2022 and 2023, this figure was close to 100%.

Due to high consumption in November, rising prices and supply tensions, withdrawals were high from the beginning of winter 2024/2025. Gas-fired power plant consumption for electricity generation peaked during this period, in the context of the *Dunkelflaute*, which significantly reduced renewable energy production in Germany.

Withdrawals from French storage facilities thus reached 116 TWh between November 1, 2024 and March 31, 2025 (95 TWh net of injections), compared with 102 TWh the previous winter (84 TWh net of injections), leaving stock levels at 27% of their maximum capacity on April 1, 2025. Although this figure is significantly lower than last year, it remains high compared to historical data.

Figure 13 : Stock levels in France by gas year



Source: AGSI – Analysis: CRE

2.5. The locational spread mechanism was used much less in 2024

The locational spread was introduced in France in winter 2017/2018 to manage congestion on the French gas network. It allows transmission system operators to call on market participants to buy and sell gas at specific points on the network, respectively upstream and downstream of the congestion.

Historically, congestion mainly occurred in the direction of the predominant flow: north to south. The tensest period on the network was the gas summer (April-October), characterized by shippers' injections into storage facilities in anticipation of the following winter. As summer is a period of low national consumption, the main gas outflows from the French network corresponded to injections into the Atlantic and Lussagnet storage facilities and transit flows to Spain, all three of which are located in the south of the network, thus causing north-south congestion.

From the end of 2022, in the context of the reconfiguration of gas flows in Europe linked to the halt in Russian gas supplies via pipeline, numerous instances of congestion, all in the south-north direction and almost exclusively during gas winters, led to the sustained use of locational spreads. During the winter of 2022/2023 in particular, the redirection of significant Norwegian gas flows to the United Kingdom caused a gas deficit in the north of the TRF, resulting in a series of south-to-north congestion events across the network.

The use of the locational spread has since decreased, but the characteristics of the congestion events – their direction and the period in which they occur – persist. Since November 1, 2023, transmission system operators have used the locational spread 59 times to manage south-to-north congestion during the gas winter. It should be noted that the occurrences in January and November 2024 were mainly triggered or exacerbated by work carried out by network operators. The 17 congestion situations during the winter of 2024/2025 also occurred during significant drops in entries at the Dunkirk interconnection point (Figure 14). In early February 2025, unplanned maintenance notably led to a reduction in production from Norwegian gas fields.

Table 3: Activation of the locational spread during the last three gas winters

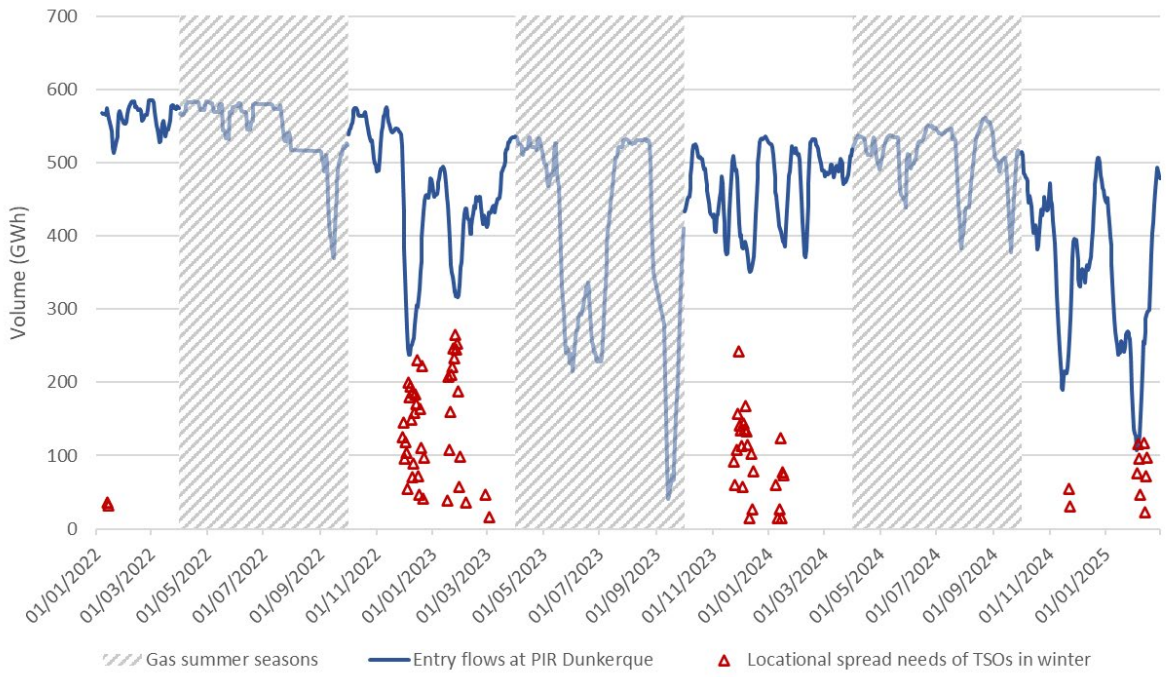
	Winter 2022 – 2023	Winter 2023 – 2024	Winter 2024 – 2025
Number of activations	110	42	17
Total allocated volume (GWh)	5,145	2,391	729
Average transaction price (€/MWh)	10.6	4	2.1
Total cost (million €)	54.6	9.6	1.5

Source: NaTran – Analysis: CRE

Annual allocated volumes have been declining since the congestion events of winter 2022/2023. They were divided by more than three between the winters of 2023/2024 and 2024/2025, while the average transaction price was halved. The total cost of these operations for network operators ultimately amounted to €1.5 million in winter 2024/2025, compared to €9.6 million in the previous winter.

The behavior and offers of market participants as part of the locational spread mechanism are subject to regular monitoring. The CRE is particularly vigilant to nominations that could have the effect of exacerbating congestion, made at the start of the day by market participants active in the locational spread mechanism.

Figure 14 : Entries at the Dunkirk interconnection point and activation of the locational spread



Source: NaTran – Analysis: CRE

3. Prices and volumes traded on the French market

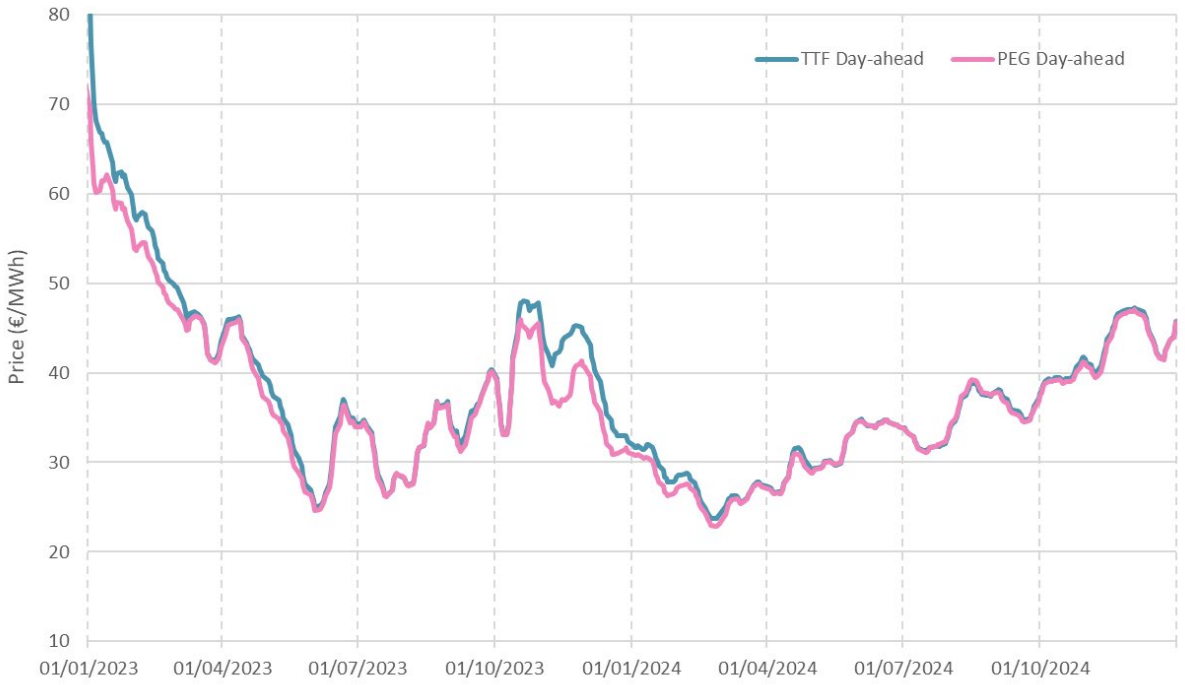
3.1. PEG prices rebounded in 2024, particularly in the short-term market

In line with the European trend, French natural gas prices began to rise again from March 2024, particularly on the spot market. At the end of February 2024, the day-ahead price at the PEG reached its lowest level since November 2022, at €22/MWh. It stood at €48.6/MWh on December 31, 2024, its highest level since October 2023.

Forward prices have also increased since February 2024, but at a slower pace than in the spot market, especially for the longer maturities (Figure 16). The Y+1 contract thus ended 2024 at €46/MWh, compared with €26.6/MWh at the end of February 2024 and €32.9/MWh at the beginning of 2024.

Despite their upward trend for most of the year, PEG prices continued to fall on an annual average basis. The average price of the day-ahead product in 2024 was €34/MWh, compared with €39/MWh in 2023. On the futures markets, the Y+1 calendar contract traded at an average of €36/MWh in 2024, €15/MWh less than in 2023. This 29% decline was also observed for Y+2 products.

Figure 15 : Day-ahead gas prices in France and the Netherlands (PEG and TTF respectively)



Source: EEX

Figure 16 : PEG forward prices

Source: EEX

The spreads between the main European hubs narrowed in 2024 for the most part. Average prices at the PEG remained below those at the TTF, THE and PSV in 2024, as in 2023, but the spreads declined across all maturities. Among the main European marketplaces, only the NBP averaged below the PEG for day-ahead products in 2024, but it remained more expensive than the PEG for futures.

In the short term, the reduction in flows between countries has limited congestion at interconnections and subsequently supported the convergence of market areas. In this context, the price difference between M+1 contracts at the PEG and TTF, the European reference price, narrowed to €0.5/MWh in 2024, compared with €1.5/MWh the previous year. It had been particularly high in the last quarter of 2023 due to the saturation of interconnections in western Europe, standing at €1.8/MWh over this period. It then gradually declined to €0.2/MWh in the second quarter of 2024. In the second half of the year, it rose again to an average of €0.3/MWh, namely three times less than the same period a year earlier. The average price difference between the corresponding day-ahead products decreased in the same proportion, by €1.4/MWh between 2023 and 2024, falling from €1.7/MWh to €0.3/MWh. Despite an increase in demand in western Europe at the beginning of winter 2024/2025, cross-border trade remained lower than the previous year, mainly due to high storage utilization in the region.

In the longer term, the development of LNG infrastructure and structurally lower consumption led to a decrease in the spreads between European hubs, which had been very high in 2022 and 2023, to the benefit of France. The average spread between Y+1 calendar products at the PEG and TTF thus narrowed from €1.7/MWh to €0.7/MWh between 2023 and 2024. This spread had reached more than €11/MWh in the second half of 2022.

The highest prices are observed in Germany and Italy, with a difference of around €2/MWh compared to France for the Y+1 calendar product.

Table 4 : Average spreads between the PEG and the main European hubs by year and maturity

		Netherlands (TTF)	UK (NBP)	Germany (THE)	Italy (PSV)
Day-ahead	2023	1.7	-0.1	2.1	4.0
	2024	**0.3**	**-0.3**	**0.6**	**2.6**
M+1	2023	1.5	0.1	2.0	1.8
	2024	**0.5**	**0.1**	**0.8**	**1.7**
Y+1	2023	1.7	1.5	3.0	2.2
	2024	**0.7**	**0.8**	**1.6**	**1.9**

Sources: EEX, Argus – Analysis: CRE

The different price dynamics depending on the maturity exacerbated the condition of *backwardation*, characterized by shorter-term prices higher than longer-term prices. In 2023, this configuration was already reflected in a downward-sloping forward curve for calendar products (Figure 16). Despite a convergence in the prices of Y+1, Y+2 and Y+3 contracts at the end of February 2024, they diverged again due to short- and medium-term supply tensions that emerged at that time. On December 27, 2024, the Y+1 contract at the PEG had a premium of €9/MWh over the Y+2 product and €16/MWh over the Y+3 product, compared with €3/MWh and €6/MWh on January 2. However, on an annual average basis, the spreads have continued to narrow since the energy crisis. In 2024, the Y+1 price at the PEG exceeded the Y+2 price by €4/MWh and the Y+3 price by €8/MWh, compared with €6/MWh and €15/MWh in 2023 and even €30/MWh and €51/MWh in 2022. The persistence of *backwardation* therefore highlights the contrast between short-term tensions and more positive market expectations regarding supply in several years.

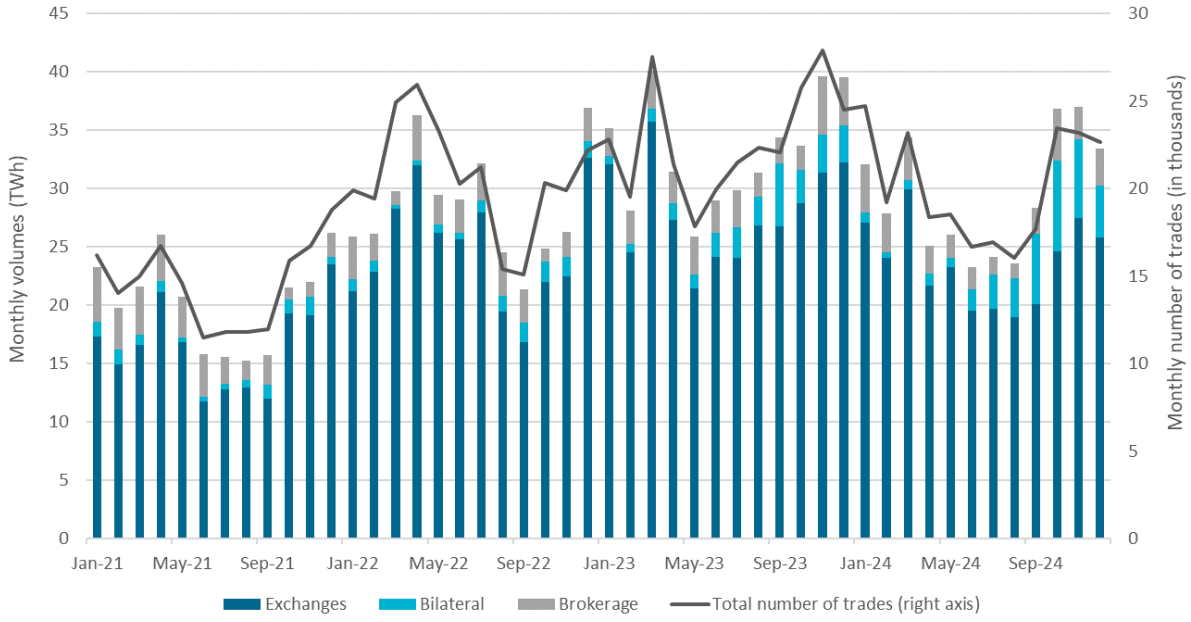
These long-term expectations are also reflected in the decline in French wholesale price volatility, which is returning to a level close to that seen before the energy crisis. This trend began at the end of 2022 and continued in 2024 (Figure 17). After several peaks in 2022, the volatility of the Y+1 calendar product at the PEG stood on average at 50% in 2023 and 36% in 2024.

Figure 17 : Volatility of the Y+1 calendar product at the PEG

Source: EEX – Analysis: CRE

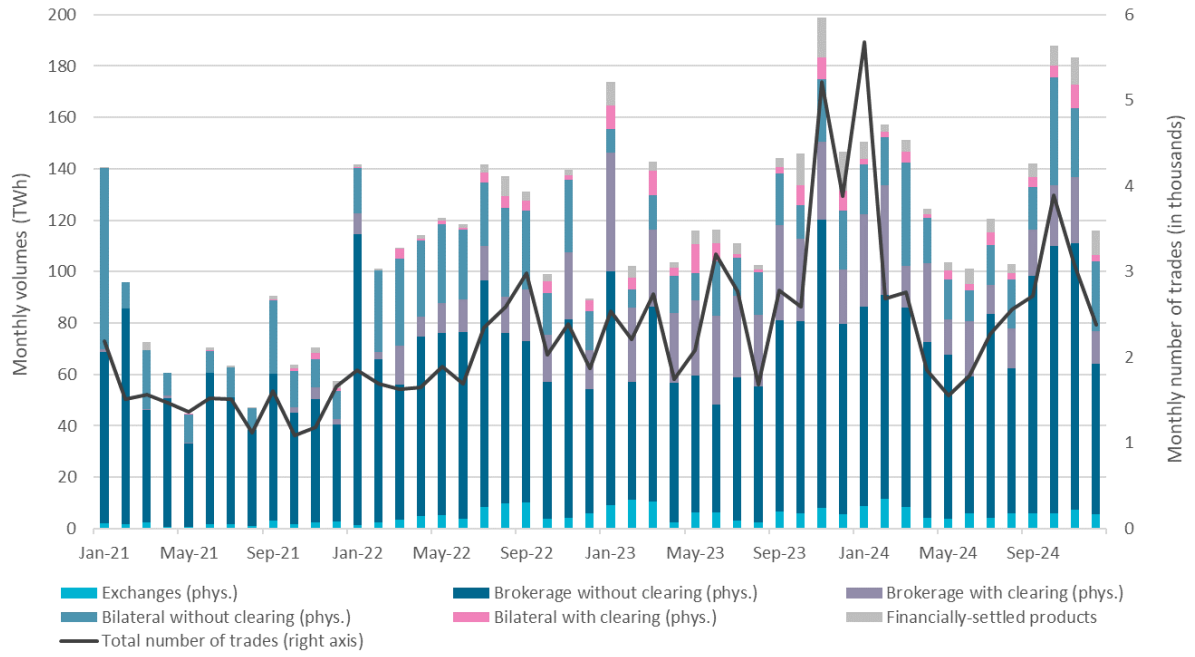
3.2. Traded volumes at the PEG are up in the forward markets and down in the spot market

Figure 18 : Traded volumes at the PEG in the spot market



Source: REMIT data – Analysis: CRE

Figure 19 : Traded volumes at the PEG in the forward markets



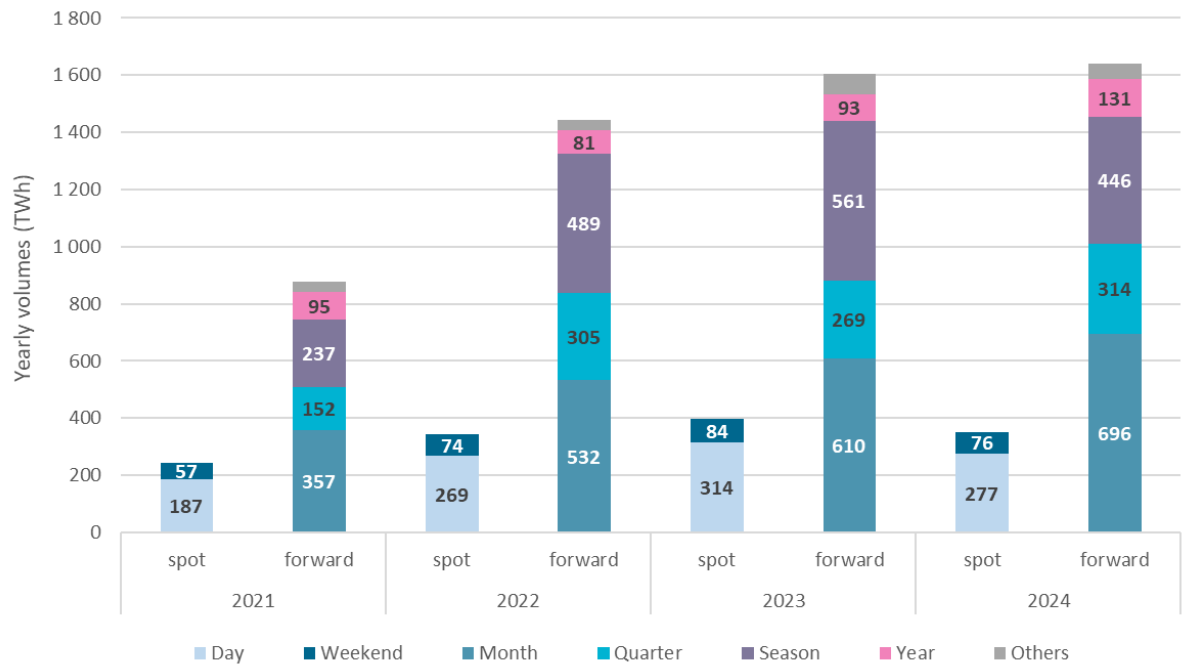
Source: REMIT data – Analysis: CRE

In 2024, traded volumes at the PEG fell very slightly compared to 2023, from 2,002 TWh to 1,994 TWh, (-0.4%). Specifically, they fell by 11% in the spot market, reflecting lower activity during the summer. Conversely, volumes rose by 2% in the forward markets. Monthly products experienced the strongest growth, followed by annual and quarterly contracts.

The characteristics of transactions at the PEG remained stable compared with previous years. In particular, the products traded continue to be predominantly for physical delivery: in the forward markets, only 4% of the volume traded in 2024 resulted in a cash settlement, compared with 5% in 2023. Furthermore, 79% of the quantities traded at the PEG in 2024 were concluded on an exchange or through a broker. This figure stood at 82% in 2023 and 78% in 2022. The same structural difference as in previous years persists regarding the use of intermediation depending on the maturity concerned: short-term products are overwhelmingly traded on exchanges and forward contracts through brokers. However, the use of clearing services for OTC transactions decreased in 2024, accounting for 21% of the total volume traded in the forward markets, down 10% compared to 2023.

Finally, the total value of trades at the PEG fell by 24% compared with 2023, in line with lower prices on average in 2024 than in the previous year. In the spot market, it reached €11 billion in 2024, compared with €15 billion in 2023 and €31 billion in 2022. In the forward markets, transactions amounted to €54 billion in 2024, compared with €71 billion in 2023 and €150 billion in 2022.

Figure 20 : Traded volumes at the PEG by product



Source: REMIT data – Analysis: CRE

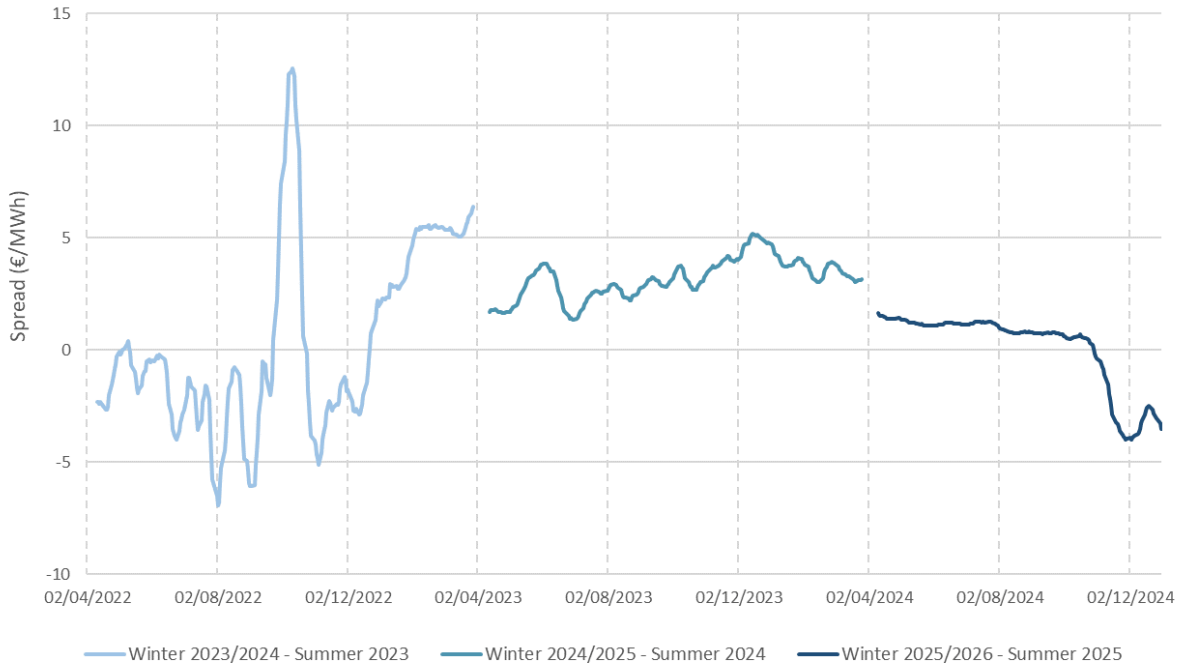
3.3. The 2024/2025 auction campaign for storage capacity was successfully conducted despite adverse market conditions

In 2023, the summer-winter spread at the PEG, which corresponds to the intrinsic value of storage in the French market area, remained high. It averaged €3.2/MWh between April 1, 2023 and March 31, 2024. These favorable market conditions enabled nearly all storage capacity for winter 2024/2025 to be subscribed at an average price of €3.5/MWh, up 46% from the previous year.

Starting after winter 2023/2024 at a lower but still positive level, the summer-winter spread fell sharply at the end of October 2024. The level of storage, down compared with the previous year, combined with the European requirement to fill storage facilities to 90% by November 1, pointed to strong gas demand during the summer of 2025. In an already tense short-term supply context, the price of natural gas for summer 2025 then rose above that of winter 2025/2026.

In January, the German market operator (THE) presented a subsidy mechanism proposed by the German government to ensure that storage facilities are 90% full by winter 2025/2026. This announcement was interpreted as a signal that German storage facilities would be filled at all costs, further driving up summer product prices and widening the already largely negative spread. Given the correlation between European hubs and Germany's storage capacity, the largest in the continent, this proposal had a major impact across European markets. The average value of the summer-winter spread at the PEG between April 1, 2024 and March 31, 2025, ultimately amounted to -0.6 €/MWh.

Figure 21 : Summer-winter spread at the PEG



Source: EEX – Analysis: CRE

Despite these unfavorable conditions, all French storage capacities for winter 2025/2026 were sold without state intervention. This result was made possible by a combination of several factors: the sales strategy of French storage operators, with early subscriptions during previous campaigns and the sale of multi-year products, the easing of the summer-winter spread at the very end of winter 2024/2025 and the absence of intervention or communication from the French government or regulator. More than half of the capacity for the coming winter had in fact been sold before the start of the last auction campaign, under better market conditions. In addition, contracts offering the possibility of reserving storage capacity over several years simultaneously proved more attractive, as the summer-winter spread was more favorable for the more distant years.

Tensions related to the regulatory environment have also eased. In March 2025, the European Commission proposed extending the gas storage regulation, while recommending introducing more flexibility based on market conditions. The filling target before the start of each winter could thus be revised downward, while the date for reaching this target could vary freely between October 1 and December 1 instead of November 1. In April, the European Parliament adopted a proposal to reduce the threshold to 83% instead of 90%, in line with the Commission's proposal for flexibility. A joint text has yet to be presented by the Parliament and the EU Council of Energy Ministers.

Table 5 : Prices and volumes of storage capacity auctions by campaign and maturity

Auction campaign	Capacity auctioned (TWh)					Average auction price per campaign
	2024	2025	2026	After 2027	**Total**	
Before 2023	87	33	5	3	**127**	2.3
2023/2024	44	41	18	-	**102**	3.4
2024/2025	-	52	22	14	**87**	0.1
Total	**131**	**126**	**44**	**17**	**317**	**2.1**
Average auction price per maturity	3.5	1.1	1.2	0.5	**2.1**	*(€/MWh)*

Sources: Storengy, Teréga (figures as of May 23, 2025) – Analysis: CRE

The auction prices for the 2024/2025 campaign for storage capacity reflect these difficult market conditions. They averaged €0.1/MWh (across all maturities), compared with €3.4/MWh last year. However, the early sale of a large portion of the 2025/2026 winter capacity helped to smooth prices, so that the average auction price for this maturity ultimately amounted to €1.1/MWh (across all auction campaigns).

4. Overview of wholesale natural gas markets in France in 2024

2024 was a year of consolidation following the 2022 energy crisis. On average, prices were lower in 2024 compared to 2023 and therefore much lower than the levels reached during the crisis. Volatility also continued to decline and appears to be stabilizing at levels close to the pre-crisis situation. A significant expansion of the global LNG supply is expected in the coming years, leading to a substantial decline in forward prices for the next few years (forward prices for 2027 at the PEG remained below €30/MWh for almost the entire year 2024).

In this context of expected growth in supply and falling prices, European prices reached a low at the end of February 2024 (the Y+1 contract at the PEG stood at €26.6/MWh on February 23, 2024). Some supply tensions then emerged and delays were announced on LNG production projects, contributing to a bullish trend during the rest of the year, with the 2025 calendar contract ending the year at €46.2/MWh, still well below 2022 levels.

French consumption reached 361 TWh in 2024, down 5.5% compared to 2023, due to the lower use of gas-fired power plants for electricity generation, while consumption by other customers remained relatively stable (+0.8% for industrial customers connected to the transmission network and -0.6% for customers connected to the distribution network). Storage facilities were used more in 2024, covering 26% of supplies, compared with 22% in 2023. Total imports via gas pipelines fell from 234 TWh in 2023 to 215 TWh in 2024 but included a 23 TWh rise in imports from Norway to Dunkirk, due to arbitrage decisions favoring deliveries to France. This increase partially offset a 28 TWh decrease in imports from Spain, in a context of declining LNG arrivals in Europe.

LNG imports fell in France as well as in Europe, with the utilization rate of French terminals relative to their maximum capacity dropping from 65% in 2023 to 50% in 2024. Yet, France remained the leading entry point for LNG in Europe for the third consecutive year in 2024, thus contributing to European supply through its regasification and transport capacities: its five LNG terminals accounted for 24% of European LNG imports over the year, and its exports, slightly down compared to 2023, remained high.

The decline in LNG imports, along with increased use of storage facilities, contributed to a reduction in cross-border trade. As a result, congestion events on the French network were much less frequent in 2024 than in previous years, although their characteristics persisted: in particular, they have been consistently in the south-north direction since the reconfiguration of European flows in 2022. The

reduction in flows with neighboring countries and, consequently, congestion at interconnections supported convergence between European hubs, with the corresponding spreads narrowing in 2024 for all maturities. In the forward markets, this phenomenon is also linked to the development of regasification infrastructure across the continent, allowing European countries to diversify their sources of supply. However, French prices remained among the lowest in Europe due to the TRF's position as an entry point for LNG in the continent.

Volumes traded in the forward markets for delivery in France continued to grow, rising by 2% in 2024 compared with 2023, while volumes traded in the spot market fell by 11%, mainly due to lower LNG imports. Overall, the volumes traded were stable compared to 2023, with no significant change in the distribution of the different types of transactions.

Following winter 2024-2025, the market remains relatively tight due to the demand linked to the replenishment of French storage facilities by winter 2025-2026. Their high utilization during the 2024-2025 winter left them at a lower level than the previous year at the beginning of the gas summer: they contained 27% of their maximum capacity on April 1, 2025, compared with 39% on April 1, 2024.

The prospect of regulatory easing and the sales strategy of French storage operators enabled the complete subscription of storage capacity for the coming winter, without state intervention, unlike in Germany and Italy, despite difficult market conditions, marked by a reversal of the price spread between summer and winter during part of the auction campaign.

SECTION 3: WHOLESALE ELECTRICITY MARKETS

1. Trends in supply and demand in France in 2024

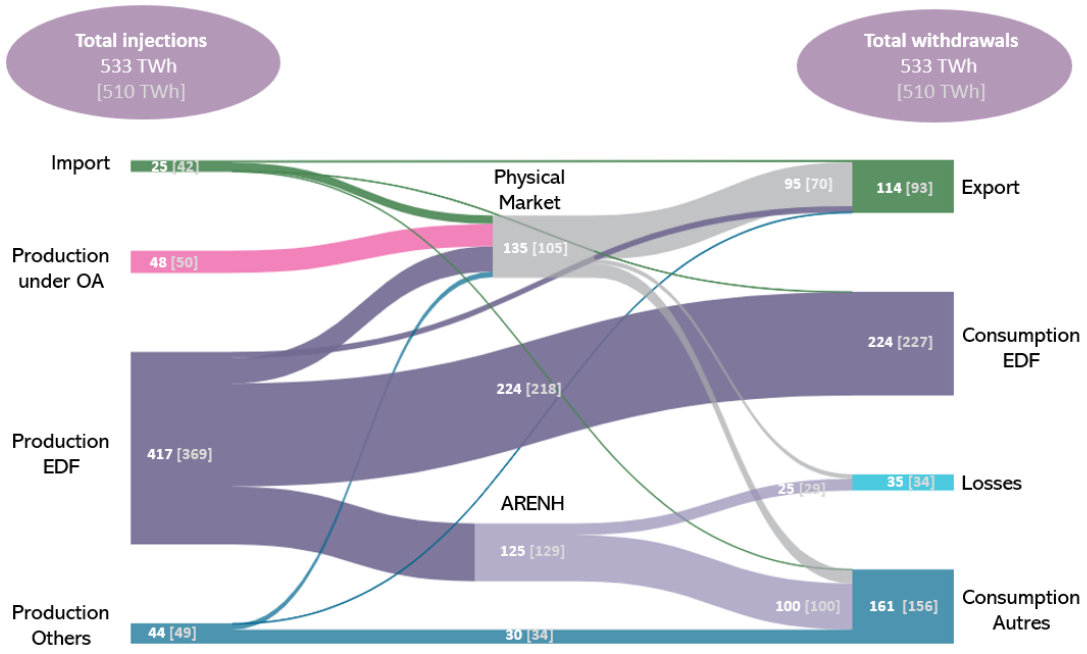
1.1. Balance of the French electricity system: injections into the grid and exports increase significantly, consumption stagnates

During 2024, the French electricity system has seen production return to its pre-crisis level of 2019. This increase in production, combined with stable consumption following the decline of recent years, has led to record levels of exports.

Figure 22 presents a simplified view of physical flows for 2024 in the French electricity system. This diagram incorporates several assumptions that need to be clarified for a full understanding:

- the balance includes only the flows recorded by balance responsible entities, not purely financial flows;
- the physical market includes the day-ahead and intraday markets operated by EPEX SPOT and Nord Pool, as well as block exchange programs between balance responsible parties, reflecting OTC (Over-The-Counter) physical delivery transactions;
- the link between each item in the balance is made proportionally to the supply of each balance responsible party for each time period;
- the figures relating to imports and exports refer to commercial exchanges recorded within the scope of the balance responsible parties at different maturities, and do not correspond to net physical exchanges at the borders (net balance, however, is the same);
- unlike other sources of production and consumption data used in this report, Corsica is not included, and the self-consumption of production auxiliaries and pumping from pumped storage facilities (STEP) are not considered.

Figure 22 : Balance of injections and withdrawals by balance responsible parties in 2024 [2023] (TWh)



Source: RTE, Analysis: CRE

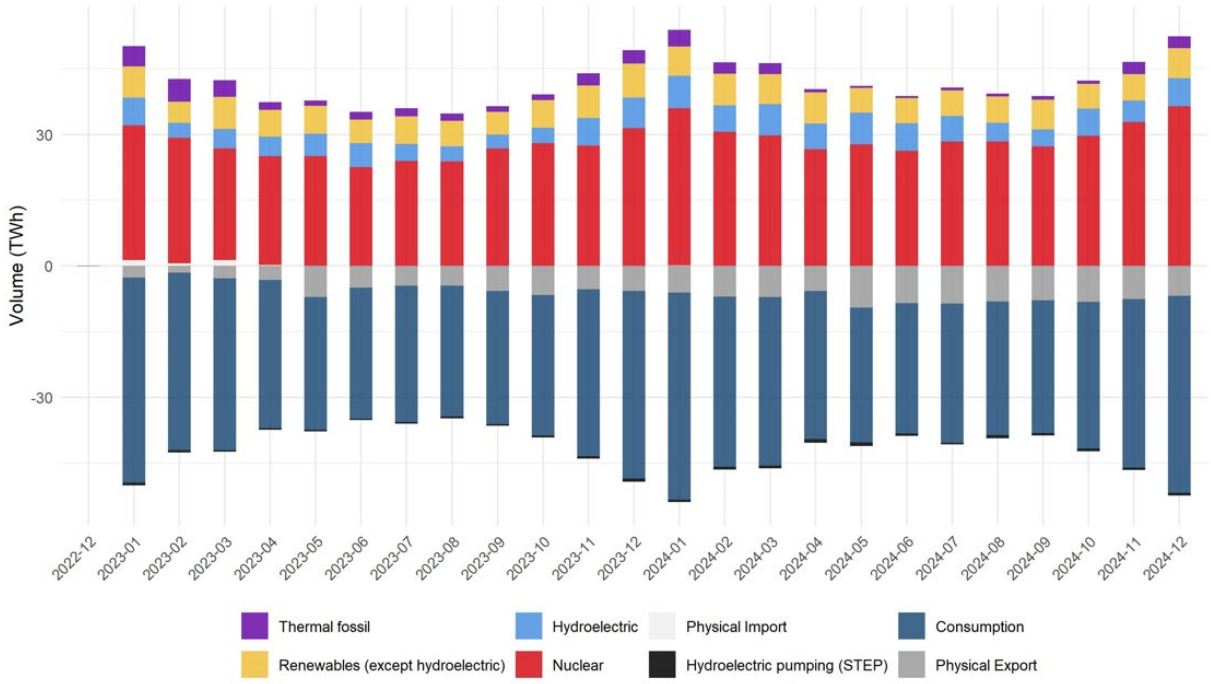
Injections into the grid increased significantly (+4.5%) between 2023 and 2024, rising from 510 TWh to 533 TWh.

ARENH[32] subscriptions for delivery in 2024 decreased slightly to 125 TWh (including 25 TWh to cover network losses, 29 TWh in 2023). The 100 TWh cap for end-customer suppliers was reached.

A significant portion of EDF's power generation does not go through the wholesale market: 54% is for EDF customers and 24% goes directly to other suppliers via ARENH. 13% of EDF's production is sold on wholesale markets (+10% compared to 2023), 5.9% goes to cover network losses and 3.1% directly to exports.

Power generation in France increased significantly (+43 TWh compared to 2023, +89 TWh compared to 2022), due to increased availability of nuclear power plants, improved hydroelectric production and growth in other renewables. As a result, the export trade balance at the borders in 2024 is 89 TWh, well above the previous record of 77 TWh set in 2002.

Figure 23 : Monthly balance of the French electricity system in 2023 and 2024 (physical flows)



Source: RTE – Analysis: CRE

Figure 23 shows the monthly balance of physical flows on the French grid in 2023 and 2024. The increase in exports over these 24 months is clearly visible.

1.2. Consumption stabilises in 2024

In 2024, electricity consumption halted its decline of recent years and saw a slight increase. However, it remains well below the levels observed before the crisis.

Electricity consumption in France stood at 440.6 TWh in 2024, representing a slight increase of 0.7% (+3 TWh) compared to 2023. We can observe the same trend also when accounting for climate variability. This level remains well below the average for the 2014-2019 period, with a decline of 6%, or approximately 35 TWh less.

[32] Regulated Access to Historic Nuclear Electricity (ARENH) is a mechanism that came into force on July 1, 2010, requiring EDF to sell part of its nuclear electricity to alternative suppliers at regulated prices of €42/MWh in 2023.

The slight increase compared to 2023 is mainly due to the increase in consumption by large industries, which grew by 2.4% compared to 2023.

Table 6 : Annual gross electricity consumption (TWh)

Year	2017	2018	2019	2020	2021	2022	2023	2024
Consumption (TWh)	481.1	477.2	472.0	448.5	471.5	453.9	438.5	442.3

The persistent decline compared to the 2014-2019 period results from a combination of factors. Rising electricity prices and ongoing energy-saving efforts during the energy crisis have entrenched new behaviours. Moreover, the energy efficiency gains achieved over the last decade has also an impact.

As depicted in Figure 24 , the difference compared to previous years is more pronounced during the winter, when heating accentuates the effect of energy savings.

Figure 24 : Consumption in France (weekly average)

Source: RTE – Analysis: CRE

1.3. Power generation rises and exceeds 2019 levels

Power generation in France grew strongly in 2024, reaching 539.0 TWh, an increase of 9% (+44.3 TWh) compared to 2023. This level exceeds the average for the 2014-2019 period, which was 537.5 TWh. This growth is mainly due to the recovery of nuclear production, which reached 361.7 TWh, mainly due to progress in maintenance and stress corrosion control, as well as increased hydro and solar production.

Table 7 : Total annual power generation (TWh)

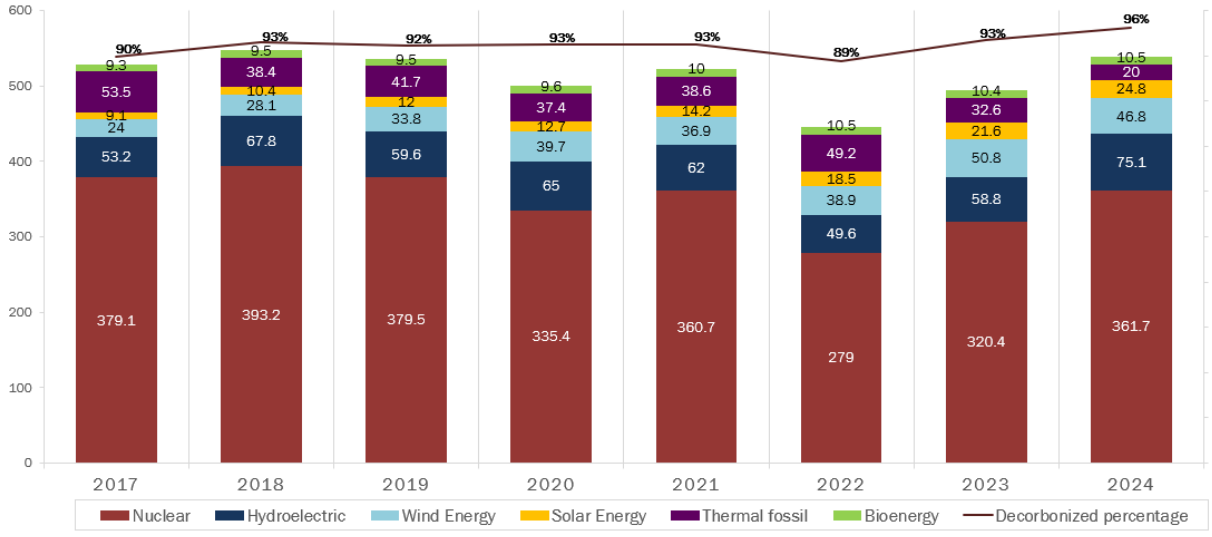
Year	2017	2	2	2	2021	2022	2023	2024
Production (TWh)	528.3	547.6	536.1	499.7	522.4	445.8	494.7	539.0

Source: RTE

Power production from fossil fuels fell to its lowest level since 1952, down 12.6 TWh compared with the previous year. The share of carbon-free production hit a record high of 96%. The French electricity fleet expanded significantly, with 154.9 GW installed at the end of 2024, driven by a strong growth in solar photovoltaic installations and, to a lesser extent, wind power.

Hydropower included in total production (Table 7) is gross of consumption related to pumping.

Figure 25 : Annual power generation by energy source (TWh)



Source: RTE – Analysis: CRE

1.3.1. Nuclear production returns to pre-crisis levels

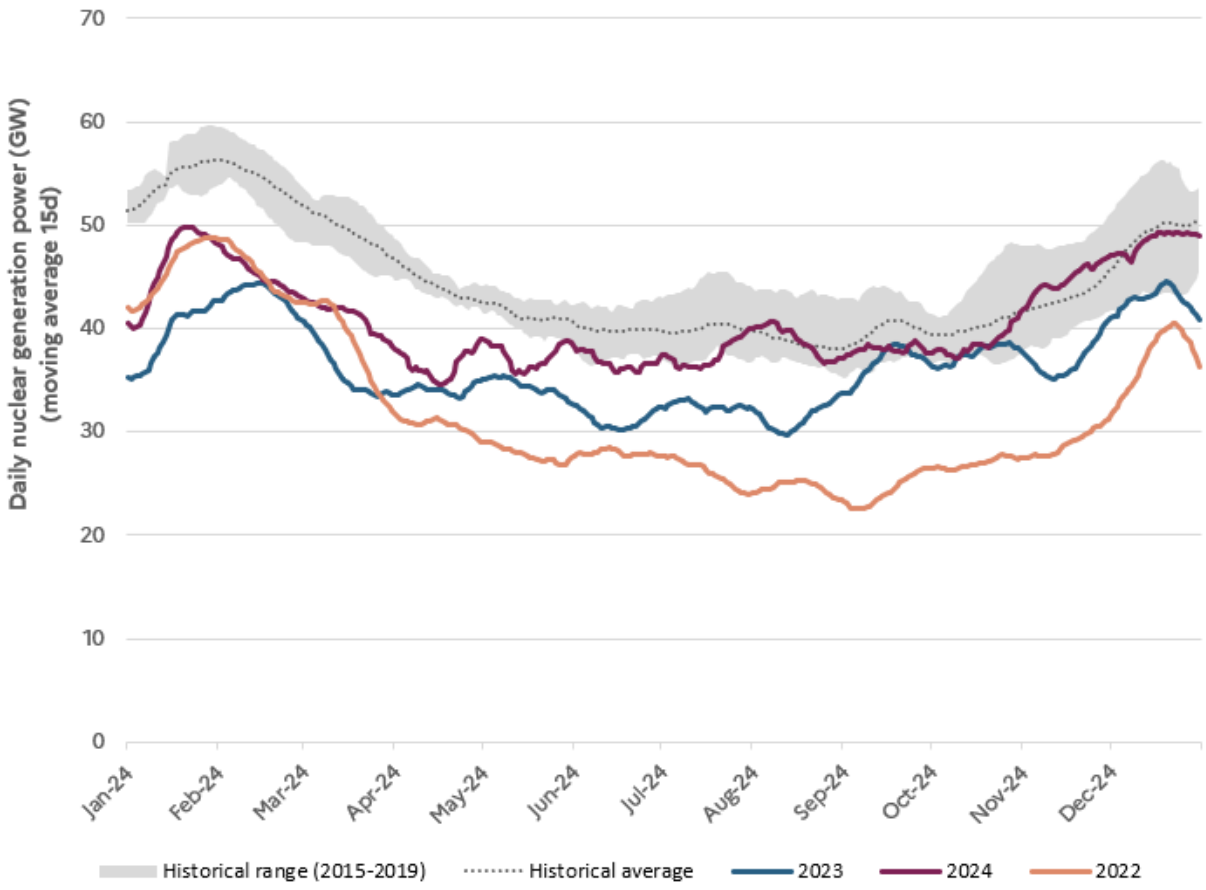
Nuclear production

In 2024, nuclear production in France recorded a strong recovery, reaching 361.7 TWh, an increase of nearly 13% compared to 2023, when production was 320.4 TWh, already up 15% compared to 2022. This was because 2022 had been severely affected by stress corrosion in many reactors. Nuclear production in 2024 returned to the level reached in 2021 (+1 TWh).

Figure 26 shows nuclear production for 2022, 2023, and 2024, as a daily average smoothed over 15-day periods, and the historical tunnel for the years between 2015 and 2019 for comparison.

The Flamanville EPR reactor was connected to the grid on December 21, 2024. The reactor will remain in the test phase for several months until it enters commercial service. With a capacity of 1,620 MW, it will be the most powerful reactor in France and also the largest power generation facility in Europe.

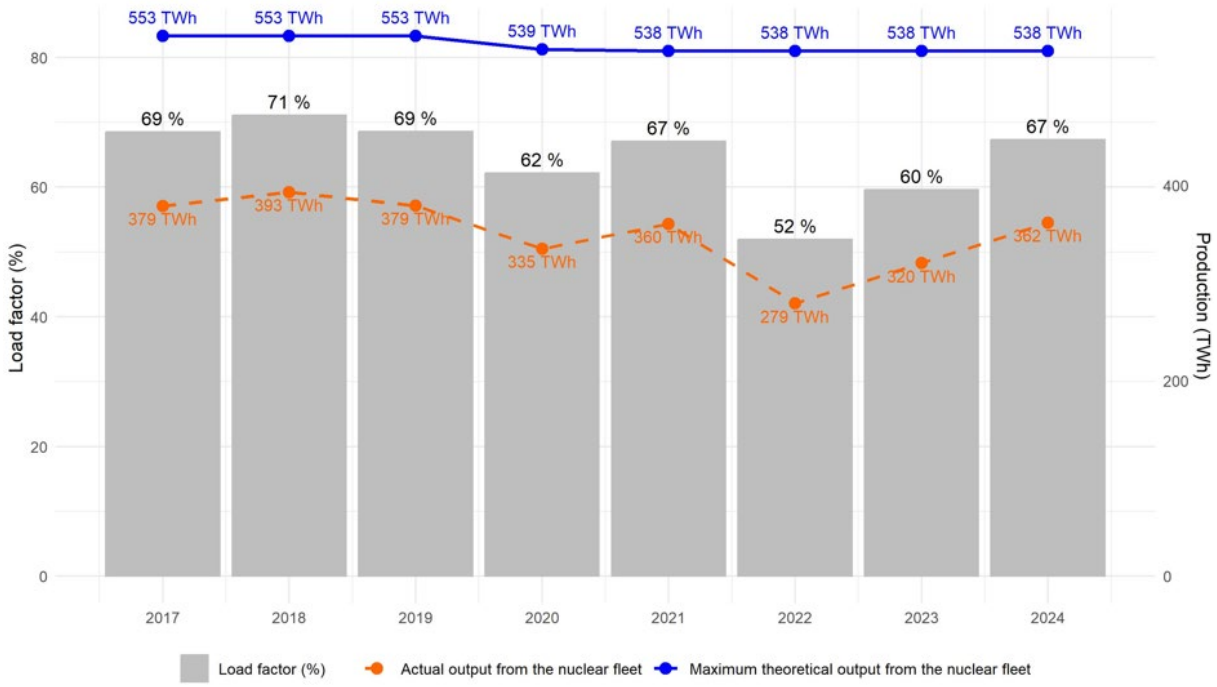
Figure 26 : Average daily production of French nuclear power plants



Source: RTE – Analysis: CRE

Figure 27 shows annual nuclear production since 2017 and the theoretical maximum production, calculated as the result of constant production at the installed capacity. The utilization rate, or load factor, is calculated as the ratio between these two quantities.

Figure 27 : Maximum capacity and actual production of French nuclear power plants



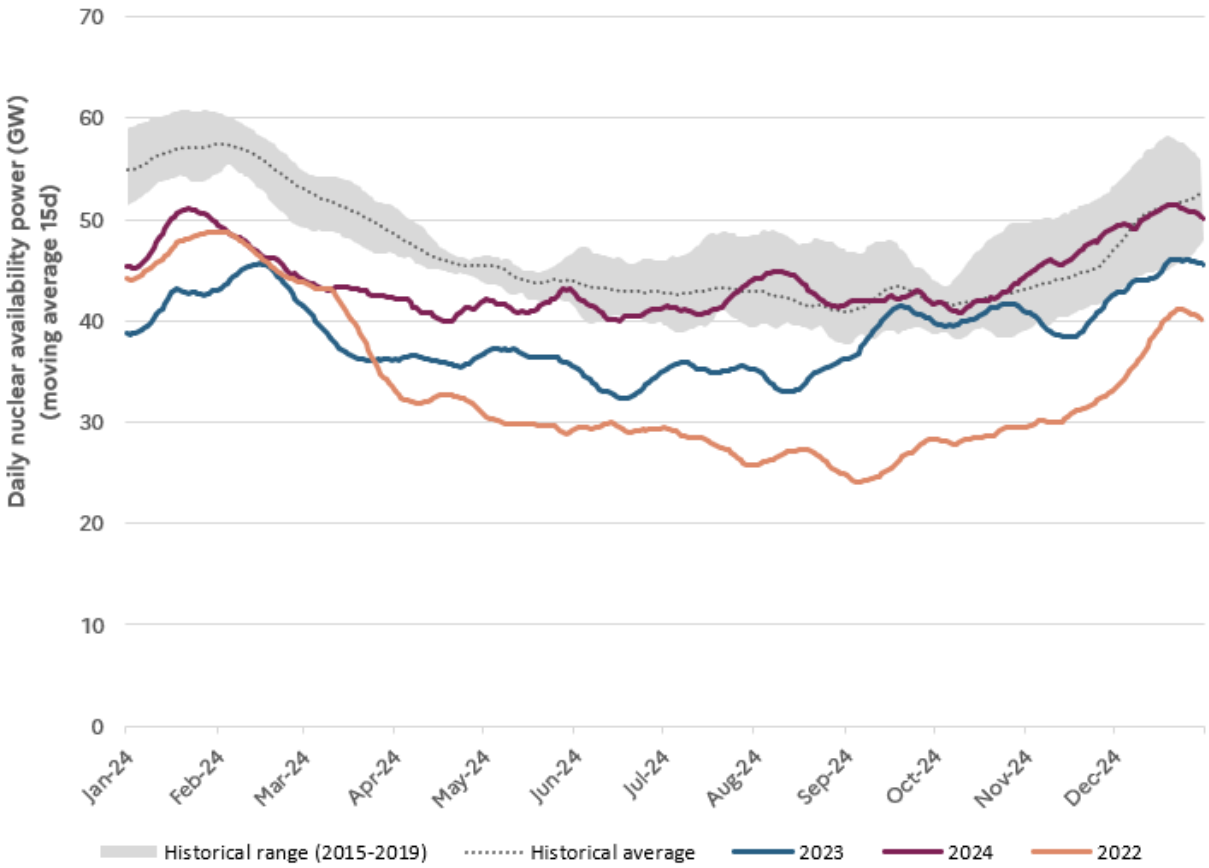
Source: RTE – Analysis: CRE

Availability of nuclear power plants

During 2024 in the availability of France's nuclear fleet has improved significantly, reaching 50 GW at the beginning and end of the year, and an average of 44.1 GW, slightly below the average for recent years (46.5 GW between 2015 and 2019). In 2022, stress corrosion had a huge impact on the availability of the French nuclear fleet, reaching historically low levels (a minimum of 22 GW at the end of August 2022 and an average of 33 GW over the year).

Figure 28 shows the available capacity for 2022, 2023 and 2024 (15-day smoothed average) and the historical tunnel for the years between 2015 and 2019 for comparison.

Figure 28 : Average daily availability of French nuclear power plants



Source: RTE – Analysis: CRE

Modulation of nuclear power

In recent years, the French and European electricity mixes have gradually decarbonized by replacing fossil thermal power plants with renewable sources, mainly solar and wind. Thus, dispatchable generation assets with high variable costs are gradually being replaced by resources with low or zero variable costs but which are not dispatchable. In this context, the economic optimization of other generation means, such as nuclear and hydroelectric power, may need to evolve.

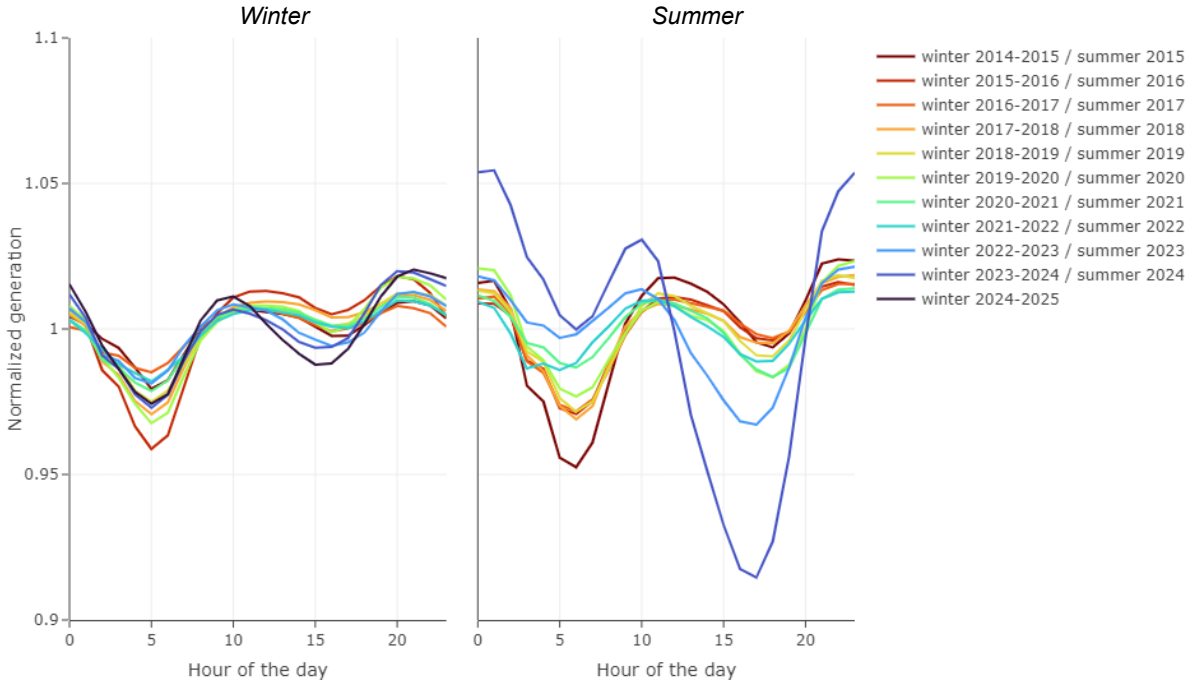
Figure 28 illustrates the evolution of intraday nuclear modulation with variations in production according to the hours of day. The phenomenon of modulation is not new; since the beginning of its operation, the French nuclear fleet has been adjusting its output to adapt to consumption variations. In winter[33], nuclear generation modulation did not change significantly between 2015 and 2024: production is maximized during morning and evening consumption peaks, with power reductions at night and midday. The winter of 2024-2025 saw a slight increase in nighttime production, offset by a greater reduction during the day compared to previous years.

However, modulation changed in summer; in 2023 and 2024, nuclear production decreased significantly at midday rather than during the night. This change is explained by economic considerations: in summer, spot prices are now lower at midday than at night due to higher solar generation in Europe.

Overall, in 2024, the nuclear fleet modulated as much in volume in 2025 as it did in 2015, but with lower total generation. The fleet increased its modulation capacity to adapt to the net consumption of renewable generation.

[33] The year is divided here into two seasons: winter from October 1st to March 31st and summer from April 1st to September 30th.

Figure 29 : Hourly generation of the French nuclear fleet normalized relative to average seasonal generation, 2015 to 2024



Source: RTE – Analysis: CRE

1.3.2. Hydroelectric production: significant growth caused by abundant rainfall

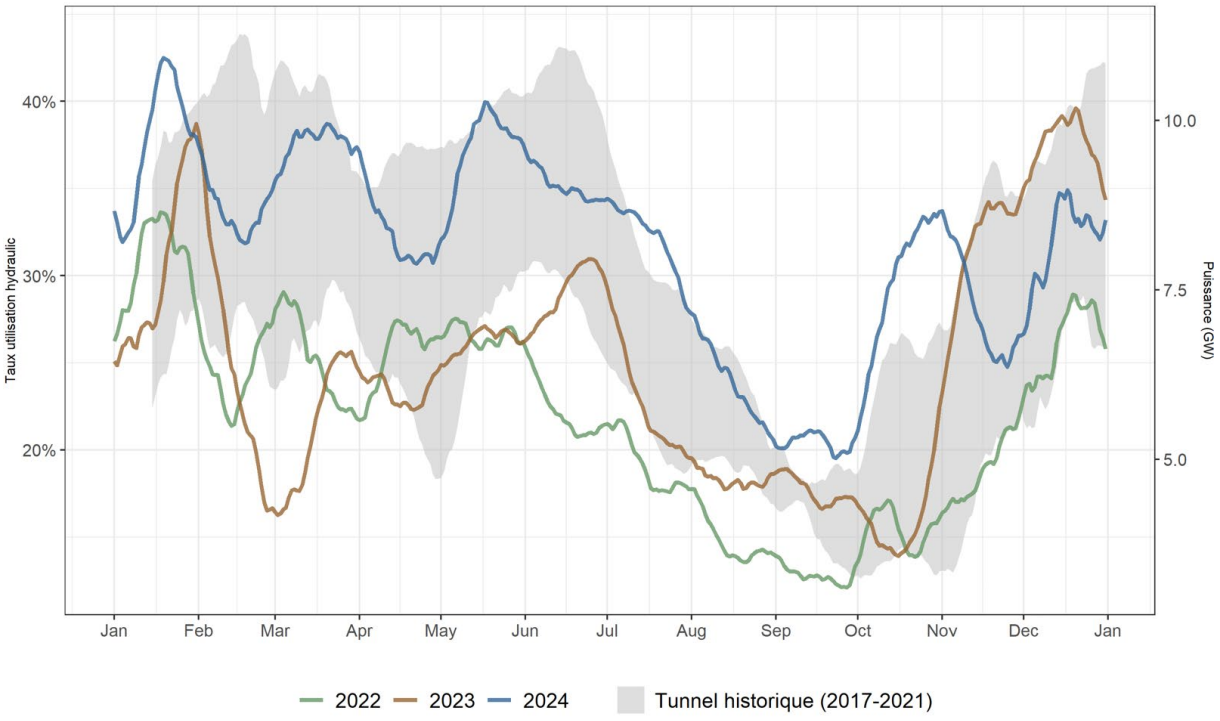
In 2024, hydroelectric production in France reached a remarkable level of 75.1 TWh, up 28% compared to 2023. This volume is the highest since 2013, thanks to abundant rainfall that made 2024 one of the ten rainiest years since 1959.

Hydropower accounted for 13.9% of total power generation, the second largest source after nuclear in terms of production volume, exceeding the combined output of solar and wind power for the first time since 2021 (75.1 TWh compared to 71.6 TWh).

Hydraulic stock levels were high throughout the year (Figure 31), reaching record levels between June and October, thanks to heavy rainfall in the Alps and Pyrenees.

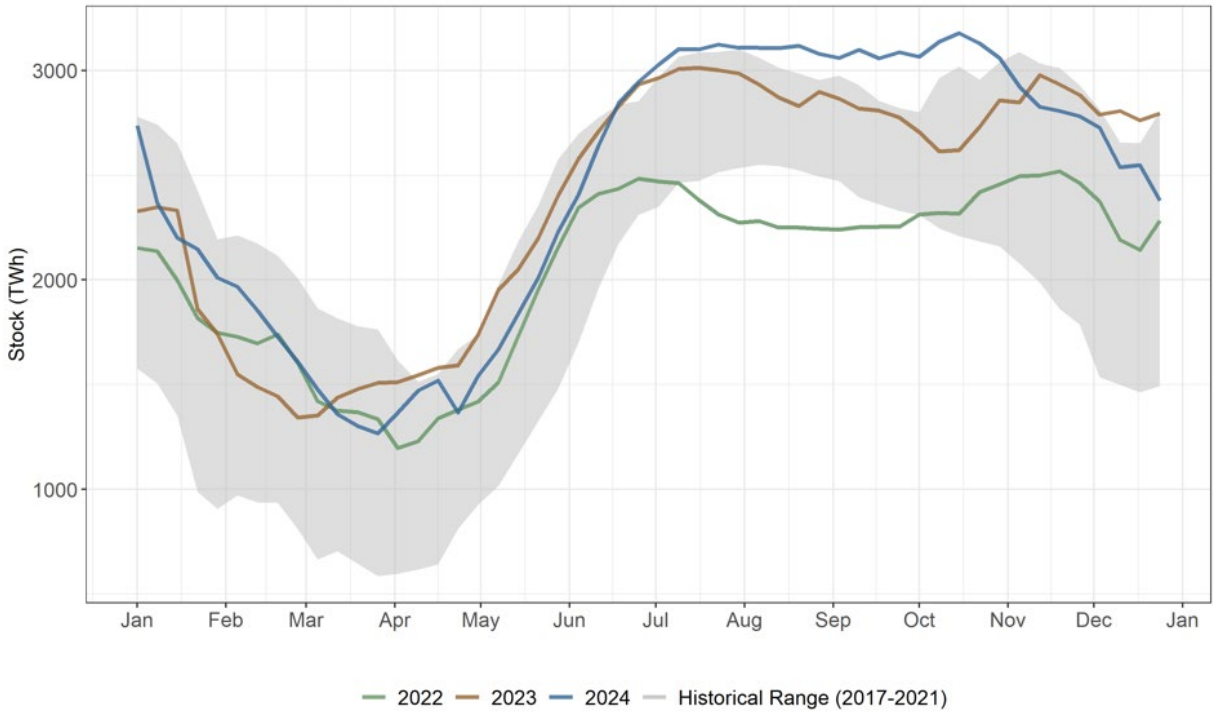
Installed capacity remains unchanged at 25.7 GW.

Figure 30 : Utilization rate (left axis) and power (right axis) of hydropower, 15-day rolling average



Source: RTE – Analysis: CRE

Figure 31 : Weekly hydraulic stock (GWh)



Source: RTE – Analysis: CRE

1.3.3. Wind and solar power: despite an increase in installed capacity, production is negatively affected by weather conditions

In 2024, France's solar capacity increased by 5.3 GW, representing a 27% increase. For the fourth consecutive year, the growth rate remained above the historical average, at +17.3% per year (Table 8).

Photovoltaic production reached 24.8 TWh, setting a new record for France. However, the load factor for solar installations fell to 13%, down 1.5% compared to 2023, due to below-average sunlight, the lowest in almost 30 years, and to a lesser extent, reductions in production during periods of negative spot prices. Despite these difficulties, solar production surpassed fossil fuel-based thermal production for the first time.

Wind power capacity increased by 1.7 GW in 2024 (+4.7% compared to 2023), compared to an increase of 1.5 GW in 2023.

Onshore wind production fell to 42.8 TWh, down 12.6% compared to 2023, due to a significant wind deficit this year. The average load factor for wind power reached 23.8%, 2.8% less than in 2023. Offshore wind power generation doubled to 4 TWh.

Table 8 : Evolution of installed wind and solar capacity

	2016	2017	2018	2019	2020	2021	2022	2023	2024	TCAM[34] 2016
Wind (GW)	11.8	13.5	15.1	16.5	17.6	18.8	21.2	22.7	24.4	+ 9.5 %
Solar (GW)	6.8	7.7	8.5	9.6	10.4	13.1	15.8	19.0	24.3	+ 17.3 %

Source: RTE

Table 9 : Changes in wind and solar power production

	2016	2017	2018	2019	2020	2021	2022	2023	2024	TCAM 2016/2024
Wind (TWh)	20.9	24.0	28.1	33.8	39.7	36.9	38.9	50.8	46.8	+ 10.6 %
Solar (TWh)	8.4	9.1	10.4	12.7	12.7	14.2	18.5	21.6	24.8	+ 14.5 %

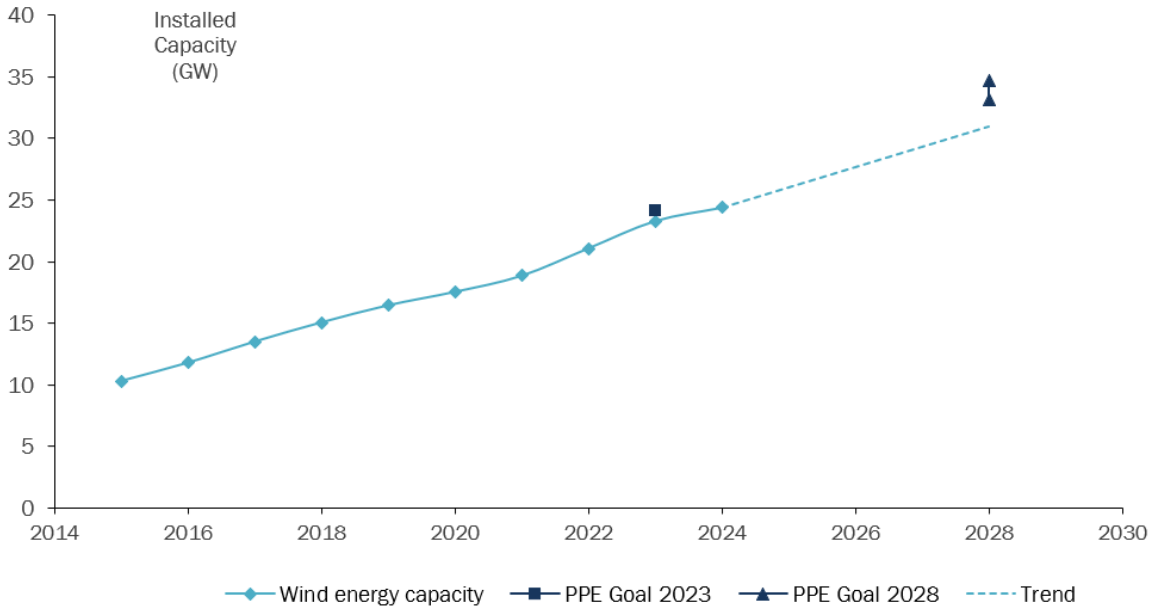
Source: RTE

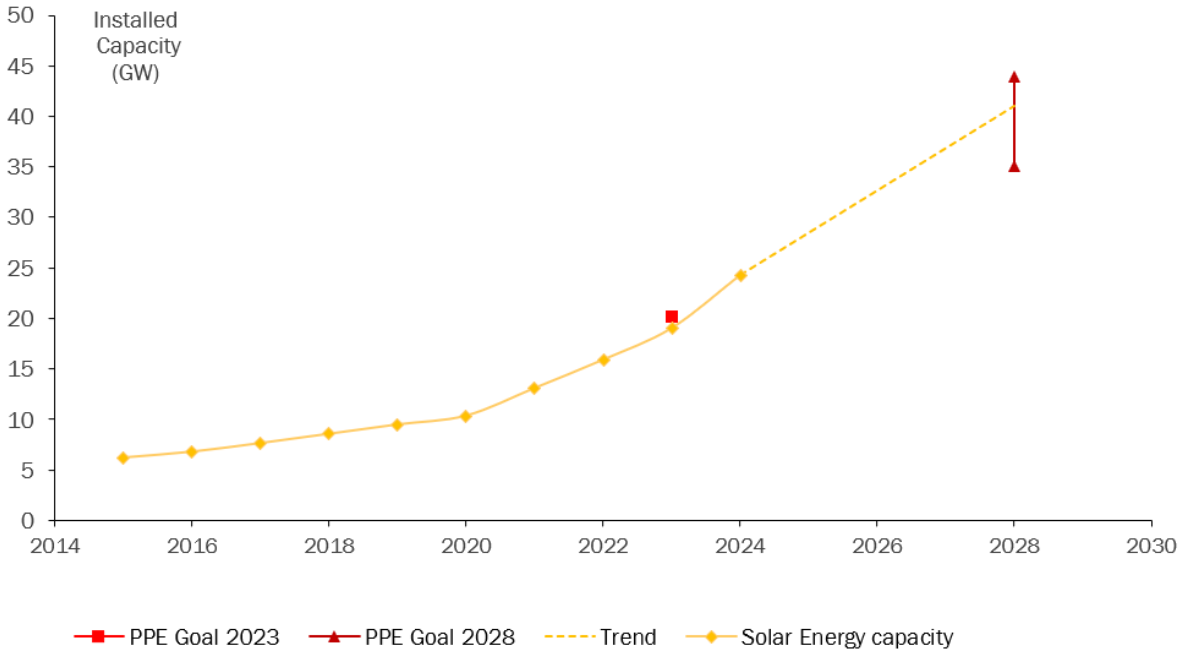
The national targets set by the multi-year energy program in 2020 (PPE 2019-2028)[35] for 2023, 24.1 GW for wind power and 20.1 GW for solar power (Figure 32) were achieved in 2024. The pace of solar capacity installation in 2023 and 2024 is sufficient, if maintained, to achieve the PPE target for 2028. However, the current pace of wind capacity installation is insufficient to achieve this target. This PPE sets a target of 33.2-34.7 GW for wind power and 35.1-44.0 GW for solar power for 2028.

[34] Average annual growth rates.

[35] Multi-year energy plans: https://www.ecologie.gouv.fr/programmations-pluriannuelles-lenergie-ppe

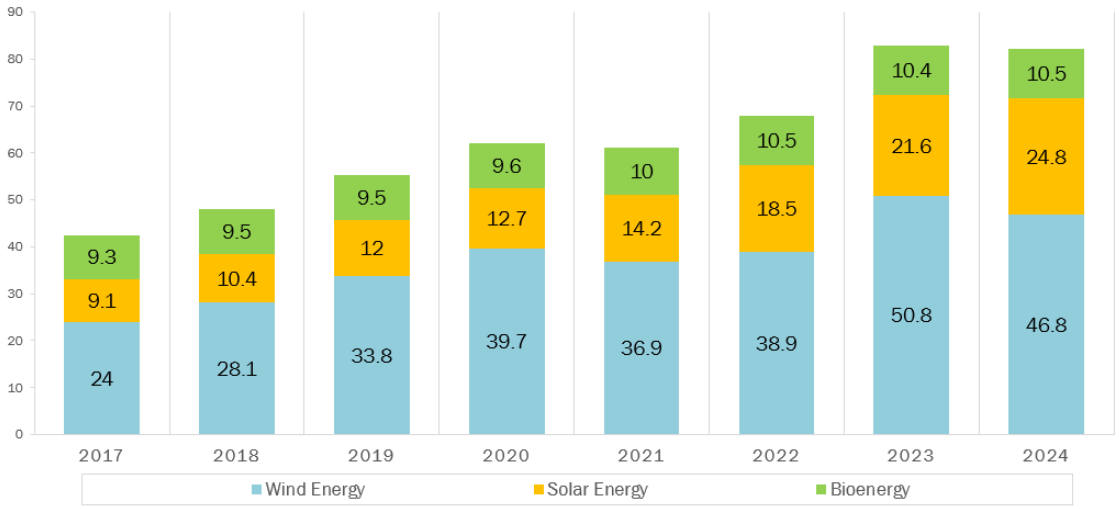
Figure 32 : Comparison of the development of solar and onshore wind farms in relation to the PPE targets 2019-2028





Source: RTE – Analysis: CRE

Figure 33 : Annual production from renewable sources (excluding hydropower)



Source: RTE – Analysis: CRE

1.3.4. Fossil fuels: power generation at its lowest level in 70 years

Aggregate production from fossil fuel power plants fell sharply in 2024 to 20.0 TWh, compared with 31.6 TWh in 2023. This volume is the lowest since 1952, when production stood at 18.3 TWh. This decline is mainly due to the decrease in gas-based production, a consequence of the abundance of decarbonized electricity in 2024.

Power generation from coal remained very low, at 0.6 TWh in 2024, and almost negligible in the French electricity mix, at 0.1% of total production.

1.3.5. France's electricity exports at record levels

In 2024, France achieved a record net export balance of 89.0 TWh, far exceeding the 2002 record of 77 TWh. Figure 34 presents details of trade by border and quarter since 2021. In 2024, the most significant exchanges were observed with Germany and Belgium, with a balance of +27.2 TWh, followed by Italy (+22.3 TWh), Great Britain (+ 20.1 TWh), Switzerland (+ 16.7 TWh) and finally Spain (+ 2.6 TWh).

Each border presented unique dynamics: for example, interconnections with Spain showed more balanced exchanges, influenced by strong renewable production in the Iberic peninsula. During the first quarter of 2024, imports from Spain exceeded exports. However, considerable exports during the third and fourth quarters caused a net export balance. The trade balance with Switzerland, meanwhile, although generally in surplus, varied seasonally, mainly due to fluctuations in Swiss hydroelectric production.

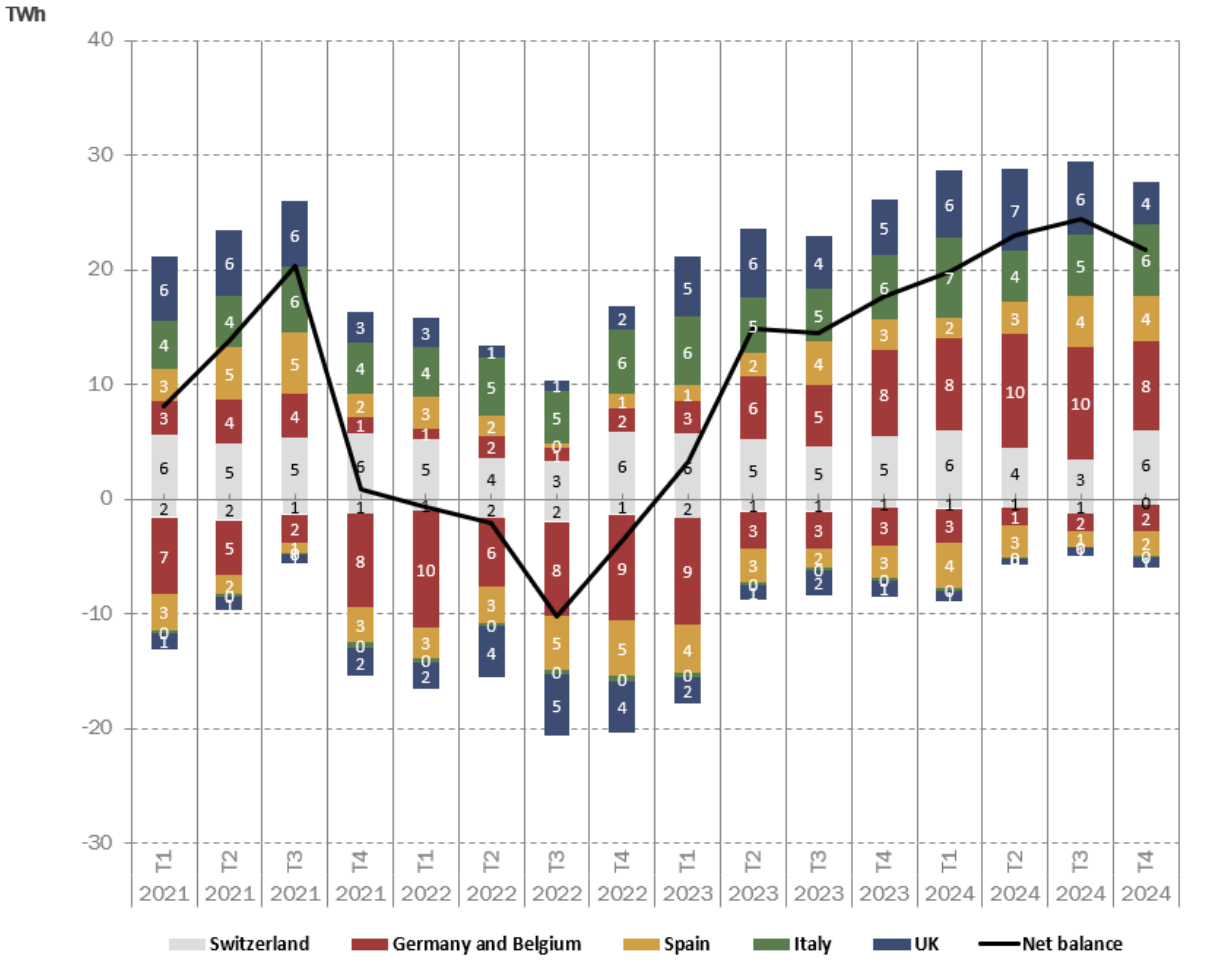
France was a net importer of electricity for only 2% of the hours in 2024.

Table 10 : France's export trade balance

France's export trade balance (TWh)	2012	2013	2014	2015	2016	2017	2018	2019	20	2021	2022	2023	2024
	44	47	65	62	39	38	60	56	43	43	-16	51	**89**

Source: RTE

Figure 34 : Quarterly volumes traded at borders by country



Source: RTE – Analysis: CRE

2. Wholesale electricity prices

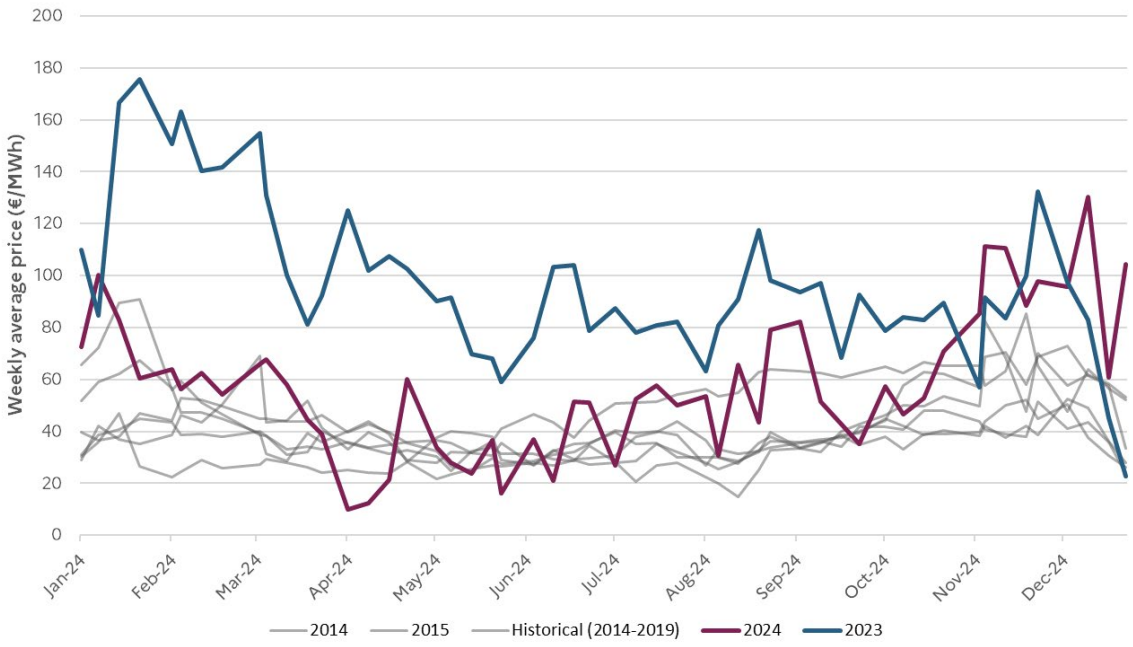
2.1. Spot prices fell sharply, with increasing penetration of renewables

Spot prices (day-ahead prices) play an essential role in the smooth operation of the European electricity system, by determining in a coordinated way at European level the day before for the following day, hour by hour, the generation mix used to meet forecasted consumption. In addition, the prices of forward products are established by reference to expectations of future spot prices over the period in question.

In 2024, spot prices fell significantly, reaching an average of €57.8/MWh, down 40% from 2023 (€96.9/MWh). This fall confirms the exit from the crisis, as it is above pre-crisis prices in nominal terms but comparable in real terms (Table 11).

This decline is mainly attributed to an improvement in fundamentals in France, with a surplus of low-cost generation from renewable and nuclear sources, especially in the spring and summer, stable consumption, and lower gas prices. The decline was much significant than market expectations in 2023, with the average spot price in 2024 three times lower than the average 2023 forward prices for annual delivery in 2024 (€162.7/MWh).

Figure 35 : Spot price trends in France compared with previous years (weekly average)



Sources: EPEX SPOT, Nord Pool – Analysis: CRE

Table 11 : Average annual spot prices in France since 2010, nominal and inflation-adjusted values

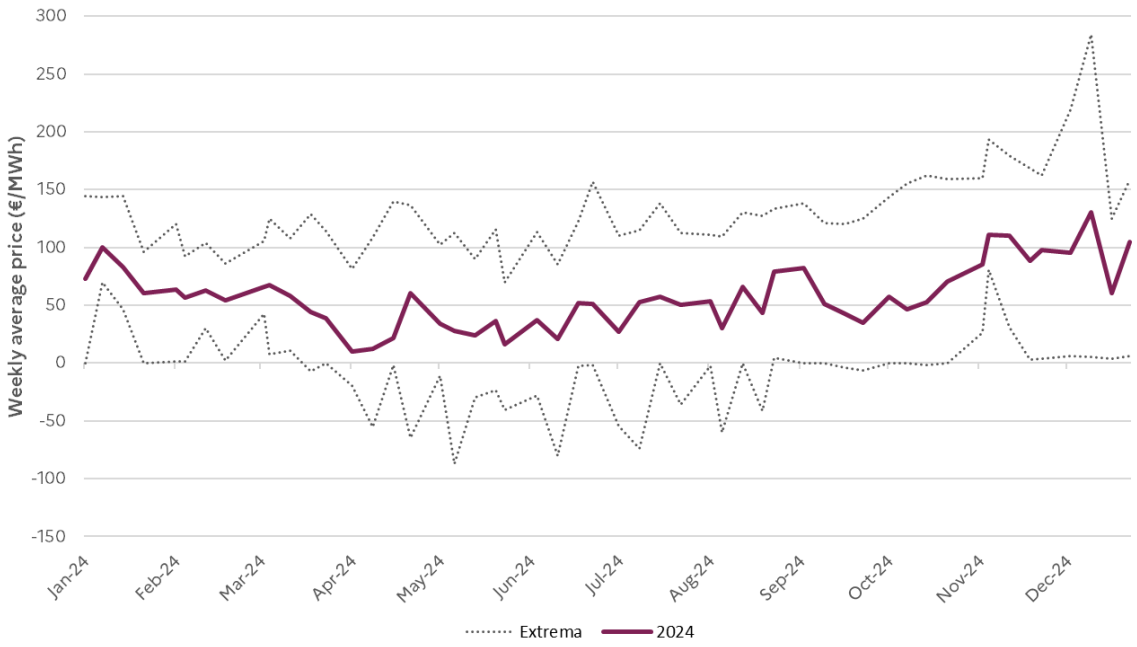
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	20	2021	2022	2023	2024
€ / MWh	48	49	47	43	35	38	37	45	50	39	32	109	276	97	58
€$_{2024}$/ MWh	59	60	56	52	41	46	44	53	58	45	37	123	294	99	58

Sources: EPEX SPOT, Nord Pool – Analysis: CRE

The growing development of renewable generation is driving down spot prices but also contributes to the rise in hourly price variability within a single day and from one day to the next (see Figure 36 and Figure 37), as well as significant price gaps between the day-ahead market and the intraday market (see Figure 38). While high price spikes were less frequent and less significant in 2024 compared to 2023, negative price spikes were more numerous, sometimes exceeding -€50/MWh.

The absolute weekly range decreased in 2024 compared to the 2019-2023 period. In 2024, the median difference between the lowest and highest hourly prices in a week was €137/MWh. However, in relative terms, this represents a median range of about 238%, approximately 35% higher than in 2023 and 6% higher than in the 2019-2022 period.

Figure 36 : Average and extreme daily hourly prices in France in 2024



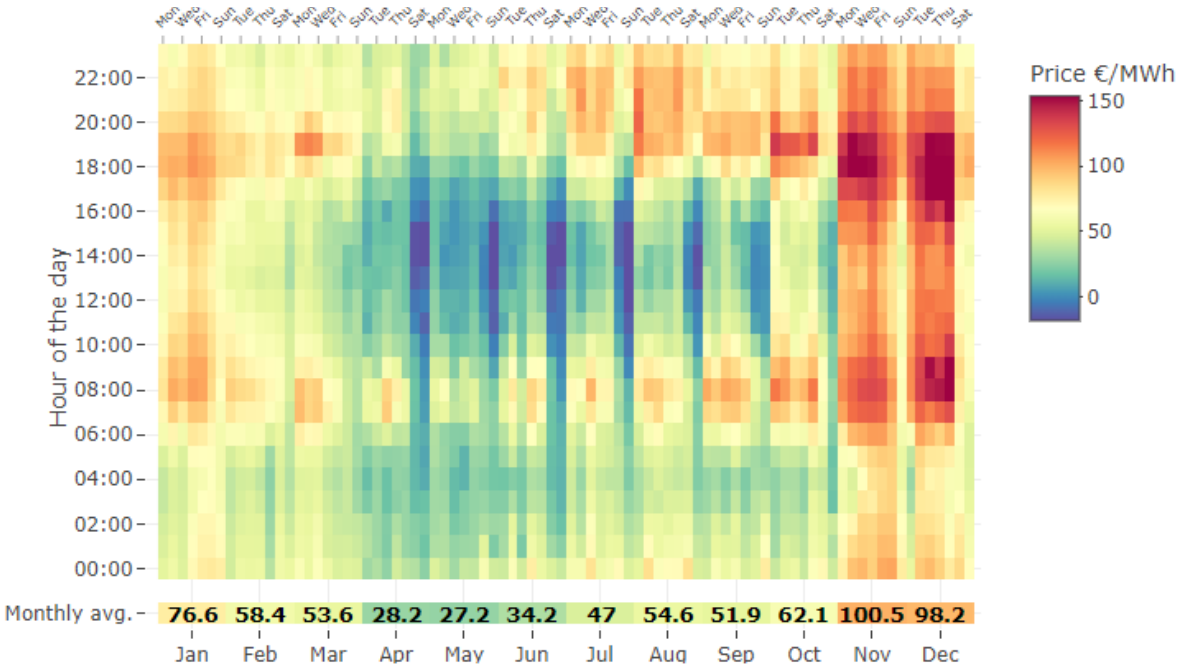
Sources: EPEX SPOT, Nord Pool – Analysis: CRE

Figure 37 shows the average day-ahead prices based on the time of day, weekdays and month of the year 2024 (hours on the y-axis and weekdays and months on the x-axis). For example, the average price for 10 a.m. on Tuesdays in May can be seen. The figure highlights the sharp fluctuations in day-ahead prices from one hour to the next, from one day to another, and between weekdays and weekends. There is a clear impact from daily consumption peaks around 8 a.m. and 6 p.m. and seasonal peaks, as well as solar production peaks between 11 a.m. and 4 p.m. in summer. Very low and very high prices frequently coexist within the same day: in 2024, there were 35 days with at least two hours priced below €10/MWh and two hours priced above €100/MWh.

Prices in the first quarter of 2024 initially followed the downward trend that marked 2023, with an overall improvement in fundamentals limiting the use of fossil power plants (8.2 TWh of production in Q1 2024 compared to 10.3 in Q1 2023). With very mild temperatures for the period in February and March and abundant wind power generation, spot prices averaged 62.8 €/MWh for the quarter.

In the second quarter of 2024, prices fell rapidly, driven by high solar and hydroelectric generation. In May, the average spot prices were $27.2/MWh, the lowest since June 2020 during the Covid-19 context. Due to maintenance work, network constraints appeared during April and May, partially limiting exports and lowering spot prices. Nevertheless, exports to Germany, Belgium and Spain were substantial, with the minimum hourly price of 2024 recorded on May 12 at -€87.3/MWh.

Figure 37 : Average daily prices in France in 2024 by hour, month and weekday (hours on the y-axis and days of the week/month on the x-axis)



Sources: EPEX SPOT, Nord Pool – Analysis: CRE

Prices then rose from July to September, with a quarterly average of €51.1/MWh. The net balance stood at 24.4 TWh of exports, setting an all-time record for quarterly exports in France. This record was driven by high spot price differentials with neighbouring countries, particularly during morning and evening peaks. Gas prices also rose from August onwards, affecting electricity prices.

The last quarter was marked by an increase in spot prices and a quarterly average of €86.8/MWh. Demand remained strong throughout the period, punctuated by cold spells, while renewable generation was more limited (12.8 TWh of wind power in Q4 2024 compared with 16.7 TWh in Q4 2023), with notably low and widespread renewable generation across Europe causing very high price spikes. Therefore, fossil thermal generation was more prominent despite rising gas and CO2 prices due to the geopolitical context.

Table 12 : Average day-ahead and intraday prices in France

Period	Average day-ahead price	Average intraday price
2019	€39.5/MWh	€39.7/MWh
2020	€32.2/MWh	€32.9/MWh
2021	€109.2/MWh	€109.7/MWh
2022	€275.8/MWh	€276.3/MWh
2023	€96.9/MWh	€98.4/MWh
2024	**€57.8/MWh**	**€57.8/MWh**

Sources: EPEX SPOT, Nord Pool – Analysis: CRE

Intraday prices (weighted average prices) were almost equal to spot prices on average, settling at €57.8/MWh in 2024.

However, there is significant intraday price variability within its trading period (i.e., from 3 p.m. on the day before delivery) compared to the day-ahead price. Figure 38 shows the monthly and annual

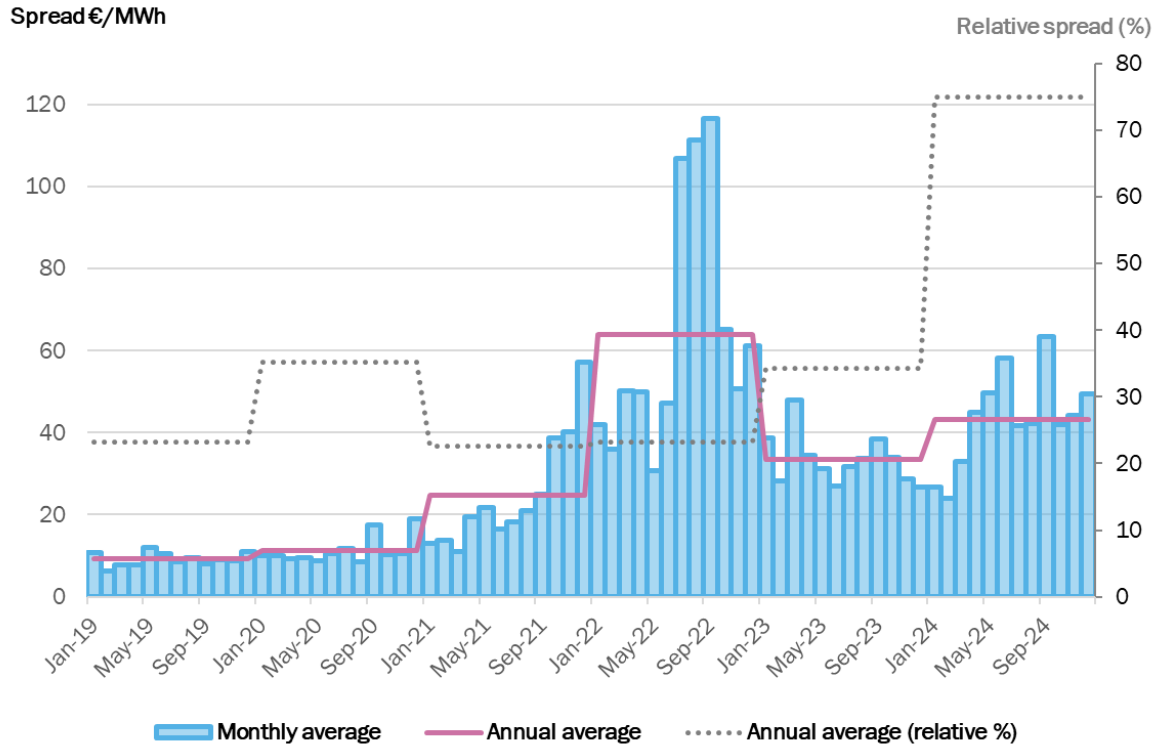
averages of the price ranges in which a given product is traded for delivery at a given hour[36], i.e. the differences observed between the day-ahead prices and the intraday extremes for the same hourly product.

The average annual spread is 43.3 €/MWh in 2024, or around 75% relative to the annual average *day-ahead* price (relative spread). Although lower in absolute terms than in 2022, this level is higher in relative terms than in all previous years. It is also higher in absolute terms than in 2018, 2019 and 2021. This increase in volatility between *spot* prices and intraday prices is partly due to the growing share of renewable energies in French and European generation, which introduces more uncertainty due to their dependence on weather conditions.

In summary, 2024 was marked by a significant decline in average spot prices in France. This decline reflects an exit from the crisis, although price levels remain above pre-crisis levels. It is mainly explained by increased nuclear availability, continued growth in renewable energy generation, and lower fuel prices. These favorable conditions deteriorated at the end of the year, with the geopolitical context driving up fuel prices and renewable generation being limited by weather conditions.

However, the average prices decrease comes with an increase in electricity price volatility. The growing integration of renewable energy has led to significant variations between day-ahead and intraday prices, with significant fluctuations within the same day and from one day to the next. The frequency of negative prices has doubled, even reaching levels below -€50/MWh on 108 occasions. This increased volatility is partly due to the intermittency of renewable resources, but also to the lack of flexibility in consumption and the controllability of these renewable assets.

Figure 38 : Monthly and annual averages of the spreads between the extremes of day-ahead and intraday prices extremes



Sources: EPEX SPOT, Nord Pool – Analysis: CRE

[36] i.e. the difference between the maximum day-ahead price and the maximum price of the corresponding intraday product on the one hand, and the minimum day-ahead price and the minimum price of the corresponding intraday product on the other.

The number of zero or negative spot prices has risen sharply

Zero or negative prices occur when there is an oversupply compared to demand, where generators agree to pay to generate (as they do not want to shut down their assets even though this results in a financial loss on the electricity market) or if generators are insensitive to the daily price (assets under purchase obligation contracts in 2024 had no incentive to shut down when prices were negative).

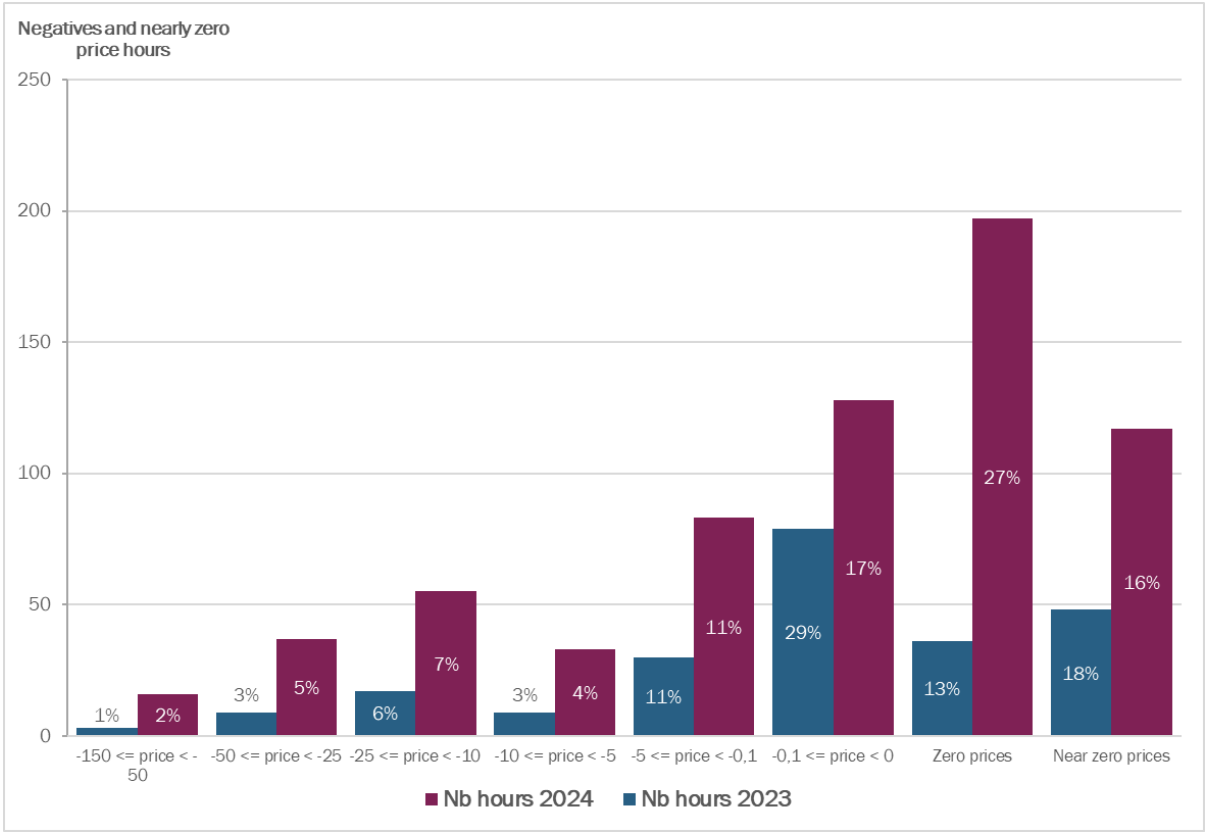
In 2024, with stable electricity consumption, the increase in production contributed to a rise in the number of hours with zero or negative prices. Dispatchable assets exposed to zero or negative prices, particularly those supported by bonus remuneration contracts, contribute to the increase in hours with prices around €0/MWh, while non-dispatchable assets or those insensitive to negative prices drive prices even lower by selling their generation at any cost. The increase in production from such assets in other European countries also contributed to price declines due to the interconnection of European markets.

The year 2024 recorded a historic level of zero or negative prices in France, with:

- 194 hours of nearly zero prices (ranging between 0 and €1/MWh), more than double compared to 2023 (88 hours),
- 197 hours of zero prices, five times more than in 2023 (36 hours),
- 352 hours of strictly negative prices, more than double the figure for 2023 (147 hours).

The negative price hours were concentrated in April, May, and June, during nighttime hours (2 a.m. to 5 a.m.) and midday (11 a.m. to 5 p.m.). It was mainly the number of negative hours during the day, amid significant solar generation, that increased compared to 2023.

Figure 39 : Distribution of nearly zero, zero and negative hourly prices in France in 2023 and 2024



Sources: EPEX SPOT, Nord Pool – Analysis: CRE

In November 2024, the CRE published a detailed analysis[37] of the phenomenon of negative prices. It concludes that negative prices are not a flaw in the functioning of the wholesale market. Instead, they are a strong signal from the market indicating the need for flexibility. The significant variability of prices throughout the day makes flexibility projects increasingly attractive from economic perspectives. However, when negative prices are due to the terms of public support contracts for renewable energies, it is necessary to adapt these contracts, and the CRE makes proposals in this regard. These adaptations will allow some negative prices back to €0/MWh or around €0/MWh but will not eliminate price volatility as long as significant flexibility measures have not been developed.

2.2. Marginality of different production sectors in 2024: the price of French electricity was less dependent on the price of gas than in 2023

A production type is considered marginal when the last production unit called to meet demand belongs to that type. Its marginal production cost theoretically determines the wholesale electricity price at that moment. The marginality of a sector can be very different from its share of annual production.

However, identifying the marginal sector is practically challenging. The main problem is the proximity of variable costs of different production sectors. Moreover, producers are not obliged to offer a bid at the day-ahead auction that is strictly equal to their variable cost: for example, they may include their start-up costs, the opportunity costs of fuel or the primary resource (see below), or agree to sell at a loss over an hour to avoid restart costs or to participate in the balancing reserve markets.

The definition of "marginal technology" can also be problematic because multiple means (possibly of different technologies) may need to adjust their production to face even a small demand variation. This can be due to: (i) the European market coupling and (ii) when the management, even marginally, of one means impacts others. For instance, "block" offers in the market that cover several time steps and are accepted or rejected simultaneously can create threshold effects.

Finally, it should be noted that "stock" production means participate in the market based not on their variable production cost but on their opportunity cost, calculated considering the value of future production. This applies particularly to reservoir hydropower and, to a lesser extent, nuclear power for plants without sufficient fuel to operate at full power until their planned refuelling date.

The determination of marginal rates for the various sectors is therefore normative in nature. The stacking of production resources and marginality at a given time is therefore only a "figurative" way of understanding the optimization of the electricity system.

In order to better reflect these findings, the CRE changed its method for determining marginal sources in 2020. The current method allows several technologies to be considered marginal at the same time. The CRE's calculations are based on marginal costs reported directly to the CRE by producers, which do not include the marginal costs of renewable production. The renewable sector is therefore excluded from this exercise, which is a significant limitation when prices are often zero or negative.

The method used for each hour of the year is described below:

1. If the daily price is equal to that of at least one other neighboring country (coupling threshold of €0.01/MWh), and if there is no means of production in France whose marginal cost is less than €1/MWh of the *spot* price, then the border is part of the marginal means.
2. Production means[38] whose marginal cost is close to the spot price are also part of the marginal means. The contribution of each means to marginality decreases exponentially with the difference between the spot price and its marginal cost[39] .

[37] https://www.cre.fr/actualites/toute-lactualite/la-cre-publie-son-analyse-sur-le-phenomene-de-prix-de-lelectricite-negatifs-et-ses-recommandations-relatives-aux-dispositifs-de-soutien-aux-energies-renouvelables.html

[38] Provided for in the call program

[39] The formula has been adjusted to take account of price increases. The contribution now decreases more slowly in line with the difference between the spot price and its marginal cost.

3. During hours when France is not coupled with any neighboring countries and there are no means of production with a cost sufficiently close to the *spot* price, marginality is assigned to the "other" category.

The method described is slightly different from that used in the report for 2023, particularly in the allocation of the "other" category. In the 2023 report analysis, an hour could only be assigned to the "other" category if no other sector could be considered marginal. In the present analysis, the "other" category can be partially assigned to an hour when there are means further away from the spot price but resulting in non-zero marginality for their sector.

Use value of water and nuclear energy

The usage values of water submitted by producers to CRE, defining the variable costs of hydroelectric production, can reach high values, although intuitively, water in reservoirs might appear as a free resource for producers. This is due to the "opportunity cost" management of hydroelectric production means with limited water stocks: to reserve hydro production for periods when prices are highest, producers define a "usage value" of water, reflecting anticipated prices during the most expensive periods. Thus, prices proposed by hydro dam operators can be very close to the anticipated marginal costs of gas plants.

A part of the nuclear fleet is optimized in usage value, not linked to fuel costs, when the fuel stock is constrained. Hence, some plants can sometimes be more expensive than CCGTs. Several factors can lead to high usage values, such as very high forward prices or changes in the outage planning of reactor units.

As mentioned above, high usage values reflect the need to conserve fuel until the next refuelling. Conversely, negative values are possible to reflect the need to operate at maximum power regardless of price when the fuel must be consumed before the next scheduled shutdown.

Opportunity cost management is essential to ensure the flexibility of limited stock means (hydroelectric, battery, and sometimes nuclear) is available during peak hours of the electrical system and that all producible stock is not unnecessarily consumed at the beginning of the year.

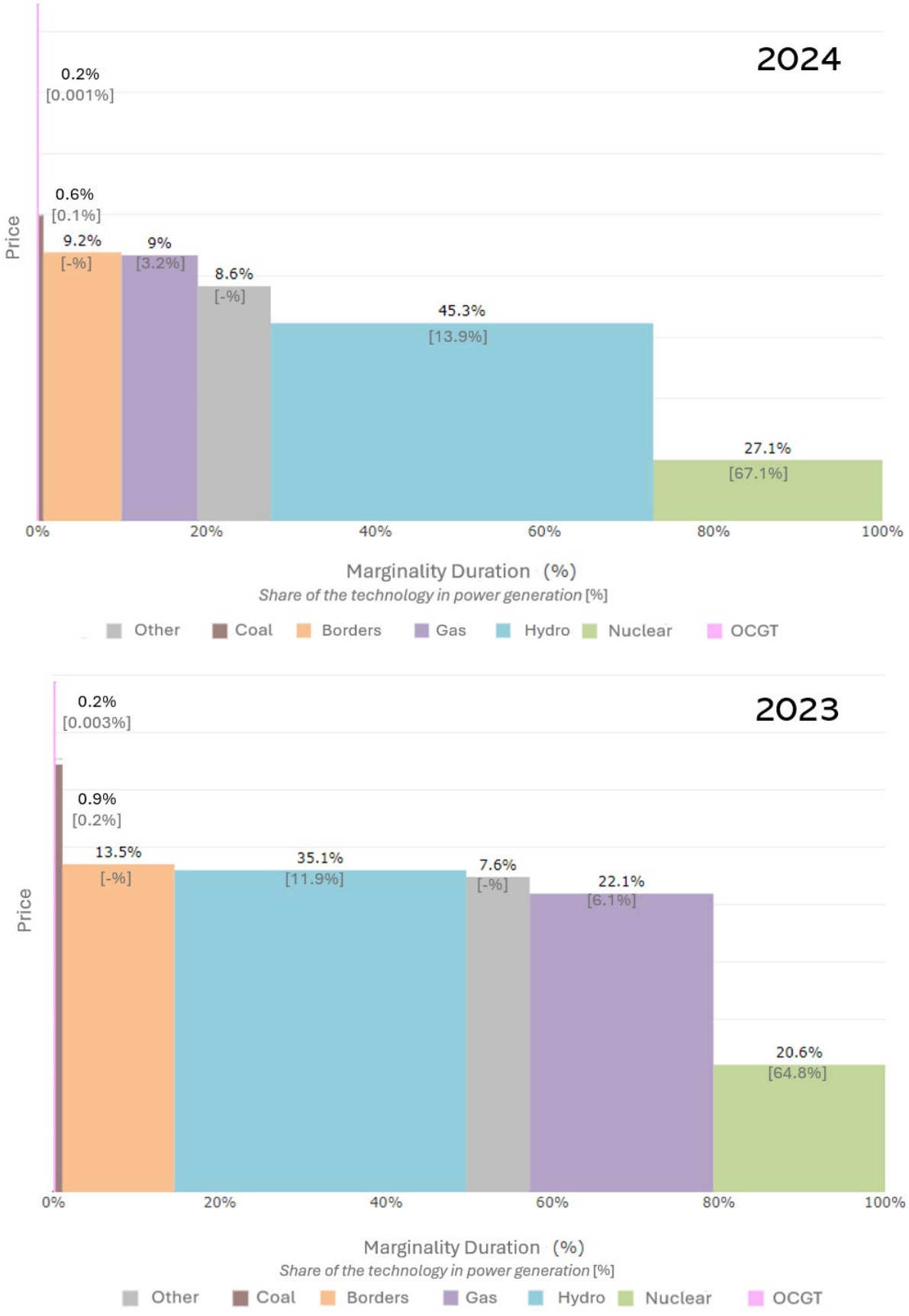
Gas marginality fell sharply in 2024 compared with the previous year (-12.1%), in favor of nuclear (+6.5%) and hydropower (+9.8%), especially during the summer. This decrease follows the decline in gas-fired power generation in 2024 compared with 2023.

The decline in gas marginality does not automatically lead to a decoupling of electricity and gas prices. Indeed, the price of gas can influence the price of electricity even when no gas-fired power plants are producing electricity in France, notably through cross-border exchanges and the value of dam water.

The French market was less dependent on other European markets in 2024 than in 2023, with the marginality of neighboring countries falling from 13.5% of hours in 2023 to 9.2% in 2024.

Marginal prices for all sectors fell significantly compared to 2023, due to a general decline in spot prices.

Figure 40 : Marginality of different production sectors in 2023 and 2024

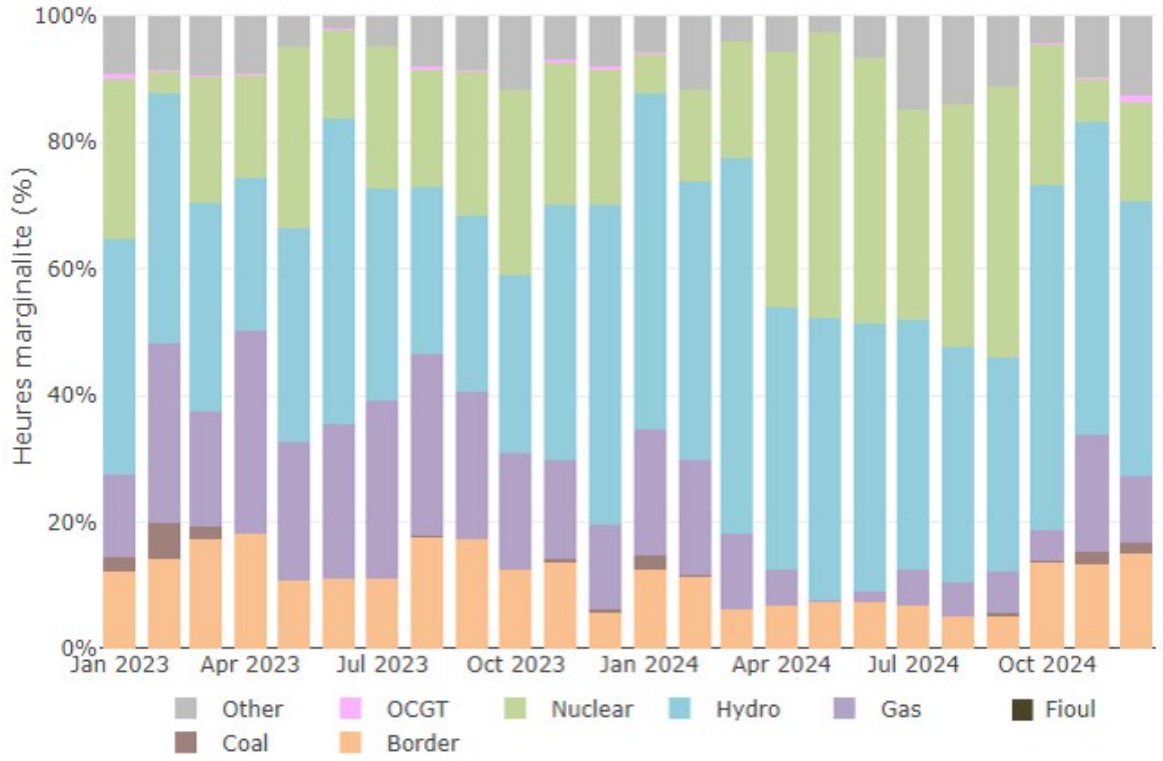


Sources: EPEX SPOT, Nord Pool, Producers – Analysis: CRE

Figure 41 shows the marginality of the sectors by month in 2023 and 2024. There is a substantial decline in the marginality of gas between March and October 2024 compared to the previous period, which is replaced by hydropower and nuclear power.

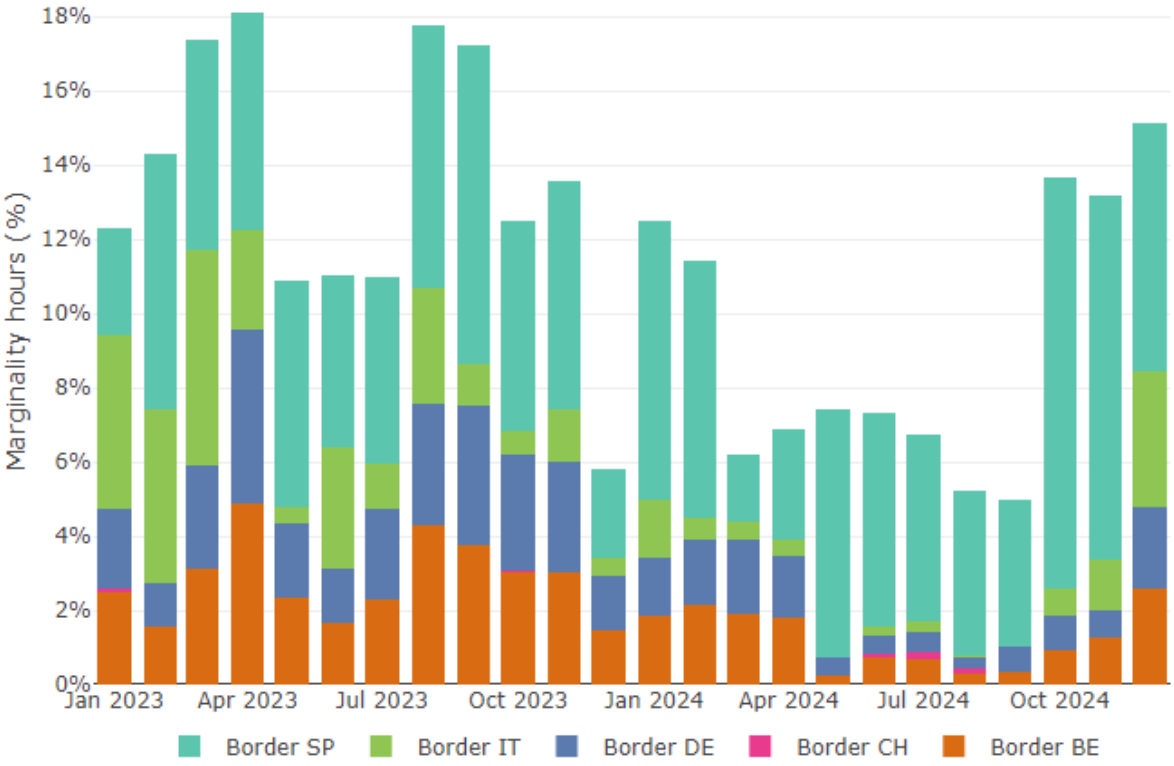
Figure 42 shows the details of the borders that contributed to price formation in France. Since the beginning of 2024, borders have been way less marginal, with a significant decline particularly in the marginality of the German, Belgian, and Italian borders, due to frequent saturation of export interconnections, which leads to price divergences. On the other hand, the Spanish border remains more often marginal, reflecting less frequent saturation of interconnections.

Figure41 : Marginality of different production sectors in 2023 and 2024 by month



Sources: EPEX SPOT, Nord Pool, Producers – Analysis: CRE

Figure 42 : Marginality of different borders in 2023 and 2024 by month



Sources: EPEX SPOT, Nord Pool, Producers – Analysis: CRE

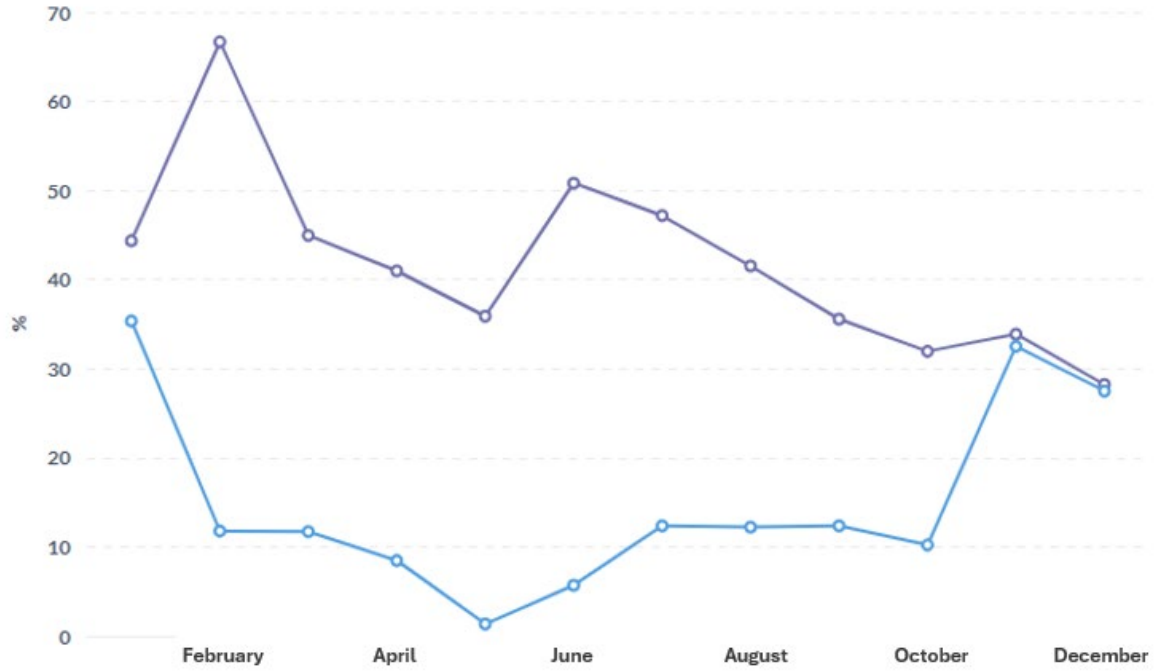
Figure 43 shows the proportion of hours per month in 2023 and 2024 when the French daily electricity price is higher than the variable cost of gas-fired generation. The estimate of the variable cost of gas-fired generation is based on daily gas prices on the PEG, CO2 prices and a theoretical efficiency of 55% for a combined cycle power plant, and the corresponding CO2 emission rate[40] .

This analysis presents another illustrative approach to estimating the influence of gas on electricity prices, and also allows us to consider the hours during which no gas-fired power plants are producing in France, but the price of electricity is still influenced by the price of gas through cross-border trade, where the opportunity costs of other energy sources are themselves influenced by gas prices.

According to this metric, there is also a sharp decline in the number of hours during which electricity prices are influenced by gas prices in 2024 compared to 2023, except in January, November, and December.

[40] https://www.statistiques.developpement-durable.gouv.fr

Figure 43 : Proportion of hours when the French daily price is higher than the variable cost of gas-based production



Sources: EPEX SPOT, Nord Pool, EEX, Argus – Analysis: CRE

2.3. Difference between *spot* prices and EDF's marginal costs

Regarding *spot* price formation, CRE analyses the differences between *spot* market prices and the marginal costs reported by EDF based on calculations from its daily optimization models.

Since 2017, the indicator presented by the CRE has been determined as the monthly arithmetic average of the differences between the *spot* price and the marginal cost[41] of EDF's fleet, divided by the average *spot price*.

$$Average\ difference = \frac{1}{12}\sum_{m=1}^{12}\frac{\sum_{h\epsilon m}(price_{spot,h} - cost_{marginal_{EDF,h}})}{\sum_{h\epsilon m}(price_{spot,h})}$$

On average, the price-cost gap in 2024 was 6.3%, the highest level since 2009, although not exceptional. This level, significantly higher than in previous years, is largely attributable to the decline in spot prices. The difference in absolute terms remains comparable to that of recent years.

The gaps published in successive monitoring reports[42] are shown in the table below.

[41] That is, the cost to EDF of producing an additional 1 MWh from its production facilities. EDF reports this figure to the CRE for each hour.

[42] The method for calculating the average difference changed in 2017.

Table 13 : Changes in EDF's price-cost differentials

Year	Price-cost difference
2008	6.0%
2009	6.5%
2010	3.2%
2011	5.0%
2012	2.2%
2013	4.5%
2014	5.5%
2015	5.3%
2016	2.9%
2017	1.5%
2018	3.5%
2019	1.5%
2020	1.5%
2021	2.6%
2022	1.2%
2023	3.0%
2024	6.3%

Source: EDF, EPEX SPOT, Nord Pool – Analysis: CRE

This indicator is based on reported data and does not prejudge the correct level of EDF's marginal costs. Furthermore, the average difference does not reflect exceptional deviations, for which CRE may implement additional controls. Finally, the indicator takes into account all market periods, including those when EDF may not be a marginal player on the *spot* market.

Without prejudice to additional checks, the CRE considers that the average difference measured in 2024 does not reflect the exercise of clear market power by EDF.

2.4. Level of convergence of French spot prices compared to neighbouring countries

The coupling of European day-ahead markets optimizes the use of interconnections, generation assets, and flexibility across Europe through an “implicit” allocation of interconnection capacities. This allocation allows simultaneous assignment of energy demanded or offered by market actors and the capacity at interconnections[43], equalizing prices across different European markets as long as interconnection capacities are not saturated.

Market coupling is essential for interconnected European countries, as it allows maximum benefit to be derived from the complementarities between national generation and consumption structures, promotes the integration of renewable energies, and strengthens the resilience of national electricity systems. France greatly benefits from this European integration, allowing it to export its surplus electricity generation to Europe and secure crucial imports for its supply security.

[43] The transmission capacity required for energy exchange is allocated "implicitly" in the auction system. Since 2015, the coupling of the CWE zone has been conducted via a flow-based multi-frontier optimization method. There are particular cases where capacity allocation can be carried out "explicitly," instead of or alongside the "implicit" allocation.

In 2024, the supply-demand balance continued to improve in France, resulting in record exports. Spot prices fell more sharply in France than in other European countries, dropping by 40% in 2024, while the average decline in France's neighbouring countries was 23%. As a result, French spot prices fell below German and Spanish prices, by €21.8/MWh and €5.3/MWh respectively. While Belgian prices were at the same level in 2023, they were €12.5/MWh higher in 2024. In 2024, the average French price is €18.2/MWh lower than the average Swiss price, compared with €10.6/MWh in 2023, and €27.8/MWh lower than the average British price, compared with €11/MWh in 2023.

Beyond its neighbouring countries, France had the lowest spot prices in Europe in 2024, apart from Norway, Sweden, and Finland, with at least €20/MWh discount on all other countries except Spain, Belgium, and Denmark. This price level is directly linked to the share of electricity produced from fossil fuels, which was only 4% in 2024 (only Norway and Sweden performed better, with 1% and 0%).

Table 14 : Monthly European spot prices spread with French spot price between 2020 and 2024 (country price – French price)

	Germany					Belgium					Switzerland				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
January	-3,0	-6,7	-43,7	-14,3	0,0	-0,1	-2,0	-20,0	-1,4	2,0	4,5	1,0	7,9	25,2	7,4
February	-4,3	-0,3	-56,7	-20,5	3,0	2,1	-0,4	-22,9	-5,3	3,1	7,9	4,9	23,1	5,0	11,6
March	-1,3	-3,1	-43,2	-9,4	11,1	0,2	-3,6	-29,5	-2,4	7,6	2,3	6,0	10,8	12,6	19,0
April	3,6	-9,5	-67,4	-5,6	34,1	1,3	-6,1	-46,5	-0,8	19,8	3,8	0,5	-5,6	9,8	34,0
May	2,7	-1,9	-20,0	4,2	40,0	0,5	0,4	-20,8	2,6	27,3	2,0	2,5	-0,4	8,3	34,8
June	0,4	0,6	-30,4	3,5	51,7	-0,2	0,9	-29,3	1,9	25,6	-0,1	0,1	6,4	0,9	14,0
July	-3,3	3,0	-85,9	0,0	20,7	-3,6	-1,0	-79,5	-2,3	7,5	-0,6	2,6	-17,8	4,8	-8,3
August	-1,9	5,4	-27,3	3,4	27,5	-1,2	2,2	-44,4	1,1	11,0	-1,2	5,2	-4,8	3,6	4,0
September	-3,5	-6,9	-48,6	12,0	26,5	-3,0	0,9	-48,2	5,6	14,8	-1,3	2,7	10,0	8,3	29,3
October	-3,9	-32,8	-26,2	3,1	24,0	1,5	-7,2	-21,4	2,1	15,8	0,4	26,1	5,1	21,2	21,2
November	-1,3	-40,9	-18,2	2,2	13,4	-0,2	-14,9	-11,5	2,5	8,4	1,3	9,8	27,2	14,2	24,3
December	-4,9	-53,6	-19,3	0,0	10,1	-1,0	-29,2	-1,6	0,9	7,0	2,9	7,6	9,2	12,6	28,0
Average price	**30,5**	**96,8**	**235,4**	**95,2**	**79,6**	**31,9**	**104,1**	**244,5**	**97,3**	**70,2**	**34,0**	**115,0**	**281,6**	**107,5**	**76,0**
	Great-Britain					**Spain**					**Italy**				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
January	4,1	29,1	7,7	17,3	7,9	3,1	0,7	-9,7	-62,5	-2,5	7,9	2,0	15,5	44,8	22,7
February	10,2	12,6	10,4	5,4	11,2	9,6	-20,5	14,7	-15,3	-18,4	12,5	8,5	27,6	13,4	29,5
March	11,7	15,9	6,0	18,8	18,1	3,9	-4,8	-11,8	-22,3	-33,3	7,6	9,9	16,3	29,0	35,8
April	14,2	11,9	-21,2	9,7	34,5	4,2	1,9	-41,6	-32,6	-14,6	11,0	6,0	16,8	29,2	59,0
May	10,2	30,3	-47,1	14,2	57,9	6,4	11,8	-10,3	-3,3	3,2	6,2	14,2	31,7	28,0	67,0
June	3,7	17,2	-59,5	6,9	50,5	4,8	9,8	-78,8	1,7	21,9	1,3	8,9	24,8	14,1	67,2
July	-0,9	30,0	-112,9	3,0	35,7	1,2	14,0	-258,2	12,8	25,3	2,6	22,0	50,5	33,0	60,6
August	3,5	48,0	-55,6	4,9	15,4	-0,6	28,6	-337,6	5,2	36,5	1,2	28,5	55,1	20,3	69,9
September	0,9	84,2	-85,8	7,6	38,1	-5,2	20,8	-253,6	14,6	20,8	0,5	23,3	41,3	27,4	63,9
October	9,8	41,5	-40,7	12,1	38,0	-1,3	27,4	-51,6	5,8	6,5	4,2	46,2	34,1	49,2	52,4
November	9,0	4,7	-30,1	19,8	15,9	1,8	-23,6	-76,3	-25,5	3,9	7,4	9,3	35,7	33,1	30,1
December	12,2	15,2	20,1	11,8	9,9	-6,5	-35,5	-173,9	3,7	13,1	5,3	12,2	33,0	47,3	37,2
Average price	**39,6**	**137,7**	**241,6**	**107,9**	**85,5**	**34,0**	**111,9**	**167,5**	**87,1**	**63,0**	**37,8**	**125,2**	**307,8**	**127,8**	**107,4**

Sources: EPEX SPOT, Nord Pool, ENTSOE – Analysis: CRE

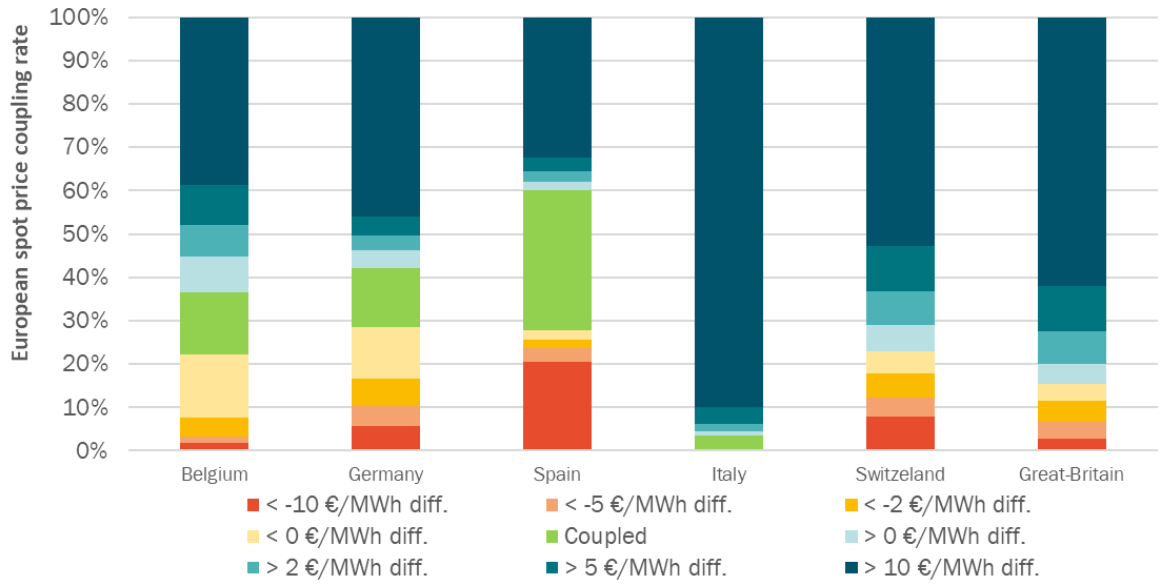
Table 14 below shows the average monthly differences between European spot prices and French spot prices since 2020. It indicates that French prices experienced a significant decline compared to its European neighbours starting in April and continuing until the end of the year, though these spreads slightly narrowed in November and December.

Figure 44 illustrates the distribution of differences between the French *spot* price and those of neighbouring countries. In 2024, the French spot price was strictly lower than the Belgian price 64% of the time, 58% for Germany, 40% for Spain, and 97% for Italy (90% of the time with the French price being more than €10/MWh lower), 77% for Switzerland and 85% for Great Britain. The French price equalled the Spanish price about 32% of the time, 14% for Belgium and Germany and 4% for Italy. French prices almost never equalled those in Switzerland and Great Britain, which are not members of the European Union and are therefore not included in the coupling.

The evolution of the convergence rate of French prices with its European neighbours is shown in the Figure 45 , on quarterly basis. A significant decrease in convergence with Italy has been observed since

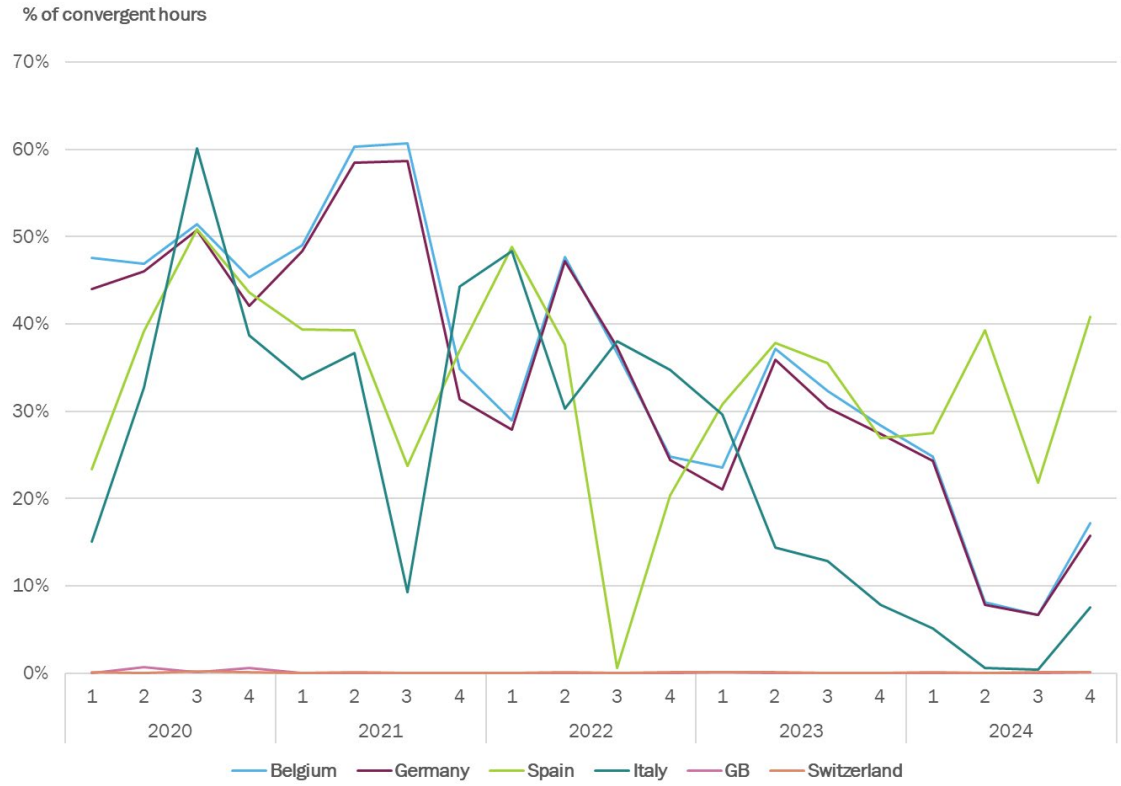
2022. Convergence with Belgium and Germany is also down compared to 2023, although it rises during the winter when the temperature sensitivity of French consumption pushes prices up. It is also noted that convergence with Spain decreases in the third quarter of 2024 due to strong demand in Spain for air conditioning in the summer.

Figure 44 : European spot prices spread with French spot prices in 2024 (country prices – French prices)



Sources: EPEX SPOT, Nord Pool, ENTSOE – Analysis: CRE

Figure 45 : Quarterly convergence rates of French spot prices with its European neighbours



Sources: EPEX SPOT, Nord Pool, ENTSOE – Analysis: CRE

2.5. Decrease in French forward prices and emergence of a significant price spread with Germany from the second quarter of 2024

Forward wholesale prices, particularly the annual product, play a major role in the electricity system economy: they largely determine the price paid by consumers, especially in retail markets dominated by fixed prices or those evolving at regular intervals, like in France, and also constitute a significant part of generators' revenue.

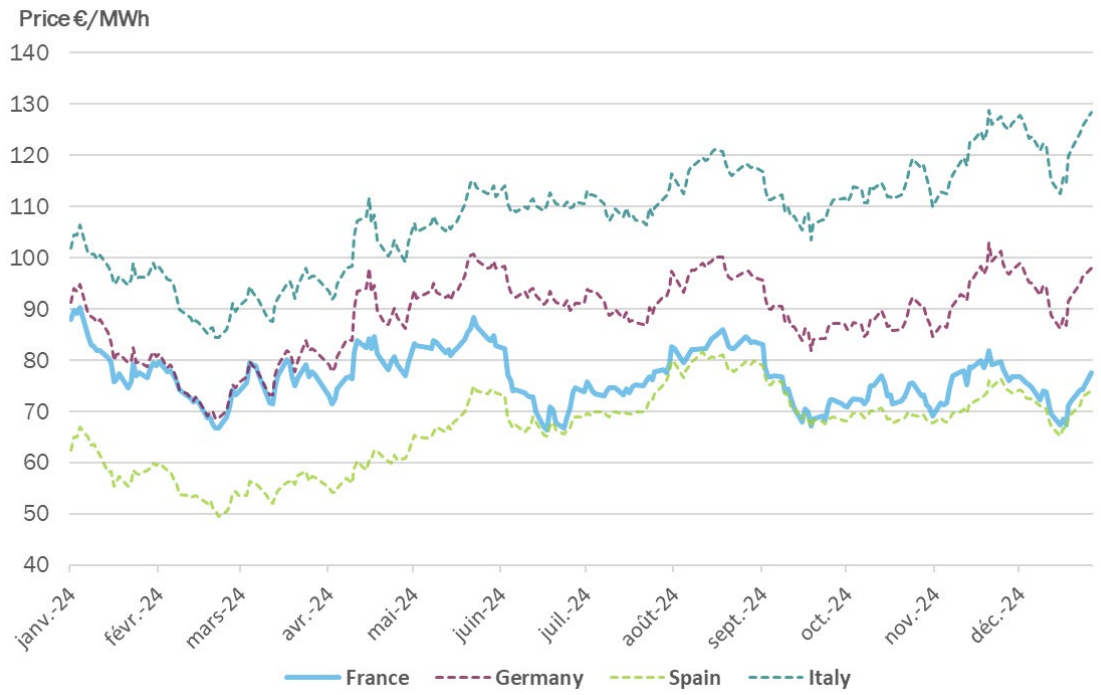
Futures markets allow electricity to be traded in advance for specific future delivery periods. They include products for different time horizons ranging from a few days to several years ahead. A market participant needing physical delivery at a given maturity date can take two approaches to hedge financially: a purchase on the spot market, covering the price risk with a cash-settled futures product, or a direct purchase of a physical product on the forward markets.

For cash-settled products, settlement prices are assessed daily until the last day of contract delivery and correspond to the average spot prices realized over the contract delivery period. These contracts are widely used by market participants to hedge against price fluctuations.

For example, a generator might secure volume and price before delivery, or a supplier might determine a supply price for consumers and secure a supply margin. In the longer term, forward prices are a signal for investment and can used as a reference in negotiating long-term contracts.

During 2024, forward electricity prices in France fell sharply compared with 2023. The price of the French Y+1 base calendar product averaged 76.6 €/MWh, more than half the average of 2023 (162.6 €/MWh), but still high compared to historical levels (46 €/MWh on average for 2017-2019, see Table 15). The Y+1 product price dropped from €88.1/MWh on January 2, 2024, to €77.6/MWh at the end of the year, hitting a low of €66.4/MWh on June 18, 2024, its lowest level since June 7, 2021.

Figure 46 : Prices of Y+1 baseload products in Europe



Source: Argus – Analysis: CRE

At the beginning of 2024, the price spread between France and Germany is very narrow. Then, starting in April, the French price breaks away from its German equivalent and falls sharply to converge with the Spanish price level. The French price then stabilizes between €70 and €80/MWh. At the end of 2024, the French Y+1 calendar product is €20.3/MWh lower than the German price and €50.8/MWh lower than the Italian price.

Decline in French forward prices in the first half of 2024

At the beginning of 2024, electricity price dynamics are driven by declining gas and CO2 prices and low demand. The winter is mild and energy-saving efforts continue. The forward contract price for delivery in the first quarter of 2025 in France drops to €81/MWh by the end of February before experiencing an upward reaction following the discovery of stress corrosion cracking on the Blayais 4 reactor, but this is short-lived. Meanwhile, European prices rose gradually until the end of March, reaching €116/MWh in the wake of the situations in the Middle East and Ukraine.

From April 2024, the France-Germany price spread on the 2025 annual contract gradually widens, up to €25/MWh lower for the French price, due to the good health of the French nuclear fleet, giving market players greater confidence in the French market. In June, the French price accelerated its decoupling from the German price and reached the prices of its Spanish equivalent between €70 and €75/MWh, driven by the growing penetration of renewables in spot prices in France and heavy rainfall filling hydro stocks.

The figure 49 shows that this France-Germany spread widened across all annual contracts and more significantly for the 2026 contract. This phenomenon can be explained by fundamental factors related to nuclear and renewable generation, but also by unbalanced hedging pressures on the buy and sell sides of the 2026 annual contract due to the end of the ARENH.

Stabilization of forward prices in the second half of 2024

In July and August, tensions over gas prices drove European electricity prices up. EDF's announcement in early September, raising its nuclear production estimate for 2024 by around 20 TWh, subsequently helped ease French prices. At that point, the price for the first quarter of 2025 fell below its German equivalent until delivery.

At the end of the year, the outlook of a cold winter and low wind generation maintained high prices, while gas prices rose and remained volatile, driven by the end of Russian gas transit through Ukraine. In mid-December, the price for the first quarter of 2025 in France benefited from a break, reaching its lowest level in 2024 at €80.8/MWh, amid milder weather forecasts and an announcement of 12 TWh higher nuclear generation.

Volatility remains stable in 2024

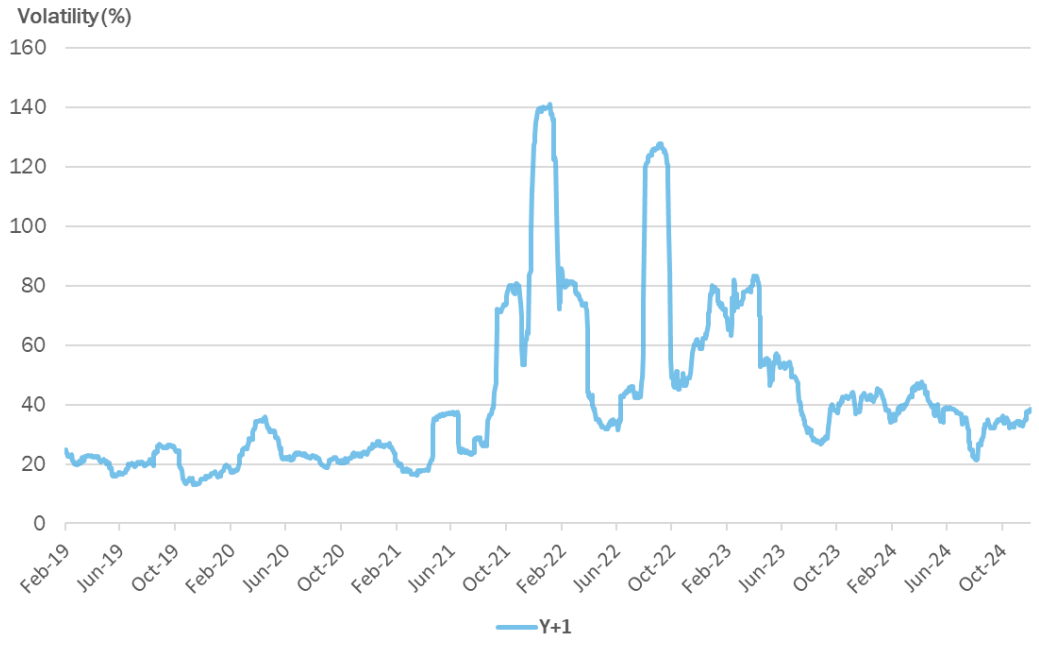
In 2024, volatility decreased compared to the previous year (37% on average versus 55% in 2023) but remains higher than in 2018 and 2019 (20% on average).

Volatility initially fluctuated between 35% and 45% during the first half of 2024, with day-to-day Y+1 price variations around €1.6/MWh. Large variations were limited and mainly due to adjustments based on weather forecasts and gas supply events. August 2024 saw volatility fall to 22% and in September, the price drop triggered by EDF's announcement on nuclear production increased volatility back to 35%, which remained unchanged for the rest of the year.

French forward prices lower than German prices for the first time since 2013

Table 15 shows that 2024 is the first year since 2013 in which the average Y+1 calendar price is lower than the German price. This trend continued and even amplified in the first half of 2025.

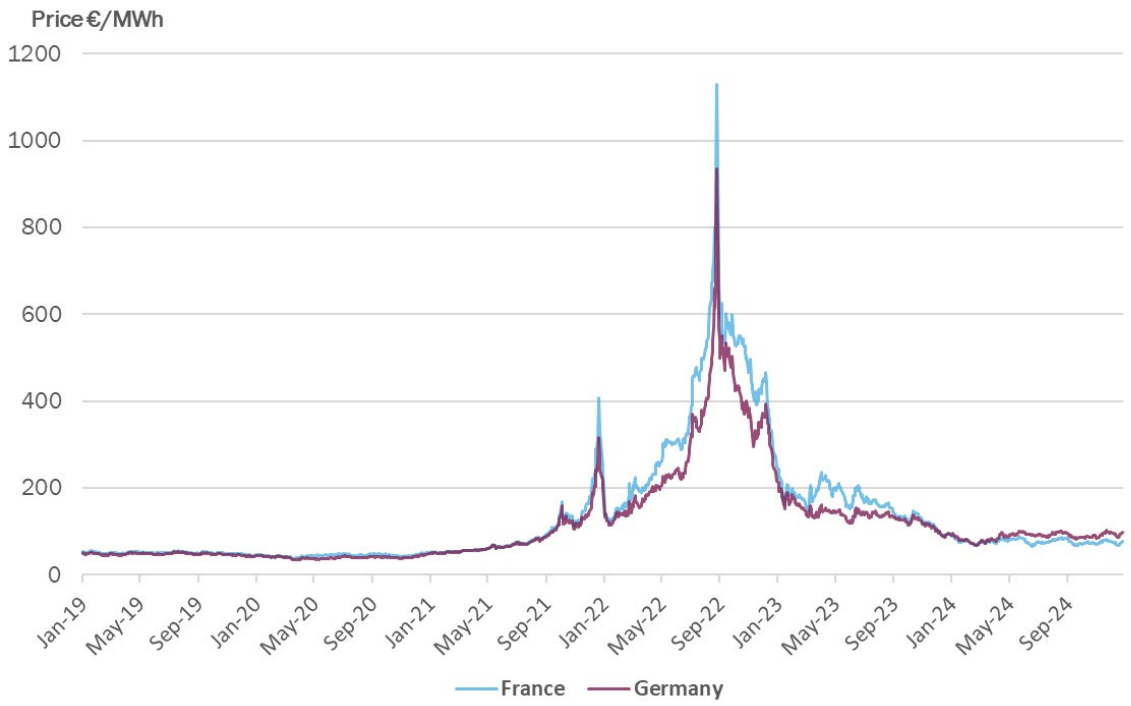
Figure 47 : Volatility[44] of the Y+1 baseload product in France



Source: Argus – Analysis: CRE

[44] $x_n = \ln(Prix_n) - \ln(Prix_{n-1})$; Volatility = $100 * \sqrt{252 * var(\{x_1, x_2 \dots x_{40}\})}$;

Figure 48 : Historical prices of French and German Y+1 baseload products (monthly average)



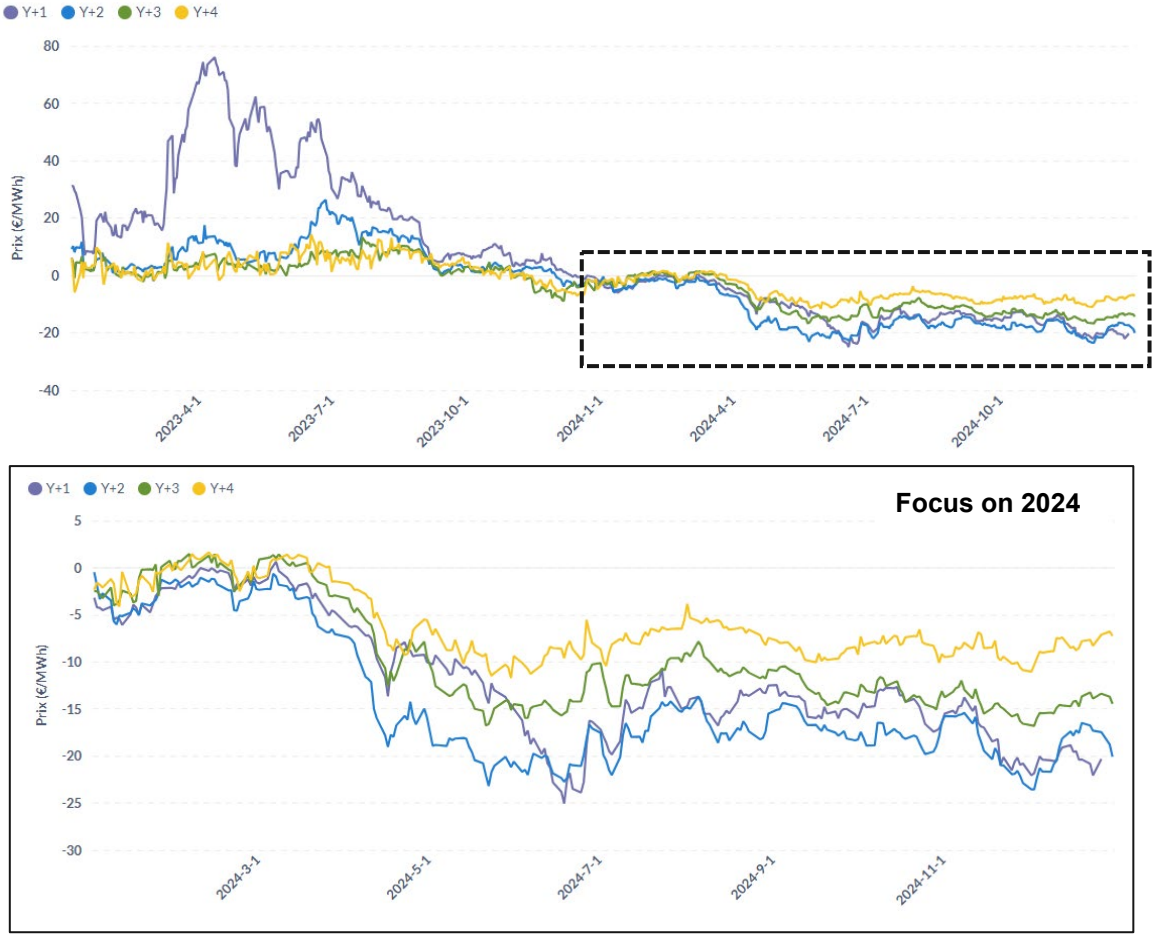
Source: Argus – Analysis: CRE

Table 15 : Evolution of the annual average price of the French and German Y+1 baseload product since 2013

Year	France	Germany	FR-DE spread	Relative spread
2013	43.3	39.1	4.2	10%
2014	42.4	35.1	7.3	17%
2015	38.2	30.9	7.2	19%
2016	33.3	26.6	6.8	20%
2017	38.3	32.4	5.9	15%
2018	49.0	43.9	5.1	10%
2019	50.9	47.7	3.0	6%
2020	44.9	40.2	4.6	10%
2021	96.4	88.8	6.6	7%
2022	367.7	298.4	69.2	19%
2023	162.7	136.8	25.1	15%
2024	76.7	88.7	-12.0	-16%

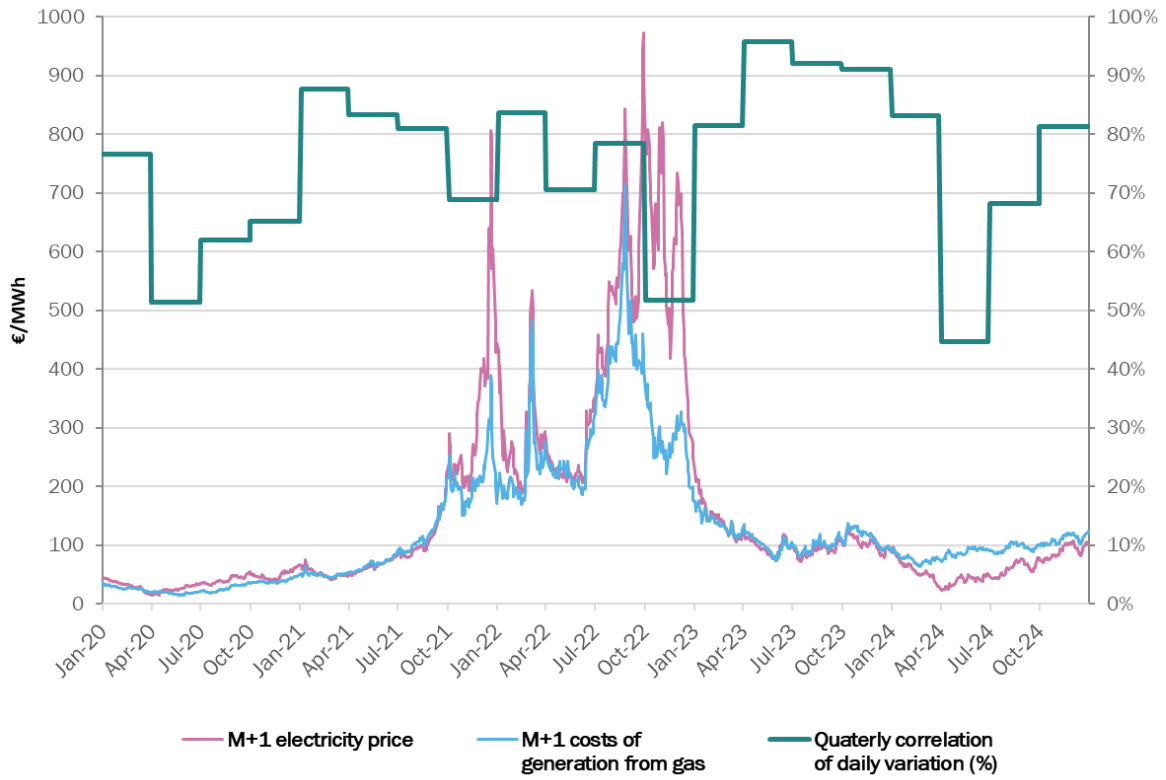
Source: Argus – Analysis: CRE

Figure 49 : Evolution of price spread between France and Germany for Y+1 to Y+4 baseload products since January 1st, 2023



Source: EEX – Analysis: CRE

Figure 50 : Quarterly correlation between daily variations French M+1 electricity price and gas-based power generation costs in France



Source: Argus – Analysis: CRE

In order to estimate the influence of gas and CO2 prices on French forward market prices, Figure 50 presents a comparison between French monthly prices and the costs of power generation from gas, which is the gas price multiplied by the standard efficiency of a gas-fired power plant (here 50%), adding the CO2 per ton price times the standard emissions of a gas-fired power plant (here 0.35 tCO2/MWh). The correlation between these price variations one day to the next allows estimating the extent to which a variation in gas production costs can affect electricity prices. A coefficient of 100% indicates that electricity prices vary exactly in line with gas production costs, whereas a coefficient of 0% indicates that electricity prices vary independently of these costs.

Between 2020 and 2023, this correlation generally ranged between 70% and 90%, apart from exceptional events such as the COVID-19 pandemic (from March to the end of 2020) with very low demand, and the period of uncertainty in supply and demand (last quarter of 2022) when prices included risk premiums and were decoupled from fundamentals. In 2024, the correlation fell sharply in the second and third quarters to 44% and 68% respectively, due to the predominance of renewables and nuclear power. Winter prices still seemed dependent on gas, with an 80% correlation in the last quarter of 2024.

The annual correlation finally stood at 75% in 2024, compared to 94% in 2023. By comparison, in Germany, applying the same methodology, the annual correlation was 96% in 2024 and 93% in 2023.

2.6. Changes in CO2 emission allowance prices

The EU Emissions Trading System (ETS) was established by the European Union in 2005 to reduce greenhouse gas emissions from industry and electricity producers. The annual volume of allowances is defined by European Directive 2003/87 according to the emissions of companies within the scope of the scheme and the targets for reducing these emissions. This volume is made available either free or sold at auction. The allowances can then be freely exchanged by market participants to adjust the coverage of their projected CO2 emissions within their scope.

The price of CO2 is strongly influenced by the trade-off between using coal or gas for power generation. If gas prices fall relative to coal, gas-fired electricity generation may become more competitive than coal-fired electricity generation, reducing the demand for CO2 allowances from fossil fuel power generators and thus putting downward pressure on the price of CO2.

In 2024, CO2 allowance prices fell significantly, averaging 66.5 €/t for the *December 2024* reference contract, compared with 85.3 €/tCO_2 in 2023, marking a 22% drop. Prices ranged from €77.5/tCO_2 (on January 3, 2024) to €52.4/tCO_2 (on February 23, 2024).

Changes to the scope of the EU ETS took effect in 2024. The maritime transport sector now has to provide carbon allowances for all emissions from intra-European transport and for half of the emissions from extra-European transport. In the aviation sector, the scope has been extended to include flights to and from the EU's outermost regions. These changes increase demand, while the allocation of free allowances also decreases. Meanwhile, the overall decline in CO_2 emissions across Europe and weak economic growth, particularly in the industrial sector, tend to reduce this demand.

At the beginning of 2024, the price of CO_2 allowances reached €52.4/tCO_2 its lowest since July 2021. This decline is mainly explained by the falling gas prices impacting coal-based generation. A rebound occurred in March, following the trend in gas prices and against a backdrop of sustained demand. The price then rose to €76.5/tCO_2 on May 22.

From June onwards, the carbon market experienced a decline, likely due to a larger volume of allowances auctioned in August compared to previous years, in view of the deadline for the allowances surrender set for September 30, instead of April 30 this year.

The CO_2 price then stabilized at the end of the year between €60/tCO_2 and €70/tCO_2, following gas price movements. A bullish sentiment took over the market in mid-December and the allowance ended the year at €72.9/tCO_2.

Figure 51 : Evolution of CO_2 allowances prices

Source: Argus

3. Volumes traded increase on the French forward market with the end of ARENH

Trading on wholesale markets takes place either over-the-counter (OTC) or on an exchange. Most OTC trades are intermediated by brokers. The traded products can be settled physically or financially. On the French market, financially settled products can be traded directly on exchanges (mainly EEX) or intermediated by brokers and then registered with an exchange for clearing through the clearing house (mainly EEX). Physically settled products are mostly intermediated by brokers but can also be traded bilaterally

Auctions organized by EDF on a platform dedicated to the forward sale of "almost-certain" volumes of energy acquired under state-guaranteed purchase obligation contracts also represent significant volumes of energy.

On forward markets (OTC, EEX exchange), the primary products traded in France range from a 3-year horizon (Y+3 product) to one day prior delivery. Most of the day-ahead and intraday trading takes place on the EPEX SPOT and Nord Pool exchanges, the designated operators in France for European day-ahead and intraday market coupling. Day-ahead trading is conducted via daily auctions (Single Day-Ahead Coupling – SDAC); intraday trading is conducted on a continuous market (Single Intraday Coupling – SIDC – and national market).

On forward markets, traded volumes on the French electricity market rose sharply by 118% in 2024 (1,434 TWh) compared to 2023 (673 TWh), representing an all-time high for the French market.

Volumes are increasing across all types of physical and financial delivery contracts. The increases are as follows:

- + 164% in volumes traded on the EEX exchange (471 TWh in 2024 compared to 179 TWh in 2023),
- + 96% in OTC financial products (807 TWh in 2024 compared with 411 TWh in 2023),
- + 120% in OTC physical products (131 TWh in 2024 compared with 59 TWh in 2023).

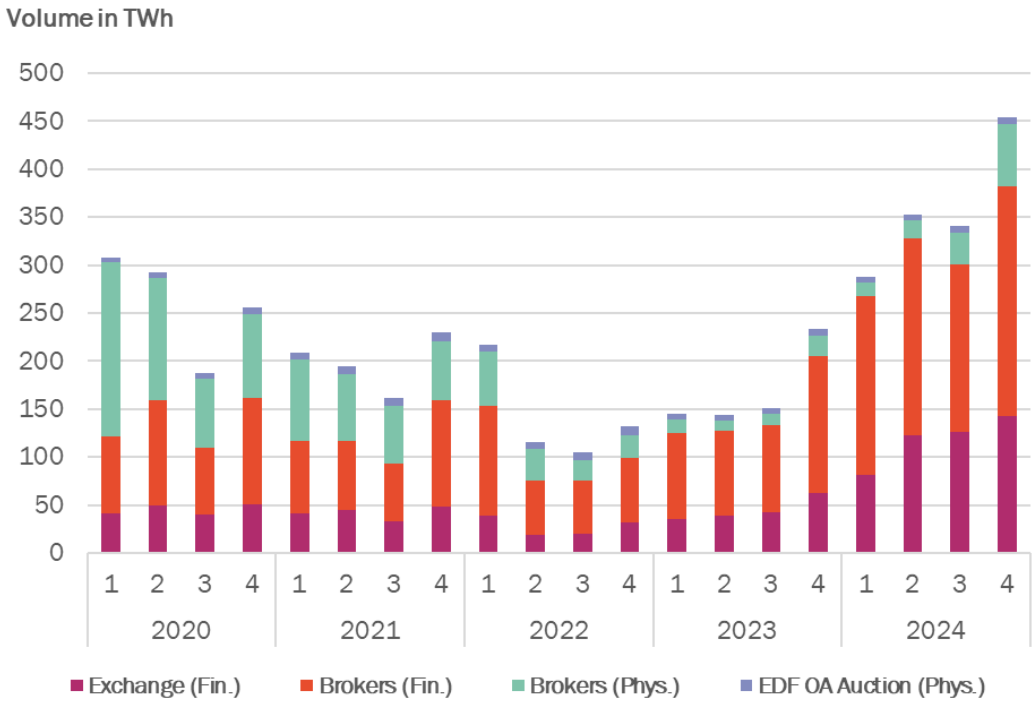
It should be noted that the volumes sold at EDF auctions for energy under purchase obligation are not directly comparable to others, as they do not involve in "back-and-forth" trades but only sales from EDF.

Figure 53 shows all volumes traded on wholesale markets by maturity, on futures markets as well as on daily and intraday markets. Between 2023 and 2024, volumes grew significantly across all maturities from 2026 onwards, particularly for annual, quarterly and monthly products:

- Annual products: up 180%, from 206 TWh traded in 2023 to 578 TWh in 2024 (including 276 TWh traded on the 2025 annual product and 302 TWh on annual products from 2026 onwards, post-ARENH),
- Quarterly products: up 94%, from 234 TWh traded in 2023 to 453 TWh in 2024,
- Monthly products: up 94%, from 195 TWh in 2023 to 377 TWh in 2024,
- Weekly products: up 73%, from 50 TWh in 2023 to 87 TWh in 2024,
- Daily forward products[45] : up 8%, from 23 TWh in 2023 to 25 TWh in 2024,
- Coupled daily market (day-ahead): up 29%, from 122 TWh in 2023 to 156 TWh in 2024,
- Intraday market: up 22%, from 20 TWh in 2023 to 25 TWh in 2024 (including 3 TWh traded at auction).

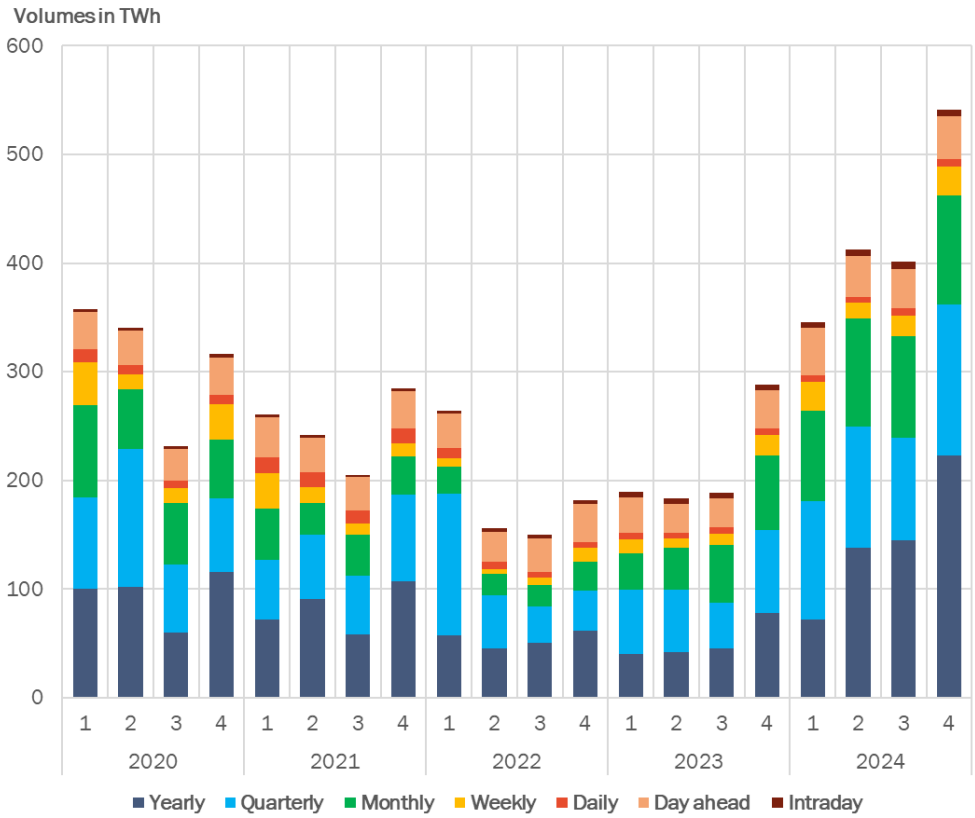
[45] Daily forward products are forward products with a duration of one day that can be delivered even several months after the transaction, while *day-ahead* products are *spot* products with hourly durations that are traded each day for the following day.

Figure 52 : Quarterly volumes traded on the EEX exchange or through brokers on forward markets, volumes sold at EDF auctions for energy under purchase obligations



Sources: EEX, REMIT data, EDF OA – Analysis: CRE

Figure 53 : Quarterly traded volumes on wholesale markets by maturity (physical and financial combined)



Sources: REMIT data, EEX, Nord Pool, EPEX SPOT, EDF OA – Analysis: CRE

On one hand, this increase in traded volumes can be explained by the exit from the crisis and the improvement in the general context in Europe: the European market has regained a certain stability and the confidence of market participants, promoting exchanges. In addition, new participants are emerging on the futures market, increasingly using trading algorithms to improve transaction efficiency and seize market opportunities, which contributes to increase the volumes traded, especially on quarterly and monthly products, and enhancing their liquidity.

On the other hand, the rise in trading volumes in France can also be explained by the end of the ARENH. The ARENH requires EDF to sell about 130 TWh of its nuclear generation at a regulated price. These volumes are allocated without going through wholesale markets. From the delivery year 2026, this mechanism will end, leading suppliers and consumers to source all their supplies on the market at that time, and EDF to sell all its generation exceeding its own customers' consumption on the market. This deadline is, in 2024, close enough for the French futures markets to record a sharp increase in volumes traded for contracts delivering in 2026 and beyond, mainly annual and quarterly products.

Previously, the market had strongly shifted towards cash-settled products with central clearing to reduce counterparty risks as prices peaked, at the expense of physical delivery products. In 2024, market players seem to be gradually returning to physically settled products now that prices have fallen, although volumes are lower than those traded in 2021 (278 TWh of physical products traded in 2021, twice as much as in 2024).

Forward products represent the largest share of traded products on the wholesale electricity markets, as market participants primarily hedge their medium to long-term exposure and adjust this hedge over time. Shorter-term markets, coupled daily and intraday markets, are essential for optimizing electricity generation fleet and the use of interconnections, even though they represent smaller trading volumes. The daily market nonetheless represents significant volumes, mainly because it can be used to buy or sell electricity whose price has already been hedged by the purchase or sale of a future financially settled contract.

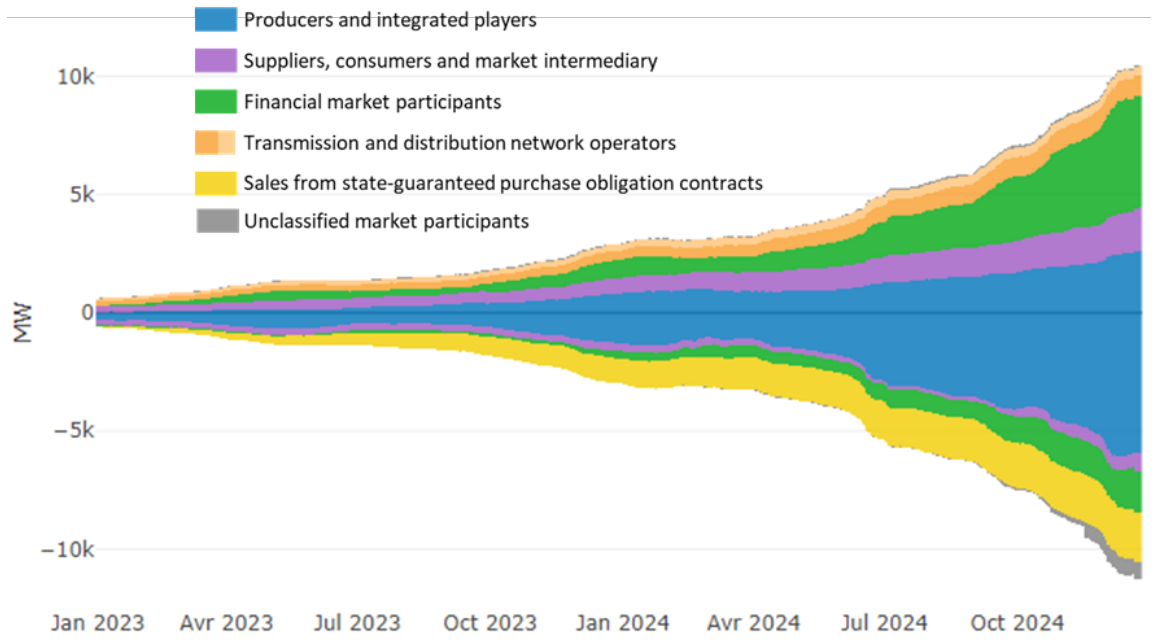
Figure 54 and Figure 55 illustrate the evolution of market participants' open positions by category, for yearly baseload contracts for delivery in France in 2024 and 2025 (physically and financially settled products combined). It should be noted that this is the evolution of open positions over the years preceding delivery.

The categories of players have been constructed as follows:

- Producers and integrated players: vertically integrated companies with generation and supply activities in France or players with generation only in France.
- Suppliers, consumers and intermediaries: pure suppliers, also known as "alternative suppliers," large consumers sourcing directly from wholesale markets, and participants acting as intermediaries in the wholesale trading of energy products between producers and suppliers, or as buyers for large consumers (this includes so-called pre-brokerage and aggregation activities).
- Financial market participants: participants who have no supply points or generation plants in France, but who may be active on the French wholesale markets at various maturities, and on cross-border electricity trading.
- System operators: transmission or distribution system operators who buy transmission losses on forward markets.
- EDF OA ("obligation d'achat"): regulated participant selling the production volumes generated by contracts under purchase obligation, in accordance with the terms and conditions set by the CRE[46] .

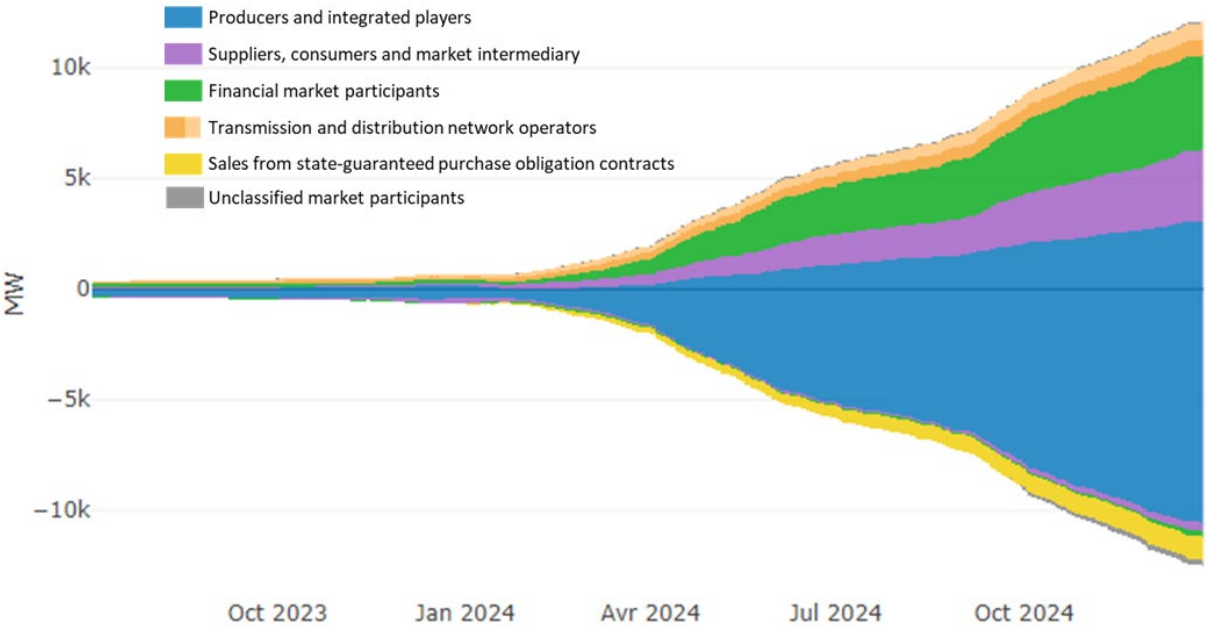
[46] CRE Decision No. 2019-259 of November 28, 2019 on the methodology for calculating the avoided cost of electricity produced under purchase obligations

Figure 54 : Evolution of market participants' open positions by category, for the yearly baseload 2025 product (physically and financially settled products combined), since January 1st, 2023



Sources: REMIT data, EDF OA – Analysis: CRE

Figure 55 : Evolution of market participants' open positions by category, for the yearly baseload 2026 product (physically and financially settled products combined), since January 1st, 2023



Sources: REMIT data, EDF OA – Analysis: CRE

For the annual base 2025 product, an initial acceleration in position-taking occurred in January 2024, followed by a more significant one from July 2024 until the start of delivery. Physical participants represent a large majority of open positions, although financial participants have taken substantial long positions starting in October 2024.

For the annual base 2026 product, total open positions were 12.5 GW on January[1,] 2025, already exceeding the total of 11.3 GW for the 2025 product at the same date, due to the end of the ARENH. Short positions are almost exclusively held by physical participants, while financial participants have taken a large share of long positions.

The Y+3 and Y+4 maturities are growing strongly, while Y+5 remains very weak

The energy price crisis of 2022-2023 highlighted the need for electricity consumers who desire stable and predictable prices in the medium and long term (three to five years) to safeguard themselves against volatility due to short-term cyclical effects.

However, liquidity for maturities beyond two years was low (Y+3) or even non-existent in France (Y+4 and Y+5), as shown by the Figure 56 .

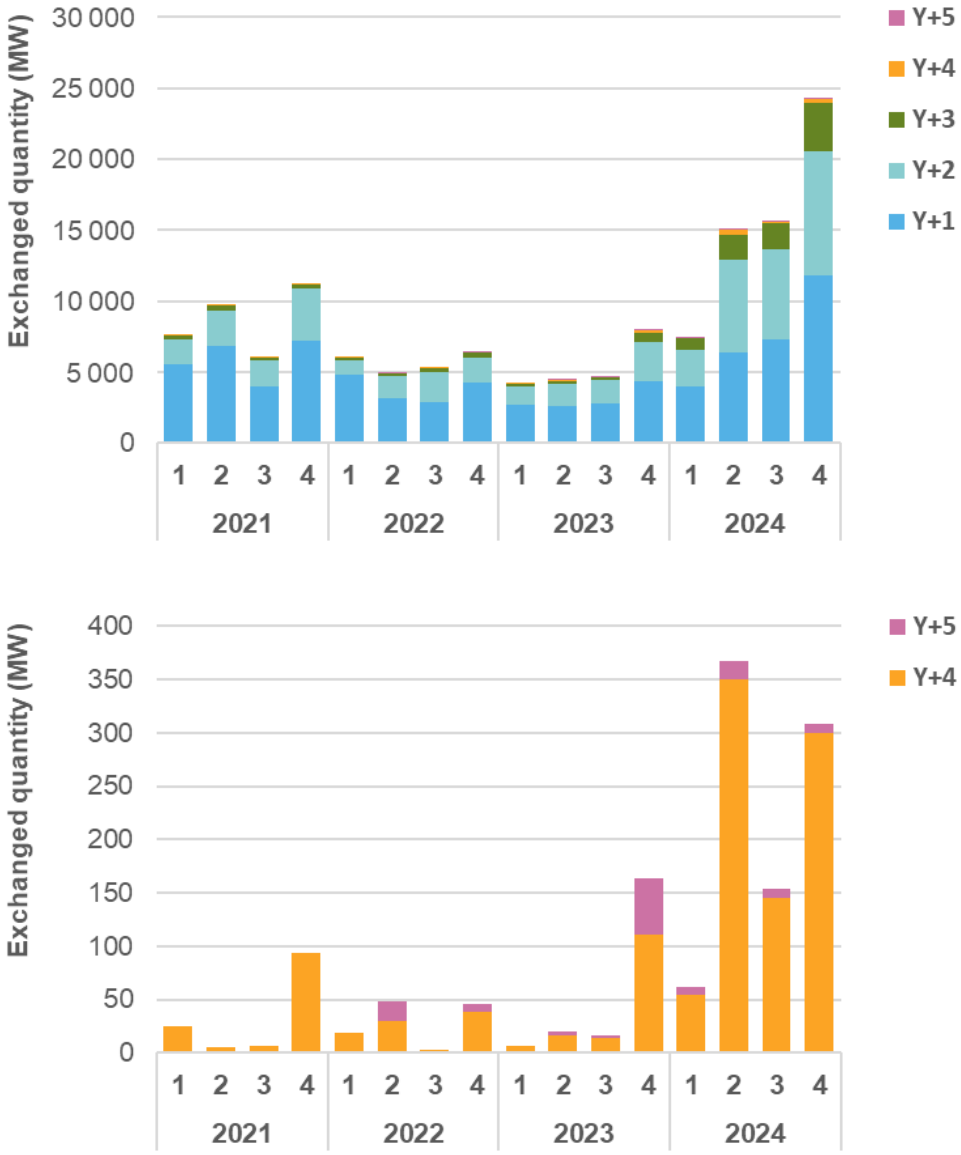
In this context, on September 27, 2023, EDF launched daily tenders[47] for the sale of physical products for delivery in years Y+4 and Y+5 for a maximum volume of 5 MW/day for each of the two products. These auctions will take place at least until the end of 2025.

Although the volumes traded for Y+1 and Y+2 maturities are higher, Y+3 and Y+4 saw a significant increase in activity compared to previous years, with five times more volumes exchanged. However, the volumes traded for Y+5 remain very low.

As part of its mission to monitor wholesale markets, CRE pays particular attention to trades on these illiquid maturities and closely monitors the operation of EDF's auctions.

[47] https://www.edf.fr/groupe-edf/edf-en-bref/optimisation-et-trading/appels-doffres-sur-des-rubans-annuels-delectricite-a-horizon-y4y5 & https://opendata.edf.fr/explore/dataset/prix-de-vente-suite-aux-encheres-rubans-d-edf-sa/table/?sort=-tri

Figure 56 : Quarterly sum of quantities exchanged on French baseload contracts Y+1 to Y+5 (in MW)



Source: REMIT data, EEX, EDF OA – Analysis: CRE

The year 2024 was marked by significant growth in activity on the French market, reflecting the renewed confidence of market participants following the 2022 crisis. This dynamic can be seen in both short-term contracts (quarterly and monthly maturities) and long-term contracts (Y+3 and Y+4 maturities). It contributes to improved liquidity on the French market, ensuring that prices reflect a balance between supply and demand, reducing volatility and facilitating the entry of new market participants. The outlook for the end of ARENH is positive, with the increase in exchanged volumes indicating greater coverage for both producers and suppliers at prices in line with market fundamentals.

4. Balancing markets: system services, adjustment and reserves

Products traded on balancing markets are considered wholesale energy products under REMIT. As such, CRE is responsible for monitoring these markets. Furthermore, pursuant to the European Electricity Balancing Guideline[48] , hereinafter referred to as the "EB Regulation") and Article L. 321-11 of the French Energy Code, the CRE approves the operating rules for these markets proposed by RTE.

4.1. General principles and future developments of balancing markets

In order to balance consumption and generation at all time, RTE, as the entity responsible for the balance of the electricity grid, requests services from market players that enable electricity generation or consumption to be modulated. To ensure this balance, different types of reserves can be mobilized: on the one hand, frequency system services consisting of frequency containment reserves (FCR) and automatic frequency restoration reserves (aFRR), which can be activated automatically. and on the other hand, tertiary reserves, which can be activated manually. In addition, replacement reserve can be mobilized through manual activation. Moreover, balance responsible parties (BRP) are financially incentivised to balance their injections and imports on one hand, and their withdrawals and exports on the other, ahead of real-time, to limit imbalance volumes to be absorbed by RTE during its operational window.

The activation and procurement of balancing reserves is evolving towards a generalization of market based mechanisms, particularly in the context of European integration of balancing markets. The CRE is actively involved in these developments, aiming to improve system efficiency for the benefit of consumers, and ensure the proper functioning of these new markets.

4.1.1. Frequency containment reserve (FCR)

Frequency containment reserve aims to contain frequency imbalances on the interconnected continental European network by modulating the injection or withdrawal of participating units in response to real time frequency imbalances. RTE contracts FCR capacity from French and foreign balancing service providers through the "FCR" (Frequency Containment Reserve) cooperation, which RTE joined in early 2017.

This cooperation involves daily auctions conducted jointly by TSOs from eight countries (Germany, Austria, Belgium, Denmark, France, Netherlands, Slovenia, Switzerland, and Czech Republic). Only the FCR capacity is subject to a market-based mechanism. Because of the way this reserve is activated (automatic and decentralized based on frequency imbalances), there is no competition for energy activations. Furthermore, exchanges between countries resulting from FCR activation are never constrained by transmission capacities at the borders, as these exchanges have already been provisioned within the safety margins of the interconnections.

4.1.2. Automatic frequency restoration reserve (aFRR)

Automatic frequency restoration reserve is automatically activated by RTE through a signal sent to all participating units. Its purpose is to balance any deviations between scheduled and actual commercial exchanges at interconnections.

[48] Commission Regulation (EU) 2017/2195 of November 23, 2017 establishing a guideline on electricity balancing

Historically, the activation of this reserve consisted in sending a single signal to all participants, without any competitive selection. Since November 2023, aFRR activation is subject to a market mechanism based on an economic merit order. Energy activations are now subject to bids submitted by market participants close to real time, with selection optimized by RTE. Throughout 2024, as analysed in this report, this real-time optimization was carried out by RTE on a France-wide basis only. However, the arrangements implemented in France were designed as a variation on those provided for by the European platform for aFRR activations, PICASSO (*Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation*). This platform came into service in June 2022 and makes it possible to take into account all bids submitted in Europe, the real-time needs of each TSO and the exchange capacities available at the borders. To date, the German, Austrian, Czech, Dutch, Slovak, Belgian, Bulgarian, Lithuanian, Greek, Estonian, Latvian, and French TSOs are connected to the PICASSO platform. RTE's connection was completed on April 2, 2025, thereby optimizing aFRR activations at the European level.

The activation of aFRR by RTE is also optimized through the European IGCC (*International Grid Control Cooperation*) platform, which makes it possible to offset opposing demands between member countries and thus limit simultaneous activations of aFRR in opposite directions across borders. RTE joined the project in 2016. To date, the TSOs of 24 countries participate in the IGCC platform.

The contracting of aFRR capacity by RTE ahead of real time, historically carried out through a regulated tariff, has evolved towards a daily call for tenders open to all certified players. Noting a clear improvement in the competitive situation of the aFRR market, both in terms of certified volumes and the number of players involved and the diversity of assets that can participate in this market, the CRE decided, by deliberation[49] in January 2024, to reopen the tendering process for aFRR capacity in June 2024.

4.1.3. Manual reserves (mFRR and RR)

Manual reserves are activated by RTE through the balancing mechanism, a market organised by RTE since 2004, and through the European platform for the exchange of standard products for replacement reserve energy (hereinafter referred to as "TERRE platform"), to which RTE connected on 2 December 2020. The participants in the balancing mechanism, known as " balancing service provider", submit offers to RTE, based on contracted or non-contracted resources. These balancing service providers may be facilities located in France (withdrawal, injection, storage), or actors or network operators located abroad, called upon through interconnections. Bids define the technical conditions for activation, a price for the activated energy and, where applicable, a start-up price. RTE activates this reserve according to its needs and respecting a so-called "techno-economic" precedence, which takes into account not only the price of the bids but also their technical characteristics. RTE activates offers to manage the supply/demand balance in France, but also to resolve any congestion on the network, to increase the provision of system services, or to restore a sufficient level of flexible means available in the system.

All generation resources connected to the transmission network are required by law to offer their available flexibility through bids submitted to the balancing mechanism.

The TERRE platform is the result of cooperation initiated in 2014 by European TSOs that use replacement reserve products to balance their zones, including RTE. All TSOs using replacement reserve products must participate, in accordance with Article 19 of the EB regulation. Any balancing market participant with balancing capacity that can be mobilized in less than 30 minutes can participate, starting at 1 MW. The TERRE platform allows, within the limits of the interconnection capacities available after the closure of intraday exchanges, the exchange of "standard" additional reserve offers, i.e. offers with certain technical characteristics that are predefined and harmonized between the TSOs participating in the platform. The bid selection algorithm performs hourly optimization for the four 15-minute periods of the following hour in order to select the bids to be activated. Balancing offers are remunerated at the marginal price of the zone in which they are activated.

[49] Decision of the Energy Regulatory Commission of January 25, 2024, terminating the derogation granted to RTE under Article 6 of Regulation (EU) 2019/943 of the European Parliament and of the Council of June 5, 2019, on the internal market for electricity

The platform was officially launched on January 15, 2020, and by the end of 2022, six TSOs were connected to it. RTE has been connected since December 2, 2020. The TERRE platform will cease to operate at the end of 2025, in line with the reform of the electricity market organization. Regulation (EU) 2024/1747, adopted on May 21, 2024, amends Article 8 of the Electricity Regulation, which now provides that "From 1 January 2026, the intraday cross-zonal gate closure time shall not be more than 30 minutes ahead of real time." This new deadline is incompatible with the use of the TERRE platform, which currently has an activation delay of 30 minutes. A European platform for the exchange of standard manual frequency restoration reserve (mFRR) products (hereinafter "MARI platform") was also launched at European level in October 2022. RTE plans to connect to the MARI platform in early 2026.

Part of the manual reserve is also subject to capacity reservation by RTE ahead of real time. For 2024, RTE has contracted half of the manual reserves through an annual call for tenders launched in July 2023, with bids to be submitted on September 16, 2023. The other half has been contracted through a daily call for tenders throughout the year. Manual reserves capacity contracting enable RTE to have 1,000 MW available at any time within 13 minutes (mFRR) and an additional 500 MW available within 30 minutes (RR).

4.1.4. The balance responsible party (BRP) mechanism

The balance responsible party (BRP) mechanism provides financial incentives for market players to match injections and withdrawals within their scope as closely as possible, with each connection point to the grid being assigned to a balance responsible party. Any imbalances (energy deficit or surplus for a given 30-minute period) are subject to financial settlement representing the value of the balancing energy that had to be mobilized by RTE, where necessary, to absorb these imbalances. The imbalance settlement period was reduced from 30 minutes to 15 minutes on January[1,] 2025, in accordance with the provisions of Article 53(1) of the EB Regulation.

Up to one hour before real time, generation schedules may be modified, and players may import or export energy through cross-border markets, thereby modifying the BRP's imbalance and the "physical" position of the France zone. After this time, and until real time, French players can continue to exchange energy between themselves on the French intraday market, without being able to modify production or import/export schedules. These latter exchanges therefore have an impact on the imbalances of the BRDs concerned, but not on the physical balance of the France zone. During this period, known as the "activation window", RTE is therefore the only player to take "physical" balancing actions. The activation window will be reduced from one hour to 30 minutes by January 1, 2029, at the latest.

4.2. Balancing markets in 2024

4.2.1. Overview

Table 16 below presents the physical and financial summary of the balancing reserves contracted by RTE and the balancing energy activated.

16 : Balancing reserves contracted by RTE, activated balancing energy and associated costs in 2023

2024	Contractualization (paid by TURPE)			Activations (paid by the BRs)			
				Upward		Downward	
Reserve	Direction	MW (average)	M	GWh	M	GWh	M
FCR	Increase and decrease	486	21	539	27.5	529	-27.1
aFRR	Increase and decrease	747	296	1,061	129.9	1,501	19.6
Rapid Reserve	Increase	1,500	27	1,815	557.2	1,397	-60.3
Complementary Reserve				1,057		2,048	
Total		**2,733**	**344**	**4,472**	**735.6**	**5,475**	**-67.8**

Source: RTE – Analysis: CRE

Capacity contracting costs are covered by public electricity transmission network usage tariffs (hereinafter "TURPE").

The contracting cost of FCR decreased by €12 million in 2024 compared to 2023, due in part to the general decrease in wholesale prices in 2024 and in part to the growth of the fleet of certified batteries to provide this reserve at a lower cost.

aFRR was contracted during the first half of 2024 on the basis of a prescription with a regulated price of €22.1/MWh, then on the basis of a daily pay-as-clear tender starting in June. The transition to market-based contracting led to an increase in contracting costs from €133 million to €296 million. This increase in costs is linked, on the one hand, to the still limited competition for this reserve, due in particular to the very gradual deployment of new qualified assets, and, on the other hand, to the high costs of building up this reserve during the afternoons in spring and summer (the offers from certified thermal assets include start-up costs and losses on wholesale markets during these periods).

The cost of contracting mFRR and RR has fallen sharply compared with 2023, a year marked by an annual tender conducted during the wholesale price crisis (September 2022). The cost of contracting these reserves for 2024 is falling to €27 million, bringing prices back to pre-crisis levels.

Activation costs are paid by the balance responsible parties through the settlement price for imbalances, except for additional costs relating to activations for reasons other than balancing, which are paid by consumers via the TURPE.

The activation of manual reserves (mFRR and RR) on the French balancing mechanism and on the TERRE platform represented a net cost of €497 million in 2024, down from €555 million in 2023. The difference compared to 2023 is mainly due to the decline in the price of upward activated offers, which follows the downward trend in wholesale electricity prices.

Energy activated from the FCR is valued at the *spot* price. As activations of this reserve are on average centered around zero, their net value is close to zero.

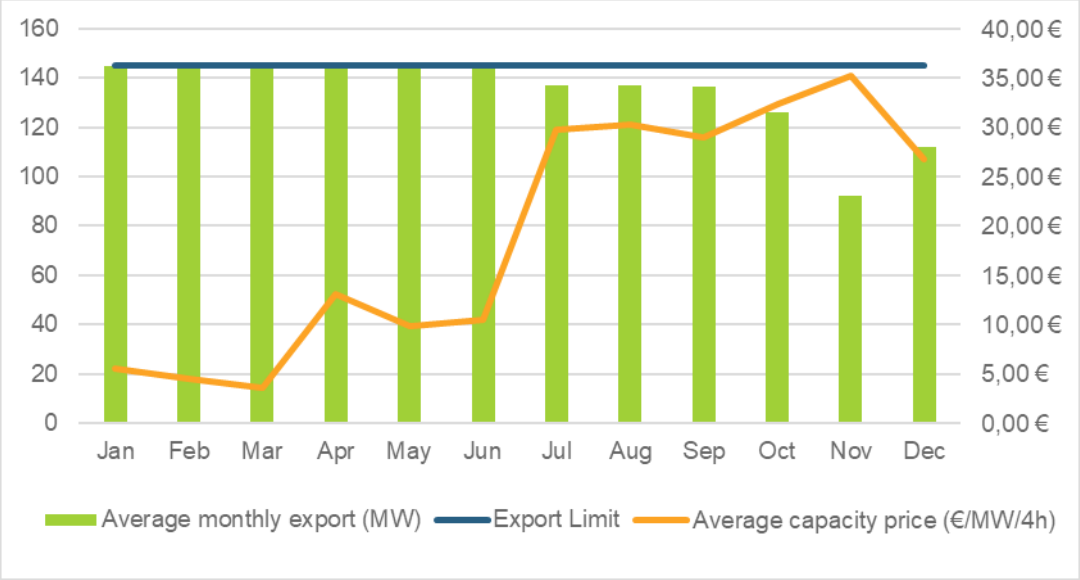
Finally, 2024 was the first year of full operation of the aFRR energy market, with RTE activating this reserve according to economic priority coming into effect in November 2023. The net cost of aFRR energy activations rose sharply to €150 million, compared with €18 million in 2023. The increase in the net cost of activations is linked in particular to the low volumes of uncontracted offers (i.e., making available a certified asset not selected on the capacity market on D-1) offered at this stage by players on the aFRR energy market, while the activation prices of battery and load shedding asset holders are higher than those of conventional means of production, both upwards and downwards.

4.2.2. The FCR cooperation

Since the 1st of July, 2020, FCR has been contracted through a daily cross-border tender conducted at 8 a.m. each day for the following day, divided into six four-hour slots constituting six different products. In 2024, the primary reserve contracting requirement for France was 486 MW.

Figure 57 shows the monthly averages of prices in France and the volumes of FCR traded by France within the FCR cooperation.

Figure 57 : FCR contract prices in France and net trading position in the FCR Cooperation (monthly average)



Source: FCR cooperation (www.regelleistung.net) – Analysis: CRE

In 2024, the average price of FCR contracted in France through the FCR cooperation will be €21/MW/4h, up from €7/MW/4h in 2023.

Two distinct trends emerged between the two halves of 2024. Starting in July, prices rose significantly before stabilizing at around €30/MW/4h. This increase is mainly due to the opening of the aFRR capacity market in June 2024, with certified assets for both reserves now tending to offer an opportunity cost on the primary reserve corresponding to the anticipated revenues on the aFRR capacity market.

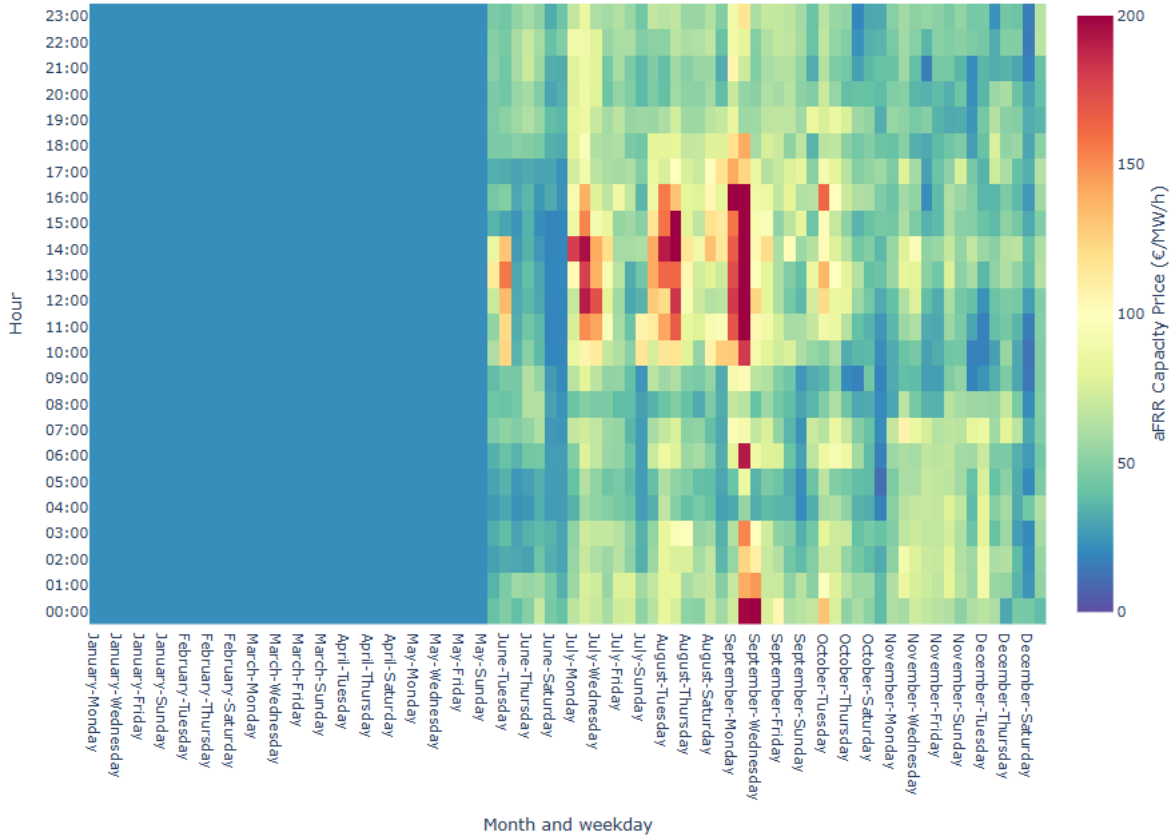
Furthermore, in general, the French FCR market stands out within the FCR cooperation due to its high liquidity and high volumes of low-price offers, linked to the development and certification of a large fleet of batteries dedicated to this reserve. Despite the rise in contract prices observed during 2024, RTE remains the main exporter within the FCR cooperation, with an average balance of 134 MW (the average European contract price for 2024 was €64/MW/4h). These exports generated additional revenue for RTE of around €11 million in 2024.

4.2.3. aFRR

As part of the development of an integrated European balancing market, the terms and conditions for contracting and activating aFRR capacity, which historically operated under regulated terms, have evolved towards market mechanisms open to all assets certified for this reserve. Thus, the market for the activation of aFRR energy opened in November 2023 and the market for the contracting of aFRR capacity reopened in June 2024 (see §4.1.2).

Regarding the aFRR capacity contracted by RTE ahead of real time, this was contracted on the basis of a requirement accompanied by a regulated price of €22.10/MW/h until the market reopened in mid-June 2024. Figure 58 shows the evolution of aFRR capacity prices per hour and per day of the week for the year 2024.

Figure 58 : Average daily prices for aFRR capacity in 2024 by hour, month and day of the week (hours on the y-axis and days of the week on the x-axis)



Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Average capacity price (€/MW/h)	22.1	22	22	22	22.10	41.17	69.59	73.89	83.84	56.90	53.83	45.27

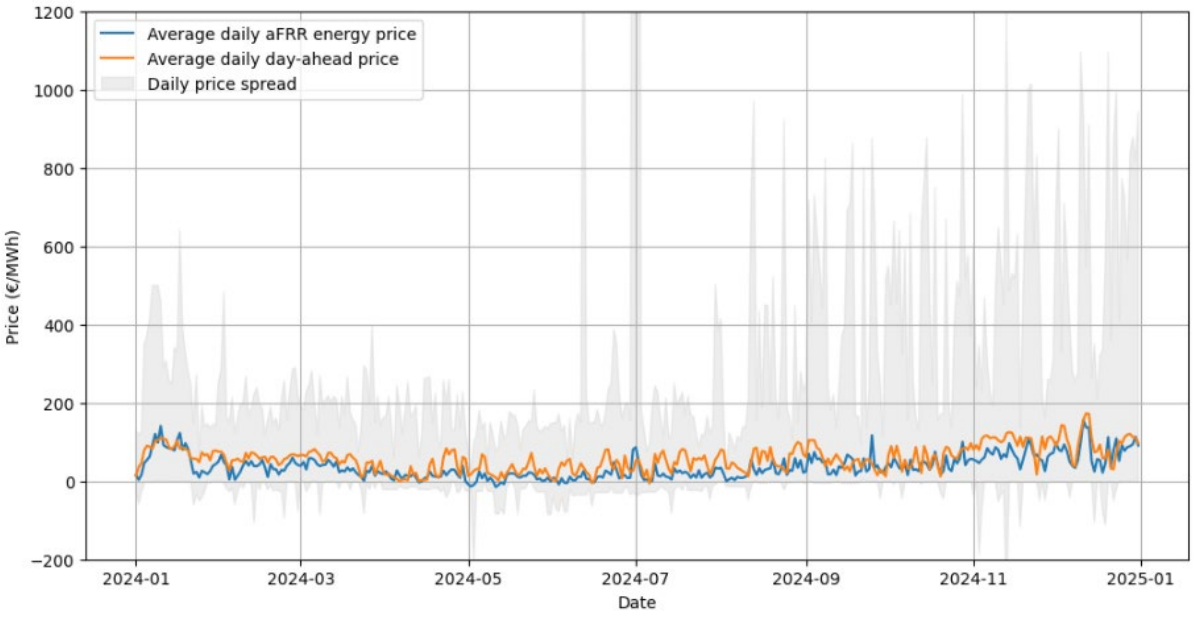
Source: RTE – Analysis: CRE

The price of aFRR capacity rose significantly after the market opened and throughout Q3 2024, reaching an average price of €83.84/MW/h in September. As shown in this graph, the high prices in Q3 were mainly concentrated at the beginning of the week between 10 a.m. and 5 p.m. These midday price peaks, when spot prices are low (due to low consumption and high solar production), reflect the start-up and production costs of power plants that are unprofitable on wholesale markets but nevertheless meet RTE's capacity needs. These price peaks are expected to ease in the future as players roll out certified assets to provide aFRR to RTE at a lower cost (batteries, load shedding).

Prices fell significantly in the fourth quarter of 2024 to €45.27/MW/h in December, with the increase in *spot* prices in winter leading to the return of thermal power plants to the wholesale market and thus the provision of aFRR at a lower cost.

With regard to the market for activating aFRR, the web Figure 59 and Figure 60 show the average daily prices for activating aFRR, both upward and downward, compared with the prices observed on the spot market, as well as their volatility[50] .

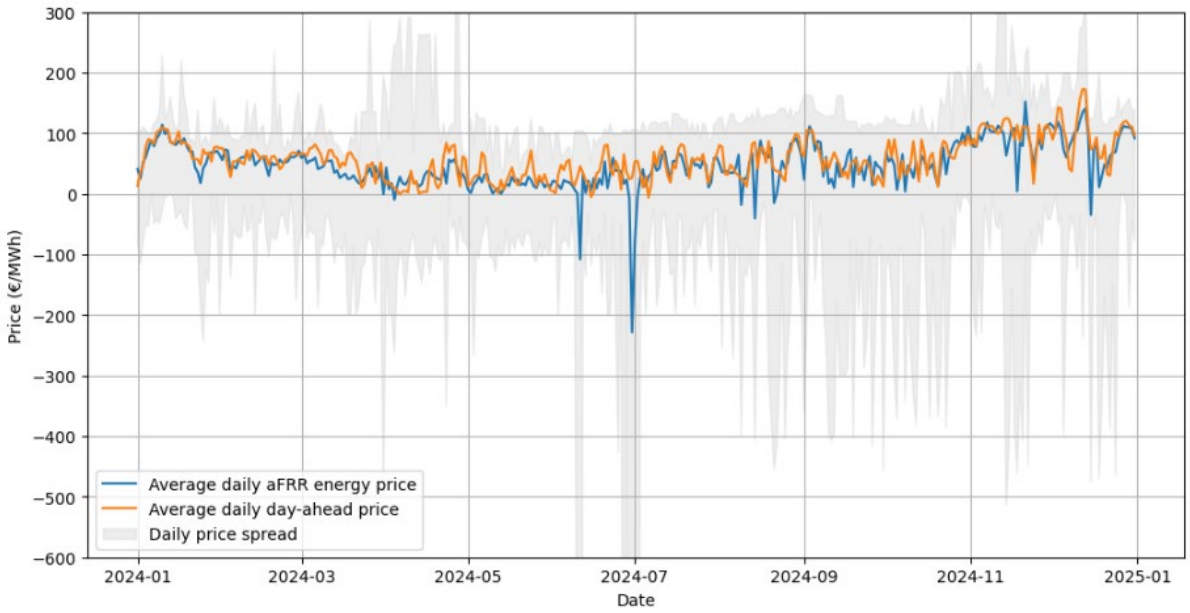
Figure 59 : Average daily prices on the aFRR activation market, upward



Source: RTE – Analysis: CRE

[50] The y-axes of these graphs have been cut to improve readability. The peaks in June and July (€1,800/MWh and €3,500/MWh upwards, -€3,500/MWh and -€4,000/MWh downwards) correspond to a technical incident affecting an operator's bid price, which has since been corrected.

Figure 60 : Average daily prices on the aFRR activation market, downward



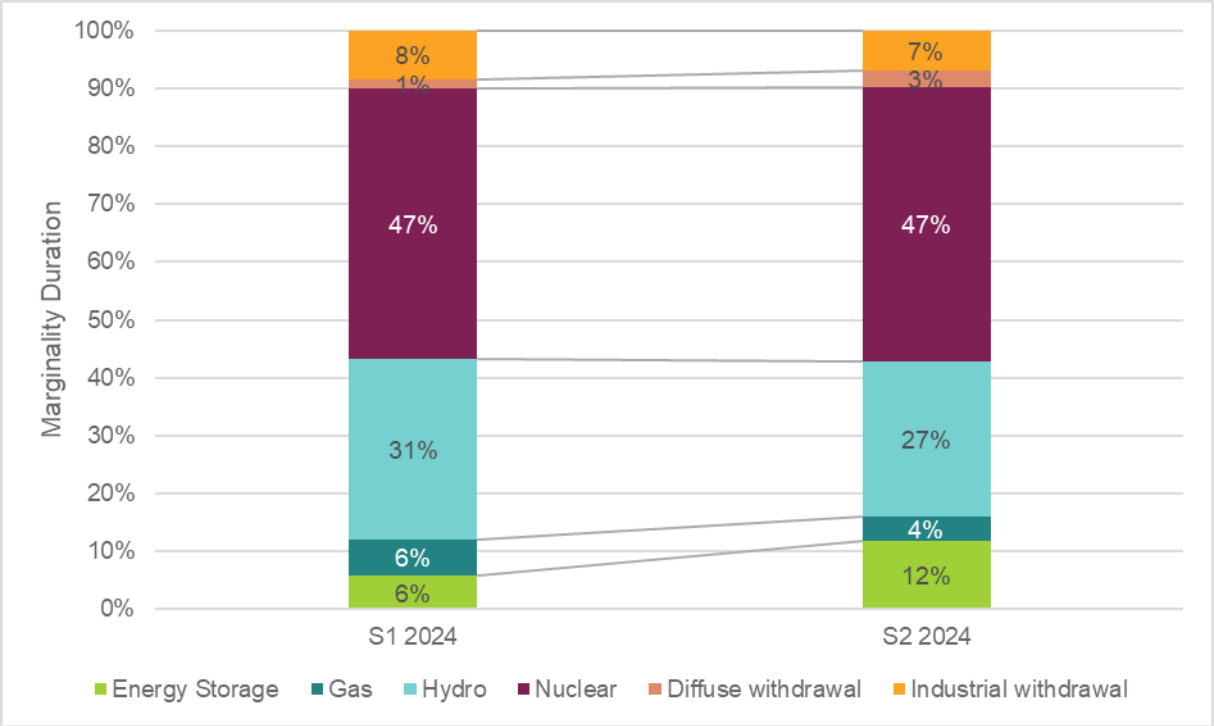
Source: RTE – Analysis: CRE

The graphs show that average aFRR activation prices are close to those of the daily wholesale market, both upwards and downwards.

However, these graphs reveal a significant daily price difference for aFRR activations, and therefore high volatility in marginal activation prices at this stage of market opening. This price volatility also increased in the second half of 2024.

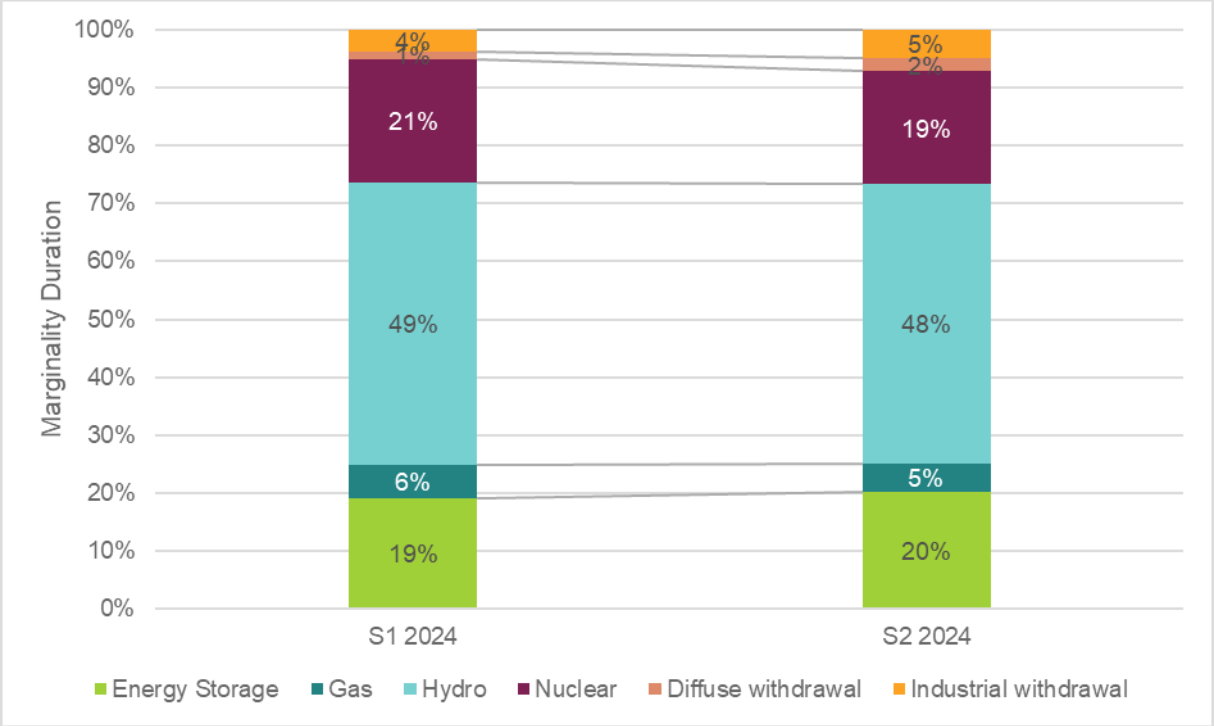
Figure 61 and Figure 62 show the marginality of the various sectors on the aFRR, for upward and downward movements respectively.

Figure 61 : Marginality of the various sectors on the aFRR upward activation market



Source: RTE – Analysis: CRE

Figure 62 : Marginality of the various sectors on the aFRR downward activation market



Source: RTE – Analysis: CRE

As these graphs show, the marginal prices of aFRR activations are set approximately 20% of the time by sectors representing less than 5% of activated volumes, both upwards and downwards.

These figures reflect the lack of liquidity in the energy market at this stage of its opening, and in particular the low volumes of uncontracted offers submitted by qualified players (i.e., energy offers submitted by a certified asset that was not selected in the capacity tender on D-1). When the imbalances to be absorbed are high, all entities offered are called upon by RTE, which tends to result in a price spike.

These figures also reflect the gradual investment in battery and demand-side response assets on the aFRR markets, with their market share in terms of activated energy volume approximately doubling between the first and second half of 2024. The prices submitted for the activation of this type of asset are higher than those submitted by production facilities, both upwards and downwards.

The combination of these two effects (lack of liquidity due in particular to the absence of uncontracted offers and the deployment of new assets with higher activation costs) results in higher net activation costs and increased volatility in aFRR activation prices.

In 2025, connection to the European PICASSO platform will give RTE access to a deeper pool of offers for the aFRR energy market at the borders, which should result in lower volatility and peak prices.

In conclusion, 2024 was marked by a significant shift in balancing costs towards the aFRR, which accounted for 41% of total balancing costs (vs. 13% in 2023). This trend is driving market participants to invest in more flexible assets, thereby preparing for the balancing of tomorrow (reduction of the operational window for all TSOs as required by European regulations). This investment focus is already underway, with battery capacity qualified for aFRR increasing from around 40 MW in early January 2024 to 136 MW in May 2025. This development of batteries will free up conventional generation resources, which will be able to use their full capacity on the energy market. At the same time, a gradual decrease in aFRR costs is expected in the coming years as competition between players increases.

4.2.4. The balancing mechanism

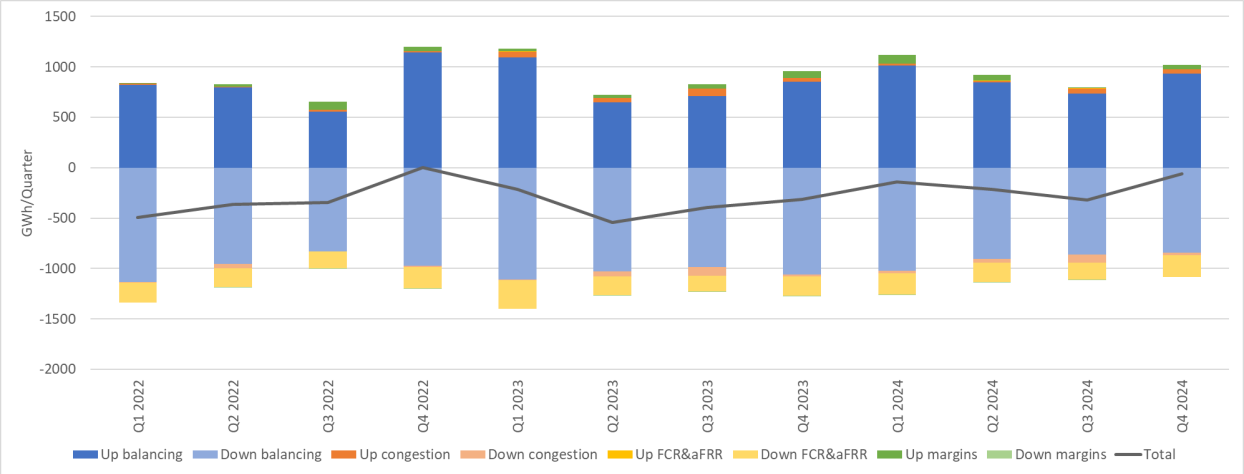
Figure 63 shows the volumes of energy activated upwards and downwards by RTE since 2021 for the various reasons.

Activations to manage system balance account for the majority of activations, but balancing services restoration ("FCR & aFRR") is a significant cause of downward activation (16% of downward activated volumes in 2023 and 17% in 2024). Activations due to congestion and margins represent low volumes. Net activated volumes are negative on average, reflecting a tendency for balance responsible parties to over-hedge for fear of having to pay a settlement price for significant negative imbalances.

Figure 64 shows the average volumes of adjustments by type of entity and direction of activation.

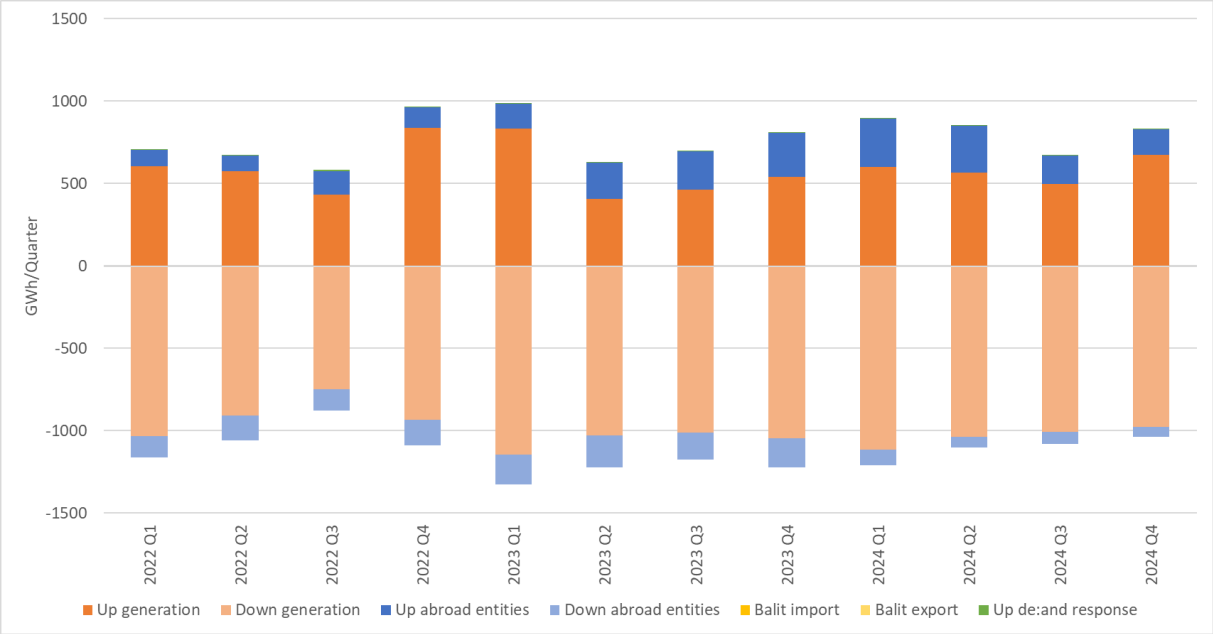
There is a large preponderance of injection-type adjustment entities (generation units), which account for 72% of upward activations and 93% of downward activations in 2024. RTE's activations of demand side response account for only 0.2% of the volumes activated by RTE in 2024. Balancing entities located abroad ("exchange points") account for a significant share of activations on the balancing mechanism, which is constant compared to 2023 (28% of upward activations in 2023 and 2024).

Figure 63 : Monthly activation volumes by reason and net volume



Source: RTE – Analysis: CRE

Figure 64 : Adjustment volumes by type of entity



Source: RTE – Analysis: CRE

4.2.5. TERRE platform

In December 2020, when it was connected, RTE only connected to the TERRE platform for four hours per day. RTE's participation in the TERRE platform has gradually increased, reaching full utilization at every time step since March 21, 2022. The figure below shows the monthly volumes activated by RTE on the TERRE platform.

In 2024, RTE activated an average of 22% of its additional reserve requirements on the TERRE platform. The liquidity of French offers on the platform remains low and the majority of French demand is met by foreign offers, which are currently lower on average than those of French players.

The TERRE platform will close at the end of 2025, in line with the reform of the European electricity market organization (see 4.1.3). From the first quarter of 2026, RTE will connect to the European platform for mFRR (MARI platform).

Figure 65 : Volumes activated on the TERRE platform

Source: RTE – Analysis: CRE

4.3. CRE's monitoring of balancing markets

Balancing markets play an important role in the proper functioning of the electricity system, and this role will become increasingly important with the development of less controllable and decentralized generation means.

The CRE reminds market participants that balancing products are wholesale energy products. The actions of participants in these markets are therefore subject to the obligations and prohibitions set out in the REMIT. In particular, ACER has issued guidance[51] on examples of practices that may, in certain circumstances, be considered abusive within the meaning of the REMIT.

As a PPAET, RTE plays a central role in monitoring these markets and works closely with the CRE to ensure compliance with REMIT on balancing markets.

In this context, the CRE regularly analyses the functioning of balancing markets, with particular attention to new markets, such as the aFRR energy market, reopened in November 2023, and the aFRR capacity market, opened in June 2024. The CRE also monitors offers activated in France on the European TERRE, PICASSO and MARI platforms, and has powers of investigation and sanction on balancing markets.

The CRE once again reminds market players that it is prohibited to source supplies on the French intraday market in response to an activation from RTE on the adjustment mechanism. This behaviour is explicitly contrary to the RE-MA rules (Article 4.2.1.2): "*The activation of an offer from an exchange point adjustment entity must not lead to a supply (for upward offers) or a sale (for downward offers) by the adjustment player on the French intraday market, whether through an explicit flow or an implicit nomination.*"

[51] ACER reported on these practices in issue No. 24 of its quarterly newsletter, ACER REMIT Quarterly Q1 2021: https://documents.acer-remit.eu/wp-content/uploads/REMITQuarterly_Q1_2021_1.0.pdf

5. The capacity remuneration mechanism

In its decision of November 8, 2016, following a year-long investigation, the European Commission approved the French capacity mechanism[52] for a period of 10 years under EU state aid rules. The current mechanism came into force in December 2016, with the first delivery year (DY) in 2017 and will end in March 2026. At that point, a new capacity remuneration mechanism is expected to take over, pending approval from the European Commission.

5.1. Reminder of the main principles of the French capacity remuneration mechanism

The provisions of Articles L. 335-1 et seq. of the French Energy Code establish a capacity obligation mechanism. This provides that "*each electricity supplier shall contribute, according to the consumption characteristics of its customers, in terms of power and energy, within the continental metropolitan area, to the security of electricity supply*". Each supplier is therefore required to procure capacity guarantees to cover the consumption of its customer portfolio during periods of national peak consumption. These guarantees can be secured by investing in production or demand response facilities, or by purchasing them from capacity operators on the market. The cost of this obligation, introduced to ensure security of supply for consumers, is freely passed on by suppliers to their customers.

Obligated parties and operators can exchange capacity guarantees bilaterally, on the OTC (Over-The-Counter) market, or through the auction market organized by EPEX SPOT. The rules of the capacity mechanism set a minimum of 15 auctions prior to the delivery year. Auctions also take place during and after the delivery year.

The price of capacity guarantees is determined by the market, where operators commit to making their resources available and obligated parties bid based on their consumers' contribution to the risk of system failure.

In theory, the price of capacity should be set at the level of the least expensive means used to meet the security of supply criterion. The rules defining the administered price, which acts as a price cap on the capacity mechanism auctions, are in line with the tension that is likely to arise in the event of a shortage of capacity: "*[the administered price] corresponds to the minimum annual capacity revenue that ensures the economic viability of developing or maintaining the capacity necessary to meet, over the medium term studied by the resource adequacy assessment, the security of supply criterion defined by public authorities*."

The main principles of the new capacity mechanism are set out in Article 19 of Law No. 2025-127 of February 14, 2025 on finance for 2025. The mechanism is transitioning towards a centralized model, thereby removing the role of obligated party. For each delivery period, which will now cover one winter electricity season, the transmission system operator, RTE, will be responsible for contracting with operators for the production, storage, and demand response capacity needed in France through a limited number of auctions. The cost of the resulting capacity mechanism is distributed among suppliers, based on their portfolio consumption during peak periods, and is implemented as a tax. Suppliers have the discretion to choose how the tax is passed on to their consumers. Finally, CoRDiS holds the authority to penalize operators who fail to comply with specific obligations to the capacity mechanism (obligation to certificate the capacities and obligation to offer a minimum volume at auction), as well as violations similar to those covered by REMIT (prohibition of insider trading and market manipulation, and obligation to disclose inside information).

[52] The operating principles of this market were reiterated in the monitoring report on the functioning of wholesale markets in 2016-2017 (Section 3, page 45: 2.5 First exchanges of capacity guarantees in 2016).

5.2. In 2024, the capacity price fell throughout the auctions

The year 2024 was mainly marked by auctions for the 2025 and 2026 delivery years.

Table 17 : Equilibrium prices and volumes traded for auctions for the 2025 delivery year

DY 2025	07/03/2024	25/04/2024	20/06/2024	19/09/2024	24/10/2024	05/12/2024
Price (€/MW)	20,009.1	19,999.9	14,999.9	10,800.9	6,191.6	0
Volume (MW)	4,367.8	4,165.3	4,181.1	3,760.4	4,092.4	10,277.7

Source: EPEX SPOT – Analysis: CRE

Table 18 : Equilibrium prices and volumes traded for auctions relating to the 2026 delivery year

DY 2026	25/04/2024	19/09/2024	24/10/2024	05/12/2024
Price (€/MW)	15,538.1	6,124.7	3,540.2	2,521.8
Volume (MW)	2,850.9	4,358.6	2,965.2	4,203.6

Source: EPEX SPOT – Analysis: CRE

The average capacity price for delivery year 2025, used as the reference price for additional capacity supply in regulated electricity sales tariffs, is €14,652/MW, compared with €27,094/MW for delivery year 2024. The capacity price has reached its lowest level since 2019.

The price set by the last auction before the delivery year is the imbalance settlement reference price, used for:

- settlement of costs when operators or obligated parties reassess their certified capacity level or capacity need;
- imbalance settlement, which takes place in DY+3 based on actual values;
- the capacity share of the TRVE cap[53];
- long-term and load-shedding tenders (AOLT and AOE), for calculating additional remuneration.

The price resulting from this imbalance settlement reference price auction exceptionally reached €0/MW in December 2024 for DY 2025. During this auction, the zero-price offer significantly exceeded demand (11.2 vs. 10.3 GW), driven in particular by the increase in capacity guarantees from regulated interconnections.

Such a price reflects a particularly relaxed situation in terms of peak supply and demand balance. Market participants expect no tension for DY 2025, in line with market fundamentals, which show a decrease in peak consumption and improved nuclear availability.

[53] Prior to DY 2024, only the last auction before the DY was taken into account for the capacity share. For DY 2024, the average of the last two auctions was used to take into account the auction schedule.

As a reminder, the imbalance settlement reference price for DY 2024 had already been set at a low level of €6,200/MW (compared with €60,000/MW for DY 2022 and €23,900/MW for DY 2023). CRE points out that a zero price does not necessarily imply an absence of penalties and therefore an incentive to make capacity available during periods of tension. In accordance with the rules of the capacity mechanism, a system imbalance of more than 2 GW will raise the imbalance settlement price to the administered price of €60,000/MW. Furthermore, operators remain incentivized through energy signals.

5.3. The low price of capacity for the 2025 delivery year illustrates the significant improvement in margins for the electricity system

After a DY 2024 that returned to more relaxed supply-demand balance levels than those experienced during the crisis, DY 2025 continues the trend. The good availability of nuclear power plants in 2024, following the completion of maintenance and inspection shutdowns related to the stress corrosion phenomenon, coupled with a slight increase in consumption, which remains well below pre-crisis levels, will allow for comfortable margins for the electricity system in DY 2025.

Despite the decline in electricity prices since spring 2023, which has reduced the profitability of thermal power generation, CRE notes that the *missing money*[54] for thermal technologies remains non-existent in 2024 for DY 2025, except for coal-fired power plants.

The level of capacity certification (Table 19) compared with the estimated capacity requirement from the RTE (Table 20) shows how the electricity system's margins are continuing to improve for DY 2025, mainly thanks to nuclear power (excluding the Flamanville EPR) and regulated interconnections. The contribution of interconnections is growing significantly for DY 2025 (10.7 GW, compared with 7.7 GW for DY 2024) thanks to the contribution of the CORE region and Italy.

[54] The income necessary to keep a generation asset in operation if it exists or to build it, but which is not provided by the energy market. The methodology is detailed in the 2019 and 2018 CRE's wholesale market monitoring reports.

Table 19 : Capacity certification levels for DY 2024 and DY 2025

Sector	March 2024 (DY 2024) (GW)	March 2025 (DY 2025) (GW)	Evolution (GW)
Nuclear	43.9	49.5	+5.6
Lake/PSH	10.2	9.8	-0.4
Renewables + other *including batteries*	16.6 *0.7*	15.8 *08*	-0.8 *+0.1*
Load shedding	3.5	3.7	+0.2
Gas	7.1	7.8	+0.7
Coal	1.4	1.7	+0.3
Oil/fuel	1.8	1.7	-0.1
Total – excluding interconnections	84.6	90.0	+5.4
Interconnections	7.7	10.7	+3.0
Total – with interconnections	92.3	100.7	+8.4

Source: RTE – Analysis: CRE

Table 20 : Capacity obligation estimates by RTE

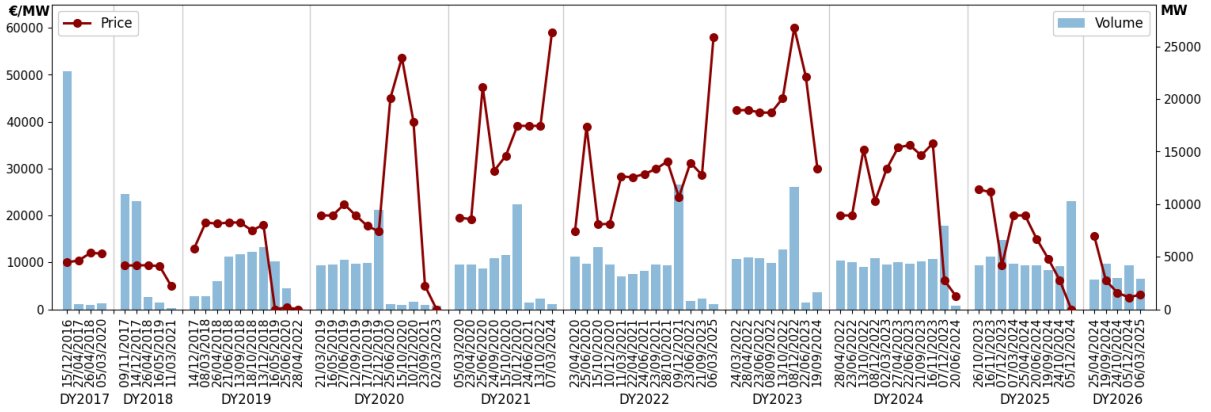
	Estimated obligation for DY 2024 (GW)	Estimated obligation for DY 2025 (GW)	Evolution (GW)
Low trajectory	90.0	90.2	+0.2
Central trajectory	91.6	92.9	+1.3
High trajectory	93.8	93.9	+0.1

Source: RTE – Analysis: CRE

Given that consumption is not returning to pre-crisis levels as quickly as expected, the capacity market is likely to be "long". The price of capacity for DY 2025 should therefore remain low during rebalancing auctions.

For DY 2026, the system appears to have sufficient margins because of improved nuclear availability and the continued development of renewable energy sources. In addition, the anticipated profitability of thermal power could decline with the fall in wholesale prices observed since 2023. To date, the prices of capacity guarantees observed in the first auctions for DY 2026 remain low, below €5,000/MW.

Figure 66 : EPEX SPOT capacity auction prices



Source: EPEX SPOT – Analysis: CRE

6. Overview of wholesale electricity markets in France in 2024

Easing of the supply/demand balance

The year 2024 was marked by a significant increase in generation, surpassing the average from 2014-2019 by rising from 494.7 TWh in 2023 to 539.0 TWh in 2024. This result is primarily due to nuclear, which returned to a generation level comparable to years prior to 2022, at 361.7 TWh. Hydroelectric generation increased by 28% compared to 2023 due to abundant rainfall, reaching 75.1 TWh. Wind and photovoltaic generation decreased by 1% from 2023 to 2024, at 71.6 TWh, due to wind generation suffering from a year with a wind deficit. The reliance on thermal power plants was at its lowest since 1952, at 20 TWh. This favorable supply-demand balance led to a record net export balance with 89 TWh of net exports.

Weather-adjusted consumption stabilized (+0.7% compared to 2023) but remained well below the average of 2014-2019.

In this context of easing supply-demand tensions, in 2024, wholesale electricity prices in France and Europe confirmed the end of the crisis initiated in 2023. They are well below those of 2022 and 2023 across all market segments, although they remain above pre-crisis levels.

Prices decreased but still above pre-crisis levels

As a result, day-ahead electricity prices fell significantly, reaching an average of €57.8/MWh, down 40% compared to 2023 and 47% compared to 2021. Average day-ahead prices in 2024 remain higher in nominal terms than pre-crisis levels but are close when adjusted for inflation (2014-2019 average at €47.8 (2024)/MWh). The variability of daily prices has increased significantly due to changes in the electricity mix, which is a strong signal for the development of short-term flexibilities, especially batteries and demand-side response. Renewable generation peaks in Europe in spring and summer intensified the frequency of negative price hours, reaching 352 hours in 2024 versus 147 in 2023. 36% percent of these hours had prices between €0 and €0.1/MWh, but the share of hours with prices below -€50/MWh reached 31% in 2024, compared with 20% in 2023. Conversely, periods of low wind generation in winter caused price spikes, notably in Germany, but also, to a lesser extent, in France.

During 2024, forward electricity prices in France trended downward. The price of the French Y+1 calendar product averaged 76.6 €/MWh, less than half the average of 162.6 €/MWh in 2023, but these prices are still high compared to the years 2014-2019. At the beginning of the year, the French price was still influenced by gas price developments, and the price spread between France and Germany was very narrow. From April onwards, the French price began to diverge from its German counterpart and recorded a sharp decline, bringing it closer to the Spanish price level, driven by high nuclear availability and the growing penetration of renewables. For the rest of the year, the price fluctuated between €70 and €80/MWh.

Forward prices in France fell more sharply than in other European countries. For the first time since 2013, the price in France for the upcoming year was lower than the German price, with a spread of around €20/MWh at the end of 2024, which remained unchanged in the first half of 2025. The record net export balance of 89 TWh generated exports valued at approximately €5 billion. Liquidity on the forward markets up to Y+4 increased significantly with the end of ARENH. Finally, the opening of the balancing markets and the high variability of hourly prices are powerful signals for the development of short-term flexibility, particularly batteries and demand management.

Growing liquidity in forward markets, but still weak for long maturities

In 2024, futures markets recorded an all-time high in trading volumes with 1,434 TWh compared to 673 TWh in 2023, an increase of 118%. The end of ARENH from 2026 onwards will mean that suppliers and consumers will have to source all their electricity from the market, while EDF will have to sell all its excess generation. The maturities with the most significant increase are annual, quarterly and monthly maturities.

Volumes are increasing across all types of physical and cash settlement contracts. During the crisis, the market shifted strongly towards cash settlement and centralized clearing to mitigate counterparty risk. In 2024, physical settlement products seem to regain interest, although volumes remain below 2021 levels. In long-dated maturities, activity has grown significantly for Y+3 and Y+4 maturities, with five times more volume traded in 2024 than in 2023. However, activity remains very low on the Y+5 maturity.

Furthermore, with the end of ARENH, total positions for the 2026 calendar product already represent a considerable volume.

Balancing markets shifting towards greater European integration and a redesign of the capacity mechanism

In 2024, electricity system balancing continued its evolution towards market-based mechanisms, with the launch in June 2024 of the aFRR capacity tender based on economic merit order, complementing the energy activation market opened in November 2023. The aFRR markets, in their start-up phase, display high prices and volatility, sending a strong signal for the development of the most efficient means of providing these services (batteries, demand management), which will free up conventional generation means to maximize their capacity for the energy market.

Balancing markets are also continuing their integration at European level, with RTE connecting to the European aFRR activation platform Picasso in April 2025 and to the European tertiary reserve activation platform Mari in 2026.

The auction prices of the capacity mechanism conducted in 2024 for the 2025 delivery year reflected a further improvement in margins on the electric system, averaging 14.7 k€/MW for 2023, compared with 27.1 k€/MW for the 2024 delivery year in 2023. The price of the last auction for the 2025 delivery year fell to €0/MW, which can be explained on the demand side by a decline in peak consumption and, on the supply side, by an increase in capacity guarantees from regulated interconnections.

KEY FIGURES

1. Gas markets

Table 21 : Gas market fundamentals in France (commercial flows)

Market fundamentals	Yearly values			Yearly variation 2024/2023	
	2022	2023	2024	In percentage	In value
Entry and exit flows					
Supply (TWh)	731	634	593	-6%	-41
Storages withdrawals	107	138	156	13%	18
Imports	617	487	425	-13%	-62
Pipeline	320	234	215	-8%	-19
LNG	297	253	210	-17%	-43
Production	7	9	12	26%	3
Demand (TWh)	731	634	593	-6%	-41
Storages injections	145	137	123	-10%	-14
End consumers demand	430	381	361	-5%	-20
Distribution consumers	253	237	236	0%	-1
Consumers connected to the transmission system	178	145	125	-14%	-20
Exports	154	112	108	3%	-4
Other	2	2	2	0%	0
Deliveries at PEG (TWh)	931	949	980	3%	31

Sources: GRTgaz, Teréga – Analysis: CRE

Table 22 : Gas prices in France

Price	Yearly values			Yearly variation 2024/2023	
	2022	2023	2024	In percentage	In value
Spot prices (€/MWh)					
PEG day-ahead (avg.)	98.7	39.9	34.0	-15%	-5.9
Day-ahead PEG Nord/TTF Spread (avg.)	24.7	1.7	0.3	-80%	-1.3
Forward prices (€/MWh)					
PEG M+1 (avg.)	112.7	39.9	34.1	-15%	-5.8
PEG Y+1 (avg.)	107.3	50.6	36.2	-28%	-14.4
Y+1 PEG/TTF spread (avg.)	6.9	1.7	0.7	-61%	-1.0
Summer-ahead/Winter-ahead spread (avg.)	-2.3	3.3	1.0	-71%	-2.4

Source: EEX – Analysis: CRE

Table 23 : Gas trading in France

Trading activity	Yearly values			Yearly variation 2024/2023	
	2022	2023	2024	In percentage	In value
Natural gas exchanged at the PEG (TWh)	1 785	2 002	1 994	0%	-8
% of national consumption	415%	525%	552%		28pp
Trading volumes in the French markets					
Spot market (TWh)	342	398	352	-11%	-46
Within-day	57	65	47	-28%	-18
Day Ahead	200	236	217	-8%	-20
Exchanges (DA, WD, WE, other spot)	297	335	282	-16%	-53
Brokers (DA, WD, WE, other spot)	32	36	33	-8%	-3
Bilateral (DA, WD, WE, other spot)	13	27	38	40%	11
Forward market (TWh)	1 443	1 604	1 641	2%	38
M+1	304	356	369	4%	13
Q+1	137	150	146	-3%	-4
S+1	204	208	179	-14%	-29
Y+1	32	41	50	22%	9
Exchanges (all maturities)	63	77	78	1%	0
Brokers (all maturities)	1 004	1 184	1 183	0%	-1
Bilateral (all maturities)	376	343	380	11%	38
Number of transactions in the French markets					
Spot market (in thousands)	247.9	273.0	240.5	-12%	-32.5
Within-day	52.8	56.8	50.7	-11%	-6.1
Day Ahead	159.5	174.8	150.9	-14%	-23.9
Exchanges (DA, WD, WE, other spot)	238.1	259.8	227.9	-12%	-31.9
Brokers (DA, WD, WE, other spot)	7.9	10.8	9.0	-17%	-1.9
Bilateral (DA, WD, WE, other spot)	1.9	2.4	3.7	54%	1.3
Forward market (in thousands)	24.6	33.4	33.2	-1%	-0.2
M+1	7.7	7.8	8.8	12%	1.0
Q+1	1.5	1.7	1.6	-4%	-0.1
S+1	1.1	1.5	1.2	-21%	-0.3
Y+1	0.6	0.7	0.7	-10%	-0.1
Exchanges (all maturities)	5.7	5.6	6.6	18%	1.0
Brokers (all maturities)	12.7	15.8	14.4	-9%	-1.4
Bilateral (all maturities)	6.2	12.1	12.2	1%	0.2

Source: REMIT data – Analysis: CRE

2. Electricity markets

Table 24 : Installed production capacity in France

	Yearly values			Yearly variation 2024 / 2023	
	2022	2023	2024	In percent	In value
Installed capacity (GW)	**143.8**	**149.1**	**155.6**	**4.3%**	**6.5**
Nuclear	**61.4**	**61.4**	**61.4**	**0%**	**0**
Hydro	**25.7**	**25.7**	**25.7**	**0%**	**0**
Fossil-fuel	**17.5**	**17.5**	**17.5**	**0%**	**0**
Coal	1.8	1.8	1.8	0%	0.0
Oil	3.1	3.1	3.1	0%	0.0
Gas	12.6	12.6	12.6	0%	0.0
RES (excluding hydro)	**39.2**	**44.5**	**51.0**	**15%**	**6**
On-shore Wind	21.2	23.3	24.4	5%	1.1
Solar	15.8	19.0	24.3	28%	5.3
Biomass	2.2	2.2	2.3	5%	0.1

Source: RTE – Analysis: CRE

Table 25 : Production from different technology sectors in France

	Yearly values			Yearly variation 2024 / 2023	
	2022	2023	2024	In percent	In value
Generation (TWh)	**439.6**	**482.6**	**539.0**	**11.7%**	**56.4**
Nuclear	**278.3**	**320.4**	**361.7**	**13%**	**41.3**
Hydro	**49.3**	**56.1**	**75.1**	**34%**	**19.0**
Fossil-fuel	**47.4**	**30.5**	**20.1**	**-34%**	**-10.4**
Coal	2.9	0.9	0.7	-17%	-0.2
Oil	1.6	1.7	1.8	9%	0.1
Gas	42.9	27.9	17.5	-37%	-10.4
RES (excluding hydro)	**64.7**	**75.6**	**82.1**	**9%**	**6.5**
On-shore Wind	38.0	47.9	46.8	-2%	-1.1
Solar	18.4	21.5	24.8	15%	3.3
Biomass	8.3	6.2	10.5	69%	4.3
Cunsumption including network losses (TWh)	**453.4**	**437.4**	**440.6**	**0.7%**	**3.2**

Source: RTE – Analysis: CRE

Table 26 : Imports and exports in France

	Yearly values			Yearly variation 2024 / 2023	
	2022	2023	2024	In percent	In value
Import (TWh)	**72.9**	**43.3**	**25.5**	**-41.1%**	**-17.8**
Import Peak (TWh)	26.2	15.9	9.0	-43.4%	-6.9
Impork Offpeak (TWh)	46.7	27.4	16.5	-39.8%	-10.9
Export (TWh)	**56.4**	**93.6**	**114.6**	**22.4%**	**21.0**
Export Peak (TWh)	18.4	32.1	40.2	25.2%	8.1
Export Offpeak(TWh)	37.9	61.5	74.4	21.0%	12.9
Export balance (TWh)	**-16.5**	**50.3**	**89.1**	**77.1%**	**38.8**

Source: RTE – Analysis: CRE

Table 27 : Balance at the borders

	Yearly values			Yearly variation 2024 / 2023	
	2022	2023	2024	In percent	In value
Balance at border (TWh)					
CWE	-27.4	2.5	27.2	988.0%	24.7
Italy	17.9	20.0	22.3	11.5%	2.3
Spain	-9.1	-1.9	2.8	-245.3%	4.7
Switzerland	12.1	16.4	16.7	1.8%	0.3
Great Britain	-9.9	13.3	20.1	51.1%	6.8
Total (TWh)	**-16.5**	**50.3**	**89.1**	**77%**	**38.8**

Source: RTE – Analysis: CRE

Table 28 : Injections and withdrawals from the French electricity system

	Yearly values			Yearly variation 2024 / 2023	
	2022	2023	2024	In percent	In value
Physical injections (TWh)	510	516	542	**5.0%**	26
Generation Excluding ARENH	309	345	392	14%	-47
ARENH generation	128	129	125	-3%	-4
Commercial Imports	73	42	25	-40%	-17
Physical withdrawals (TWh)	510	516	542	**5.0%**	26
End-user consumption	411	383	385	1%	2
Water pumping	7	6	8	33%	2
Commercial Exports	56	93	114	23%	21
Grid losses purchased on markets	36	34	35	3%	1

Source: RTE – Analysis: CRE

Table 29 : Spot and forward prices on the French electricity market

	Annual values			Annual variation 2024/2023	
	2022	2023	2024	Percentage	Value
Short-term market prices					
Intraday price France €/MWh	276,3	98,4	57,8	-41%	-40,6
Day-ahead price France €/MWh	275,8	96,9	57,7	-40%	-39,2
Peakload day-ahead price France €/MWh	317,1	109,6	64,2	-41%	-45,4
Day-ahead France-Germany spread €/MWh	40,4	1,7	-21,9	-1388%	-23,6
Peakload day-ahead France-Germany spread €/MWh	49,7	3,4	-24,0	-806%	-27,4
Day-Ahead France-Germany convergence rate %	34%	29%	14%	-52%	-0,2
Forward market prices					
M+1 price France €/MWh	394,4	108,9	61,4	-44%	-47,5
M+1 France-Germany spread €/MWh	109,6	4,9	-17,3	-453%	-22,2
Q+1 price France €/MWh	539,6	128,2	72,7	-43%	-55,5
Q+1 France-Germany spread €/MWh	203,0	11,3	-10,4	-192%	-21,7
Y+1 price France €/MWh	367,7	162,7	76,7	-53%	-86,0
Y+1 France-Germany spread €/MWh	69,3	25,9	-12,0	-146%	-37,9

Sources: Argus, EEX, EPEX SPOT, Nord Pool – Analysis: CRE

Table 30 : Spot and forward volumes on the French electricity market

	Annual values			Annual variation 2024/2023	
	2022	2023	2024	Percentage	Value
Intraday market - TWh					
Buy	12,9	20,4	22,1	8%	1,7
Sell	13,2	19,0	21,4	13%	2,4
SPOT market - TWh					
Buy	122,4	117,6	148,1	26%	30,6
Sell	119,6	117,8	144,4	23%	26,6
Forward market					
Volumes TWh	**568,6**	**673,6**	**1 434,8**	113%	761,3
Exchange (financial)	108,6	178,7	471,1	164%	292,4
Brokers (financial)	294,5	411,9	807,1	96%	395,3
Brokers (physical)	132,8	59,9	131,2	119%	71,2
EDF OA Auction (physical)	32,7	23,1	25,4	10%	2,3
Y+1 product					
Volumes TWh	60,1	123,2	226,1	83%	102,9
Q+1 product					
Volumes TWh	72,2	82,1	168,4	105%	86,4
M+1 product					
Volumes TWh	127,3	106,0	253,3	139%	147,3

Sources: REMIT data – Analysis: CRE

Table 31 : Concentration index (HHI) of the different segments of the wholesale electricity market in France

	HHI - Market concentration	
	2023	2024
Delivery		
Forward markets (Physical) - purchases	1180	681
Forward markets (Physical) - sales	1113	2575
Futures markets (Financial) - purchases	615	404
Futures markets (Financial) - sales	662	1410
EPEX - purchases	848	665
EPEX - sales	2638	4080
Injections		
Generation	6252	6820

Sources: RTE data, REMIT – Analysis: CRE

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