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DE RÉGULATION
DE L'ÉNERGIE

SURVEILLANCE

REPORT 2018

Functioning of the
wholesale electricity
and natural gas
markets

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SUMMARY

CRE ensures proper functioning of the wholesale energy markets by examining market participants' operations and comparing them with all the sources of information at its disposal, and cooperating closely with ACER and the other European regulators.

The scope monitored by CRE, within the framework of the REMIT regulation, represented 637,450 transactions in the wholesale energy markets in 2018, i.e. the equivalent of 1,720 TWh traded or more than €66 billion.

On 9 April 2018, CRE published its deliberation No. 2018-073 of 22 March 2018¹ communicating about the integrity and transparency of the wholesale energy market. In that deliberation, CRE reminded market participants of their main obligations with regard to the REMIT regulation.

As at the time of publication of the present surveillance report, four investigations are open, three for the wholesale electricity market and one for the wholesale natural gas market. In addition, the reports of two other investigations (one for the wholesale electricity market and one for the natural gas market) were forwarded by the chairman of CRE to the dispute settlement and sanctions committee (CoRDIS).

Moreover, a procedure opened following a referral to CoRDIS by the chairman of CRE, resulted in a €5 million penalty applied to the Vitol SA company by CoRDIS². The company appealed this decision before the Council of State.

In addition, CRE monitors the compliance, by persons professionally arranging transactions (PPAT), with their obligations as set out under Article 15 of the REMIT regulation. In that regard, in 2018, CRE audited the surveillance activities of the electricity and natural gas exchanges based in France, i.e. EPEX SPOT and Powernext, in order to ensure operational and effective implementation of the REMIT regulation. CRE also supported RTE with the setting up of its surveillance activity as provided by the abovementioned Article 15.

With a long-standing commitment to having a harmonised set of surveillance rules and practices within the European Union, CRE actively participates in REMIT-related working groups and European forums and contributes to cooperation with ACER, as well as with the energy regulators of the other European Union member states and with financial authorities, for the implementation of the REMIT regulation. Within this framework, CRE had four chairmanships or co-chairmanships of European working groups within ACER and CEER in 2018 and 2019. CRE places major importance on the rigorous and constructive advancement of European work and projects.

The European initiatives coordinated by ACER aiming at a common approach as regards the implementation of the REMIT regulation, led to two new publications by ACER providing non-binding guidance on market manipulation of the capacity hoarding in the intraday electricity market, and of the layering and spoofing in the continuous wholesale markets (see section 4.1).

Moreover, CRE participated in a comparative study, launched at the initiative of CEER, concerning the market practices accepted in the energy sector such as mentioned under recital 14 of the REMIT regulation. Unlike the financial sector, no such practice is accepted in the energy sector. Energy sector regulators of European Union member states as well as of the European Economic Area have not established such practices within the framework of REMIT or national regulation and do not intend to do so. A press release³ by CEER was published on this topic.

Data management

The quality of transaction and fundamental data is essential for conducting wholesale market surveillance, and as a result CRE is highly involved in ACER's work in this field. In particular, it contributed to defining, together with other European authorities, possible improvements regarding the quality of data, aimed in particular at harmonising data notification formats that are still to be set up. CRE also takes part in data completeness and quality tests. In this context, CRE wishes to maintain the national system for collecting data from organised marketplaces (exchanges and brokers) in order to avoid any discontinuation in the data falling within the scope of CRE's surveillance.

Consequences of Brexit

The prospect of the United Kingdom leaving the European Union without a deal has major impacts particularly for market participants (producers, exchanges and brokers, suppliers and their clients) established in the United Kingdom or operating in its markets. Business relocations of the different market participants have begun or are ready to be activated, contracts have been transferred or are ready to be transferred.

¹ <https://www.cre.fr/Documents/Deliberations/Communication/remit>

² CRE's press release: <https://www.cre.fr/Actualites/Le-CoRDIS-sanctionne-pour-la-premiere-fois-des-manipulations-de-marche-sur-un-marche-de-gros-de-l-energie>

³ <https://www.ceer.eu/documents/104400/-/-/f09f1797-75e0-e105-b740-522dae9d83b1>

Some brokerage firms have been approved by the competent financial authority for the relocation of their organised trading facility (OTF) in France, which includes the trading of wholesale energy products. These companies are considered as PPATs under Article 15 of the REMIT regulation. Within this context, CRE will support these companies, particularly with the implementation of obligations regarding the detection and reporting of suspected insider trading and market manipulation.

Lastly, if the United Kingdom leaves the European Union without a deal, the participants registered with the British regulator (Ofgem) posting orders and making transactions in wholesale energy products for delivery in the European Union, must again register with a European regulator. In order to facilitate this change, ACER⁴ and Ofgem⁵ communicated about the re-registration arrangements. In addition to these communications, CRE answered to operational questions coming from certain companies about the potential consequences of Brexit regarding the registration obligation in accordance with Article 9 of the REMIT regulation.

Upward trend in commodity prices and particular climate conditions in 2018

The year 2018, building on the year 2017, was characterised by major growth in the commodities prices. The price of oil, gas and CO₂ followed a net upward trend as from second half of 2018. Oil increased by more than 32% on average. Despite the upward trend started in 2016, the absolute level of these prices has stayed at the historical average of the last twelve years. The price of the CO₂ allowance, after rounding off the year 2017 at a price of €8.2/tCO₂ tripled and the year 2018 closed at a price of €24.6/tCO₂.

With regard to weather conditions, after a cold spell in February-March, the year 2018 saw temperatures warmer than the average and warmer than temperatures observed in 2017. However, rainfall was normal and heavier than in 2017, which improved hydraulic production.

This general context was the backdrop to the development of wholesale electricity and gas prices.

Wholesale electricity markets: general upward trend in prices across Europe

Driven by the increase in commodity prices, the year 2018 saw a major rise in electricity prices as from March 2018 in France and Europe.

French electricity production in 2018 was up by 3.6% compared to 2017, from 529 TWh to 549 TWh. The increase in production is in line with an improvement in nuclear plants availability, the high level of hydraulic stocks and new renewable plants. Excluding hydraulic production, production from renewable energy increased by 13%. Thanks in particular to high availability of the hydraulic sector, the gas and coal sectors were used less than in 2017.

The average baseload spot price for 2018 saw a major increase, standing at €50.2/MWh, i.e. a 12% increase compared to 2017 (€45/MWh). Intraday prices also stood at about €50/MWh and followed the development in the baseload spot prices. The price of the peaking spot product also increased heavily (+10%) to reach €59.1/MWh.

The price of one-year, two-year and three-year calendar products in France and Europe increased considerably in 2018. On average in 2018, the Y+1 France calendar futures price stood at around €49/MWh but increased throughout the year to reach close to €60/MWh at the end of the year. The ARENH volume requested for 2019 in the 2018 windows, under these conditions, was 20.4 TWh to supply transmission system operators' losses and 133 TWh for end customers. ARENH was competitive because of the increase in calendar prices, which far surpassed €42/MWh.

The volumes traded in the wholesale electricity markets dropped compared to 2017. Even though they fell in volume, annual products have always been those that have been traded the most against an increase in ARENH demand these last two years, which substitutes purchases in the wholesale markets. The volumes of intraday products increased heavily, over 40% compared to 2017, but remained marginal (roughly 9 TWh) compared to other products.

Capacity market: price increase in 2018

Concerning the capacity market, six auctions took place in the EPEX SPOT market in 2018 for delivery year 2019, as well as one for delivery year 2017 and another one for delivery year 2018. To date, two auctions have taken place in 2019 for delivery year 2020. Auctions for delivery in 2019 resulted in a sharp increase in capacity guarantee prices for an average price of approximately €17,365/MW, instead of an average €9,350/MW for the year 2018.

⁴ <https://documents.acer-remit.eu/category/all-documents/>

⁵ <https://www.ofgem.gov.uk/about-us/ofgem-and-europe/preparing-eu-exit>

In accordance with the provisions of Article L.131-2 of the French energy code, CRE monitors the capacity guarantee market, for which the prohibitions and obligations specified in Articles 3, 4 and 5 of the REMIT regulation apply. In that regard, the specific behaviour of certain participants led CRE to question them.

CRE performed analyses on the general balance of the capacity market, which shows that the prices obtained were compatible with the fundamentals of this market. However, the current functioning of the capacity mechanism deviates in practice from the theoretical framework, particularly due to the possibility for demand to materialise freely in the different auctions, which leads certain participants to propose their capacity guarantees at auctions at floor prices.

Therefore, CRE considers that after receiving initial feedback about the mechanism, reflection must be conducted to develop the design of the capacity mechanism, geared towards, for example a mechanism with greater centralisation such as with British, Irish and Polish mechanisms.

Wholesale gas markets: price increase, growth in LNG arrivals, storage reform and single market zone

The gas market remained stable with supply volumes and outlets close to those of 2017. Growth in LNG continued (up by 15% compared to 2017), while land imports dropped slightly (-0.4% compared to 2017). In addition, the year was marked by heavy storage demand (+45% compared to 2017), particularly during the injection season, driven by the low level reached at the end of winter and by the implementation of the new storage reform.

The 1st November 2018 was marked by the inauguration of the single gas market zone, the Trading Region France (TRF), a result of the merger between the PEG Nord and the TRS. The PEG Nord and TRS prices were replaced by the new PEG reference price, which will enable customers in the south of France to profit from the price and liquidity conditions of the single zone.

The spot prices of the main gas hubs in Europe increased in 2018 compared to 2017. Prices at the Dutch TTF and the PEG Nord stood at an average €22.8/MWh and €22.6/MWh respectively compared to €17.3/MWh and €17.5/MWh in 2017. Despite a relatively cool winter, spot prices reached a historical record of 1st March 2018 with €51/MWh at the PEG Nord and €85/MWh at the TTF, following the cold spell in Europe against tight supply with a very low level of European stocks. Prices then continued to increase in spring and summer particularly due to the high injection demand, low LNG imports and high consumption from gas plants.

European futures prices followed a major upward trend in 2018, against a general increase in commodity prices. In 2018, the 2019 calendar product stood at an average €21/MWh compared to €17/MWh last year.

Trading in the intermediated markets increased significantly in 2018, with overall volumes up by 17% (677 TWh) and the number of transactions up by 1% compared to 2017. Trading in spot markets increased by 3.5% in 2018 and volumes traded in the futures markets were up by 22%. This increase in futures prices is due in part to the increase in activity for seasonal products related to the high subscription level during storage capacity auctions.

NOTICE

The present report covers data from the 2018 calendar year. Where possible, highlights of the surveillance activity for the first months of 2019 are also mentioned.

CRE's activity in 2018 within the framework of its surveillance mission



637,450 transactions
1,720 TWh traded
Over €66 billion

42 requests
for Information



183 alerts received from ACER since October 2017
About 30 cases being analysed as part of surveillance
1,324 participants registered with CRE
2 PPATs audited



4 chairmanships or co-chairmanships
of European REMIT working groups



6 investigations were opened, 2 of which were forwarded to CoRDIS
1st sanction by CoRDIS under REMIT - €5 million

Wholesale market in France in 2018

Price of electricity



+26% on average for spot prices
+35% for futures prices

Price of natural gas



+25% on average for spot prices
+23% on average for futures prices

SECTION 1
SURVEILLANCE OF WHOLESALE MARKETS BY CRE

1. OPERATIONAL IMPLEMENTATION OF CRE'S SURVEILLANCE MISSION WITHIN THE FRAMEWORK OF THE REMIT REGULATION

Since 2006, the French Energy Regulatory Commission (CRE) is responsible for monitoring French wholesale electricity and natural gas markets. Each year it publishes its surveillance report on the functioning of French wholesale electricity and natural gas markets, and every quarter it publishes its observatory on wholesale markets.

Since 28 December 2011, surveillance of wholesale energy markets performed by CRE, has been governed by European regulation No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency (REMIT).

In accordance with the provisions of Article L. 131-2 of the French energy code, CRE monitors the wholesale electricity and natural gas markets and guarantees in particular compliance with Articles 3, 4, 5, 8, 9 and 15 of REMIT.

In that regard, CRE pays specific attention to the provisions aimed at ensuring integrity and transparency in the wholesale energy markets by:

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

CRE endeavours to also ensure compliance by persons professionally arranging transactions (PPAT) with their obligations concerning the detection and notification of suspected insider trading or market manipulation under Article 15 of the REMIT regulation.

Lastly, the application of certain provisions of the REMIT regulation was extended to the French capacity guarantee market. In accordance with Article L. 131-2 of the energy code, CRE guarantees compliance with the prohibition of insider trading (Article 3), the obligation to publish insider information (Article 4) and the prohibition of market manipulation (Article 5).

As presented in the previous wholesale market surveillance report, the operational implementation of REMIT breaks down within CRE into two divisions: the Wholesale market surveillance division (DSMG) and the Wholesale market analysis and control division (DACG).

Implementation of the REMIT regulation is continuing at European level within the framework of the provisions of Article 16 of the REMIT regulation which specifies in particular, cooperation with ACER, the European Securities and Markets Authority (ESMA), energy regulators of the other member states of the European Union and financial authorities.

2. CRE'S SURVEILLANCE ACTIVITY IN 2018

CRE bases its surveillance mission on cross-monitoring of the wholesale markets aimed at both analysing the impact of current events in the energy sector and on detecting abnormal behaviour by market participants that could constitute a breach of REMIT.

CRE monitors operations in the wholesale electricity, natural gas and capacity guarantee markets in order to detect any unusual event or abnormal behaviour that could be qualified as market abuse under REMIT.

For the year 2018, the scope monitored by CRE within the framework of REMIT represented 637,450 transactions in the wholesale energy markets, i.e. the equivalent of 1,720 TWh traded or more than €66 billion. CRE made 42 requests for information from market participants in 2018.

At the date of publication of this report, CRE had received from ACER 183 alerts of potentially suspicious behaviour since October 2017 up to the end of 2018. It is currently conducting about 30 analyses of cases of suspicious behaviour detected through other sources apart from ACER alerts and six investigations have been opened to date.

2.1 Sources of detection of potentially suspicious behaviour

CRE's surveillance activities are based on the ex-post detection of potentially suspicious behaviour either by internal detection tools or following declarations transmitted by external parties.

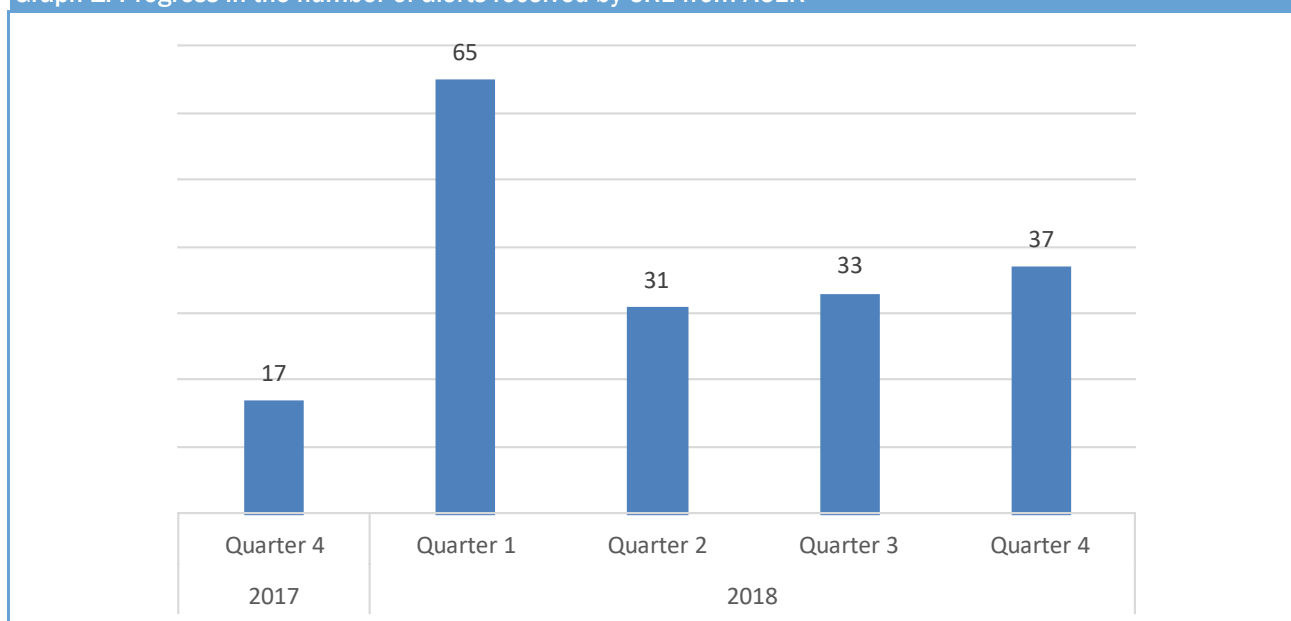
Internal detection uses surveillance tools designed to ensure monitoring of the prevailing conditions in the markets but also detection tools aimed at monitoring specific market segments and precise behaviour as well as at focusing on the given behaviour of certain market participants.

External detection is based on the declaration of suspicions coming from different sources. First, PPATs, who, within the framework of their missions and obligations under Article 15 of the REMIT regulation, are required to immediately alert the national regulatory authority, if they have reason to suspect that a transaction might breach Article 3

or 5 of REMIT. CRE highlights the value of this mission since PPATs are a major source of information, in their capacity as organisers of trading operations on their platforms.

ACER also transmits suspicions that it detects, as well as alerts from its automatic internal detection systems. With regard to the latter point, since the end of 2017, it has transmitted to national regulators on a monthly basis the alerts concerning transactions it deems suspicious. These alerts serve to identify unusual transactions which, upon analysis, could lead to the opening of an in-depth analysis by CRE. The surveillance platform under development by ACER has generated more than 183 alerts of potentially suspicious behaviour transmitted to CRE since October 2017 up to the end of 2018 (Graph 1). Some of those alerts exclusively concern the French market under CRE's responsibility, others concern cross-border products and therefore also involve other regulators. The initial analyses conducted by CRE on 19 of its alerts led to the conclusion that no suspicion of a breach could be identified. CRE's conclusions were shared with ACER and should enable an adjustment of the detection algorithms so as to improve the relevance of these alerts but also the quality of the data on which they are based. CRE is continuing the analysis of the remaining alerts.

Graph 1: Progress in the number of alerts received by CRE from ACER



Source: CRE

Similarly, other regulatory authorities, in France or abroad, transmit to CRE the information relating to potentially suspicious behaviour.

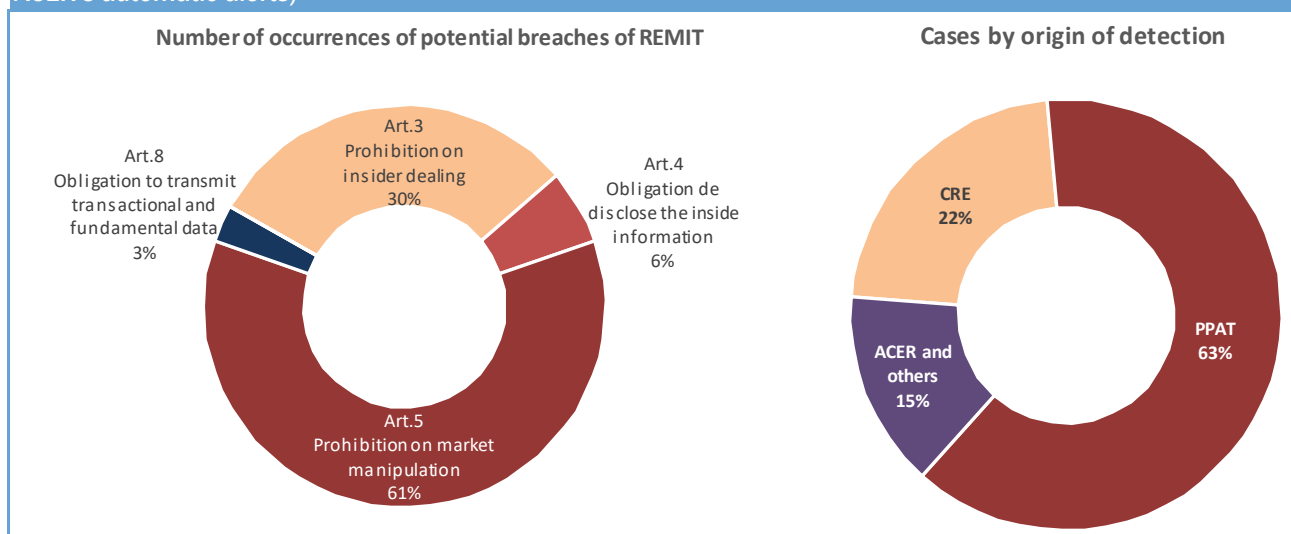
Thirdly and lastly, CRE also receives information concerning suspicious behaviour from market participants. CRE encourages this vigilance and wishes to reiterate that all persons having suspicions of breaches of REMIT can signal them, anonymously or not, at the following address: surveillance@cre.fr or on the relevant notification platform⁶.

Suspicious behaviour detected internally by CRE or externally gives rise to analyses aimed at ensuring the reasonable nature of the suspicion. Apart from the detailed analyses of these suspicious cases, CRE also analyses unusual market events and specific behaviour of certain market participants. As at the date of publication of this report, and in addition to the analysis of ACER alerts, about 30 analyses are currently open by CRE. Four analyses were closed in 2018 without the opening of an investigation.

Suspicious of REMIT breaches, which were analysed, most often concern suspicions of breaches of Articles 3 and 5 of the regulation (prohibition of insider trading and market manipulation), in 30% and 61% of cases respectively.

⁶ <https://www.acer-remit.eu/np/home>.

Graph 2: Distribution of surveillance cases under in-depth analysis (excluding analyses of cases arising from ACER's automatic alerts)



Source: CRE

2.2 Surveillance of practices for managing insider information

CRE, in its deliberation No. 2018-073 of 22 March 2018⁷, in particular reiterated market participants' obligation to publish insider information (Article 4 of REMIT) and the prohibition of insider trading (Article 3(1) of REMIT) which apply to all persons holding insider information in connection with a wholesale energy product. In order to limit the risk of transmission and use of insider information, CRE had recommended *“to participants concerned, especially groups with both electricity or gas production activities or infrastructure and trading activities, to set up relevant control procedures for the circulation and use of insider information (establishment of insider lists, setting up of appropriate mechanisms, such as Chinese walls, in terms of processes or installations, ...)”*.

Each market participant is therefore encouraged to establish and keep effective internal mechanisms and procedures aimed at avoiding breaches of the provisions contained in REMIT, taking into account the guidance provided by ACER⁸ and in the abovementioned deliberation.

In this context, CRE intends to perform an audit of the internal mechanisms and procedures set up by groups having both electricity production and trading activities in order to ensure that they comply with the provisions of Articles 3 and 4 of REMIT.

2.3 Support to PPATs in their surveillance mission

As mentioned above, PPATs play an essential role in the surveillance of wholesale energy markets given their surveillance obligations. Article 15 of REMIT in fact requires that PPATs immediately alert the relevant regulatory authorities of their suspicions of breaches of Articles 3 and 5 of REMIT but also that PPATs *“establish and maintain effective arrangements and procedures to identify breaches of Article 3 or 5”*.

In this context, in 2018 CRE conducted an audit to assess the compliance of electricity and gas exchanges based in France, i.e. EPEX SPOT and Powernext, with Article 15 of REMIT and with the non-binding guidelines given by ACER in Chapter 9 of its guidances⁸. The observations made by CRE through this audit were shared with other European regulators whose markets are concerned by the activities of EPEX SPOT and Powernext. While possible improvements were identified, the audit conducted did not reveal any anomalies in the surveillance activities of EPEX SPOT and Powernext. In that regard, CRE reiterates the importance for PPATs to communicate to it any structural changes in the market and their surveillance activities and to maintain an approach for the continuous improvement of deadlines and specific procedures in compliance with Article 15 of the REMIT regulation.

In 2018, CRE also supported RTE in the implementation of its surveillance activity, in particular for certain market segments and especially those related to explicit allocation of cross-border capacity for intraday markets. As for the other PPATs, CRE encourages RTE to be proactive in the detection of suspicious cases while paying close attention to the quality of its analyses.

⁷ <https://www.cre.fr/Documents/Deliberations/Communication/remit>⁸ <https://documents.acer-remit.eu/category/guidance-on-remit/>

⁸ <https://documents.acer-remit.eu/category/guidance-on-remit/>

2.4 Relocation of market participants in view of Brexit

The intensification of Brexit preparatory work was notable as from summer 2018 because of the continued uncertainty surrounding the outcome of negotiations between the United Kingdom and the European Union.

In this context, during the second half of 2018 and the first quarter 2019, several market participants, operating a natural gas supply business in France but whose trading activities are located in the United Kingdom, underwent reorganisations in view of relocation in France or in other countries of the European Union.

Uncertainty about the effective date of Brexit also influenced certain brokerage firms, particularly those with an organised trading facility⁹. Given the consequences of Brexit on the application of the REMIT regulation but also on financial regulation¹⁰ and the applicability of the notion of OTF, brokerage firms expressed their intention to relocate their services to France and have been certified to continue to implement their OTF activity including for wholesale energy markets.

2.5 Participants' registration data

Market participants are required, in compliance with Article 9 of the REMIT regulation, to register "*with the national regulatory authority in the Member State in which they are established or resident or, if they are not established or resident in the Union, in a Member State in which they are active*". As at 31 December 2018, 1,324 participants were registered with CRE, i.e. an increase by 75 participants compared to the year 2017.

Each market participant is responsible for ensuring the accuracy and update of information registered. Any change in the information supplied in the registration form must be communicated rapidly to the regulatory authority concerned. Information that has become incorrect must be corrected as soon as possible. Contacts, contact details and data reporting entities are examples of data fields that may contain errors.

Lastly, against discussions in progress about the United Kingdom leaving the European Union, CRE wishes to share the documents published by ACER¹¹ and the British regulator Ofgem¹² on that topic. It is stated that if the United Kingdom leaves the European Union without a deal, the participants registered with Ofgem posting orders and making transactions in wholesale energy products in the European Union must again register with a European regulator. This change is facilitated by a functionality of the CEREMP registration platform. After the participant has made its request to change regulatory authority and once it is validated by Ofgem, the participant shall have to provide, and if necessary, correct, its information in the fields that are pre-filled based on information already available.

CRE draws participants' attention to the fact that re-registration requests shall only be validated by Ofgem once an official decision attesting to the United Kingdom leaving the European Union without a deal has been made. Nevertheless, in anticipation of said decision, requests can now be made.

For any question concerning registration, market participants may contact CRE's wholesale market surveillance department at enregistrement.remit@cre.fr.

3. INVESTIGATION AND SANCTION IN THE EVENT OF A BREACH OF REMIT

CRE can, in the case of a reasonable suspicion of a breach of REMIT which can be characterised by unusual market behaviour or functioning, carry out investigations. In accordance with the provisions of the energy code, CRE's chairman can decide to open an investigation, and designate an investigating officer for that purpose. An investigation may lead, if necessary, to referral by CRE's chairman to the dispute settlement and sanctions committee (CoRDiS).

As at the date of publication of the present surveillance report, six investigations have been opened since 2016, two of which were transmitted to CoRDiS. Of these six investigations, four concern the wholesale electricity market and two concern the natural gas market. All of these investigations cover possible breaches of Articles 3, 4 and 5 of the REMIT regulation, respectively prohibition of insider trading, the obligation to publish insider information and prohibition of market manipulation.

In addition, a procedure opened following a referral to CoRDiS led, on 5 October 2018, to the decision to apply a €5 million penalty to the Vitol SA company for having engaged in market manipulations at the Sud gas exchange

⁹ OTF is a multilateral system which brings together at the discretion of its operator multiple buying and selling interests, to enter into transactions in bonds, structured finance products, emissions allowances or derivatives. In France, operation of an OTF is subject to approval by the prudential control authority (ACPR) after consultation with the financial market authority (AMF) when its operator is an investment service provider, or to authorisation by AMF when it is operated by a market undertaking.

¹⁰ https://www.esma.europa.eu/sites/default/files/library/esma70-155-7253_public_statement_mifidii_bmr_provisions_under_a_no_deal_brexit.pdf

¹¹ <https://documents.acer-remit.eu/category/all-documents/>

¹² <https://www.ofgem.gov.uk/about-us/ofgem-and-europe/preparing-eu-exit>

point (PEG) between 1 June 2013 and 31 March 2014. The decision by CoRDIS¹³ revealed that the operating mode of the Vitol SA company was liable to send wrong indications as to the state of supply and demand at the PEG Sud. This decision was contested before the Council of State.

This decision is the first sanction by CoRDIS regarding wholesale energy market surveillance. In its press release of 9 October 2018, CRE commended this decision, which shows the existence of active and effective surveillance and proper functioning of the markets. On that occasion, CRE reiterated that the function of the wholesale electricity and gas markets is to effectively and transparently organise the meeting of supply and demand. The resulting prices must reflect the scarcity or on the other hand, the abundance of energy, excluding all manipulations of any sort. Businesses taking part in these markets are therefore subject to strict obligations as concerns behaviour and transparency, in compliance with the European REMIT regulation.

At European level, ACER communicated publicly about seven decisions imposing sanctions, between 2015 and 2019, relating to investigations in connection with breaches of the provisions of REMIT¹⁴. Three sanctions, including one for the wholesale electricity markets and two for the gas markets, concern investigations conducted by the Spanish regulator, two for the electricity market by the Danish regulator, one for gas by the French regulator and one for gas by the German regulator. All of the decisions concern a breach of the provisions of Article 5 of REMIT and the amount of the penalty is between roughly €20,000 and €25,000,000.

Graph 3: Decisions imposing sanctions at the European level in connection with breaches of the provisions of REMIT (extract from issue No. 16 of the ACER REMIT Quarterly Q1 2019)

Decision date	NRA, Member State	Market Participant	Type of REMIT breach	Fine	Status	Source
24 November 2015	CNMC (ES)	Iberdrola Generación S.A.U.	Article 5	EUR 25,000,000	Under appeal	Link
5 October 2018	CRE (FR)	VITOL S.A.	Article 5	EUR 5,000,000	Under appeal	Link
30 October 2018	Prosecutor/DUR (DK)	Energi Danmark A/S	Article 5	DKK 1,104,000 (approx. EUR 147,000)*	Final	Link
28 November 2018	CNMC (ES)	Galp Gas Natural, S.A.	Article 5	EUR 80,000	Under appeal	Link
28 November 2018	CNMC (ES)	Multienergía Verde, S.L.U.	Article 5	EUR 120,000	Under appeal	Link
21 December 2018	Prosecutor/DUR (DK)	Neas Energy A/S	Article 5	DKK 153,000 (approx. EUR 20,400)*	Final	Link
20 February 2019	BNetzA (DE)	Uniper Global Commodities SE + Two traders	Article 5	EUR 150,000 and fines of EUR 1,500 and EUR 2,000 for each trader respectively	Final	Link

Note: Article 18 of REMIT establishes that the rules on penalties for breaches of Article 3 and 5 of REMIT are established by the Member States. The implementation regime is therefore different across Member States and some breaches of REMIT may be sanctioned under national provisions. Please consult the sources for the status of the proceedings and more information on the Decisions.

** This amount includes both the (i) fine and (ii) confiscated profit.*

Source: ACER

4. COOPERATION AT EUROPEAN LEVEL

With a long-standing commitment to having a harmonised set of surveillance rules and practices within the European Union, CRE actively participates in REMIT-related working groups and European forums and contributes fully, within the framework of Article 16 of REMIT, to cooperation with ACER, as well as with the energy regulators of the other European Union member states, as well as with financial authorities, for the implementation of the regulation.

CRE participates actively in the European groups relating to the implementation of REMIT. It is a member of ACER's coordination group and co-chair of the REMIT working groups of ACER and the European Council of Energy Regulators (CEER) (AMIT, CMIT, REMIT Policy Task Force and REMIT IT management & Governance).

¹³ CRE press release: <https://www.cre.fr/Actualites/Le-CoRDIS-sanctionne-pour-la-premiere-fois-des-manipulations-de-marche-sur-un-marche-de-gros-de-l-energie>

¹⁴ Issue No. 16 of the ACER REMIT Quarterly Q1 2019: https://documents.acer-remit.eu/wp-content/uploads/REMITQuarterly_Q1_2019_1.0.pdf

These groups, and the associated task-forces, contribute in particular to the implementation of the REMIT regulation at the operational level. They also take part in drafting guidance published by ACER. CRE places great importance on the rigorous advancement of this work within the framework of constructive collaboration.

4.1 ACER's non-binding guidelines concerning manipulative practices

CRE contributed to work to draft common positions for the analysis and qualification of different practices that could constitute market manipulation under Article 5 of the REMIT regulation.

In addition to the non-binding guidelines relating to practices such as wash trades published in June 2017, this work led to two publications by ACER providing non-binding guidelines concerning:

- a manipulative practice such as capacity hoarding in the intraday electricity market, defined as the acquisition of all or part of the available transmission capacity without using it or without using it effectively, published in March 2018¹⁵;
- a manipulative activity such as layering and spoofing in the continuous wholesale markets, defined as the issuing by a market participant of one large or 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 book¹⁶.

4.2 Absence of market practices accepted throughout Europe

In 2018, CRE took part in a comparative study, launched at the initiative of CEER, concerning the market practices accepted in the energy sector such as mentioned under recital 14 of the REMIT regulation. In its recital 14, REMIT mentions the notion of "*accepted market practices*" which allow market participants to claim that a certain type of behaviour in the energy markets is legitimate and that the transactions or underlying orders comply with those accepted market practices.

Following this comparative study, unlike in the financial sector, no market practice is considered to be accepted in the energy sector. Regulators of the energy sector of European Union member states as well as of the European Economic Area have not established such practices within the framework of REMIT or national regulation and do not intend to do so. A press release¹⁷ by CEER was published on this topic.

4.3 Progress in the setting up of data exchanges

Centralised data collection by ACER began in October 2015 for standard data and in April 2016 for non-standard data. ACER communicates data to the relevant regulators, provided that their IT systems meet the security criteria put in place by ACER.

CRE met all of the security criteria as at the end of 2015 and began to receive such data in 2016.

For ACER and for CRE similarly, work to set up the databases associated with these flows is being continued. In its April 2019 issue of the REMIT Quarterly¹⁴, ACER shared the progress of this work and the close collaboration with regulators to solve data declaration problems identified. The analyses currently focus on standard data with the main goal of improving the consistency between the information relating to the life cycle of the transaction data and the accuracy of certain fields.

Since the quality of transaction and fundamental data is essential for conducting its missions, CRE became involved in ACER's work in this field. It thus contributed to defining, with other European authorities, the main elements to improve with regard to the harmonisation of data declarations and completeness and quality tests.

Under these conditions, CRE wishes to maintain the national system for collecting data from organised market-places (exchanges and brokers) in order to avoid any discontinuation in the data falling within the scope of CRE's surveillance.

¹⁵ For more information: <https://acer.europa.eu/Media/News/Pages/ACER-publishes-guidance-on-capacity-hoarding-in-intraday-electricity-markets-that-could-constitute-market-manipulation.aspx>

¹⁶ For more information: <https://www.acer.europa.eu/Media/News/Pages/ACER-publishes-guidance-on-layering-and-spoofing-in-continuous-wholesale-energy-markets.aspx>

¹⁷ <https://www.ceer.eu/documents/104400/-/-/f09f1797-75e0-e105-b740-522dae9d83b1>

Useful references

Regarding suspicions of market abuse

In order to ensure the best possible market surveillance, it is requested of any person suspecting market abuse to alert:

- CRE's departments in charge of market surveillance at the address: surveillance@cre.fr;
- or ACER's departments by going onto the Agency's ad hoc notification platform: <https://www.acer-remit.eu/np/home>.

Regarding registration of market participants

For any question concerning registration, market participants may contact CRE's wholesale market surveillance department at enregistrement.remit@cre.fr.

Regarding REMIT

All public documents concerning the implementation of the REMIT regulation can be found on the REMIT Portal made available by ACER: <https://documents.acer-remit.eu/>.

SECTION 2
CONTEXT OF THE ENERGY MARKETS

After a decline during the first quarter, the year 2018, building on the year 2017, was characterised by major and steady growth in the prices of commodities. A reversal in this trend was seen as from the fourth quarter. Similar developments were observed in electricity prices which globally followed commodity prices, except at the end of the year when electricity continued to show a marked increase. This upward trend which began in 2016 however maintained the absolute level of these prices within the historical average of the last twelve years.

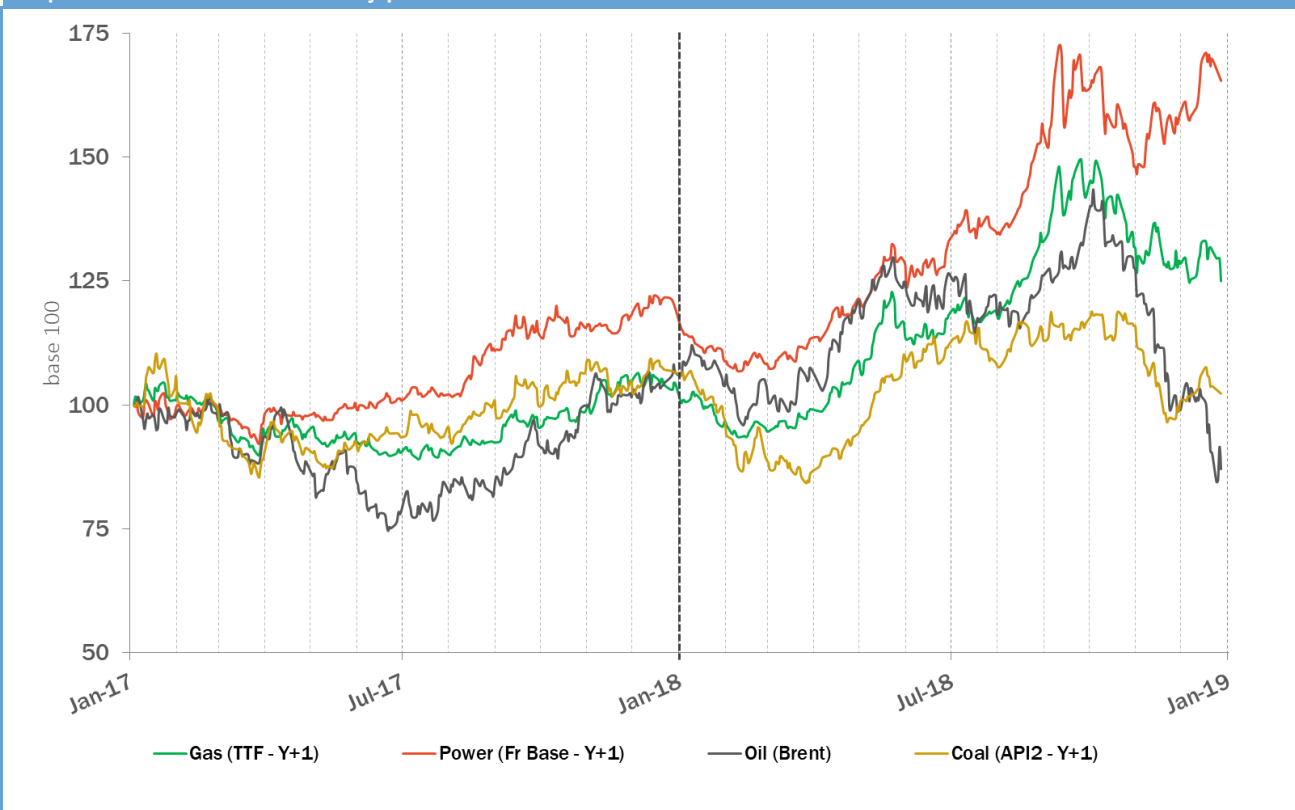
The year 2018 was particularly marked by the change in the price of the CO₂ allowance, which tripled during the year.

The climate in 2018 was warmer in general compared to normal temperatures and to those of 2017. Adverse weather conditions, increasingly marked as the months progressed, had consequences on electricity demand in France and Europe, with perceptible effects in the wholesale markets. Temperature variations recorded during the year were reflected in electricity consumption, particularly during the cold winter spell of February-March 2018. In addition, rainfall levels in 2018 were slightly higher than normal and way above that of 2017, which raised hydraulic stock levels and the production of hydroelectricity.

1. GENERAL INCREASE IN COMMODITY PRICES IN 2018

The upward trend in the prices of the main energy commodities started in the second half of 2017 intensified in 2018, marking periods of major volatility. Prices soared at the end of summer reaching record levels since 2014 (2011 for electricity). The markets then became less tight in the fourth quarter, with the exception of the electricity market which continued an upward trend.

Graph 4: Evolution in commodity prices

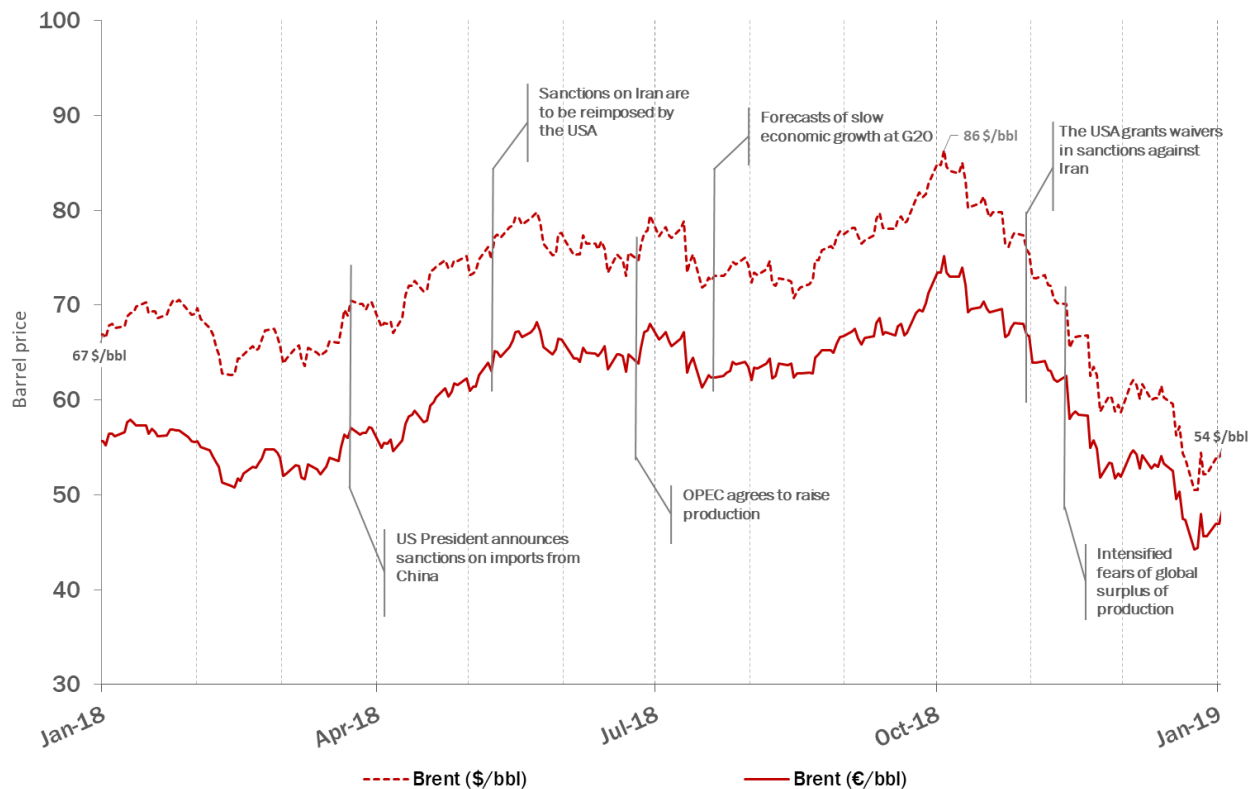


Source: EEX, ICIS, Reuters- Analysis: CRE

1.1 Brent price continuously on the rise until September nearing \$100/bbl until plummeting by 40%

The oil markets were very agitated in 2018, particularly driven by announcements in connection with the United States. The Brent oil price started the year at \$67/bbl and continued the increase started in 2017 due to prospects of robust demand and moderate supply. The price marked a net upward trend over the first three quarters, sustained in particular by the announcement of the President of the United States of the withdrawal of his country from the Iran nuclear agreement, preventing Iran from exporting their oil, and the decline of production in Venezuela. The other announcements often had downward effects on the markets, like the imminent commercial war between the USA and China, the increase in OPEC production¹⁸ and pessimistic revisions of economic forecasts, but however did not hinder the rise in the Brent price, which, early October, reached its highest level in five years with \$86/bbl (Graph 5).

Graph 5: Price of oil



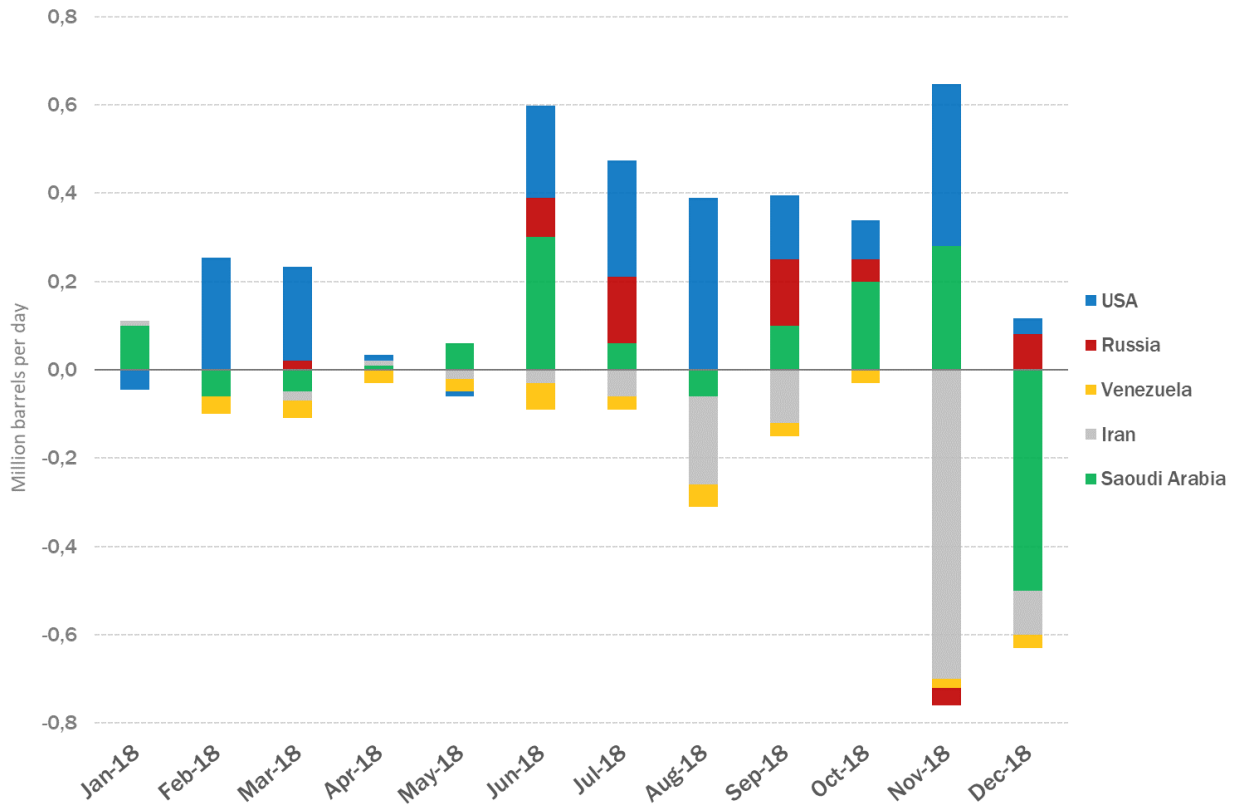
Source: Reuters, Bloomberg – Analysis: CRE

While certain analysts predicted that the symbolic \$100/bbl mark would be surpassed, starting from October, the price dropped heavily over the following months with a 23% loss recorded in November i.e. the greatest monthly drop since the financial crisis of 2008-2009. This reversal was triggered by the materialisation of fears of a drop in demand, particularly from the Sino-American commercial war. Regarding production, concomitant factors supported the decline: Saudi Arabia, Russia and the USA posted high levels of production, close to their record levels (Graph 7). Moreover, the USA granted exemptions enabling eight countries to continue to import Iranian oil. Excess supply therefore led OPEC to reduce their production in December 2018 by 1.2 million barrels per day (Graph 6).

¹⁸ Organisation of the Petroleum Exporting countries



Graph 6: Month-by-month variation in monthly crude oil production by country



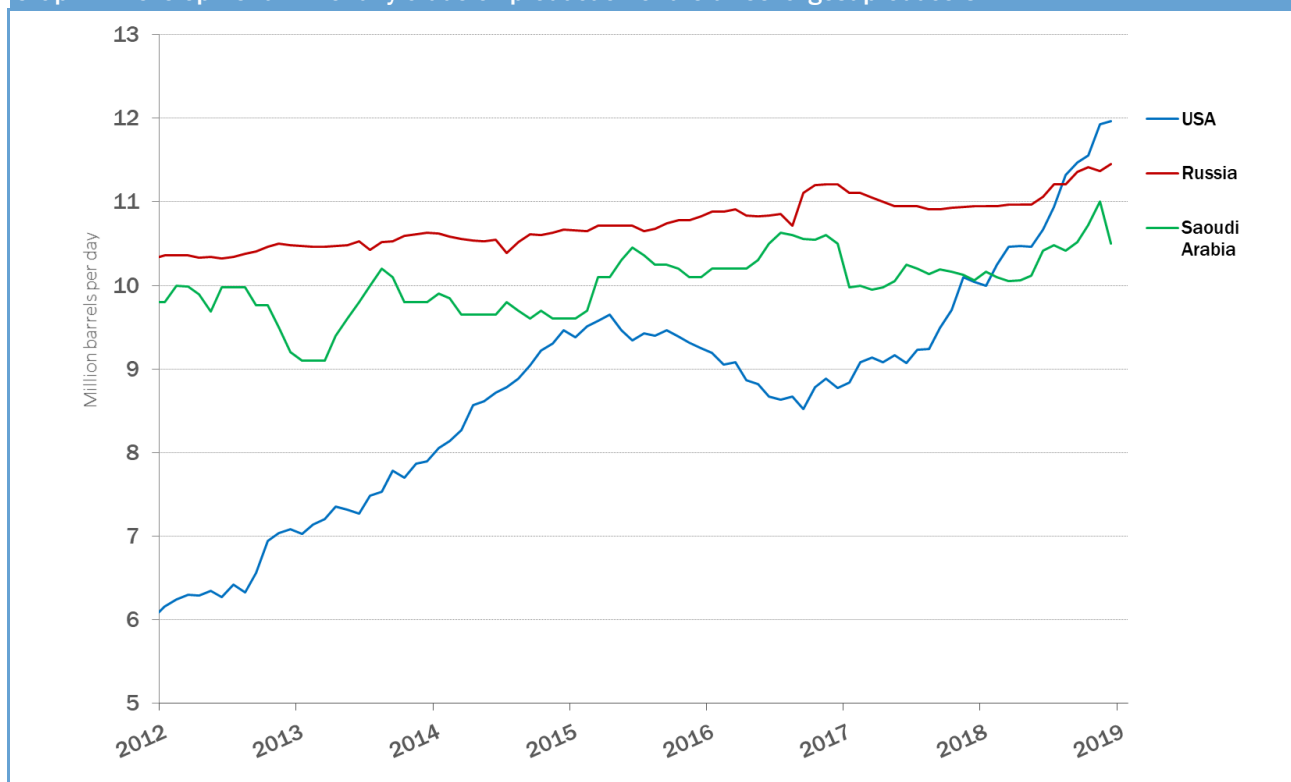
Source: U.S. Energy Information Administration (EIA), Reuters – Analysis: CRE

The year therefore ended with a price below €50/bbl at a level close to 20% lower than that of early January. The average price over the year was €60.7/bbl, i.e. a 25% increase compared to the average for 2017.

The year 2018 was also characterised by global oil demand exceeding 100 million barrels per day (mbd), up by 1.6 mbd compared to the level of 99.9 mbd in 2017. The United States contributed most to this growth with an increase by 0.6 mbd in their oil demand (0.3 mbd in 2017) followed by China with 0.5 mbd.

Another highlight of the year 2018, the USA became the leading global producer of crude oil ahead of Russia and Saudi Arabia, in particular due to the boom in shale oil which has accelerated since the start of the decade (Graph 7). Their exports doubled in 2018 compared to 2017, reaching an average 1.9 mbd.

Graph 7: Development in monthly crude oil production of the three largest producers



Source: U.S. Energy Information Administration (EIA), Reuters – Analysis: CRE

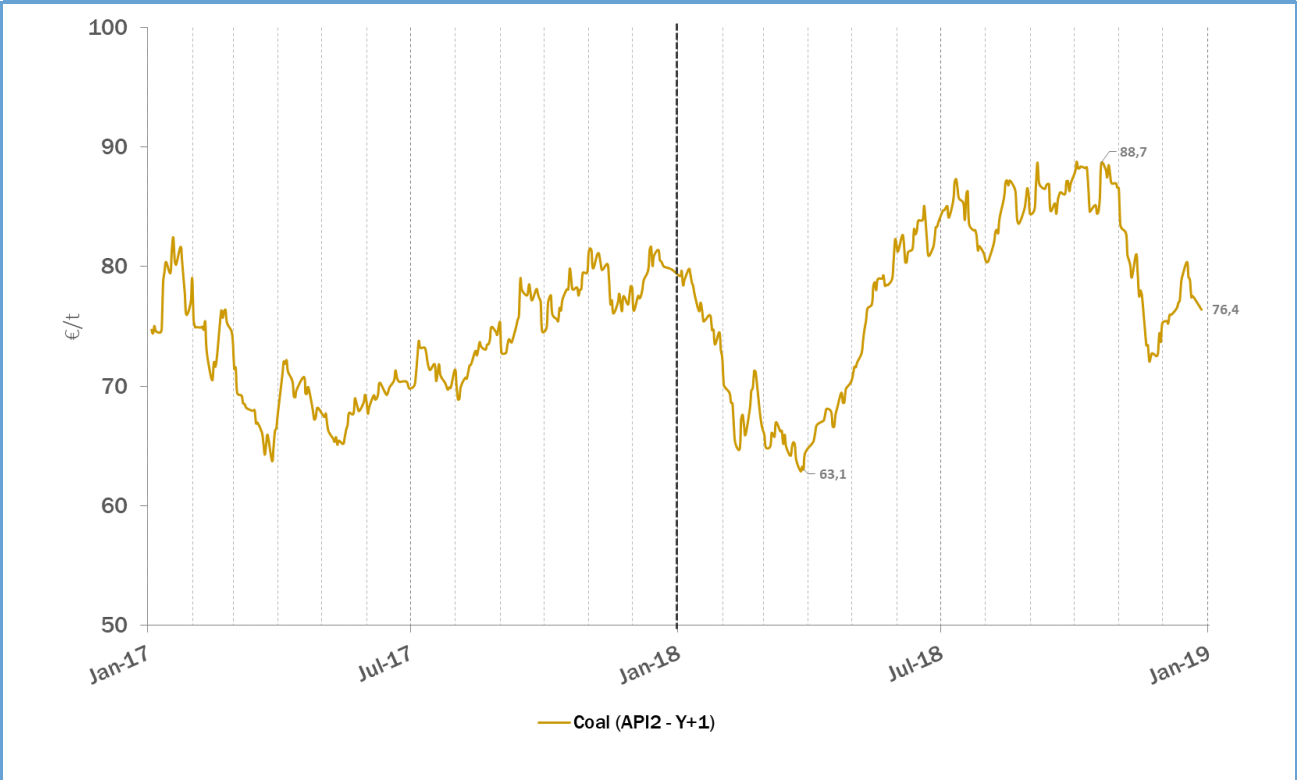
1.2 Like oil, steady increase in coal prices followed by a major decline end 2018

The futures prices of the coal (API2) Y+1 calendar product stood at an average €78/t in 2018 compared to an average €73/t in 2017, i.e. an approximately 6% increase (Graph 8). This near stability was however the result of a major increase over the first three quarters with a price peak at €89/t at the end of October followed by a large drop over the last two months.

Apart from the upward trends seen in other commodity markets and particularly the abovementioned disruptions in the oil markets, the development of coal markets was guided by activity in Asia, especially in China, the leading world consumer. China in fact showed a heavy coal demand in summer 2018 in the electricity sector following episodes of hot temperatures.

The price then dropped in the month of November, still in connection with China, which, having accumulated major coal stocks heading into winter and recording good renewable electricity production, set up port restrictions to contain its coal imports over the end of 2018. According to data by the Chinese customs department, the country imported 10.23 million tonnes in December, i.e. a 55% drop compared to the same month in 2017. The increase in Chinese imports stood at 3.9% with a total of 281 million tonnes in 2018 compared to 6.1% the previous year. Countries in the Atlantic Basin (Americas, Europe and Mediterranean) imported 229 million tonnes of thermal coal in 2018 compared to 233 million tonnes in 2017.

Graph 8: Price of the futures coal API2 Y+1 contract



Source: Reuters – Analysis: CRE

2. 2018 CLIMATE YEAR VERY SEASONAL

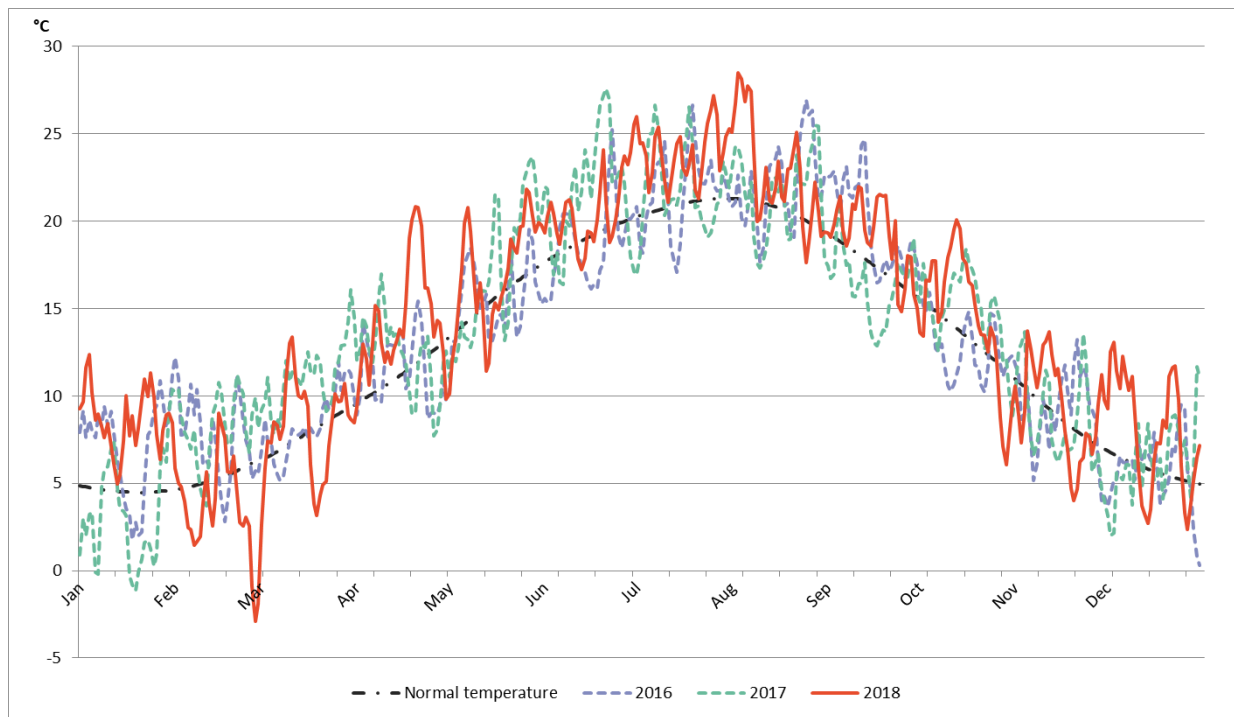
Temperatures in France during the year 2018 (Graph 9) were higher than those of 2017 with an average 0.6 °C increase, i.e. +4.4%, and higher than normal temperatures by an average +0.82 °C, i.e. 6.1%.

In the first half of 2018, the temperatures recorded were colder than in the same period in 2017, with, in particular, an average negative difference of -0.16 °C due in particular to the cold spell in February/March, which put temperatures in the negative by -2.9 °C; nevertheless the temperature still remained higher than normal seasonal temperatures with an average positive difference of +0.52 °C. In the second half of 2018, temperatures recorded were considerably warmer than in the same period in 2017 (+1.1 °C), above temperatures for the period.

These high average differences mask a major disparity seen as the months progressed compared to normal seasonal temperatures. Indeed, with the exception of the months of February and March with a negative difference up to - 2.94 °C compared to normal seasonal temperatures, the rest of the year was warmer with differences that varied between +0.03 °C and +3.09 °C. These variations fuelled part of the volatility in electricity spot prices, especially at the start of the year (very marked effect of the cold spell).

Average overall rainfall was slightly higher than normal across all of France in 2018 (+1.45%). After a year 2017 with very low rainfall across the entire territory, rainfall increased 22% in 2018 compared to the previous year.

Graph 9: Temperature curve in France



Source: Thomson Reuters

3. TRIPLING OF THE PRICE OF THE CO₂ ALLOWANCE

The year 2018 saw a continued increase in the price of the CO₂ allowance which started in Q3 2017. While the year 2017 closed off at a price of €8.2/tCO₂, which represented a 20% increase compared to the previous year, the year 2018 ended with a price of €24.6/tCO₂, that is, three times the price during the year.

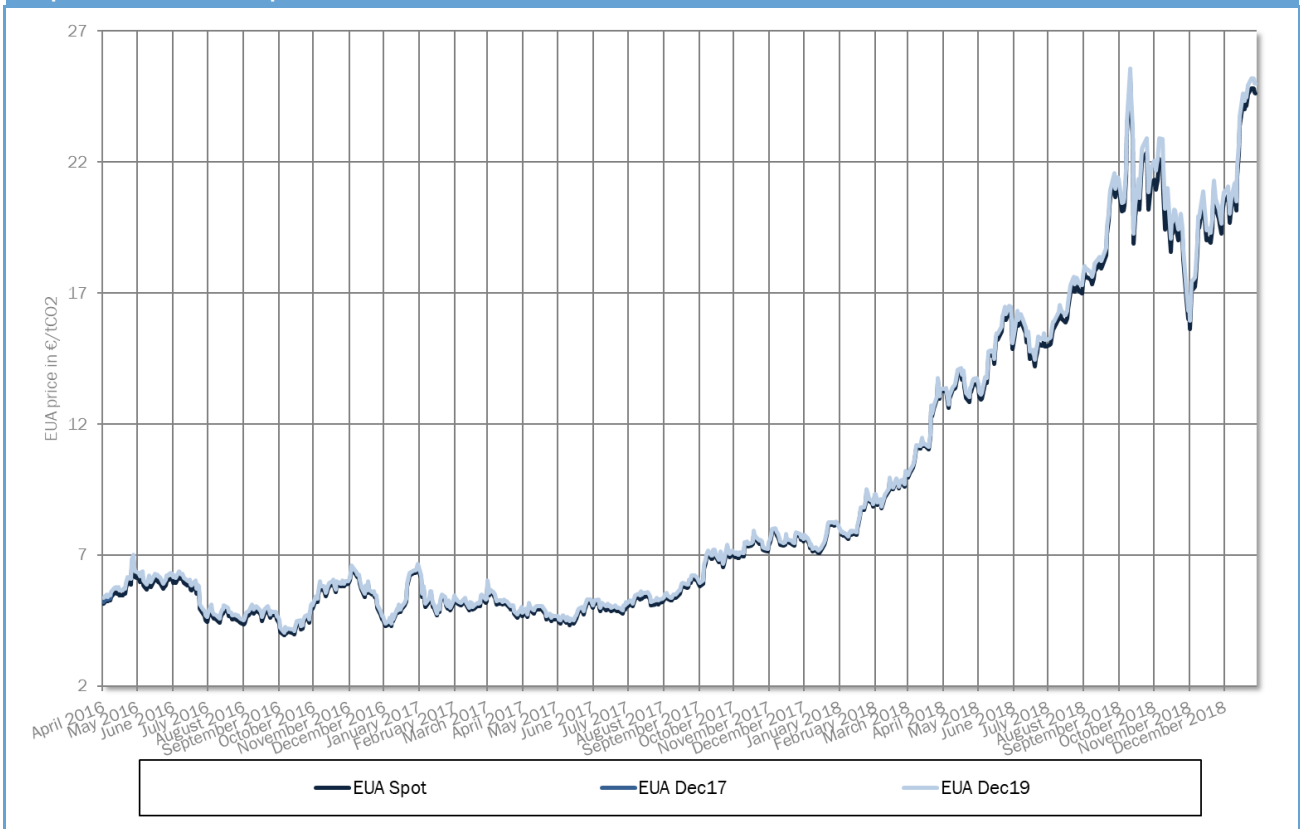
The highest for the year, in September 2018, was €25.2/tCO₂. This price was also the highest in ten years and especially since the start of phase III of EU ETS, in 2013, which had, among other things, introduced auctions as the default method for the allocation of allowances.

The upward trend in the price of CO₂ allowances was driven in particular by the regulatory framework of the EU ETS market. In January 2019, the entry into operation of the market stability reserve (MSR) announced a restriction of the volume of allowances in circulation. In addition, the revision of the rules of phase IV of EU ETS, which shall start in 2021, hints at greater emission reduction ambitions. This context, which suggests reductions in the supply available in the market, triggered a purchase movement: some market participants modified their hedging strategy to cover themselves more proactively and industrial clients sought to better optimise their purchase and sale of allowances.

In the shorter term, the increase in the price of CO₂ allowances is also connected with that of other commodities, particularly gas and coal. This buying interest is reflected directly in the volumes traded over the year. A volume of 13.4 GtCO₂ was traded in 2018 in the exchanges and through brokers, i.e. a more than 60% increase compared to the year 2017.

At the end of 2018, the price of the allowance experienced downward price movements, due, among other things, to ongoing discussions about the withdrawal of the United Kingdom from the European Union, which resulted in uncertainty about the future of the market.

Graph 10: Price development of the CO₂ allowance



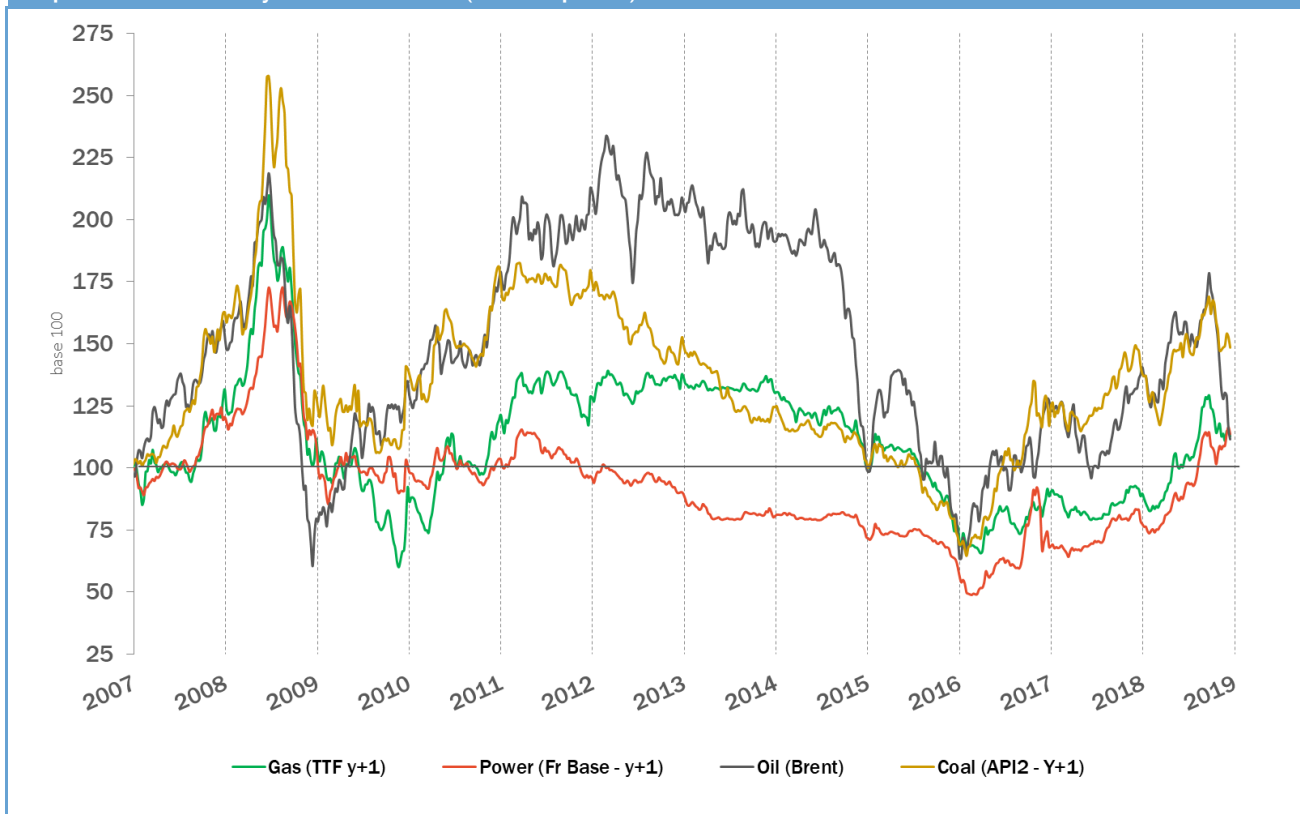
Source: ECX – Analysis: CRE

4. INCREASE IN COMMODITY PRICES IN 2018

The year 2018 was characterised mostly by a general increase in the wholesale price of commodities. Between January and December 2018, the price of gas increased from €17 to €22/MWh and that of electricity from €42 to €60/MWh.

However, the absolute level of these prices remained within the historic average of the last twelve years (Graph 11). Since 2007, the average price of electricity has stood at €47/MWh, i.e. very close to the average price of the year 2018, which was €49/MWh. This observation is also true for the gas market, with an average price of €22/MWh since 2007, compared to €21/MWh in 2018. The price history also shows that an upward trend has been ongoing since 2016 and that higher price peaks were seen previously, particularly before the 2009 financial crisis which saw a price peak of €93/MWh for electricity, €42/MWh for gas, €138/t for coal and €90/bbl for oil. The correlation between the prices of commodities and that of oil in particular remains significant in market dynamics.

Graph 11: Price history of commodities (current prices)



Source: EEX, ICIS, Reuters- Analysis: CRE

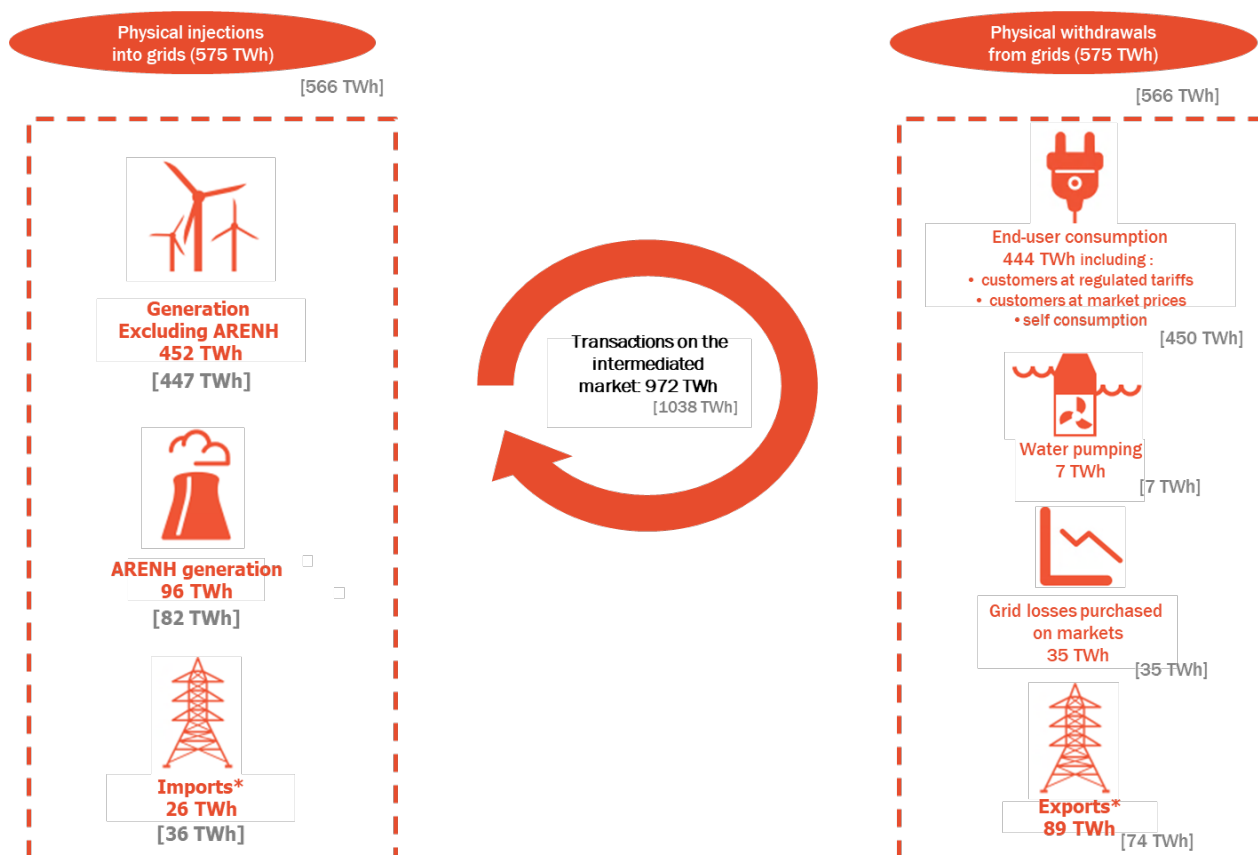
SECTION 3
WHOLESALE ELECTRICITY MARKETS

1. DEVELOPMENT IN SUPPLY AND DEMAND IN FRANCE IN 2018

Against the major increase in commodity prices, in particular gas and coal, and a very strong increase in the price of the CO₂ allowance (from €5/tCO₂ to €20/tCO₂ in 18 months), the year 2018 was marked by tightness in supply during winter, in particular during the first quarter because of the low availability of nuclear generation portfolio. Nevertheless, this tightness was eased with the improvement of nuclear availability levels, high production of the hydraulic sector and growth in wind generation.

Graph 12 presents a simplified version of the main flows for 2018 in the French electricity system and compares them to the figures for 2017 (between brackets).

Graph 12: Injections and withdrawals for 2018 [2017]



*Commercial flows

Source: RTE – Analysis: CRE

1.1. Consumption stable in 2018 compared to 2017 with a few seasonal differences

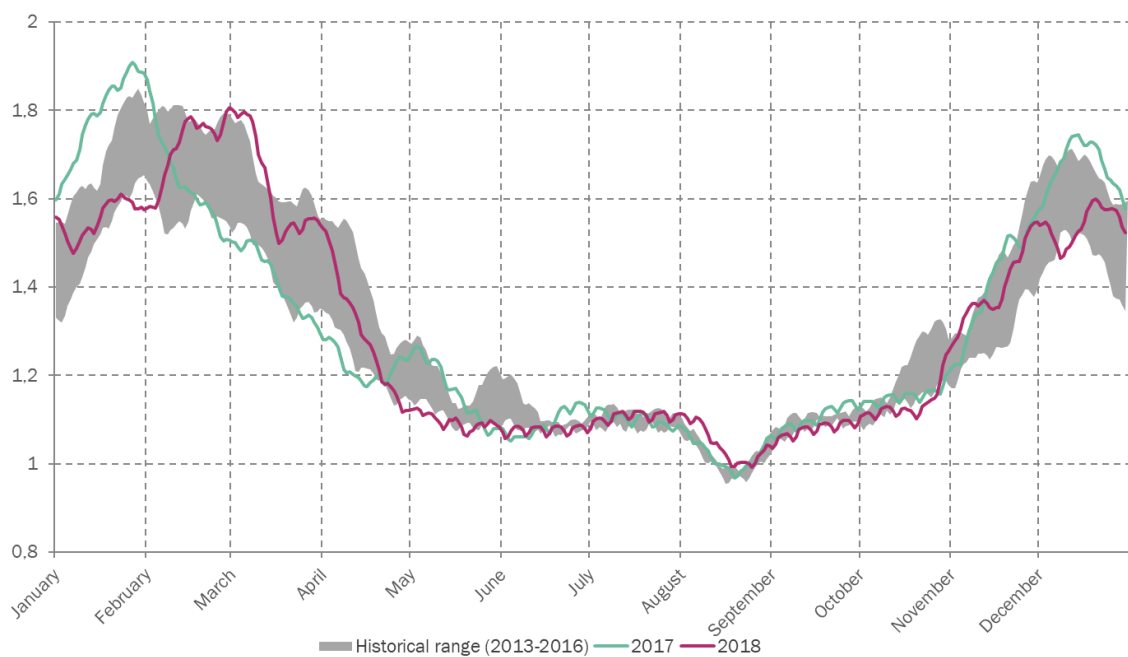
Total consumption in France in 2018 was relatively stable over the year compared to 2017 levels, going from 450 TWh to 444 TWh, i.e. a variation of -1% (Graph 13). The major consumption increase during the weeks of the cold spell at the end of February and early March, was offset by a drop in consumption in fall, because of temperatures higher than normal for the season. A considerable drop in consumption was also observed in the month of December, because of cool temperatures.

Physical injections into the network slightly increased, between the years 2017 and 2018, with a 1.6% increase from 566 TWh to 575 TWh. ARENH¹⁹ subscriptions in 2017 for delivery in 2018 went from 82 to 96 TWh because of the better competitiveness of the ARENH product. ARENH remained competitive for the second consecutive year because of the increase in calendar prices, which exceeded €42/MWh several times during the year (as in 2017), against uncertainty about the availability of nuclear generation and the increase in the price of commodities. The ARENH volume requested at the end of 2018 for 2019 in the 2018 windows was 20.4 TWh to supply transmission system operators' losses and 133 TWh for end customers.

¹⁹ The ARENH product corresponds to baseload energy delivered in the year, but also a guaranteed capacity. The arbitrage takes place between, on the one hand, the sum of the prices of calendar prices, and capacity prices, and on the other hand the ARENH price set at €42/MWh.

Graph 13: Consumption in France

Daily consumption (TWh) - moving average 15 days



Source: RTE – Analysis: CRE

Totalled installed capacity of French generation increased 1.6% in 2018, going from 130.8 GW to 132.9 GW, and its composition grew for renewable energy and dropped as concerns thermal generation. The production capacity of Fuel oil power plants dropped by 16%, i.e. 4.1 GW in 2017 to 3.4 GW in 2018; this large drop was fully offset by the installation of new renewable production means (+10.8% from 23.2 GW in 2017 to 25.7 GW in 2018).

Total electricity production in 2018 was up after decreasing for two consecutive years, by +3.6% compared to 2017. French production thus went from 529.4 TWh to 548.6 TWh for the year. Nuclear and hydraulic resources contributed more to production than in 2017, while fossil-fuel generation plants were used less (-27.6%). Renewable energy production also increased by 5.4% (including 3.8% thanks to wind generation), in line with the increase in renewable capacity.

Lastly, the import/export trade balance in 2018 showed an increase in the French net export balance compared to 2017 (+60%), in particular during the second and last quarter of 2018 (Graph 14). In the fourth 2018, exports increased significantly compared to 2017, where the import/export balance was almost at par. This balance reflects the high availability of French energy generation fleet whose competitive production costs led to the use of inter-connections mostly for export. France maintained a net export balance in 2018 of 60.2 TWh. It was even a net exporter during the first quarter 2018, which saw a cold spell, with a net export balance of 14 TWh.

Graph 14 : Quarterly volumes traded at borders²⁰



Source: RTE – Analysis: CRE

1.2. Availability of nuclear generation improved compared to 2017, but the production rate of the sector remained low

The year 2018 was marked by an increase in the rate of nuclear availability, going from 71.7% to 74.8%. The availability rate continued on from that of the years 2016 and 2017, except for a few episodes in winter and in September/October, where it was in the middle or even the high end of the historic range for 2012-2016; the availability rate generally remained in the low part of this range.

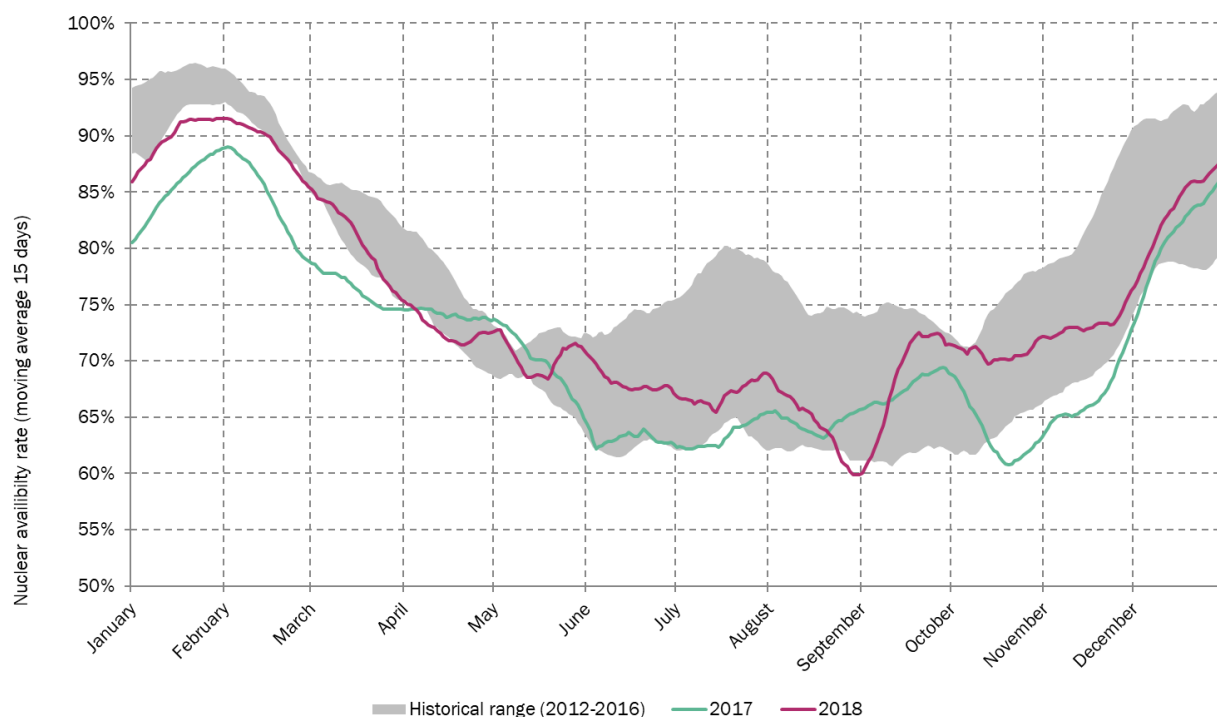
Improvement of nuclear availability caused a 3.7% increase in this sector's generation compared to 2017, and ended the drop in production for this sector over the last two years with -1.3% between 2016 and 2017, and -9% between 2015 and 2016.

A few episodes of nuclear plant shutdowns marked the year 2018. Seven reactors with an average capacity of 9 GW were down during the cold spell in the first quarter 2018. Winter was greatly marked by the heat wave that started at the end of May with a rapid progression towards high temperatures seen in July and August. This heat wave led to the shutdown of three reactors and to the power of certain nuclear plants being modulated.

²⁰ The volumes shown correspond to trading in interconnection lines (referenced by ENTSO-E) but do not take into account roughly 2.7 TWh corresponding in particular to a few cross-border lines in the distribution networks, the Corsica-Italy lines and compensation for water rights unlike physical exchanges in France.



Graph 15: Rate of French nuclear availability



Source: RTE – Analysis: CRE

1.3. Renewable energy installed capacity (excluding hydraulic) exceeded fossil fuel installed capacity

Installed capacity of renewable generation (excluding hydraulic) continued to grow reaching 25.7 GW and exceeding for the second consecutive year installed thermal fossil capacity generation, excluding nuclear generation (Graph 16). This was the result, first of all, of the closing of eight thermal power plants since 2017, including one using fossil fuel which was stopped in March 2018. At the same time, wind and solar generation in particular, has had a steady growth rate for several years now with an average annual growth rate for the 2013-2018 period of 12% for wind, and 17% for solar generation (Table 1).

In terms of production, against the decreased use of fossil generation related to the high level of hydraulic stocks and the improvement in the availability of nuclear plants, the production of renewable sector (excluding hydraulic) was equal to 47.7 TWh in 2018 and higher than the production of thermal fossil generation (excluding nuclear) in 2018 (Graph 17) by 8.3 TWh.

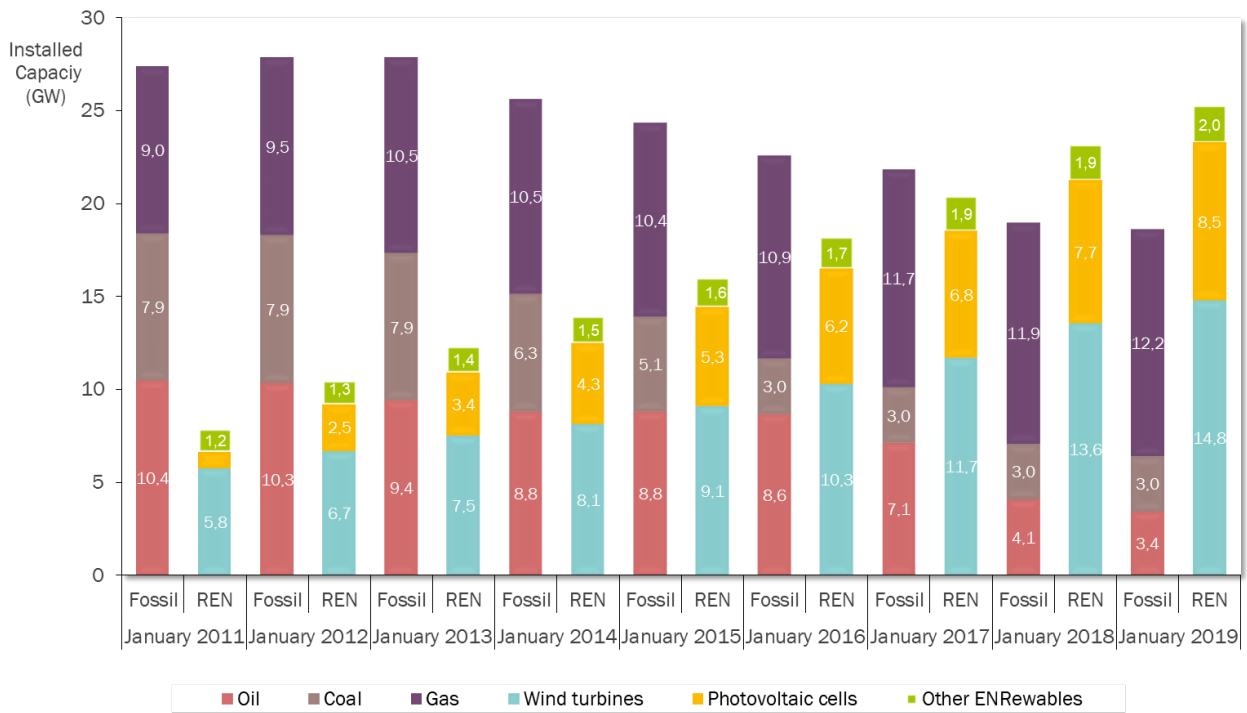
Table 1: Development of installed capacity of renewable sectors

	2013	2014	2015	2016	2017	2018	AAGR ²¹ 2013/2018
Wind (GW)	8.1	9.1	10.3	11.7	13.6	15.1	+12%
Solar (GW)	7.3	5.3	6.2	6.8	7.7	8.5	+17%

Source: RTE – Analysis: CRE

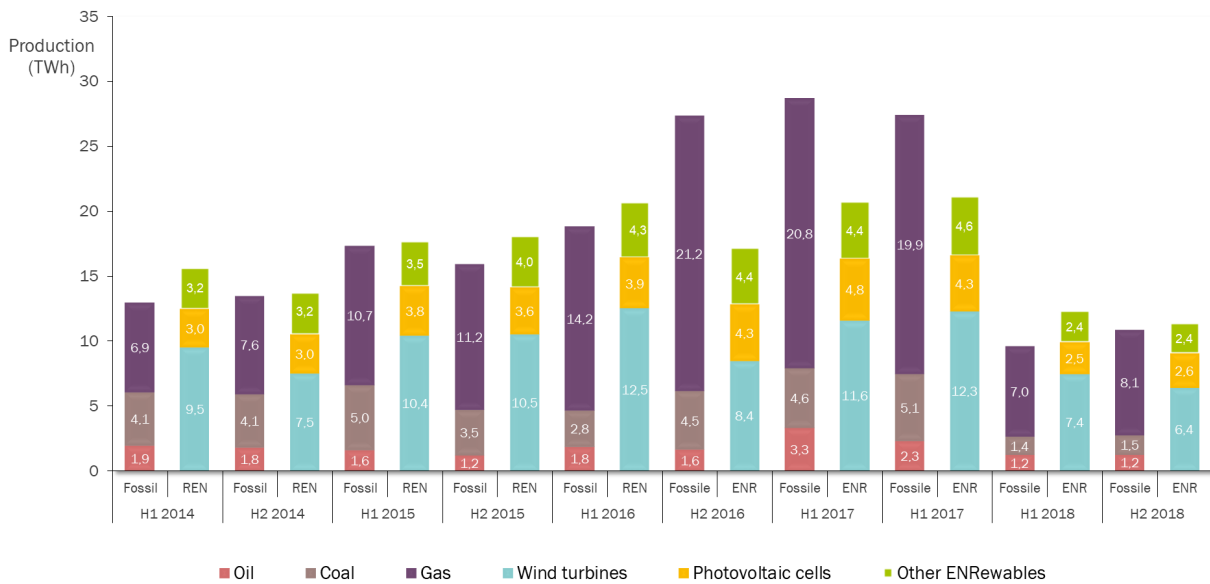
²¹ Average annual growth rate

Graph 16: Comparison of installed capacity of thermal fossil resources (excluding nuclear) and renewable energy resources (excluding hydraulic)



Source: RTE – Analysis: CRE

Graph 17: Comparison of six-month production of the thermal fossil (excluding nuclear) and renewable energy sectors (excluding hydraulic)



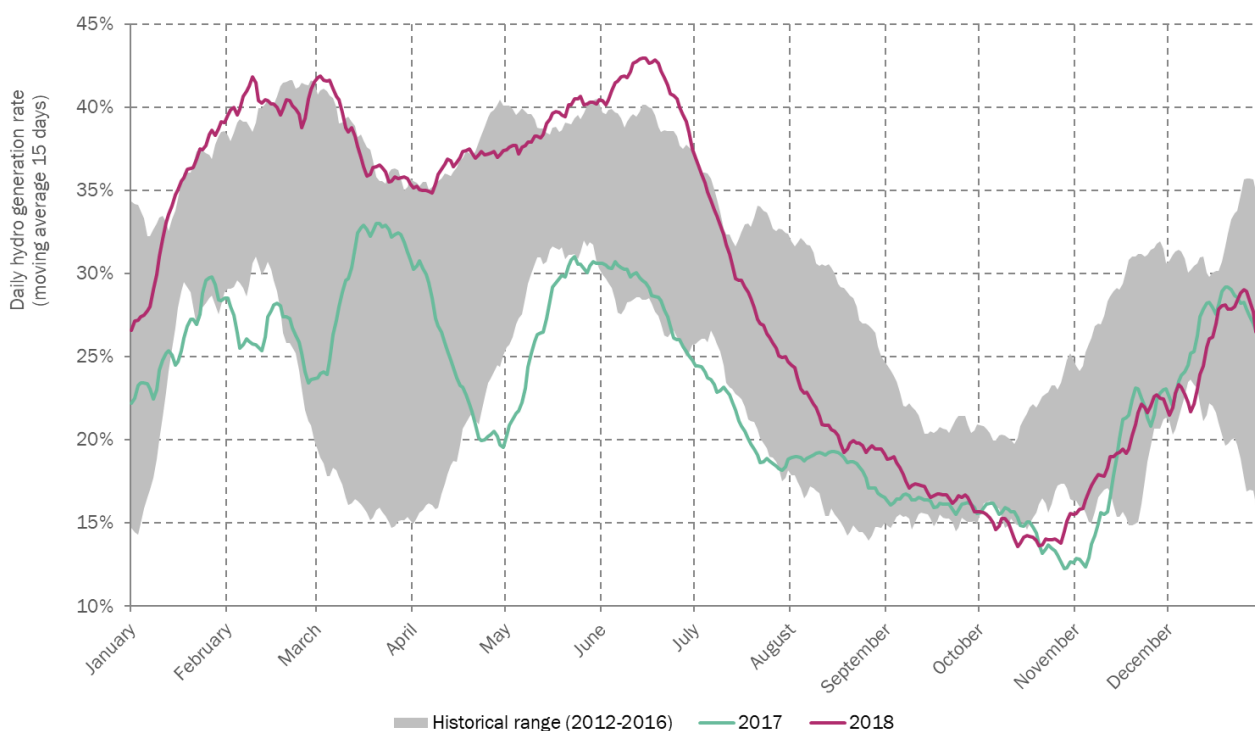
Source: RTE – Analysis: CRE

1.4. Hydraulic production up in 2018 with a high rate of use

The average production rate of the hydraulic sector increased considerably in 2018 (+6.5%) compared to 2017. The production rates were at the top part of the historic range between mid-January and mid-July with peak use at 43% towards mid-June. In total, hydraulic production in 2018 stood at 68.3 TWh, a level higher than the past two years (63.9 TWh in 2016 and 53.6 TWh in 2017).

Rainfall increased 22% in 2018 compared to 2017. High hydraulic production contributed significantly to easing the system particularly during the cold spell and during periods of low nuclear availability.

Graph 18: Rate of production of the hydraulic sector



Source: RTE – Analysis: CRE

1.5. Gas and coal sectors used less compared to 2017

The year 2018 was marked by a drop for the second consecutive year of installed capacity of the thermal fossil sectors, particularly that of fossil fuel (-16.1%). Thermal production was also down, going from 54.4 TWh in 2017 to 39.4 TWh in 2018 (-27.6%), distributed across the three production means, coal (-40.2%), gas (-23.2%) and fuel (-42.2%).

In terms of contribution to injections into the network, the gas sector was used the most. The production rate of this sector was an average 29% in 2018 with an 11-point drop compared to 2017. The production profile of the gas sector over the year (Graph 20) showed that it was used to a large extent during the cold spell of February/March. The rest of the year, modulation behaviour was observed and the rate remained mostly within the average of historic levels.

In general, the clean spark spread and the clean dark spread²² (Graph 19) showed values lower than those of the previous year, which makes these types of plants less profitable, while a positive average was maintained in 2018. These two indicators occasionally showed negative values, particularly during periods of high production using

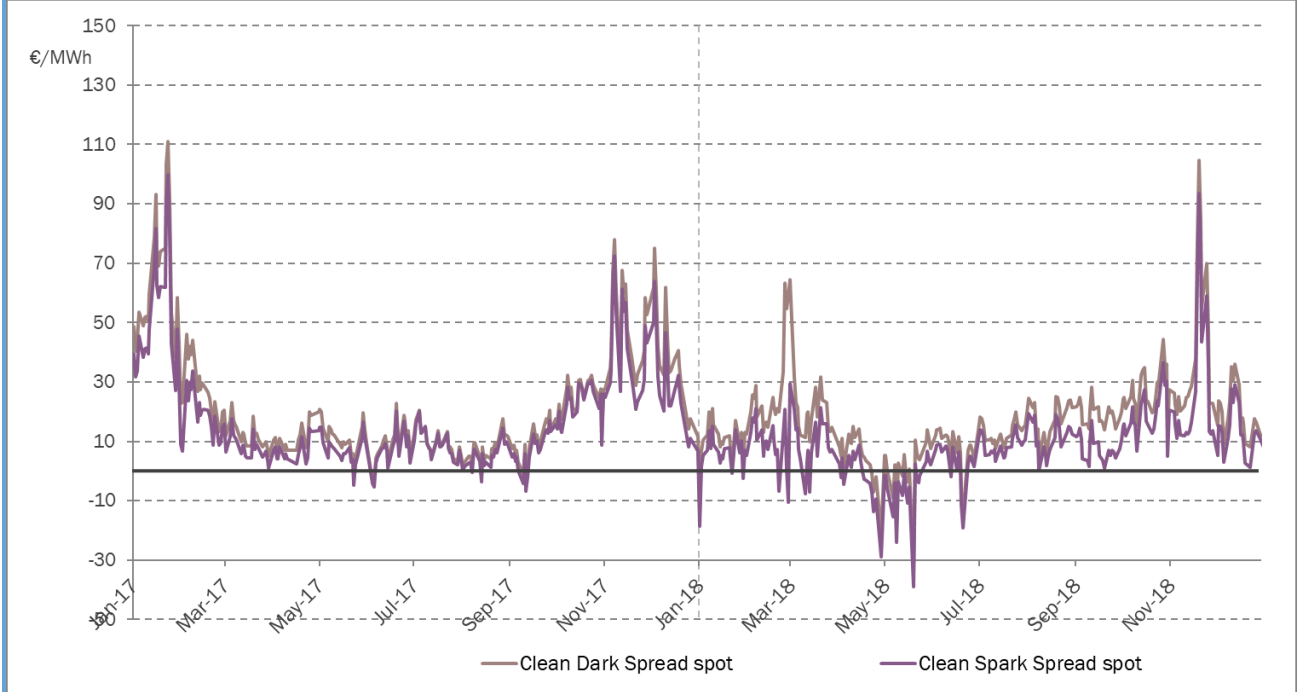
²² The clean spark spread (CSS) and clean dark spread (CDS) measure the theoretical profitability of a gas- or coal-fired power plant. The calculations presented are indicative, and do not take into account all plant costs, in particular fixed costs and start-up costs, and are therefore not the only indicators for the decision to start a unit.

CDS (€/MWh) = $p_E - (\alpha p_C + \beta p_{CO_2})$, where p_E is the day-ahead peak electricity price in France, p_C is the price of coal, p_{CO_2} the spot price of CO₂, α the average yield of a coal plant (35%) and β the emission factor of coal plants (0.96 tCO₂/MWh). Calculations were done assuming a coal calorific value of 8.14 MWh/t.

CSS (€/MWh) = $p_E - (\gamma p_G + \delta p_{CO_2})$, where p_E is the day-ahead peak electricity price in France, p_G is the price of gas, p_{CO_2} the spot price of CO₂, γ the average yield of a gas plant (52%) and δ the emission factor of gas plants (0.43 tCO₂/MWh).

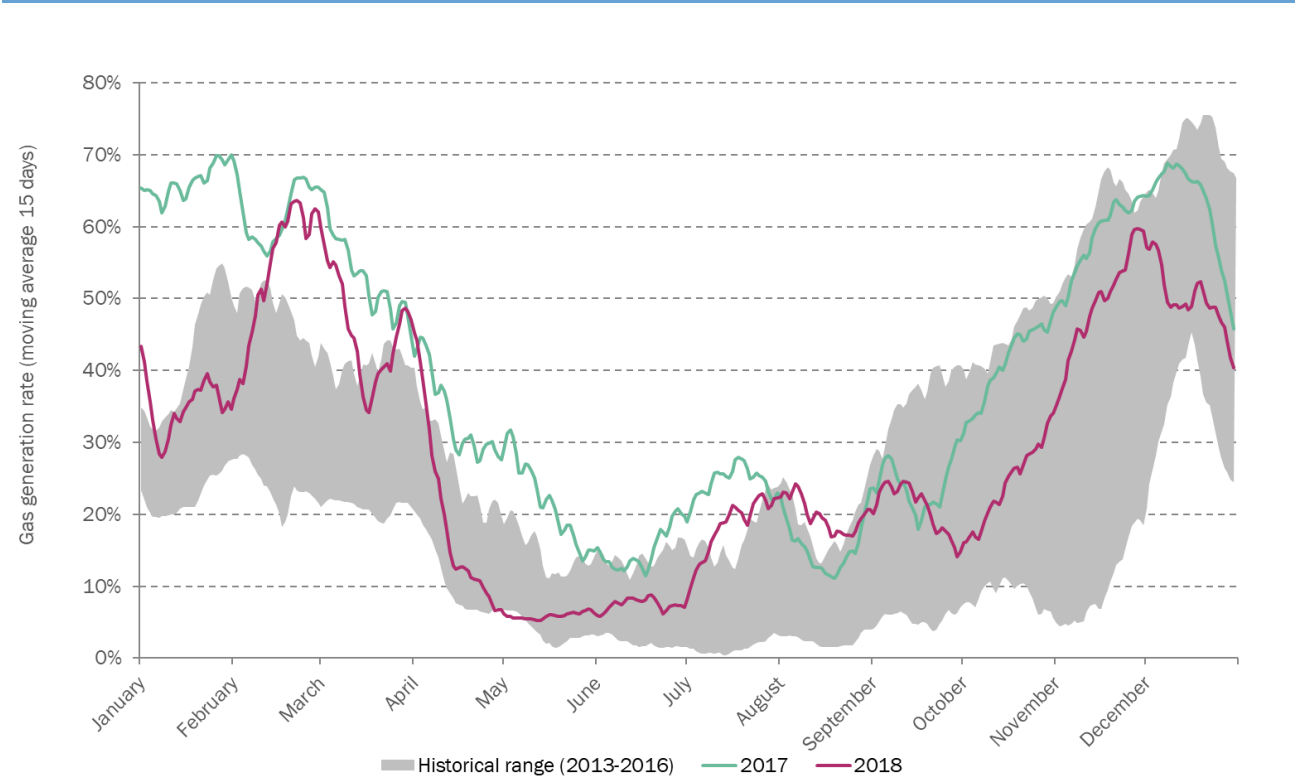
sources other than gas and coal. The production rate of the coal sector was an average 21% compared to 37% in 2017 (Graph 21). Production was however lower in volume than that of gas, totalling 5.8 TWh in 2018.

Graph 19: Peak spot clean dark spread and peak spot clean spark spread



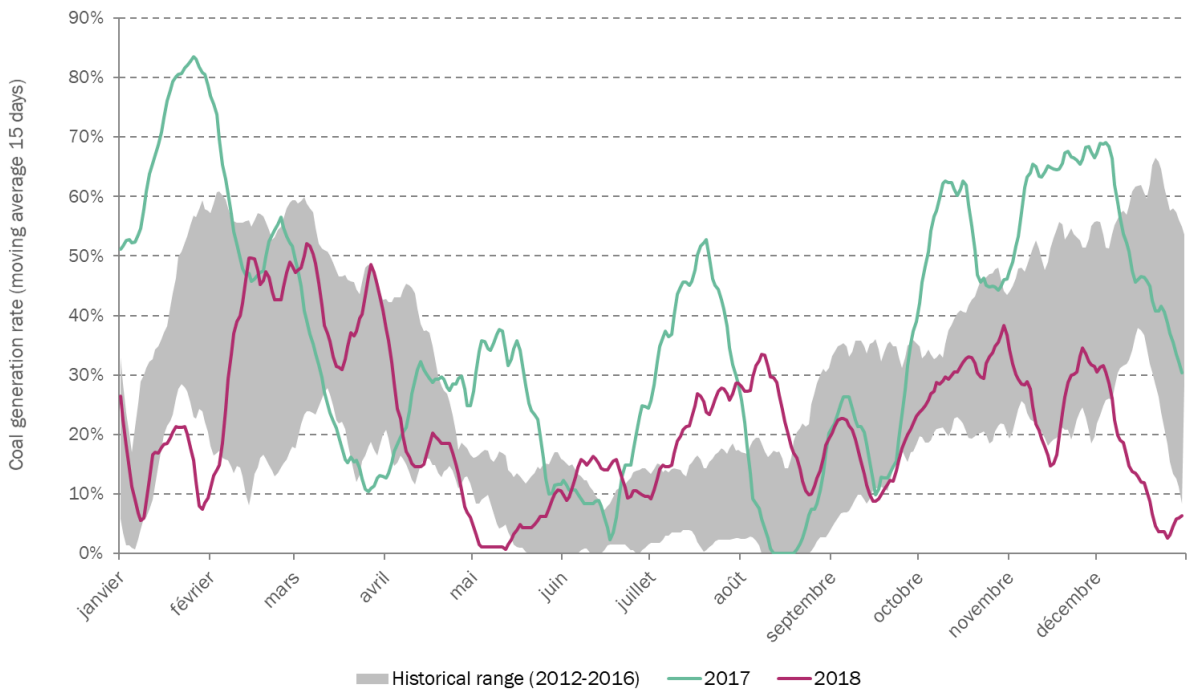
Source: ECX, Heren, Powernext, EPEX SPOT - Analysis: CRE

Graph 20: Production rate of the gas sector



Source: RTE – Analysis: CRE

Graph 21: Production rate of the coal sector



Source: RTE – Analysis: CRE

1.6. Marginality of the different generation sectors in 2017 and 2018

A production sector is said to be marginal when the last unit of production used to meet demand belongs to that sector. Its marginal production cost in theory then determines the market price in EPEX SPOT's day-ahead auction. The marginality of a sector can be very different from its share in annual production. CRE estimated marginality of production sectors by taking into account the marginal cost of production of the French power plants and offers executed during EPEX SPOT's day-ahead auctions.

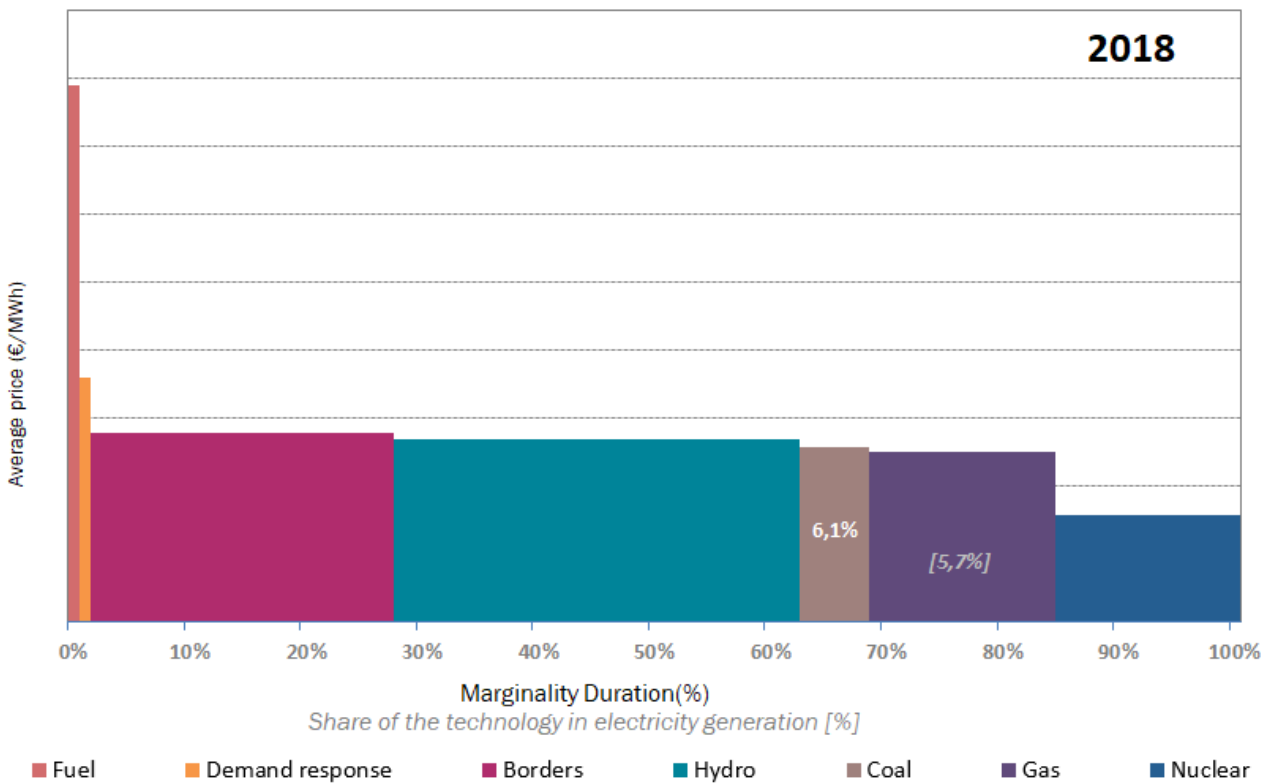
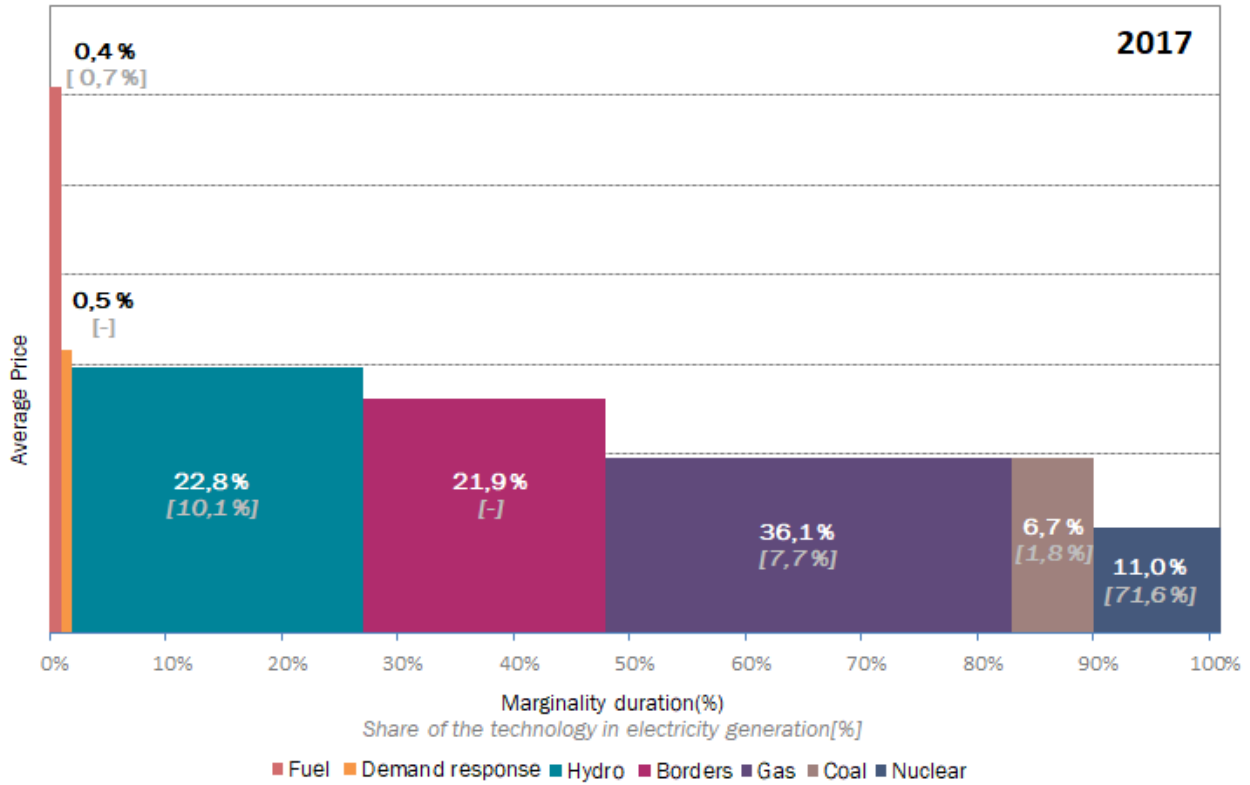
The study of sector marginality in 2018 corroborates fundamental analyses. Given the improved nuclear availability in 2018, marginality of the sector increased by 4.6% in 2018. Hydraulic production was also up considerably in 2018, even reaching historically high values at the start of the year. As such, the sector saw its marginality increase greatly compared to the previous year (+11.8%), reaching a level of 34.6%.

These two increases caused a drop in marginality of the gas sector in 2018, which fell to 16.5%.

Marginality of the coal sector was relatively stable and had relatively little impact on the price in the French market. On the contrary, trading at borders with France's neighbouring countries was an essential factor in price formation because it determined prices 27% of the time in 2018. This value was up by almost 5% compared to last year.



Graph 22: Marginality of the different generation sectors in 2017 and 2018



Sources: EPEX SPOT, RTE, Producers

2. WHOLESALE ELECTRICITY PRICES UP CONSIDERABLY SINCE MAY 2018

2.1. Spot prices grew significantly in 2018 with episodes of price peaks in the first quarter (effect of cold spell) and in the fourth quarter

The average baseload spot price for 2018 saw a major increase, standing at €50.2/MWh, i.e. a 12% increase compared to 2017. Intraday prices followed the same pattern as baseload spot prices and stood at an average of €51.2/MWh for hourly products in 2018, which corresponds to a 14% increase compared to 2017 (Table 2).

The year 2018 started with rather low prices, then the cold spell brought a price peak and then dropped quite quickly. Prices then increased progressively as from early May until the end of the year.

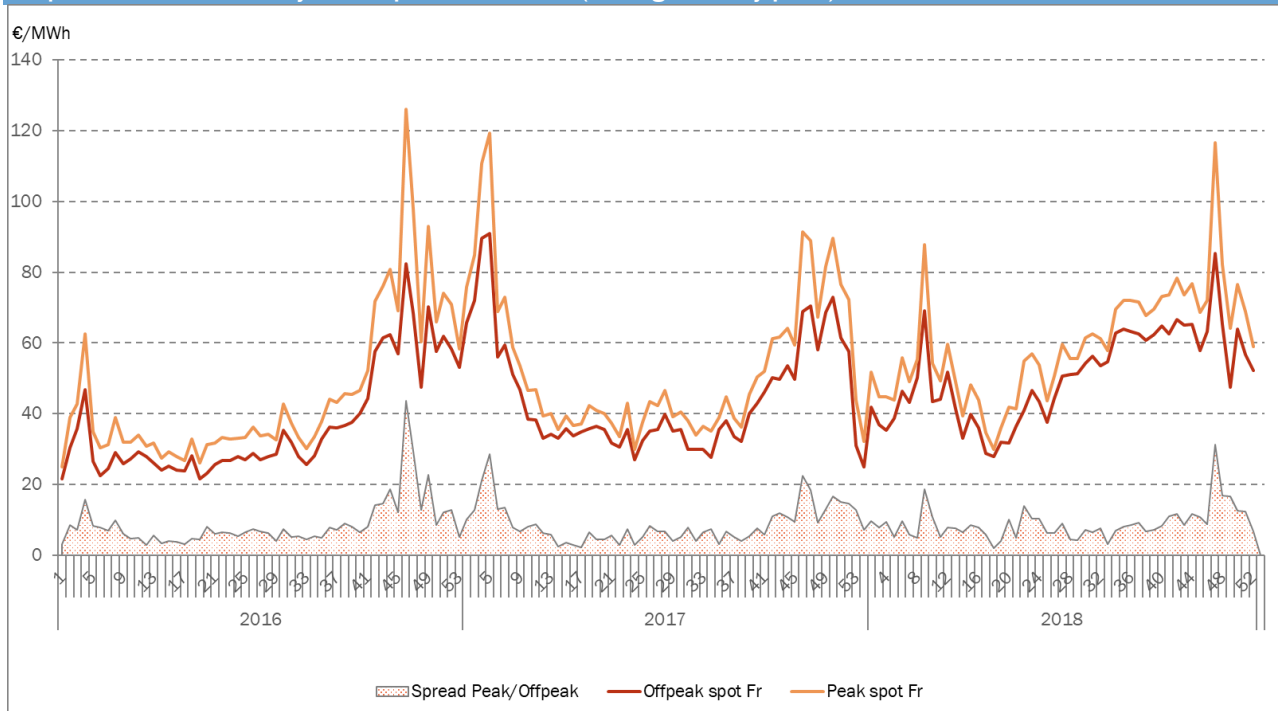
Tightness in the market was seen at the end of November with a major price peak during week 47. Price peaks were seen in particular on Tuesday 20, Wednesday 21, Thursday 22 and Monday 26 November, with baseload day-ahead prices higher than €200/MWh for the 6:00 p.m. peak. French prices were influenced in particular by the very tight situation in Belgium because of the low Belgian nuclear availability for the period (2 GW available for 6 GW installed) combined with a cold spell (up to 5 °C below normal temperatures for the season) and a use rate for French nuclear resources also low because of the delay in the return of several units and several social movements. Belgian baseload day-ahead prices for those same days exceeded €300/MWh each time for the evening peak. Prices then dropped in December because of cooler temperatures and better availability of the Belgian nuclear generation resources (Graph 23).

Table 2: Average day-ahead and intraday prices

Period	Average Day-Ahead price	Average Intraday price
2016	€36.68/MWh	€36.86/MWh
2017	€44.98/MWh	€45.05/MWh
2018	€50.20/MWh	€51.19/MWh

Source: EPEX SPOT

Graph 23: Evolution of day-ahead prices in France (average weekly price)

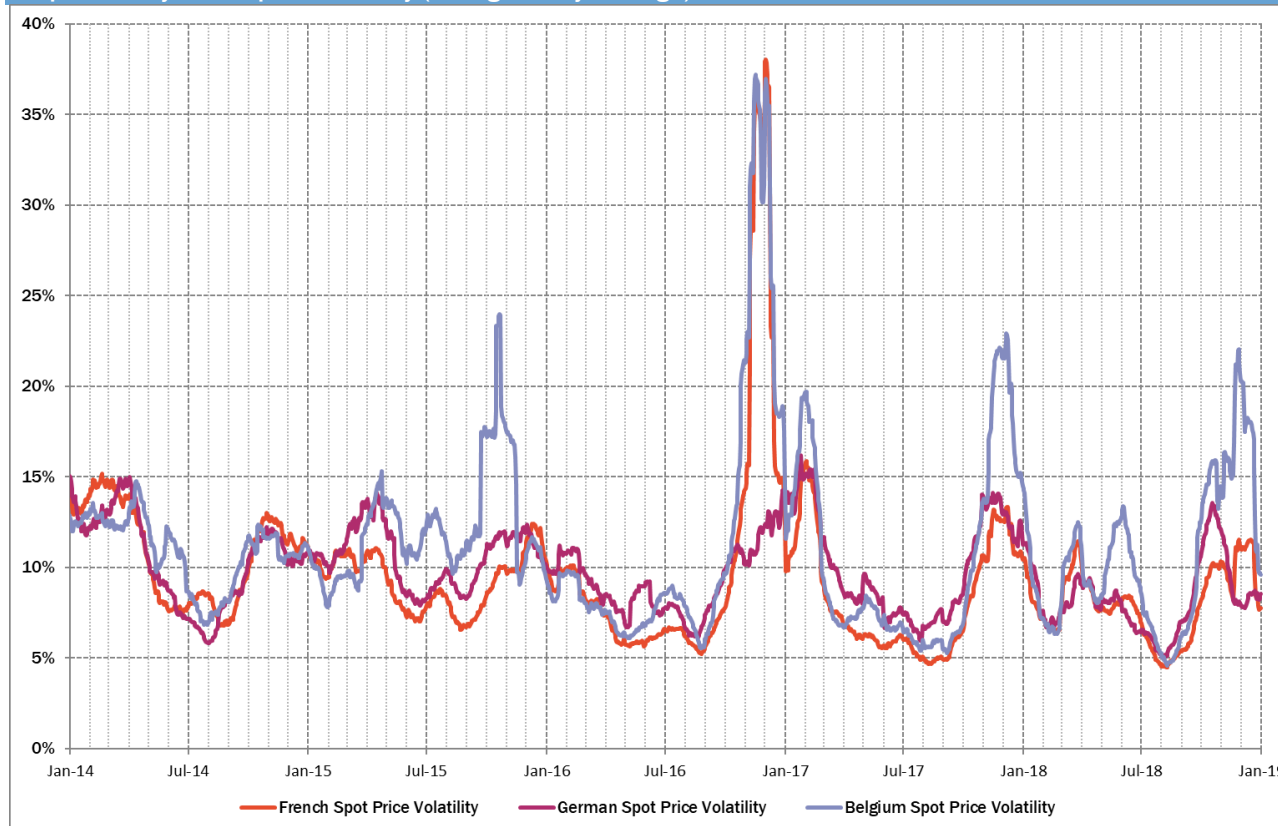


Source: EPEX SPOT



These episodes of tightness in prices occurred against the evolution in French market volatility during the year with a slight peak in March during tightness related to the cold spell followed by a major drop in volatility in the middle of the year, and then an increase in the fourth quarter of 2018 (Graph 24).

Graph 24: Day-ahead price volatility (rolling 30-day average)



Sources: EPEX SPOT, Belpex - Analysis: CRE

2.2. Difference between spot prices and EDF's marginal costs in 2018

With regard to the formation of the spot price, CRE specifically monitors differences existing between the prices in the spot market and the marginal costs of EDF's generation facilities resulting from the calculation of its daily optimisation models. On average, the price/costs difference in 2018 was 3.5%, i.e. slightly higher than that observed over the last two years, but remained within the lower range of values observed over the last ten years. Ever since CRE has measured this indicator (2008), it has never exceeded 6.5%. The differences published in successive surveillance reports are presented in the following table.

Table 3: Development in the differences between prices and EDF's marginal costs

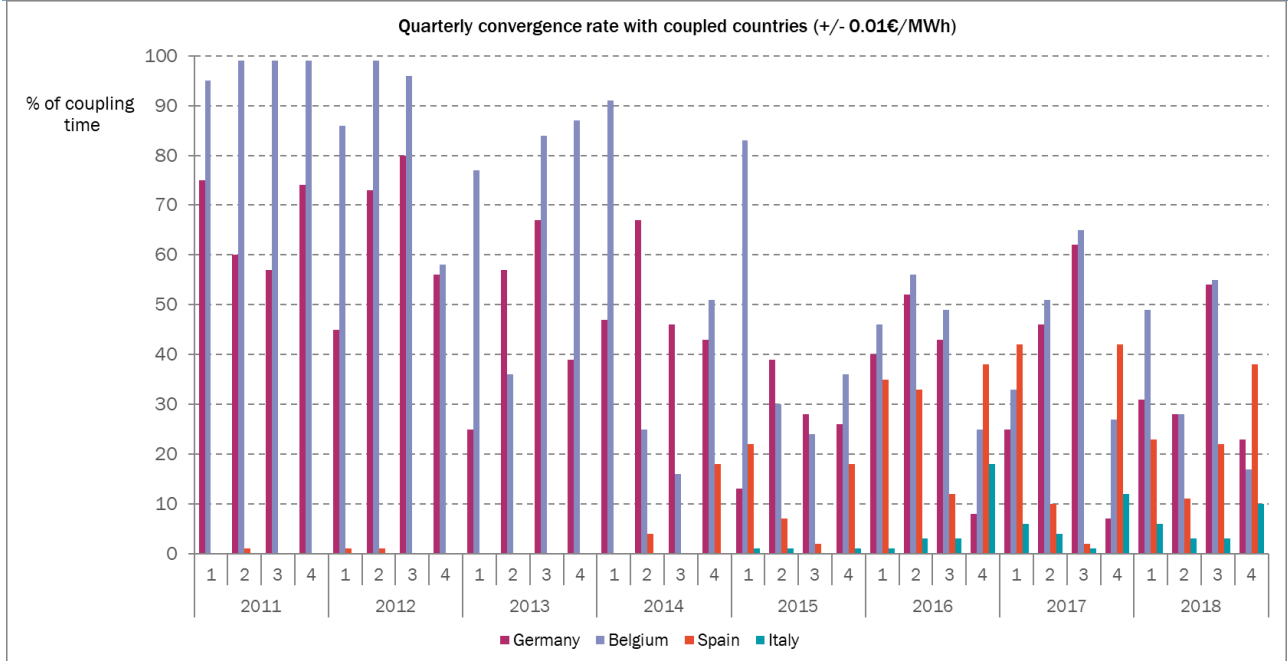
Year	Price/cost difference
2008	6.0%
2009	6.5%
2010	3.2%
2011	5.0%
2012	2.2%
2013	4.5%
2014	5.5%
2015	5.3%
2016	2.9%
2017	1.5%
2018	3.5%

Without pre-empting additional checks, CRE considers that the average difference measured in 2018 does not reflect the exercise of market power.

2.3. Contrasting convergence rates according to periods of French spot price volatility

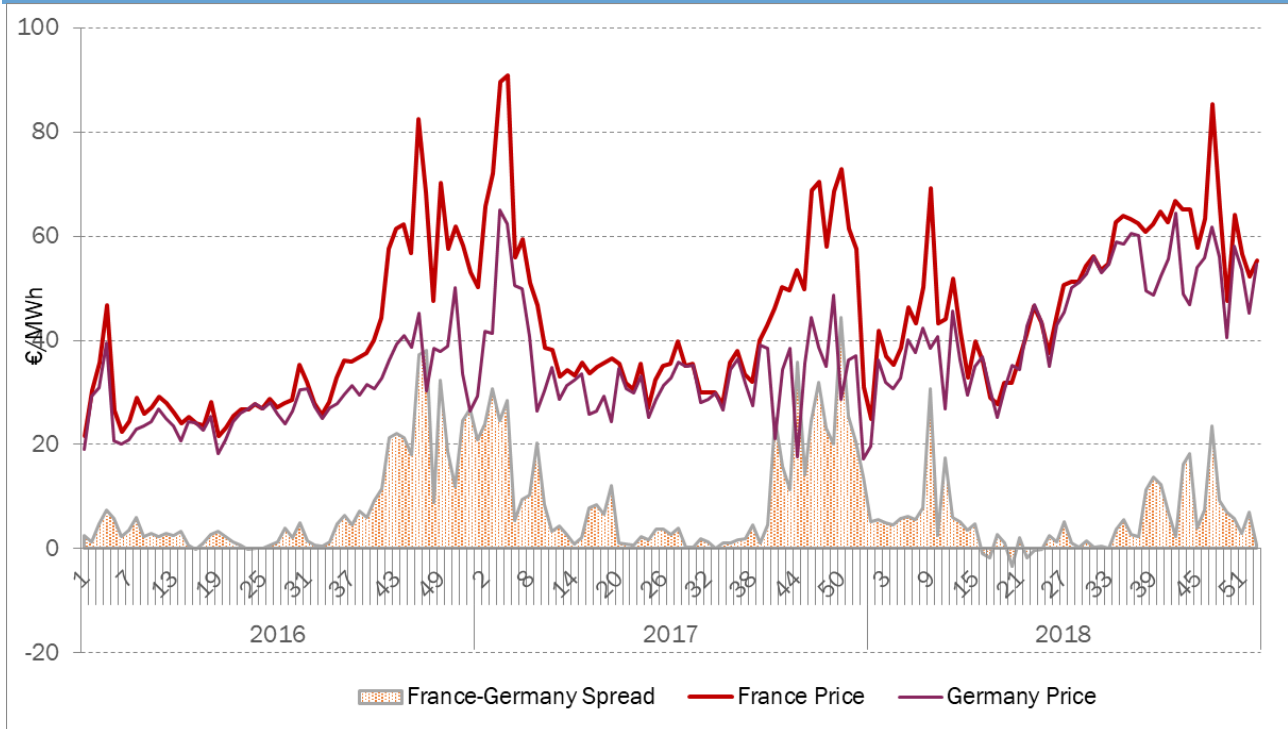
Spot price spreads increased compared to 2017 at all borders except the French/German border (Graph 25 and Graph 26) whose annual average spread in absolute value went from €10.9/MWh in 2017 to €5.8/MWh in 2018. Apart from the market fundamentals in both countries, changes related to flow-based capacity calculation in the CWE region implemented in April 2018 as well as the introduction of the electricity border between Germany and Austria in October 2018 can explain the increase in trading and the drop in the price spread. Differences at the German border were structurally high during first and fourth quarter 2018 and low for the two middle quarters.

Graph 25: Quarterly convergence rates of hourly prices with coupled countries



Sources: EPEX SPOT, Belpex, OMEL, IPEX

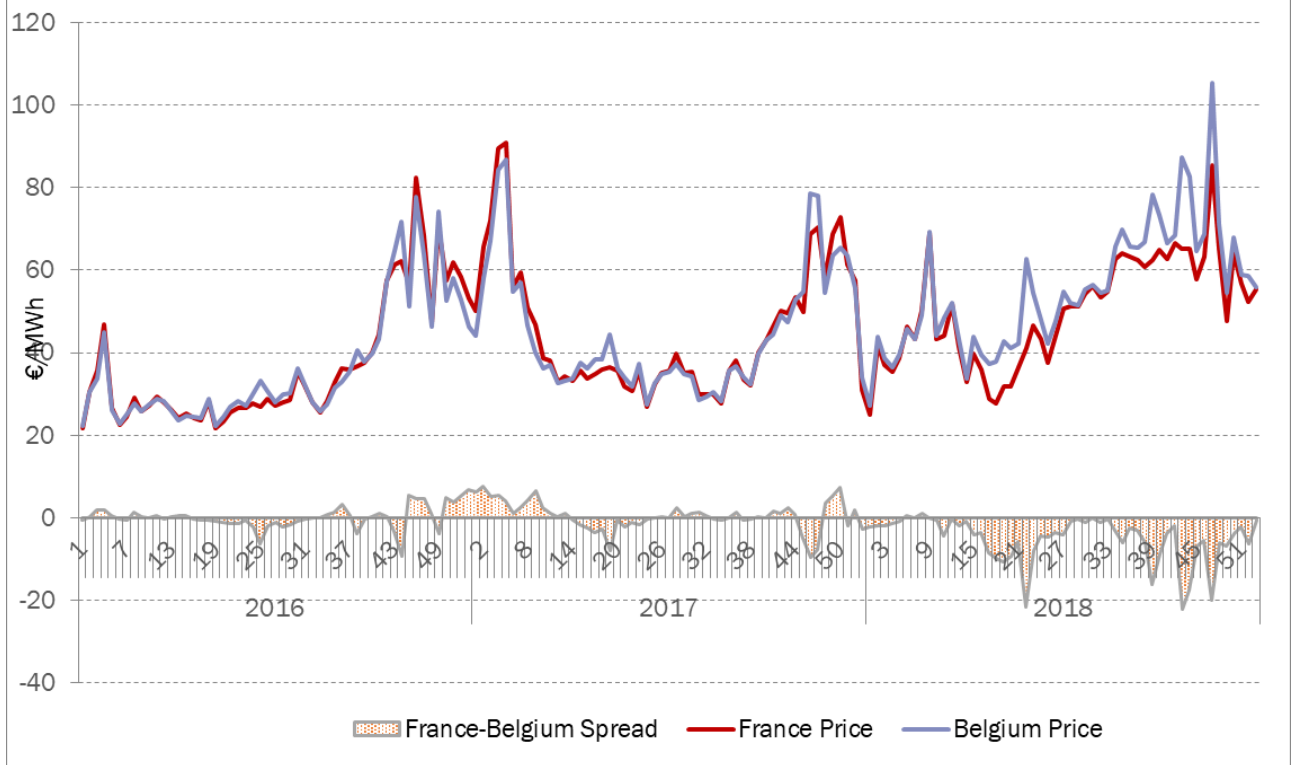
Graph 26: France and Germany spot price (weekly averages)



Source: EPEX SPOT

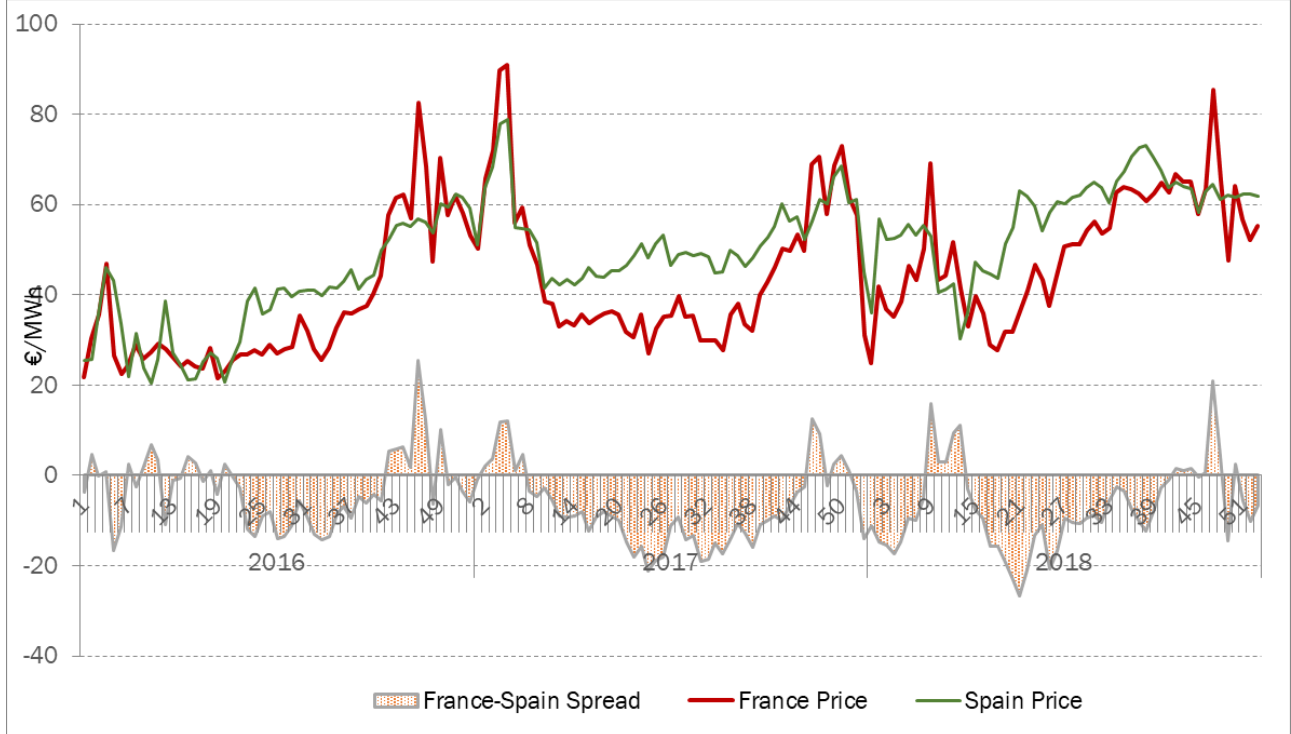


Graph 27: France and Belgium spot price (weekly averages)



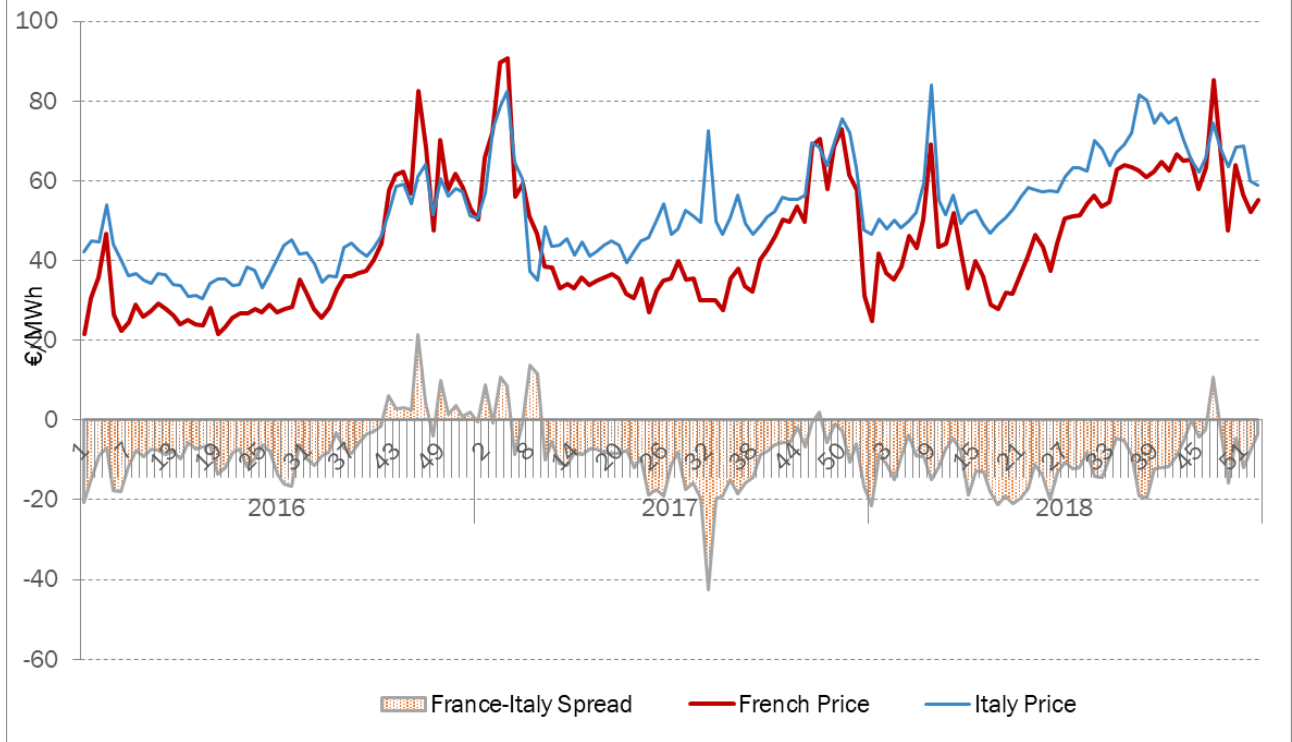
Sources: EPEX SPOT, Belpex

Graph 28: France and Spain spot price (weekly averages)



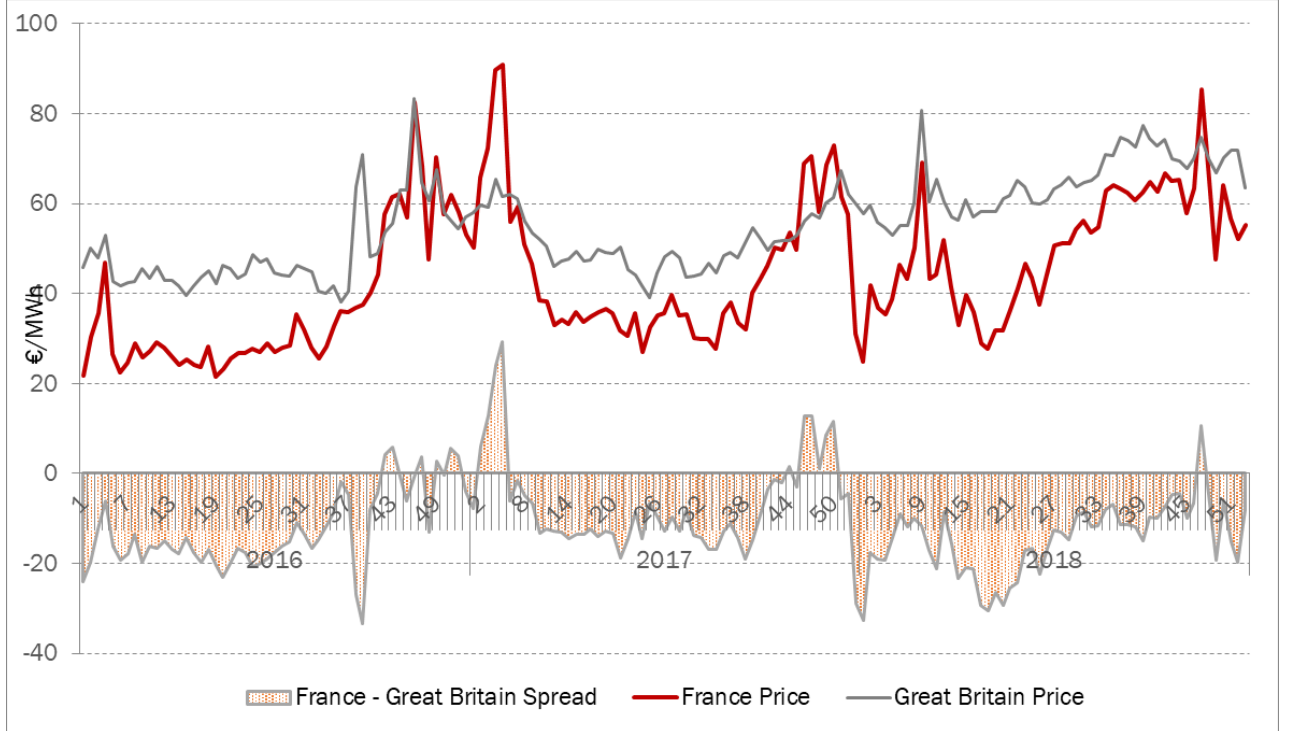
Sources: EPEX SPOT, OMEL

Graph 29: France and Italy spot price (weekly averages)



Sources: EPEX SPOT, IPEX

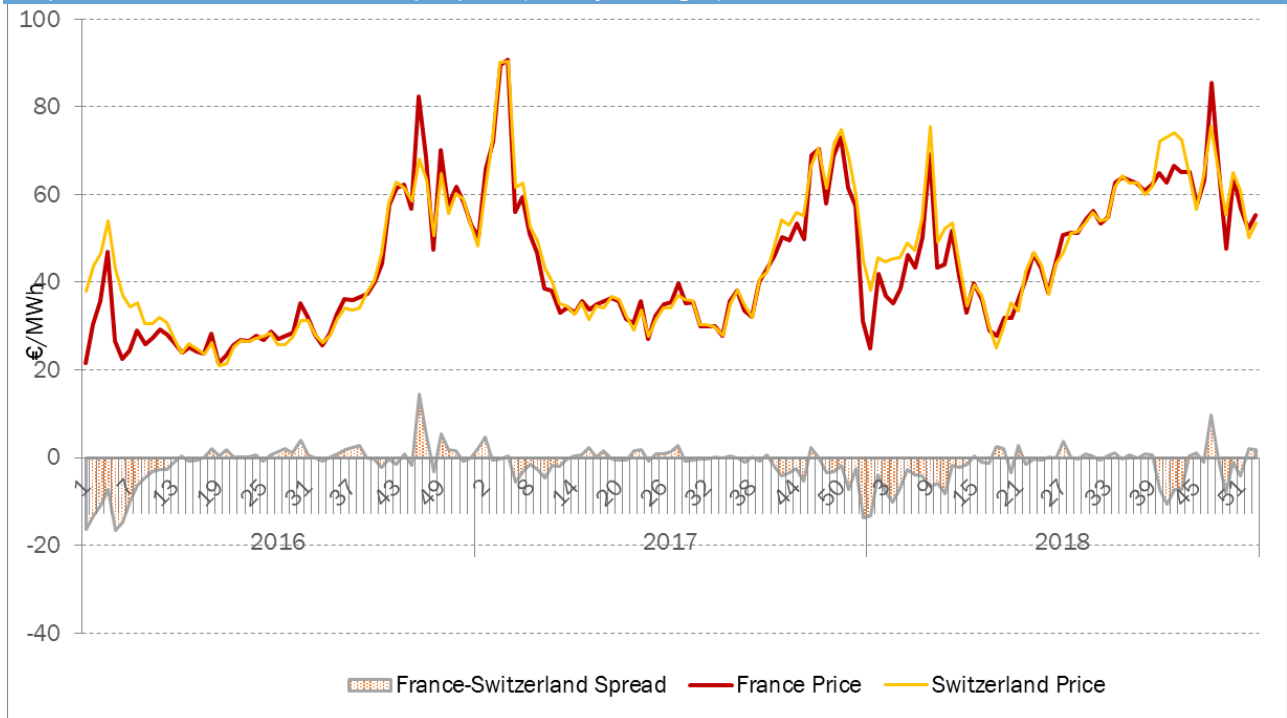
Graph 30: France and Great Britain spot price (weekly averages)



Sources: EPEX SPOT, APX



Graph 31: France and Switzerland spot price (weekly averages)



Source: EPEX SPOT

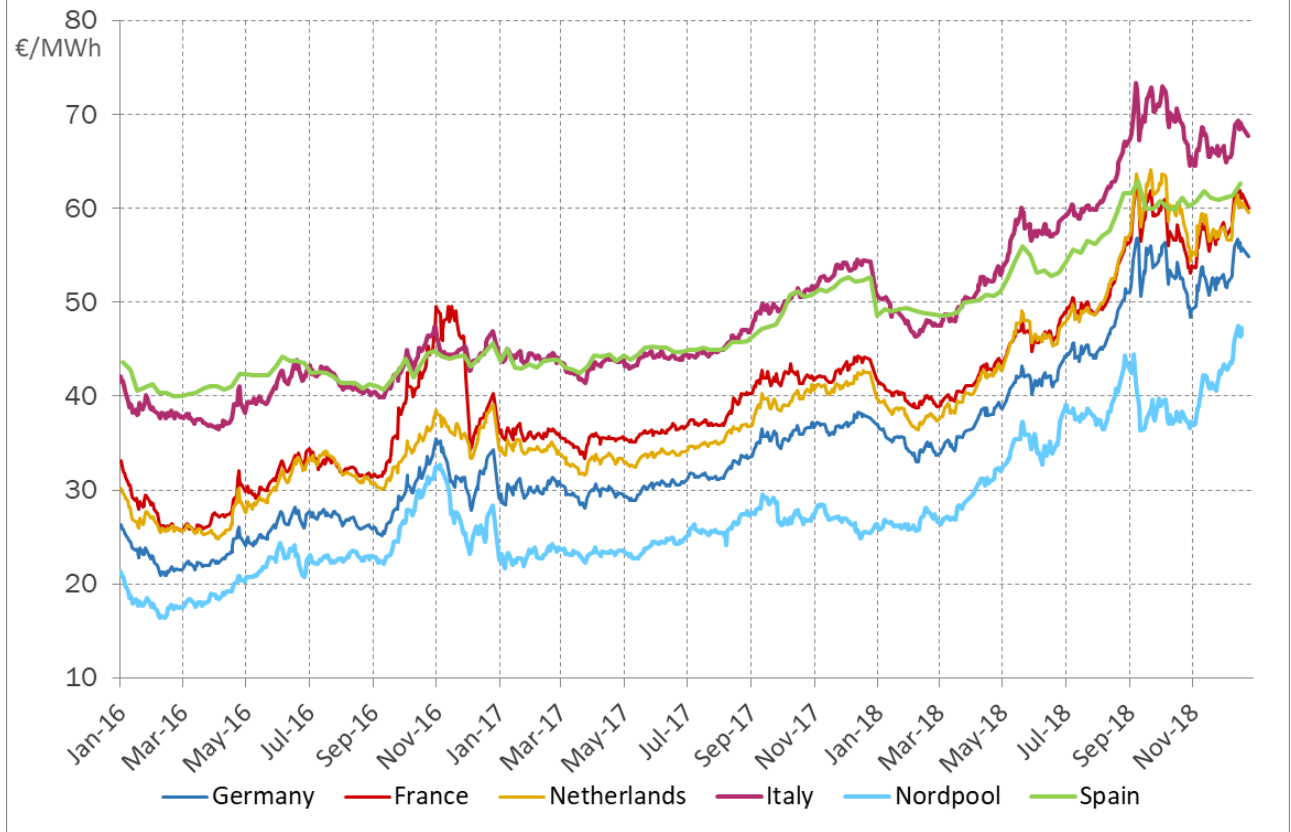
2.4. Implementation of XBID

The cross-border intraday trading platform XBID was put in place in June 2018. It is a continuous intraday trading platform which implicitly matches orders entering all countries of the coupled region (14 countries: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Lithuania, Latvia, Norway, the Netherlands, Portugal, Spain and Sweden) and standardises capacity allocation among the countries. The orders give rise to an international transaction if there is enough capacity available at the border. Extensions in scope are scheduled for 2019 and 2020, particularly for the France/Italy border, with the final objective being to extend the continuous intraday cross-border market to all of Europe.

2.5. General increase in futures prices in France and Europe throughout 2018

Prices of futures products for Y+1 delivery in Europe increased significantly in 2018, with a major acceleration as from March 2018 (Graph 32). Spain was the exception with an increase in prices slightly lower than the rest of Europe. This general increase is related in particular to the general rise in the prices of fuel (gas and coal) and CO₂ over the same period.

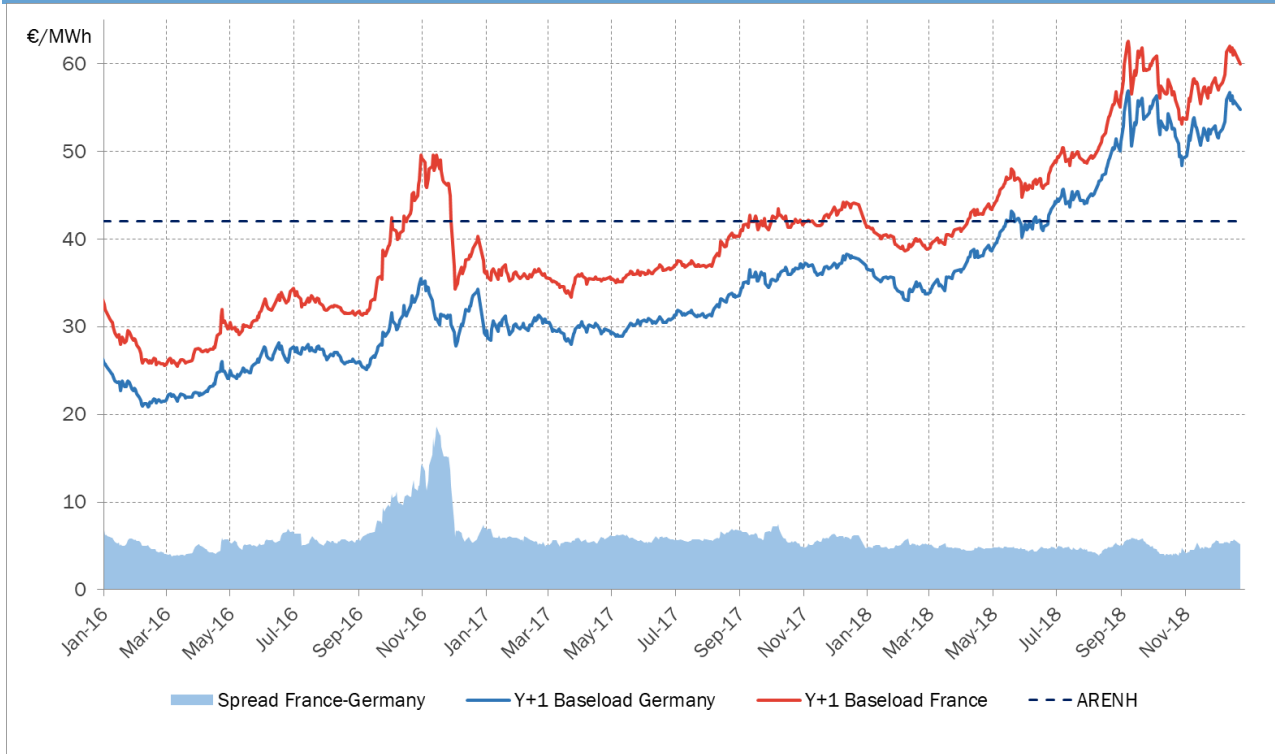
Graph 32: Price of Y+1 products in Europe



Sources: EEX, EPD, ICE Index, Heren

The price spread for futures products between Germany and France was down with stable fluctuations around €4.8/MWh on average in 2018, compared to an average €5.9/MWh in 2017 (Graph 33). The French Y+1 calendar product traded constantly above the ARENH price as from April 2018 with an average at almost €49/MWh over the year.

Graph 33: Price differences between the French and German calendar products



Source: EPEX SPOT, EEX



Prices of calendar products in France for three-year timeframes increased throughout all of 2018, and in particular as from March 2018 (Graph 34). A major increase in prices brought back volatility in calendar products and a considerable increase in differences between one-year, two-year and three-year timeframes with higher prices for the long timeframes.

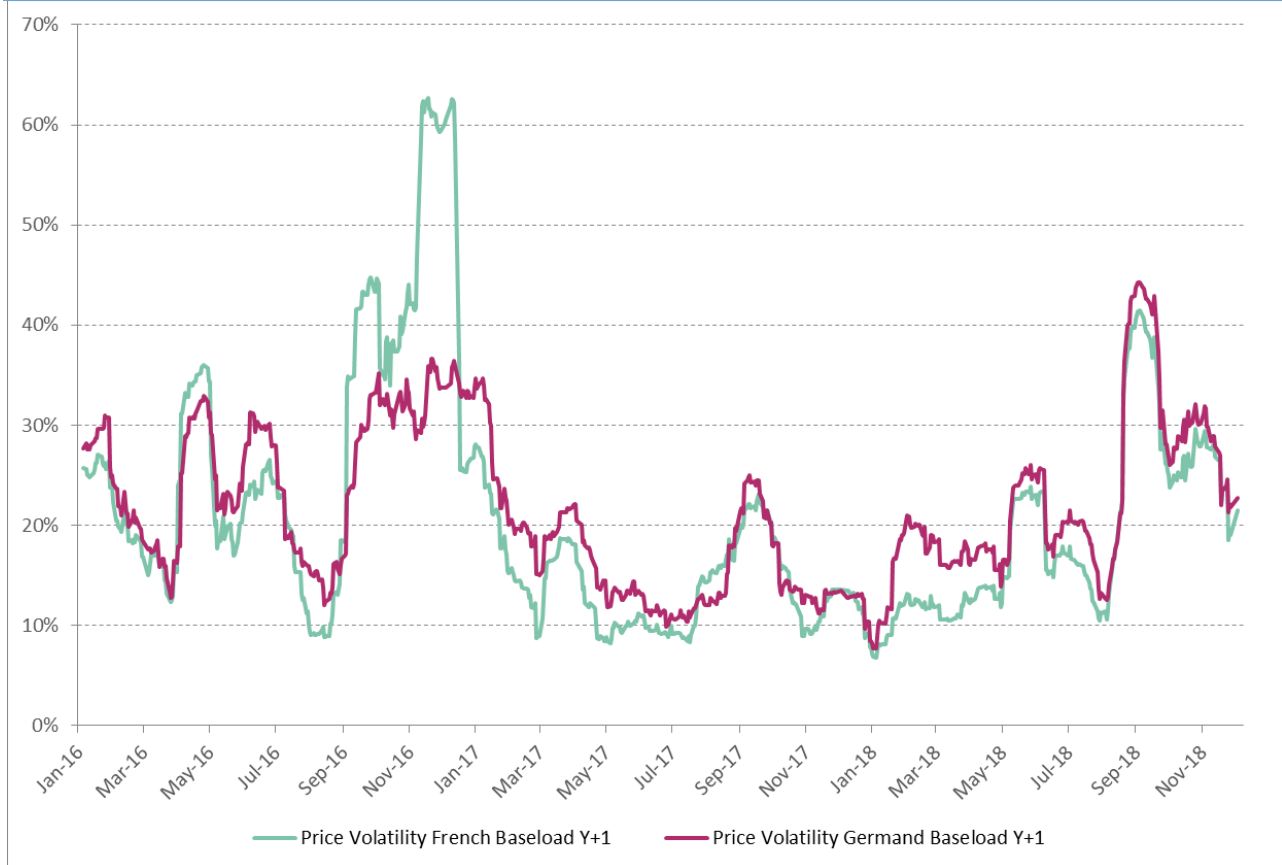
Since the futures price reflects an average of spot prices anticipated for a given delivery year, the shift in prices between Y+1, Y+2 and Y+3 products in 2018 seems to translate a greater perception of market participants' uncertainty for the upcoming year given the general context of markets (uncertainty about the level of hydraulic stocks, availability of nuclear plants, constraints in Belgium and upward cycle in commodities, etc.).

Graph 34: Development in prices of calendar products in France for the next three years



Source: EEX

Graph 35: Volatility of calendar product prices



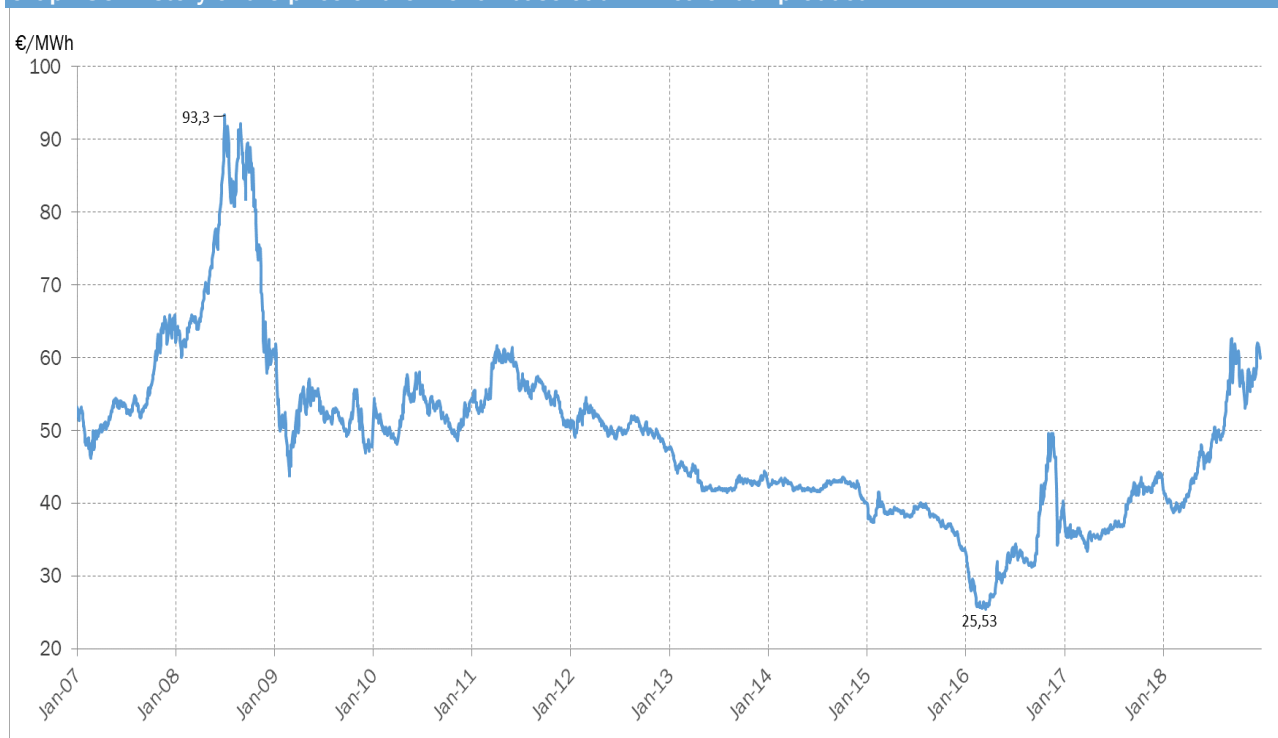
Source: EEX, CRE analysis

Concerning the volatility of Y+1 calendar products in France and Germany, their prices were quite close for the second half of the year, but for the first half of the year, and especially from January to April, there were significant differences, with greater volatility for the German calendar product (around 15.5% on average over the period for the German product compared to 11% for the French product).

Moreover, French and German Y+1 calendar products were more volatile in 2018 than in 2017 (plus 3% for the French calendar product and plus 4% for the German product on average over 2018 compared to 2017) with a peak higher than 40% in September followed by volatility that remained quite high at the end of the year with an average 26% and 28% respectively for the French and German products for the months of November and December 2018.

To put the prices for the year 2018 into perspective, a history of the quoted price of the French baseload Y+1 calendar product since 2007 is shown in Graph 36. The average price of electricity for the 2007-2008 period was roughly €48.65/MWh with a maximum of €74.12/MWh on average for the year 2008 and a minimum of €33.33/MWh on average for 2016. The average for the year 2018 was approximately €48.96/MWh, which is similar to the average for the entire period and within the range of historic prices since 2007. The price increase followed an episode of low prices in the year 2016.

Graph 36: History of the price of the French baseload Y+1 calendar product



Source: EEX

3. CAPACITY GUARANTEE MARKET AND CRE SURVEILLANCE

In its decision of 8 November 2016, following a one-year investigation, the European Commission authorised, in accordance with EU rules on State aids, the French capacity mechanism. This mechanism went live in December 2016 for delivery year 2017.

3.1. Main principles of the French capacity mechanism

The capacity mechanism set up in France is based on a few main principles:

- it is a market-wide mechanism, which means that all capacity contributing to the security of supply must participate, unlike with certain specific capacity mechanisms such as strategic reserves;
- it is a decentralised mechanism, i.e. each participant is responsible for securing the supply of their clients with capacity guarantees²³. Decentralisation has the advantage of making participants accountable and enables them to use their detailed knowledge of their respective portfolios;
- it is a market mechanism, with the capacity price being the result of the supply/demand balance thus created.

For a given delivery year, the mechanism breaks down into two components:

- on the one hand that of **capacity operators** (producers, load shedding operators and interconnection operators) that are required to commit to the level of availability of their resources during the system's peak times through a certification from RTE; they then obtain capacity guarantees;
- on the other hand, that of **obligated parties** (suppliers, system operators for their losses or large consumers wishing to manage their supply themselves) having the obligation to hold capacity guarantees equivalent to the estimated consumption of their portfolio in a situation of extreme cold during the system's peak periods.

²³ Contrary to centralised mechanisms such as those set up in the United Kingdom which provides for centralisation, by National Grid (operator of the English transmission system), of the contracts with capacity operators.

Obligated parties and capacity operators can trade capacity guarantees bilaterally, in the OTC market or through a market organised by EPEX SPOT. These organised auctions, in a continuous operating regime, total 15²⁴ for a given delivery year before it has started.

Once the delivery year has ended, an effective check of the composition of obligated parties' portfolios as well as the actual availability of capacity is performed and can lead to a penalty for differences observed in availability for capacity operators, and in coverage of the obligation, for obligated parties. This "settlement of differences" is carried out based on a capacity reference price defined by CRE.

The following three characteristics of this mechanism have a major influence on the formation of prices and guarantee trading.

i. Capacity guarantees can be traded throughout the process

The French capacity mechanism is intended to send signals ahead of the delivery year to encourage investments or the continued operation of capacity necessary for compliance with the security of supply criterion. For this reason, in a continuous regime, capacity guarantee trading is possible as from four years before the delivery year.

In addition, the estimate made by participants of their capacity obligation is refined as the delivery year approaches and their client portfolio becomes known more specifically. For this reason, capacity guarantee trading is possible during the entire period preceding the year of delivery, and even during and afterwards, for the last finer balancing operations.

The financial settlement of differences is performed three years after the delivery year, for technical reasons concerning the reconstitution of effective consumption. Capacity guarantees of a given year can therefore be traded over a period of eight years, starting four years before the delivery year and ending three years after.

ii. As with the energy market, capacity guarantees can be traded internally, bilaterally, OTC or during organised auctions

Capacity guarantee trading can be done during organised auction sessions, but also over the counter, bilaterally or through internal transfers for integrated participants.

Therefore, capacity guarantees are not all traded in one place.

iii. Settlement of differences is based on a price resulting from auctions

The calculation of the financial settlement relating to capacity re-balancing of obligated parties and that of the financial settlement of capacity portfolio managers uses a reference price defined by CRE. For delivery years 2017, 2018 and 2019, this reference, termed "*Prix de Référence Marché* – market reference price, was defined as the simple arithmetic mean of prices revealed by the auctions preceding the delivery year.

As from delivery year 2020, CRE replaced the market reference price by the *Prix de Référence des Ecartés en Capacité* - capacity difference reference price, defined as the price resulting from the last auction organised before the start of the delivery year, thus giving it a major role.

3.2. Price formation principles: theoretical missing money framework

Formation of the price of capacity guarantees results from the meeting, in the market, of operators' supply, committing to the availability of their resources, and of the demand of obligated parties, corresponding to the contribution of their customers to the risk of system failure.

By considering that the conditions of perfect competition²⁵ are met, it is possible to estimate the balancing price resulting from the theoretical meeting between all supply and demand.

²⁴ https://www.rte-france.com/sites/default/files/2016_11_29_regles_mecanisme_de_capacite_1.pdf

²⁵ In classical economics, the perfect competition is based on five criteria:

- Atomicity: a large number of small buyers and sellers compared to the market.
- Homogeneity: products are identical and substitutable; there is no competition based on product or brand.
- Fluidity of the market: freedom to enter and exit the market; no institutional constraints.
- Transparency of the market: information cannot be a source of power in the market.
- Mobility of production factors: economic agents have work and capital based on their needs.

3.2.1. Demand formation: demand should approach, in theory, a demand at any price²⁶

The need for capacity guarantees is created by the legal requirement imposed on participants to cover the consumption of their withdrawal sites. Supposing that penalties in the event of a difference are well proportioned, this obligation should naturally lead obligated parties to demand capacity guarantees "at any price" equal to their best estimate of their inflexible need.

For participants having a price-elastic demand and not certifying their load-shedding capacity under the capacity mechanism, the decision between consuming at peak times or shedding load (thus reducing their capacity obligation) results in a demand that should be equal to the level of the additional revenue necessary for load shedding.

3.2.2. Supply formation: supply should, in theory, form taking into account the revenue necessary for the continued operation of the installation, minus the revenue it already has in other markets

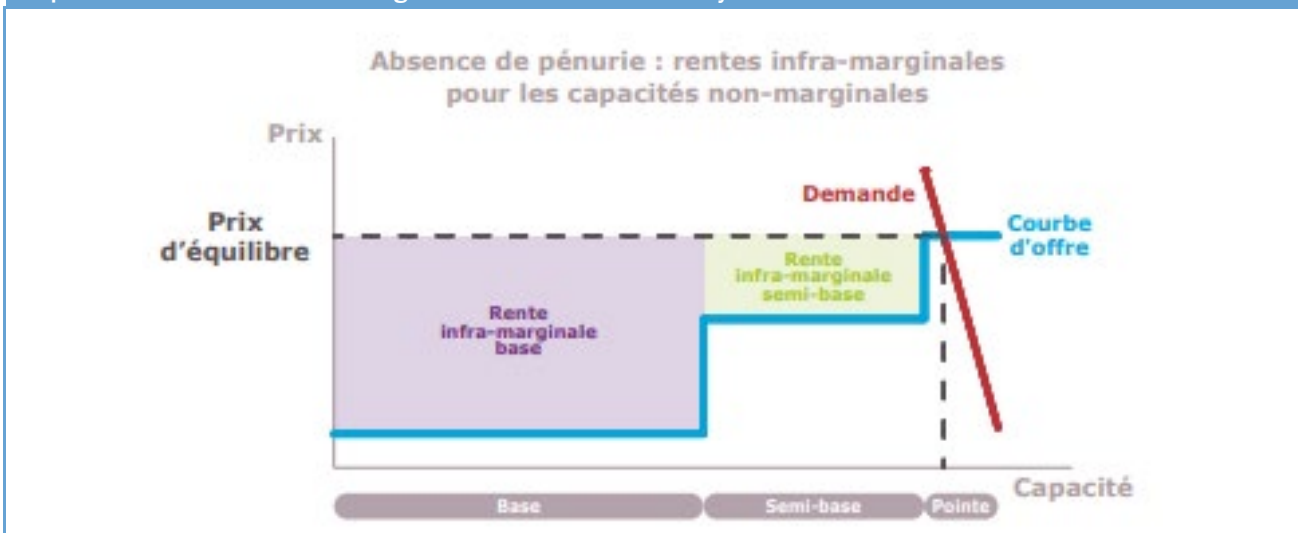
Capacity operators have several options to dispose of their asset, which can be cumulative if the services provided to the electricity system are different: sale in the energy market, participation in system services and the capacity mechanism.

In an "energy-only" market, economic theory leads to the conclusion that an operator's offer is made based on its marginal production cost, i.e. the variable operating cost of its installation. Indeed, once the market price exceeds this cost, the operator has an incentive to produce, thus recovering its variable costs. Therefore, at any time, the market price is set by the variable operating cost of the last resource used²⁷.

Operators' revenues enable them to:

- cover their variable costs when they are activated;
- receive an "infra-marginal" income when they are activated but when another resource determines the market price, enabling it to recover the rest of its operating costs.
-

Graph 37: Illustration of infra-marginal income in the electricity market



Source: RTE "Impact assessment of the capacity mechanism"

In the "energy-only" market, each operator thus estimates each year, the future revenue hoped for in the energy market and its propensity to cover all of its operating costs.

²⁶ In practice, this demand considered "at any price" is limited by the penalty level in the event of a capacity difference.

²⁷ Capacity whose variable costs are almost zero (for example hydraulic capacity), but must manage their stock constraints, give a value to the energy stored. This "value in use", determined by an arbitrage between the immediate use of a portion of the stock, with a gain valued at market price, and the conservation of this same stock for a future use, at a potentially higher price, determines whether or not the capacity takes part in the market.

The introduction of capacity mechanisms in Europe and throughout the world results from the observation that this economic framework does not enable all capacity resources necessary for compliance with the security of supply criterion to cover their costs.

The capacity mechanism should therefore enable operators for which the revenues in the energy market are not sufficient for covering fixed annual costs, to find additional revenue, if their presence is necessary for compliance with the security of supply criterion.

It results from this principle that operators have an incentive to provide supply, in the capacity market, at a level enabling them to complete the revenue obtained elsewhere in the energy market, to cover the costs they incur to remain in operation in the given year. Therefore, their offer should stand at a level enabling them to cover the fixed operating costs and annual investment costs necessary for their operation, minus the revenue brought by the energy market in situations of infra-marginal income²⁸.

The capacity market thus fulfils its objective in theory: if a capacity does not obtain sufficient revenue in the energy market but is necessary for compliance with the security of supply criterion, it can count on the additional revenue in the capacity market to remain in operation. If this same capacity is not useful for security of supply reasons, then it shall stop operations²⁹.

These price formation principles should, in particular, lead capacity whose income is ensured only by the energy market to offer their capacity guarantees at a price of almost zero³⁰.

3.2.3. Formation of prices enabling compliance with the security of supply criterion

If supply and demand comply with the principles mentioned above and provided that perfect competition conditions are met, then the balancing price shall form, each year, so as to enable the resources necessary for compliance with the security of supply criterion to cover their fixed annual costs, and therefore to be available during peak times.

In that regard, if security of supply is ensured only by the energy market, the capacity price shall, in theory, have zero value, with the capacity necessary for compliance with the criterion already being sufficiently remunerated in the energy market. In practice, the mechanism generates costs that will be integrated in operators' offers, which would lead to a slightly positive price.

3.3. Simulations show the great sensitivity of market balance

CRE built models to carry out market simulations to measure the balance sensitivity to different parameters. The determination of a "theoretical price" of capacity uses the evaluation of a theoretical balance based on the meeting of all offers and demands during a single auction described above.

Construction of the global demand curve

As mentioned, in theory, demand should be made at any price to ensure full coverage of obligated parties' obligation. It is therefore assumed, in the model, that all demand is carried out at the administered price (€20,000/MW in 2017 and €40,000/MW in 2018), a price materialising by definition, the price cap of the capacity market.

RTE's different demand scenarios evaluated for projected estimates are used to set the volume of this demand.

²⁸ And also minus, in theory, the cocooning costs that would be incurred if the participant does not obtain in the markets the revenue necessary to pursue operation of the asset.

²⁹ Under the assumption that the shutdown of an installation is without cost. In practice, closing or cocooning an installation is not feasible immediately and has financial consequences which must be integrated.

³⁰ The matter of costs associated with the capacity mechanism is set aside in this case.

³¹ These obligation forecasts correspond to consumption variations modelled in the forecast report on the supply/demand balance for electricity in France, RTE, Edition 2016 and 2017.

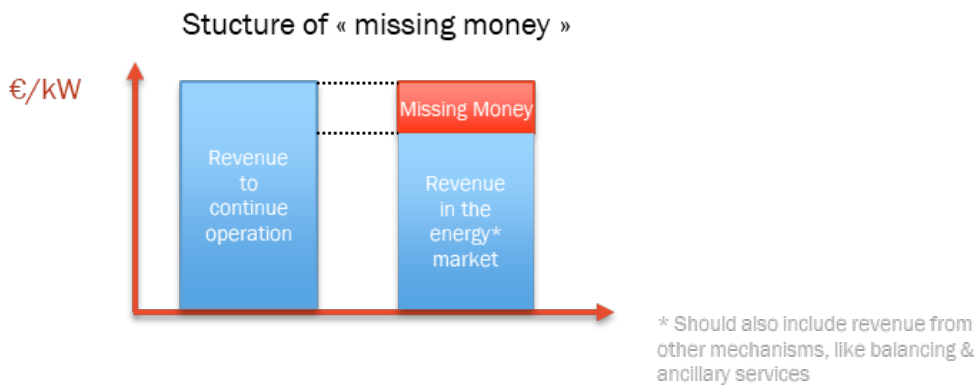
Construction of the global offer curve

The model assumes that participants seeking to capture missing money in the capacity market, i.e. for a given capacity, the revenue necessary for its continued operation (if it exists) or its construction (for a new capacity), but which is not provided by the energy market.

This has several consequences:

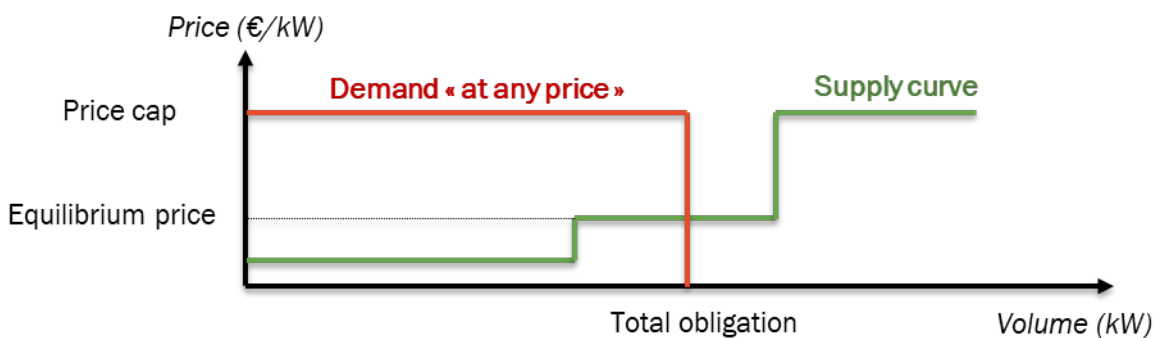
- the price of the offer depends on the associated capacity;
- this price is related to revenue in the energy market;
- as a corollary, the resources for which financing is ensured should, in theory, offer their capacity at price of zero (in particular hydraulic, solar, wind, or nuclear).

The global offering is described by a set of volume/price couples associated with each capacity, or aggregated capacity, existing or under construction in France.



Determination of balance

The balancing price is obtained at the intersection of the supply and demand curves and corresponds to the missing money of the marginal capacity.



REMINDER: precise and definitive knowledge of the state of the system is possible only after a delivery year, after exact measurement of consumption, contribution of load shedding and actual availability of resources during system tightness.

3.3.1. Hypotheses adopted

Determination of global demand

The different global demand scenarios adopted for the study of "theoretical" balance are based on obligation forecasts made by RTE. These forecasts were published for estimate reports and were available on RTE's website.

The scenarios for delivery years 2017 and 2018³¹ are as follows:

DY 2017

Consumption variant	Obligation (integrating the security coefficient)
High	90.7 GW
Reference	89.7 GW
Low	88.4 GW

DY 2018

Consumption variant	Obligation (integrating the security coefficient)
High	88.6 GW
Intermediate 3	88.3 GW
Intermediate 2	87.9 GW
Low	87.7 GW

DY 2019

Consumption variant	Obligation (integrating the security coefficient)
High	88.5 GW
Intermediate 3	88 GW
Intermediate 2	87.4 GW
Low	87.1 GW

Determination of supply

CRE elaborated a tool to evaluate the missing money of French electricity system capacity, which requires having, for each capacity:

- fixed costs;
- marginal costs, which depend on the price of commodities (CO₂, gas, fuel oil and coal), output and emission factor;
- a method for evaluating revenue obtained in the energy markets.

The fixed costs and hypotheses of production costs used stem from public data, in particular those used within the framework of RTE's 2017 forecast report³². Marginal costs are built on the basis of public commodity quotations. Several supply scenarios are studied based on different commodity cost hypotheses.

The method for evaluating revenue in the energy markets is based on a mark-to-market approach. It translates progressive securing of revenue by smoothing sale volumes over a period of 24 months. The mark-to-market value of a capacity corresponds, for a given day before the delivery year, to an anticipation of future revenue in the electricity market calculated based on available quotations at this date in the futures market.

³¹ These obligation forecasts correspond to consumption variations modelled in the forecast report on the supply/demand balance for electricity in France, RTE, Edition 2016 and 2017.

³² Other data sources are used: the "Projected Costs of Generating Electricity 2015 Edition" and "World Energy Outlook 2016" of the International Energy Agency.

This methodology for determining energy revenue does not necessarily reflect the cost reference that would be used by a producer to make a decision concerning the continued operation of its capacity at a given time t . In particular, in the absence of technical constraints related to the cocooning of capacity and provided that the market is sufficiently liquid, the producer, could, in theory, base its decision to remain in operation only according to quotations on the day of the capacity auction. The decision between continuing operation or cocooning the production unit, by buying volumes already sold in the market, is independent of their hedging strategy³³. However, the consequence of such a methodology would be volatile missing money that would change significantly depending on quotations.

Available capacity offer comes from the public certified capacity registry³⁴:

DY 2017

Nuclear	Lake / PSP	RE + Other (excluding EDF OA)	DSR	Gas	Coal	Oil	Total
55.4 GW	9 GW	14 GW	2.4 GW	7.1 GW	2.2 GW	3.7 GW	93.8 GW

DY 2018

Nuclear	Lake / PSPS	RE + Other (excluding EDF OA)	DSR	Gas	Coal	Oil	Total
56.6 GW	9.2 GW	14.4 GW	2 GW	7 GW	2.5 GW	2 GW	93.8 GW

DY 2019

Nuclear	Lake / PSPS	RE + Other (excluding EDF OA)	DSR	Gas	Coal	Oil	Total
55.2 GW	9 GW	15 GW	1.7 GW	7 GW	2.4 GW	1.6 GW	92 GW

3.3.2. Simulation result

Theoretical simulations of all supply and demand showed that, for a given delivery year, balancing prices are very sensitive to the different hypotheses, in particular of fixed production capacity costs and of the level of demand.

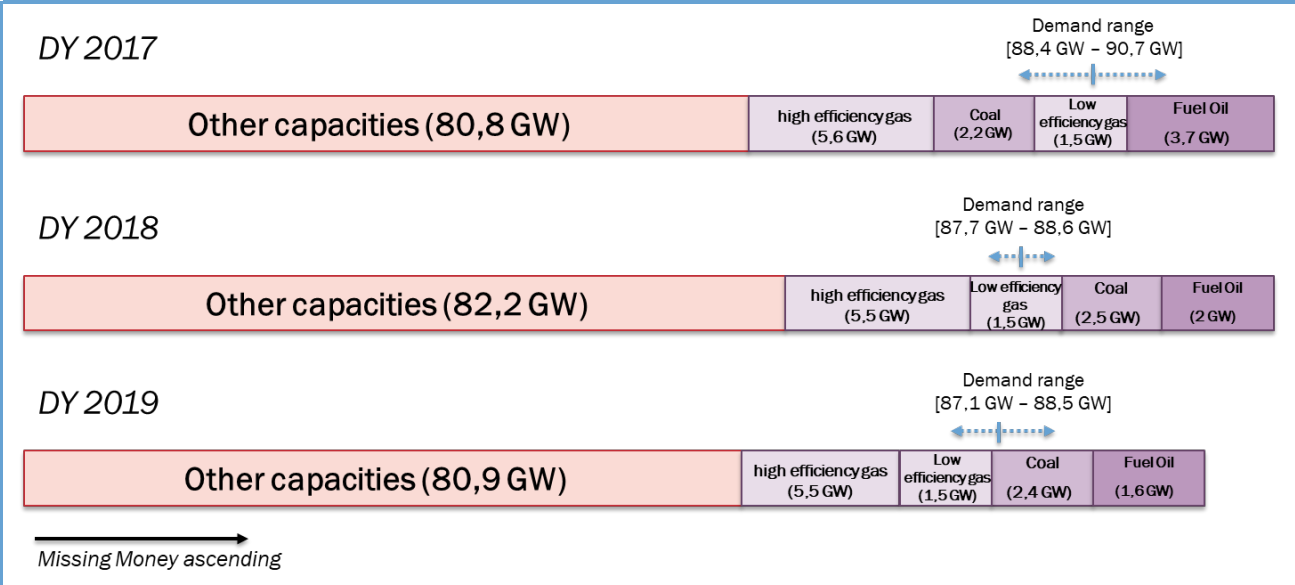
Building a total supply curve and assuming that fossil-fired capacity resources are those having the greatest missing money of the generation fleet³⁵, it appears that the existing uncertainty surrounding global demand does not enable a clear result about marginal capacity to be achieved.

³³ To illustrate, let us assume that the producer covered all of its production for an amount R_0 and that it incurs the fixed costs CF and the variable costs of production Cv_0 (mainly the cost of commodities). If, at time t , the market allows it to sell its production at an amount M by bearing the variable production costs Cv_t , the arbitrage is as follows, with MM being the income expected in the capacity auction: $R_0 + MM - Cv_0 - CF > R_0 - M + Cv_t - Cv_0$. Indeed, the producer chooses between remaining in operation and receiving a capacity income, or cocooning the capacity and buying in the market the production sold and reselling the commodities. The result of the inequality is simply the following: $MM > CF - (M - Cv_t)$.

³⁴ As at 01/07/2017 for DY 2017 and as at 23/04/2018 for DY 2018 and DY 2019.

³⁵ Hypothesis that can be challenged, due in particular to load shedding.

Graph 38: Illustration of supply/demand balance in the capacity market given the status of the generation fleet



Source: CRE

With regard to missing money, for the years 2017 to 2019, a difference of more than €20,000/MW can be observed between the different cost scenarios for fossil-fired capacity.

Here are for example, based on the minimum and maximum fixed cost hypotheses adopted, certain results for fossil-fired capacity:

DY 2017

	CCGT 58% output	Coal 35% output	CCGT 55% output	Fuel CT 40% output
Missing money	€[0 -16]/kW	€[0 - 3]/kW	€[0 - 24]/kW	~€26/kW

DY 2018

	CCGT 58% output	CCGT 55% output	Coal 35% output	Fuel CT 40% output
Missing money	€[0 -8]/kW	€[0 - 16]/kW	€[0-21]/kW	~€26/kW

DY 2019

	CCGT 58% output	CCGT 55% output	Coal 35% output	Fuel CT 40% output
Missing money	€0/kW)	€0/kW	€[0-20]/kW	~€26/kW)

The missing money levels calculated for the different capacity resources can be wide and generate major balancing price elasticity of capacity guarantee demand.

The global balance of the system is provided, for the years in question, at the level of the missing money of fossil-fired plants. This missing money has varied since the start of the mechanism, due mainly to the price of commodities (coal, gas and CO₂) and variations in futures electricity prices. Variations in the balancing prices of the years 2017, 2018 and 2019 can be explained by the fact that "marginal" capacity in the capacity market, which was a gas plant the first years, became a coal plant for 2019.

3.4. Timeframe of the mechanism, multiplicity of auctions and supply constraints lead participants to deviate from the theoretical framework

In practice, the capacity market deviates from the theoretical framework thus leading spot auctions of the French mechanism to set a price different from the theoretical price. In particular, participants' operational constraints limit the materialisation of all supply and demand at each auction.

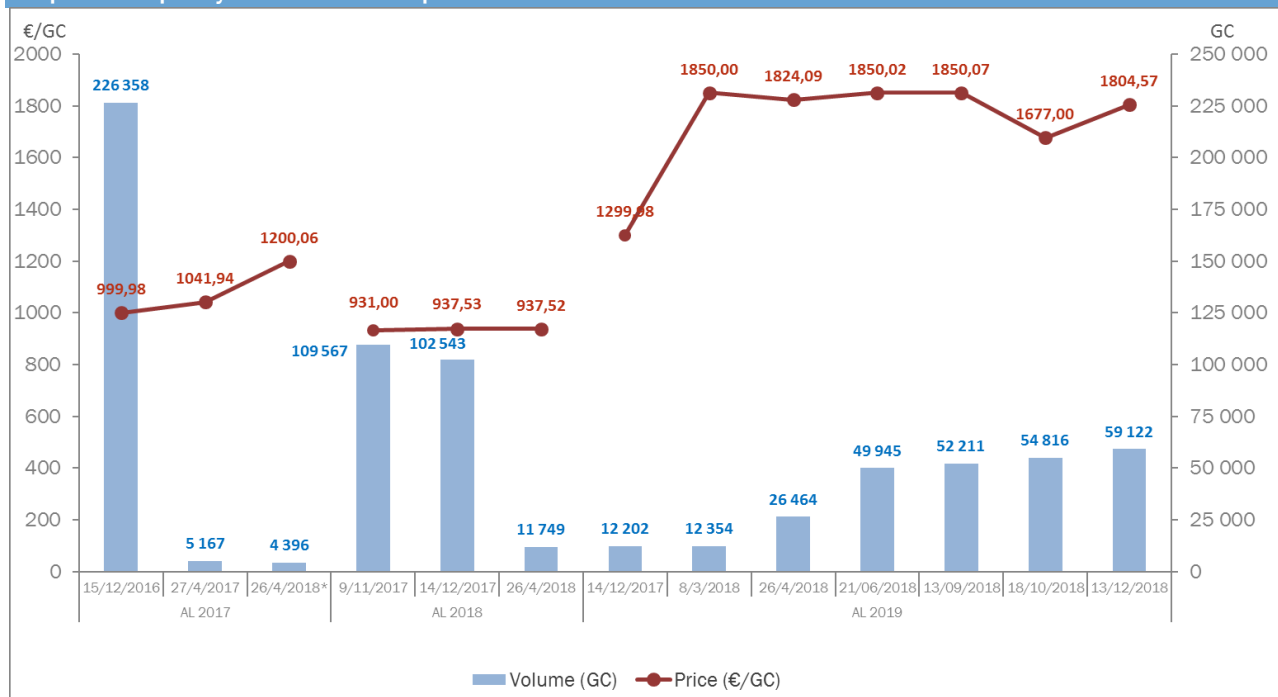
With regard to demand, cash flow problems can lead suppliers to defer their expenses on the system to periods when consumers are billed. With regard to supply, the volumes offered at auctions are limited, for the main operators, by the rules of the capacity mechanism³⁶.

Lastly, in addition to this issue of the meeting of supply and demand, there is also the fact that the calculation of the missing money of each capacity, and thus of the "theoretical price", changes with time as projected operating costs or projected energy market prices vary.

In practice, the first capacity guarantee auction took place in December 2016 only for delivery year (DY) 2017. Three other auctions took place in the EPEX SPOT market in 2017 and six in 2018 (Graph 39).

While the first auction resulted in a capacity guarantee (CG) price of almost €10,000/MW and those in 2017 (for delivery in 2018) of almost €9,300/MW, the auctions that took place at the end of 2017 and then in 2018 (for delivery in 2019) resulted in a significant increase in capacity guarantee prices for an average price of roughly €17,365/MW (Graph 39).

Graph 39: Capacity market: auction prices and volumes



The session of 26/04/2018 for DY 2017 product is the first auction after the delivery year with PP1 and PP2 every day (Peak period: Days of the delivery period, used for the calculation of the obligation of obligated parties for a given delivery year).

Source: EPEX SPOT – Analysis: CRE

3.5. CRE's analysis: participants' behaviour in the capacity guarantee market raises questions about the mechanism's market design

In the first quarter 2018, CRE undertook discussions with the main participants present in the capacity auctions. Requests for quantitative and qualitative information about participants' strategies were addressed to the participants concerned. The answers received provide details about individual offer strategies and the prices proposed.

Against the continued high price for delivery in 2019 at around €1,800/MW, and its recent increase to €2,000/MW for delivery in 2020, CRE is continuing detailed analyses of the prices observed at auction, and in particular, of the

³⁶ Because of the concerns expressed by the European Commission concerning market liquidity, capacity operators of over 3 GW of certified capacity must offer a minimum level of capacity guarantees at each auction.



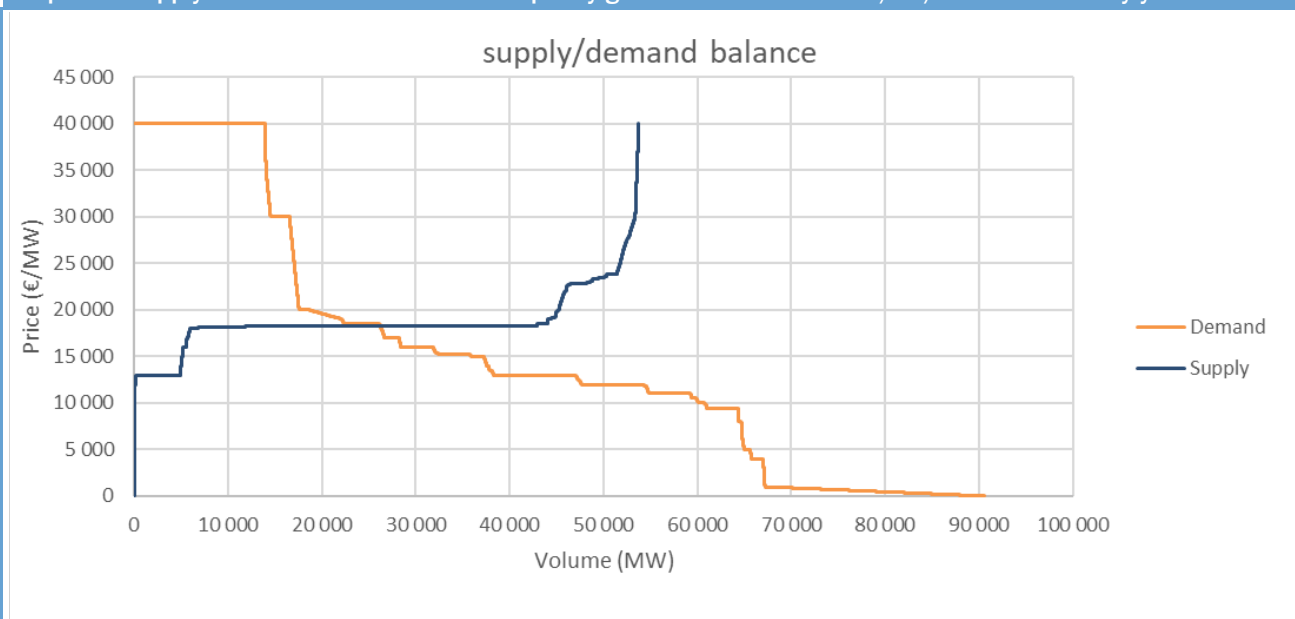
result of the confrontation between the different supply and demand curves and the demand of the different market participants.

As mentioned above, the theoretical framework deviates heavily from the current functioning of the mechanism, due in particular to the possibility for demand to materialise freely in the different auctions in the OTC market. In addition to this freedom, there is also the timeframe of the mechanism, which authorises participants to be covered in capacity guarantees over a period of eight years³⁷.

This uncertainty, regarding the effective meeting of supply and demand at each auction, makes certain participants concerned that the capacity auctions set a price significantly different from the price that would have been determined within the framework of a single auction. This led them to propose their capacity guarantee at auctions at floor prices (or reserve prices) at their estimate of the "theoretical price".

By way of illustration, (Graph 40) below shows the supply/demand balance for the auction of 26 April 2018 for delivery year 2019. No capacity is offered at a zero price, and a very long price tier is observed which, in practice, sets the balancing price. The same is seen for certain other auctions conducted in 2018 (for DY 2019) and in 2019 (for DY 2020).

Graph 40: Supply and demand curve at the capacity guarantee auction of 26/04/2018 for delivery year 2019



Source: EPEX SPOT – Analysis: CRE

Since these price tiers represent a significant volume compared to the liquidity of the capacity market, their impact on the auction price, and more globally on the capacity market³⁸ is undeniable.

The simulations presented previously shows that the prices resulting from the different auctions for delivery years 2017 and 2018 seem compatible with the fundamentals of the capacity market.

CRE notes that the architecture of the mechanism does not enable the effective meeting of supply and demand and leads certain participants to not offer their capacity guarantees at the missing money level of their capacity.

Therefore, CRE considers that a reflection must be launched to develop the design of the capacity mechanism, geared towards, for example a mechanism with greater centralisation such as with British, Irish and Polish mechanisms. These reflections can take place within the current context of the consideration of foreign capacity contributions and harmonisation of rules at supranational level on the occasion of the entry into force of the European regulation on the functioning of the internal market for electricity, the "Clean energy for all Europeans package".

³⁷ In a continuous regime, based on the current rules, participants can trade capacity guarantees four years before the start of the delivery year and up to three years after.

³⁸ Capacity auctions have a strong impact on the market, both because of the volumes traded (in 2017, the auctions organised moved 24% of capacity guarantees and 23% in 2018) and the calculation of the capacity difference reference price.

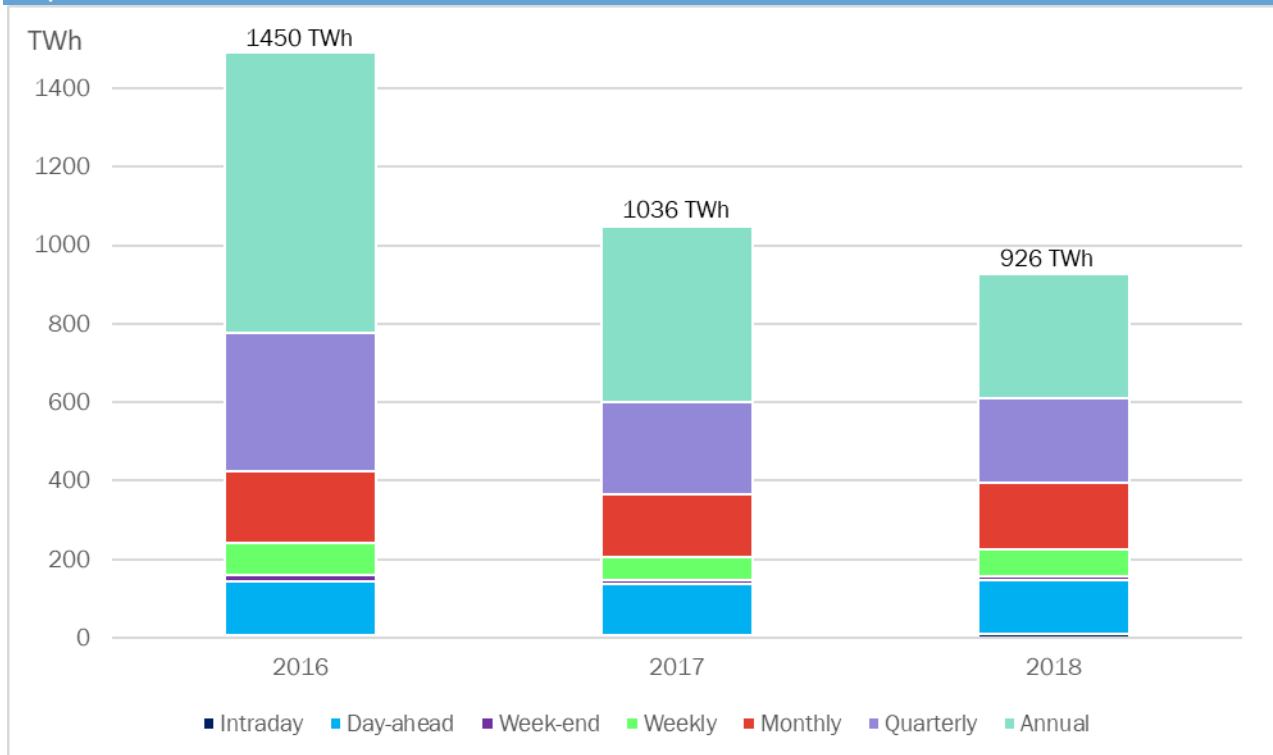
4. DEVELOPMENT IN THE VOLUMES TRADED IN THE WHOLESALE MARKET IN 2018 AGAINST A MAJOR INCREASE IN PRICES

The volumes traded in the wholesale markets dropped compared to 2017 (Graph 41). Annual products are always those that are traded the most, even though their share dropped slightly compared to 2017, i.e. 34% instead of 42% of the total volume traded over the year. This is related to the increase in ARENH demand for the last two years, which substitutes purchases in the wholesale markets.

The volumes of intraday products increased heavily, over 40% compared to 2017, but remained marginal (roughly 9 TWh) compared to other products. This increase, as seen above, was due in part to the implementation of XBID, which contributed to increasing liquidity in the French intraday market. Volumes traded in day-ahead auctions remained relatively stable over the last three years.

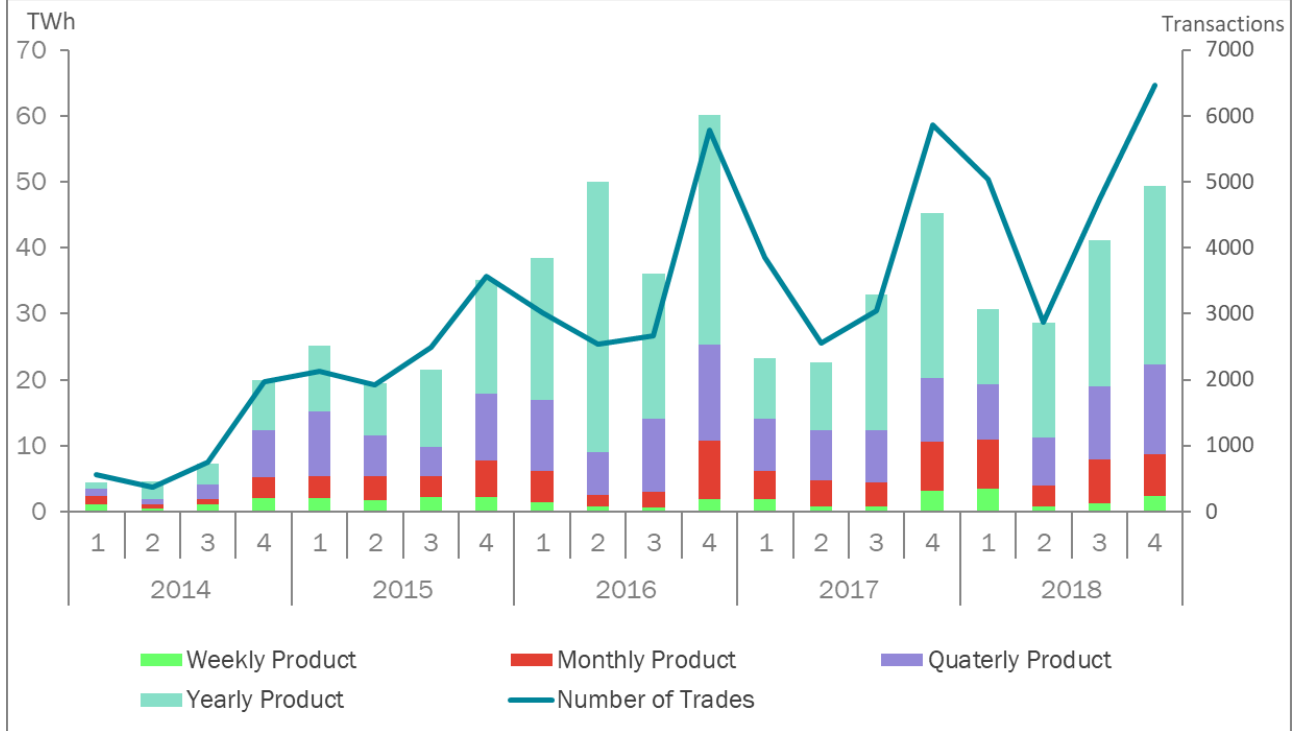
Volumes traded in the futures exchange increased slightly compared to 2017 with seasonality remaining quite marked (Graph 42), while volumes traded in the intermediated futures market dropped compared to 2017 (Graph 43). It appears that the annual product volumes traded in the exchanges increased by 19.8% while dropping 37.6% in the intermediated markets. The intermediated markets however remain the preferred place for annual product trading, since they represent 75% of volumes. This trend is also observed for quarterly products where the increase in volumes traded in the exchanges was 22.4% and the drop was 13.8% in the intermediated markets, which represent 81% of volumes. In addition, an increase in monthly and weekly product trading was observed in the exchanges (18.9% and 21.6% respectively) and in intermediated markets (4.6% and 13.3% respectively). Therefore, it seems that compared to 2017, in 2018 participants were more interested in products offering greater flexibility.

Graph 41: Volumes traded in the wholesale markets



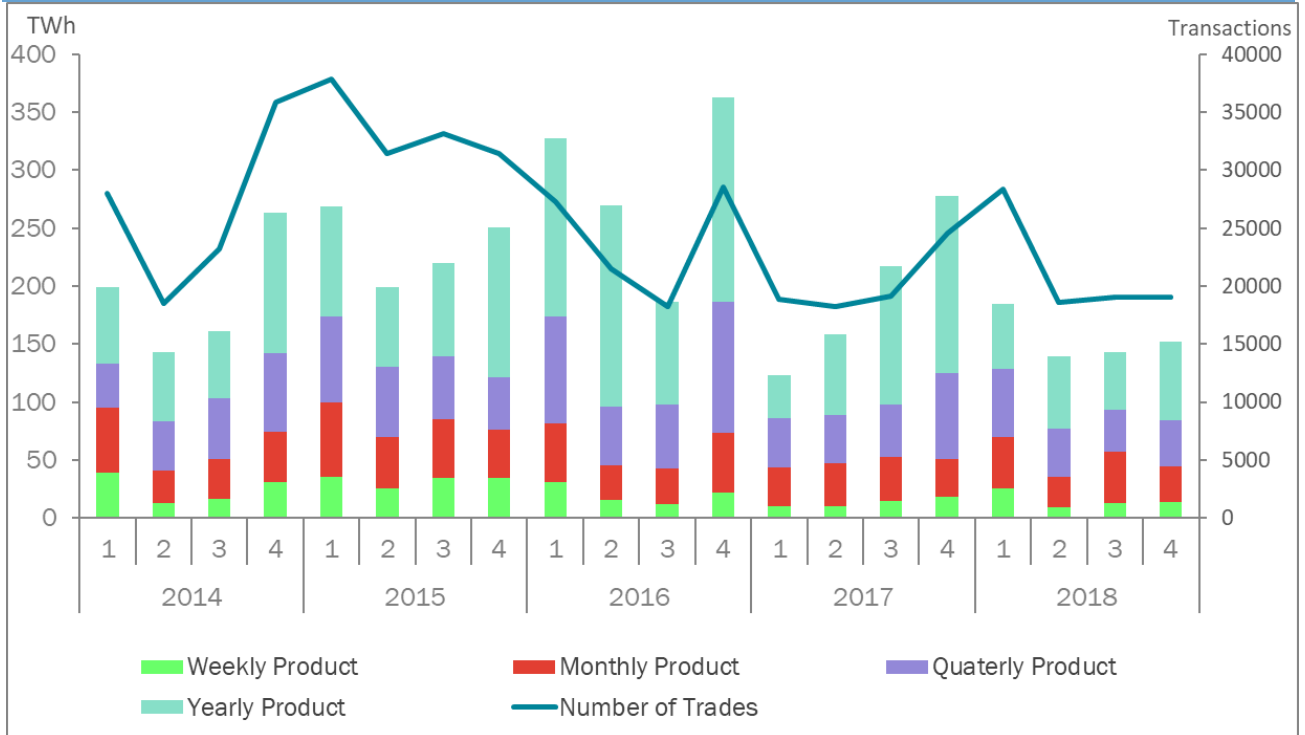
Sources: EPEX SPOT, EEX, Brokers

Graph 42: Volumes traded in the futures exchange



Source: EEX

Graph 43: Volumes traded in the futures intermediated market



Sources: Brokers

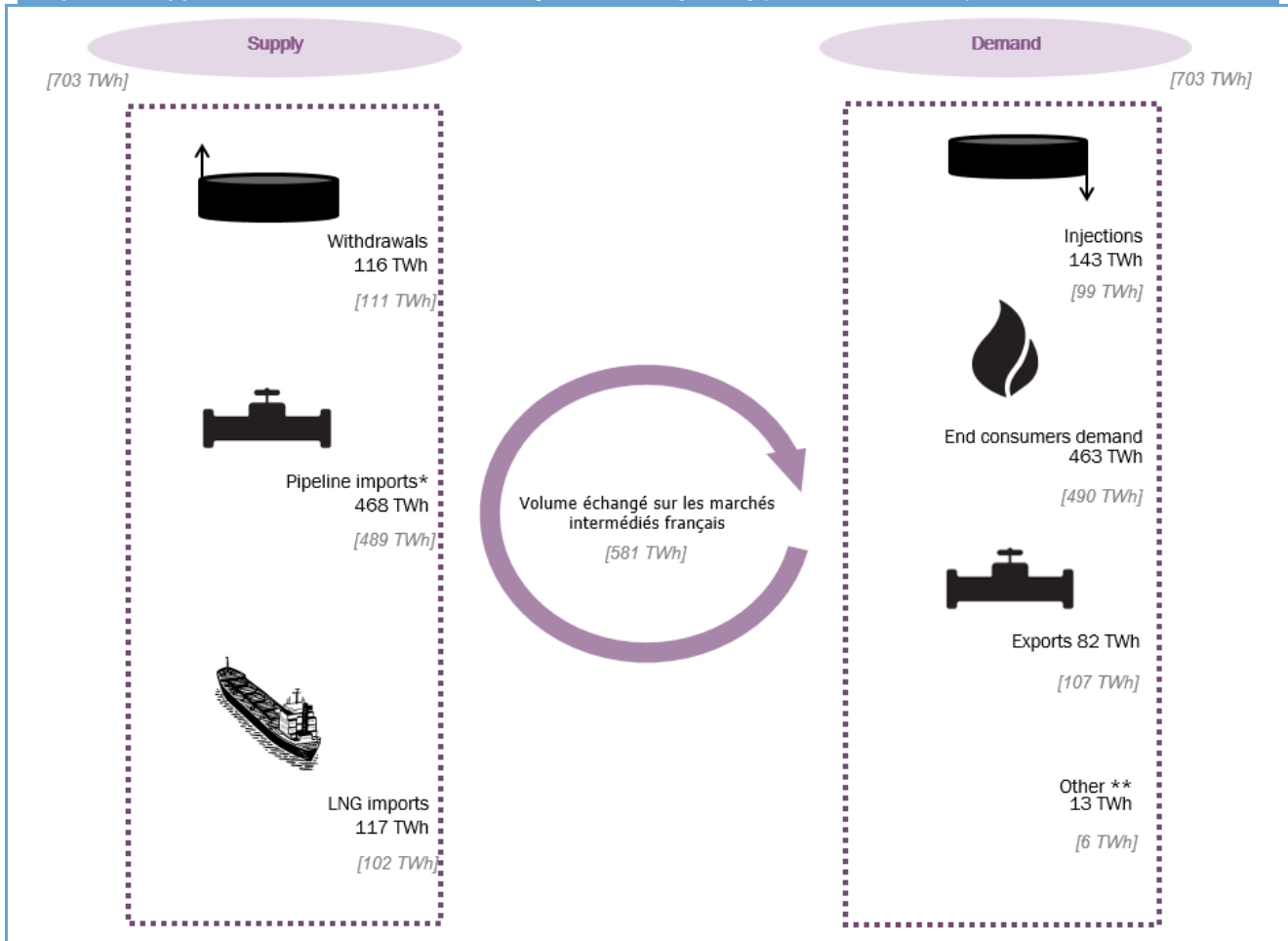
**SECTION 4
WHOLESALE NATURAL GAS MARKETS**

1. DEVELOPMENT IN THE WHOLESALE GAS MARKET CLIMATE IN 2018

1.1 Balance in the French system

In 2018, the gas market remained stable with supply volumes and outlets close to those of 2017 (Graph 44). The fundamentals of gas market balancing were however different compared to the previous year.

Graph 44: Supplies and outlets in the French system 2018 [2017] (commercial flows)



* including backhaul allocations

** the Other item corresponds to the volume consumed by the TSOs and DSOs to ensure the functioning of the system (self-consumption, metering error, losses, etc.)

Source: GRTgaz, Teréga – Analysis: CRE

Final consumption, because of the generally cool temperatures and the decrease in consumption of gas-fired power plants dropped 6% compared to 2017, reaching 463 TWh. However, a cold spell hit at the end of winter in Europe and France causing major supply tightness in the markets with a price peak at over €50/MWh in France.

The year 2018 was also characterised by high use of storage, in particular during injection season, with injected volumes reaching a total of 143 TWh, i.e. a 45% increase compared to the previous year (Graph 45). Injection demand was particularly high because of storage levels that had reached a critical level at the end of winter and the implementation of the storage reform (see 1.3). The storage level therefore increased from less than 4 TWh at the end of winter to 125 TWh in autumn.

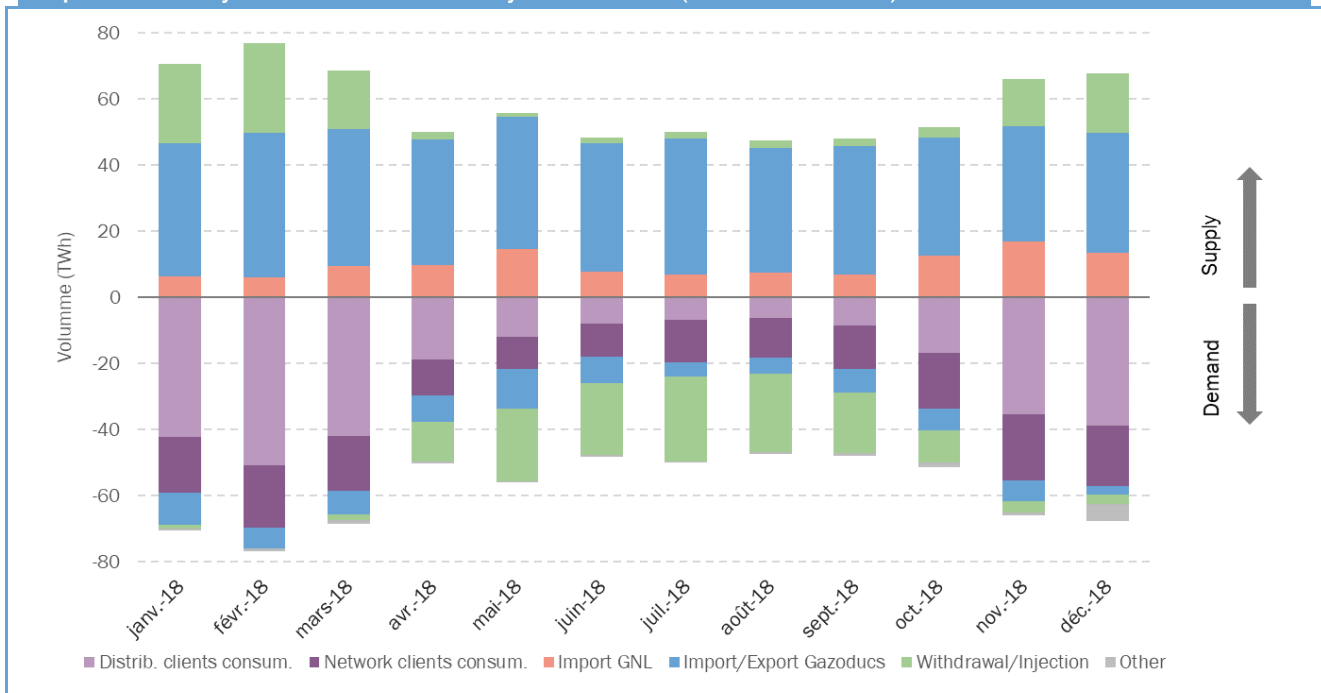
LNG continued to boom in 2018 with an imported volume of 117 TWh compared to 102 TWh in 2017 and 80 TWh in 2016. This increase however reflects a seasonal disparity with low arrivals in summer because of high Asian demand, but a pickup in activity in autumn (Graph 45).

The increase in LNG imports was offset by a drop in land imports via pipeline for which the commercial flows went from 489 TWh in 2017 to 468 TWh in 2018. Commercial flows related to exports dropped by 25 TWh, i.e. a 23% decrease, due in particular to the drop in backhaul allocations towards Germany.

Lastly, liquidity in the wholesale markets through exchanges and brokers continued to increase in 2018 with roughly 680 TWh of volumes traded, i.e. an almost 20% increase compared to 2017.

The fourth quarter of 2018 was marked on 1 November 2018 by the inauguration of the single gas market zone, the Trading Region France (TRF), a result of the merger of the PEG Nord and the TRS (see Section 4, chapter 1.6).

Graph 45: Monthly balance of the French system in 2018 (commercial flows)



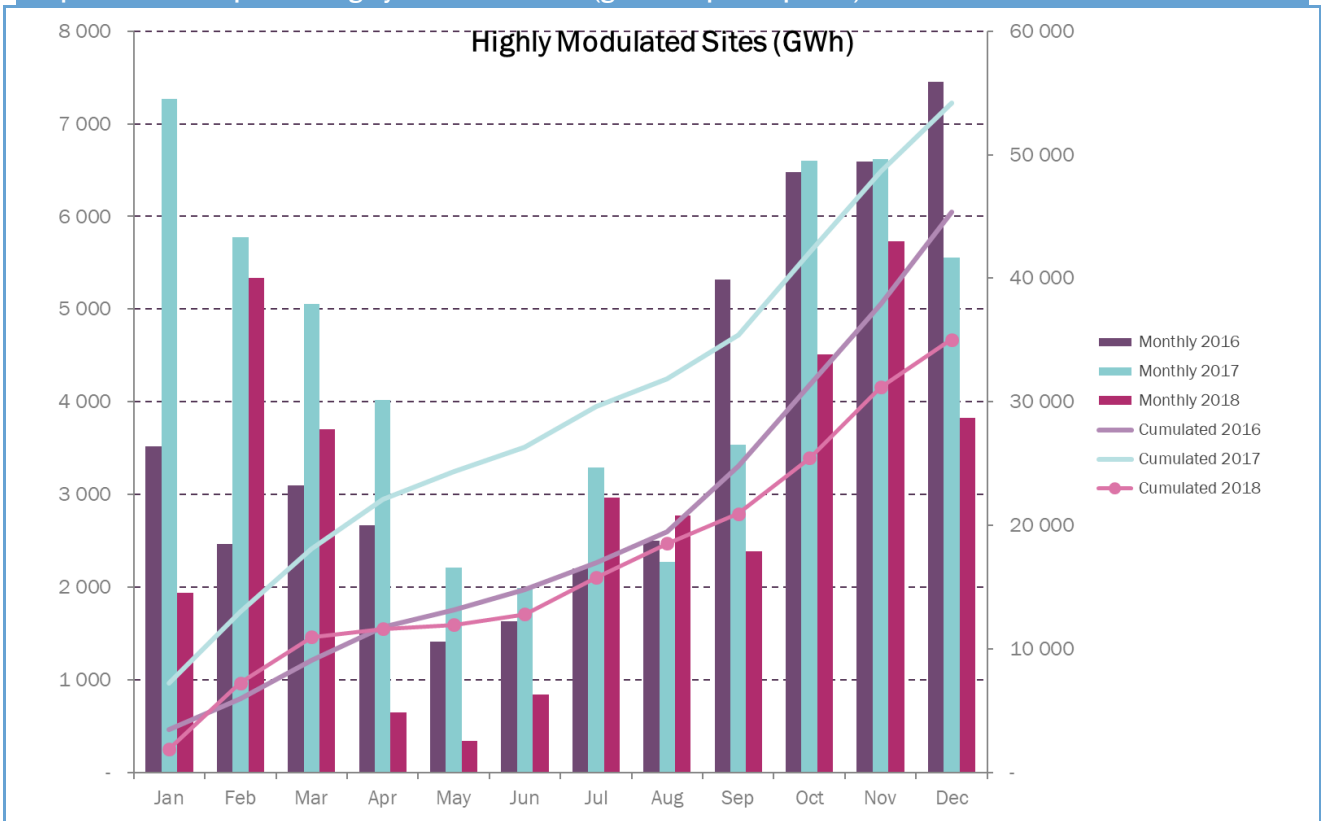
Source: GRTgaz, Teréga – Analysis: CRE

1.2 Consumption down 6% in connection with mild temperatures and little use of gas plants

The drop in total gas consumption seen in 2018 is due in part to the drop in consumption of gas-fired power plants. Consumption of these sites stood at 35 TWh in 2018, down 19 TWh, i.e. 35% (Graph 46). Their activity was particularly low from April to June because of high hydraulic and wind production and an increase in nuclear production. Nuclear unavailability in summer led to an increase in their consumption.

In parallel, consumption of system clients excluding power plants followed the same trend as in previous years. It stood at 133 TWh in 2018, i.e. a 1.5% drop compared to 2017, and 0.7% compared to 2016.

Graph 46: Consumption of highly modulated sites (gas-fired power plants)



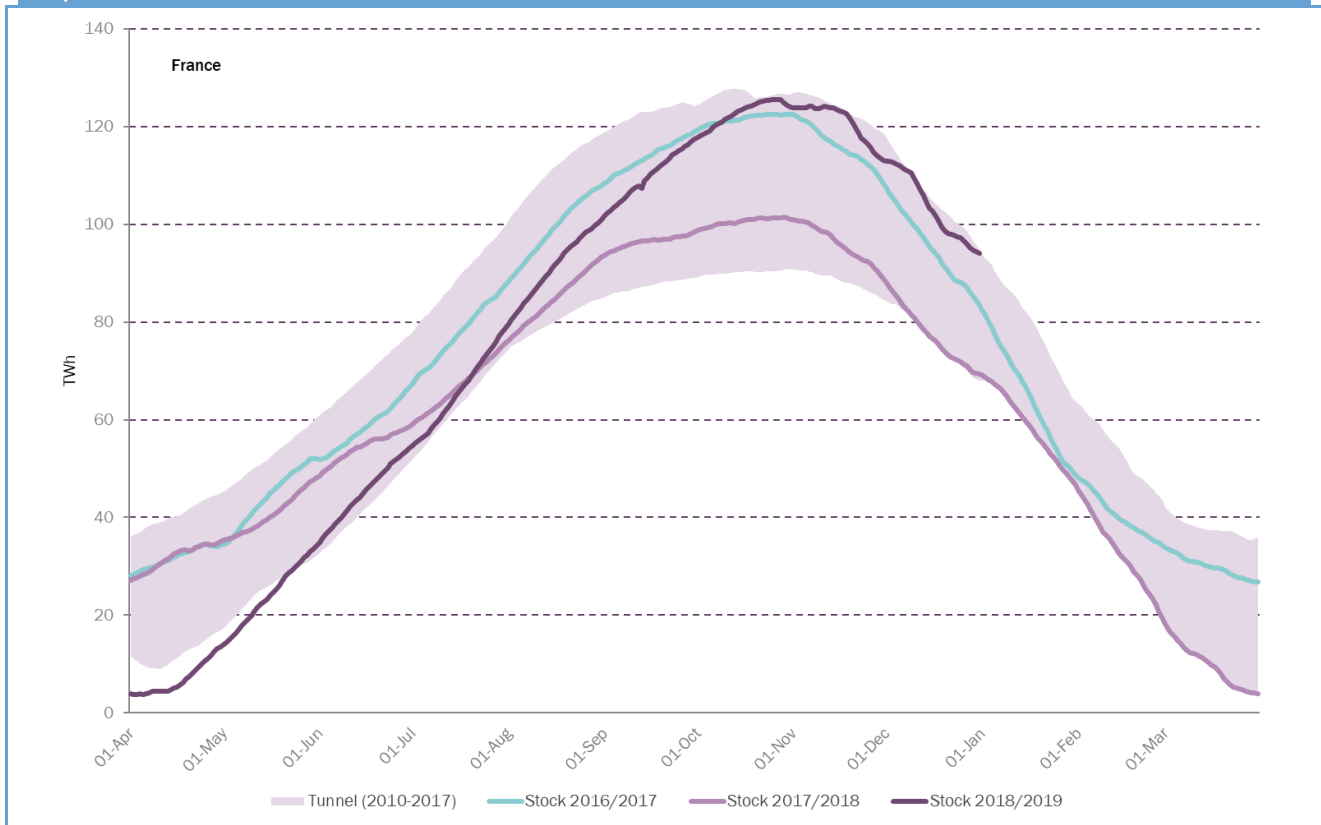
Source: GRTgaz, Teréga – Analysis: CRE

1.3 Record level of injections into storage

While the storage level in France reached the low end of the historic range since 2010 as at 1 January, the withdrawal rate remained high in winter bringing it to a critical level with less than 4 TWh early April. Injections were then very high as from the end of winter and 2018 saw a record annual injection, with stock levels at up to 125 TWh, i.e. the high end of the historical range (Graph 47). Average net injection stood at almost 600 GWh/d compared to 354 GWh/d in 2017 or 445 GWh/d in 2016. Between June and August 2018, injections represented 50% of gas outlets.

This record storage level was in particular stimulated by the implementation of the gas storage reform: CRE set the modalities for the selling of storage capacity through auctions, adopting in particular a reserve price of zero to maximise capacity subscriptions and ensure security of gas supply in winter³⁹. Almost all available capacity was subscribed during the auctions of March 2018.

Graph 47: Stock levels in France



Source: Storengy, Teréga – Analysis: CRE

³⁹ <https://www.cre.fr/Documents/Presse/Communiqués-de-presse/la-cre-met-en-oeuvre-la-reforme-du-stockage-du-gaz-naturel>

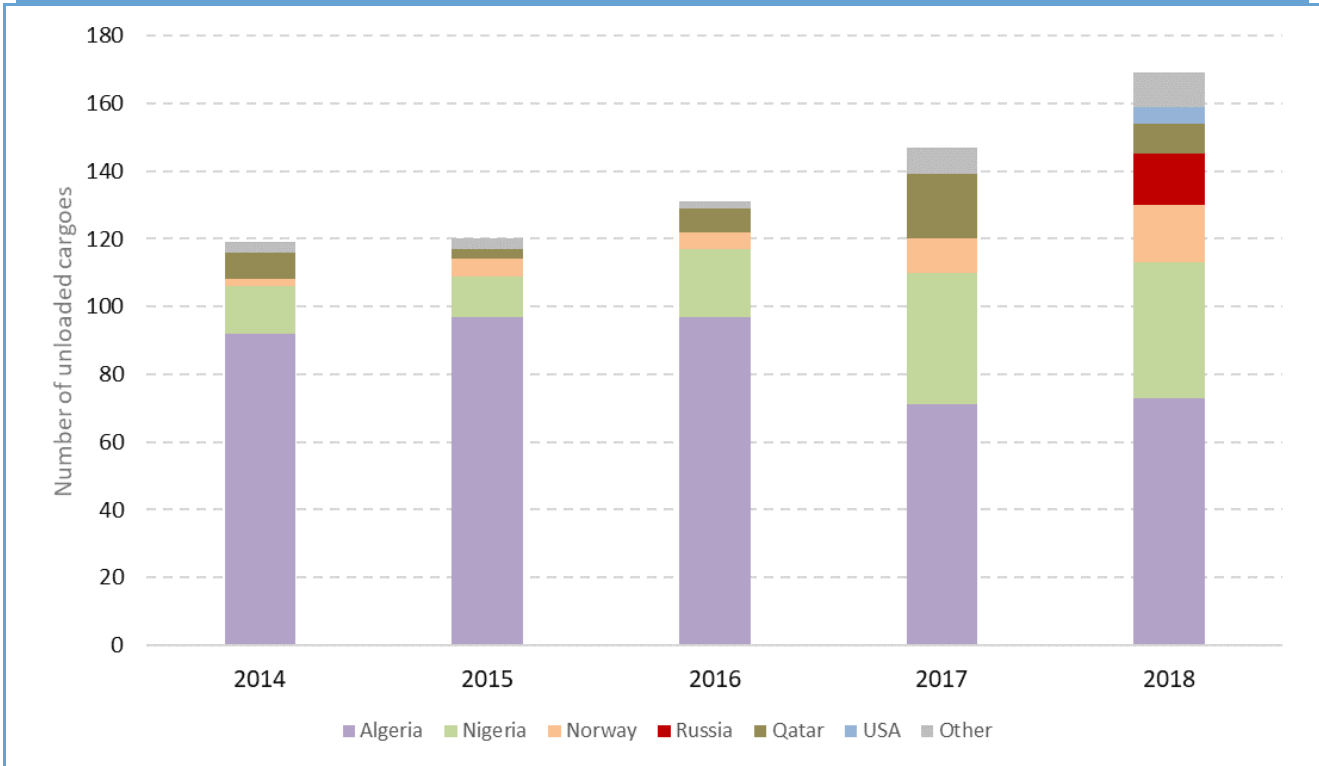


1.4 A 15 TWh increase in LNG supply

For the fourth consecutive year, LNG imports were up in France reaching 117 TWh in 2018, i.e. its highest since 2011.

Growth in gas demand in Asia remained robust, particularly in China, in line with policies to replace the use of coal by gas. LNG cargo went more often to Asia to the detriment of Europe because of more interesting prices there. This effect intensified in summer 2018 with the increase in oil prices to which numerous Asian contracts are still indexed, and an increase in demand in connection with heat waves; LNG arrivals in France thus reached a relatively low level for the season.

Graph 48: Number of cargo received in 2018 by country of origin

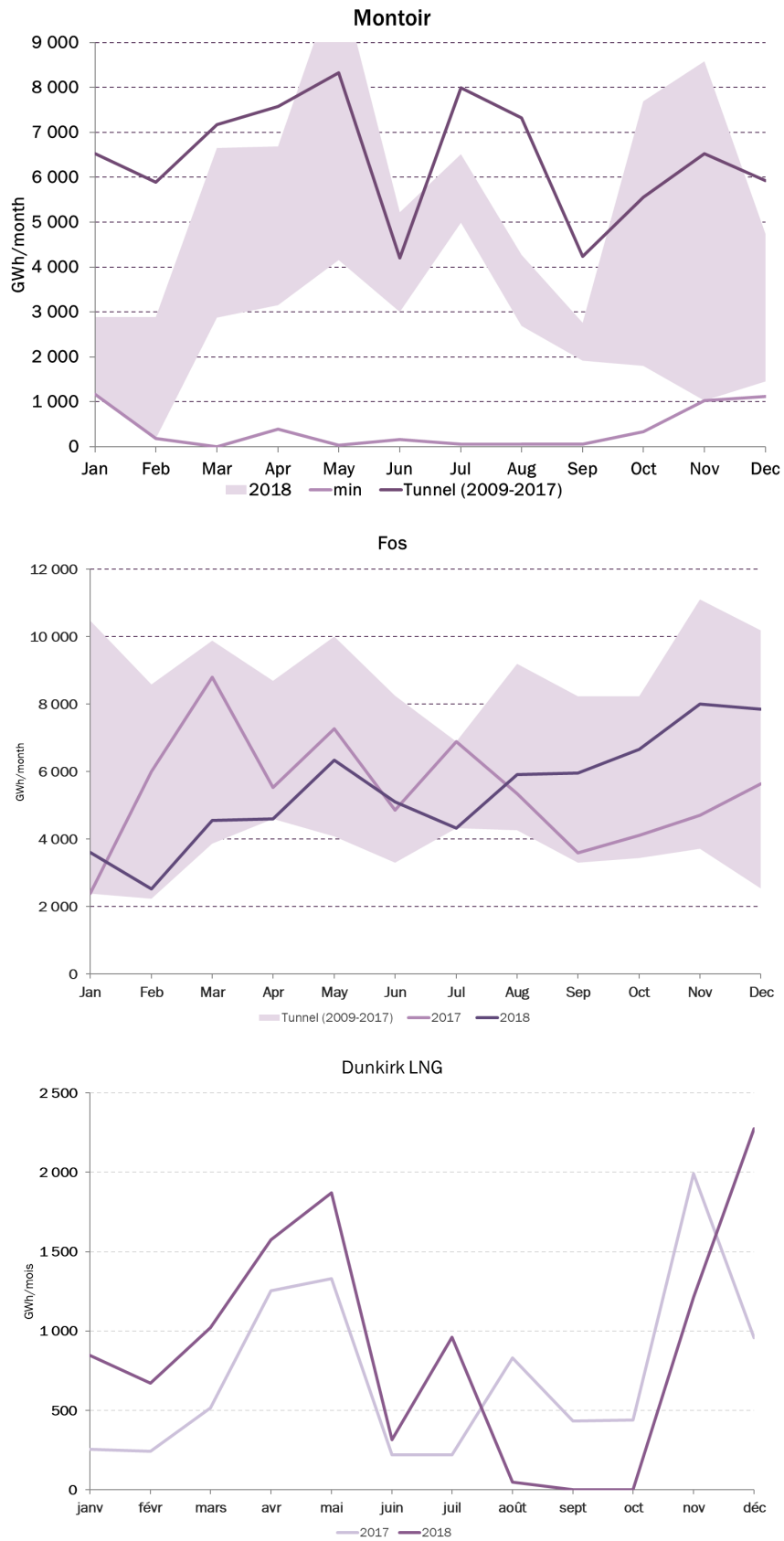


Source: Argus – Analysis: CRE

The last quarter was then marked by a major pickup in activity in French LNG terminals with twice as much volumes regasified compared to the previous quarter thanks this time to a drop in Asian demand and the increase in global LNG supply.

LNG volumes available in the world in fact increased by almost 10% in 2018 (as in 2017) with the commissioning of several major liquefaction trains, for example Ichthys LNG in Australia, Yamal in Russia and certain trains in the USA. As a result, in 2018 France received its first deliveries coming from Russia with 15 unloading operations according to Argus data, and its first five deliveries coming from the USA (Graph 48).

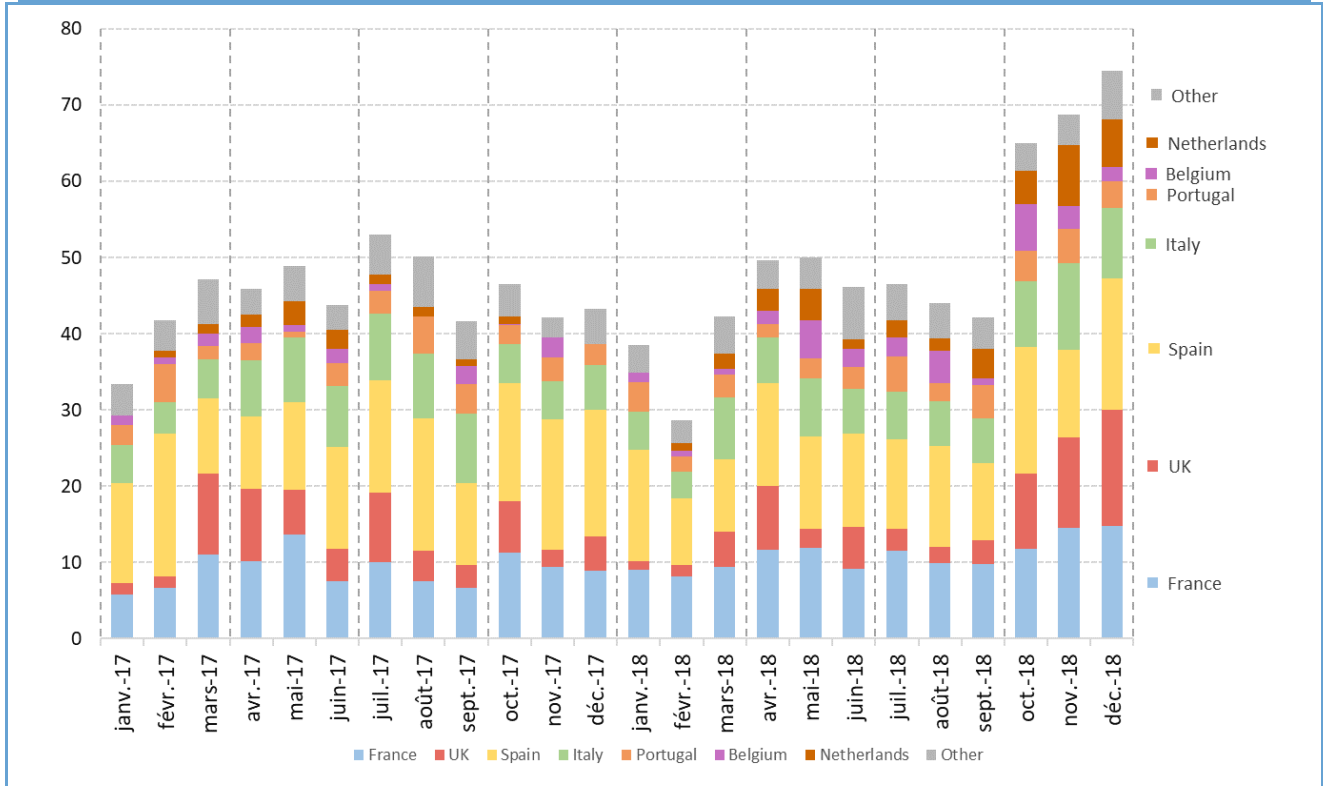
Graph 49: LNG terminal send-out (commercial flows)



Source: GRTgaz – Analysis: CRE

The Montoir terminal therefore saw record send-out in the networks in the months of October and November with a total of 18 unloading operations (16.7 TWh) in the fourth quarter (Graph 49). In 2018, France was the second leading LNG importer in Europe behind Spain and ahead of the United Kingdom and Italy (Graph 50).

Graph 50: LNG imports by country in the European Union

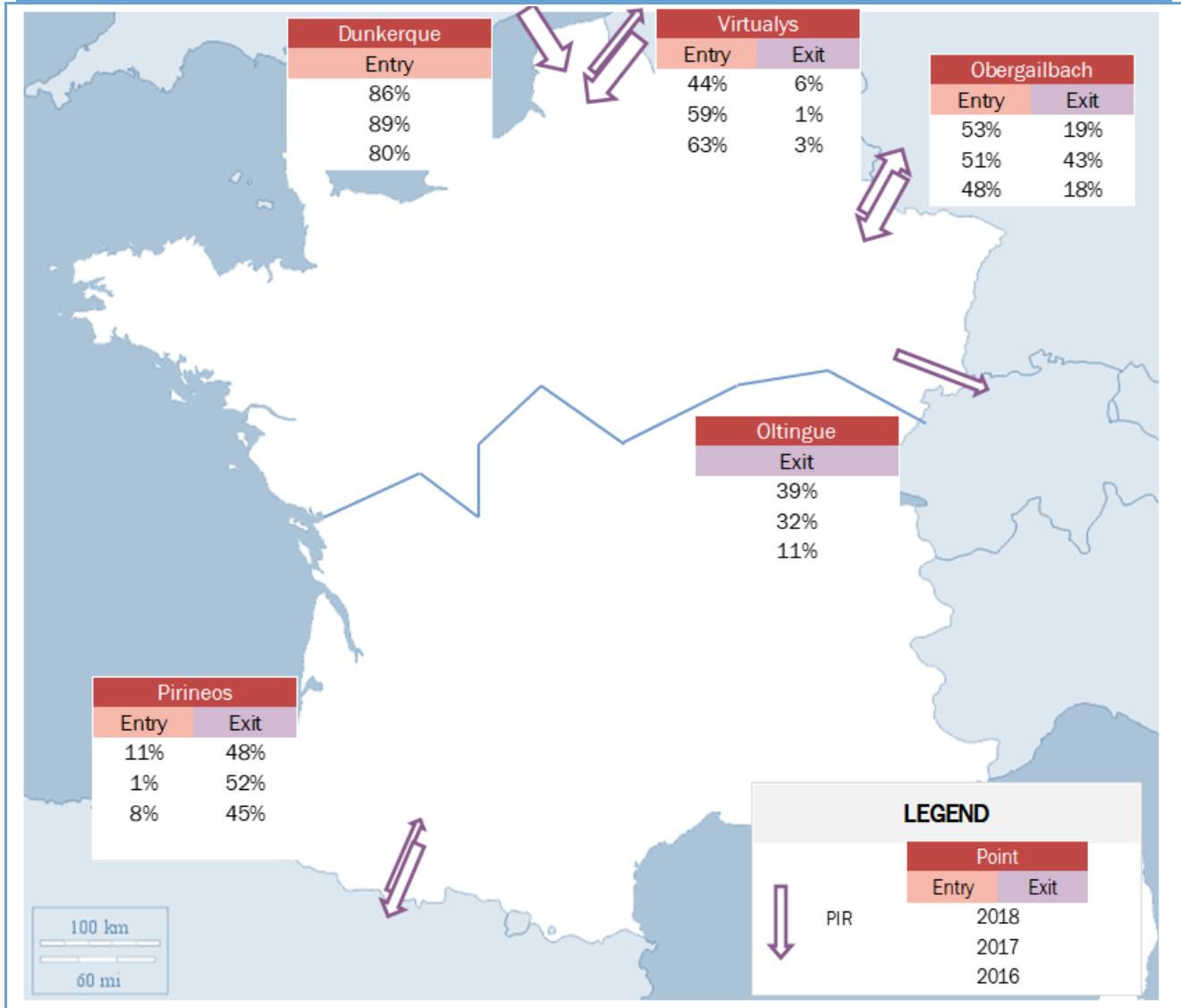


Source: Reuters, GRTgaz – Analysis: CRE

1.5 Drop in pipeline imports

The drop in imports seen in 2018 (-21 TWh) through pipelines was due mostly to lower volumes allocated via Virtualys, the virtual interconnection point between Belgium and France. The increase in LNG imports and the drop in consumption generally enabled less supply to come from northern Europe. The situation of the French market was occasionally more relaxed than the Dutch market (TTF) with a French spot price lower than the Dutch reference. Flows to Belgium increased significantly with a 6% use of exiting capacity, i.e. 3.2 TWh, almost ten times more than in 2017 (Graph 52).

Graph 51: Rate of use of French interconnections (commercial flows)



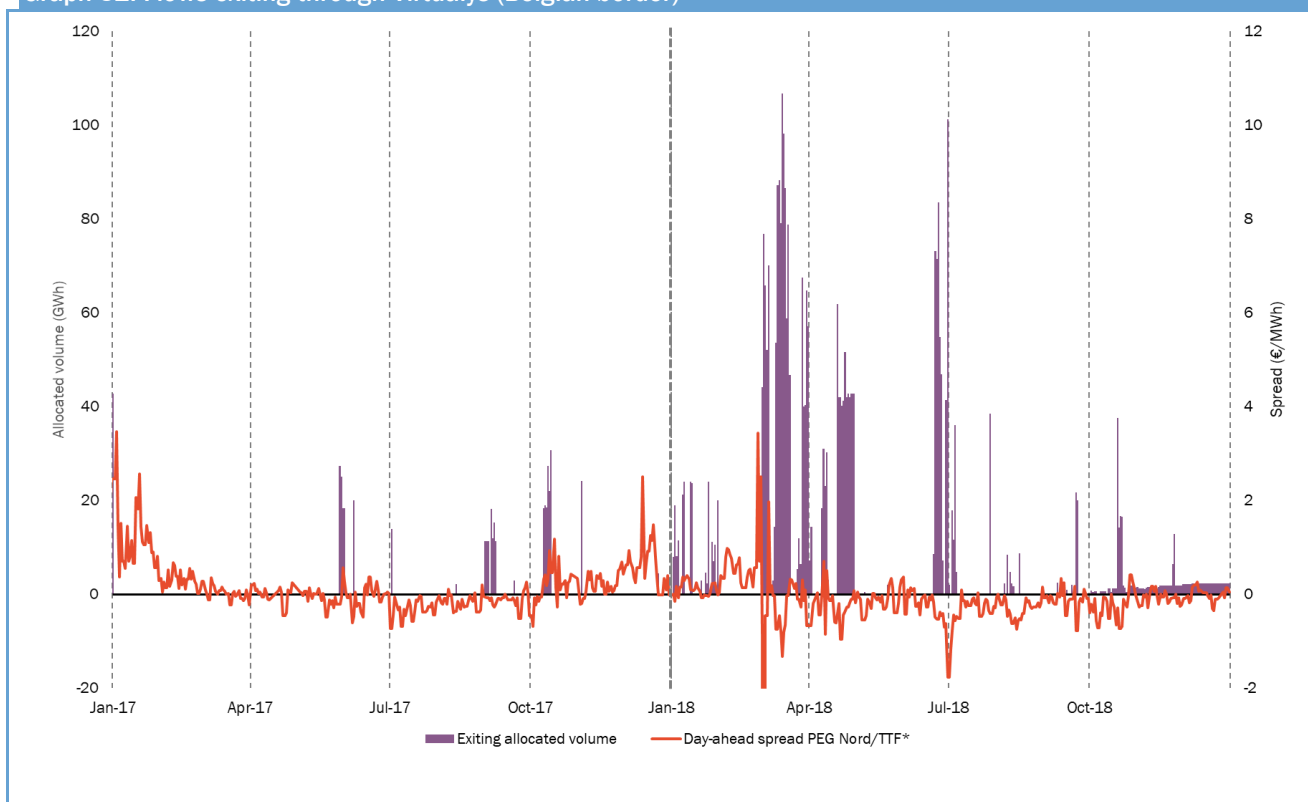
Source: GRTgaz, Teréga – Analysis: CRE

Compared to 2017, the level of exports in the south was up globally by 3 TWh in 2018 whose last quarter was marked by greater activity in connection with attractive price spreads, heightened by the introduction of the single PEG price after 1 November, and by supply arbitrage.

The volumes exiting the link between France and Switzerland through which gas passes en route to Italy grew considerably with an 8% increase in the use of Oltingue for a total exiting commercial volume of 33 TWh compared to 27 TWh in 2017, its highest level in six years. On the contrary, flows to Spain dropped by 3 TWh, i.e. close to 10% compared to 2017 but Pirineos was used heavily during the fourth quarter with a use rate of 70%.

Net imports at Obergailbach increased by 20 TWh, resulting from lower backhaul capacity allocations to Germany which went from 43% in 2017 to 18% in 2018, i.e. a level similar to that of 2016. This drop in allocations brought down French exports for the year 2018.

Graph 52: Flows exiting through Virtualys (Belgian border)



*PEG after 1 November 2018

Source: GRTgaz, ICIS– Analysis: CRE

1.6 A single market zone in France thanks to the merging of the PEG Nord and TRS zones

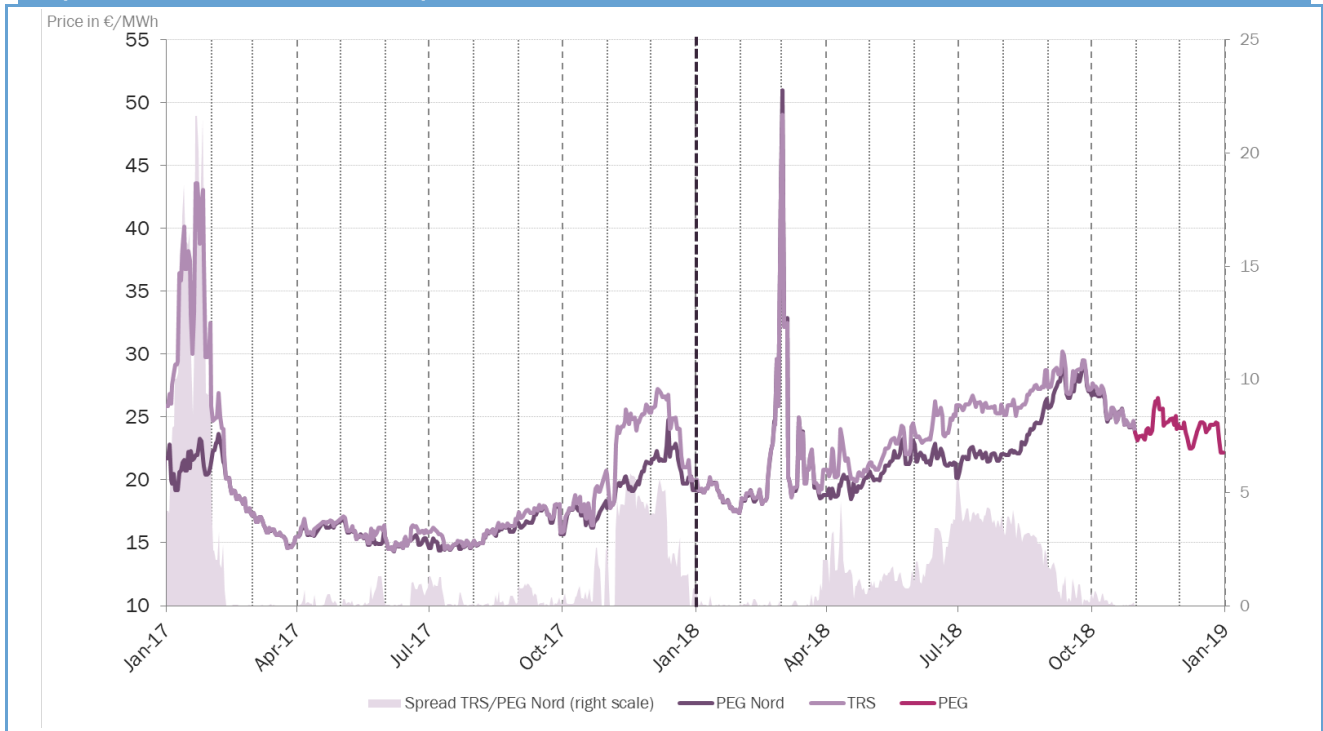
1 November 2018 was marked by the inauguration of the single gas market zone, the Trading Region France (TRF), a result of the merger between the PEG Nord and the TRS. This launch represented the achievement of 15 years of work driven by CRE in collaboration with transmission system operators, which aimed to introduce a single market price in France and enhance the attractiveness, liquidity and proper functioning of the French gas market as well as the security of supply of France.

The Val de Saône and Gascogne-Midi projects, major investment projects increased transmission capacity between the north and south of France, so as to ease most of the risk of bottlenecks in the transmission network, which existed until then at the North-South link, and led to price spreads between the zones, to the detriment of customers in the south of France. More attractive and better linked to European networks, the new PEG single marketplace will enable all French customers to access the same wholesale gas price.

In addition to physical investments in the transmission network, CRE, in its deliberations concerning the functioning of the single market zone, defined mechanisms to lift residual bottlenecks (that may continue to exist following the creation of the TRF), among which the locational spread, which enables TSOs to launch a call for tender to purchase gas on one side of the bottleneck and sell it on the other side.

The locational spread mechanism was set up early for winter 2017/2018 and was used on 13 days of that period (including 4 in 2018) for bottlenecks in the south-east. All of the volumes demanded (476 GWh) was supplied by market participants. As for any episode of tightness in the markets, the locational spread mechanism is examined attentively under CRE's wholesale market surveillance activities.

Graph 53: PEG Nord, TRS and PEG prices

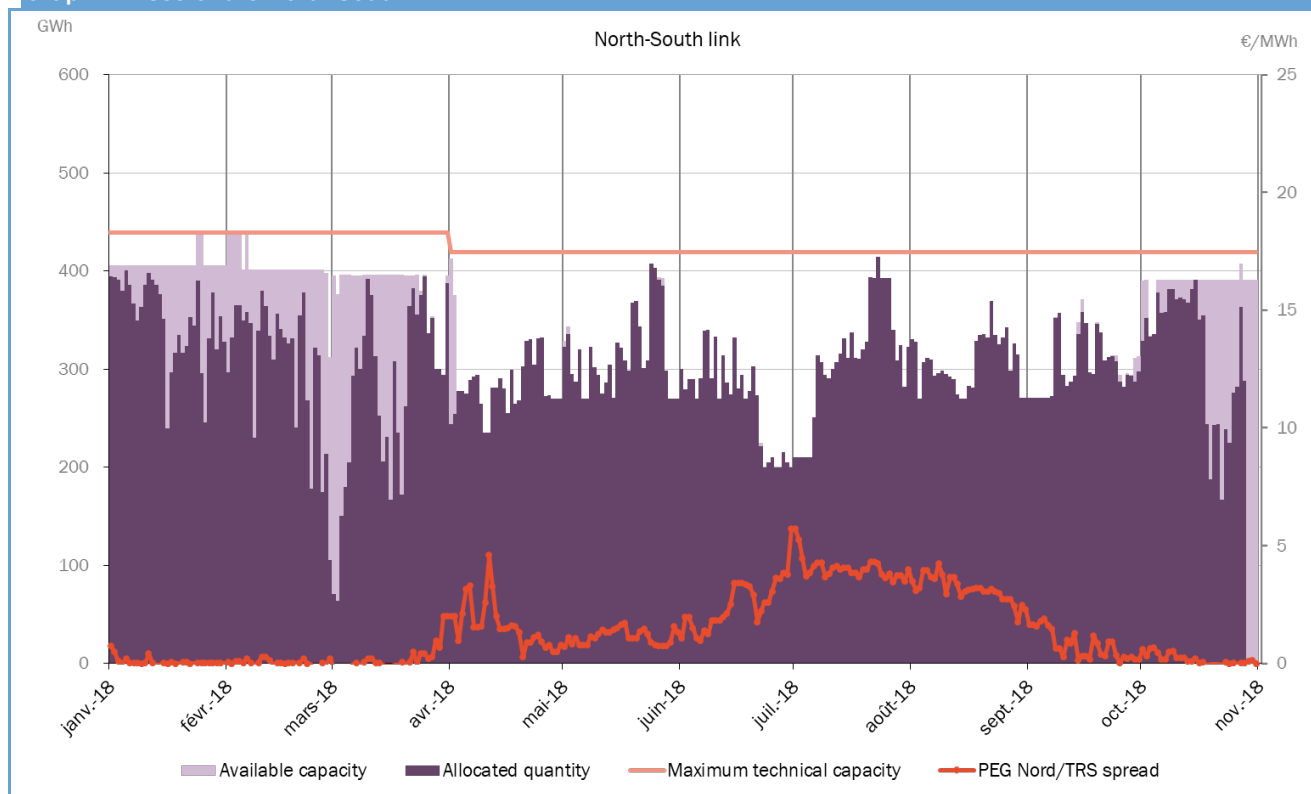


Source: ICIS- Analysis: CRE

In 2018, PEG Nord and TRS prices progressively converged towards the new PEG reference price (Graph 53). The last episode of a major spread in spot prices of the two zones was recorded during summer because of the high LNG price, strong demand for injection into storage and low availability of the North-South link. The spread thus reached its annual maximum with €5.7/MWh. This price difference in 2018 stood at an average €1.4/MWh, historically the average has been €1.34/MWh since the creation of the TRS on 1 April 2015.

The rate of use of capacity available at the North-South link was 89% in 2018 (92% in 2017) with full use from April to September; its availability rate in 2018 was 79% compared to 84% in 2017 (Graph 54). In parallel, the last JTS capacity was allocated in July and totalled 655 GWh for the year.

Graph 54: Use of the North-South link



Source: ICIS- Analysis: CRE

2. MAJOR UPWARD TREND IN NATURAL GAS PRICES IN 2018

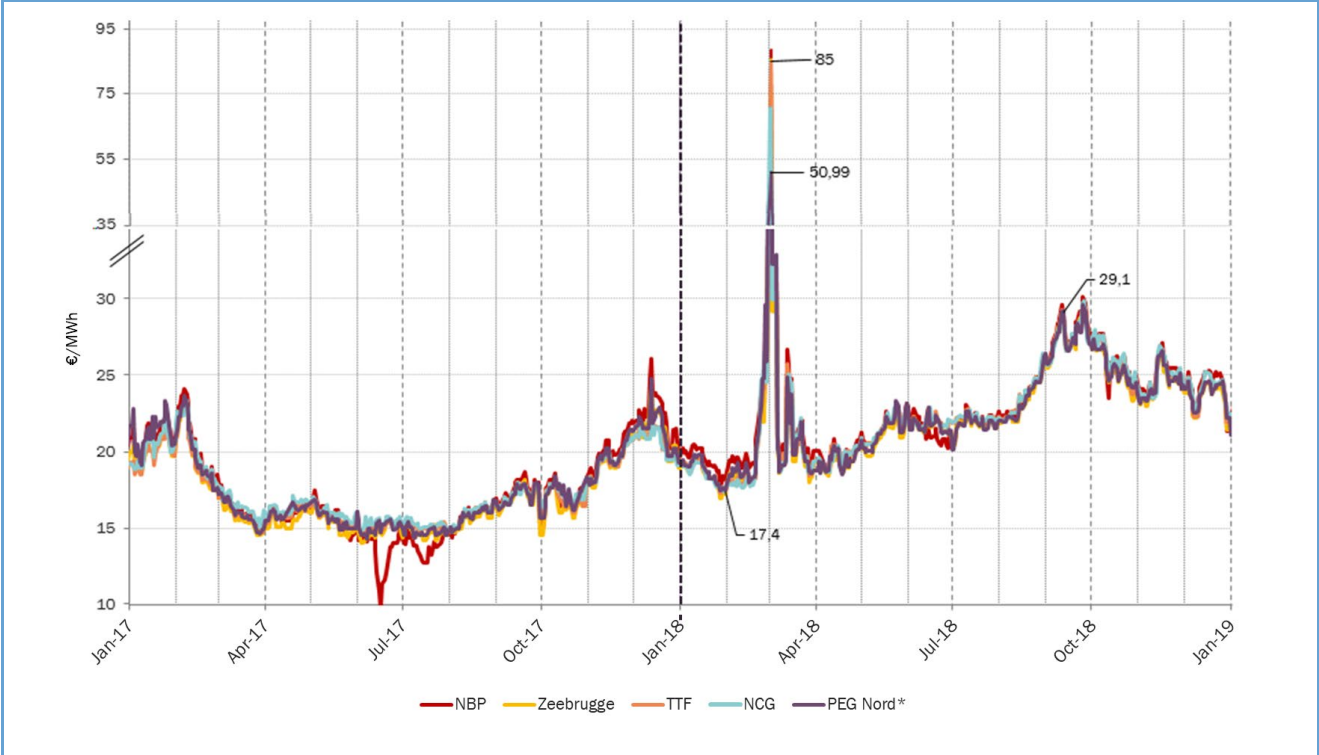
2.1 Global increase in spot prices and historic peak at the end of winter

In 2018, spot prices of the main marketplaces in Europe increased considerably on average compared to 2017 (Graph 55). Prices at the TTF and the PEG Nord (PEG as from 1 November) stood at an average €22.8/MWh and €22.6/MWh respectively compared to €17.3/MWh and €17.5/MWh in 2017, i.e. a roughly 30% increase. Despite a relatively cool winter, spot prices reached an all-time high as at 1 March following the cold spell in Europe against tight supply with a critically low level of European stocks. The day-ahead price index at the PEG Nord thus peaked at €51/MWh, i.e. a relatively low level compared to other markets, with for example €85/MWh at the TTF.

Prices then continued to increase in spring and summer since the market remained tight particularly due to the high injection demand, the high LNG price and greater consumption by gas plants. The day-ahead price thus reached close to €30/MWh at the end of September, and then the return of very good storage levels and the drop in global LNG prices contributed to easing the markets at the end of the year. The new PEG price closed off 2018 at €22/MWh compared to €19/MWh at the start of the year.

The main gas hubs in north-west Europe posted excellent convergence. The PEG Nord even recorded a price lower than that of the TTF; 68% of the time, the PEG Nord index was lower than the TTF.

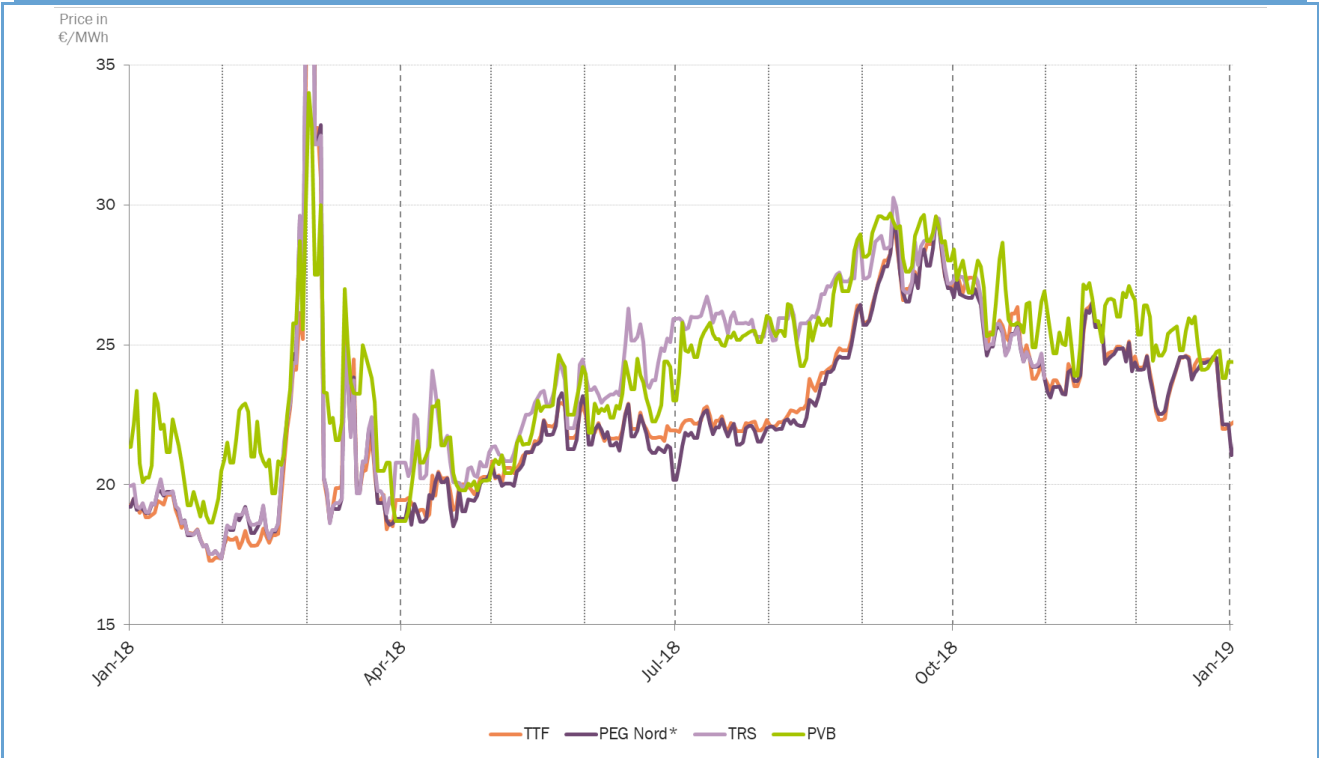
Graph 55: Gas day-ahead spot prices in Europe



*PEG after 1 November 2018

Source: ICIS- Analysis: CRE

Graph 56: Gas day-ahead spot prices in Europe in 2018



*PEG after 1 November 2018

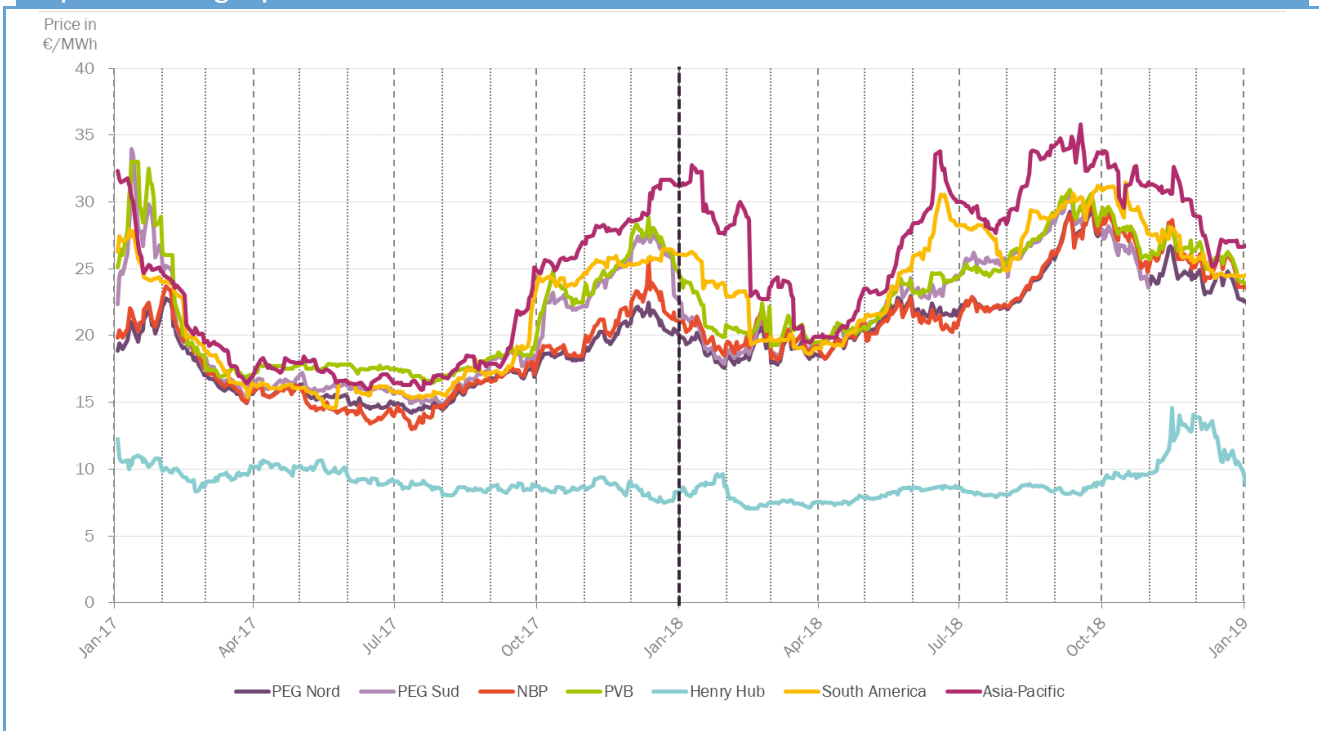
Source: ICIS- Analysis: CRE

2.2 Price movements in Asia direct the LNG market

Like European prices, global prices increased generally in 2018. The price in the USA of the Henry Hub (M+1) was again the lowest with an annual average of €8.9/MWh, however with a price peak at the end of the year at €14/MWh. In parallel, Asia's price average was €22.4/MWh for the year. The Asia-Pacific price index fluctuated greatly over the year starting with a high price at the beginning of the year stimulated by winter demand. After the drop in spring, prices were at their highest levels in summer with a peak at €36/MWh to end the year at a level close to that in Europe (Graph 57). Apart from hot summer temperatures and fortuitous supply, the price remained closely in connection with the development in the price of oil because of the ongoing strong indexation in Asia of LNG supply contracts.

European prices, particularly those at the TRS and PVB which are particularly sensitive to LNG arbitrage with Asia, followed the trend. The Asia-Pacific/NBP difference stood at an average €5.5/MWh (€3.8/MWh in 2017) with a maximum of €12/MWh in summer which explains the drop in LNG deliveries in Europe in this period.

Graph 57: World gas prices



*PEG after 1 November 2018

Source: ICIS- Analysis: CRE

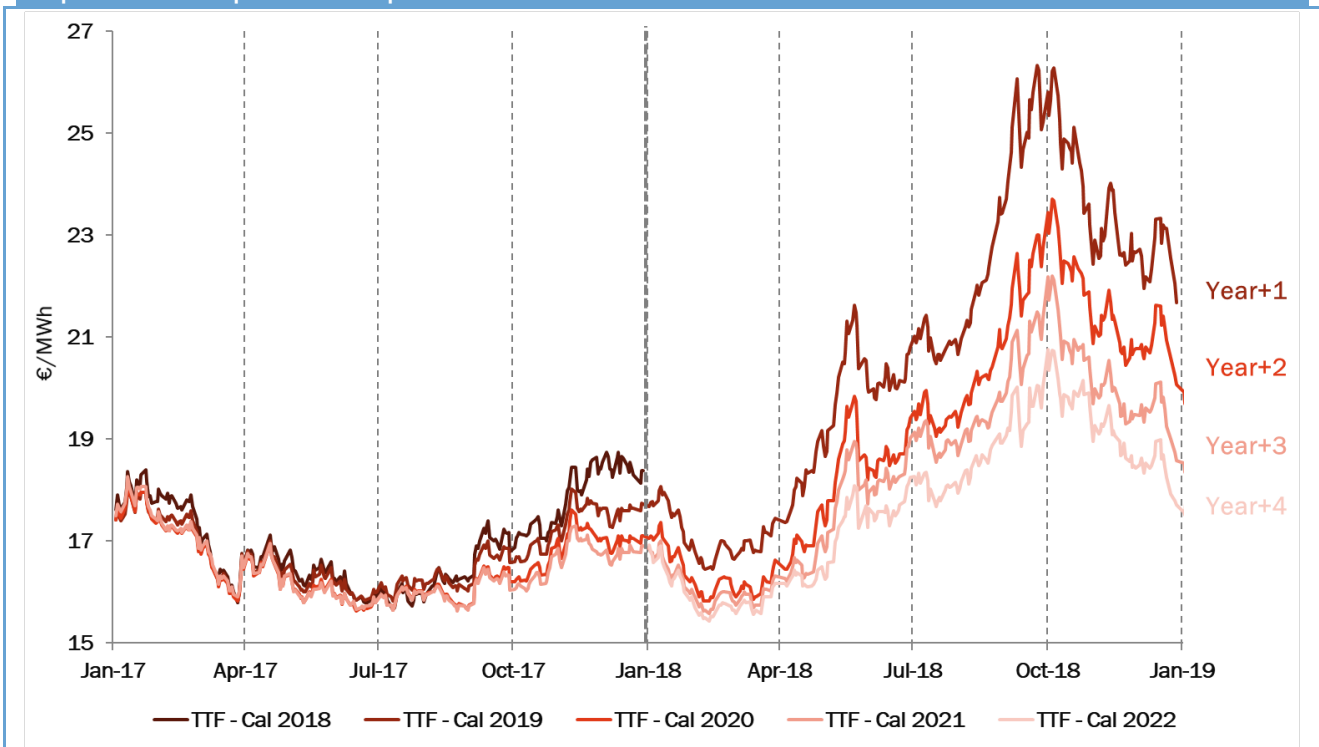
2.3 Major increase in futures prices following commodity prices

European futures prices followed an upward trend in 2018, against a general increase in commodity prices (Graph 58).

In 2018, the 2019 calendar product stood at an average €21/MWh while the average price observed in 2017 for this same product was an average €17/MWh, i.e. a 23% increase. Driven by the price of oil, the 2019 calendar product peaked at €26.2/MWh early October, i.e. its highest level since 2014.

While the prices of the different timeframes were close to levels in 2017, backwardation of prices intensified in 2018 with an average price spread of €1.6/MWh between 2019 and 2020 products, and €3/MWh between 2019 and 2022 products. These price spreads reveal that the market projected in 2018 a tight situation for 2019 which would ease up over the following years.

Graph 58: Futures prices in Europe



Source: ICIS- Analysis: CRE

2.4 A successful storage injection season

Differences in winter/summer prices remained relatively low in 2018, below €2/MWh. The average difference was €1.1/MWh with a low point observed mid-March, at close to €0.3/MWh, over a short period, before returning to higher levels (Graph 59).

Graph 59: Winter/summer price difference in France



Source: ICIS- Analysis: CRE

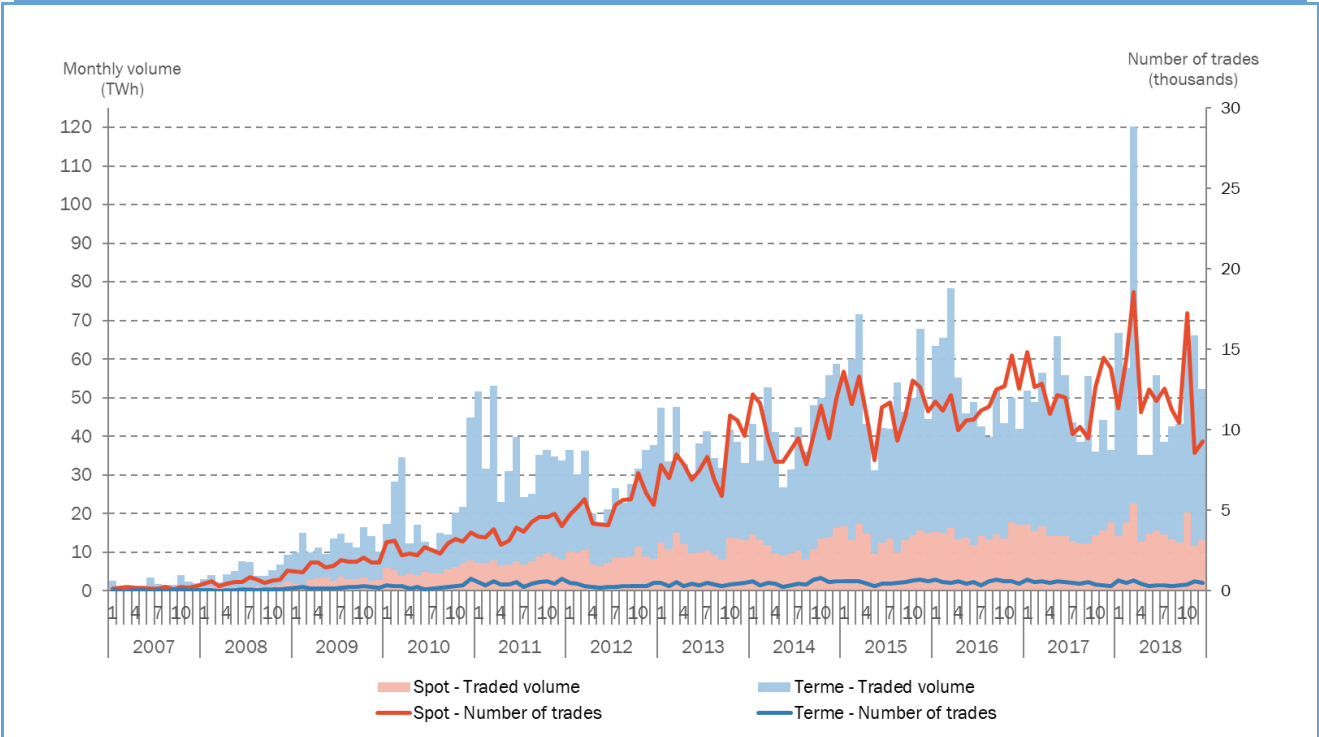
With the new storage capacity selling arrangement, two capacity auctions took place in 2018. The first auction from 5 to 26 March allocated almost all capacity (128 TWh) for winter 2018-2019 at prices ranging from €0 to €2/MWh, i.e. an auction price consistent with the winter/summer price difference. The second auction which was composed of several sessions between November 2018 and February 2019 also allocated all storage capacity for winter 2019-2020. Sustained by the increase in the winter/summer price difference, the auction prices for the sessions of November and December 2018 were higher, with prices varying between €0.8/MWh and €4.3/MWh.

3. INCREASE IN VOLUMES TRADED IN FRANCE IN 2018

Growth in trading in the intermediated spot markets (via Powernext or brokers) intensified in 2018 with a 3.5% increase compared to 0.5% in 2017. Volumes traded in the spot markets thus reached 183 TWh in 2018 with close to 150,000 transactions (Graph 60).

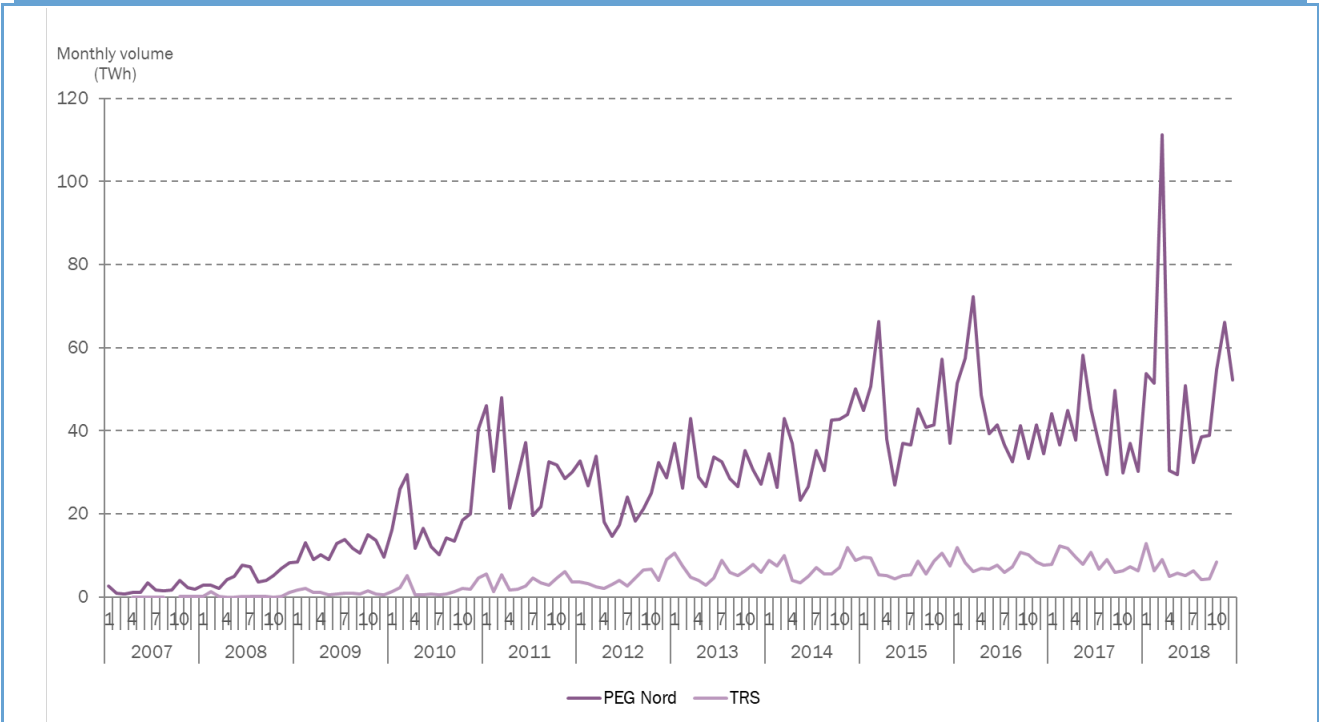
In the futures markets, the volumes traded increased heavily by 22%, unlike the 2017 trend when futures trades had dropped by more than 10%. Volumes traded in the futures markets thus reached 494 TWh in 2018 with roughly 5,500 transactions (Graph 60). The month of March saw a high level of activity in the futures markets with a volume traded of almost 100 TWh, i.e. almost triple the monthly activity of the rest of the year. This peak was partly related to the storage capacity auctions for winter 2018-2019 during which the markets repositioned themselves based on capacity allocated. In particular, numerous trades of Season products were observed in the month of March with four times more volume traded compared to the rest of the year.

Graph 60: Development in volumes traded and in the number of transactions in the French intermediated market



Source: ICIS- Analysis: CRE

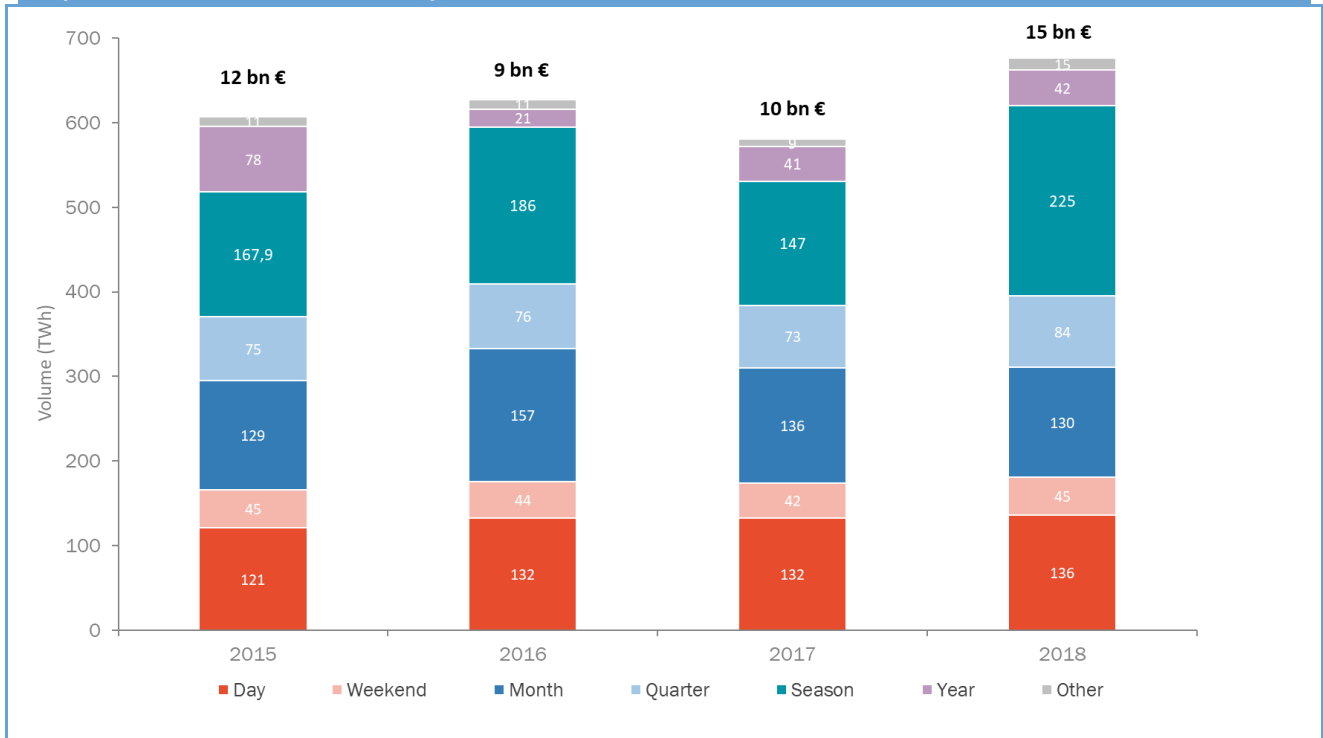
Graph 61: Volumes traded at each PEG in the intermediated market



Source: ICIS- Analysis: CRE

Because of the high upward trend in gas prices in the wholesale markets in 2017, the value of trades increased by almost 50% compared to 2017 (Graph 62). Apart from the strong increase in season products, the other products were traded at similar levels compared to 2017.

Graph 62: Volumes traded for each product in the intermediated market



Source: Powernext, brokers – Analysis: CRE

4. PROPER FUNCTIONING OF THE WHOLESALE NATURAL GAS MARKETS IN FRANCE

In 2018 the PEG Nord price (then PEG) converged with the markets of north-west Europe, translating a good integration of the French market into the European market. More widely, all north-west European markets, including in particular that of Germany, the United Kingdom, Benelux and France had a good correlation of spot and futures prices.

The result is an interconnected European market which represents a significant price reference at world level, which contributed to strengthening the robustness of the underlying markets including that of France. A good reaction was seen in prices both upwards and downwards according to market conditions, changes in the supply/demand balance and other exogenous market signals.

CRE remains attentive to individual behaviour of market participants that could compromise the integrity of the wholesale gas market in France.

KEY FIGURES

1. ELECTRICITY MARKET

Table 4: Installed production capacity in France

				Annual variation 2017/2018	
	End 2016	End 2017	End 2018	As a pourcentage	As a value
Generating facilities (GW)	130,8	130,8	132,9	1,6%	2,1
Nuclear	63,1	63,1	63,1	0,0%	0,0
Hydraulic	25,5	25,5	25,5	0,0%	0,0
Fossil-fired	21,8	18,9	18,6	-1,9%	-0,4
Coal	3,0	3,0	3,0	-0,1%	0,0
Fuel oil	7,1	4,1	3,4	-16,1%	-0,7
Gas	11,7	11,9	12,2	2,5%	0,3
Renewable (excluding hydraulic)	20,4	23,2	25,7	10,8%	2,5
Wind	11,7	13,6	15,1	11,4%	1,5
Solar	6,8	7,7	8,5	11,3%	0,9
Renewable thermal	1,9	1,9	2,0	4,0%	0,1

Source: RTE

Table 5: Production of the different technology sectors in France

				Annual variation 2017/2018	
	2016	2017	2018	As a pourcentage	As a value
Production (TWh)	531,3	529,4	548,6	3,6%	19,2
Nuclear	384,0	379,1	393,2	3,7%	14,1
Hydraulic	63,9	53,6	68,3	27,4%	14,7
Fossil-fired	45,9	54,4	39,4	-27,6%	-15,0
Coal	7,3	9,7	5,8	-40,2%	-3,9
Gas	35,3	40,9	31,4	-23,2%	-9,5
Fuel oil	3,3	3,8	2,2	-42,1%	-1,6
Renewable (excluding hydraulic)	37,5	42,3	47,7	12,8%	5,4
Wind	20,7	24,0	27,8	15,8%	3,8
Solar	8,3	9,2	10,2	10,9%	1,0
Renewable thermal	8,5	9,1	9,7	6,6%	0,6
Consumption (TWh)	483,0	482,0	478,2	-0,8%	-3,8

Source: RTE

Table 6: Imports and exports in France

	Annual variation 2017/2018				
	2016	2017	2018	As a pourcentage	As a value
Imports	34,4	38,5	30,8	-20,0%	-7,7
Peak imports (TWh)	12,7	14,6	11,9	-18,6%	-2,7
Off-peak imports (TWh)	21,7	23,9	18,9	-20,9%	-5,0
Exports	73,5	76,4	91,0	19,1%	14,6
Peak exports (TWh)	25,1	26,3	31,7	20,5%	5,4
Off-peak exports (TWh)	48,4	50,1	59,3	18,4%	9,2
Net export balance	39,1	37,9	60,2	58,9%	22,3

Source: RTE

Table 7: Balance at borders

	Annual variation 2017/2018				
	2016	2017	2018	As a pourcentage	As a value
Balance at borders, in TWh					
CWE zone	-5,4	-10,9	6,1	-155,8%	17,0
Spain	7,8	12,5	12	-3,7%	-0,5
United Kingdom	10,0	8,0	12,9	62,3%	4,9
Italy	16,5	18,2	18,6	2,5%	0,4
Switzerland	10,1	10,3	10,6	2,8%	0,3
Total	39,1	38,0	60,2	37,0%	22,2

Source: RTE

Table 8: Clean dark and clean spark spread and coal

	Annual variation 2017/2018				
	2016	2017	2018	As a pourcentage	As a value
Y+1 maturity					
Coal (€/t)	48,6	65,1	73,9	13,4%	8,7
Peak clean dark spread (€/MWh)	22,5	21,6	18,8	-12,6%	-2,7
Peak clean spark spread (€/MWh)	10,2	12,0	11,0	-8,9%	-1,1

Source: ICE, EPEX SPOT, EEX

Table 9: Injections and withdrawals in the French electricity system

	Annual variation 2017/2018				
	2016	2017	2018	As a pourcentage	As a value
Injections, in TWh					
Production, excluding ARENH and VPP, in TWh	531	447	452	1,0%	4,7
ARENH, in TWh	0	82	96	17,0%	13,9
Imports, in TWh	33	36	30	-17,1%	-6,2
Withdrawals, in TWh					
End customer consumption, en TWh	447	446	444	-0,5%	-2,3
Pumping, in TWh	7	7	7	2,9%	0,2
Exports, in TWh	74	74	93	25,3%	18,8
Losses in TWh	36	36	35	-2,0%	-0,7

Source: RTE

Table 10: Participants in the French electricity market

	Annual variation 2017/2018				
	2016	2017	2018	As a pourcentage	As a value
Balancing responsible	197	233	220	-6%	-13
Active in electricity generation	26	28	24	-14,3%	-4
Holder of rights of regulated access to ARENH	0	18	19	5,6%	1
Final customers provider	32	35	29	-17,1%	-6
Active on imports/exports	77	55	49	-10,9%	-6
Active on bloc exchange	103	108	89	-17,6%	-19
Active on Exchange	96	100	84	-16,0%	-16

Source: RTE, EPEX SPOT, Brokers

Table 11: Spot and futures prices in the French electricity market

	Annual variation 2017/2018				
	2016	2017	2018	As a pourcentage	As a value
Spot market prices					
Intraday price France, in €/MWh	36,87	45,05	52,36	16,2%	7,31
Day-Ahead price France Baseload, in €/MWh	36,67	44,99	50,2	11,6%	5,21
Day-Ahead price France Peakload, in €/MWh	45,69	53,66	59,14	10,2%	5,48
France-Germany Day-ahead Baseload spread, in €/MWh	7,59	10,68	6,01	-43,7%	-4,67
France-Germany Day-ahead peakload spread, in €/MWh	10,32	10,94	7,41	-32,3%	-3,53
Day-Ahead France-Germany convergence rate	36,0%	35,0%	34,0%	-2,9%	-1,0%
Forward market prices					
M+1 price France, in €/MWh	41,23	45,21	53,37	18,0%	8,16
M+1 France-Germany Spread , in €/MWh	11,88	9,42	6,36	-32,5%	-3,06
Q+1 price France, in €/MWh	39,55	42,5	53,32	25,5%	10,82
Spread Q+1 France-Germany, en €/MWh	10,51	7,04	6,55	-7,0%	-0,49
Y+1 price France, in €/MWh	33,38	38,29	48,99	27,9%	10,7
Spread Y+1 France-Germany, en €/MWh	6,79	5,87	4,84	-17,5%	-1,03
Y+1 Peakload/Baseload ratio					
France	1,33	1,31	1,27	-3,1%	-0,04
Germany	1,26	1,25	1,23	-1,6%	-0,02

Source: EPEX SPOT, EEX

Table 12: Spot and futures volumes in the French electricity market

	Annual variation 2017/2018				
	2016	2017	2018	As a pourcentage	As a value
NEB					
NEB Volumes, in TWh	549,6	414,5	431,8	4,2%	17,2
NEB/French consumption ratio	1,3	0,9	1,0	-	0,0
Spot market in TWh	144,8	135,8	144,9	0,7	9,1
Volumes in the EPEX SPOT intraday market, in TWh	6,1	6,5	9,0	39,8%	2,6
Portion of Intraday cross-border Fr-Ger volumes	0,6	0,7	0,7	-	0,0
Volumes in the EPEX SPOT Day-Ahead market, in TWh	110,7	105,7	113,8	7,6%	8,1
Volumes in the Broker Day-Ahead market, in TWh	28,0	23,7	22,1	-6,4%	-1,5
Forward market					
Volumes, in TWh	1309,3	902,8	783,2	-13,3%	-119,6
Broker market share	0,9	0,9	0,8	-	-0,1
EEX market share	0,1	0,1	0,2	-	0,1
Number of transactions	102516	83379	93200	11,8%	9821
Broker market share	0,9	0,8	0,8	-	0,0
EEX market share	0,1	0,2	0,2	-	0,0
Y+1 product					
Volumes, in TWh	496,1	338,7	240,7	-28,9%	-98,0
Number of transactions	11686	8528	7437	-12,8%	-1091
Q+1 product					
Volumes, in TWh	125,9	121,8	106,4	-12,6%	-15,4
Number of transactions	9655	10155	9296	-8,5%	-859
M+1 product					
Volumes, in TWh	119,5	108,9	125,2	15,0%	16,3
Number of transactions	20260	21176	27457	29,7%	6281

Source: EPEX SPOT, EEX, Brokers

Table 13: Concentration indices (HHI) for the different segments of the wholesale electricity market in France

	HHI - Market Concentration			
	2017		2018	
Deliveries		EDF included		EDF included
OTC - block purchases	379	810	475	911
OTC - block sales	575	632	683	729
EPEX - purchases	513	870	360	774
EPEX - sales	395	2401	401	1978
Injections				
Generation	3466	7068	2816	5517
ARENH	2014		1754	
Imports	1415	1146	796	731
Withdrawals				
End-consumer consumption	1835	5012	1450	4326
Grid losses	1583	1545	2066	1789
Exports	1453	2207	721	2098

Sources: RTE, EPEX SPOT, Brokers

2. GAS MARKET

Table 14: Fundamentals of the gas market in France

Market fundamentals	Yearly values			Yearly variation 2018 / 2017	
	2016	2017	2018	In percentage	In value
Entry and exit flows					
Supply (TWh)	678	703	701	0%	-2
Storages withdrawals	118	111	116	4%	5
Imports	561	592	585	-1%	-7
<i>Pipeline</i>	481	489	468	-4%	-22
<i>LNG</i>	80	102	117	15%	15
Production	0	0	0	-37%	0
Demand (TWh)	678	703	701	0%	-2
Storages injections	113	99	143	44%	43
End consumers demand	488	490	463	-6%	-27
<i>Distribution consumers</i>	304	297	286	-4%	-11
<i>Consumers connected to the transmission system</i>	184	193	176	-9%	-16
Exports	71	107	82	-23%	-25
Other	7	6	13	104%	7
Deliveries at PEGs (TWh)	808	829	860	4%	30
PEG Nord*	649	677	732	8%	55
TRS	159	152	128	-16%	-24
Infrastructure figures					
North-to-south link**	95%	91%	89%		-2%
Availability of North-to-south link**	81%	84%	80%		-4%
Utilization de Dunkerque (UK -> France)	80%	89%	86%		
Utilization of Virtualys interconnection (Entry)	63%	59%	43%		-16%
Utilization of Pirineos interconnection (Exit)	45%	52%	48%		-4%
Stock levels (TWh as at the end of the Quarter)	96	83	69	-17%	-14
Avg. Net variation of French stocks (GWh/j)	-4	-11	27	-334%	38
Avg. LNG terminals send-out (GWh/j)	214	280	320	14%	40
Avg. Exports from France to Spain (GWh/j)	102	120	114	-5%	-6

*PEG after 1 November 2018

**Calculation up to 1 November 2018

Source: GRTgaz, Teréga – Analysis: CRE

Table 15: Price of gas in France

Prices	Yearly values			Yearly variation 2018 / 2017	
	2016	2017	2018	In percentage	In value
Spot prices (€/MWh)					
PEG Nord day-ahead (avg.)*	14,3	17,5	22,8	30%	5,3
TRS day-ahead (avg.)	7,8	19,5	23,9	23%	4,4
Day-ahead PEG Nord/Sud spread (avg.)**	1,3	2,0	1,4	-31%	-0,6
Day-ahead PEG Nord/TTF Spread (avg.)*	0,3	0,2	-0,2	-196%	-0,4
Forward prices (€/MWh)					
PEG Nord M+1 (avg.)*	14,2	17,4	22,4	29%	5,0
TRS M+1 (avg.)	15,4	19,6	22,9	17%	3,3
PEG Nord Y+1 (avg.)*	15,6	17,3	20,9	21%	3,7
M+1 PEG Nord/Sud spread (avg.)**	1,2	2,2	1,4	-36%	-0,8
M+1 PEG Nord/TTF spread (avg.)*	0,2	0,3	0,3	-7%	0,0
Summer-ahead/Winter-ahead spread (avg.)	1,9	1,4	1,1	-20%	-0,3

*PEG after 1 November 2018

**Calculation up to 1 November 2018

Source: Powernext, ICIS – Analysis: CRE

Table 16: Gas trading in France

Trading activity	Yearly values			Yearly variation 2018 / 2017	
	2016	2017	2018	In percentage	In value
Wholesale markets activity in France					
Natural gas exchanged at PEG* (TWh)	621	598	634	6%	36
% of national consumption	127%	122%	137%		15%
Trading volumes in the French intermediated markets					
Spot market (TWh)	176	177	183	4%	6
Intraday	27	27	32	20%	5,3
Day Ahead	104	105	102	-2%	-2,5
Exchange (DA, WD, WE, other spot)	137	158	161	2%	2,4
Brokers (DA, WD, WE, other spot)	39	18	22	21%	3,9
Forwards market (TWh)	451	404	494	22%	90
M+1	125	113	96	-15%	-17,2
Q+1	43	47	40	-14%	-6,5
S+1	71	78	132	70%	54,1
Y+1	7	25	19	-26%	-6,5
Exchange (all maturities)	39	19	11	-40%	-7,5
Brokers (all maturities)	412	385	482	25%	97,2
Number of transactions in the French intermediated markets					
Spot market	141 939	146 313	149 605	2%	3292
Intraday	29 487	29 881	32 716	9%	2835
Day Ahead	91 935	94 792	93 065	-2%	-1727
Exchange (DA, WD, WE, other spot)	121 551	137 844	137 891	0%	47
Brokers (DA, WD, WE, other spot)	20 388	8 469	11 714	38%	3245
Forwards market	6 270	5 766	4 978	-14%	-788
M+1	3 617	3 452	2 468	-29%	-984
Q+1	512	559	375	-33%	-184
S+1	438	411	520	27%	109
Y+1	54	117	106	-9%	-11
Exchange (all forward maturities)	1 334	867	554	-36%	-313
Brokers (all forward maturities)	4 936	4 899	4 424	-10%	-475

*Deliveries resulting from trading in the intermediated markets in France

Source: GRTgaz, Teréga, Powernext, brokers – Analysis: CRE

Table 17: Gas trading in France

Market participants on French gas markets	Yearly variation 2018 / 2017				
	2016	2017	2018	In percentage	In value
Number of active shippers by type of point					
PEG	103	110	112	0	2
PIR	49	56	52	0	-4
PITD	35	37	40	0	3
PITS	43	45	52	0	7
Number of companies importing LNG					
Montoir	2	2	5	2	3
Fos Tonkin	1	1	2	100%	1
Fos Cavaou	2	4	5	25%	1
Dunkerque	na	2	2	0%	0

NOTICE

The sources of different data used to produce graphs for the previous surveillance reports, and in particular, price indices, have been updated so as to be more precise, which may explain the variation in certain graphs for periods preceding 2018 compared with previous surveillance reports.

The underlying data for the key figures tables are available on CRE's website in the section "Open Data" (www.cre.fr/Pages-annexes/Open-Data).

The other data used to establish the present report being subject to confidentiality clauses for their publication in non-aggregated form or in digital forms other than graphical display, are not made available.

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