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REPORT

EDITION 2020

ELECTRICITY AND GAS INTERCONNECTIONS



EDITION 2020

ON ELECTRICITY AND GAS INTERCONNECTIONS

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MESSAGE

FROM THE PRESIDENT OF CRE

A decade after the adoption of the third legislative package, this new edition of the CRE report on interconnections, covering the years 2018 and 2019, marks the coming of age of the internal market, but also the opening towards a new era, that of the decarbonisation of energy in Europe. The European Union's stated ambitions represent a remarkable change of direction and bring with them many challenges. However, one certainty remains: the interconnections between national energy systems are an essential asset for the transition to more renewable energies and the reduction of greenhouse gas emissions at European level.

The commitment to integration with neighbouring countries has been carried by CRE since its creation twenty years ago. This report once again demonstrates the very good level of interconnection achieved by France, both for gas and electricity. The decisions taken by CRE have been guided by the idea of solidarity between member states, in the framework of a balanced relationship and in the search for efficiency. The creation of a single gas market area in France reflects this ambition, which has made France a new strong point in the European market, with greater liquidity and lower network usage tariffs for international shippers.

Developments over the last two years confirm the major role of interconnections in the construction of Europe. Electricity trade with the rest of the EU has increased sharply after the lows of 2016 and 2017. New interconnection capacity is being built with Italy, Spain and Great Britain, and 2019 marked the validation of the Celtic project, which will give Ireland direct access to the continental European market. Gas movements have reached historically high levels, both incoming and outgoing, reflecting the increased role of the French market in international trade. French wholesale prices have for several years experienced excellent convergence with European reference prices and are often even lower than the Dutch market reference in 2019.

As regards the rules for the functioning of the internal market, 2019 marked the entry into force of the "Clean energy for all Europeans" legislative package. After intensive efforts to implement the provisions of the third package in practice, some

“ The commitment to integration with neighbouring countries has been carried by CRE since its creation twenty years ago.

of the guidelines of the new rules raise questions. The level of detail achieved in the technical prescriptions is particularly high and raises concerns about a lack of flexibility or even a mismatch with the concrete realities of the electricity system. The provisions requiring to dedicate 70% of physical interconnection capacity to exchanges between member states therefore does not take account of capacity calculation rules and network operating constraints. This could be particularly costly if remedies were to be systematically applied. These measures, which are essentially based on redispatching and countertrading can lead to extremely high levels of compensation for market players. If misapplied, these provisions could even lead countries that have invested most in the robustness of their networks to unjustifiably contribute to the remediation costs incurred by their neighbours with more fragile networks. This is a major concern for CRE as the French network appears particularly robust in the face of the development of cross-border trade, due to the investments made in its internal networks and financed by the French end consumer.

The call for a fair balance between prescription and pragmatism in the European legislation is a message that CRE regularly conveys. At a time when reflections are advancing on the revision of the regulation on trans-European energy networks and when the texts implementing the Green Deal are being prepared, CRE calls for effective coordination between the national and European levels. Stimulating innovation requires promoting flexibility and agility, including at institutional level. In this respect, national regulators must be considered as assets, capable of setting in music a decentralisation that respects the coherence of the EU.

Jean-François CARENCO,
President of CRE



THE 10 TAKE AWAYS OF THE REPORT

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FRANCE, THE CROSSROADS OF ENERGY IN EUROPE

France has achieved a high level of interconnection with its neighbours, consolidating a central position in the European energy system. It is the leading exporter of electricity in Europe and the creation of a single market area for gas has been accompanied by an increase in trade, particularly with the Iberian Peninsula and Italy.

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THE INTERNAL MARKET, A PROJECT NEARING COMPLETION

The construction of the internal market has been initiated a long time ago. Most provisions of the third legislative package, which has constituted a decisive step in the structuration of the internal market, are now in force. It has defined market models that promote the development of wholesale markets in support of price transparency and smooth energy trade between countries. Interconnections have thus become links between bidding zones serving the optimisation of the European energy system, from an economic, environmental and security of supply point of view.

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THE EXTENSION OF MARKET COUPLING CONTINUES, STRENGTHENING THE EUROPEAN INTEGRATION OF ELECTRICITY MARKETS

The European electricity market model is based on market coupling for short-term maturities. It ensures consistency between prices, interconnection capacities and energy flows, and its application is progressing with the integration of Central European countries into the daily coupling. For intraday exchanges, the deployment of a harmonised platform is effective in most countries.



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APPLYING THE NETWORK CODE ON GAS TARIFFS IN A TRANSPARENT AND FAIR MANNER

The gas transmission tariffs that came into force in France on 1 April 2020 (known as "ATRT7") comply with the provisions of the European network code on gas transmission tariffs, the objective of which is to ensure the transparency and non-discrimination of transit flows. Thus, and choosing to apply this code to the main network, CRE has excluded regional networks (used only for domestic consumers) from the cost base taken into account. This treatment avoids any risk of cross-subsidies between categories of users, and respects the principles of cost reflectivity and non-distortion of cross-border trade.

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TRANS-EUROPEAN ENERGY NETWORKS: STRENGTHENING THE POWERS OF REGULATORS

The European Commission has launched the process of revising the guidelines on trans-European energy networks. Drawing lessons from its experience, CRE recommends that the status of Project of Common Interest (PCI), granted at a very early stage of the decision-making process, be considered as a presumption of utility. Subsequently, it is essential to confirm the role of the regulator in its ability to verify the value of projects and allow it, if necessary, to waive their implementation.

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FRANCE'S SINGLE GAS MARKET ZONE: BENEFITS BEYOND BORDERS

Created on 1 November 2018 with the merger of the Northern and Southern zones, the Trading Region France (TRF) is a success. It provides France with a single virtual gas exchange point and therefore a single price reference on the wholesale market. The resulting increased liquidity has ensured strong convergence with the reference prices of Northern Europe, which is also beneficial to neighbouring countries. This project was carried out thanks to investments sized to ensure the upholding of firm capacities at interconnections, in particular to the Iberian Peninsula or to Switzerland and Italy. CRE considers that such an approach should be the basis for any comparable project in Europe.

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CLEAN ENERGY PACKAGE: COMBINING AMBITION AND PRAGMATISM

The "Clean Energy for all Europeans" package makes energy transition the primary objective of the construction of the internal energy market, linking renewable energy and system security. However, the technical provisions are now reaching an unprecedented level of sophistication. This should not, however, reduce the flexibility of the regulatory framework at a time when the electricity system is undergoing profound changes. Ambition should not be synonymous with overregulation.

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70%, A RULE TO BE APPLIED IN A PROPORTIONATE MANNER

CRE has historically been committed to working towards the optimisation of cross-border energy exchanges on French interconnections. Providing at least 70% of the network capacity, as foreseen by the Clean Energy Package, materialises the ambitious target of increased exchanges supported by the European Union and also by CRE, but raises complex implementation questions. A uniform application of this minimum level could lead to technically and economically irrelevant measures. CRE thus recommends a pragmatic and proportionate implementation, which will allow an effective improvement of cross-border trade, together with real economic benefits for final consumers.

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CROSS-BORDER REDISPATCHING AND COUNTERTRADING COST SHARING MUST BE FAIR

Redispatching and countertrading are remedial actions used by TSOs to ensure network operational security and the effective availability of electricity interconnection capacities. The Clean Energy Package establishes close cooperation between TSOs, with the idea of sharing costs where the remedial actions, or their causes, are of a cross-border nature and in particular where these actions compensate the effects of so-called 'polluting' flows from neighbouring networks. Cost sharing should therefore not penalise countries with strong networks, such as France, by making them bear part of the hitherto insufficient reinforcement of neighbouring networks.

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THE RULES AT INTERCONNECTIONS HAVE BEEN ADAPTED TO PREPARE FOR A POSSIBLE EXIT OF THE UNITED KINGDOM FROM THE INTERNAL MARKET

Uncertainties about the framework conditions of Brexit remain significant, in particular whether or not the United Kingdom will remain in the internal market. In order to ensure the smooth operation of the interconnections at the France-Great Britain border regardless of the final outcome, CRE and Ofgem have adopted a set of rules applicable in the event of decoupling of interconnections already existing or under development. 'Explicit' auctions would then be implemented for all electricity market timeframes.



1. COMPETITION AND ENERGY TRANSITION, DRIVERS OF EUROPEAN INTEGRATION

1.1 FROM THE FIRST DIRECTIVES TO THE GREEN DEAL

1.2 RENEWING THE ASSESSMENT OF INTERCONNECTION PROJECTS

1.3 THE INTERNAL MARKET, A PROJECT NEARING COMPLETION

PART 1

COMPETITION AND ENERGY TRANSITION, DRIVERS OF EUROPEAN INTEGRATION

1.1 From the first directives to the Green Deal

2019 will remain a pivotal year for the Energy Union. A few months after the publication of the legislative package untitled "Clean energy for all Europeans", the European Commission, led by Ursula von der Leyen, has made energy transition the cornerstone of its action for the next five years. In the communication published on 11 December 2019¹ presenting the "European Green Deal", the European Commission has set the objective of a European economy characterised by the absence of net greenhouse gas emissions by 2050 and in which growth will be decoupled from resource use. The Green Deal represents a comprehensive strategy in which energy plays a central role, renewing the principle, introduced by the Energy Union, of providing clean, affordable and secure energy to European consumers. It reinforces the orientations proposed in the long-term strategy on climate change presented at the end of November 2018, in particular by affirming the importance of energy efficiency and the shift towards renewable energies, the rapid phase-out of coal and the decarbonation of gas. It underlines the principle of a fully integrated, interconnected and digital European energy market.

The Green Deal is a programme to be implemented through the various acts and initiatives proposed in the roadmap attached

1.1.1 Achievements of the first legislative packages

The last twenty years have seen the establishment of a competitive internal energy market based on a new organisation of the electricity and gas sectors. Infrastructures, and in particular interconnections, are a central tool for achieving the European Union's ambitions in terms of market opening and now energy transition: harmonisation of the rules for the use of interconnections facilitates flows and exploits complementarities between

to the Communication of 11 December 2019. These actions are based on the achievements of the European Energy Policy, such as the national plans put in place by the Energy Union and the trans-European infrastructures introduced through the revision of the Regulation of 2013. In addition, the strategic actions on offshore wind energy or smart sector integration will further strengthen the role of electricity and gas networks to accommodate an increasing share of renewable energies. The Green Deal as well as the Clean Energy Package (CEP) mark a shift in the fundamental objectives of energy markets integration by giving an increasing importance to the evolution of the energy mix through the development of renewable energies. As such, the CEP mainly deals with electricity. As regards gas, the Commission is carrying out a large number of studies aimed in particular at making gas a means of speeding up the energy transition, for example by facilitating energy storage or contributing to the provision of flexibility, with a view to bringing the electricity and gas sectors closer together.

countries. It remains to be ensured, however, whether the rules can be adapted to a very changing environment, characterised, among other things, by the integration of decentralised generation sources on the networks and the decarbonation of the energy mix, and to effectively support technological progress, particularly the digitisation of networks.

The Directives of 1996 on the internal market in electricity² and of 1998 on the internal gas market³ which launched the process of liberalisation of the European electricity and gas markets, were adopted at a time when European systems presented some inefficiencies and strong differences. Consequently, the search for rationalisation of energy production, transmission and distribution for greater economic efficiency through the introduction of competition and the promotion of innovation was a central objective. One of the main provisions was third-party access to the network (i.e. the establishment of a set of rules governing the connection and injection of energy) allowing

network users to develop their own commercial strategy and to ensure the balance of the system as a whole.

These main principles were specified in the second energy package, adopted in 2003, which was then supplemented by two technical regulations on access to the electricity and gas networks. The systematic establishment of independent regulatory authorities is an important step forward in this legislative package. The rules on the unbundling and independence of network operators from production and supply activities have also been clarified and full market opening has been decided as from 1 July 2007.

1.1.2 The decisive stage of the third legislative package

Adopted in 2009, this package of two directives and three regulations emphasised the primacy of the European level, resulting in the creation of the Agency for the Cooperation of European Energy Regulators (ACER) and the European Networks of Transmission System Operators for Electricity and Gas (ENTSO-E and ENTSOG). The third energy package endorsed market models that promote the development of wholesale markets to ensure price transparency and smooth trade through a system of wholesale prices governing energy flows between

countries. Interconnections have thus become links between marketplaces and the support of hedging products. As a result of these developments, the link between infrastructure and supply contracts has tended to loosen. In this context, system operators have a fundamental role, since they ensure consistency between the contractual and physical spheres.

Box 1: The evolution of the objectives of European legislative packages

Since the first energy package that marked the beginning of the opening up of the energy sector to competition, the European objectives have evolved towards a better recognition of the challenges of sustainable development, which is embodied in the package "Clean energy for all Europeans" and in the European Green Deal. The main objective of the 1996⁴ and 1998⁵ Directives was the creation of a competitive market, with the environment being present only as a secondary consideration, as a principle to be protected in the same way as the consumer and security of supply. This objective was broadened in the second package of 2003, under the formulation of a competitive, secure and environmentally-sustainable market.

In parallel with the directives on the organisation of the energy sector, European climate policy has developed. The first significant step in this field is the climate-energy package, which brings together a set of acts designed to enable the European Union to achieve its objectives in the field of energy and to fight against climate change. This package sets three targets for 2020, related to reducing emissions, increasing the share of renewable energy and improving energy efficiency. Defined in 2007 and translated into the European legislation in 2009, these objectives reflect an inflexion that can be observed in the third package, where energy efficiency and energy from renewable sources appear alongside the terms of the fight against climate change.

In 2014, the European Union strengthened its energy and climate objectives with, on the one hand, the introduction of the Energy Union into the European Strategic Programme by the Council and, on the other hand, the definition of climate and energy objectives for 2030. In May 2019, the fourth package, "Clean energy for all Europeans", was a further step towards completing the review of European energy policy to integrate the transition to clean energy and the commitments arising from the Paris Agreement.

¹ Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, "The European Green Deal", 11 December 2019, COM(2019) 640 final: https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF

² Directive (EC) 96/92 of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0092:EN:HTML>

³ Directive (EC) 98/30 of the European Parliament and of the Council concerning common rules for the internal market in natural gas: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31998L0030&qid=1593607978617&from=EN>

⁴ Ibid.

⁵ Ibid.

The market models implemented for gas and electricity have strong similarities in terms of overall architecture. However, there are energy-specific constraints that have been taken into account in the network codes and guidelines implemented since 2009. Detailed rules on the different aspects of third-party access to the network (transmission capacity allocation, balancing, technical compatibility, pricing rules, etc.) have been developed in compliance with the provisions of the 2009 gas⁶ and electricity⁷

1.1.3 Clean Energy Package: the ambition of a coherent framework at the price of over regulation?

The CEP is a set of eight legislative acts, four directives and four regulations, which amend pre-existing texts with a view to ensuring consistency and complementing them, in particular by enhancing the security of electricity supply. Drawing lessons from the difficulties encountered during the winter of 2016-2017 and from the capacity mechanisms established by several member states, this legislative package includes provisions to ensure that production capacities comply with requirements while limiting, as far as possible, distortions of competition. The Commission has indeed committed itself to preserving the principle of an "energy only" market, according to which investment incentives should be derived from market prices (and in particular their volatility in times of supply-side stress).

With regard to energy transition, in addition to the texts on energy efficiency, which aim to reduce energy consumption by at least 32.5% by 2030, the CEP reinforces the obligations of member states for renewable energy by setting their share at 32% at least of their gross final energy consumption by 2030. As this is a collective target, the member states must organise themselves to share the effort to achieve this, by drawing up "National Energy and Climate Plans" (NECPs). These plans,

regulations. Translating the ambition of integration specific to the third package has therefore required very important work on the definition and then on the implementation of harmonised rules on access to interconnections, work that is very advanced but still not completed after a decade. At a time when the energy framework is undergoing profound change, it is essential that the regulations remain sufficiently flexible to accompany the changes and allow national specificities to be taken into account.

framed by the 2018 EU Regulation on the governance of the Energy Union and climate action⁸ are being discussed with the Commission with a view to achieving realistic but sufficiently ambitious national targets.

With regard to the electricity market, the CEP consists of a directive and two regulations that strengthen its European dimension. A number of network codes adopted within the framework of the third package have been taken over or even strengthened. Interconnection capacities even acquired a new political dimension on this occasion, with the objective of making 70% of physical capacities available to the market. The powers of ACER were also confirmed in the new 2019 regulation⁹ with, however, a rebalancing of decision-making powers between the Director and the Board of Regulators. Other important changes include provisions strictly framing the capacity mechanisms by limiting their deployment to cases where problems of matching supply and demand are identified. They provide for methodologies based on concepts such as the value of the undistributed energy. This is supposed to ensure the economic relevance of choices. Ultimately, these rules are very complex, which may lead to over-regulation at the expense of innovation.

Table 1 List of directives and regulations comprising the Clean Energy Package

Date	Directives and regulations
30 May 2018	Energy Performance of Buildings Directive (EU 2018/844) amending Directives 2010/31/EU and 2012/31/EU
21 December 2018	Renewable Energy Directive (recast) (EU 2018/2001)
21 December 2018	Energy Efficiency Directive (recast) (EU 2018/2002) amending Directive 2012/27/EU
21 December 2018	Energy Union Governance Regulation (EU 2018/1999)
5 June 2019	Regulation on risk-preparedness in the electricity sector (EU 2019/941) repealing Directive 2005/89/EC
5 June 2019	ACER Regulation (recast) (EU 2019/942)
5 June 2019	Regulation on the internal market in electricity (recast) (EU 2019/943)
5 June 2019	Directive on the internal market in electricity (recast) (EU 2019/944) amending Directive 2012/27/EU

⁶ Regulation (EC) 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) 1775/2005: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0715&from=DA>

⁷ Regulation (EC) 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) 1228/2003: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0714&from=EN>

⁸ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the governance of the Union with regard to energy and climate, amending Regulations (EC) N°663/2009 and (EC) N°715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Directives 2009/119/EC and (EU) 2015/652 of the Council and repealing Regulation (EU) 525/2013 of the European Parliament and of the Council: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1999&from=EN>

⁹ Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing an Agency for the Cooperation of Energy Regulators of the European Union (recast): <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0942>

1.2 Renewing the assessment of interconnection projects

Recognising the central role of networks in European energy policy and the objective of completing the internal market, the third package introduced the obligation for transmission system operators to prepare ten-year network development plans (TYNDP) at national and European levels.

At national level, this exercise is supposed to be carried out every two years by electricity transmission system operators (TSOs) and every year for gas TSOs. It consists of identifying the main infrastructures to be built or reinforced in the next ten years, listing the investments decided or to be made within three years and presenting a provisional calendar for all the

proposed projects. After consultation with market players, the implementation of the ten-year plans is monitored and evaluated by the regulatory authority.

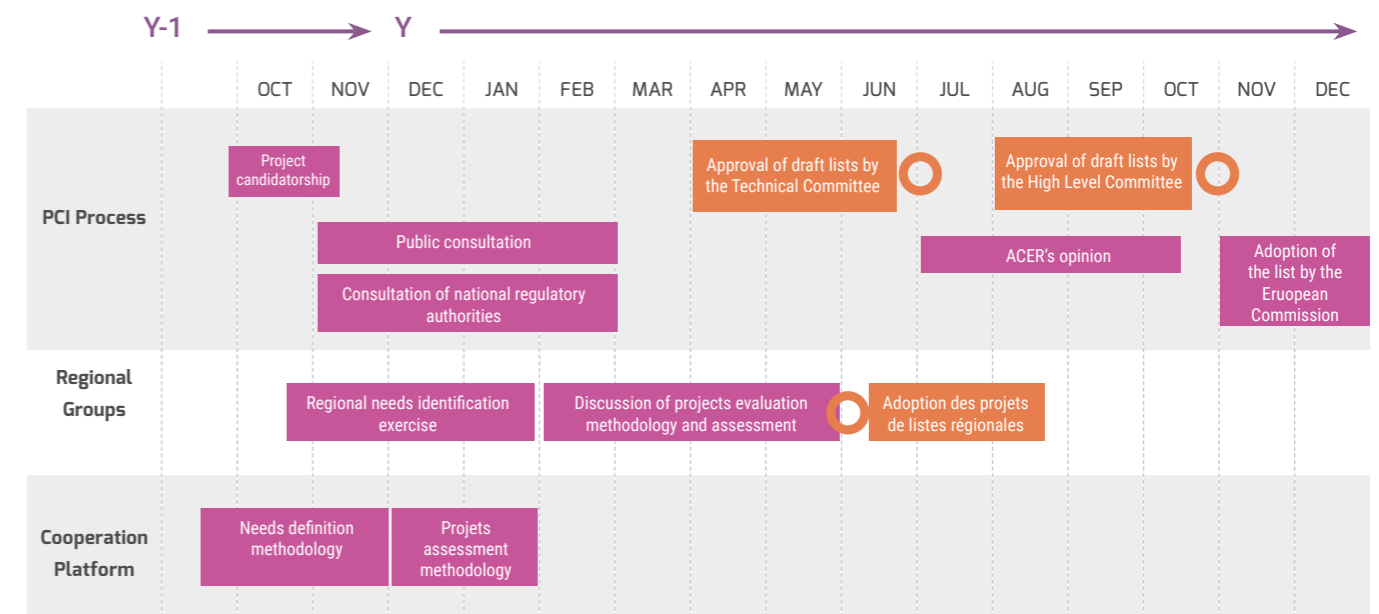
A non-binding European network development plan is also drawn up every two years by the European networks of electricity and gas TSOs, respectively ENTSO-E (European Network of Transmission System Operators for Electricity) and ENTSOG (European Network of Transmission System Operators for Gas). The third European legislative package requires national regulatory authorities to ensure consistency between the national and European ten-year plans.

1.2.1 Towards an integrated vision of interconnection projects

The 2013 Trans-European Energy Networks Regulation (known as the "infrastructure package")¹⁰ has given a new dimension to the TYNDP by making it the main tool for assessing projects applying for the Project of Common Interest (PCI) status. The cost-benefit analyses (CBAs) developed for this purpose, however, require the consideration of time horizons well beyond

the ten years originally envisaged. Since its adoption in 2013, the Regulation has contributed to the commissioning of 30 projects and 75 more are expected to be completed by 2022. The fourth selection round of the PCIs was completed with the adoption of a new list on 11 March 2020¹¹.

Figure 1 Selection process for projects of common interest (indicative timetable)



¹⁰ Regulation (EU) 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision 1364/2006/EC and amending Regulations (EC) 713/2009, (EC) 714/2009 and (EC) 715/2009: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:115:0039:0075:EN:PDF>

¹¹ Technical information on Projects of Common Interest accompanying Commission Regulation (EU) 2020/389 final of 31 October 2019 amending Regulation (EU) 347/2013 of the European Parliament and of the Council on guidelines for trans-European energy infrastructure as regards the Union list of projects of common interest: https://ec.europa.eu/energy/sites/ener/files/technical_document_4th_pci_list.pdf

The revision of the infrastructure package, confirmed by EU Energy Commissioner Kadri Simson at her hearing before the European Parliament's Industry, Research and Energy Committee (ITRE) on 4 December 2019, has been launched by the European Commission and should lead to a new legislative proposal by the end of 2020¹². The aim is to adapt the Regulation to the new priorities set out in the Green Deal. For example, the relevance of the infrastructure categories and priority corridors, the selection criteria (including the quantification of the environmental impact of projects) and the conditions for funding by the Connecting Europe Facility (CEF).

After an initial phase of implementation of the Regulation, which enabled the validation of numerous interconnection projects necessary for the construction of the internal market, CRE considers that the PCI selection process must now evolve to be more selective and guarantee the effective implementation of only those projects that are most useful to the European community. To achieve this, CRE considers that one of the challenges will be to

amend the governance associated with the validation of projects in order to strengthen the role of regulators in the assessment and approval of projects. Fundamentally, two challenges appear in the context of energy transition: the first will be to ensure that diversified scenarios are taken into account, making it possible to show the contribution of projects in several possible futures of the energy system, which will have to be modelled in an integrated manner. The second will be to integrate the environmental benefits and impacts of projects when assessing their social value, an assessment that needs to be robust and reliable on a pan-European scale. On 12 June 2020, CRE contributed to the European Commission's public consultation on the roadmap for the revision of the guidelines for trans-European energy infrastructure¹³.

“
CRE considers that the PCI selection process must now evolve to be more selective.”

1.2.2 Numerous indicators to characterise projects' environmental value

Since their creation in 2008 and 2009, ENTSO-E and ENSTOG have each developed their own network planning tools according to their own criteria but with one thing in common: interconnections are assessed mainly on the basis of the gains in terms of production or supply costs that they enable at a European scale.

This modelling is based on projections of gas and electricity consumption, the electricity generation mix, as well as fuel and CO₂ prices. While ENTSO-E and ENSTOG used different projections in the first editions of the TYNDP (2012, 2014 and 2016), the Commission invited them to develop common modelling of electricity and gas systems. This has led to the development of common scenarios for the TYNDP 2018, which represents the first step towards an integrated representation of electricity and gas networks. However, further progress are still needed to achieve an effective common modelling.

In this context, CRE stresses the importance of ensuring that scenarios are developed in complete neutrality with regard to particular interests or certain technological choices. With regard to the exercise conducted in 2019, in spite of the workshops and consultations with stakeholders, the definition of long-term trends remained the responsibility of the TSOs. Despite better coordination between electricity and gas operators, the assumptions underlying these scenarios are not sufficiently

explained. Leaving the development of scenarios, needs analysis and project assessment to TSOs alone introduces the risk of a bias towards infrastructure construction where other solutions might be better suited.

Characterising the projects' environmental value

While the reduction in supply costs has been used as the basis for calculating the value of interconnection projects, for both electricity and gas, the existence of additional benefits in terms of greenhouse gas emissions or security of supply is already recognised, but their assessment remains incomplete and subject to significant methodological biases.

Thus, there are increasing efforts to quantify and monetise extra-financial benefits, which is reflected in an increase in the number of indicators in cost-benefit analysis (CBA) methodologies. However, the choice of relevant indicators is still under debate, particularly with regard to the sustainability of gas. Taking into account new types of innovative projects is also a challenge, on the one hand because CBA methodologies are not adapted to their characteristics and on the other hand because they are associated with more uncertainty. Work on the Green Deal should allow for the emergence of guidelines in this regard.

CRE considers that it is fundamental that the contributions of interconnections to reduce greenhouse gas emissions, reduce losses on the grid if necessary and increase the security of supply of member states should be taken into account more rigorously. In particular, the value of CO₂ emissions taken into account in CBAs must be consistent with the long-term price forecasts for the European CO₂ market¹⁴. Analytical methods must also accurately assess the redistributive effects between member states, and between consumers and producers within countries, which can sometimes be very significant.

Moreover, the economic evaluation of the positive externalities of interconnections remains a complex exercise and is very sensitive to methodological choices. There is a risk in aggregating benefits that may be redundant and qualitative analyses cannot become the sole justification for projects. Quantification and monetisation must be based on scientifically-proven methods which are the subject of a consensus at European level.

1.3 The internal market, a project nearing completion

1.3.1 The third package: harmonisation of rules, a collective process led by regulators

1.3.1.1 In the electricity sector: from short to long term, integration is progressing

The third package, adopted in 2009, has set out the main guidelines for the integration of European electricity markets¹⁵. It has defined reference models for the different electricity market timeframes, also called target models, to accompany the completion of the internal electricity market. The objectives of the internal market are to enhance price competitiveness through more efficient use of generation units, to support energy transition and to promote security of supply. Electricity interconnections are a key element of this.

In this perspective, Regulation 714/2009¹⁶ aimed at strengthening cross-border trade in electricity. In particular, it provided for the harmonisation of national network operation practices and the coordination of interconnection operation processes. Several network codes and guidelines, set out below in Figure 2, have been adopted between 2015 and 2018 under this Regulation. They provide a central role to wholesale markets and electricity interconnections.

For the deployment of the network guidelines, the TSOs and/or the market coupling operators (NEMO – nominated electricity market operator) coordinate to jointly develop proposals for methodologies to be applied at national, regional or European levels. For France, nearly 90 methodologies have been developed as a result of the guidelines ruling market and interconnection operation (FCA, CACM and EB)¹⁷. By mid-2020, more than 90% of the CACM Regulation's implementation methods had been

approved, almost 70% for the FCA Regulation and just over half for the EB Regulation. It should be underlined that more than 80% of the regional and European methodologies were unanimously adopted by the concerned regulators. Thus, although disagreements on certain topics led to the transfer of some 20 decisions to ACER, the implementation of network guidelines is a concrete expression of the quality of consultation, cooperation and compromise between European regulators.

A large part of the regulatory framework to enhance cross-border trade in electricity has therefore been adopted. In the day-ahead and intraday timeframes, a significant number of member states are integrated into the coupling of European markets¹⁸. The development of an internal market for balancing is initiated, through the creation of European balancing exchange platforms. The optimisation of cross-border electricity trading thus makes it possible to benefit from synergies between generation mixes and national demand structures, to promote the integration of renewable energies through the geographical multiplication of sources and to strengthen the resilience of national electricity systems.

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The creation of European balancing exchange platforms has initiated the development of an internal market for balancing.”

¹² Opening remarks from Commissioner Simson at the ITRE Committee: «The energy-related elements of the European Green Deal & 2020 energy policy priorities», 23 January 2020: https://ec.europa.eu/commission/commissioners/2019-2024/simson/announcements/opening-remarks-commissioner-simson-itre-committee-energy-related-elements-european-green-deal-2020_en

¹³ CRE's contribution to the European Commission's roadmap for the revision of the guidelines for trans-European energy infrastructure: <https://www.cre.fr/en/Documents/Presse/Press-releases/the-cre-contributes-to-the-new-trans-european-guidelines-on-energy-infrastructure>

¹⁴ CRE's public consultation n°2020-005 of 5 March 2020 relating to RTE's transmission network 10-year development plan, elaborated in 2019 (in French): <https://www.cre.fr/content/download/22058/279939>

¹⁵ Some of the provisions for the integration of European electricity markets have been further elaborated in the "Clean energy for all Europeans" package, which is the subject of section 1.3.2 of this report.

¹⁶ Regulation (EC) 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) 1228/2003: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32009R0714&from=EN>

¹⁷ CRE published a table monitoring the instruction of methodologies resulting from the European guidelines on electricity networks on its webpage dedicated to network codes (in French): <https://www.cre.fr/Electricite/Reseaux-d-electricite/codes-de-reseau-europeens>

¹⁸ Concrete progress in the implementation of methodologies for calculating and allocating capacity at the day-ahead, intraday and balancing timeframes is described in sections 2.2.3, 2.2.4 and 2.2.5 of this report.

Figure 2 The electricity network codes and guidelines families

Network codes related to the connection to the power grid are not covered in this report.

Because of the close intertwining of the various processes related to network and market operation and the broad geographic scope of coordination, the TSOs and/or the NEMOs deal with complex technical and organisational issues when implementing methodologies. The delay of some key features, such as a grid model common to all European TSOs¹⁹, has a cascading effect on other Processes that will be developed on the basis of these elements. As a result, European markets are still heavily dependent on voluntary initiatives that existed before the network codes and guidelines, as illustrated by flow-based market coupling in Central-Western Europe (CWE). The effective and timely implementation of the methodologies, which is a real challenge for the TSOs and/or the NEMOs, must therefore continue to be supported and encouraged by European regulators.

Moreover, while the methodologies have generally allowed the establishment of rules that balance the need to harmonise practices at regional or European levels with the need to accommodate national specificities, some could be considered as having led to excessive uniformity. This is for example the case with the obligation made to European TSOs and NEMOs to forego the functionality of the coupling algorithm ensuring consistency between import-export positions and price levels. Features such as the scheduling approach, congestion management or activation of reserves also remain national prerogatives. CRE will continue to promote the best possible balance between the level of harmonisation necessary for European integration and the upholding of certain features of national models, when the transition costs would be much higher than the expected benefits.

1.3.1.2 In the field of gas, a high level of harmonisation of rules to support cross-border integration

Four natural gas network codes

In the case of natural gas, the implementation of the third legislative package and the network codes which it provided for, represented a decisive step in the integration of the European market, in particular by harmonising the rules on access to interconnections. The market model put in place, which is close to the design of the electricity market in its philosophy, now articulates interconnections and marketplaces, thus allowing the wholesale price to guide flows between countries.

The market model known as “hub-to-hub” described by the Council of European Regulators since 2011, has been translated into concrete terms in the first network code on the allocation of interconnection capacity between market areas (Regulation (EU) 984/2013 of 14 October 2013, repealed by Regulation (EU) 2017/459 of 16 March 2017 establishing a network code on capacity allocation mechanisms in the gas transmission networks, known as the “CAM” – capacity allocation mechanism – code). This code marked a decisive step by harmonising the rules for allocating cross-border capacity, the nature of capacity products and by generalising the “entry-exit” system around a virtual hub. These rules were supplemented in 2017 by provisions relating to the offer of additional capacity (known as “incremental” capacity). Today, capacities are marketed, for each timeframe, through simultaneous auctions organised by the PRISMA Platform²⁰. The auctions conducted in 2018 and 2019 show that few interconnections are currently congested, which translates into a very high level of price convergence between European hubs. In the market monitoring report (MMR) published in October 2019²¹, ACER and CEER therefore note that most of the time the wholesale gas price spread is lower than the cost of transport between market places. In 2018, the price spreads between the most liquid hubs (including the Dutch TTF) and the other European marketplaces were most of the time below €1 per MWh, whereas spreads sometimes exceeding €5 per MWh were not uncommon a few years ago.

The second code, which deals with network balancing (EU Regulation (EU) 312/2014 of 26 March 2014 on the establishment

of a network code on the balancing of gas transmission networks, known as the “BAL” – balancing – code) consists of implementing market balancing at the European level. Its principle is, for both market players and network operators, to use wholesale markets to manage the balance between gas injections into the networks and gas consumption by end customers. This code has accompanied the increase in volumes traded on the hubs.

A third code concerns the interoperability of networks (EU Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules, known as the “INT” – interoperability – code). Its aim was to remove certain obstacles due to technical incompatibilities. It deals in particular with interconnection agreements or gas odourisation.

“
The implementation of network codes represents a decisive step in the integration of the European market.”

The fourth and latest code concerns the harmonisation of tariff structures (Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on the harmonisation of gas transmission tariff structures, known as the “TAR” – tariff – code). It aims at improving the transparency of gas transmission tariffs within the European Union and, above all, to avoid any discrimination between shippers. In particular, the code complements the CAM network code which introduced allocation rules via explicit auctions with a reserve price, in order to determine a method for calculating this reserve price which ensures in particular that there are no cross-subsidies between domestic transport and transit. Without imposing a single calculation method, the TAR code requires regulators to justify the choice of the tariff structure implemented. A single methodology must be applied within the same balancing zone, respecting the principle that cross-border flows and flows for domestic consumption are treated in an equivalent manner. The code describes a reference methodology, based on capacity and distance as weighting factors (known as the “capacity-weighted distance” or CWD method) to which the price structures of each TSO shall be compared. Finally, the TAR code reinforces and harmonises transparency and consultation obligations.

¹⁹ The common grid model, which corresponds to the harmonisation of the representation of networks and production units at a pan-European level, should have been available from mid-2018. Its actual implementation is currently planned for the second half of 2021.

²⁰ UHowever, a competing platform to PRISMA has been established on the borders between Poland and Germany and between Poland and the Czech Republic.

²¹ ACER-CEER Market Monitoring Report (MMR) 2018: <http://www.acer.europa.eu/en/Electricity/Market%20monitoring/Pages/Current-edition.aspx>

Box 2: Implementation of the network code on the harmonisation of gas transmission tariff structures

The TAR code provides that regulatory authorities shall submit their draft tariff structure for public consultation. ACER verifies its compliance with the TAR code and publishes a review report recommending, when necessary, adjustments before the actual implementation of the tariff structure.

In France, CRE conducted four public consultations in 2019 in the context of its preparatory work on the ATRT7 tariff (third-party access to the natural gas transmission system), which came into force on 1 April 2020. In particular, from 23 July to 4 October 2019²², CRE carried out a consultation on all matters (level and structure of the tariff) relating to the ATRT7 tariff period, which met broad participation (91 responses received). In accordance with the provisions of the TAR code (Article 27), it was forwarded to ACER which issued its opinion on 4 December 2019²³. In its review report, the Agency concluded in particular that CRE's public consultation is complete within the meaning of the code, but that some of the information published would have benefited from being more detailed (particularly regarding the flow scenarios used) and that the method used to calculate the reference price complies with the principles of transparency and non-discrimination established by the code.

As recommended by ACER in its opinion, CRE supplemented the information it had published on certain subjects (including the flow scenarios used, the simplified tariff model, the justification for the 10% tariff differentiation applied at interconnection points between transmission networks and LNG terminals – PITTM) in its final tariff decision of 23 January 2020²⁴.

This decision led in 2020 to a change of +0.2% at entries to IPs (network interconnection points), of -4.5% at PITTM, of +3.2% at exits towards regional networks, of -5.4% at the Oltingue exit and of -6.8% at the Pirineos exit.

More generally, the feedback on the implementation of the tariff code, in particular from ACER in its report published on 6 April 2020²⁵, showed the need to read the code in the light of reaching the objective of non-discrimination. As regards the regional networks, which are used exclusively for the needs of French consumers, CRE thereby classified them as "ancillary services", thus excluding their costs from the basis used to determine the tariff terms at IPs, PITTM or PITSS (points of interconnection between transmission systems and storage facilities). CRE's objective is to exclude any risk of cross-subsidies between domestic users and cross-border users (who only use the main network, from an entry IP to an exit IP). In its review report on CRE's public consultation, ACER had considered that this solution appeared to be contrary to the provisions of the TAR code, adopting a broad interpretation of the concept of "transmission services", which the code defines as "regulated services that are provided by the transmission system operator within the entry-exit system for the purpose of transmission". CRE welcomes the fact that in its report of April 2020, the Agency indicates that the solution adopted by CRE may constitute an alternative option when regional networks are not part of the entry-exit system. ACER proposes that further work be carried out at European level to define a common doctrine.

Also, CRE has followed with interest the tariff development processes of its European neighbours and especially of those countries with which it is directly interconnected. The application of the code has led to a significant improvement in tariff transparency. Although it is difficult at this stage to assess the application of the TAR code and its impact on tariff levels in Europe²⁶, it is nonetheless worth noting that some changes in the methodologies lead to very significant tariff movements.

Some of these movements raise a question about the compliance with the principles of the TAR code, in particular those relating to the cost reflectivity and the absence of cross-subsidies between categories of users. For example, the methodology applied by the German regulator (Bundesnetzagentur or BNetzA) led in 2020 to a +82% increase in the exit tariff from the German network to France at the Medelsheim IP. This issue was pointed out by ACER which states in its report²⁷ on BNetzA's public consultation that the magnitude of tariff changes (i.e. significant increases in tariffs for cross-border capacity and decreases in tariffs for domestic capacity) raises concerns about the compliance with the principles of cost reflectivity, absence of cross-subsidies and non-distortion of cross-border flows.

CRE has continuously contributed to BNetzA's work and consultations and has stressed that such developments were unacceptable.

²² CRE's public consultation n°2019-013 of 23 July 2019 relating to the new tariff for the use of natural gas transmission networks GRTgaz and Teréga: <https://www.cre.fr/en/Documents/Public-consultations/New-tariff-for-the-use-of-natural-gas-transmission-networks-GRTgaz-and-Terega>

²³ ACER, Analysis of the Consultation Document on the Gas Transmission Tariff Structure for France: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/Agency%20Report%20-%20analysis%20of%20the%20consultation%20document%20for%20France.pdf

²⁴ CRE's deliberation of 23 January 2020 deciding on the tariffs for the use of GRTgaz's and Teréga's natural gas transmission networks: <https://www.cre.fr/en/Documents/Deliberations/Decision/tariffs-for-the-use-of-grtgaz-s-and-terega-s-natural-gas-transmission-networks>

²⁵ ACER, The internal gas market in Europe: The role of transmission tariffs: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/The%20internal%20gas%20market%20in%20Europe_The%20role%20of%20transmission%20tariffs.pdf

²⁶ ACER's report of 6 April 2020 does not allow any conclusion to be drawn as to the effect of the application of the code on the evolution of tariff levels: very different degrees of variation can be seen from one country to another, in one direction or the other. For example, tariffs at domestic points increased in half of the cases analysed, and decreased in the other half. While some countries are experiencing very moderate tariff evolutions, others have decided on very significant tariff evolutions at IPs, which may be due to sometimes major tariff overhauls (both in level and structure), as in the Netherlands or Germany.

²⁷ ACER, Analysis of the Consultation Document on the Gas Transmission Tariff Structure for Germany: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/Agency%20report%20-%20analysis%20of%20the%20consultation%20document%20for%20Germany.pdf

1.3.2 The Clean Energy Package, a decisive step or simply an extension of the third package?

In its presentation in 2016, the European Commission was very clear about the ambitions of its proposals for the new legislative package: to make the European Union the world leader in energy transition while modernising the European economy. The consumer is at the centre of the package, with the aim of guaranteeing access to competitive energy and enabling it to become an energy supplier, but also to protect vulnerable consumers. The price signal remains the cornerstone of the functioning of the European market, both for the organisation of flows and for ensuring the long-term balance between means of production and needs.

While the ambitions are laudable, questions remain. Indeed, the CEP included within the Regulation 2019/943²⁸ a number of provisions of technical nature contained in the network codes and guidelines adopted in the context of the implementation of the third legislative package. The aim was to "incorporate in a single European Union legislative act the fundamental principles of market functioning and capacity allocation in the temporal framework of the balancing, intraday, daily and forward market". The will to streamline the functioning of the market while dealing with the uncertainties inherent in the development of renewable energies is clear, giving priority to the internal market and cross-border integration. The objective is to promote the increase in renewable energy production by expanding the market opportunities beyond borders, bearing in mind, however, that trade is not, strictly speaking, about renewables, but about the possible surpluses that they give rise to on national markets. In this respect, Directive 2019/944²⁹ and Regulation 2019/943, both devoted to the internal electricity market, strengthen the provisions on cross-border coordination, for example with new provisions on regional coordination centres. In general, the level of technical requirements has been strengthened and new network codes could be implemented. In fact, the CEP raises very concrete implementation issues, some of which resemble a technical translation of policy guidelines, sometimes without problems and difficulties having been identified. This is the case, for example, of the adequacy provisions or the 70% cross-border capacity rule.

Adequacy provisions

Regulation 2019/943 stipulates that prices resulting from the confrontation between supply and demand should be the main driver for investment in flexibility sources. However, it recognises that specific measures can be taken to ensure the adequacy of the production means, such as capacity mechanisms, but within a strict context in order to limit market distortions as much

as possible. The Regulation therefore provides for a series of methodologies to be proposed by ENTSO-E and subsequently approved by ACER. In the face of the ambitions, it is necessary to develop a pragmatic approach. For example, ENTSO-E is to carry out an annual EU adequacy study based on a unified market modelling methodology. This exercise requires the definition of key parameters such as the value of energy not served or the cost of entering the market for a new generation plant. However, beyond concepts, it is essential to take into account the physical realities of the power system, in particular the practical limits of the flexibility that can be mobilised by network users. The Regulation also provides for national capacity mechanisms to take into account the participation of generation capacities located in other EU countries, a provision that needs to be addressed by a pan-European methodology. However, the French experience shows the complexity of this provision and, in particular, the need for reciprocity in the mechanisms put in place by each country, while taking into account differences that may exist between the capacity mechanisms existing in Europe. It is on this condition that the contribution of interconnections to the security of supply can be better exploited.

The example of the 70% rule

Regulation 2019/943 also leads to far-reaching changes in capacity calculation. Noting the insufficient level of use of electricity interconnections in recent years, European legislators have introduced several provisions in this regulation, which aim to increase the capacity made available for cross-border trade. TSOs are therefore required to guarantee a minimum level of 70% of the network capacity for cross-border trade by the end of 2025. A bidding zone configuration review process, in addition to that already required by the CACM Regulation, has also been launched, to assess the consistency of existing bidding zones with the congestions observed on the networks. As the latest ENTSO-E technical study³⁰ identified no structural congestion on RTE's network, CRE considers that France should not be concerned by the study of alternative configurations in this review process.

The obligation to make at least 70% of the network capacity available for cross-border trade represents a paradigm shift from the original concept of capacity calculation. So far, based on the observation of flows on their internal networks, the TSOs had to maximise interconnection capacities while respecting operational security limits. With the introduction of a minimum level of 70%, an obligation of means was thus replaced by an obligation of result. While the optimisation of cross-border exchange capacities

²⁸ Règlement (UE) N°2019/943 du Parlement européen et du Conseil du 5 juin 2019 sur le marché intérieur de l'électricité : <https://eur-lex.europa.eu/legal-content/FR/TXT/HTML/?uri=CELEX:32019R0943&from=FR>

²⁹ Directive (UE) 2019/944 du Parlement européen et du Conseil du 5 juin 2019 concernant des règles communes pour le marché intérieur de l'électricité et modifiant la directive (UE) N°2012/27 : <https://eur-lex.europa.eu/legal-content/FR/TXT/HTML/?uri=CELEX:32019L0944&from=FR>

³⁰ Bidding Zone Configuration Technical Report 2018 de l'ENTSO-E : https://docstore.entsoe.eu/Documents/Events/2018/BZ_report/20181015_BZ_TR_FINAL.pdf

is an objective that has always been supported by CRE, CRE considers that the implementation of this minimum level must be carried out in a pragmatic and proportionate manner. Indeed, its uniform application for all elements of the network and in all situations does not make it possible to efficiently increase interconnection capacities³¹.

The minimum level of 70% came into force on 1 January 2020, unless the TSOs have been granted a temporary derogation coordinated at CCR level, or if member states have launched an action plan. This approach, currently being implemented by Germany, the Netherlands and Poland, includes a series of measures to address structural congestion to reach the minimum level of 70% by the end of 2025. In the absence of structural congestion on its network, France has not launched an action plan. However, as the implementation of the minimum level of 70% requires the development of several operation tools, CRE has granted RTE a six-month derogation in the Core region, repeated once, and a one-year derogation in the Northern Italian Borders (NIB) and South-Western Europe (SWE) regions³².

Expanded prerogatives for ACER

The governance rules strengthen the role of ACER. Where the consensus of the regulatory authorities was necessary, ACER is now responsible from the outset for the validation of pan-European

methodologies. Regulation 2019/942³³ underlines the risks of fragmentation of national decision-making. It therefore gives the Agency broader prerogatives to settle disagreements between national regulators on the implementation of network codes and guidelines and to supervise European and regional entities. The reinforcement of ACER's powers is accompanied by changes to the decision-making rules, which will have to be approved by the Council of Regulators, which until then only had an advisory role. The latter can now also issue opinions on the texts submitted by the Director, or even propose amendments.

This balance in decision-making needs to be welcomed. However, it cannot hide the challenge of the future increase in the number and complexity of decisions that ACER will have to make. If the implementation of the third package is not yet completed, the very detailed technical requirements of the CEP risk making the market organisation more rigid. ACER will therefore have the responsibility, in these decisions, to provide the necessary flexibility to accompany an electricity system subject to the upheavals of the energy transition.



THE STAKES OF REDISPATCHING AND COUNTERTRADING UNDER THE CLEAN ENERGY PACKAGE

The identification and resolution of network congestions are the pillars of the operational management by the TSOs of the electricity system. To that aim, TSOs act upstream of the markets, by calculating exchange capacities between zones, and downstream, by carrying out security analyses and triggering remedial actions. The latter can be costly (redispatching and countertrading) or inexpensive (topological remedial actions). Historically, these actions were largely unilaterally decided by each TSO. The further integration of European markets requires increased cooperation and coordination of these actions at the interfaces between TSOs in different countries. The CACM Regulation contains detailed provisions to achieve this.

In particular, it provides for the coordination and sharing of the costs of redispatching and counter-trading with cross-border relevance. CRE supports increased cooperation and solidarity between member states. Nevertheless, several key aspects need to be taken into account.

First of all, increased congestions were observed in recent years in a number of European countries such as Germany, the United Kingdom and Spain. They are largely explained by national policies on the evolution of the energy mix. In particular, a rapid and massive energy transition, accompanied in the case of Germany by an accelerated nuclear power phase-out, is disrupting for electricity flows and putting the concerned networks under strain. When these networks do not benefit from the developments necessary to adapt to these changes, major congestion situations arise and lead to an explosion in the costs of remedial actions. In the three countries mentioned, these costs have increased fivefold between 2013 and 2017. In Germany alone, these costs exceeded 1 billion euros in 2018. By way of comparison, they were only around 10 million euros in France.

In addition, these congestions also have a significant impact on the capacities offered at interconnections. Indeed, when elements of the internal networks are already saturated, they can no longer accommodate the electricity flows generated by cross-border trade. Such a situation of capacity "shortage" is particularly observed at Germany's borders: as renewable energy production is located in the North of the country while consumption is rather concentrated in the South, there are very significant North-South physical flows. Given the inadequacy of Germany's internal network to handle these flows, they partly transit through neighbouring networks (e.g. via the Netherlands, then Belgium and France) and further saturate the trade exchange capacities at Germany's borders as well as the internal networks of these neighbouring countries. For example, in the Central-Western European (CWE) region, frequent cases of very limited cross-border trade due to heavy congestion in the German network led regulators to impose in April 2018 a minimum margin of 20% to be reserved for cross-border trade.

In this context, CRE is very vigilant in developing methodologies to coordinate and share the costs of these remedial actions. The very great disparity in these costs between member states is the result of significant differences in energy policies and in particular in the levels of investment in the networks of each member state. In France, the costs of redispatching and countertrading are low due to the size and consistency of the investments made to date in the transmission system. Over the last ten years, RTE has invested almost 14 billion euros (of which 12 billion euros in its transmission networks). As the levels of these investments are largely defined at the national level, CRE will ensure that the redispatching and countertrading methodologies do not place an undue burden on the French consumer. Only a fair approach can ensure that the necessary investment is made and that satisfactory levels of cross-border trade are restored. This is also the objective of Regulation 2019/943³⁴ which makes member states responsible for their structural congestion.

³¹ CRE's position on this subject can be found in CRE's contribution to the European Commission's Green Deal, detailed in the Position Paper No. 9 "Challenges of the use of electrical interconnections": <https://www.cre.fr/en/media/File/autres/fiche-europe-1>

³² CRE's deliberation dated 12 December 2019 granting derogations from the minimum levels of available capacity for cross-zonal trade in the Core, Italy North and South-Western Europe capacity calculation regions <https://www.cre.fr/en/Documents/Deliberations/Decision/derogations-from-the-minimum-levels-of-available-capacity-for-cross-zonal-trade-in-the-core-italy-north-and-south-west-europe-capacity-calculation-renewed-on-18-June-2020>:

<https://www.cre.fr/en/Documents/Deliberations/Decision/allocation-of-a-derogation-from-the-minimum-levels-of-available-capacity-for-exchanges-between-zones-in-the-core-capacity-calculation-region>

³³ Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32019R0942&from=EN>

³⁴ Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast): <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0943&from=EN>



2. FRENCH ELECTRICAL INTERCONNECTIONS

2.1 RECENT AND FUTURE DEVELOPMENT OF ELECTRICITY INTERCONNECTIONS AT THE FRENCH BORDERS

2.2 RULES AT THE FRENCH BORDERS AND BALANCE IN THE USE OF ELECTRICITY INTERCONNECTIONS

PART 2

FRENCH ELECTRICAL INTERCONNECTIONS

2.1 Recent and future development of electricity interconnections at the French borders

CRE has a longstanding commitment for the increase of capacity at the French borders for the benefit of European grid users. Three new interconnections are currently under construction in France, with Italy (Savoy-Piedmont) and Great Britain (ElecLink and IFA2). Two other projects have also been approved by CRE: the Biscay Gulf project at the France-Spain border, approved in 2017, and the Celtic interconnection project between France and Ireland, approved in 2019. Together, these projects represent an increase in exchange capacity of 5.9 GW at the French borders. Other projects are also under consideration, as RTE notably plans to reinforce existing interconnections.

These reinforcements mainly concern the interconnections with Belgium and Germany. The Avelin Avelgem reinforcement project, which is currently under way, will increase the exchange capacity from around 0.6 GW to 1 GW, at a total cost of €140M (€40M for RTE), which, combined with the developments at Aubange, should increase capacity by 1.5 GW. Two projects are planned to increase exchange capacities between France and Germany: a voltage level increase between Muhlbach (Alsace) and Eichstetten (Baden) from 225 kV to 400 kV (resulting in a capacity increase from 150 to 300 MW), and a capacity increase of 1.8 GW between Vigy (Moselle) and Uchtelfangen (Saarland).

In total, RTE's 2019 10-year network development plan foresees a doubling of interconnection capacities by 2035³⁵. In order to ensure the financial and industrial sustainability as well as the acceptability of these projects, RTE has proposed to establish a prioritization under the form of a set of "packages". That way, the scheduling of projects is established taking into account their state of progress, the expected benefits and the risks to which they are exposed.

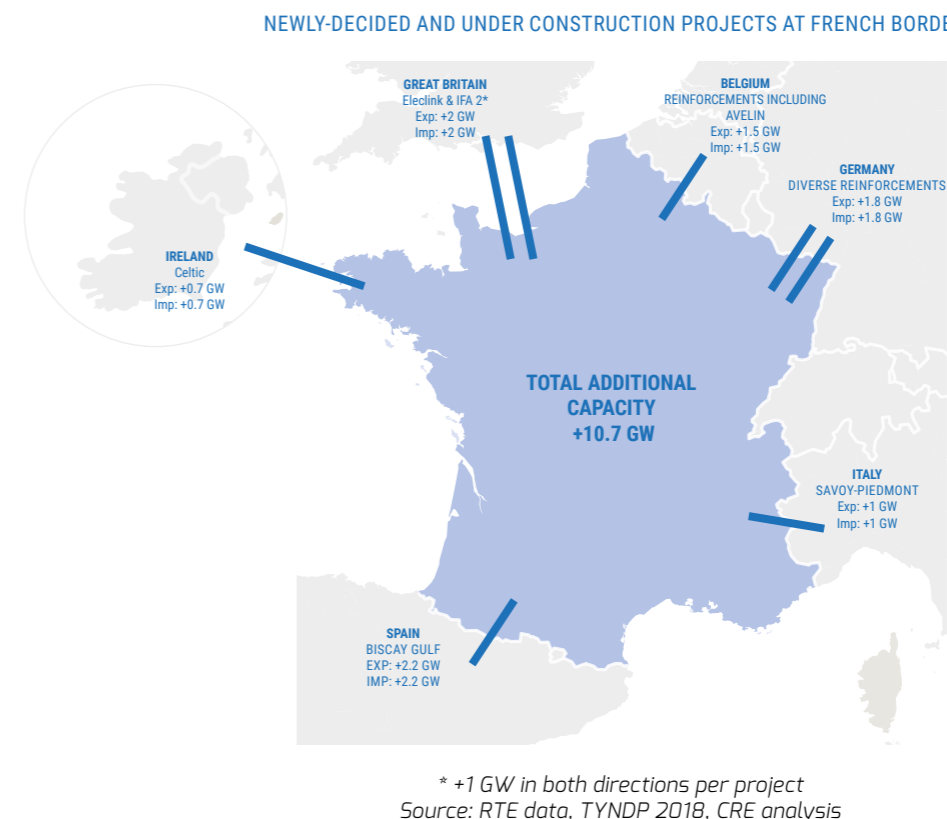


Three new interconnections are currently under construction in France, with Italy (Savoy-Piedmont) and Great Britain (ElecLink and IFA2).

³⁵ which corresponds to the implementation of packages 0 to 2, 10-year network development plan for 2019 (in French): <https://www.rte-france.com/analyses-tendances-et-prospectives/le-schema-decennal-de-developpement-du-reseau#Documents>, a summary of the report is available in English: <https://assets.rte-france.com/prod/public/2020-07/Sch%C3%A9ma%20d%C3%A9veloppement%20de%20r%C3%A9seau%202019%20-%20Synth%C3%A8se%20E2%80%93%20English%20version.pdf>



Figure 3 Development of electricity interconnections at borders, decided or currently in progress



NB: These data represent the expected nominal capacities at each border used for system planning, but are not directly comparable with the average commercial NTC on D-2 as derived from the capacity factor. The presentation aims to help understand the evolution in capacities across all French borders.

CRE supports this approach, which is relevant from an economic, financing and industrial point of view. In addition, it considers that projects that have already been decided and which present a beneficial cost-benefit analysis (CBA) should be commissioned first and foremost. Conversely, CRE considers that projects with

the United Kingdom are too uncertain at this stage and that, as regards the Spanish border, it is preferable to give priority to a successful commissioning of the Biscay Gulf project than to directly initiate new projects.

Table 2 Increase in capacity at borders according to the calendar proposed by RTE

Package	Amount	Description
Package 0	2 GW with Great Britain 1.2 GW with Italy	Projects under construction with commissioning planned over the next three years.
Package 1	2.2 GW with Spain 1.5 GW with Belgium 1.8 GW with Germany	Projects already launched or to be launched quickly, as they are cost-effective in all situations and are subject to consensus with host countries.
Package 2	1 GW with Belgium 0.7 GW with Ireland 2.8 to 3.4 GW with Great Britain 1.5 GW with Switzerland	Projects with an uncertain framework and which will be committed in the medium term if the uncertainties are resolved.
Outside the packages	3 GW with Spain 1.4 to 2 GW with Great Britain	Projects cannot be ordered for economic and social reasons.

Source: RTE data (TYNDP 2019), CRE analysis

2.1.1 A first interconnection between France and Ireland

The Celtic project, linking Knockraha and La Martyre, will be the first interconnection between Ireland and France. With a capacity of 700 MW, this 575 km direct-current power link is expected to be commissioned in 2026. The Celtic project comes in the context of Brexit, where the establishment of a direct link between the European market and Ireland has become a priority. The project will also contribute to the development of renewable energies and is expected to have positive effects in terms of security of supply. As such, the Celtic project has been recognised as a Project of Common Interest (PCI) in 2015, 2017 and 2019.

Following the investment request submitted by RTE and the Irish TSO (EirGrid), CRE and the Irish Commission for Regulating Utilities (CRU) have concluded an agreement for cross-border cost allocation of the project. The joint decision of the two regulators, taken on 25 April 2019³⁶, provides for an allocation that reflects the benefits of this interconnection for both countries.

In particular, in light of the positive externalities of the project for the European Union and the associated risks, this decision was conditioned to the obtaining a significant European subsidy, requested by RTE and EirGrid. On 2 October 2019, the European Commission granted the project financial support of €530.7M³⁷. CRE and CRU had jointly discussed the distribution of costs through the Connecting Europe Facility (CEF) thus validating the cost allocation agreement. This subsidy reflects the interest of the project in terms of solidarity and security of supply, as well as its contribution to the achievement of European energy objectives.

The consultation process prior to the implementation of the project has been completed on the French side, while the Irish consultation is still ongoing. The development phase of the project started in January 2020 and is expected to continue until 2022.

2.1.2 Projects in progress and under study with Spain and Italy

While the exchange capacity at the France-Spain border is currently of 2.8 GW, it should reach 5 GW with the Biscay Gulf project. This project was approved by CRE jointly with the Spanish regulator CNMC on 21 September 2017³⁸. It received an EU financial support of €578M. The precise route of the line is currently under revision following geological analyses of the seabed carried out by RTE and the Spanish TSO, REE. New studies are underway and the results should be available by the end of 2020.

Other interconnection projects between France and Spain are included in the new PCI list drawn up by the European Commission in accordance with the delegated Regulation (EU) 2020/389 of the European Commission of 31 October 2019³⁹. In view of the scale of the increase in exchange capacities that the Biscay Gulf project is expected to generate, CRE recommended that RTE focus as a priority on the success of this project, especially as the new projects planned across the Pyrenees are not yet ready to be implemented, considering that their socio-economic benefits are still uncertain due to uncertainties over local acceptability and the needs for reinforcements.

As regards interconnections with Italy, the construction of the Savoy-Piedmont line is close to completion. A PCI since 2013⁴⁰, the new line consists in building two direct-current cables with a capacity of 600 MW each, which will connect the substations of Grand-Ile (Savoy) and Piosasco (near Turin). The line, long of 190 km, passes through the Fréjus tunnel and follows the route of the A42 (France) and A32 (Italy) motorways. Part of the interconnection located in Italy benefits from derogations from the rules on separation of assets and from the use of interconnection revenues, granted by CRE and the Italian regulator ARERA, on the basis of Article 17 of Regulation 714/2009. A second derogation procedure for the remaining interconnection in Italy is currently under examination⁴¹. This derogation has no impact on the operation of the interconnection by Terna.

³⁶ CRE's deliberation of 10 October 2019 adopting the decision reviewing the joint decision on cross-border cost allocation for the Celtic Interconnector project: <https://www.cre.fr/en/Documents/Deliberations/Decision/cross-border-cost-allocation-for-the-celtic-interconnector-project2>

³⁷ European Commission, Completing the energy union: the EU invests €556 million in priority energy infrastructure: https://ec.europa.eu/info/news/completing-energy-union-eu-invests-eu556-million-priority-energy-infrastructure-2019-oct-02_en?pk_campaign=ENER%20Newsletter%20October%202019. The EC's decision was formally adopted on 31 October 2019: https://ec.europa.eu/inea/sites/inea/files/cef-e-2019_cid.pdf

³⁸ CRE's deliberation of 21 September 2017 adopting the joint decision on cross-border cost allocation for the Biscay Gulf project: <https://www.cre.fr/en/Documents/Deliberations/Decision/biscay-gulf-project>

³⁹ Commission delegated Regulation (EU) 2020/389 of 31 October 2019 amending Regulation (EU) 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32020R0389&from=EN>

⁴⁰ The project is not included in the 2019 PCI list as it is being finalised and no longer requires access to the provisions of Regulation (EC) 2013/347.

⁴¹ CRE's deliberation of 6 February 2020 regarding the decision on the derogation request by the company Pi.Sa.2 pursuant to Article 63 of Regulation (EU) 2019/943 of 5 June 2019 on the electricity internal market (in French): <https://www.cre.fr/Documents/Deliberations/Decision/demande-de-derogation-de-la-societe-pi.sa.2-en-application-de-l'article-63-du-reglement-ue-2019-943-du-5-juin-2019-sur-le-marche-interieur-de-l-e>

2.2 Rules at the French borders and balance in the use of electricity interconnections

2.2.1 General overview

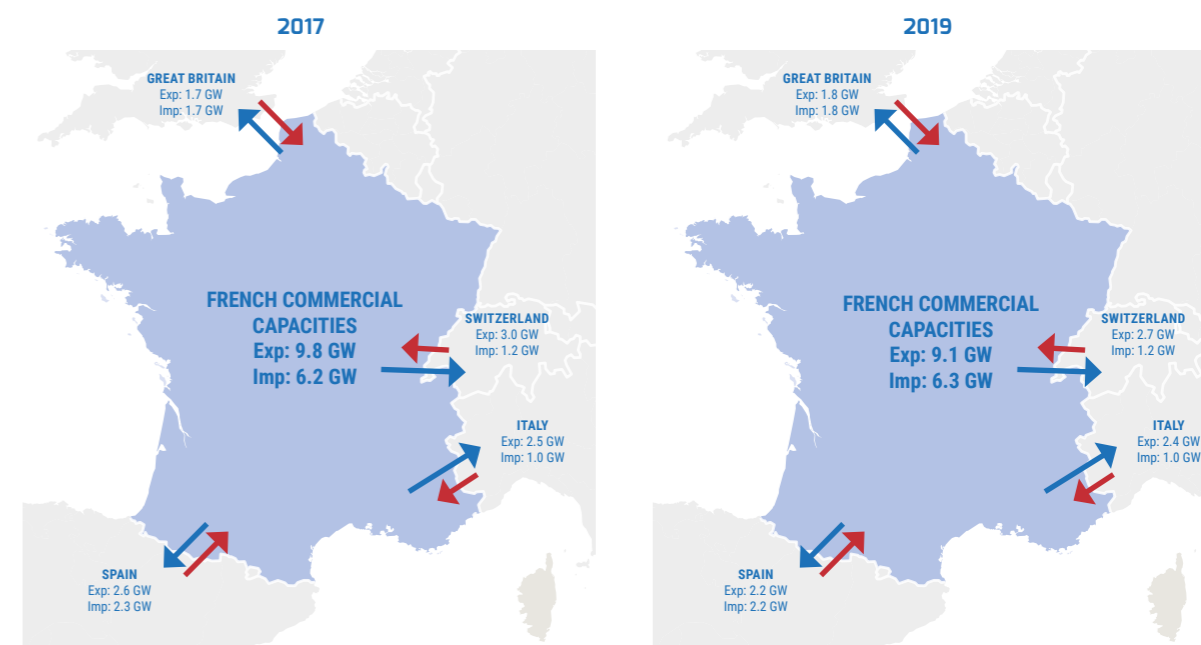
2.2.1.1 Evolution of interconnection capacities at French borders

The development and appropriate use of interconnections should ensure that the most economically efficient resources are used to secure Europe's electricity supply. In this context, the objective of the capacity calculation is to estimate the maximum exchange volumes that can transit over borders while respecting the security of the system.

There are marked differences between the French borders, due in particular to the characteristics of neighbouring networks and to

the rules for capacity calculation. Thus, while the principle of net transfer capacity (NTC) is generally applied since the introduction of flow-based calculation in May 2015, trading capacities in the CWE region are no longer determined ex ante by border (France-Belgium on the one hand and France-Germany on the other) but in a common way, taking into account the interdependence of flows across borders, following the principle of maximising the value of trade at regional level. Therefore, this method does not make it possible to calculate exchange capacities by border.

Figure 4 Evolution of commercial interconnection capacities (excluding CWE) between 2017 and 2019 (yearly averages)



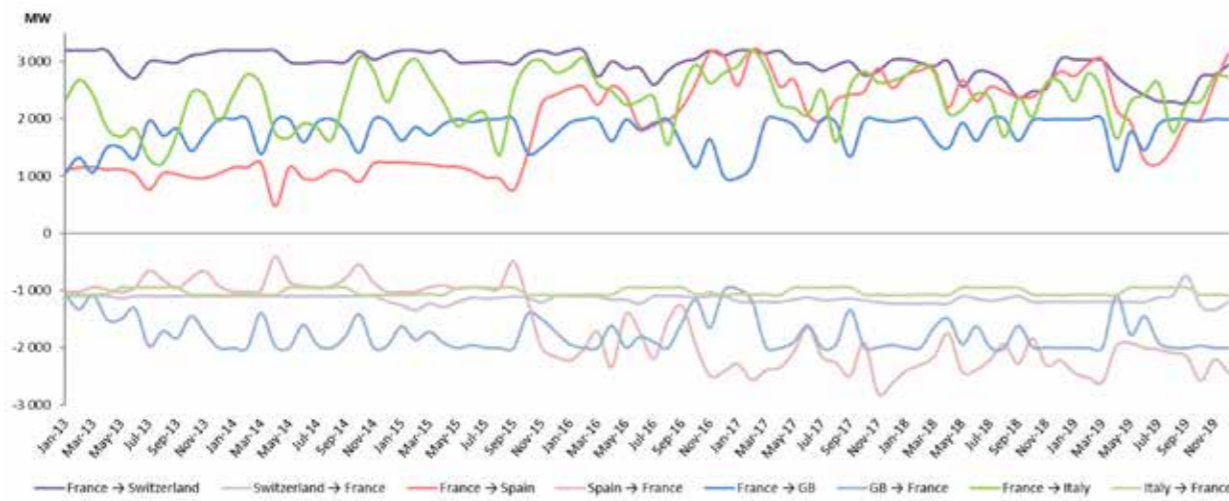
Source: RTE data, CRE analysis

On the other borders, years 2018 and 2019 initially marked the return to normal at the Interconnexion France-Angleterre (IFA), after the damages of winter 2016-2017, although maintenance operations tended to reduce the average level offered in 2019. On the other hand, the Swiss border experienced unavailability of 237 MW in 2018 and 92 MW in 2019, due to technical problems on the Swiss side, reaching an average of 2.8 GW and 2.7 GW respectively. The unavailability was more pronounced at the

border with Spain. Stable in 2018, France's export capacity to Spain was reduced by about one third of its usual value, to 1.8 GW over the period from early April to early December 2019 (compared to 2.9 GW over the first months of 2019 and 2.4 GW over the same period in 2017 and 2018), following damage to the 400 kV Argia-Cantegrit line.

Figure 5 below illustrates the monthly variations in available capacity levels at French borders.

Figure 5 Commercial interconnection capacities (excluding CWE) from 2015 to 2019 (monthly averages)



Source: RTE data, CRE analysis

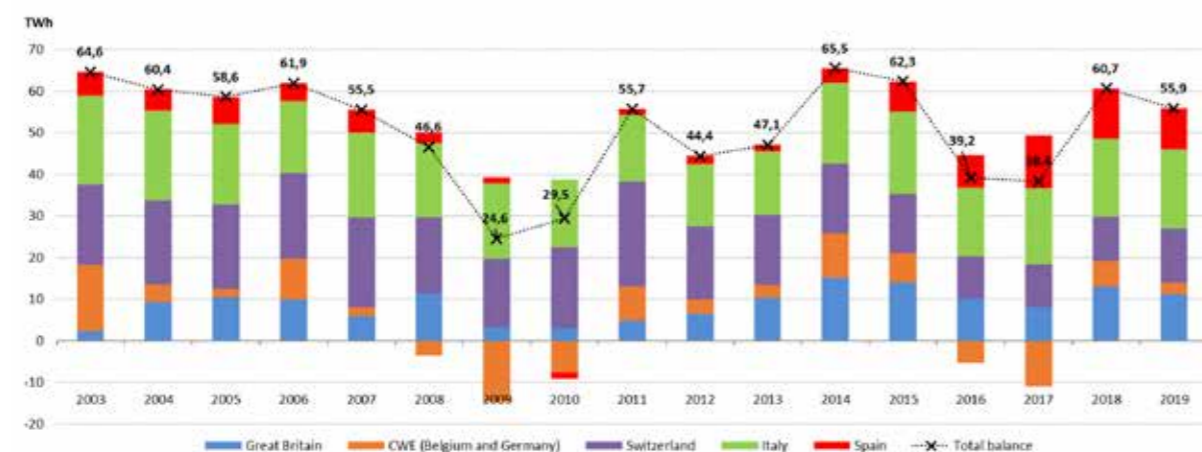
2.2.1.2 Commercial exchanges at French borders

French export balance is up again

After a trough in 2016 and 2017, French electricity exports started to rise again in 2018. From 2017 to 2018, they rose from 74.1 TWh to 86.3 TWh, before declining slightly in 2019 (83.7

TWh). Imports decreased by 10.0 TWh in 2018 to 25.6 TWh, before increasing slightly in 2019 to 27.8 TWh. After the tense situation of winter 2016-2017, France came back to a position of net exports to all neighbouring regions in 2018 and 2019.

Figure 6 Annual net commercial flows by border



Source: RTE data, CRE analysis

Figure 7 Monthly net trade flows by border

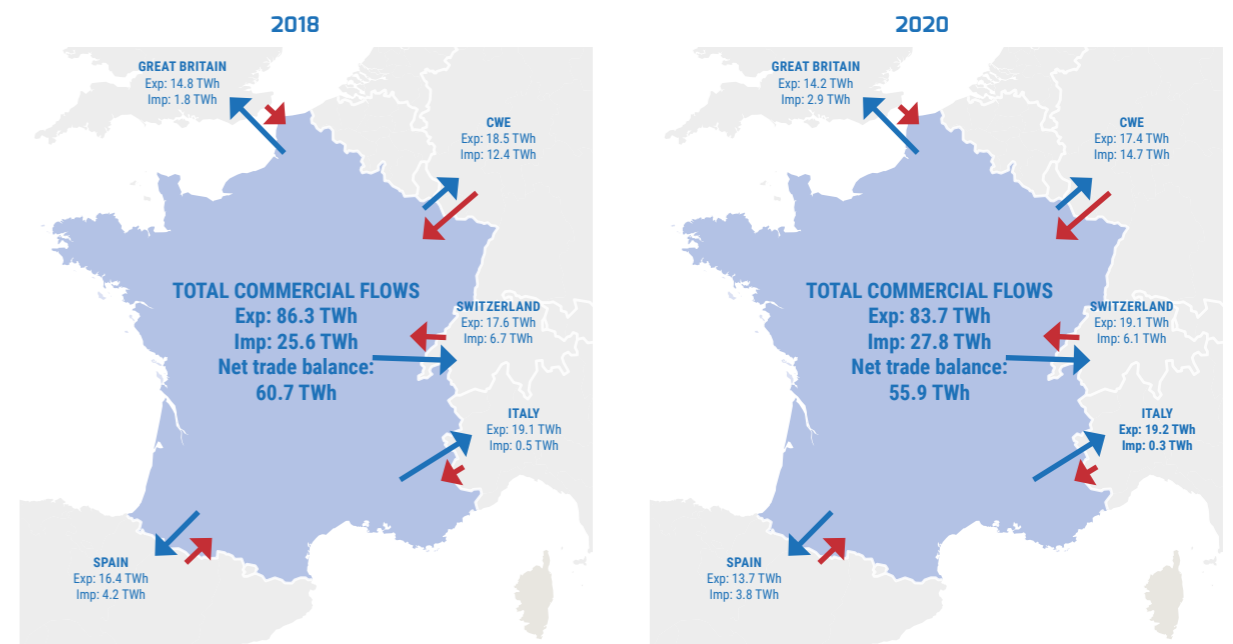


Source: RTE data, CRE analysis

The monthly balances of French imports and exports show a marked seasonality due to the sensitivity of French consumption to temperature and the maintenance periods of nuclear power plants. In 2018 and 2019, France presented an export balance for each month. Exports even reached the record level of 17.4 GW at 4 p.m. on 22 February 2019. France was a net importer for 17 days in 2018 and 25 days in 2019 (compared to 52 days in 2017), mainly spread over the winter months. The decrease in the number of days during which France was a net importer compared to 2016 and 2017 is due to better availability of generation assets.

The variability of France's exchange levels according to borders and seasons highlights how interconnections can exploit the complementarity of national means of production and consumption profiles. They thus provide France with a flexibility that contributes to the passage of the peak during cold winter periods (the level of electricity consumption in France is particularly influenced by temperatures: 2,400 MW of additional power are required for each drop of one degree in winter at peak time, which represents half of the thermos-sensitivity of European consumption in winter).

Figure 8 Trade flows across French borders in 2018 and 2019



Source: RTE data, CRE analysis

NB: data excluding mutual assistance between TSOs and recovery of losses and deviations.

Contrasting situations at each border

In 2018, net exports increased with all countries except Spain. In 2019, the trend was downward with the CWE region, Spain and Great Britain, and upward with Switzerland and Italy.

The trend in exchanges partly followed the availability of interconnections, as is the case of Great Britain, with which net exchanges rose from 8 TWh in 2017 to 13 TWh in 2018 before falling slightly to 11 TWh in 2019. The interconnection remains overwhelmingly used for export (94% and 90% of the time in 2018 and 2019, compared with 77% in 2017).

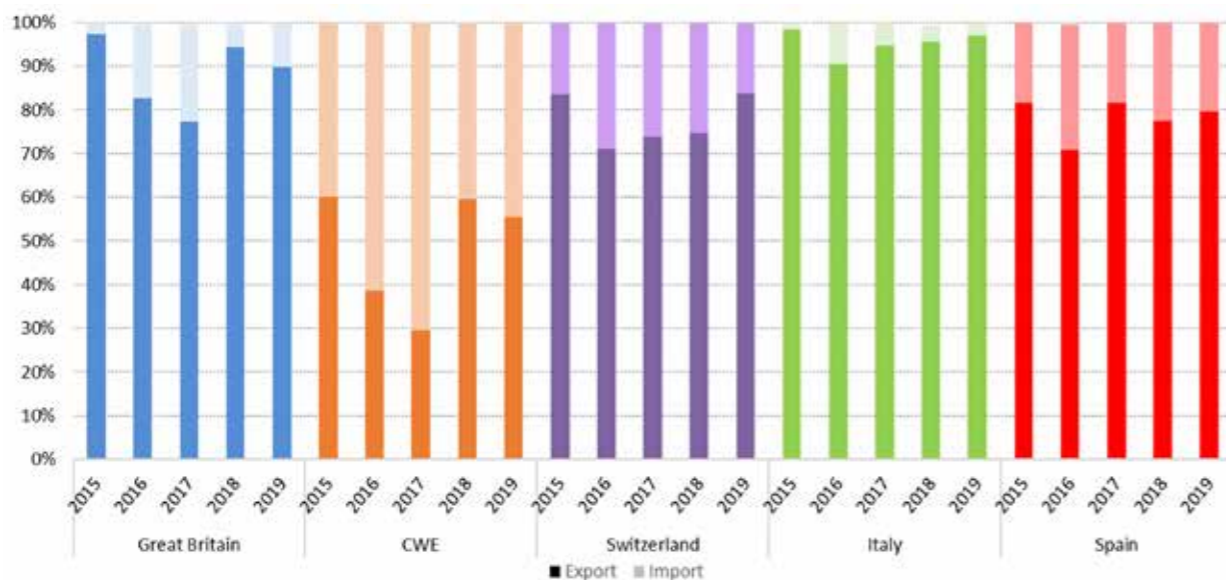
The balance of French exports to Switzerland also increased again in 2018 and 2019, reaching 11 and 13 TWh respectively (compared with 10 TWh in 2017) thanks to greater availability of French nuclear power plants to which long-term contracts are attached. Oddly, imports at this border are higher during the summer months due to the high level of Swiss hydroelectric production, which is rather available during the summer months. The balance of exchanges with Italy increased slightly in 2018 and 2019, reaching 19 TWh (compared with 18 TWh in 2017). The interconnection utilisation rate is very high (94% in 2019), and it is almost exclusively used for export (97% of the time in 2019 compared to 95% in 2017).

France's export balance to Spain decreased successively in 2018 and 2019, from 13 TWh in 2017 to 12 TWh in 2018 and 10 TWh in 2019. This decrease is due, in 2018, to higher hydroelectric production in the Iberian Peninsula. France was a net importer from Spain in March 2018 due to significant Spanish wind generation and in November 2018 during a tense situation on the market. In 2019, trade with Spain decreased after exchanges were limited by a line outage. The interconnection is still used mainly for exports (80% in 2019) and is used on average at 87% of its capacity.

France became a net exporter to the CWE region again in 2018 and 2019 (with a net balance of 6 TWh in 2018 and 3 TWh in 2019), in contrast to the two previous years. On the other hand, France remains an importer from the CWE region during winter. The import maximum from CWE was down from 9,221 MW in 2017 to 7,764 MW in 2018 and 9,090 MW in 2019 (compared to 3,655 MW in 2014, before the implementation of the flow-based calculation). The export maximum was slightly higher than in the 2016-2017 period. The trade balance with the region declined in 2019 due to greater availability of Belgian nuclear power plants, with Belgium becoming a net exporter in 2019. In the region, the level of availability of nuclear power plants and the production of renewable energy have been important factors in the development of exchanges: Belgium and France have regained positive net positions on an annual basis, while strong wind generation maintains Germany's export position in winter. Figure 9 below shows the direction of use of the various French interconnections (as a percentage of the time), irrespective of the level of flows. All interconnections are mainly used for export since 2018. This reflects the fact that French wholesale prices are generally lower than those of all neighbouring countries, except Germany.

Moreover, at borders where market coupling has been implemented (i.e. all French borders, except with Switzerland), daily flows are systematically directed from the country where prices are the lowest to the country where they are the highest. This has made automatic the link between day-ahead market price spreads and flows at borders.

Figure 9 Direction of use of French interconnections (as a percentage of time)



Source: RTE data, CRE analysis

Reading: in 2019, the interconnection between France and Great Britain was used almost 90% of the time to export electricity from France to Great Britain.

Evolution of congestion income

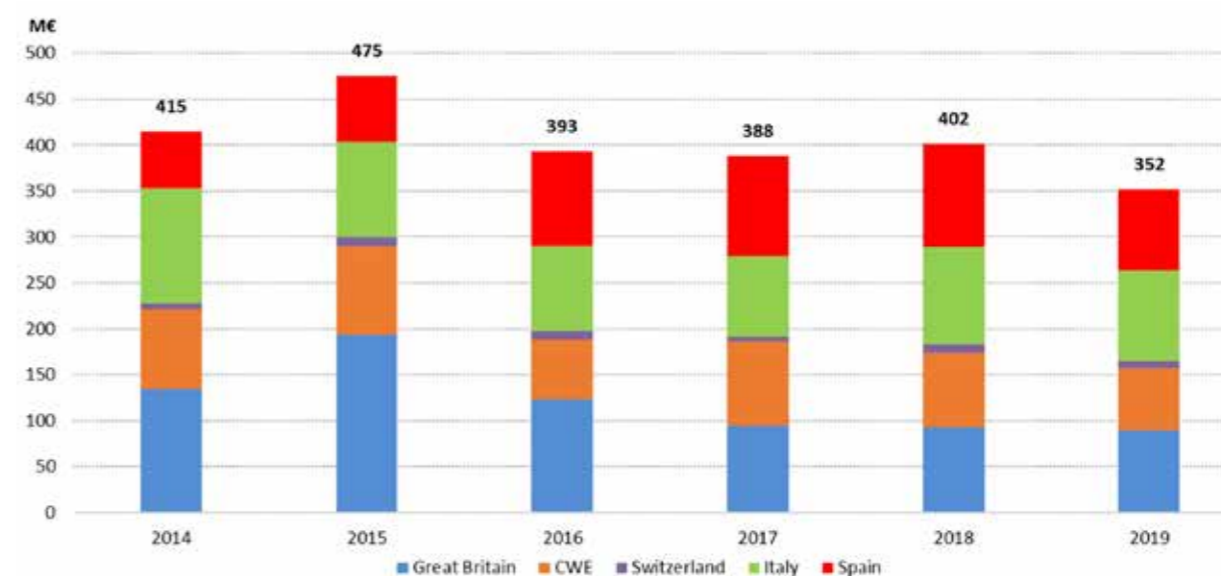
The congestion income corresponds to the revenues generated by the allocation of interconnection capacities at different timeframes (revenues from long-term auctions, implicit day-ahead allocation⁴² and the intraday allocation⁴³). These revenues are used to guarantee the effective availability of the allocated capacities ("product firmness"), to develop interconnection capacities through investments and, finally, as a deduction from the tariff for the use of the transmission network.

The level of the congestion income reflects for each border the volumes traded at the interconnections and the price spreads between interconnected countries, from which are deducted the compensation paid to market players whose transmission rights are reduced ("curtailments"). After a slight increase in 2018, the

congestion income followed the decrease in price spreads to reach €352M in 2019 (see figure 10 below).

This reduction in congestion income is particularly marked at the borders with Spain (from €112M in 2018 to €88M in 2019) and with the CWE region (from €82M in 2018 to €68M in 2019). Despite an increase in overall trades at the borders with Great Britain, Switzerland and the CWE region (+4% on average between 2018 and 2019), the congestion income at these three borders is down (€-3M at the France-GB border, €-2M at the border between France and Switzerland and €-14M at the border with the CWE region) due in particular to the reduction in price spreads. The weakness of the congestion income from the France-Switzerland interconnection is explained by the priority access to interconnection capacity and the free access available under the historical long-term contracts.

Figure 10 Congestion income from French interconnections – excluding capacity mechanism (2014 to 2019)



Source: RTE data, CRE analysis

RTE also receives interconnection revenues from the participation of French interconnections in capacity mechanisms. The IFA (*Interconnexion France-Angleterre*) interconnection can therefore take part in the British capacity mechanisms since 2017; all French interconnections participate in the French capacity mechanism since 2019.

This participation could be extended in the future to the capacity mechanisms of other countries bordering France.

Table 3 Interconnection revenues from capacity mechanisms (2017-2019)

Actual (current € M)	2017	2018	2019
Revenues from capacity mechanisms	1.1	3.4	98.5
- capacity mechanism in the United Kingdom	1.1	3.4	3.2
- capacity mechanism in France	-	-	95.4

⁴² Explicit allocation only at the border with Switzerland.

⁴³ When carried out by auction; the continuous intraday allocation shall not provide for any remuneration for the capacity.

2.2.2 Long-term timeframe

2.2.2.1 Context and regulatory developments for long-term timeframes in the electricity sector

European Regulation (EU) 2016/1719 establishing an orientation relating to the allocation of forward capacity, known as the "FCA Regulation" (forward capacity allocation), which entered into force on 17 October 2016, governs the functioning of long-term transportation rights. This Regulation establishes the principles for calculating the long-term exchange capacity between zones and defines the method for allocating rights by explicit auction⁴⁴ according to harmonised rules and via a single platform. Since the entry into force of the FCA Regulation, several application methodologies have been adopted, either at European level or at the level of each "capacity calculation region" (CCR).

Long-term rights' firmness

The objective of long-term rights is to allow market participants to secure their cross-border transactions up to one year in advance by providing hedging tools for cross-border price spreads. Sold by TSOs, these rights offer, depending on the case, physical hedging

(possibility to effectively nominate cross-border transactions at maturity via PTR – physical transmission rights), or financial hedging (payment to the rights holder of a remuneration equal to the day-ahead price spread for all the subscribed power, via non-nominated PTR or FTR – financial transmission rights).

Transmission capacities actually available in the short term, when the rights are exercised, should in theory be at least equal to the volumes of the rights sold in the long term. If unforeseen events reduce the capacity actually available at the time of delivery, the allocated long-term rights may be reduced, subject to compensation of the holders. The terms and conditions of this compensation determine the degree of "firmness" of the long-term rights: a right is considered firm if it is guaranteed to remain unchanged or if compensation will be paid in the event of a change.

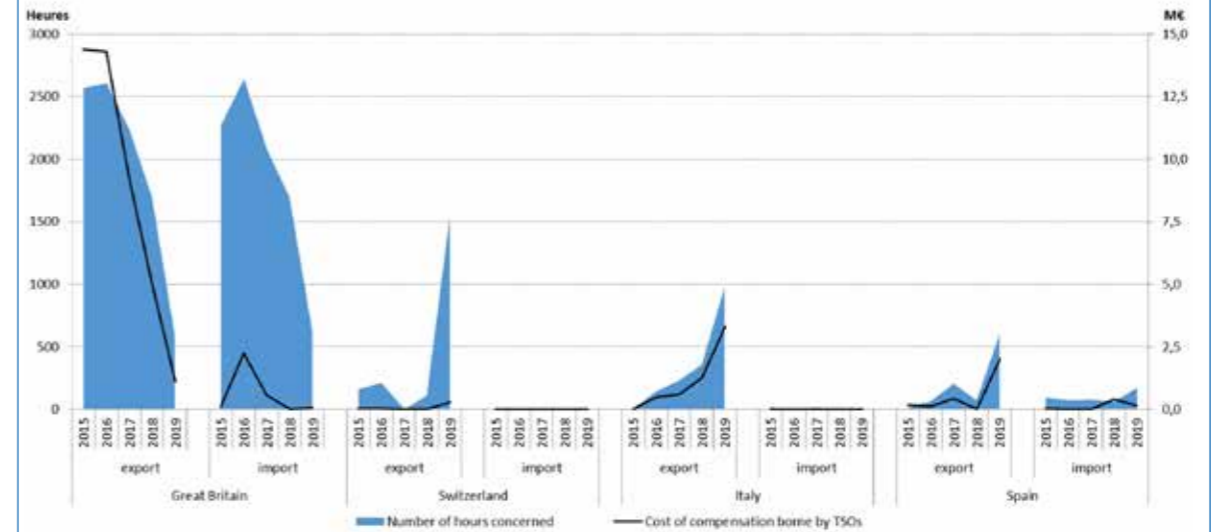
Box 3: Capacity reductions at French borders

The number of capacity reductions varies considerably from one border to the other. At the border with Belgium and Germany, for example, there has been no reduction since 2011⁴⁵. Conversely, the France-Great Britain interconnection experienced numerous reductions until 2019, and the number of reductions in Switzerland increased in that year. These differences can be explained by several factors:

- The methods used to calculate the capacity offered at the long-term maturities, which provide greater or lesser margins to face contingencies, as well as the distribution of capacity among the allocation maturities. At the British border, no capacity calculation is carried out: the whole physical capacity of the cable is therefore offered to the market, mainly at timeframes that are far from real-time (half-yearly or annual). As a result, a significant amount of long-term capacity is exposed to reductions in the event of a link failure.
- The degree of meshness of the network: at the German, Belgian or Swiss borders, the networks are dense and allow a certain flexibility. At the British border, on the other hand, a single direct-current link handles all exchanges; any problem or maintenance on this link therefore automatically leads to significant reductions in capacity. A damage to half of the cables led to a sharp reduction in capacity during the winter of 2016-2017. The resolution of this incident significantly reduced the occurrence of reductions and the associated compensation costs in 2018 and 2019.
- The random occurrence of damages to the network or means of production, as well as scheduled maintenance, which differently affect borders. This effect occurs at the borders with Switzerland, Spain and Italy, which are exposed to network damages and constraints in 2019, leading to capacity reductions.

In the event of a capacity reduction, the TSO informs the market participant holding that capacity that it will not be able to honour it and will pay a financial compensation, in accordance with the conditions now prescribed by the FCA Regulation.

Figure 11 Number of hours of long-term capacity reduction per border and associated compensation, excluding CWE (2013-2019)



Source: RTE data, CRE analysis

Reading: in 2019, TSOs reduced interconnection capacity from France to Switzerland for 1,542 hours and paid €0.28M in compensation.

Table 4 Average volume of capacity reductions per border (2013-2019)

(MW)		2013	2014	2015	2016	2017	2018	2019
Great Britain	Export	32	28	33	536	333	179	296
	Import	33	37	51	521	351	176	275
Switzerland	Export	12	24	17	40	0	29	97
	Import	0	0	0	0	0	0	0
Italy	Export	14	9	22	351	231	242	349
	Import	0	50	24	0	794	0	0
Spain	Export	39	15	23	179	596	149	248

Source: RTE data, CRE analysis

⁴⁴ Auctions organised by TSOs which only concern cross-border interconnection capacity, as opposed to implicit auctions in which capacity and energy are allocated simultaneously.

⁴⁵ With the exception of the month of October 2015 in the Belgium-France direction, where the TSOs had to make an average of 23.33 MW of reductions over three days. The flow-based calculation in place since 2015 in the CWE region limits the reductions in long-term rights, as it includes a so-called 'capacity reduction' procedure in the capacity calculation carried out in D-2, a procedure known as "LTA inclusion" which ensures that the flow-based domain calculated at that time at least covers the long-term rights already allocated, at the cost of expensive remedial actions if necessary.

An allocation via auctions

The principles for the application of the Regulation are laid down in the harmonised allocation rules (HAR) and their regional annexes applied since 1 January 2018. Implemented in anticipation (from 2015) at French borders, their fundamental principle is to allocate the rights via explicit auctions with settlement at the marginal price. These auctions are organised no less than at annual and monthly timeframes.

An increasingly financial use of long-term rights?

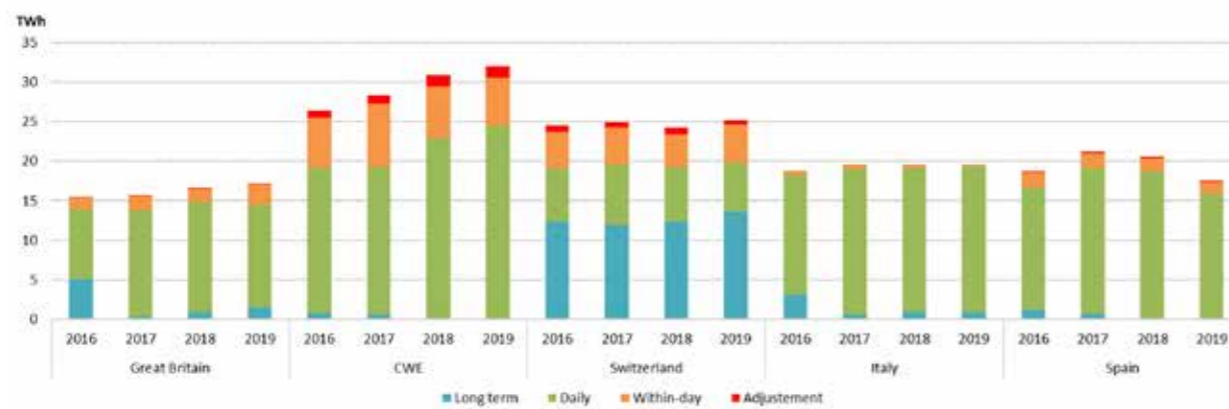
While historically all the rights allocated to the French borders were physical rights (PTR), there is now a decrease in physical nominations⁴⁶ of long-term rights.

Since the introduction of day-ahead coupling (at all borders except with Switzerland), the share of day-ahead nominations

has increased to around 70% of all nominations in 2018 and 2019. Long-term nominations are stabilising at low levels, with long-term products being used more often for financial hedging purposes rather than to secure supply. In 2019, long-term nominations accounted for 2% of total nominations (excluding those at the Swiss border), 8% at the UK border, 4% at the Italian border and 0% at the Spanish border and with the CWE region. The possibility to nominate long-term rights disappeared at the end of 2019 at the borders with Germany and Belgium, following the replacement of long-term physical rights by financial rights at the borders of the CWE region.

Switzerland alone keeps a high proportion of long-term nominations (54% of total nominations at borders) due to the persistence of long-term power purchase agreements at this border.

Figure 12 Distribution of nominations by border and timeframe



Source: RTE data, CRE analysis

A harmonisation of financial rights is being discussed in several capacity calculation regions, such as the Core region. The type,

form and timeframe of the allocation currently applied at French borders are summarised in Table 5 below.

Tableau 5 Type, form and timeframe of the long-term allocation applied at French borders

Border	Type of product	Forme des produits	Description
FR - GB	PTR	Base	Annual/Semi-annual/Quarterly/Monthly/Weekend
FR - BE	FTR	Base	Annual/Monthly
FR - DE	FTR	Base	Annual/Monthly
FR - CH ⁴⁷	PTR	Base	Annual/Monthly
FR - IT	PTR	Base	Annual/Monthly
FR - ES	PTR	Base	Annual/Monthly

⁴⁶ A nomination refers to the use, by the holder of the physical transmission rights, of the exchange capacity between bidding zones, and is equivalent to the use of the transmission right in order to physically transit energy from one bidding zone to another.

⁴⁷ The France-Switzerland border has not been the subject of a decision in the context of the implementation of the FTA Regulation, as Switzerland does not fall within its scope. Long-term rights at this border are only offered in the FR>CH direction, as all capacity in the CH>FR direction is booked for long-term OTC energy contracts.

In practice, at French borders, physical rights (PTRs) are seldom nominated, with players preferring to receive remuneration at the price spread just as allowed under the financial rights (FTR). Although there are significant differences between long-

term products along French borders, the harmonisation of their characteristics is considered welcome by market players, without constituting an end in itself, as long as the differences are justified.

2.2.2.2 Calculation and distribution of forward capacity

The FCA Regulation prescribes the systematic implementation of a coordinated calculation of forward capacity before each allocation timeframe in each capacity calculation region (CCR) and provides details of its principles. It also requires the implementation of a regional methodology for the allocation of this capacity between timeframes. The objective is to optimise the levels of long-term cross-border capacity offered to the market.

In the CCRs of which France is a member, only the TSOs in South-Western Europe submitted and had approved, in March 2020, the methodologies for calculating and allocating the forward capacities provided for in the FCA Regulation. The TSOs proposed a deterministic calculation method based on scenario analysis applied to the common network model.

In the Channel region, the methodology for calculating capacity was the subject of an intervention by the European Commission, ACER and the region's regulators during the development process, as the TSOs and merchant interconnectors were unable to reach agreement. These two methodologies are currently being examined by the regulators of the Channel region, who are due to give their opinion by September 2020. However, these developments are still subject to developments in the Channel region in the context of Brexit (see Box 4 below).

In the Core and NIB (Northern Italian Borders) regions, the methods for calculating and allocating long-term capacity were still being developed by the TSOs at the beginning of 2020.

2.2.2.3 The specific case of Switzerland

At the Swiss border, in addition to the absence of pan-European coupling in day-ahead and intraday timeframes, there are long-term contracts with free priority access to interconnection capacity, which does not exist at any other French border. Some of these contracts were signed as early as the 1950s and some go beyond 2050. In addition, these contracts allocate particularly flexible access rights to interconnections, allowing holders to make late nominations, for example, which limits the possibility that unused capacity under long-term contracts is offered to market players in explicit day-ahead capacity auctions, or that nominated capacity is offered in the opposite direction ("netting"). Until the early 2012 and the expiry of part of a 610 MW contract, the long-term contracts have saturated the entire interconnection for export to Switzerland, i.e. approximately 3,100 MW. CRE and its Swiss counterpart EICOM then decided that the capacity released by the expiry of portions of the long-

term contracts would be made available to market players and offered at day-ahead and long-term timeframes. This makes it possible to offer an increasing volume of capacity at day-ahead and long-term timeframes.

On the occasion of the public consultation conducted by CRE in April 2018 on the use of long-term cross-border electricity transmission rights at French borders, market players indicated a preference for the allocation of new released capacity at long-term timeframes, in order to offer long-term risks hedging possibilities at this border.

2.2.3 Day-ahead timeframe

2.2.3.1 Capacity calculation

In accordance with the provisions of the CACM Regulation, the TSOs of the four capacity calculation regions (CCR) of which France is part have jointly developed methodologies for the coordinated calculation of capacity at the day-ahead timeframe. These methodologies were approved by CRE between October 2018 and November 2019⁴⁸. They were effectively implemented in November 2019 for the Northern Italian Borders region (building on the coordinated calculation already implemented on a voluntary basis) and in January 2020 for the South-Western Europe region. The CACM Regulation establishes the flow-based approach (multiple-border optimisation of flows) as the target model for calculating day-ahead capacity, except when the TSOs demonstrate that a coordinated NTC calculation⁴⁹ border-by-border would be at least as effective, or, in the case of the Northern Italian Borders CCR, until Switzerland joins the European market coupling. Thus, the Core CCR is developing a flow-based capacity calculation, following on from the CWE region, while the Northern Italian, South-Western Europe and Channel CCRs are based on a coordinated NTC capacity calculation.

The approval of these methodologies represents a real step forward in the proper use of interconnections. CRE will ensure that their implementation will bring all expected benefits, by optimising the offered capacities through the efficient use of measures available to the TSOs, such as remedial actions, and by ensuring transparency on the assumptions and results of the capacity calculation. In addition, capacity calculation should

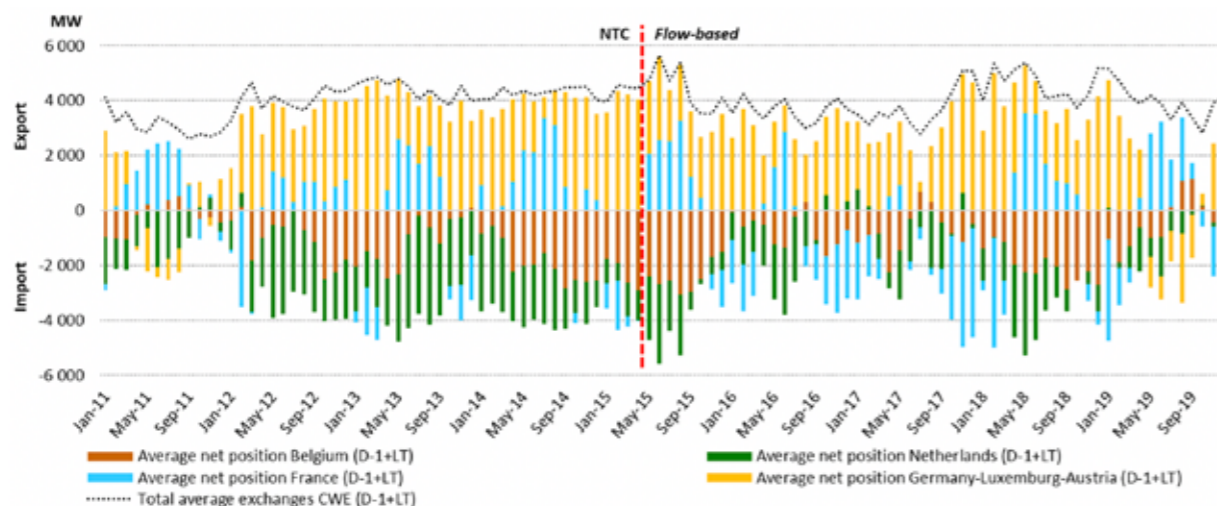
not be a means for TSOs to manage constraints they might encounter in their internal networks, to the detriment of cross-border exchanges.

State of play in the Central-Western Europe (CWE) / Core region

Flow-based capacity calculation and allocation have been voluntarily developed by TSOs, power exchanges and regulators of the CWE region since the end of the 2000s. This model, which was implemented in May 2015 (i.e. before the entry into force of the CACM Regulation), aimed to maximise the value of cross-border exchanges by optimising the use of the capacity of the region's meshed networks. In the first two years, however, cross-border capacity was significantly limited by the presence of pre-congested German internal network elements, which significantly reduced the flow-based domain. As a remedy and at the request of the regulators, the TSOs have committed to guaranteeing from April 2018 onwards a minimum level of 20% of the thermal capacity (known as "20% minRAM" for minimum remaining available margin) on all network elements taken into account in the capacity calculation, alongside the introduction of the electricity border between Germany and Austria, effective since October 2018⁵⁰.

Average cross-border exchanges within the CWE region, after a period of decline between mid-2015 and mid-2017, have returned to or even exceeded in 2018 the levels observed before the implementation of the flow-based capacity calculation (see

Figure 13 Net positions and average cross-border exchanges (D-1 and LT nominations) in the CWE region (2011-2019)



Source: CREG analyses based on TSO monitoring data in the CWE region.

Reading: in 2018-2019, average hourly cross-border exchanges within the CWE region were between 4 and 5 GWh, up from 2016-2017. As such, they return to, or even exceed, their levels prior to the introduction of flow-based market coupling in 2015. Moreover, while Germany has been a net exporter since 2011, it was a net importer in the spring and summer of 2019.

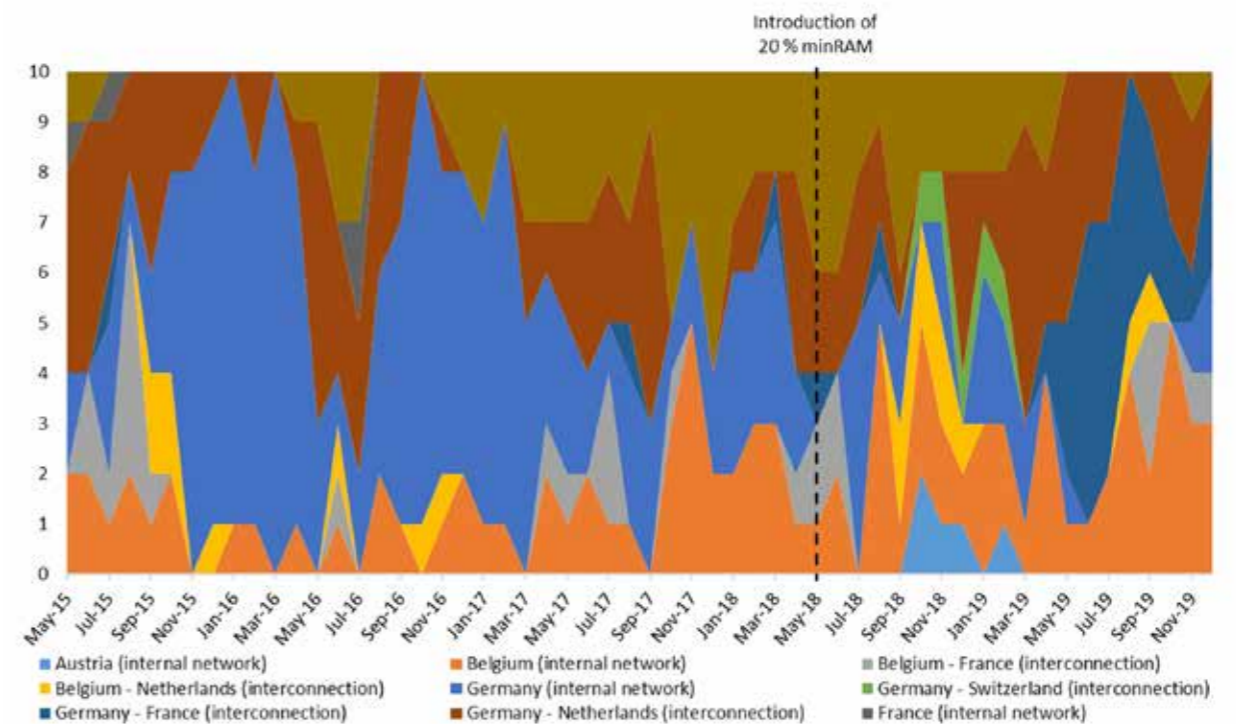
Figure 13). While the introduction of the 20% minRAM, ensuring a minimum capacity for cross-border exchanges, most likely contributed to this increase, other effects may also have had a positive impact. Some TSOs of the CWE region have indeed initiated a more dynamic management of the limits of the flows that can be transported by their network elements by adapting them to ambient conditions, thus contributing to an increased ability to support higher levels of cross-border exchanges.

In addition, market fundamentals have a decisive influence on the levels of cross-border trade. While some areas of the CWE region had experienced supply-demand tensions in 2016, 2017 and 2018⁵¹, 2019 was more balanced in all countries, resulting in a lower utilisation of interconnections. These lower constraints of the interconnection capacities have also led to an increase in

price convergence within the region, from approximately 35% between 2016 and 2018 to over 45% in 2019.

However, the effect of the introduction of the 20% minRAM can be clearly identified by analysing the location of the network elements most limiting exchange capacities. While the German internal network elements appeared to be particularly constraining between summer 2015 and winter 2017, congestion materialises more frequently on the interconnections and on the Belgian and Dutch internal network elements from spring 2018 onwards (see Figure 14). Ensuring a moderate level of capacity on those network elements that are only slightly influenced by cross-border exchanges indeed frees up significant margins for cross-border exchanges.

Figure 14 Location of the 10 most limiting network elements per month since the beginning of flow-based calculation in the CWE region



Source: CWE TSO monitoring data, CRE analyses

Reading: Prior to the introduction of the 20% minRAM in May 2018, congestion often materialised on internal network elements, particularly in Germany. For instance, in March 2016, the ten network elements with the most limited allocation were located in Germany. Since the introduction of the 20% minRAM, congestion has shifted to interconnections, notably between Germany and the Netherlands and Germany and France (particularly in 2019).

⁴⁸ The dates of approval as well as links to CRE's decisions and the methodologies concerned can be found in the monitoring table published on CRE's website (in French): <https://www.cre.fr/Electricite/Reseaux-d-electricite/codes-de-reseau-europeens>

⁴⁹ The flow-based approach determines a domain of exchange capacities that can be simultaneously achieved in a region, which is particularly relevant in the case of meshed networks, whereas the NTC approach determines border-by-border exchange capacities.

⁵⁰ A detailed description of the capacity calculation improvements implemented in the CWE region can be found in the Focus 2 of CRE's 2018 report on electricity and gas interconnections: <https://www.cre.fr/en/Documents/Publications/Thematic-reports/Interconnections-report-2018>

⁵¹ For example, the low availability levels of French nuclear power plants during the winter of 2016-2017, the drought in the summer of 2018 having affected water resources in France and Austria and coal-fired power plants in Germany, or the unplanned unavailability of the majority of Belgian nuclear power plants in the autumn of 2018.

The flow-based capacity calculation of the CWE region will be continued in the Core CCR, which go-live is scheduled for mid-2021. This CCR, whose capacity calculation methodology was adopted by ACER in February 2019, will extend and adapt the method historically promoted by the CWE region⁵². The wide geographical scope of this CCR, as well as the challenges related to the implementation of the 70% rule, have contributed to significant implementation challenges.

In the context of the implementation of the provisions of the CEP related to capacity calculation, all TSOs in the CWE region have committed to continuing to ensure a minimum capacity of 20% in 2020, whether they were granted a derogation (Austria, Belgium, France) or their member state has launched an action plan (Germany, the Netherlands).

State of play in the Northern Italian Borders (NIB) region

Since February 2016, a coordinated calculation of day-ahead capacity was in place at the borders of the Northern Italy region (NIB for North Italian Borders) in the direction of imports into

Italy. This methodology was expected to increase the level of capacity available to market players by reducing uncertainties through a calculation closer to real-time and improved coordination among TSOs. However, at the end of 2016, an average increase of only 135 MW for all borders in the NIB region was observed, of which 37%⁵³ was allocated to the France-Italy border. This limited increase was confirmed in 2017, as France's export capacity to Italy increased by only 70 MW compared to its value in 2015 (2,460 MW). Decreases were observed since then, resulting in available capacity levels below their values before the implementation of the coordinated calculation (2,412 MW in 2018, 2,367 MW in 2019).

In addition, in 2019, the coordinated capacity calculation at the day-ahead timeframe led to an average capacity level by 177 MW lower than the value calculated at the monthly timeframe. The D-2 calculation only allows an increase in capacity in 35% of cases for an average increase of 184 MW.

Figure 15 Capacity limitations at the France-Italy border according to origin (left) and average Italian import capacity observed depending on the origin of the limitation (right) in 2019



Source: RTE data, CRE analysis

Reading (right): In 2019, when the Italian grid created limitations, Italy's import capacity amounted to approximately 1,850 MW. By contrast, when the Swiss, French or Slovenian grids created limitations, Italy's import capacities amounted to more than 2,500 MW.

Apart from those due to interconnections (25% of cases), the limitations of exchange capacity at the France-Italy border are mainly due to constraints on the Swiss network (in around 40% of cases) or on the Italian network (in around 20% of cases).

However, constraints on the Italian grid result in significantly lower levels of capacity at the France-Italy border than constraints on the Swiss network (more than 700 MW difference).

In the light of these observations, CRE has worked together with the other regulators of the NIB region to remove several limitations present in the capacity calculation methodology implemented from 2016 to 2019.

First, TSOs used to check that the coordinated capacity calculated at the day-ahead timeframe was included in a band (a process called "lower total transmission capacity – higher total transmission capacity" or "LTTC – UTTC"), which did not exceed 600 MW upwards and 500 MW downwards compared to the capacity calculated at the annual timeframe. Between February 2016 and October 2017, this limitation reduced capacity in 23% of cases, for an average reduction of 1,025 MW. The LTTC, on the other hand, generated a capacity increase in only 8% of cases during the same period. Moreover, it was an increase of only 103 MW on average.

Secondly, the Italian TSO Terna used to set the capacity for all borders of NIB without capacity calculation between 15% and 30% of the hours of the year, spread over approximately 150 days per year ("low consumption days"), mainly to allow the upholding of frequency and voltage on its control area. In 2019, the average capacity available when Terna applied this restriction was 1.2 GW lower than the average capacity observed over the year. Such a reduction has a comparable order of magnitude to the total thermal capacity of the new Savoy-Piedmont interconnection, for which the social welfare had been estimated at €25M per year. This capacity calculation methodology, approved in 2015, has been improved in the context of the implementation of the CACM Regulation: a new methodology for calculating capacity at the day-ahead and intraday timeframes in the NIB region was approved by CRE in November 2019. In particular, the new methodology removed the LTTC-UTTC process, as well as introduced a systematic calculation of interconnection capacity (including in the event of a "low consumption day") from 1 January 2020 onwards. In this new calculation, Terna's constraints can still be taken into account, but in a way that is more transparent for market players. Such an approach will notably allow a better monitoring of the capacity reductions generated by this constraint as well as their economic impact and, in the long term, the opportunity to remove these constraints will be analysed. The TSOs of the NIB region must provide by June 2021 a CBA identifying the most efficient means to manage the Italian constraints.

In view of the increasing probability of export flows from Italy, the new methodology also provided for the implementation of a capacity calculation in this flow direction at the day-ahead timeframe⁵⁴. This calculation will be implemented in September 2020.

In the context of the implementation of the CEP provisions related to capacity calculation provisions, the Italian, Austrian and French TSOs have been granted a derogation for 2020. RTE has committed to guaranteeing 70% of capacity at the France-Italy border in 70% of the relevant hours.

State of play in the South-Western Europe (SWE) region

In 2018 and 2019, the SWE CCR did not have a coordinated capacity calculation for the day-ahead timeframe. Following on from the historical practice, the capacities made available to the day-ahead market at the France-Spain border resulted from the selection of the most restrictive capacity value determined by RTE, on the one hand, and by its Spanish counterpart REE, on the other hand, during the weekly analyses. An analysis of the evolution of these cross-border capacities is presented in the sheet dedicated to the France-Spain border (see Annex 3). It should be noted that, mainly following the incident on the Argia-Cantegrit line from May 2019, the French network more frequently limited exchange capacities in 2019 (60% of the time on export and 45% of the time on import) than in 2018 (36% of the time on export and 26% of the time on import).

A coordinated capacity calculation, which methodology had been approved by CRE in November 2018, was introduced at the end of January 2020. The calculation, initially carried out for 4 hourly steps and then extrapolated by the TSOs to the remaining hourly steps, was extended to 6 hourly steps in May 2020. Simulations were carried out by the TSOs between July 2019 and January 2020, showing that the coordinated capacity calculation results in an average increase of around 100 MW across the France-Spain border, compared with the weekly analyses. In about two thirds of the simulated hours, the capacity determined in a coordinated manner was higher than the uncoordinated value, with gains of more than 1 GW for some hour⁵⁵. The coordinated capacity calculation methodology for the day-ahead timeframe for the SWE CCR may soon need to be modified to incorporate the provisions of the CEP related to capacity calculation.

In the context of the implementation of the provisions of the CEP related to capacity calculation, all TSOs in the SWE region have been granted a derogation for 2020. RTE has committed to guaranteeing 70% of capacity at the French-Spanish border for 70% of the relevant hours.

“ A coordinated capacity calculation, which methodology had been approved by CRE in 2018, was introduced in 2020. ”

⁵² The CWE region comprises Germany, Belgium, Luxembourg and the Netherlands.

⁵³ The capacity calculation determines a total exchange, or transfer capacity for all NIB borders (TTC). Border-by-border capacity is then calculated using fixed "splitting factors" (about 50% for Switzerland, 37% for France, 9% for Slovenia and 4% for Austria).

⁵⁴ Until now, import capacity is determined at the monthly timeframe and is not recalculated afterwards.

⁵⁵ Coordination and refinement of the assumptions underlying the capacity calculation may reveal constraints that would not otherwise have been apparent, which is why coordinated daily capacities below the unilaterally-determined values were observed in about one-third of the simulated hours.

State of play in the Channel region

Currently, the calculation of interconnection capacity at the France-GB border is not carried out in a coordinated manner. The capacity given to the market corresponds to the minimum of the values calculated by each TSO. Nevertheless, given the specificity of the region, and in particular the fact that all interconnections

are high-voltage direct-current (HVDC) cables, the maximum capacity of these cables was generally allocated to the market. A coordinated capacity calculation methodology for the day-ahead and intraday timeframes in the Channel region was approved by CRE in December 2018. Given the uncertainties related to Brexit, this methodology has not yet been implemented.

2.2.3.2 Capacity Allocation

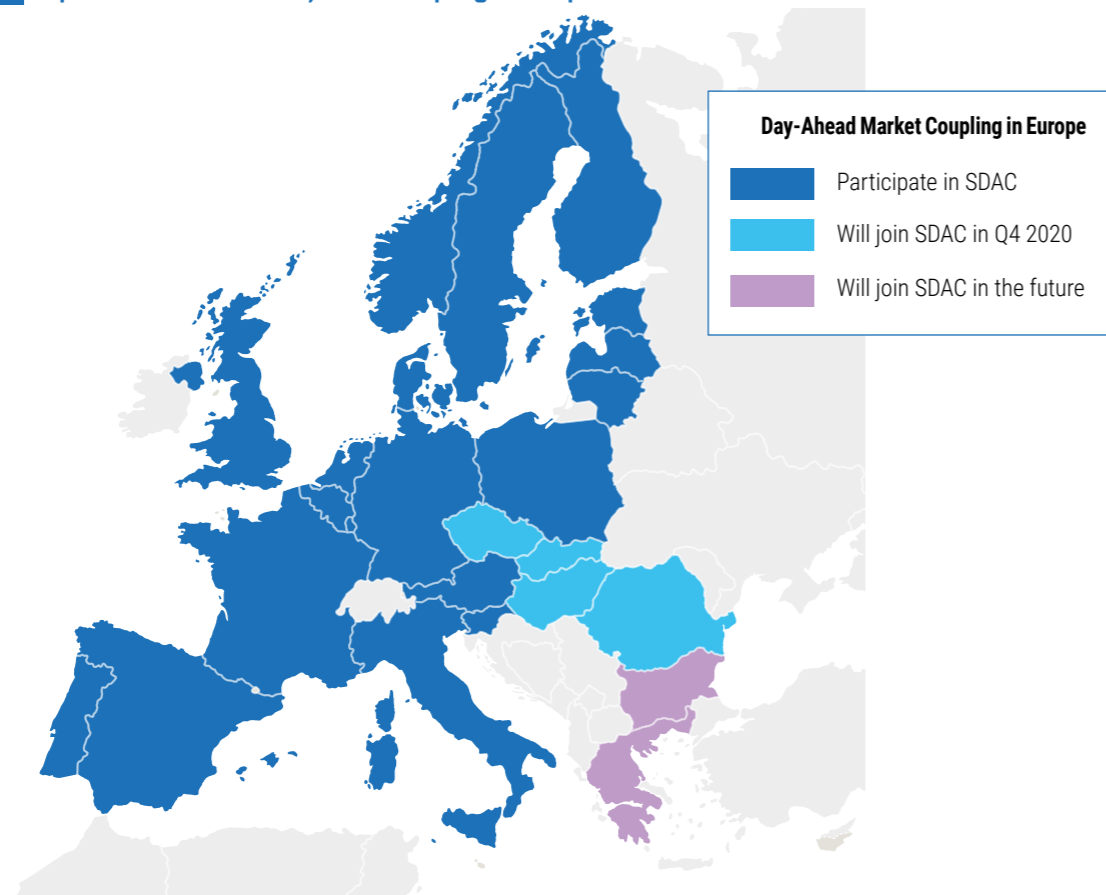
Market architecture and target model

In the target model for European cross-border capacity allocation management, the allocation of capacity on the day-ahead timeframe is carried out "implicitly", i.e. jointly with allocation of energy, by means of an auction system operated by the "Euphemia" algorithm. Currently, the single day-ahead coupling project is used by 21 member states as well as the United Kingdom (see Box 4 on Brexit) and Norway, and is intended to eventually cover all member states. The Czech Republic, Hungary, Romania and Slovakia, which are currently part of another coupling project, as well as Greece, are expected to join the single day-ahead coupling in the second half of 2020.

Since 2015, all French borders with EU member states are implicitly coupled. In the absence of a comprehensive agreement with the EU, and in accordance with the CACM Regulation, Switzerland does not participate in the coupling and conducts its daily auction independently at 11:00 a.m., which then allows players to react and change their orders during the pan-European coupling at noon.

The CWE coupling region is to date the only EU region that performs the allocation by using the flow-based approach. This method allows taking into account the interdependence of cross-border flows for the whole region and improving the representation of the networks' physical constraints. Consequently, it can achieve a more optimal allocation of cross-border capacities. Since its launch in the CWE region in 2015, the flow-based approach has been implemented by including a so-called "intuitive" adjustment, which ensures that cross-border exchanges always take place from an area where the price is lower to an area where the price is higher. As ACER's Decision 04/2020 of 30 January 2020 no longer authorises the use of this adjustment as a functionality of flow-based allocation, the intuitive patch will be phased-out over the next few months concurrently with the go-live of the allocation in the ALEGrO cable between Germany and Belgium within the day-ahead coupling.

Figure 16 Implementation of the day-ahead coupling in Europe



Box 4: Allocation rules at the France-GB border in the event of the exit of the United Kingdom from the EU without a withdrawal agreement

On 29 March 2017, the United Kingdom notified the European Council of its intention to withdraw from the European Union in accordance with Article 50 of the Treaty on European Union. Following the provisions of that Article, its withdrawal from the European Union should have taken place on 29 March 2019. In the absence of a postponement of that date or of the entry into force of a withdrawal agreement, European law would no longer have applied to the United Kingdom. Such an event would have led, in particular, to the exit of Great Britain⁵⁶ from the European day-ahead market coupling.

In order to prepare for this possible outcome and ensure continued electricity exchanges between the two countries, CRE approved on 14 March 2019 allocation rules for the 2,000 MW cable linking France to the United Kingdom (known as the Interconnexion France-Angleterre - IFA)⁵⁷ based on national law, replacing European law. On 17 October 2019, CRE approved an update of these rules, as well as a set of rules specific to the ElecLink interconnection⁵⁸, a 1,000 MW cable under construction in the Channel Tunnel.

In the event of Great Britain's exit from the European day-ahead market coupling, the implicit day-ahead allocation, in force since 2014, would thus be replaced by an explicit auction. Capacity at the France-GB border would then be allocated separately from energy, as is the case for Switzerland. For the long-term and intraday timeframes, the explicit allocation already applied would be maintained.

After several postponements of the withdrawal date, the United Kingdom left the European Union on 31 January 2020, the date on which the withdrawal agreement entered into force. This exit opened a transition period, during which the United Kingdom and the European Union are negotiating the terms of their future relationship, until 31 December 2020. As European law continues to apply to the United Kingdom during this period, it continues for the time being to participate in the European day-ahead market coupling.

If the conditions of the future relationship allow the United Kingdom to remain in the internal market, its participation in the European day-ahead market coupling should be maintained. If, on the other hand, its access to the internal market is called into question, the arrangements for electricity allocation on the cables linking France to the United Kingdom will have to be negotiated, which could lead to a decoupling of Great Britain from the European day-ahead market coupling.

Overview of exchanges on the day-ahead timeframe: evolution of price spreads

Several countries are supplied with electricity produced in France: the United Kingdom and Italy import from France most hours of the year, mainly because of their energy production fundamentals. Other countries display less directional export-import balances with France: the wholesale price spreads with Spain is highly

dependent on the price of Spanish natural gas, whereas Germany follows a particular seasonal pattern (see section on the France-Germany interconnection below). Belgium and Switzerland, due in part to their smaller size, are heavily influenced by French fundamentals: apart from exceptional situations such as in Belgium in 2018, their prices on the wholesale markets follow the French trend with a relatively small range of price spreads.

⁵⁶ Only Great Britain (i.e. excluding Northern Ireland) is involved in the European day-ahead market coupling.

⁵⁷ CRE's decision of 14 March 2019 approving RTE's proposal concerning the rules for access to the Interconnexion France-Angleterre in the event of the exit of Great Britain from the single day-ahead market coupling (in French): <https://www.cre.fr/Documents/Deliberations/Approbation/Approbation-des-regles-IFA-en-cas-de-sortie-de-la-Grande-Bretagne-du-couplage-journalier-europeen>

⁵⁸ CRE's decision of 17 October 2019 approving the modifications to the rules for access to the ElecLink interconnection in the event that Great Britain maintains or withdraws from daily single market coupling: <https://www.cre.fr/en/Documents/Deliberations/Approval/ifa-ifa-2-access-rules-in-the-event-of-great-britain-remaining-or-leaving-the-single-day-ahead-market-coupling>

Figure 17 Day-ahead wholesale price spreads from 2017 to 2019 (monthly averages)



Source: RTE data, CRE analysis

Reading: In December 2019, the difference between prices on the French and British wholesale markets was on average of €10 per MWh.

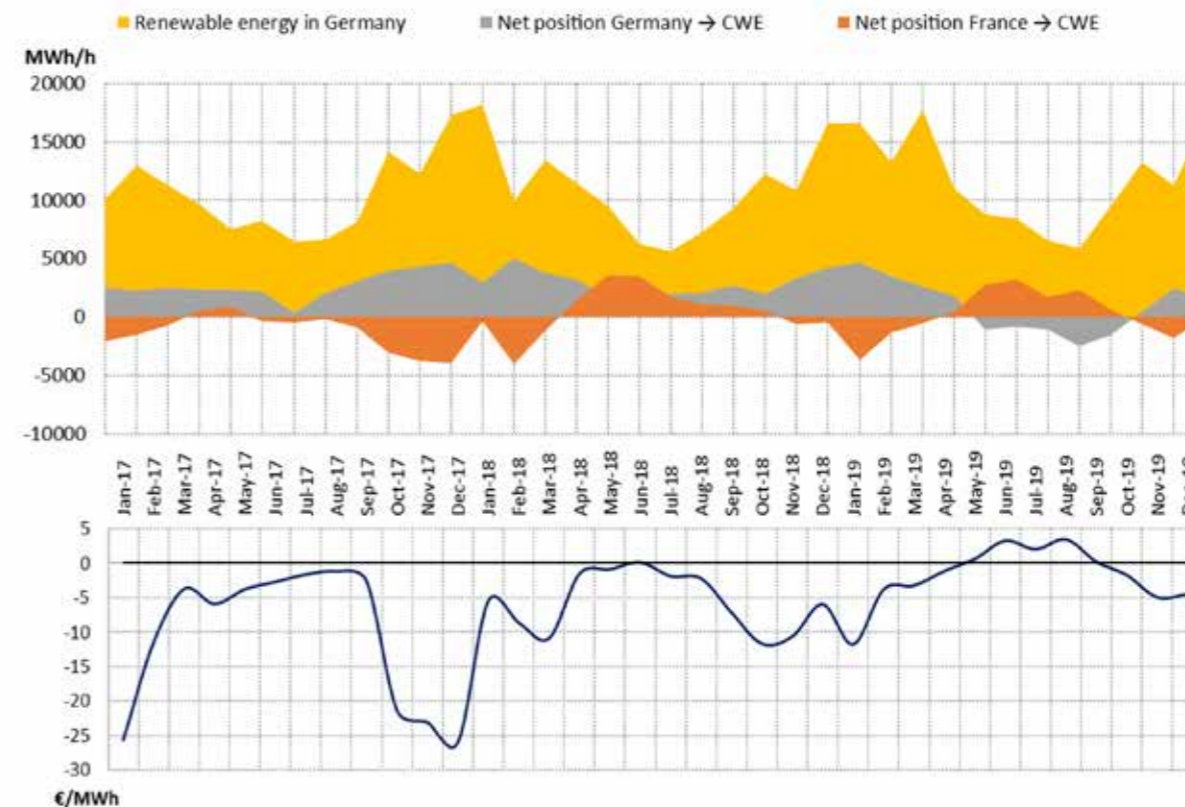
An example of cross-border allocation favouring the energy transition: the France-Germany interconnection

Cross-border exchanges with Germany, the country that exchanges the most energy with France, show a particular seasonal pattern. Figure 18 shows that the day-ahead wholesale price spreads are particularly large in autumn and winter: in autumn 2018, French prices were on average about €10 per MWh higher than German prices. The same import trend can be observed in France's net position relative to the CWE region (see Figure 13), which shows that France imports from other countries to fulfil its demand and its exports to other neighbouring countries. This import trend in France in winter, linked to the high thermal sensitivity of French consumption, allows French end consumers to benefit from the seasonal effect of wind energy, particularly in

Germany, which has an installed capacity of more than 40 GW. It therefore reduces the cost of energy for the French consumer by transporting German surplus production, just as the export of French nuclear power during other periods reduces the cost of electricity for its neighbours.

In recent years, solar-photovoltaic and wind energy have become fundamental energy generation sources for the European power supply-demand balance. However, the network integration of renewable energy has led to unforeseen technical challenges, sometimes leading to congestions in network elements and limitations in cross-border interconnection capacity (see the Focus on RDCT).

Figure 18 Net positions between France and Germany and German wind power generation (top) and wholesale price spread between Germany and France from 2017 to 2019 (monthly averages) (bottom)



Source: RTE data, CRE analysis

NB: the negative price spread indicates possibilities for improving the current FR-DE interconnection capacities.

The introduction of competition between nominated electricity market operators (NEMO): a successful technical challenge for the CWE region, but still a task to be completed in other European regions

The CACM Regulation provides that member states shall allow more than one day-ahead & intraday Nominated Electricity Coupling Operators (NEMOs) to operate the electricity markets, except where a monopolistic operator has been designated. In 2015, CRE designated both EPEX SPOT and EMCO as NEMOs in France for a period of four years, their designations were renewed on 21 November 2019 for a further four-year period.

The possibility of having several NEMOs operating in the same area, however, required technical developments which were approved by regulators in 2016, but required several years of technical developments on TSO' and NEMO' sides. On 2 July

2019, EMCO, the incumbent operator in the Nordic region owned by Nord Pool AG, joined EPEX SPOT to operate the day-ahead coupling in the CWE region. Between September 2019 and March 2020, EMCO managed approximately 5% of the volumes traded on the day-ahead power market in France. Other operators have announced their intention to operate the day-ahead coupling on the French market in the future.

Competition from NEMOs was to be implemented simultaneously in the CWE region and in the Nordic region, but the project in this region was postponed several times and was implemented almost one year later than its continental counterpart. CRE considers that it is imperative that competition between NEMOs can take place within all member states where the function of day-ahead & intraday coupling is not exercised by a monopolistic operator.

Box 5: Partial decoupling incidents: the consequences of two events with different market designs

On 7 June 2019 and 4 February 2020, EPEX SPOT and Nord Pool respectively encountered technical problems during the day-ahead multi-regional coupling process. These were the first significant incidents since the coupling was implemented in 2009. Both incidents led to the partial decoupling of the NEMO concerned in a part of the European energy system including France. In these circumstances, the agreed procedures for the operation of the day-ahead coupling provide for local auctions by the decoupled NEMOs, with an explicit allocation of cross-border interconnection capacities impacted via the JAO platform. The two decoupling events have implied different consequences for market players, due to the implementation since 2 July 2019 of the "multi-NEMO" solution allowing several entities to operate the day-ahead coupling in the CWE region.

On 7 June 2019, EPEX SPOT, then the sole operator of the daily coupling of the electricity market in France, received a "corrupted" order, i.e. an order that was not accepted by the EPEX trading system, following an involuntary action by a market participant. The order blocked EPEX's SPOT servers, which could not be back to normal in time for operating the market coupling within its standard schedule. In accordance with the procedures established by the NEMOs, the Crisis Committee triggered the partial decoupling of all markets managed by EPEX SPOT, which involved performing local day-ahead power auctions in the relevant bidding zones and explicit auctions of cross-border capacities using the JAO platform. The bidding zones concerned were Austria, Belgium, France, Germany, the Netherlands and the United Kingdom. Due to a second IT problem, as a consequence of EPEX's efforts to solve the problem of corrupt orders, the results of the local auctions were erroneous as these did not take into account all the submitted orders. These auctions were therefore cancelled and players were given the opportunity to resubmit their portfolios. The final and correct results of the second EPEX SPOT local auctions were published after the deadline for cross-border nominations in degraded mode, which meant that market participants had to nominate the cross-border capacity rights they held without having the necessary information, which prompted some of them to relinquish their right to nominate. The impact of this event on wholesale prices was uneven across the region: while some countries such as Belgium experienced extreme prices with an average of €-133.6 per MWh, the impact on the day-ahead prices in France was more moderate, with a daily average of €3.7 per MWh.

On 4 February 2020, Nord Pool received an order that prevented the computer system from successfully aggregating the supply and demand curves of its customers, a prior step for submitting Nord Pool's portfolio to the pan-European coupling algorithm. Having been unable to solve the technical issue within the timeframe defined in the procedures, Nord Pool declared its partial decoupling of the CWE region, whereas EPEX SPOT remained coupled across the region as per the multi-NEMO solution. As a result, EPEX SPOT carried out the coupling without Nord Pool's portfolios in the CWE region, nor the interconnections managed exclusively by Nord Pool (Baltic Cable, Kontek and COBRA Cable), while Nord Pool endeavoured several times to conduct local auctions for each area of the CWE region, without success. Consequently, having been unable to conduct local auctions before the closure of the TSO gate for nomination of NEMO physical exchange positions, Nord Pool was forced to cancel its auctions for the whole region. As a result, some players held important non-traded volumes (around 5% of total daily auction volumes in France) and could only balance their portfolios either on XBID during the intraday timeframe, or via bilateral trades.

EPEX SPOT and Nord Pool have both implemented patches in their systems in order to prevent these problems from happening anew. However, the occurrence of two critical events in a few months leads CRE to remain vigilant in order to follow up market operators and TSOs in their efforts to improve existing procedures and processes, so that these situations can be avoided in the future. In particular, the requests of market players, who consider that the time periods given for their interactions in degraded mode are too short, shall be taken into account. NEMOs shall continue to improve their communications with the markets during disruptions, and provide for training sessions to market participants in degraded mode before the end of 2020, with configurations as close to reality as possible.

The requirements of the Clean Energy Package imply significant changes to the pan-European coupling algorithm.

The CEP, in force since 1 January 2020, introduced the obligation to align the duration of products traded on the day-ahead and intraday markets with the imbalance settlement period, i.e. for France, 30 minutes up to 1 January 2025, and 15 minutes thereafter.

The transition from 1-hour to 15-minute market time unit of products available for the day-ahead coupling will generate additional complexity for the "Euphemia" algorithm. All other

things equal, this extra complexity will lead to an increase in computation time. The algorithm will also have to evolve to meet other requirements: the extension of the flow-based approach to the Core region⁵⁹, new network topologies, additional bidding zones added into the coupling, etc. By means of Decision No. 04/2020 of 30 January 2020, ACER concluded that certain non-essential products could be removed from the algorithm in order to improve its performance. CRE considers that the products used in the vast majority of coupled countries should be retained as a priority over other products that were introduced in order to address local specificities.

2.2.4 Intraday timeframe

2.2.4.1 Capacity calculation

The methodologies establishing a coordinated capacity calculation for the intraday timeframe have been approved by CRE for the four CCRs of which France is a part of, between 2018 and 2019, simultaneously with the methodologies covering the day-ahead timeframe. They introduce an intraday capacity calculation based on the same approach as the calculation of day-ahead capacity (flow-based or coordinated NTC). Although the technical development of intraday capacity calculation is currently less advanced than that of the day-ahead capacity calculation, given that the TSOs proceed by stages of implementation, CRE considers that they will face the same challenges of increasing exchange capacities, non-discrimination and transparency.

In 2018 and 2019, most of French borders were not subject to an intraday capacity calculation. Following on from the historical practice, the interconnection capacities made available for intraday exchanges on the Spanish, Italian and British borders corresponded to the remaining capacity (leftovers) from the

day-ahead timeframe. For the Swiss border, the capacity was equivalent to the non-nominated part of the long-term contracts between France and Switzerland. It should be noted, however, that the coordinated intraday capacity was implemented in the NIB CCR in November 2019 and is expected to be deployed in the SWE CCR in the summer of 2021.

At the Belgian and German borders, pending the implementation of the intraday capacity calculation provided for in the Core CCR in mid-2022, intraday interconnection capacities are, since May 2015, determined by extracting bilateral capacity levels from the day-ahead flow-based capacity domain. Following a request from regulators and market participants, the process of unilateral intraday capacity increases after their extraction, which had been introduced by TSOs in 2016, was further improved in October 2019.

2.2.4.2 Capacity Allocation

Prior to the launch of the pan-European XBID (for "cross-border intraday") project on 13 June 2018, cross-border energy flows within the intraday timeframe were traded by the means of regional projects of voluntary participation. France was coupled via a continuous trading system with Germany, Belgium and Switzerland, and explicit auction mechanisms⁶⁰ were in place for the Spanish, Italian and British borders. Currently, and thanks to the implementation of XBID, market players in 20 member states⁶¹, including France and its German, Belgian and Spanish

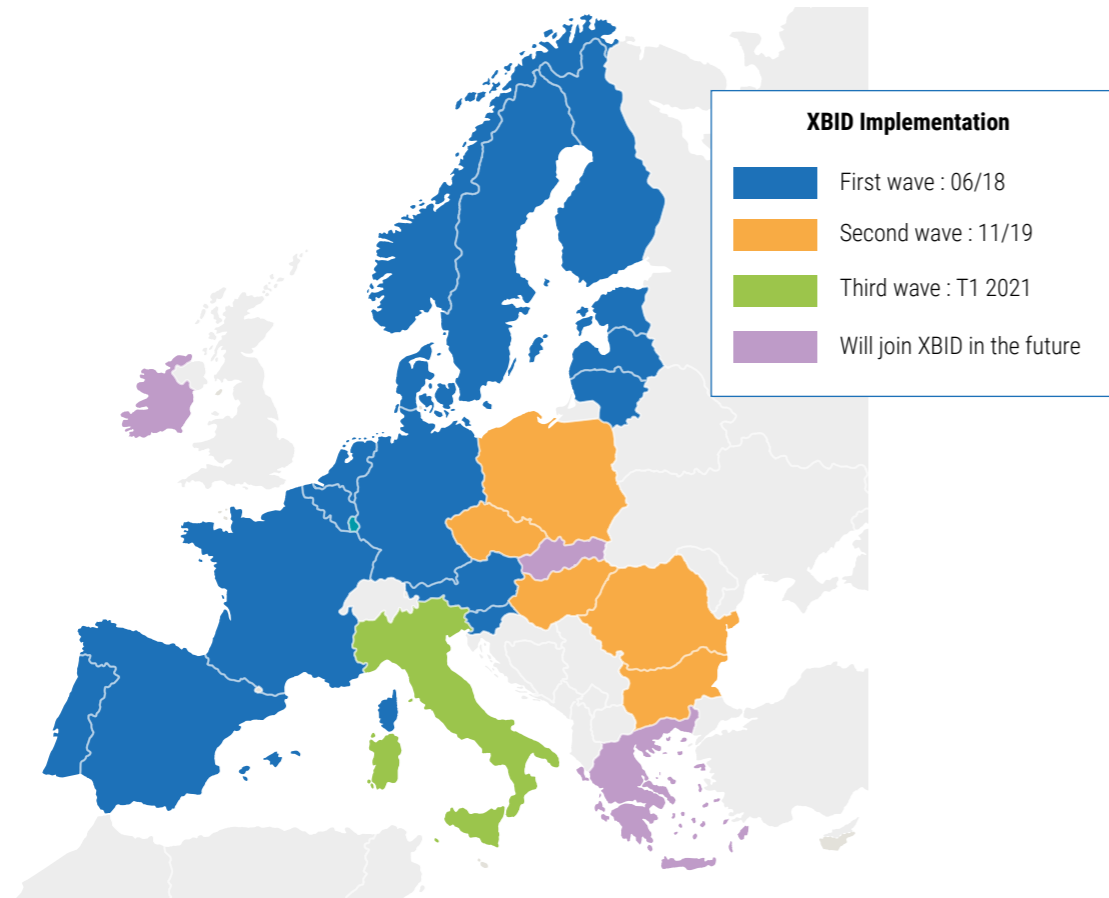
neighbours, can carry out continuous energy exchanges over most of Europe via the XBID platform, subject to available cross-border capacity at the interconnections. At the border with Germany, the exchange of products on a half-hourly basis and the possibility of permanently acquiring cross-border capacity unbundled from energy exchanges have been maintained. This method, called "explicit access", accounts for about 20% of all volumes traded on an intraday basis across this border.

⁵⁹ The Core region includes the CWE region, Poland, Slovakia, the Czech Republic, Romania and Hungary.

⁶⁰ Acquisition of cross-border capacities unbundled from energy exchanges.

⁶¹ Including Norway.

Figure 19 Implementation of the XBID intraday coupling project in Europe



Thanks to XBID, players can trade from the day before the delivery day until one hour before the delivery hour, allowing them to react in real-time to changes in market fundamentals and correct their positions. In the few past cases of disruption of day-ahead market coupling (see Box 3 on partial decoupling incidents), many market participants were able to liquidate their positions by using the intraday continuous market as a back-up market.

The single intraday coupling project aims to be extended to all EU member states, the next step being the inclusion of Italy, by March 2021. As with the day-ahead coupling, and in accordance with the provisions of the CACM Regulation, Switzerland cannot participate in XBID until a comprehensive agreement with the EU has been concluded. The UK, due to the uncertainties related to Brexit, does not participate either. On both borders, capacity is therefore allocated by explicit capacity auctions.

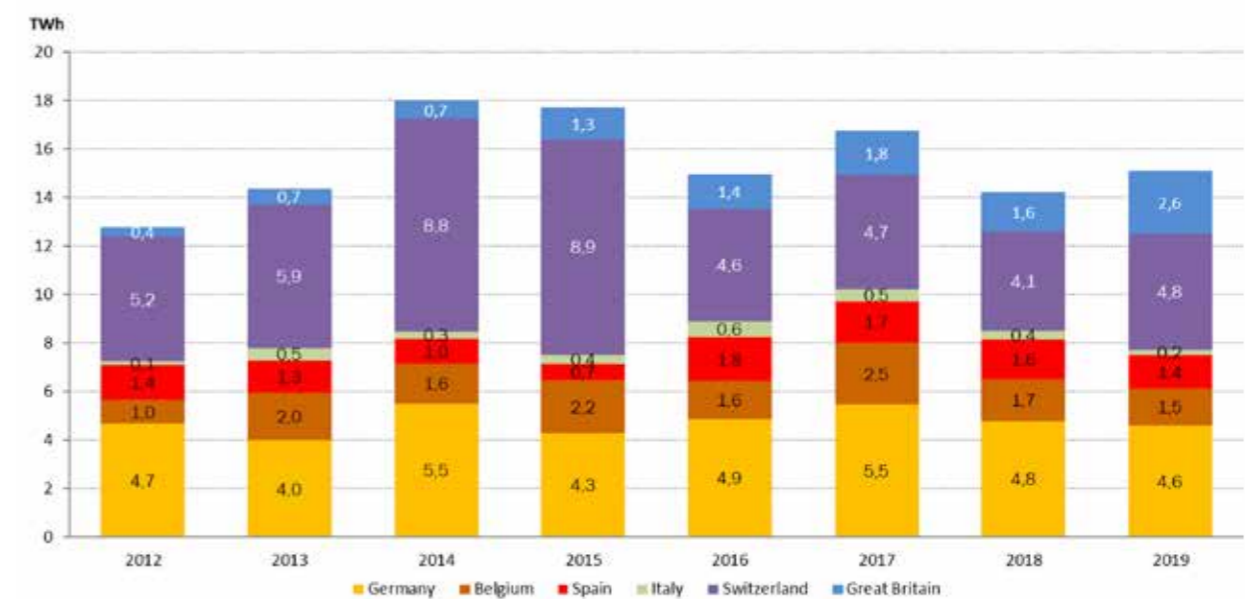
In order to establish a capacity pricing system for the intraday timeframe in accordance with Article 55 of the CACM Regulation, in addition to the continuous system, three intraday auctions (IDAs) per day will be implemented with the go-live planned for 1 January 2023. These auctions will use a technology similar to the day-ahead coupling, and continuous intraday market will have to be interrupted in order to conduct these auctions: during the first year after go-live, the interruption will be of one hour per auction, with a subsequent interruption target of 40 minutes per auction. CRE considers that these auctions will only be useful to market participants if they are conducted after recalculations of capacity at the intraday timeframe are implemented, in order to value all the "new" capacity resulting from these recalculations.

2.2.4.3 Intraday: a timeframe dominated by exchanges with Germany and Switzerland

France's intraday timeframe shows a slight increase in 2019 compared with 2018 (+3% in volume), due to increased trade on the British and Swiss borders. Its dynamism stems largely from cross-border trade, which can account for more than two-thirds of the volumes traded at this timeframe. Intraday trade with Switzerland is more significant compared to other borders due to its geographical position linking the markets of Central and Western Europe with those of Italy, which allows players to take

advantage of arbitrage opportunities, particularly in the direction of Switzerland to France. In addition, market participants use of the intraday timeframe to balance their portfolios in near real-time, since Switzerland cannot participate in the pan-European day-ahead coupling. Intraday trading is also important the France-Germany border, as the German market is very liquid in this timeframe.

Figure 20 Cross-border trading volume in the intraday timeframe



Source: RTE data, CRE analysis

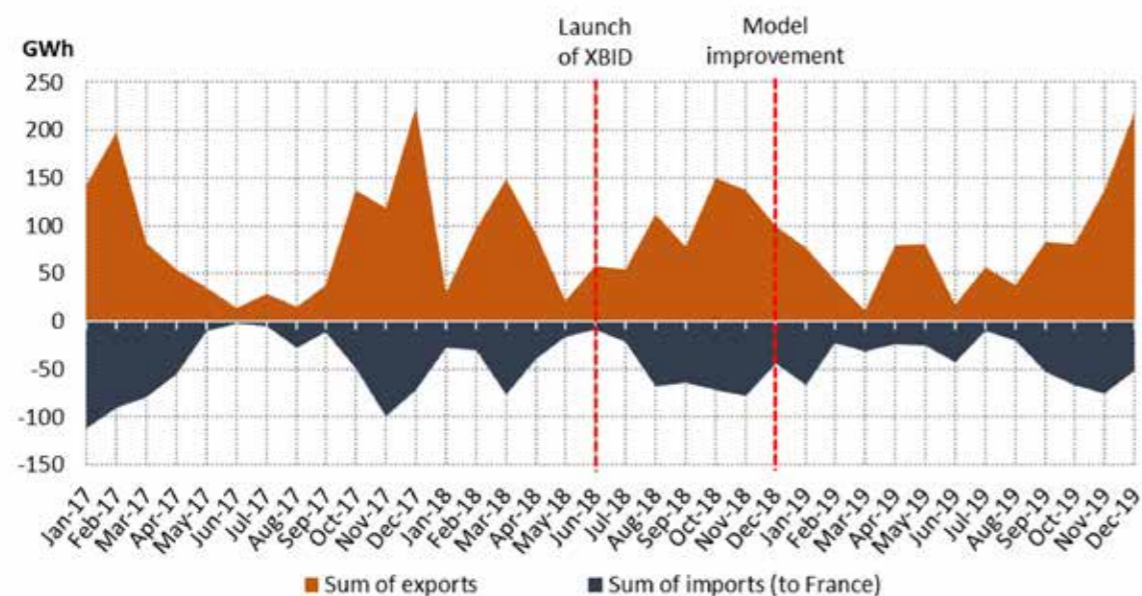
2.2.4.4 South-Western Europe: towards a continuous implicit intraday allocation

Prior to the implementation of XBID, cross-border intraday trade with Spain was performed via two explicit auctions per day. The low number of events, and the allocation of capacities without the respective power associated, have led to lost opportunities and thus to a sub-optimal use of cross-border capacities. CRE welcomed the implementation of the XBID project in Spain, as it should enable market players on both sides of the border to have continuous access to interconnection capacities and an efficient allocation model, thus benefiting from a significant improvement compared to the previous system. However, the energy markets of the Iberian Peninsula have also retained a mechanism of internal and cross-border auctions between Spain and Portugal for the intraday timeframe, also known as "regional auctions". CRE considers that such mechanisms must not disrupt the proper functioning of the target model and, in particular, shall

not generate interruptions to the XBID platform at borders other than those concerned by these auctions.

When the XBID system was launched in June 2018, the model initially adopted in the region allowed market participants to trade only during the hours preceding the next regional auction, i.e. between 4 and 6 hours. Following requests from market players and CRE, six months after the launch of XBID, the Spanish NEMO and TSOs updated their technical solution allowing the exchange of energy for all periods of the intraday timeframe. CRE encourages the transition from regional models to the target model defined in the CACM Regulation, as this will allow market participants in all member states to take full advantage of the possibilities available within the intraday timeframe.

Figure 21 Cumulative intraday monthly volumes at the France-Spain border.



Source: RTE data, CRE analysis

Reading: following the improvement of the XBID model in December 2018, intraday monthly export volumes from France to Spain amounted to approximately 100 GWh, while flows in the opposite direction amounted to 45 GWh.

2.2.5 Balancing

2.2.5.1 Energy exchanges and balancing capacities are developing at most French borders.

Close to real-time, the TSOs are responsible for balancing the power system between consumption and production. An imbalance immediately leads to a change in the frequency of the interconnected grid in continental Europe: a drop in production or a rapid increase in consumption causes a slow-down of the power plants and thus a drop in the frequency of the grid. Conversely, a drop in consumption or a sudden increase in production increases the frequency of the network. As electricity interconnections ensure synchronisation of the frequency across the entire continental European grid, an imbalance in a TSO's area has therefore an impact on the frequency of the entire network and TSOs therefore share responsibility for the quality of the frequency.

For balancing, TSOs use reserves provided by producers, consumers or storage operators, which may vary their injections or withdrawals. Rapid actions to limit frequency variations are carried out simultaneously by all TSOs, whatever the origin of the initial imbalance: the primary reserve (the frequency containment reserve or FCR) fulfils this role. Then, it is up to the TSO of the area in which the imbalance occurred to "make up" for the energy deficit or surplus in its area, using secondary reserves (the

automatic frequency restoration reserve or "aFRR"), the rapid tertiary reserve (manual frequency restoration reserve or "mFRR") or the additional tertiary reserve (replacement reserve or "RR").

Interconnections now make it possible for RTE and others TSOs to exchange, where economically relevant, balancing energy on the one hand and FCR capacity on the other, thereby reducing the balancing cost borne by network users.

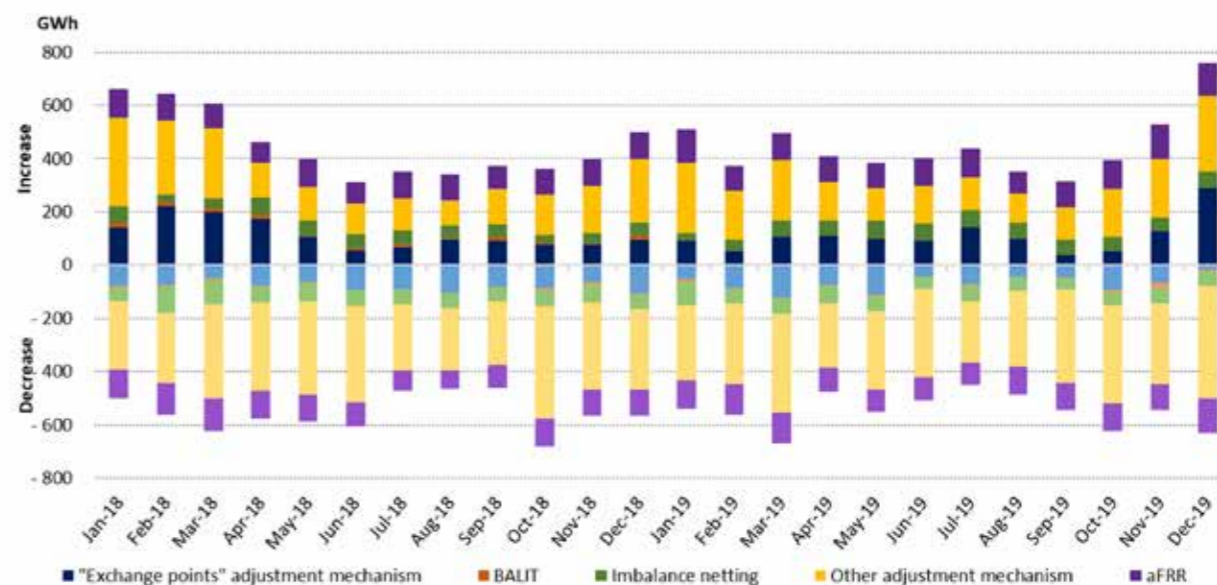
To balance the system, RTE may use balancing energy provided by balancing players located in neighbouring countries. These adjustments are either activated directly by RTE with the balancing actors concerned (for the German and Swiss borders, through the "exchange points"), or by the concerned TSO (for the United Kingdom and Spain, through the "BALIT" mechanism set up by RTE and the British TSO – National Grid – in 2010, and joined by the Spanish – REE – and Portuguese – REN – TSOs in 2014). In both cases, these activations require the availability of exchange capacities across the borders. These activations account for a significant proportion of the balancing energies activated by RTE: in 2019, they represented, in volume terms, 40% of upward tertiary reserve activations and 20% of downward activations.

The use of balancing platforms, described below, is intended to replace these mechanisms.

Moreover, since 2016, RTE has been involved in the International Grid Control Cooperation project (hereafter the IGCC), alongside the Dutch, German, Danish, Swiss, Czech, Belgian, Austrian, Hungarian, Slovenian and Italian TSOs. This cooperation makes it possible for participating TSOs to compensate for their

imbalances, by trading energy in real-time, within the limit of the total offsetting imbalances' potential and the trading capacities available at the borders. This cooperation avoids, as far as possible, simultaneous upwards and downwards activations of the aFRR in different countries, where border trade capacities allow it. In 2019, this mechanism allowed RTE to avoid 35% of aFRR upward activations in volume and 37% of downward activations in volume.

Figure 22 Upward and downward balancing energy activations



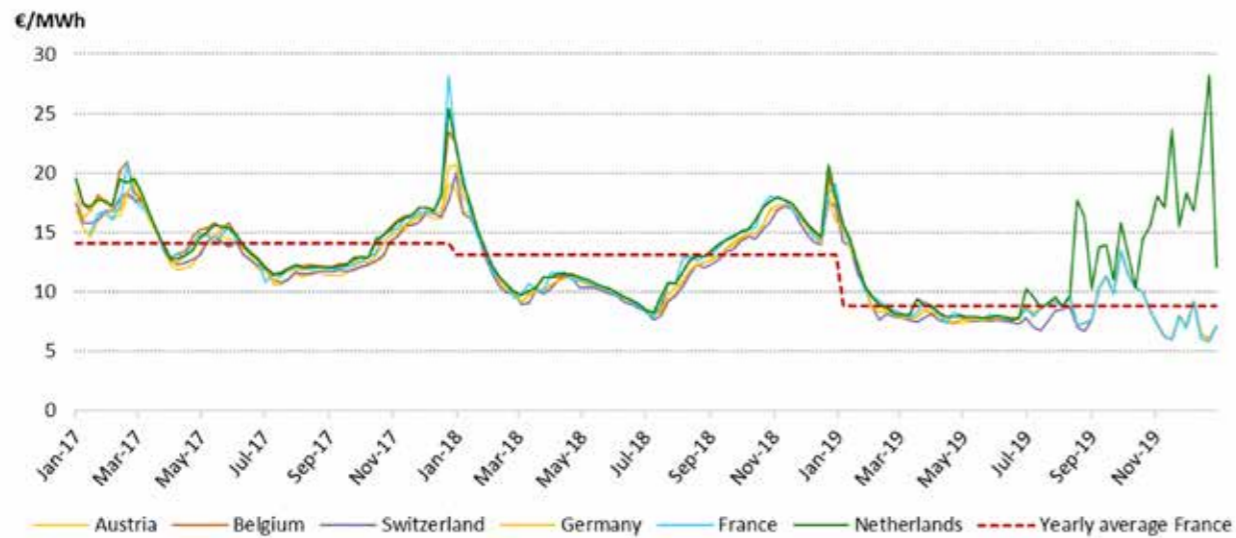
Source: RTE data, CRE analysis

Reading: in December 2019, RTE activated balancing offers at interconnections for 310 GWh upwards (291 GWh under the "exchange point" adjustment mechanism and 19 GWh under BALIT), i.e. 40% of tertiary reserve upward activations, and for 25 GWh downwards (19 GWh under the "exchange point" adjustment mechanism and 7 GWh under BALIT), i.e. 4% of tertiary reserve downward activations.

Finally, RTE joined in 2017 the "FCR cooperation", leading to a common contractualization of the FCR between six European countries (Austria, Belgium, France, Germany, the Netherlands and Switzerland). The aim of this cooperation is to reduce the cost to contract this reserve by mobilising the cheapest resources from these six countries through a tender open for all the means capable of supplying the primary reserve (producers, consumers,

storage). The participation in the FCR cooperation has resulted in a significant decrease of the contracting cost. While the cost of the primary reserve in France was €92M in 2015, it was €63M in 2018, and €48M in 2019. This cooperation does not require to ensure there is sufficient exchange capacities at borders, as FCR exchanges can use the safety margins provided for this purpose when calculating capacities.

Figure 23 Average price of the primary reserve contractualized, by country, between 2017 and 2019



Source: RTE data, CRE analysis

2.2.5.2 EU balancing regulation will further integrate balancing markets

The EBGL Regulation provides for the creation of European or regional platforms for the exchange of balancing energy and the compensation of imbalances. The RR, mFRR and aFRR platforms implemented a model in which TSOs share the balancing bids they have received in their zone and submit their requests to the platforms, in order to optimise the activation of bids, taking into account the exchange capacities available across their borders.

The implementation framework for the regional RR exchange platform (the TERRE project) was approved by regulators in December 2018. The platform was commissioned at the beginning of 2020; RTE will start using it in the fall of 2020. This platform will allow TSOs that apply, like RTE, a "proactive" balancing model (i.e. using slower balancing reserves that can be activated in anticipation of imbalances), to minimise the cost of RR activations. The estimated gain for all participating countries is €110M per year.

Regarding the mFRR and aFRR platforms, ACER published their implementation framework, as well as the principles for determining energy balancing prices in January 2020. The

implementation of these platforms requires a certain degree of harmonisation of traded products as well as the rules for the financial settlement of activated offers. The EBGL regulation defines common principles, such as the settlement of activated bids at the marginal price, while the detailed parameters are defined in ACER decisions.

The mFRR platform will have to be implemented by mid-2022 at the latest. It will allow TSOs to share their mFRR bids through auctions organised every 15 minutes, as with the RR platform, but also to activate mFRR at any time between auctions.

The aFRR platform, which is expected to be implemented by mid-2021, will introduce activation of the aFRR according to real-time economic precedence (as opposed to activation in the prorata currently in force in France) and harmonise at 300 seconds the duration to reach a full activation of the aFRR instead of 400 seconds today. In France, on the same date, the aFRR capacities will also be tendered instead of the current prescription, and the aFRR products will evolve to remove the "emergency" ramp requirement, which currently requires aFRR providers to be

able to cross the entire control band in 133 seconds in the event of an exceptional imbalance. This latter change will offset the upward effect on aFRR's cost of the transition in the activation time from 400 to 300 seconds under European harmonisation.

The above RR, mFRR and aFRR exchange platforms only concern the activations and exchanges of balancing energy, close to real-

time. Contracting upstream balancing capacities may also be subject, under the terms of the EBGL Regulation, to cross-border exchanges, such as the Cooperation FCR mentioned above, but the development of these balancing capacity exchange projects is on a voluntary basis.



3. FRENCH GAS INTERCONNECTIONS

3.1 FRANCE HAS DIVERSIFIED GAS SUPPLY SOURCES AND SUFFICIENT GAS INFRASTRUCTURES

3.2 FUNCTIONING OF THE GAS MARKET AND DEVELOPMENT OF INTERCONNECTIONS

3.3 RULES AT FRENCH BORDERS AND REVIEW OF SUBSCRIPTIONS AT GAS INTERCONNECTIONS

PART 3

FRENCH GAS INTERCONNECTIONS

3.1 France has diversified gas supply sources and sufficient gas infrastructures

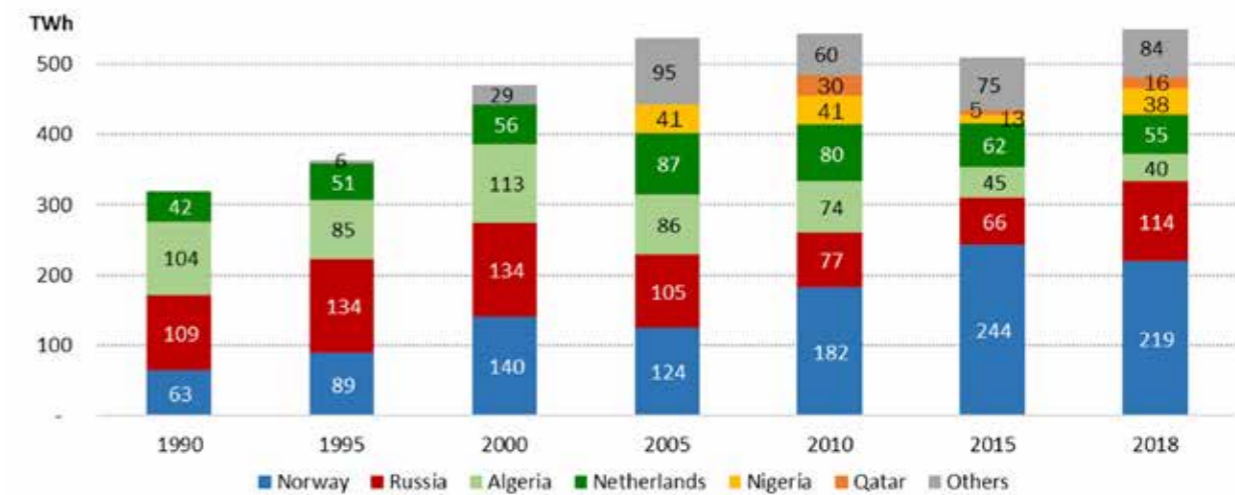
Gas remains a major source of energy. In France, 11 million sites are supplied with gas and 42% of households consume it. The industrial sector is also an important outlet, accounting for more than a third of demand. France imports almost all the gas consumed on its territory, which represents an annual bill of around 10 billion euros. The quality of integration of the French network into the international system is therefore a major challenge and should enable importers to arbitrate between the different sources of supply in order to benefit from the cheapest supplies.

The development of European players' arbitrage capacities has been a major focus of the reorganisation of the European market in recent years, with the creation of liquid wholesale markets linked together by high-capacity interconnections. The European Union now has a flexible system comprising several major supply routes: on the one hand, the pipeline routes with the East-West corridor from Russia (and soon from the Caspian Sea), with the North-South corridor from Norway, and with the South-North corridor from North Africa; and on the other hand with the supply of gas in the liquid form ("liquefied natural gas" or LNG). With the very strong growth of unconventional gas production in North America, international competition between

the major exporters has intensified. After a period of tension on the international markets, which resulted in price peaks in mid-2010, the fall in oil prices and the more moderate increase in needs in Asia opened up a period of low prices from which Europe and France are fully benefiting.

While domestic production continues to decline in the European Union, Russia is pursuing a strategy that includes a constant effort to strengthen export routes, with the completion of the Nord Stream 2 and the Turkish Stream, as well as the development of supplies of LNG from the Yamal Peninsula. Gazprom, Russia's leading natural gas producer, which exports its production by pipeline under long-term contracts with its customers, has been offering short-term products since September 2018 (on its electronic sales platform – ESP) in order to adapt to the new strategies of its customers and to cope with LNG growth. Russia's market share reached 46% of EU imports in 2019, in a context where all LNG exporters have increased their deliveries to the EU, the United States ahead. Norway is the second largest supplier with 29% of European imports. North Africa, on the other hand, is experiencing a marked decline, with Algeria accounting for only 7% of deliveries.

Figure 24 French natural gas imports by origin



Source: SDES data, Ministry of Ecological and Solidarity Transition, CRE analysis.

The abundance of LNG in Europe is in line with the growth observed worldwide. In 2019, global imports of LNG reached 354.7 million tonnes, i.e. 13% more than in 2018 – the highest growth rate since 2010⁶². As in 2018, this growth was fuelled by abundant supply, with a strong increase in production in the United States, Russia and Australia. Asia is the main destination market, although its share in global demand is declining from 76% in 2018 to 69% in 2019. This reduction is due to a lower economic growth, but also to a lower demand from Japan due to greater use of its nuclear plants. At the same time, China's import growth has slowed. China is indeed giving priority to domestic production and renewable energy, and is seeking to secure its external supplies by developing pipeline projects backed by long-term delivery contracts. It is worth noting that the "Power of Siberia" pipeline was commissioned early December 2019 and will eventually bring 38 billion cubic metres (bcm) of Russian gas to China every year.

In this context, Europe plays the role of an "adjustment market" thanks to its capacity to accommodate possible surpluses of

gas shipped worldwide. Indeed, the liquidity of its wholesale markets and the flexibility of the offers and services offered in European LNG terminals make the EU a preferred destination for any cargo seeking an outlet. Underground storage capacities also increase the possibilities for absorbing LNG, especially when consumption is insufficient in the short term. The year 2019 was thus a record year for LNG supplies. LNG deliveries in the EU came to 108 Gm3 i.e. 27% of natural gas imports⁶³. Spain, France and the United Kingdom are the main European importers.

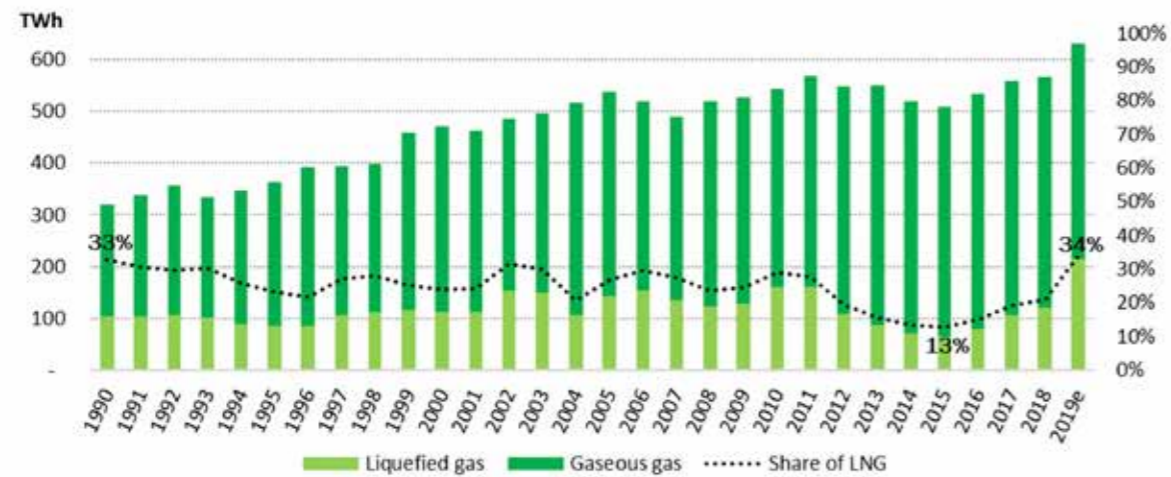
In France, the share of LNG in gas imports in 2019 is at a level not seen since 1990, with 15.6 million tonnes imported, i.e. more than a third⁶⁴ of gas imports, highlighting the relative growth of LNG compared to pipeline imports following the sharp decline observed between 2011 and 2015, when the Fukushima accident led Japan to import massive quantities of LNG to compensate for the shutdown of its nuclear power plants.

⁶² GIIGNL Annual Report 2020: https://giignl.org/sites/default/files/PUBLIC_AREA/Publications/giignl_-_2020_annual_report_-_04082020.pdf

⁶³ Ibid.

⁶⁴ Ibid.

Figure 25 Gaseous and liquefied gas supplies to France since 1990



Source: SDES data, Ministry of Ecological and Solidarity Transition, CRE analysis.

LNG influx has shown the relevance of recent regulatory developments in France, with the creation of the single market zone (see the Focus dedicated to the merger of market zones) and the reform of access to storage. It has been accompanied by a decrease in

pipeline imports and an increase in re-exports to Spain and Italy. As far as prices are concerned, the PEG price (Point d'échange de gaz of the Trading Region France) is increasingly lower than those observed on the Dutch market (TTF for Title Transfer Facility).

3.2 Functioning of the gas market and development of interconnections

3.2.1 Interconnections bring flexibility, diversity and security to France's gas supplies

Since the closing down of the Lacq field in 2013, almost all the natural gas consumed in France is imported, but the great diversity and complementarity of the supply sources available to France (land interconnection capacities, LNG terminals and storage facilities) make the French gas system one of the most robust in Europe. This diversity contributes to the security of supply of France and Europe. It also enables market players to arbitrate between the different supply sources according to their competitiveness, to the benefit of French and European consumers, who can thus benefit from the lowest prices.

France has land interconnection points with Belgium, Germany, Switzerland and Spain. In addition, it is directly connected to the Norwegian production fields in the North Sea via the Franpipe pipeline, which is 840-kilometre-long and was commissioned in October 1998.

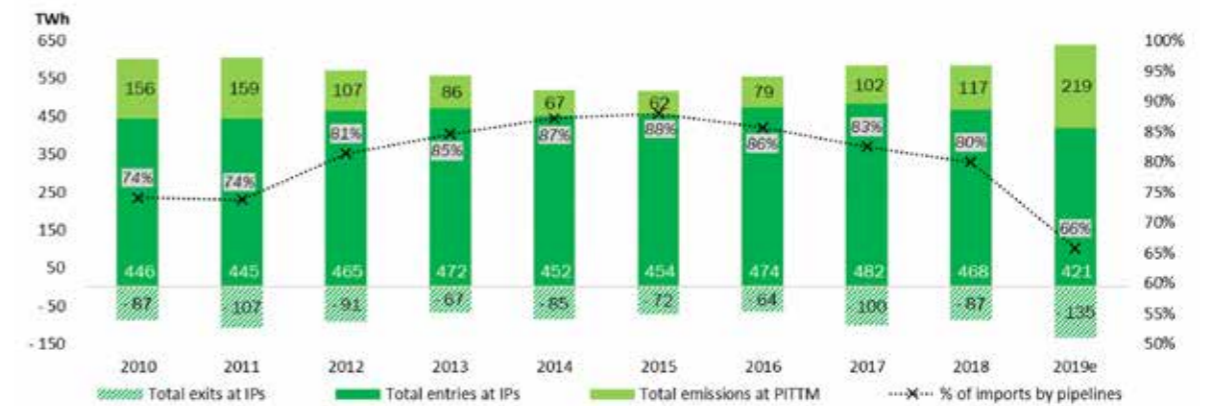
Firm land entry capacities on the French territory amounted to 2,380 GWh/d in 2019, an increase of 575 GWh/d since 2005

(+32%). Over the last two years, it is worth noting the creation of 100 GWh/d of entry capacity from Switzerland at Oltingue, commissioned on 1 June 2018. Firm land exit capacities to neighbouring systems more than doubled between 2005 and 2019, reaching 694 GWh/d.

France also has four LNG terminals (Fos-Tonkin, Fos-Cavaou, Montoir-de-Bretagne and Dunkerque LNG), with a cumulated capacity of 1,311 GWh/d. These capacities have not changed since the beginning of 2017 and the commissioning of the Dunkirk terminal. It should be noted that part of the 520 GWh/d of firm capacity at the Dunkirk terminal can be used (up to 250 GWh/d) to supply Belgium directly.

At the end of 2019, France had a total of approximately 3,691 GWh/d of import capacity (including 1,311 GWh/d of LNG), an increase of 1,346 GWh/d since 2005 (+57%).

Figure 26 French natural gas imports and exports

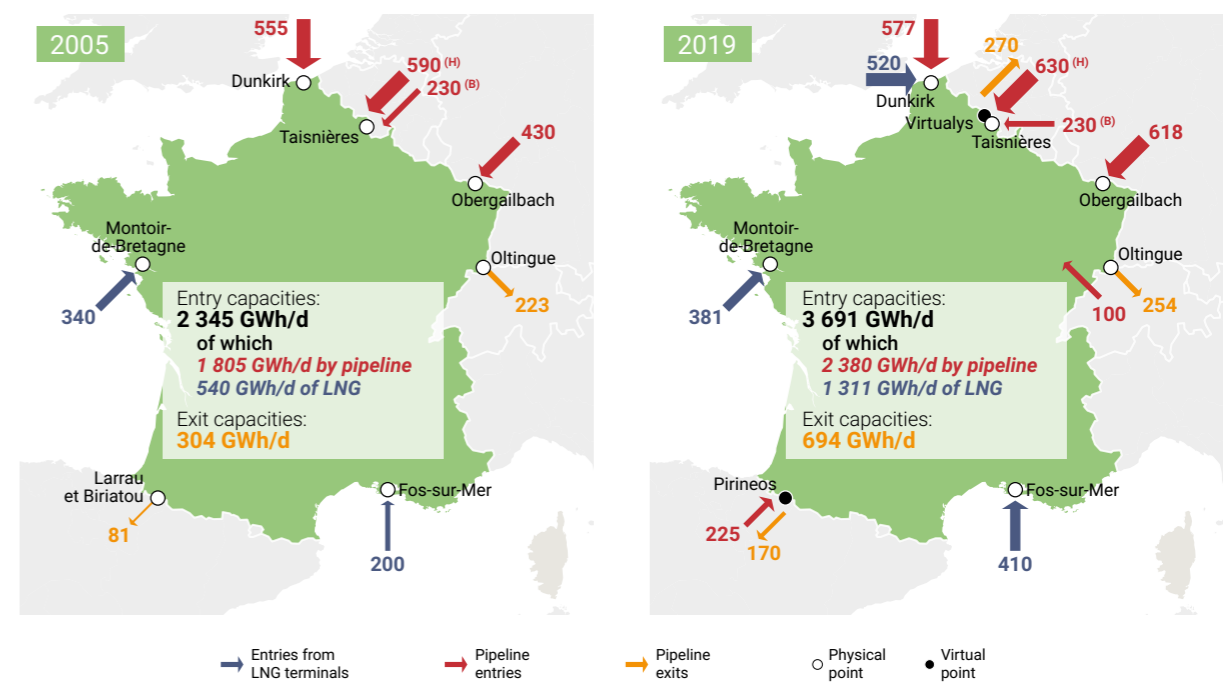


Source: GRTgaz and Teréga data, CRE analysis

Of all the physical interconnection points available to France, the Dunkirk IP – which receives gas from Norway via the Franpipe – is the point through which transit the largest volumes of gas (its utilisation rate is also the highest, with 86% and 85% in 2018 and 2019). After reaching a historically high point in 2017 (196 TWh),

entry flows at Dunkirk remained at high levels in 2018 (190 TWh) and 2019 (191 TWh), accounting for around a third of French imports (33% in 2018, 30% in 2019). However, some of these volumes are to transit towards Italy (via Switzerland) and Spain.

Figure 27 Capacity of French land interconnections and LNG terminals in 2005 and 2019



Source: GRTgaz and Teréga data, CRE analysis

NB: it should be noted that the Dunkirk terminal serves both the French and Belgian grids: part of its capacity (up to 250 GWh/d) can supply Belgium directly. As the export capacity to Belgium amounts to 270 GWh/d, the remaining available capacity is marketed via the Virtualys PIV.

More than a quarter of French imports are transit through the interconnection points with Belgium. Natural gas with low calorific value (known as "L gas") from the Groningen field (Netherlands) is delivered through the Taisnières-L ("Taisnières-B" in French) entry point, where flows decreased from 56 TWh in 2018 to 49 TWh in 2019. The Taisnières-H IP, is supplied with high calorific value gas (known as "H gas") from fields in the North Sea. The Alveringem point is for its part mainly dedicated to "backhaul" flows from France to Belgium, allowing to deliver non-odorised gas from both the Dunkirk terminal and the Franpipe pipeline. Since 1 December 2017, the Alveringem and Taisnières interconnections were grouped together within the Virtualys virtual interconnection point (VIP), through which 101 TWh and 119 TWh of gas transited from Belgium, in 2018 and 2019 respectively.

The interconnection with Germany at Obergailbach is the main supply route for Russian gas. However, it is used well below its maximum capacity (utilisation rate of 44% in 2018 and 20% in 2019), with flows falling sharply between 2018 and 2019, from 103 TWh to 43 TWh (-58%), i.e. 9% of French imports net of re-exports in 2019. This drop in flows comes at a time when the German market is undergoing major restructuring, notably with the merger of the NCG and Gaspool zones. While some of the exit capacity from Germany at Medelsheim have been reallocated to domestic points, thereby reducing available entry capacities to France, CRE stresses the need to ensure the stability of interconnection capacities. Good cross-border cooperation is essential with regard to the transmission capacities made available to the market.

Figure 28 Evolution of the import-export balance at French interconnections and LNG terminals from 2015 to 2019

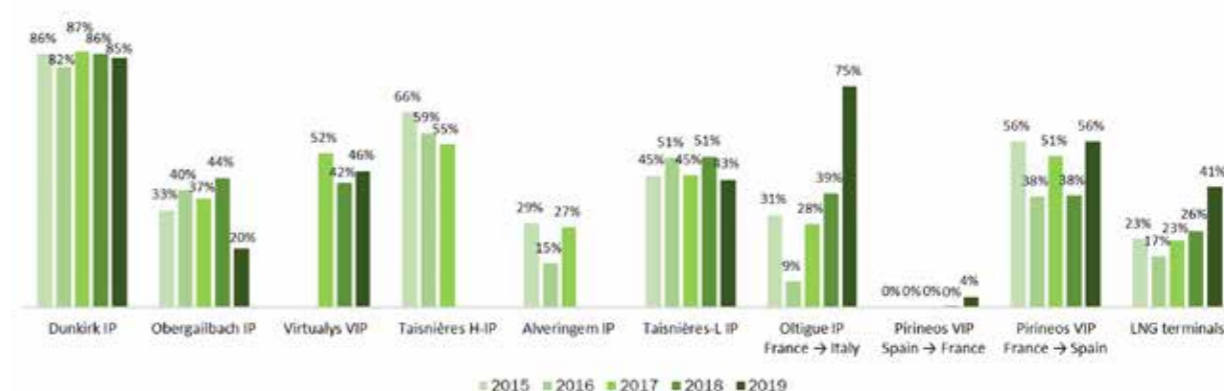


Source: GRTgaz and Teréga data, CRE analysis

France also has two interconnection points with Spain – grouped together within the Pirineos VIP – which allow bidirectional flows between the two countries. However, this interconnection is used almost exclusively in the France to Spain direction. Net gas flows from Spain to France have remained marginal until recently (less than 50 days between January 2010 and the end of October 2019). A reversal of flows was nevertheless observed during 46 days between 1 November and 31 December 2019, due to the sharp decline in the wholesale price of gas in Spain, which was sometimes lower than the French price in a context of high LNG imports coupled with mild weather conditions in Spain at the end of the year. France nevertheless remains a transit country for the Iberian Peninsula. In 2019, Spain thereby imported 9 TWh more gas from France than in 2018, settling at 49 TWh (+23%).

The interconnection with Switzerland, at Oltigue, makes it possible to exchange gas with Italy in particular. The Oltigue IP was significantly more used in 2019, with 66 TWh of gas exported (+98% compared to 2018). On the one hand, this increase can be explained by the significant influx of LNG to France in 2019, which made the supply at the PEG very competitive for Italy. On the other hand, the low level of availability in 2019 of the Trans Europa Naturgas pipeline (TENP) linking the Netherlands and Italy via Germany and Switzerland, led shippers to use the supply route via France. Although physical flows are possible from Switzerland to France since June 2018, no gas flow has been observed.

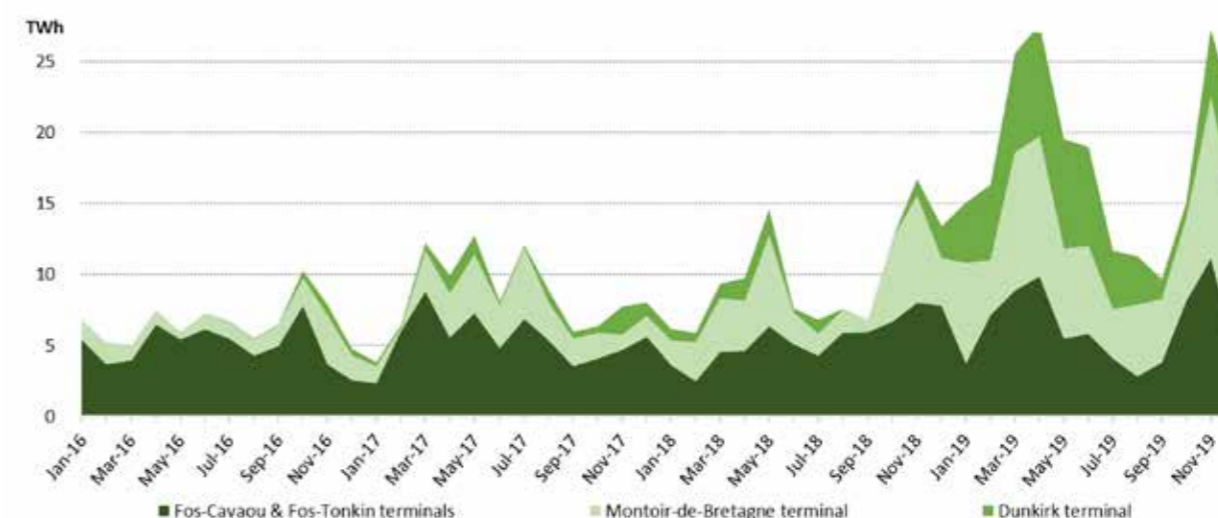
Figure 29 Capacity utilisation rate of French interconnections and LNG terminals (% of effective technical capacity)



Source: GRTgaz and Teréga data, CRE analysis

With respect to LNG, the increase in imports resulted in growing activity at Montoir and Dunkirk terminals, while activity at Fos terminals remained stable.

Figure 30 Monthly LNG imports at French LNG terminals (2016-2019)



Source: Smart GRTgaz data, CRE analysis

The significant increase in LNG imports is due in particular to the sharp drop in prices on the international LNG market, which has been fully exploited thanks to the significant capacities of French gas infrastructures.

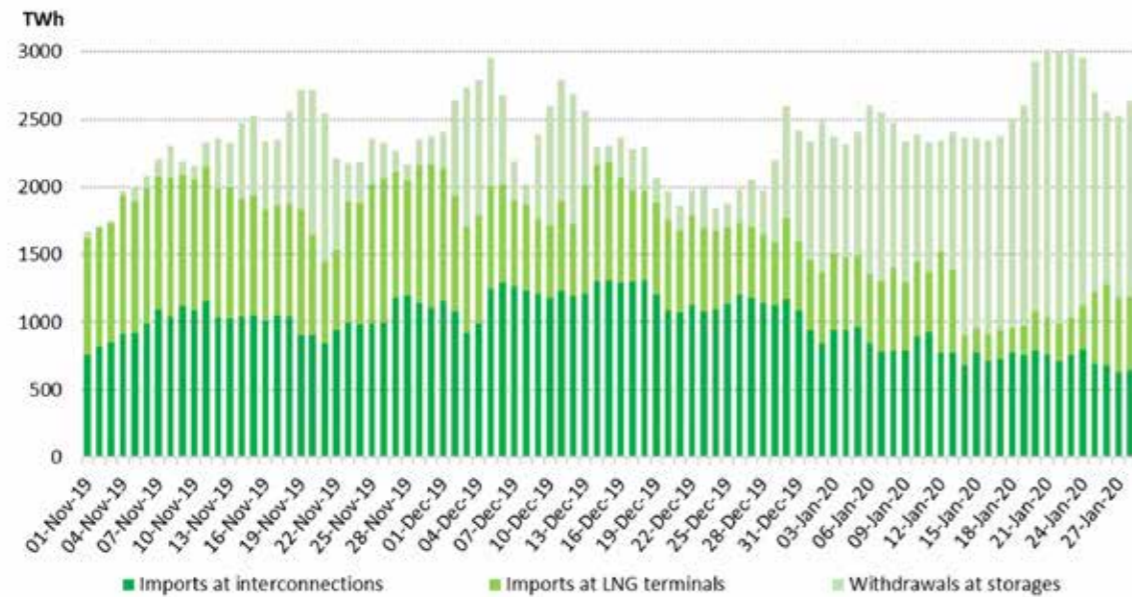
France also has significant underground storage capacities (approximately 130 TWh) spread over the whole territory (14 sites, out of which 3 are mothballed), which represent approximately 100 days of average consumption. As a central tool for security of supply, these storage capacities are an essential asset for managing seasonal variations in consumption and provide the

flexibility critical for balancing the transmission networks. In particular, they help to ensure the firmness of transmission capacities at interconnections. The introduction of the regulated regime on 1 January 2018, which modalities were implemented by CRE (decisions of 22⁶⁵ and 27 March 2018⁶⁶), has led market players to subscribe greater amounts of storage capacities, thereby strengthening France's security of supply. The availability of underground storage capacities has also been a key factor for attracting LNG. By acting as an interface between LNG unloading and the final market, storage has absorbed a significant part of these imports.

⁶⁵ CRE's deliberation of 22 March 2018 on the introduction of a storage tariff term into the tariff for the use of GRTgaz and TIGF transmission networks: <https://www.cre.fr/en/Documents/Deliberations/Decision/storage-tariff-term>

⁶⁶ CRE's deliberation of 27 March 2018 setting the level of the storage tariff term in the tariff for use of the natural gas transmission systems of GRTgaz and TIGF as from 1 April 2018: <https://www.cre.fr/Documents/Deliberations/Decision/terme-tarifaire-stockage-1er-avril-2018>

Figure 31 Gas entries on the French network during winter 2019-2020

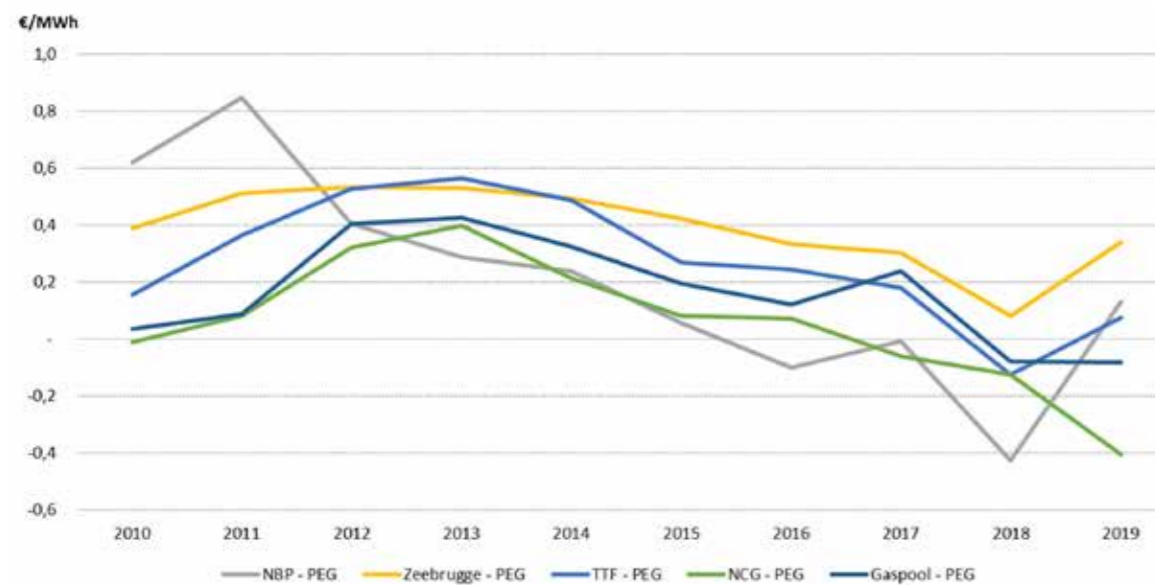


Source: Smart GRTgaz data, CRE analysis

Box 6: Convergence of the French price with the main European hubs

The main gas hubs in North-Western Europe have shown a strong convergence of their wholesale gas prices over the last two years, thanks to the fluidity of European markets. In particular, there has been a trend towards a reduction in the price difference (or "spread") between the PEG and the most liquid markets in North-Western Europe.

Figure 32 Average annual price spreads between the PEG and other main European markets (day-ahead spot prices)



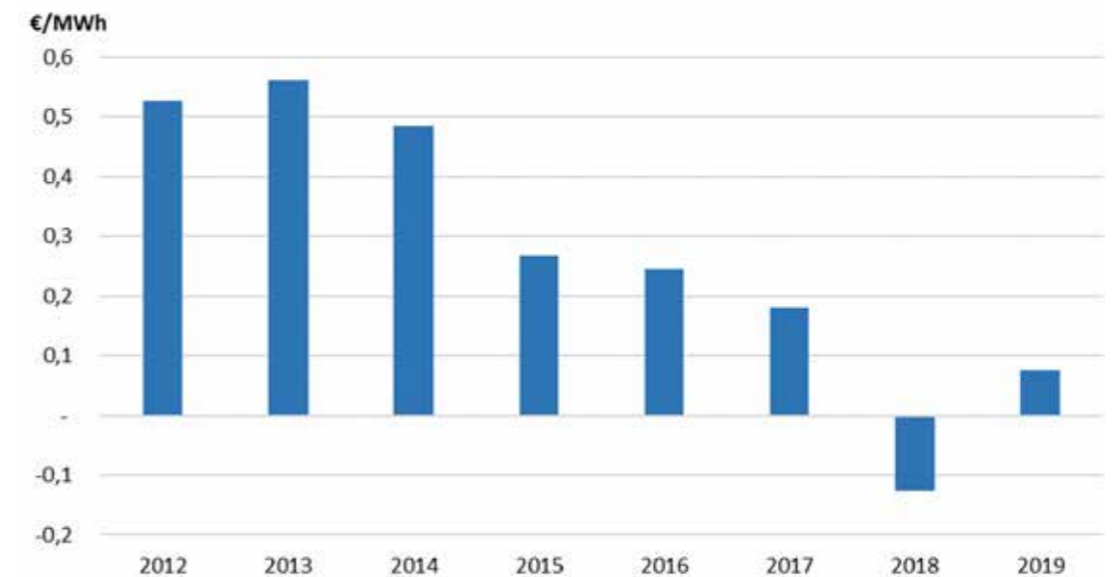
Source: ICIS Heren data, CRE analysis

NB: NBP (United Kingdom), Zeebrugge (Belgium), TTF (Netherlands), PEG (France), NCG and Gaspool (Germany).

Reading: in 2019, the PEG France price was, on average, only 7 eurocents higher than the Dutch TTF price.

Following the merger of the market zones and the storage reform, the French market has gained in attractiveness and liquidity and the price of gas at the TRF PEG shows a very little spread with the TTF (Europe's reference hub), and was even negative in 2018. The PEG – which for several years was among the most expensive hubs among its counterparts in North-Western Europe – is now average, with price spreads that have narrowed overall.

Figure 33 Average annual price spreads between PEG and TTF (day-ahead spot prices)



Source: CIHI Heren data, CRE analysis

NB: PEG North before 1 November 2018, then PEG France.

Reading: in 2019, the PEG France price was, on average, only 7 eurocents higher than the Dutch TTF price.

3.2.2 Development of gas interconnections at French borders

Since 2005, CRE has supported the development of gas interconnections relying on procedures of appeal to the market (or "open seasons") which aim at identifying the need for new infrastructure, dimensioning it according to users' needs, and allocating the corresponding capacity in a non-discriminatory manner. These procedures have reduced the risk that the final consumer will bear the costs of an under-utilised infrastructure, via the transmission tariffs. CRE considers that the existing capacities are sufficient, in a context of uncertainty regarding the future of gas consumption. The development of any new capacity should only be considered if there is a proven market interest and if the project is supported by robust cost-benefit

analyses (CBAs). A fair sharing of costs between countries, reflecting the distribution of benefits, should also be ensured.

The latest developments consist in the creation of 100 GWh/d of entry capacity at the Oltingue IP and the commissioning in June 2018 of the Val-de-Saône and Gascogne-Midi projects, in order to implement the merger of the zones on 1 November 2018 (see the Focus on the merger of market zones). The conversion plan of the Hauts-de-France region to H gas to cope with the end of L-gas imports is still underway.

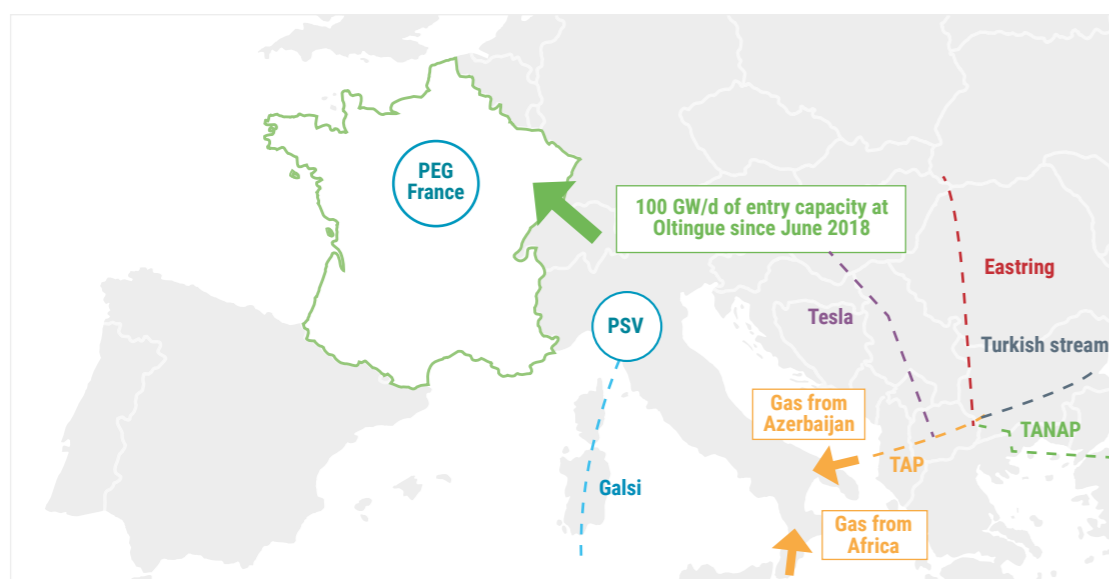
3.2.2.1 Creation of entry capacities at Oltingue

From 2010, GRTgaz worked in consultation with the Italian (Snam) and Swiss (Swissgas) transmission system operators (TSOs) on a solution enabling a physical flow from Italy to France via Switzerland, as the Oltingue point could only operate in the France to Switzerland direction.

In 2012, GRTgaz launched an open season for the creation of firm backhaul capability at Oltingue. Faced with insufficient demand, CRE finally opted for an option requiring much less

investments, validating the creation of 100 GWh/d of so-called "quasi-firm" capacity (CRE's decision of 17 December 2014). These new capacities were commissioned on 1 June 2018 by GRTgaz at a final cost of €17.5M. They increase the possibilities of diversifying France's supply sources by opening up access to gas from Libya or Algeria via the Italian Peninsula and, in the long term, to gas from the Caspian Sea via the Transadriatic Pipeline (TAP), transiting via Greece, Albania and the Adriatic Sea to reach Italy.

Figure 34 Entry capacities at Oltingue and gas supply from Italy



3.2.2.2 Towards the end of L gas in North-Western Europe

Part of North-Western Europe is supplied with low-calorific value gas (L gas), mainly from the giant Groningen field in the Netherlands, which is currently in a depletion phase. The increasing frequency of earthquakes caused by gas extraction has led the Dutch government to gradually reduce production as early as 2014, before announcing in September 2019 that the site would cease production in 2022. The Dutch government may have to reduce L-gas production even more rapidly. In order to keep on delivering L gas, the Netherlands have invested in H-gas depletion converters and has committed to honour current supply contracts, which end in 2029 for France. L-gas consuming regions in Germany, Belgium, Luxembourg, the Netherlands and France have launched conversion plans. As regards Belgium and France, a cooperation agreement has been signed between the concerned TSOs in France (GRTgaz), Belgium (Fluxys) and the Netherlands (Gasunie Transport Services – GTS).

In addition, as the conversion project in France and Belgium was granted the status of Project of Common Interest (PCI) in 2017, GRTgaz and Fluxys Belgium have submitted an investment request for a joint decision by CRE and CREG on a cross-border cost allocation. After reviewing the CBA proposed by GRTgaz and Fluxys Belgium, and concluding that France and Belgium would each derive a positive net benefit from the conversion project, CRE and CREG decided⁶⁷ that France and Belgium will bear separately the costs incurred by their respective TSOs.

In France, the Hauts-de-France region counts 1.3 million customers connected to the distribution network and 96 customers connected to the transmission network supplied with L gas, i.e. approximately 10% of French consumption. In order to ensure continuity of supply, it was decided to convert the network to high-calorific value gas (H gas) used everywhere else in France.

Figure 35 L-gas and H-gas transmission networks in the Hauts-de-France region



Source: GRTgaz, L gas to H gas conversion project⁶⁹

3.2.2.3 Rejection of the investment application for the STEP project

The Spanish and French markets are connected to each other by two pipelines located West of the Pyrenees, at Larrau and Biriato, which together account for a total capacity of 225 GWh/d from Spain to France, and of 165 GWh/d firm capacity and of 60 GWh/d interruptible capacity from France to Spain.

A second corridor to the East of the Pyrenees was envisaged, the Midi-Catalonia ("MidCat") project, which was to result in the creation of 230 GWh/d of capacity in the Spain to France direction and 180 GWh/d of capacity in the France to Spain direction. This project, which required very significant reinforcements of

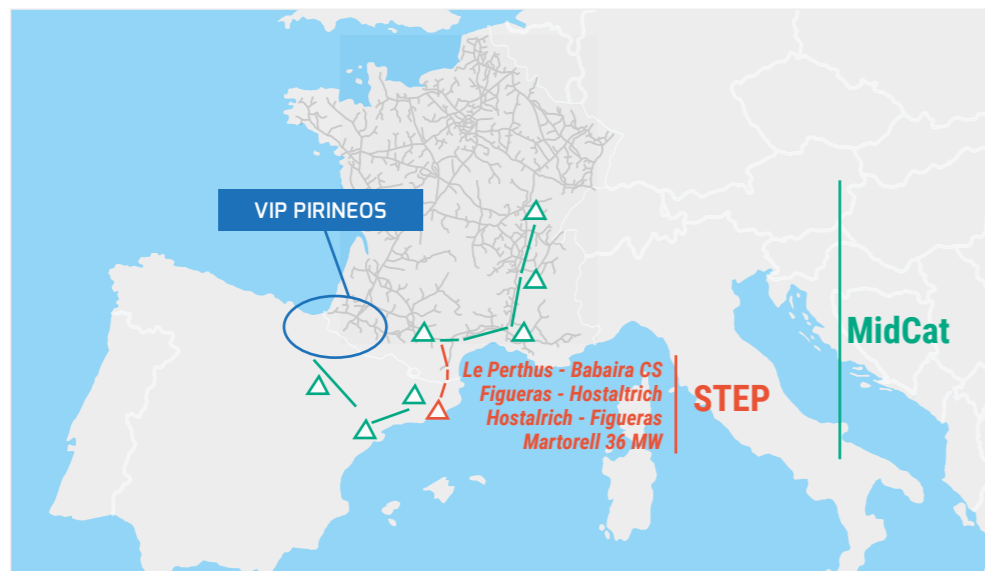
the French grid (notably the Eridan and Arc Lyonnais projects), was estimated to cost 2 billion euros. The French (Teréga) and Spanish (Enagas) operators proposed a less ambitious project, the South Transit East Pyrenees (STEP), only covering the link between the French and Spanish networks, but which, in the absence of reinforcement in the core of the French network, would only have provided with interruptible capacity to market players. The STEP project had PCI status, which led Teréga and Enagas to file an investment application with CRE and the Spanish regulator (CNMC) on 23 July 2018.

⁶⁷ CRE's deliberation of 17 December 2014 concerning the revision of the 10-year development plan and the decision to approve GRTgaz's investment programme for 2015 (in French): <https://www.cre.fr/Documents/Deliberations/Approbation/programme-d-investissements-2015-grtgaz>

⁶⁸ CRE's deliberation of 4 October 2018 adopting the joint decision on the processing of the request for the cross-border cost allocation of adapting parts of the Belgian and French transmission networks to H gas (in French): <https://www.cre.fr/Documents/Deliberations/Decision/Traitement-de-la-demande-de-repartition-transfrontaliere-des-couts-d-adaptation-au-gaz-H-des-parties-des-reseaux-de-transport-belges-et-francais>

⁶⁹ GRTgaz, Project for the conversion of L gas into H gas (in French): <http://www.grtgaz.com/grands-projets/le-projet-tulipe/presentation/actualites/projet-tulipe.html>

Figure 36 The MidCat and STEP projects



Source: Pöyry Report on STEP of 17 November 2017, published on 27 April 2018

Consisting of 227 km of gas pipelines between Barbaïra (France) and Figueras (Spain) and a new compressor station in Martorell, STEP was to create up to 230 GWh/d of capacity from South to North and 180 GWh/d from North to South. At the request of the European Commission, STEP was the subject of an in-depth CBA carried out by an independent consulting firm. Published on 27 April 2018⁷⁰, the study concludes that the costs of the project exceed its expected benefits in most scenarios and that the benefits are exclusively located in the Iberian Peninsula.

meet market needs and that the benefits are largely insufficient compared to its costs, CRE and CNMC have concluded that the project is not sufficiently mature to receive a favourable regulatory decision and, a fortiori, be the subject of a cross-border cost allocation decision. These arguments were set out in a joint decision published on 17 January 2019⁷¹ under Article 12 of Regulation (EU) 347/2013. The STEP project is no longer part of the 4th list of PIC projects published on 31 October 2019⁷² by the European Commission.

Following in-depth analyses, which showed that the STEP project, in its current configuration and planned capacities, does not



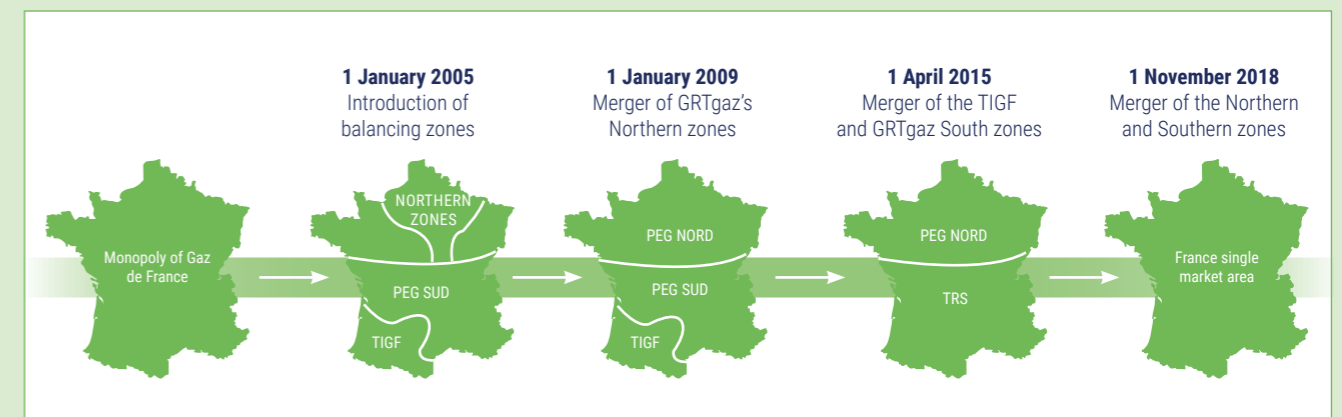
THE MERGER OF MARKET ZONES

From 5 balancing zones to the single market area

The merger of the Northern and Southern zones, which took place on 1 November 2018, is the result of a long process. With the opening up to competition, France introduced on 1 January 2005 an entry-exit model with 5 balancing zones. These zones were designed according to network management constraints and each corresponded to France's different gas entry and exit points⁷³. Each balancing zone had a corresponding market place called a PEG (*Point d'échange de gaz*), allowing shippers to buy or sell gas in that zone.

The merger of GRTgaz's 3 Northern zones to create the Northern PEG (GRTgaz Nord) on 1 January 2009 was an important milestone, allowing the emergence of a large marketplace in France, alongside the Southern PEG (GRTgaz Sud) and the TIGF (ex-Teréga) zone. Following a study conducted in 2009-2010 by GRTgaz and TIGF, which concluded that there was no structural congestion between the two networks in the Southern zone, CRE decided (decision of 13 December 2012⁷⁴) to create, as of 1 April 2015, a common market place (common PEG) for GRTgaz Sud and TIGF balancing zones, thereby constituting the Trading Region South (TRS).

Figure 37 The different steps in the creation of the gas market in France



A roadmap for the creation of a single gas market zone in France was defined by CRE as soon as July 2012. After a very broad consultation, the decision was taken by CRE in its decision of 7 May 2014⁷⁵. The investment scheme combines the reinforcement of the Burgundy artery (Val-de-Saône project) by GRTgaz and the completion of the Gascogne-Midi project by TIGF, which led to increase transmission capacity from North to South by around 250 GWh/d at a cost of €872M. The aim was to remove congestions in most market configurations at an optimal cost. Residual congestion may however appear in some cases.

CRE has decided to guarantee the upholding of firm capacities at interconnections. To do this, contractual mechanisms have therefore been developed following in-depth work carried out within the "Gas conciliation" (Concertation gaz) committee (CRE's decision of 26 October 2017⁷⁶), then specified in July 2018 (decision of 24 July 2018).

⁷⁰ Pöyry, Cost benefit analysis of STEP as first phase of MidCat – final report: https://ec.europa.eu/energy/sites/ener/files/documents/study_public_acceptance_infrastructure_development.pdf

⁷¹ CRE's deliberation of 17 January 2019 adopting the joint decision on the investment request submitted by Teréga and Enagás concerning the STEP gas interconnection project (available in French and in English): <https://www.cre.fr/Documents/Deliberations/Decision/Projet-d-interconnexion-gaziere-STEP>

⁷² European Commission, Commission publishes 4th list of Projects of Common Interest – making energy infrastructure fit for the energy union: https://ec.europa.eu/info/news/commission-publishes-4th-list-projects-common-interest-making-energy-infrastructure-fit-energy-union-2019-oct-31_en

⁷³ 3 zones in the North (corresponding to the Montoir-de-Bretagne LNG terminal, the entry point for gas from Northern countries – Norway and the Netherlands – and the entry point for Russian gas via Germany) and 2 zones in the South (corresponding to the Fos-sur-Mer LNG terminals on the one hand, and to the land interconnection point with Spain on the other hand).

⁷⁴ CRE's deliberation of 13 December 2012 deciding on the tariffs for the use of natural gas transmission networks: <https://www.cre.fr/en/Documents/Deliberations/Decision/tariffs-for-the-use-of-natural-gas-transmission-networks>

⁷⁵ CRE's deliberation of 7 May 2014 setting out guidelines for the creation of a single marketplace in France by 2018: <https://www.cre.fr/en/Documents/Deliberations/Orientation/single-marketplace-in-france-by-2018>

⁷⁶ CRE's deliberation of 26 October 2017 on the creation of a single gas market area in France on 1st November 2018: <https://www.cre.fr/en/Documents/Deliberations/Decision/single-gas-market-area-in-france>



Figure 38 Identification of the Northern and TRS zones and of the Val-de-Saône and Gascogne-Midi projects.



Review of the implementation of France's single gas market area

With the creation of the Trading Region France (TRF), on 1 November 2018, France now has a single entry-exit zone and a single virtual gas exchange point and, consequently, a single price reference on the wholesale market. The market has thus gained in liquidity and competitiveness. This merger benefits all French consumers thanks to more competitive prices, especially for those in the South who had frequently been penalised by price spreads with Northern France. The Southern zone, highly dependent on deliveries to the Fos LNG terminals, was indeed very sensitive to fluctuations in the international price of LNG. The PEG's market liquidity has also improved: the bid-ask spread on day-ahead products went from €0.13 per MWh in winter 2017-2018 to €0.08 per MWh in winter 2018-2019⁷⁷. The PEG is now the fourth largest European market in terms of traded volumes and number of market players (between 2018 and 2019, the number of active players on the market rose from 68 to 79). Since the introduction of the TRF, the PEG spot price has become closer to that of the TTF with an average spread of €0.05 per MWh (average from 1 November 2018 to 31 December 2019).

In its decisions concerning the management of the France zone (the PEG TRF), CRE has taken particular care to ensure that exit capacities to the Iberian Peninsula or to Switzerland and Italy are not affected by changes in the operation of the French gas system. The single market area therefore has positive effects not only on French consumers, but also on the European market as a whole, since the countries downstream of France benefit from the improved competitiveness of the PEG TRF. This success was made possible by the quality of the dialogue with market players organised by the TSOs and by the combination of investments and market mechanisms. Such a project is long and must take into account the interests of all players, including those of neighbouring interconnection markets. Such an approach should be the basis for any comparable project in Europe.

3.3 Rules at French borders and review of subscriptions at gas interconnections

3.3.1 Interconnections' operating rules

3.3.1.1 The functioning of interconnections within the EU is governed by the CAM code

The marketing of transmission capacity at the gas interconnections between member states and/or market areas is set out in Commission Regulation (EU) 984/2013 on the establishment of a network code on capacity allocation mechanisms in gas transmission networks, adopted on 14 October 2013 and replaced in 2017 by Regulation (EU) 2017/459 (see paragraph 1.3.1.2).

The CAM code regulates the type of capacity products offered (in terms of characteristics and volumes) and how they are auctioned, according to a common EU-wide calendar. The principle is to combine annual products, allowing transmission capacity to be reserved over several years, with shorter-term products up to the intraday timeframe. The annual products are allocated once a year and capacity can then be booked in annual blocks of up to

15 years (from years 6 to 15, supply cannot exceed 80% of the technical capacity). At least 10% of the firm annual marketable capacity must be dedicated to short-term products (i.e. auctions of quarterly, then monthly, then daily, then intraday capacities). At the end of each auction, unsold capacities are returned to shorter-term products.

These rules were amended in 2017 to provide for the allocation of additional capacities (also referred to as "incremental capacity") and for the dates on which auctions are held for annual and quarterly products. Capacities are now marketed according to the following calendar.

Tableau 6 Marketing calendar for firm interconnection capacity according to CAM

Annual	Quarterly	Monthly	Daily	Intraday
1 st Monday of July	1 st Mondays of August, November, February and May	3 rd Monday of each month	The day before, before 4:30 p.m.	The day before, from 7p.m., and then at every hour of the day.

The entry into force of the new CAM code has also led to changes in the rules for marketing of interruptible capacities from 1 October 2017⁷⁸. Initially, interruptible capacities were marketed if at least 98% of firm capacities had been allocated. For now on, interruptible capacities are offered in case the corresponding standard product for firm capacity was sold at an auction premium, was sold out, or was not offered.

In France, the CAM network code applies to interconnection capacities with Belgium (Taisnières-L IP and Virtualys VIP – which combines the capacities of the Taisnières-H and Alveringem IPs), Germany (Obergaillbach IP) and Spain (Pirineos VIP).

3.3.1.2 Changes to the conditions for subscribing capacity at the Dunkirk IP

The Dunkirk interconnection point connects the French transmission system to the Norwegian gas fields located in the North Sea, which is not part of the EU. Capacities at this interconnection point are therefore not concerned by the provisions of the CAM

code. However, following requests from several shippers, CRE has gradually modified the rules for marketing capacity at the Dunkirk IP to converge with the CAM code rules (decisions of 27 July 2017⁷⁹, of 8 March 2018⁸⁰ and finally of 23 April 2020⁸¹).

⁷⁸ CRE's deliberation of 27 July 2017 on the change in the capacity selling arrangements at the Dunkirk PIR, the change in interruptible capacity selling arrangements, and the creation of entry capacity at the Oltingue PIR: <https://www.cre.fr/en/Documents/Deliberations/Decision/capacity-selling-arrangements>

⁷⁹ Ibid.

⁸⁰ CRE's deliberation of 8 March 2018 on the evolution in the capacity marketing conditions at the Dunkirk IP (in French): <https://www.cre.fr/Documents/Deliberations/Decision/pir-dunkerque2>

⁸¹ CRE's deliberation of 23 April 2020 on the method for marketing entry capacity at the Dunkirk and Oltingue IPs (in French): <https://www.cre.fr/Documents/Deliberations/Decision/mode-de-commercialisation-de-la-capacite-en-entree-aux-pir-dunkerque-et-oltingue>

The Dunkirk interconnection point connects the French transmission system to the Norwegian gas fields located in the North Sea, which is not part of the EU. Capacities at this interconnection point are therefore not concerned by the provisions of the CAM code. However, following requests from several shippers, CRE has gradually modified the rules for marketing capacity at the Dunkirk IP to converge with the CAM code rules (decisions of 27 July 2017, of 8 March 2018 and finally of 23 April 2020). Historically, the Dunkirk IP is distinguished by the existence of a specific capacity restitution mechanism. Set up to open up the interconnection to competition, this mechanism requires any shipper holding more than 20% of the technical capacity of the

IP to surrender some of this capacity to the market in the event that shippers' demand exceeds available offer. In addition, and unlike the IPs subject to the CAM code, annual, quarterly and monthly capacities at Dunkirk IP were until now marketed via "open subscription periods" (allocation in proportion to requests – prorata – at the end of a marketing window). Daily capacities, for their part, were marketed via a "first come, first served" basis. CRE's decision of 23 April 2020 completed the process of harmonising practices with the other French and European IPs. Thus, from 1 October 2020, the Dunkirk IP will be marketed on the PRISMA European platform according to the calendar and auction system specific to the CAM code.

3.3.2 Evolution of interconnection capacity subscriptions

3.3.2.1 Review of capacity auctions

Demand for capacity at French interconnections expressed by market players has been low for several years, particularly for long-term products.

Obergailbach, only 10% of the annual auctions organised in July 2019 resulted in actually allocating capacity, for extremely low subscription levels.

On the one hand, the annual capacity auctions organised over the last three years on the PRISMA platform have resulted in a very limited number of allocations⁸³ (see Table 7 below, left-hand columns) and the subscription rates for new interconnection capacity therefore remain very low (see Table 7 below, right-hand columns). By way of illustration, it can be noted that at

On the other hand, almost all of the annual firm capacity subscriptions carried out were closed at the reserve price. Over the last two years, only four annual auctions have been concluded at a premium (twice at Pirineos in July 2018 and once at Oltingue in July 2019).

Table 7 Share of annual firm capacity "successful" auctions and share of subscribed capacity

Annual firm capacity auctions	March 2017		July 2018		July 2019	
	% successful auctions	% subscribed capacities	% successful auctions	% subscribed capacities	% successful auctions	% subscribed capacities
Entry Obergailbach IP	10%	0%	0%	0%	0%	0%
Entry Taisnières-H IP	5%	0%	-	-	-	-
Exit Taisnières-L IP	0%	0%	0%	0%	5%	7%
Exit Alveringem IP	0%	0%	-	-	-	-
Entry Virtualys VIP	-	-	24%	2%	0%	0%
Exit Virtualys VIP	-	-	0%	0%	0%	0%
Entry Oltingue IP	0%	0%	0%	0%	0%	0%
Exit Oltingue IP	0%	0%	0%	0%	100%	1%
Entry Pirineos VIP	2%	0%	0%	0%	0%	0%
Exit PIV Pirineos VIP	7%	0%	7%	0%	7%	0%

Source: PRISMA data, CRE analysis

NB: the % of successful auctions corresponds to the number of auctions resulting in an allocation, compared to the number of auctions launched; the % of subscribed capacities corresponds to the volume of firm capacities subscribed, compared to the volume of firm capacities auctioned.

⁸² Ibid.
⁸³ With the exception of exit capacities at Oltingue IP, which received at least one subscription offer at each of the annual auctions organised in July 2019 (hence the 100% successful auction rate), despite a very low volume of subscribed capacities (in the order of 1%).

3.3.2.2 Interconnection subscription rate

The low demand shown at auctions is largely explained by the very high level of long-term capacity already subscribed (between 71% and 95% in 2019), particularly at Dunkirk (95%), Oltingue (91%) and Pirineos (91%). This situation is notably due to the historical development of interconnections, supported by import contracts or long-term subscriptions.

subscribed, despite a decrease in 2018 and 2019. Taisnières-H and Alveringem IPs – brought together on 1 December 2017 in the Virtualys VIP – showed subscription rates of 87% and 83% in 2018 and 2019 respectively. Pirineos is subscribed at higher levels in the France to Spain direction (between 88% and 93%) than in the Spain to France direction (79%). The Obergailbach IP remains historically the least subscribed (from 91% in 2010, the subscription rate fell to 75% in 2015 and 71% in 2019).

Over the last five years, the most subscribed interconnection point has been Dunkirk (between 95% and 100%). Oltingue is also highly subscribed (between 91% and 100%), in the France to Switzerland direction. The Taisnières-L IP remains highly

Figure 39 Subscription rate for firm capacities at French interconnections (% of firm capacities offered)

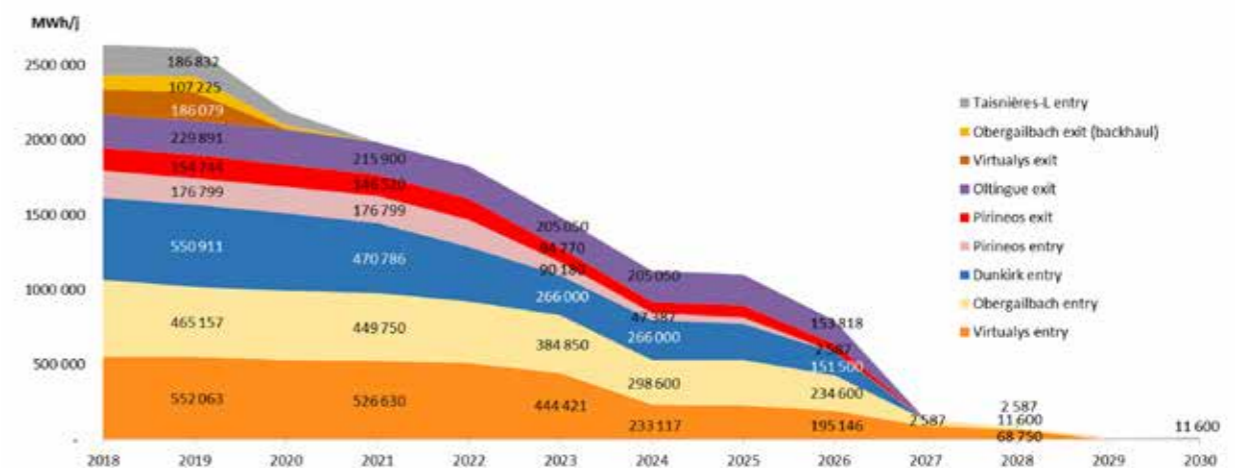


Source: GRTgaz and Teréga data, CRE analysis

For a long time, long-term contracts have been favoured to secure supply routes, thus bringing a certain stability to the European gas system. However, in recent years, changes in the functioning of the European markets have gradually led players to adopt supply strategies more oriented towards the wholesale markets and the

short term. The low level of long-term capacity subscriptions on the PRISMA platform illustrates this trend (which could be accentuated with the gradual expiry of long-term subscriptions at French borders (see Figure 40 below).

Figure 40 Long-term capacity bookings at French interconnections



Source: GRTgaz and Teréga data, CRE analysis

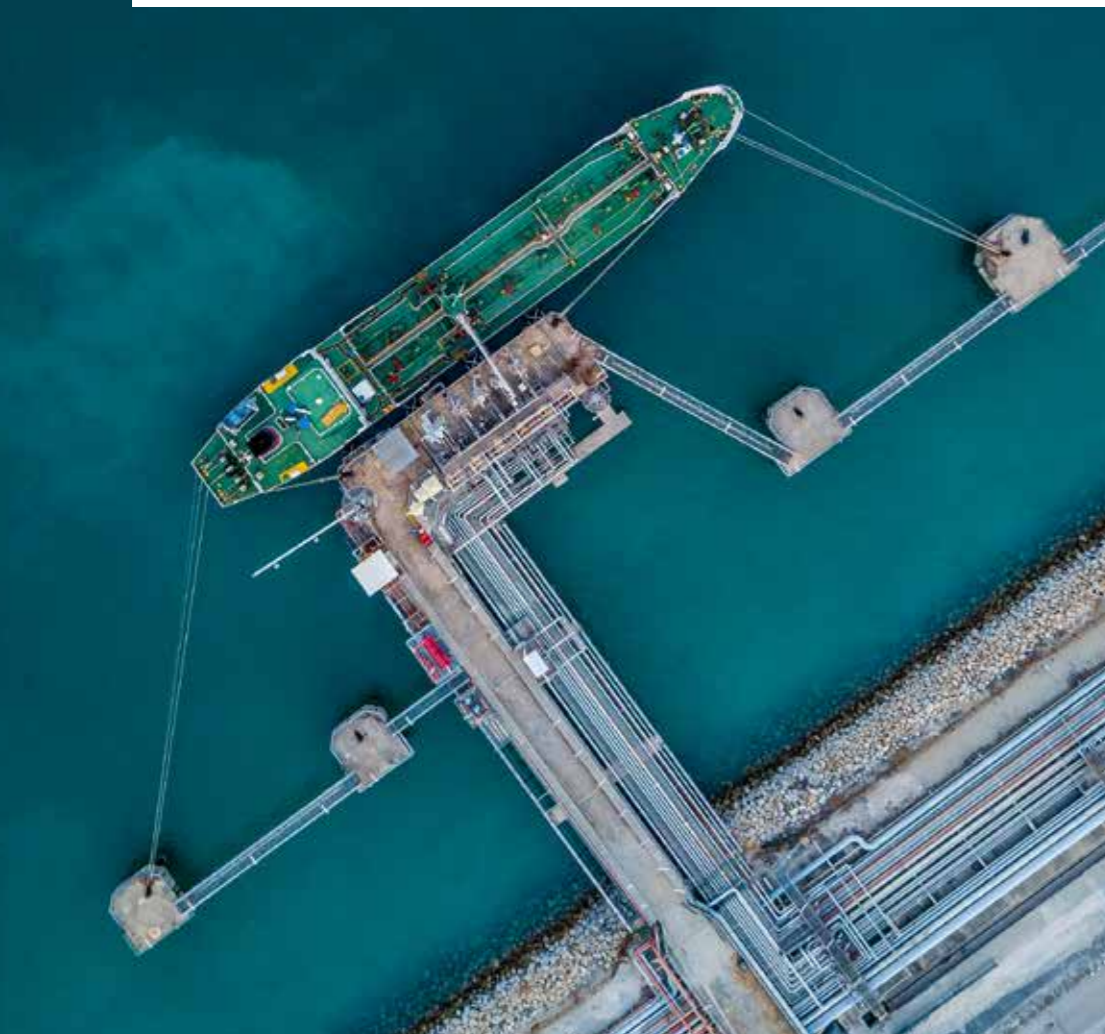
Box 7: LNG – new long-term capacity subscriptions at French LNG terminals

French terminals have seen a net increase in activity in 2019 with the reception of 269 LNG tankers. In total, supplies amounted to 231 TWh, of which 5% were allocated to the Belgian market from the Dunkirk terminal. In this context, new market calls were launched, leading to new subscriptions of long-term capacity at all French terminals.

At Fos-Tonkin, the extension of the terminal's activity beyond 31 December 2020, until at least 2028, was validated by a call for subscriptions conducted by Elengy in February 2019. The extension of the terminal's operations – even if the capacity level has been halved (to 1.5 Gm³ per year) – will be accompanied by investments to ensure the sustainability of vessel reception as well as of offloading and storage facilities, pumps and regasification installations. Following this call, Elengy has announced that it wishes to develop services at this terminal as well as its LNG-fuel business.

At Montoir, 3.5 Gm³ per year of capacity has been allocated by Elengy for the period 2021-2035 via a call for subscriptions in July 2019, and all the capacities offered have been subscribed.

Two other procedures have been initiated. Dunkerque LNG launched a call to the market in February 2020 for 3.5 Gm³ per year of capacity from the fourth quarter of 2020, for which the qualification phase was completed on 28 February 2020. Fosmax LNG launched a call for subscription on 8 April 2020 for all available capacity, i.e. 1 Gm³ per year (10 TWh of already available capacities and 3 TWh of additional capacities per year). The reservation period will run from January 2021 to 2030.

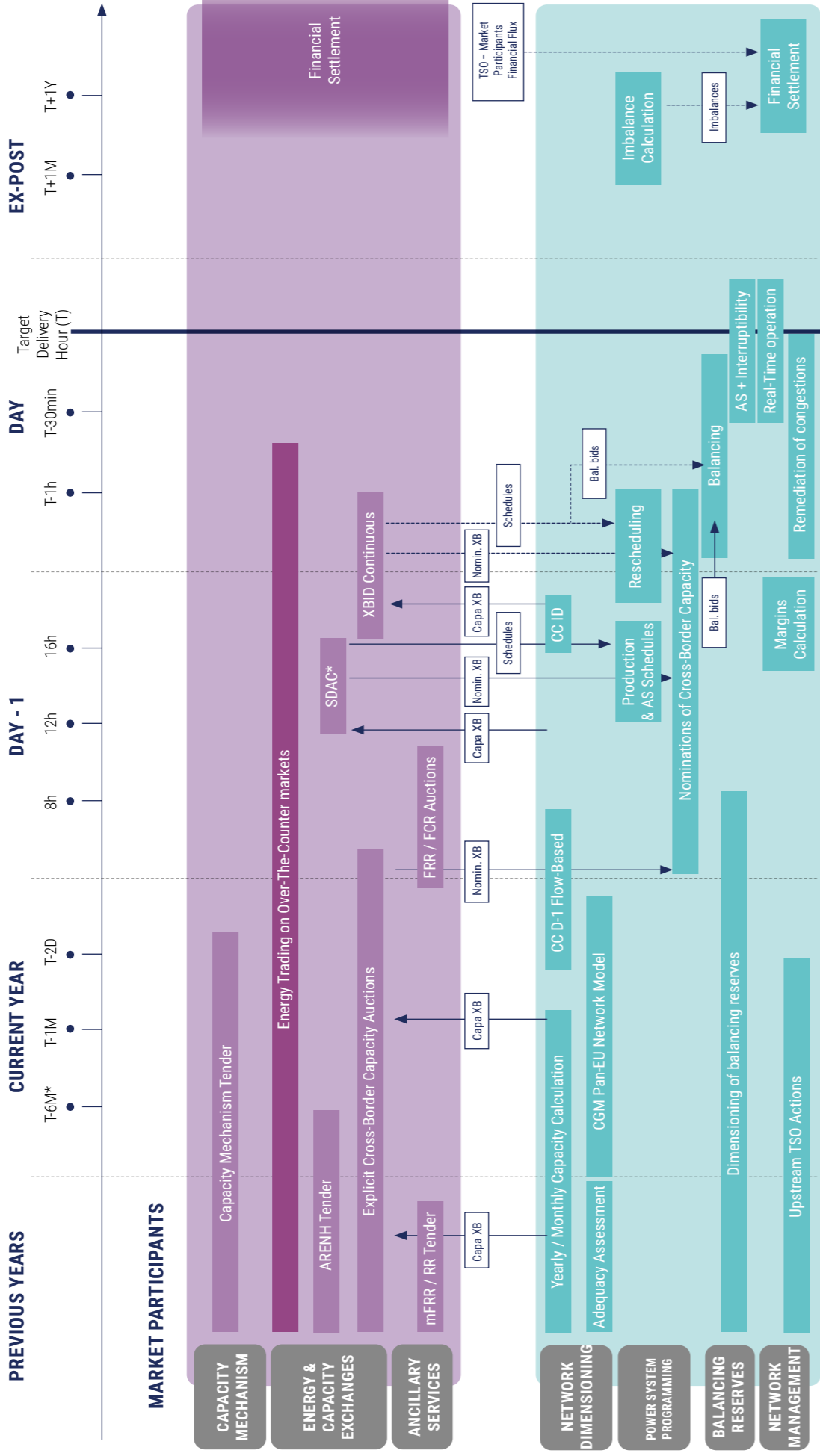


ANNEXES

- ANNEX 1: ELECTRICITY TIMEFRAME MANAGEMENT
- ANNEX 2: GAS TIMEFRAME MANAGEMENT
- ANNEX 3: ELECTRICAL INTERCONNECTION FACTSHEETS
- ANNEX 4: GAS INTERCONNECTION FACTSHEETS

ANNEX 1: ELECTRICITY TIMEFRAME MANAGEMENT

■ Continuous market
■ Auctions
■ TSO processes
■ SDAC : Single Day-Ahead Coupling
■ CGM : Common Grid Model
■ XB : Cross-Border
■ AS : Ancillary Services



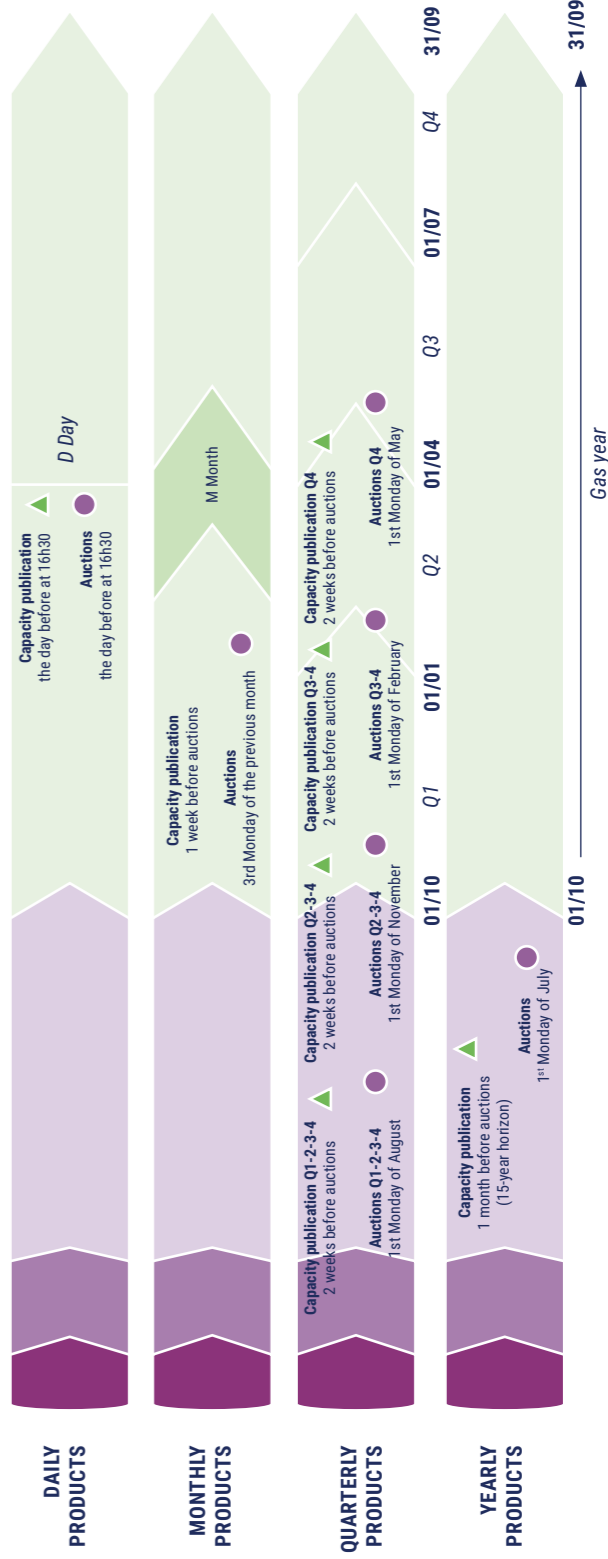
TRANSMISSION SYSTEM OPERATOR (IN FRANCE, RTE)

ANNEX 2: GAS TIMEFRAME MANAGEMENT

CALENDAR OF NOMINATIONS AND RENOMINATIONS DURING THE GAS DAY



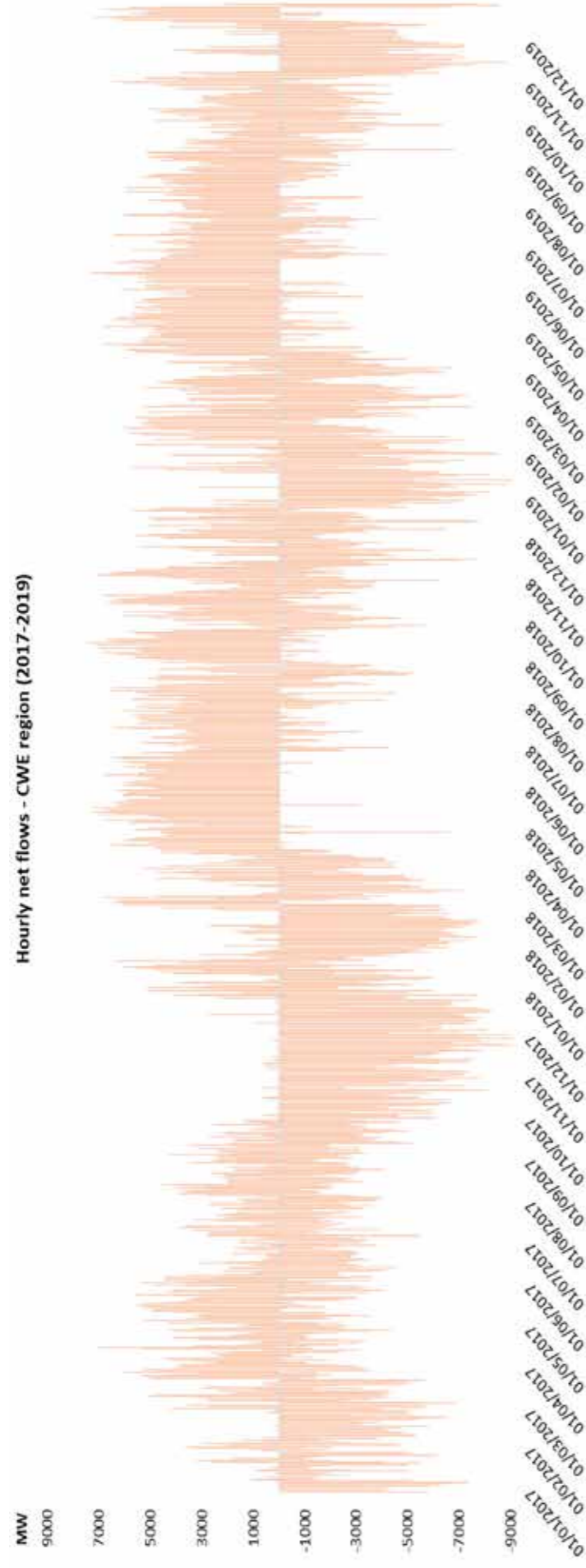
CALENDAR OF FIRM CAPACITY AUCTIONS AT INTERCONNECTIONS (AS PER THE CAM) FOR ANNUAL, QUARTERLY, MONTHLY AND DAILY PRODUCTS*



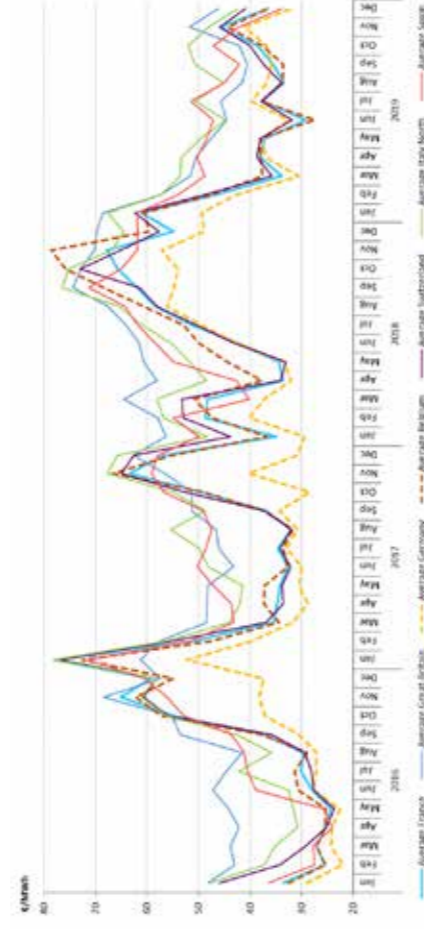
* The intraday product is not represented here. It applies 4 hours after the daily subscription and until the end of the gas day. The first auction is published from 7:00 p.m. to 2:30 a.m., and then the following auctions are published at each hour of the day.

Electrical interconnection between France and the CWE region

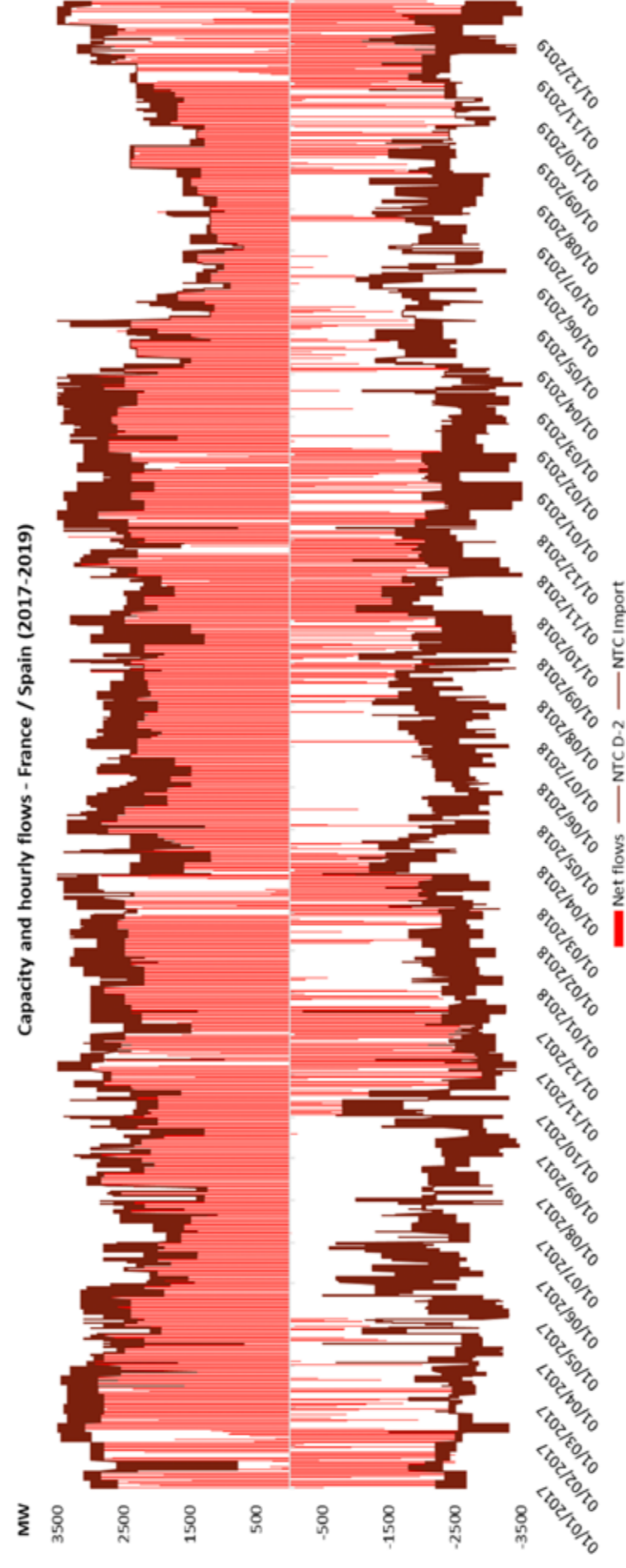
- Highlights: France was a net exporter to the CWE region in 2018 and 2019.

Hourly net flows - CWE region (2017-2019)


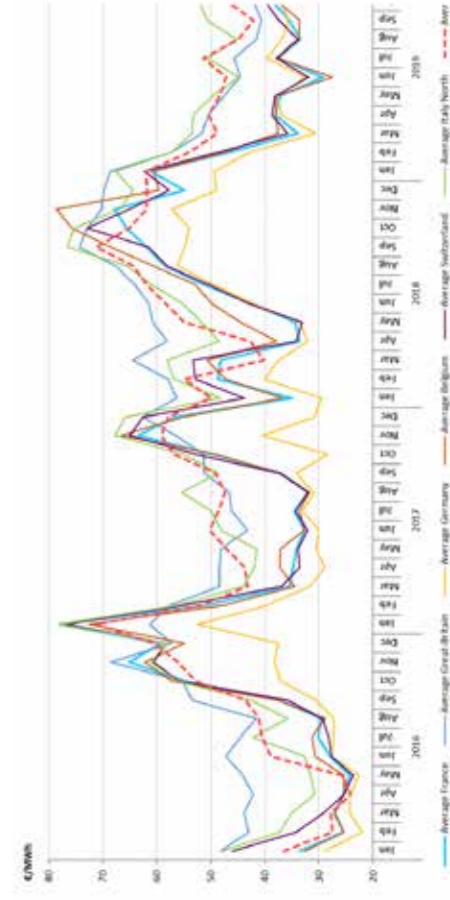
	2017	2018	2019
Net exchange balance (TWh)	-10.9	6.1	2.7
Exports (TWh)	8.7	18.5	17.4
Imports (TWh)	-19.6	-12.4	-14.7
% of time used for export	30%	60%	55%
Average price spread with Belgium (€ per MWh), in absolute terms	3.8	6.2	2.8
Price convergence rate with Belgium	45%	37%	46%
Average price difference with Germany (€ per MWh), in absolute terms	10.9	6.6	5.0
Price convergence rate with Germany	35%	35%	44%


Electrical interconnection between France and Spain

- Highlights: a damage to the Argia-Cantegrit interconnection line reduced cross-border exchange capacity between April and December 2019.

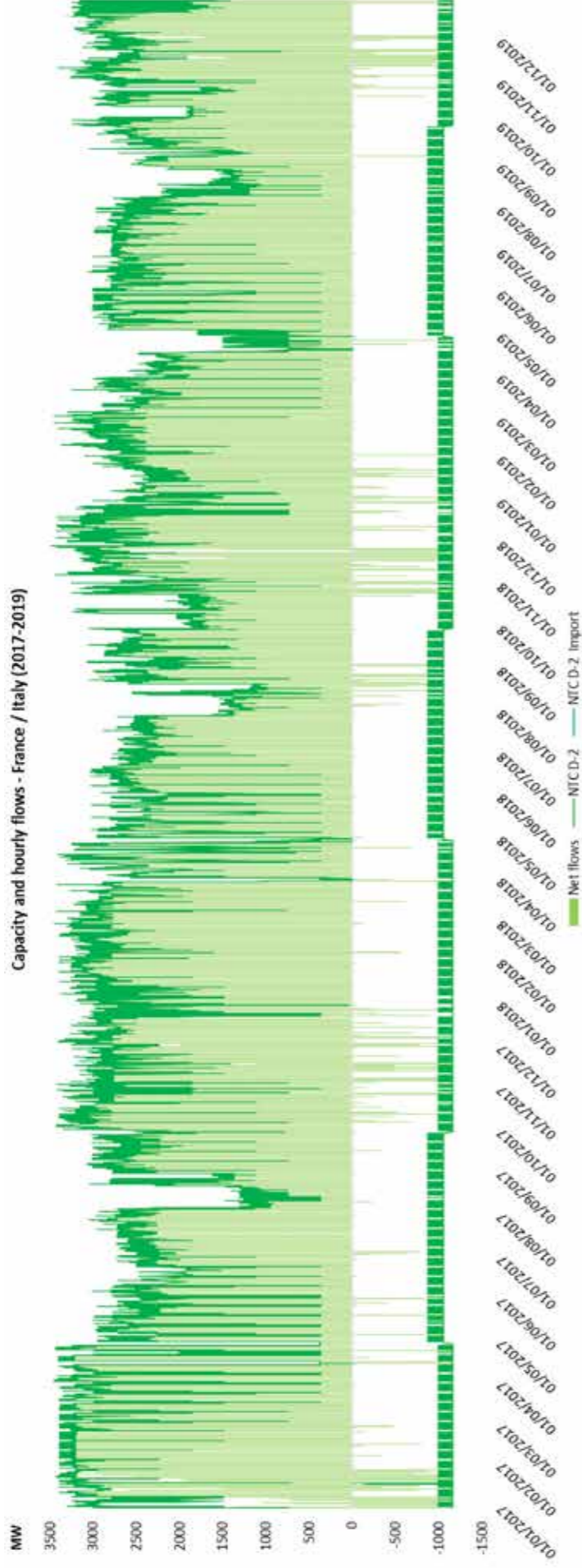
Capacity and hourly flows - France / Spain (2017-2019)


	2017	2018	2019
Average observed export capacity (MW)	2,560	2,568	2,202
Average observed import capacity (MW)	-2,295	-2,184	-2,246
Net exchange balance (TWh)	12.8	12.2	10.0
Exports (TWh)	17.0	16.4	13.7
Imports (TWh)	-4.2	-4.2	-3.8
Utilisation rate - exports	88%	89%	91%
Utilisation rate - imports	73%	81%	73%
% of time used for export	82%	77%	80%
Average price difference (€ per MWh), in absolute terms	10.2	10.8	10.1
Price convergence rate	25%	24%	22%

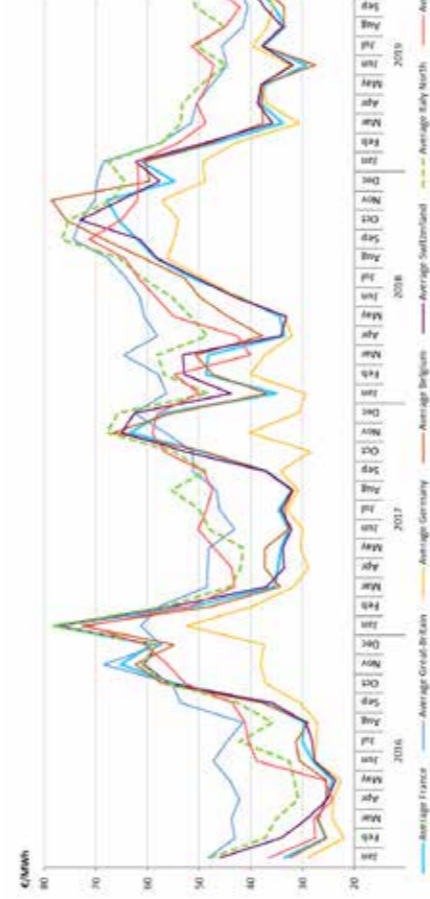


Electrical interconnection between France and Italy

- Highlights: the Savoy-Piedmont project is under construction. Italy limits its imports on days of low consumption or high domestic production.

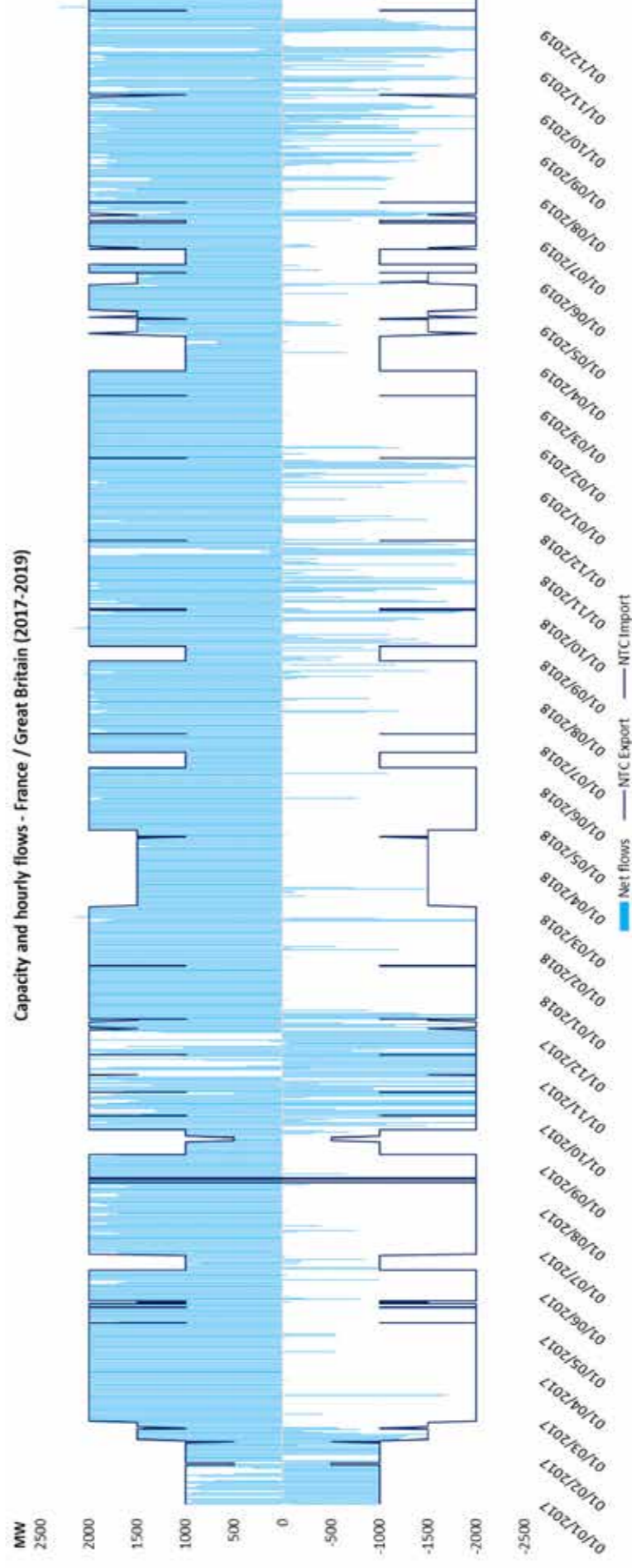


	2017	2018	2019
Average observed export capacity (MW)	2,530	2,410	2,368
Average observed import capacity (MW)	-1,020	-1,020	-1,019
Net exchange balance (TWh)	18.2	18.6	18.9
Exports (TWh)	18.8	19.7	19.2
Imports (TWh)	-0.7	-0.5	-0.3
Utilisation rate - exports	89%	93%	95%
Utilisation rate - imports	64%	67%	63%
% of time used for export	95%	96%	97%
Average price difference (€ per MWh), in absolute terms	9.8	11.0	11.9
Price convergence rate	26%	18%	14%

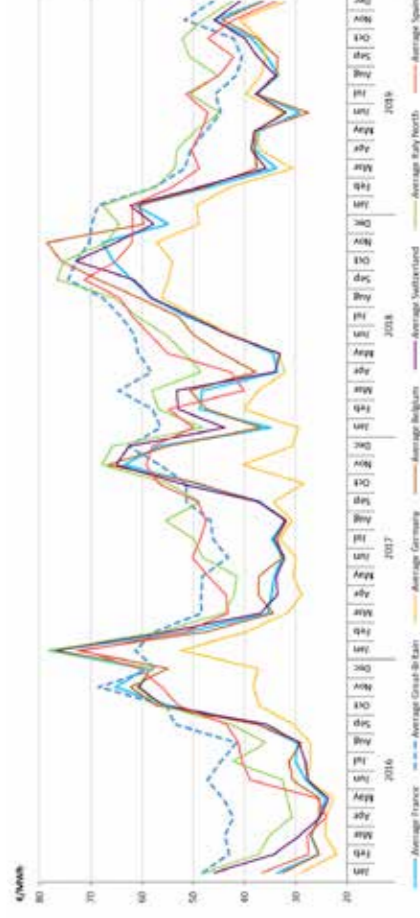


Electrical interconnection between France and the United Kingdom

- Highlights: maintenance operations conducted between April and June 2019 affected exchange capacities. ElecLink and IFA2 projects are in progress.

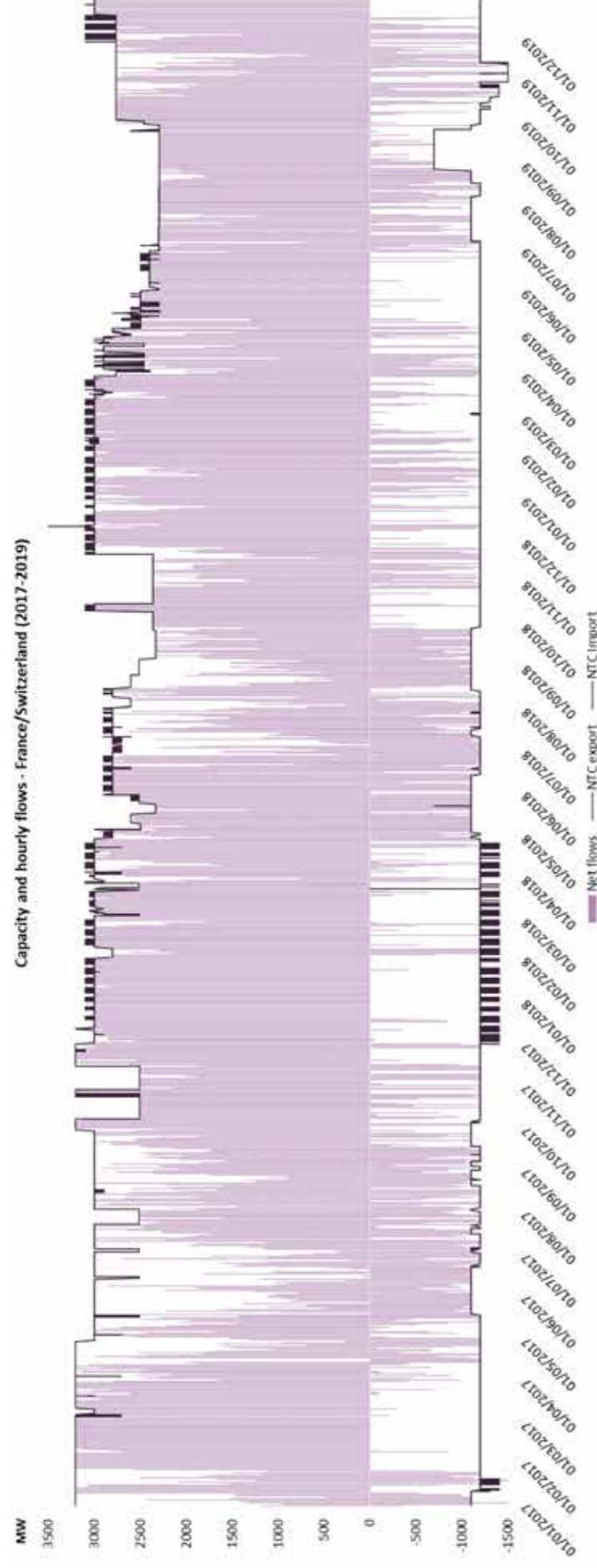


	2017	2018	2019
Average observed export capacity (MW)	1,740	1,856	1,849
Average observed import capacity (MW)	-1,740	-1,856	-1,848
Net exchange balance (TWh)	7.9	13.0	11.2
Exports (TWh)	11.8	14.8	14.2
Imports (TWh)	-3.9	-1.8	-2.9
Utilisation rate - exports	84%	88%	83%
Utilisation rate - imports	75%	42%	43%
% of time used for export	77%	94%	90%
Average price difference (€ per MWh), in absolute terms	11.2	14.3	9.1
Price convergence rate	20%	16%	19%

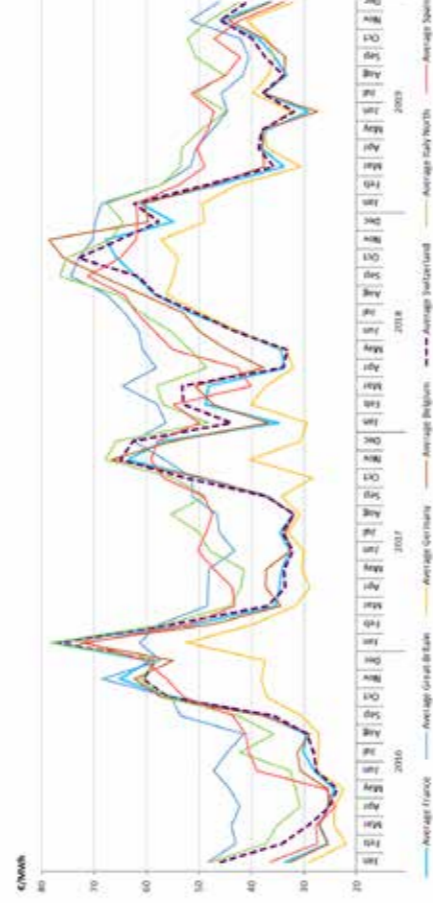


Electrical interconnection between France and Switzerland

- Highlights: constraints on the Swiss grid have led to limitations of cross-border exchange capacities in 2018 and 2019.



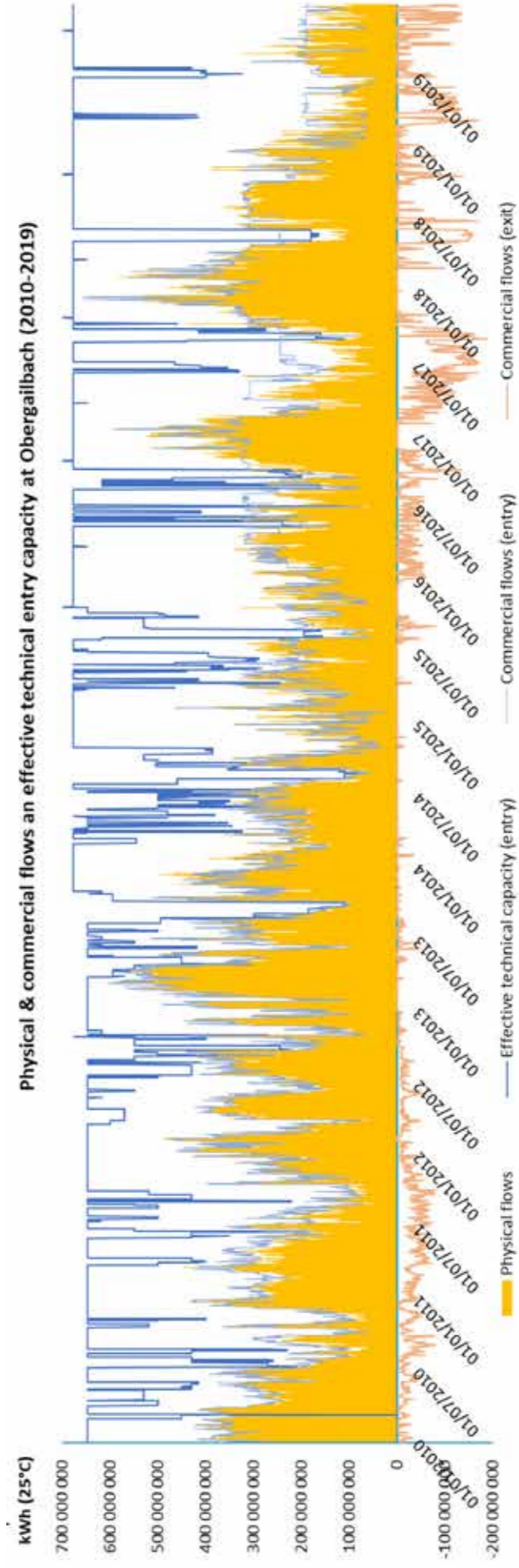
	2017	2018	2019
Average observed export capacity (MW)	3,005	2,771	2,678
Average observed import capacity (MW)	-1,180	-1,183	-1,163
Net exchange balance (TWh)	10.4	10.9	13.1
Exports (TWh)	17.7	17.6	19.1
Imports (TWh)	-7.2	-6.7	-6.1
Utilisation rate - exports	62%	68%	72%
Utilisation rate - imports	63%	69%	61%
% of time used for export	74%	75%	84%
Average price difference (€ per MWh), in absolute terms	4.1	5.2	3.5
Price convergence rate	0.4%	0.4%	0.5%



ANNEX 4: GAS INTERCONNECTION FACTSHEETS

Gas interconnection between France and Germany - Obergaillbach IP

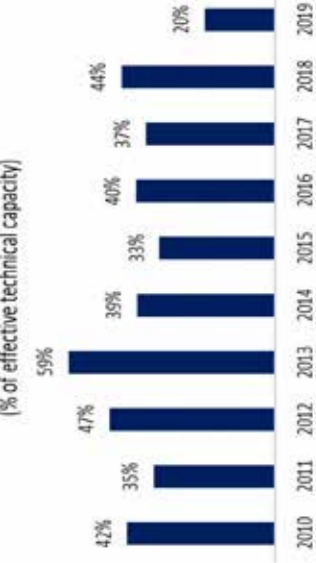
- The interconnection between France and Germany at Obergaillbach is an entry point for Russian gas into France. It was used at a historically low level in 2019, in a context of very significant LNG arrivals in Europe and particularly in France.
- The auction calendar and capacity reservation rules are governed by the CAM code. Entry and backhaul capacities are marketed by GRTgaz on the PRISMA platform.



Average subscription rate of firm capacities at Obergaillbach IP (% of firm capacity offered)



Average utilisation rate of capacities at Obergaillbach IP (% of effective technical capacity)



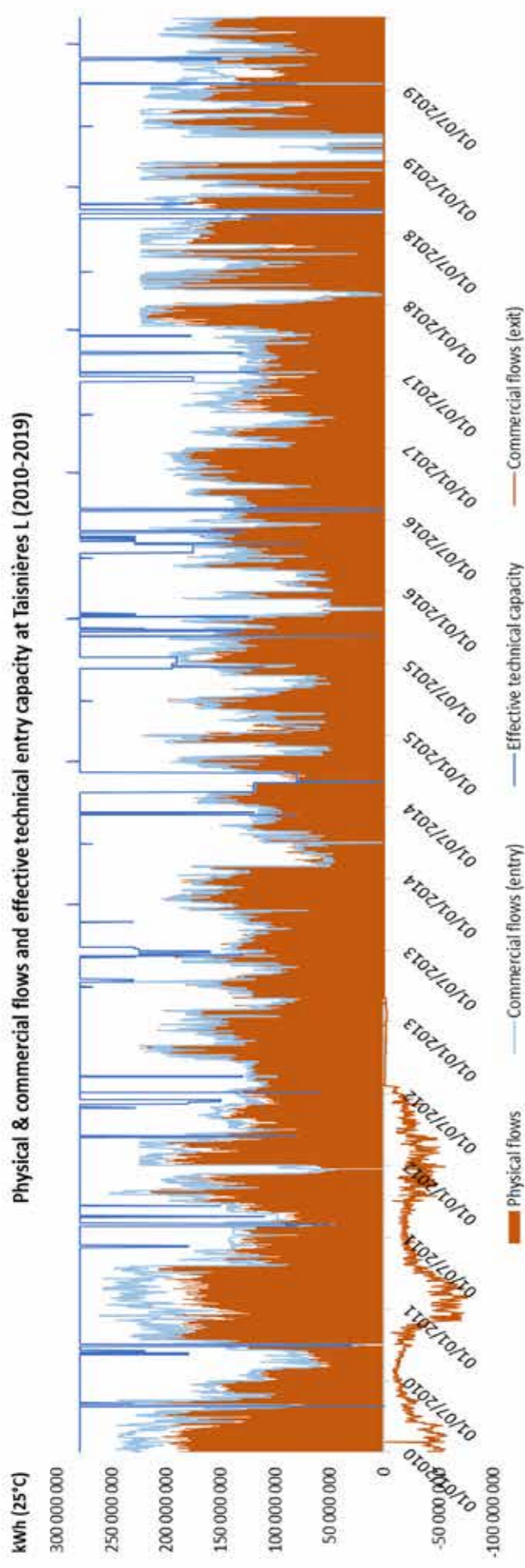
Net import balance at Obergaillbach IP (TWh)



Gas interconnection between France and Belgium, L gas – Taisnières-L IP

- The Taisnières-L interconnection point between France and Belgium allows the supply of L gas (low calorific value) from the Netherlands. The volume of flows transiting through it is relatively stable from one year to the next; L-gas imports are however expected to decrease over the next few years due to the planned end of exploitation of the Groningen field.
- The auction calendar and capacity reservation rules are governed by the CAM code. The capacities are marketed by GRTgaz on the PRISMA platform.

Physical & commercial flows and effective technical capacity at Taisnières L (2010-2019)



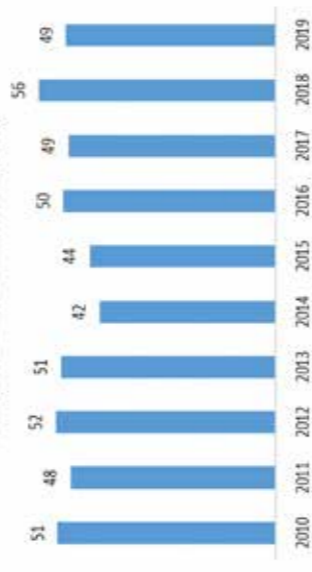
Average subscription rate of firm capacities at Taisnières L IP (% of firm capacity offered)



Average utilisation rate of capacities at Taisnières L IP (% of effective technical capacity)



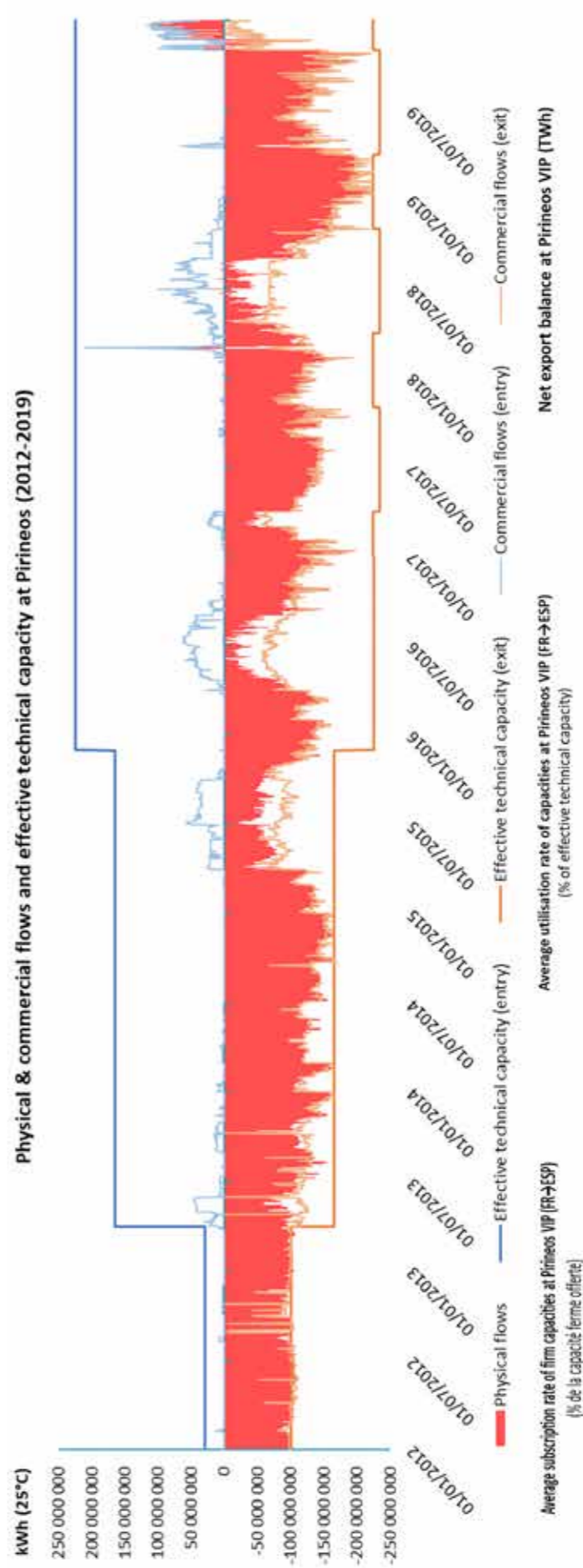
Net import balance at Taisnières L IP (TWh)



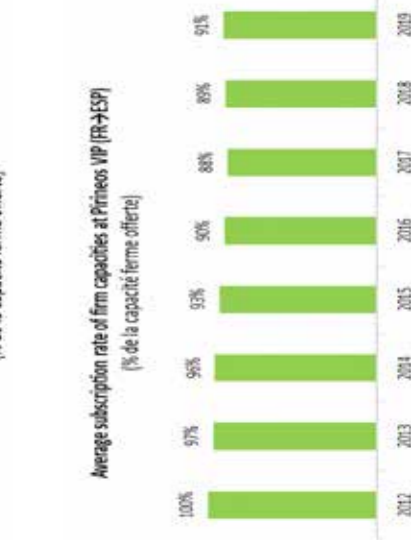
Gas interconnection between France and Spain – Pirineos VIP

- The virtual interconnection point of Pirineos between France and Spain includes 2 bidirectional gas pipelines that allow gas exchanges between the 2 countries. Historically, flows have mainly been directed from France to Spain; a reversal of flows was nevertheless observed in the last two months of 2019, but the utilisation rate of the interconnection in the direction Spain to France remains very low.
- The auction calendar and capacity reservation rules are governed by the CAM code. Capacities are marketed by Feréga on the PRISMA platform.

Physical & commercial flows and effective technical capacity at Pirineos (2012-2019)



Average subscription rate of firm capacities at Pirineos VIP (FR→ESP) (% de la capacité ferme offerte)



Average utilisation rate of capacities at Pirineos VIP (FR→ESP) (% of effective technical capacity)

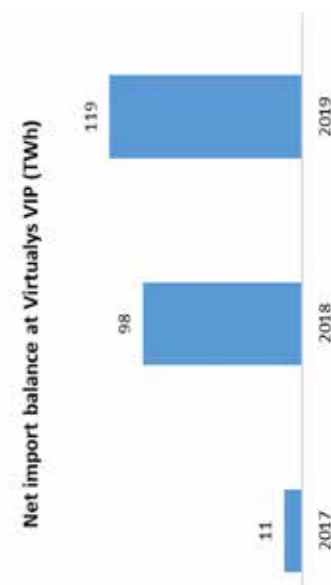
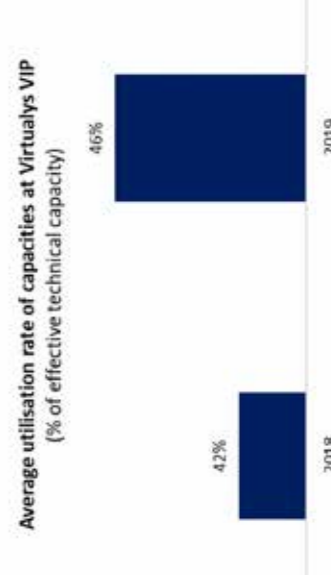
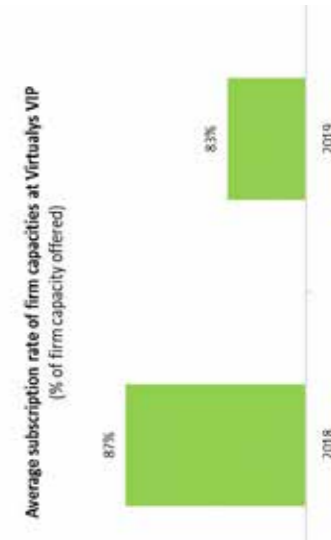
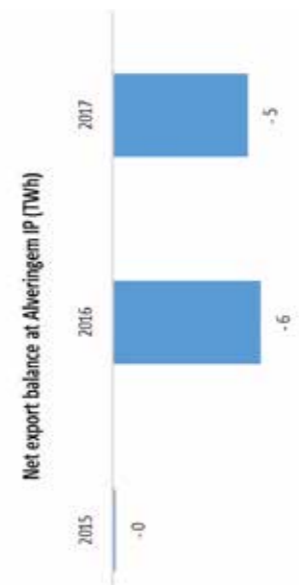
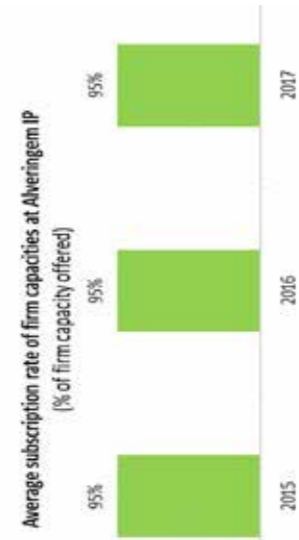
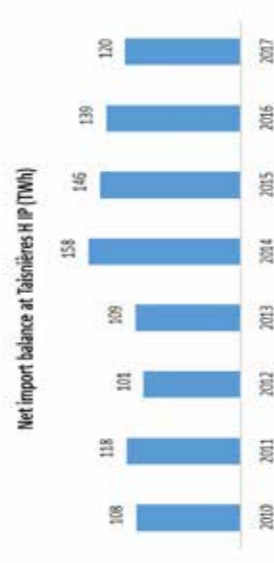
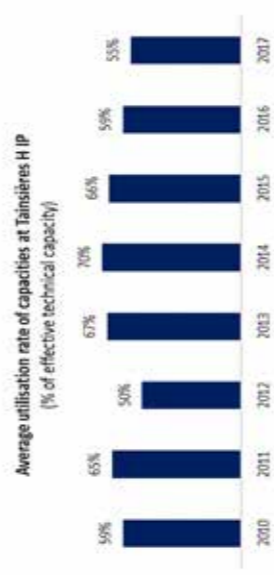
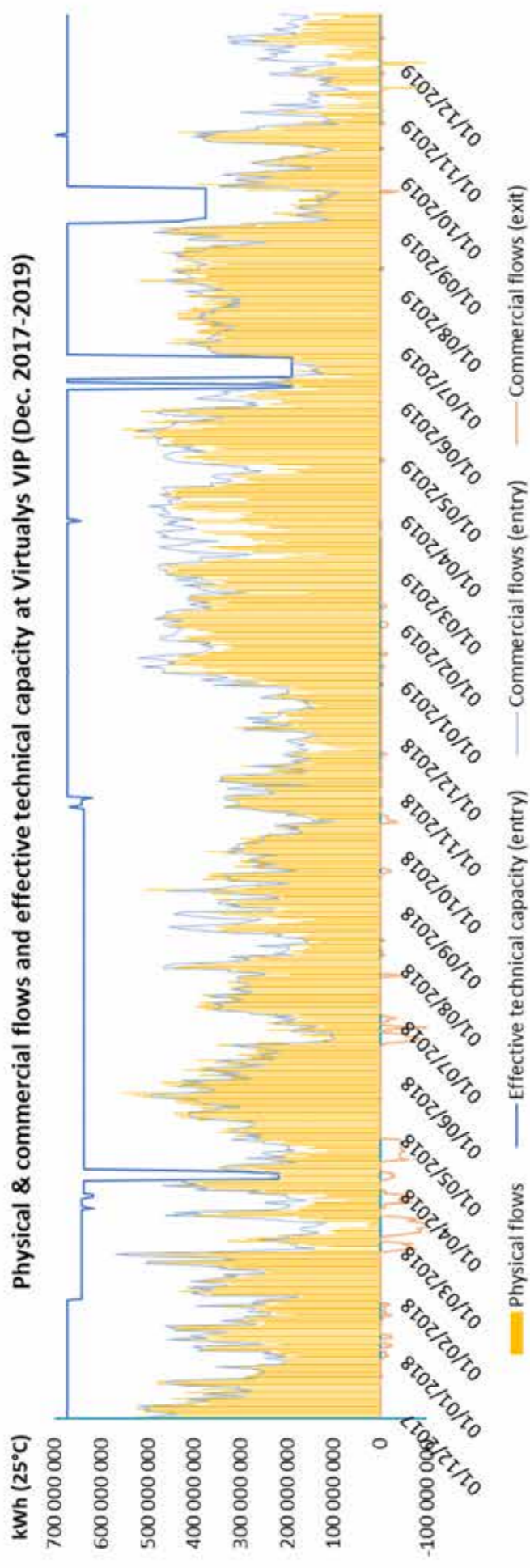
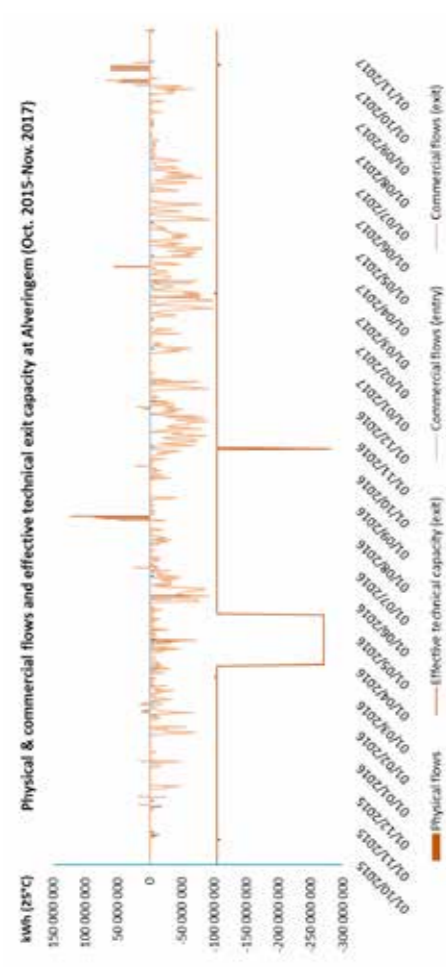
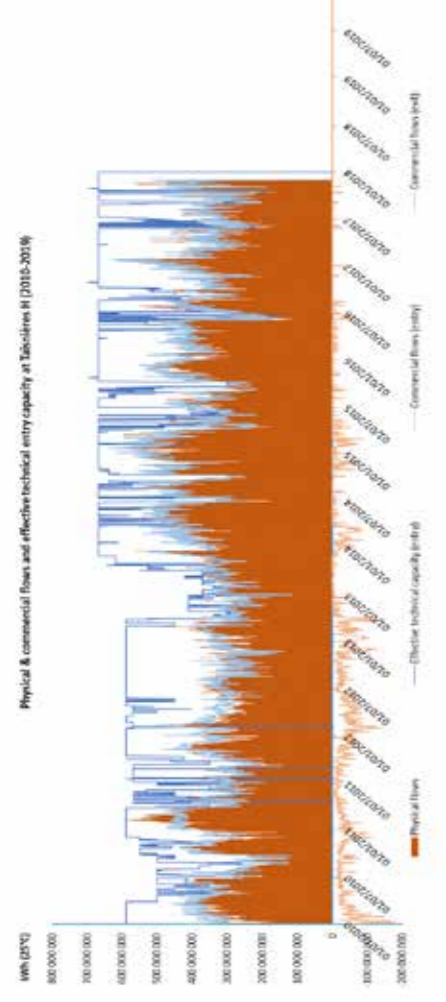


Net export balance at Pirineos VIP (TWh)



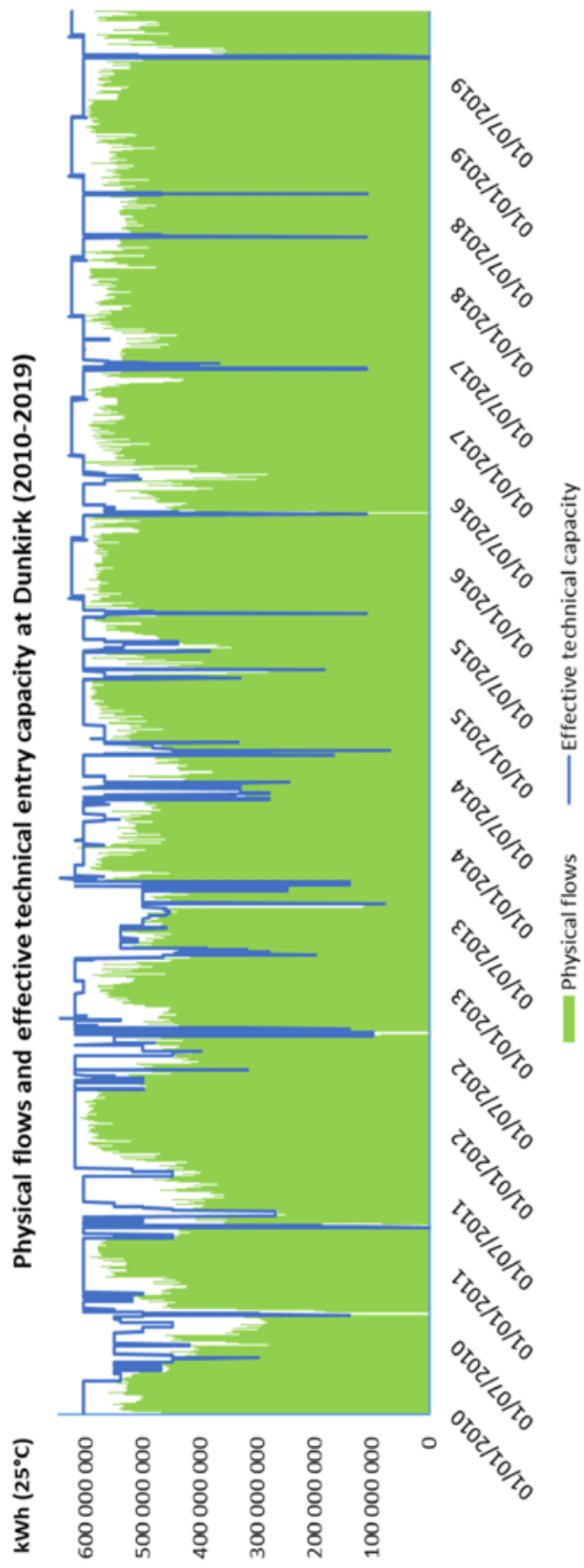
Gas interconnection between France and Belgium, H gas – Virtualys VIP (Taisnières-H and Alveringem IPs)

- The interconnection points of Taisnières-H and Alveringem, grouped together within the Virtualys VIP since 1 December 2017, allow exchanges of H gas (high calorific value) between France and Belgium.
- The auction calendar and capacity reservation rules are governed by the CAM code and capacities are marketed on the PRISMA platform.



- The Dunkirk interconnection point connects France to the Norwegian gas fields in the North Sea. It is the most important supply point (approximately 1/3 of gas imports into France in recent years).
- CRE's decision of 23 April 2020 led to changes, effective from 1 October 2020, in the conditions and calendar of capacity auctions to bring them closer to the CAM code's requirements. Capacity, which was previously sold on GRTgaz's website, will now be sold on the PRISMA platform.

Physical flows and effective technical capacity at Dunkirk (2010-2019)



Average subscription rate of firm capacities at Dunkirk IP
(% of firm capacity offered)



Average utilisation rate of capacities at Dunkirk IP
(% of effective technical capacity)



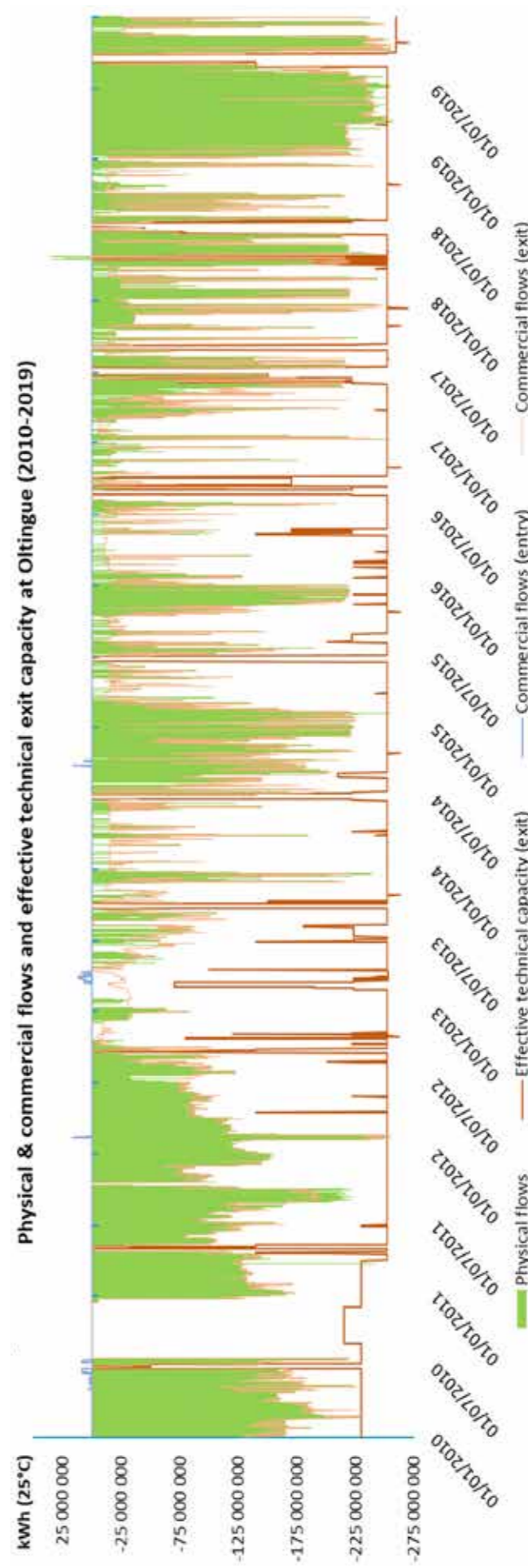
Net import balance at Dunkirk IP (TWh)



Gas interconnection between France and Italy (via Switzerland) – Oltingue IP

- The Oltingue interconnection point connects France to Italy via Switzerland and allows the Italian Peninsula to be supplied with Norwegian gas. Import capacities to France (100 GWh/d) were commissioned on 1 June 2018 but are currently unsubscribed.
- Although this is not an interconnection between 2 EU member states, the auction calendar and the rules for booking capacity at Oltingue are aligned with those defined by the CAM code. Capacities and marketed by GRTgaz on the PRISMA platform (note, however, that entry capacity is marketed according to specific rules with a calendar aligned with that for interruptible products).

Physical & commercial flows and effective technical exit capacity at Oltingue (2010-2019)



Average subscription rate of firm capacities at Oltingue IP (FR→IT)
(% of firm capacity offered)

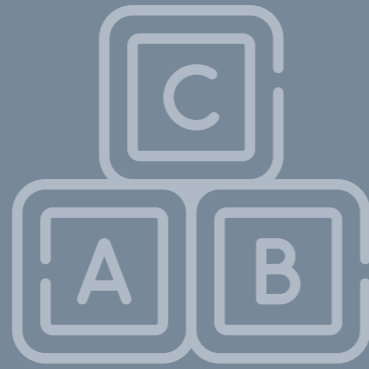


Average utilisation rate of capacities at Oltingue IP (FR→IT)
(% of effective technical capacity)



Net export balance at Oltingue IP (TWh)





20% minRAM: (minimum remaining available margin) – minimum level of capacity (20% of thermal capacity of the considered network element) that TSOs of the CWE region must provide to cross-zonal electricity exchanges since April 2018.

ACER: (Agency for the Cooperation of Energy Regulators) – is a European agency endowed with legal personality, instituted by regulation (EC) no. 713/2009 and created in 2010. The ACER is operational since the 3rd March 2011. Its headquarters is located in Ljubljana in Slovenia. The objective of the ACER is to help the national regulatory authorities in exercising and coordinating their regulatory tasks at the European level, and, if necessary, to complement their activities. It plays a key role in the integration of the electricity and gas markets.

aFRR: (automatic frequency restoration reserve) – load reserve activated automatically by a signal from the TSO.

ATRT: (*Accès des tiers aux réseaux de transport*) – means the tariff for transporting gas on the transmission system, determined by the CRE and applied by the French gas TSOs.

Backhaul capacity: Entry to or exit capacity from a gas interconnection point that is in the reverse direction to the main physical flow (a backhaul capacity is available if the net flow remains in the same direction as the main physical direction of the flow).

BAL (network code): Commission regulation (EU) no. 312/2014 establishing a Network Code on Gas Balancing of Transmission Networks.

Balancing zone: perimeter within which each shipper must observe equality between its injections and withdrawals according to a time step and procedures that differ between electricity and gas.

BNetzA: (*Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen*) – the Federal Network Agency, the German regulatory authority for electricity, gas, telecommunications, post and railway activities.

CACM (guideline): (Capacity Allocation and Congestion Management) – Commission regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management.

Calorific value: measures the amount of energy contained in the gas, usually expressed in megajoules per cubic metre (MJ/m³) and constantly measured by gas transporters.

CAM (network code): Commission regulation (EU) 2017/459 establishing a network code on capacity allocation mechanisms in gas transmission systems.

Capacity mechanism: the objective of the capacity mechanism is to guarantee the security of supply of the power system by remunerating the capacity of generation units during periods of tension for the system, within the limit of the reliability criterion. The principle of the French capacity mechanism is based on the obligation for each electricity supplier to cover, through capacity guarantees, the consumption of its customers during peaks in electricity consumption.

CBA: (Cost-benefit analysis) – is the prior assessment of an investment decision in the light of all the costs and benefits induced, expressed in monetary terms when possible or at least quantified.

CBCA: (Cross-Border Cost Allocation) – cross-border sharing of the costs of a Project of Common Interest.

CCR: (Capacity Calculation Region) – in electricity, geographical area within which a coordinated capacity calculation is performed. In application of ACER's decision No 06/2016 of 17 November 2016, France is part of four capacity calculation regions: Core, Northern Italian Borders, South-Western Europe and Channel. France was historically part of the Central-Western Europe region.

CEER: (Council of European Energy Regulators) – is an association created in 2000 at the initiative of the national energy regulators of the EU and EEA member states. The CEER organisation structure is composed of a general assembly, sole decision-maker, a Board, working groups specialised in various domains (electricity, gas, consumers, international relations, etc.) and a secretariat that is based in Brussels. A work program is published every year. In conformity with the statuses, decisions are based on consensus and, failing that, by qualified majority voting.

CEF: (Connecting Europe Facility) – is a financing mechanism implemented by the EU for transport, energy and digital projects of common interest (PCI).

Central-Western Europe (CWE region): electricity capacity calculation region covering Austria, Belgium, France, Germany, Luxembourg and the Netherlands.

Channel region: electricity capacity calculation covering Belgium, France, the Netherlands and the United Kingdom.

"Clean energy for all Europeans" package: also known as the "Clean Energy Package" (CEP), is made of eight legislative acts framing EU energy policy. In particular, Regulation (EU) 2019/943 of the Parliament and of the Council of 5 June 2019 on the internal electricity market lays down the rules for the organisation of the European electricity markets.

CMP: congestion management procedures in the event of contractual congestion.

CNMC: (*Comisión Nacional de los Mercados y la Competencia*) – Spanish regulatory authority notably in charge of electricity and gas infra-structures.

Congestion rent: revenues created by the allocation of interconnection capacities at the various timeframes.

Continuous allocation: allocation method for which orders are executed directly when being placed on the order book (competing orders are executed in an order depending on their price and then their entry time).

Contractual congestion: situation in which the users of an interconnection cannot contractually obtain transmission capacity, even though it is physically available.

Core region: electricity capacity calculation region covering Austria, Belgium, Croatia, Czech Republic, France, Germany, Hungary, Luxembourg, the Netherlands, Poland, Romania, Slovakia and Slovenia.

Countertrading: remedial actions through which two TSOs conclude a cross-zonal electricity exchange in the direction contrary to the congestion observed.

CREG: (*Commission de régulation de l'électricité et du gaz*) – Belgian regulatory authority in charge of electricity and gas infrastructures.

CRU: (Commission for Regulation of Utilities) – is the regulatory authority of the Irish Republic in charge of energy and water.

CWD: (Capacity Weighted Distance) – reference pricing methodology based on capacity and distance as weighting factors, in the TAR code.

Decarbonization: refers to all the measures and techniques aimed at reducing the carbon content of energy. In the case of gas, this involves the promotion and use of so-called "green" gases alternative to methane that emit little or no greenhouse gases.

EB (guideline): (Electricity Balancing Guide-line) – Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing.

EirGrid: is the Irish electricity transmission system operator (excluding Northern Ireland, where Northern Ireland Electricity operates).

EICom: is the Swiss federal independent regulatory authority in charge of electricity.

Elengy: owns and operates the French LNG terminals of Montoir-de-Bretagne and Fos-Tonkin, and operates the Fos-Cavaou terminal, owned by Fosmax LNG.

Entry-exist system: System of access to the gas transmission networks that allows the shippers to subscribe separately entry and exit capacities. It opposes the point-to-point system in which entry and exit capacity are booked jointly.

ENTSO-E: (European Network of Transmission System Operators for Electricity) – the TSOs cooperate at the EU level through the ENTSOs to promote the implementation and the functioning of the internal gas and electricity markets and cross-border exchanges, and to ensure an optimal utilisation, a coordinated exploitation and a robust technical evolution of the gas and electricity transmission systems. In this context, the ENTSOs elaborate the European network codes on the basis of the guidelines established by the ACER and in close cooperation with the Agency.

ENTSO-G: European Network of Transmission System Operators for Gas, see ENTSO-E.

Explicit auction: auction organised by the TSOs and which concerns only the allocation of the cross-border capacity.

FCA (guideline): (Forward Capacity Allocation) – Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation.

FCR: (Frequency Containment Reserve) – primary load reserve activated automatically according to the frequency measured on the network in order to stabilize the frequency.

Firm capacity: interconnection capacity which utilisation is contractually guaranteed.

Flow-based capacity calculation: capacity calculation approach that determines a domain of feasible cross-zonal commercial exchanges within a region with several borders.

Flow-based market coupling: approach to capacity calculation and allocation which consists in reflecting as closely as possible the network physical limitations on the constraints imposed to commercial flows, taken as an input to the market coupling algorithm. It constitutes the target model prescribed by the CACM Regulation for daily and intraday maturities.

Fluxys: is the Belgian gas transmission system operator, also operating LNG terminal and underground gas storage facilities in Belgium.

FTR: (Financial Transmission Rights) – long-term rights that don't allow to nominate energy, but guarantee their holders to receive the concerned bidding zones' price spread.

Green Deal: the Green Deal for Europe is a set of policy initiatives

initiated by the European Commission chaired by Ursula von der Leyen with the overarching aim of making Europe climate neutral by 2050, providing a roadmap with actions to promote resource efficiency by moving towards a clean and circular economy and to halt climate change, biodiversity loss and pollution.

GRTgaz: is one of the two operators of the French natural gas transmission system, operating over most of the country, with the exception of the South-Western region (where Teréga operates).

Guideline: formerly known as "administrative directives", the guidelines are an administrative act by which the European institutions aim at better coordinating the application of the European legislation or the national administrative practices in a non-binding manner, i.e. without legal obligations for the addressees.

HAR: (Harmonised Allocation Rules) – harmonised allocation rules for long-term rights.

Hub: corresponds to the central point of a network which ensures, by its concentration, a maximum number of connections. In gas, the term "hub" refers to the most significant market places in a given geographical area.

Implicit auction: Auction organised by the NEMOs and the TSOs and which concerns at the same time the capacity and the energy, which are allocated simultaneously.

Incremental capacity: A possible future increase in technical capacity via market based procedures or possible new capacity created where none currently exists that may be offered based on investment in physical infrastructure or long-term capacity optimisation and subsequently allocated subject to the positive outcome of an economic test.

Infrastructure package: Regulation (EU) no. 347/2013 of the European Parliament and of the Council on guidelines for trans-European energy infrastructure.

INT (network code): Commission Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules.

Interruptible capacity: interconnection capacity which utilisation is not contractually guaranteed.

JAO: (Joint Allocation Office) – European platform in charge of explicit capacity auctions, among others in the long-term timeframe, collectively owned by European TSOs.

LNG: (Liquefied natural gas) – natural gas brought to a liquid state by cooling to -160°C, with the main purpose of enabling it to be transported by LNG carriers.

Market coupling: means the common treatment of the supply and demand curves of several markets according to their economic relevance, i.e. the matching of the highest buy orders with the lowest sell orders, irrespective of the market where they were

placed, but taking into account cross-border interconnection capacities. In other words, within the limits of the interconnection capacity made available, the counterpart of a transaction on a power exchange may come from a foreign exchange without the participants being obliged to explicitly buy the corresponding capacity at the relevant border. This is an "implicit" allocation of capacity, as opposed to "explicit" allocations, where participants trading across borders must purchase the corresponding interconnection capacity in an unbundled manner from energy purchases/sales.

Market coupling can be carried out in the form of auctions (where buy and sell orders are matched simultaneously), or on a continuous basis (where orders are processed on a first-come, first-served basis).

The target model for the daily maturity is an auction-based coupling, while the intraday model is a continuous coupling.

mFRR:(manual frequency restoration re-serve) – load reserve activated manually by the TSO, with an activation time of less than 15 minutes.

National Grid: is the British electricity and natural gas transmission system operator.

NEMO: (Nominated Electricity Market Operator) – market coupling operator.

Network code: refers to common European rules on cross-border operation of electrical and gas interconnections and systems of the member states.

NIP: (Network interconnection point) – physical or notional interconnection between the gas transmission network of a TSO and that of one or several other TSOs, either within the same Member-State or with adjacent UE member state(s).

Northern Italian Borders (NIB) region: electricity capacity calculation covering Austria, France, Northern Italy and Slovenia.

NTC: (Net Transfer Capacity) – in electricity, commercial interconnection capacity. This term also refers to one of the two main capacity calculation approaches, within which the commercial interconnection capacity is determined on a per-border basis (contrarily to flow-based, which determines a domain of feasible cross-zonal commercial exchanges within a region with several borders).

Odorization: operation consisting of providing an odour to natural gas, which is odourless, for safety reasons. In France, odorization is carried out by injecting Tetrahydrothiophene (THT) into the natural gas transported on the networks, in a centralized manner, i.e. at the entry points into the gas transport networks. In other countries, this operation is carried out in a decentralised manner, upstream of the distribution networks.

Ofgem: (Office of Gas and Electricity Markets) – is the regulator for electricity and gas market in the United Kingdom.

Open Season: procedure used to dimension a new infrastructure

based on the market needs, and to allocate the corresponding capacities in a non-discriminatory manner.

PCI: (Project of common interest) – key cross border infrastructure projects that link the energy systems of EU countries which are intended to help the EU achieve its energy policy and climate objectives.

PEG: (Point d'échange de gaz) – gross market zone for the exchange of gas in France. Following the merger of the Northern and Southern zones as of 1st November 2018, PEG North and TSR were replaced by the PEG France.

Physical congestion: state of saturation of the network when an electricity line or a gas pipeline does not allow the transport or distribution of all the quantities injected or withdrawn, taking into account the characteristics and performance of the network equipment.

PITS: (Point d'interface transport stockage) – physical or notional interconnection point between a gas transmission network and one or several underground storage sites.

PITTM: (Point d'interface transport terminal méthanier) – physical or notional interconnection point between a gas transmission network and one or several LNG terminals.

PRISMA: booking platform for gas transmission capacity. Price spread: difference between the prices of two market zones.

PTR: (Physical Transmission Rights) – long-term rights that give a physical access to cross-border capacity, by allowing their holders to nominate energy exchanges between the concerned zones.

Redispatching: remedial actions through which a TSO changes the dispatch of a generation unit or the consumption program of a withdrawal site in order to address a localised congestion.

REE: (Red Eléctrica de España) – is the Spanish electricity transmission system operator.

Reserve price: eligible floor price in an auction.

RR: replacement reserve, load reserve manually activated by the TSO, with an activation time of more than 15 minutes.

RTE: (Réseau de transport d'électricité) – is the French electricity transmission system operator.

Snam: is the Italian gas transmission system operator.

South-Western Europe (SWE) region: electricity capacity calculation covering France, Portugal and Spain.

Storengy: is the main underground gas storage facility operator in France (together with Teréga and Géométhane).

SwissGas: is the Swiss gas transmission system operator.

TAR (network code): Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas.

Teréga: is one of the two operators of the French natural gas transmission system, which operates in the South-West of the country.

Terna: is the Italian electricity transmission system operator.

TRS: (Trading Region South) – market zone of the South of France that merged with the PEG Nord zone as of 1st November 2018.

TSO: Transmission System Operator

TTF: (Title Transfer Facility) - market zone for the exchange of gas in the Netherlands.

TYNDP: (Ten Year Network Development Plan) – is developed by ENTSO-E and ENTSO-G. It is a Union-wide plan, which includes the modelling of the integrated network, scenario development and an assessment of the resilience of the system. It is drawn up pursuant to Article 48 of Regulation (EU) No 2019/943 and serves as a basis for the assessment of cross-border investments in networks.

VIP: (Virtual Interconnection Point) – grouping of two or more interconnection points which connect the same two adjacent entry-exit systems, for the purposes of providing a single capacity service.

VOLL: (Value of Lost Load) – is a concept used to determine the value of an undistributed kWh. The cost of the VOLL thus represents the cost attributed to a power outage in a given system. It is used to assess the adequacy of the electric system and determine security of supply criteria, to estimate the necessary investments in terms of production capacities or to arbitrate the management of the power system close to real time (dispatching).

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