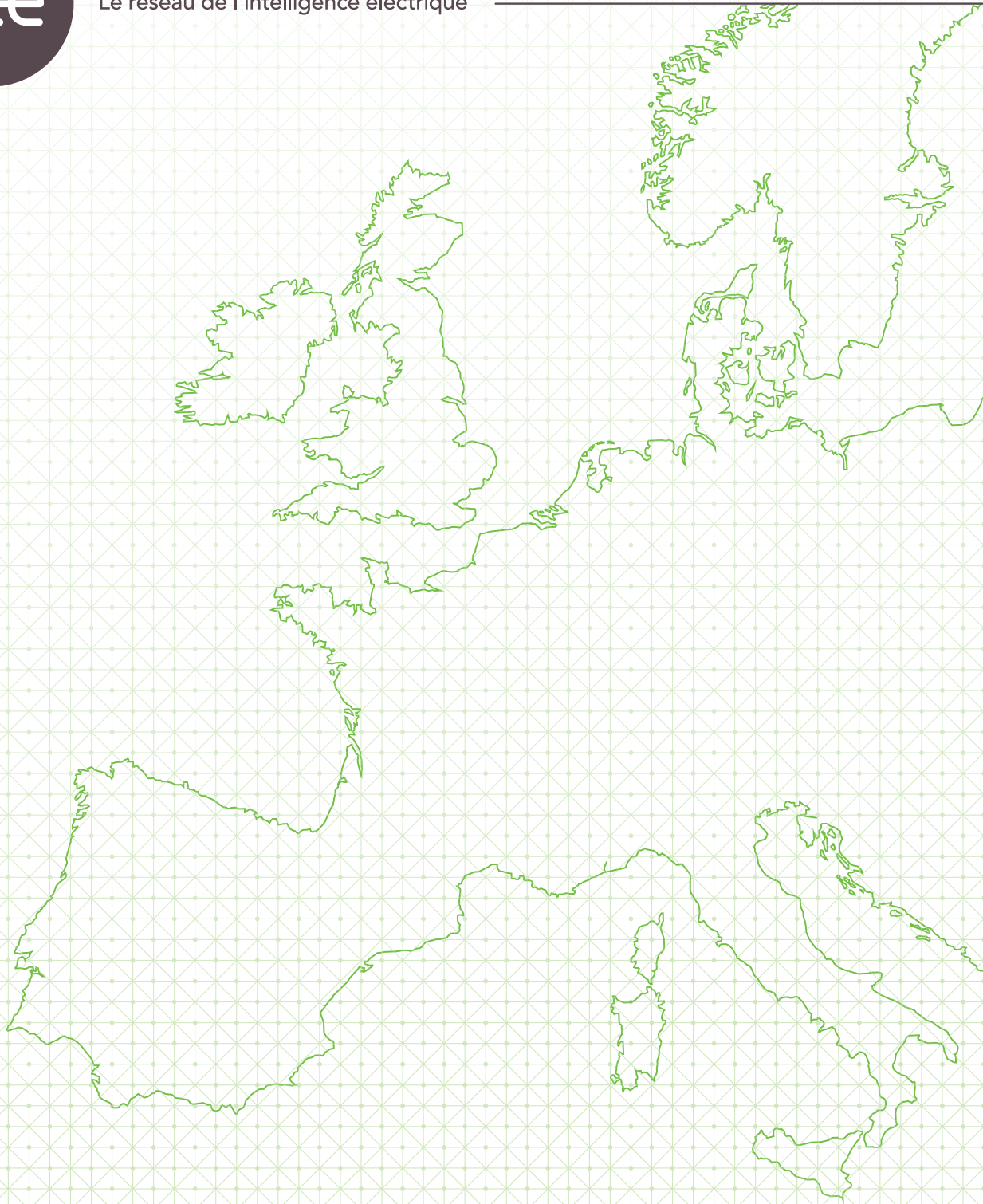




Rte

Le réseau de l'intelligence électrique

June 2016



French electricity balancing roadmap

Green paper

Short version

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INTRODUCTION

The electricity balancing market is the final timeframe to ensure frequency stability on the power system. It continuously maintains equality between the power fed into the grid (electricity generated nationally or imported from abroad) and the power withdrawn from it (electricity consumed nationally or exported abroad). On an open market where many balancing stakeholders can independently manage their portfolio (generators, suppliers, traders, etc.), it is also the final timeframe to ensure compliance with the technical constraints of the power system, such as those linked to the network flows.

In all European countries, pursuant to the third “energy” package, transmission system operators (TSOs) are in charge of balancing the power system. In particular, in France this task has been entrusted to RTE in accordance with the provisions of article L. 321-10 of the French Energy Code. This article provides that “the transmission system operator must continuously balance power flows on the grid, as well as ensuring the reliability, security and efficiency of this grid, taking into account its technical constraints.”

To do this, RTE – together with stakeholders involved in the power sector and subject to approval of the French national regulatory authority (NRA) – defines all the technical and financial terms and conditions related to balancing. In particular, these terms and conditions include the rules on scheduling, the balancing mechanism, the balance-responsible scheme and the rules on ancillary services (hereinafter referred to as “balancing market terms and conditions”). As far as the stakeholders providing balancing energy or balancing capacity are concerned, they are referred to as “balancing service providers¹” (BSPs).

These terms and conditions are not set in stone; instead, they must reflect and support changes made to the power system and ensure that balancing can be achieved cost-effectively and efficiently, while including all the stakeholders involved in the power system.

Recent changes to these terms and conditions are concrete examples of the work done in France to support the development and integration of new balancing resources, demand response in particular.

In this regard, the density of the regulatory work done on demand response has highlighted the extent of the changes that need to be made to the power system’s existing processes so that ambitious reforms can be brought in. Many competitive and technical issues have arisen and have required careful regulatory application to really enable demand response participation.

Furthermore, the context in which the balancing market terms and conditions are drawn up has recently changed considerably – both in France and at European level. Until recently, these terms and conditions were framed by five articles from the French Energy Code (articles L. 321-10 et seq.). They are currently framed by new articles, several laws and many European regulations adopted under the third “energy” package (referred to as “guidelines”). This context of major successive legislative and regulatory changes reinforces the need to share information with stakeholders involved in the power system and discuss with them so that everybody is able to react at the right time and at the right level. Again, the work done on demand response is particularly revealing of this need. Indeed, RTE was particularly committed to putting all the changes made to the regulatory framework governing the electricity markets into perspective, and presenting (during the various phases involved in the consultation process) the issues associated with the developments discussed.

With this experience and on the eve of a new crucial round of reforms which will lead to a structural review of the model used for balancing the French power system, RTE – working alongside the French NRA – wants to engage in an innovative dialogue process based on a green paper and further elaborated by a white paper to give stakeholders an insight into the issues associated with future reviews of the balancing market terms and conditions.

The progressive harmonisation of the electricity markets initiated at European level within the framework of the third “energy” package has led the European Commission, Member States, NRAs and TSOs to investigate the issue of the balancing process being harmonised at European level and the establishment of a European balancing market.

This work was initiated several years ago based on Framework Guidelines on Electricity Balancing defined by ACER, which was then developed by ENTSO-E in

1. In accordance with the Guideline on Electricity Balancing.

a proposal for a European regulation. This proposal was covered in an opinion issued by ACER on 20 July 2015. It is on this basis that the European Commission is now working with Member States on a draft text – the Guideline on Electricity Balancing – as part of the comitology process. A number of modifications are being considered compared to the work that has been done by ENTSO-E and ACER (for example, the provisions made for the imbalance settlement period).

At the same time, the electricity market design is once again the heart of a new legislative package at the European level. This package – known as the Clean Energy For All Europeans package – is awaited by the various stakeholders operating in the sector and directly linked to the political ambition set out by the new European Commission to build the Energy Union. One of its main aims is to bridge the gap between legislation on electricity markets and legislation on climate and environmental targets. In particular, this involves designing a market fit for renewable energy sources (RES), which is able to support their development.

To that extent, an important part of this legislative package will be focused on renewables support schemes. It follows up on the work done in the field of the Environment and Energy State aid Guidelines. The aim is to make sure that RES are held responsible for their impact on the power system, as any other market players, but that the regulatory framework provides incentives for investors.

While RES will face more responsibilities, it is crucial to ensure that the market effectively allows them to be responsible and to have actual leverage and possibilities to act. If RES generators are effectively able to participate and value their generation in the markets, they will less rely on public support. Moreover, changing the market design and adapting it to the new energy mix is a key issue to ensure that market signals are consistent with the physical needs of the power system.

As such, the Clean Energy For All Europeans package's aim is clear (and is explicitly described as such by the European Commission); it seeks to ensure that the European and national markets are "open" to RES while at the same time introducing specific measures to ensure that markets are fit for RES. The European framework on short-term markets should be reviewed accordingly

(for example, the possibility of significantly reducing the balancing timeframes available to TSOs so as to provide more time for RES to be balanced on an intraday basis would need to be looked into).

During the comitology process about the Guideline on Electricity Balancing, as well as during negotiations on the legislative proposals of the Clean Energy For All Europeans package, important decisions regarding the power system's balancing processes will be taken; however, the existing basis is now sufficiently well-defined to be discussed and preparations now need to be made so it can be applied at French level.

This will lead to structural changes in the balancing market's design, as the proposed target differs from the mechanisms implemented in France. Examples include the temporal separation between the intraday markets and balancing, the formulation of standard balancing bids, their being shared on common platforms to which the TSOs direct their balancing needs, procedures for putting together and activating bids, procedures for remunerating bids, the methods for calculating the imbalance price, the time period for calculating the imbalances, etc.

This green paper is therefore a reference document that can be used to (i) frame discussions about how European measures on the integration of balancing processes can be applied and (ii) continue with the work being done in France on involving power generating units and demand response facilities in the balancing process (this work should eventually ensure that France becomes a proactive player within the framework of negotiations on the Clean Energy For All Europeans package).

This green paper is based on a short description of the core principles of the French balancing market in order to put future developments into perspective. It then details the major market design options by defining the various issues. It is based on qualitative analyses of those options. Moreover, it provides a first timetable for the implementation of the target model.

Based on further quantitative analyses of the market design options and on the definition of priorities set out by the French NRA, RTE will later publish a white paper on the French electricity balancing roadmap. The latter will provide a clear definition of the target for the market design along with cost-benefit analysis.

1. THE BALANCING MODEL CURRENTLY IN USE IN FRANCE

The discussions carried out at European level show that the balancing model in use in France is largely unknown outside of the balancing stakeholders who are directly involved in it. Its intrinsic characteristics might make it harder to grasp than others; in particular it is based on very accurate predictive knowledge of the power system status, on balancing bids that finely reflect the technical capabilities of available balancing resources and on coordinated management of the supply-demand balance and network constraints.

As work is being done on harmonising balancing processes throughout Europe – prompting debates on the best practices to be implemented – the fundamental features of the French model need to be reviewed and the results obtained need to be shared with those of other European countries.

This is an essential step for understanding, with the necessary perspective, the wide choice of designs that can be used to apply the future European framework.

1.1 The design of the French balancing model

The model implemented in France rests on two fundamental pillars:

- ▶ provide the balance responsible parties (hereinafter referred to as the “BRPs”) with the option to optimise their portfolios and anticipate the balance of their perimeter up to a timescale that is relatively close to real time;
- ▶ enable TSOs to make the most appropriate decisions for balancing the system and ensure centralised and coordinated management of the supply-demand balance and network constraints. These decisions rely on predictive analyses produced by the TSO based on data sent by the market parties at different timeframes.

The regulatory and operational application of these principles aims to ensure that all tasks are properly defined, allowing the BRPs to optimise their portfolios within a framework that is relatively unconstrained, while providing the TSO with the data and levers it needs in order to ensure system reliability.

In this system, there are relatively few constraints affecting balancing stakeholders compared with other

mechanisms, and a low volume of reserves is procured by the TSO ahead of real time. The electricity markets therefore have significant room up to close to real time and relatively little capacity is “reserved” for balancing the power system (and “taken out” of the market in order to meet this specific requirement). There is a corollary to this flexibility offered to balancing stakeholders: detailed information should be transmitted to the TSO and updated regularly so that it can ensure the power system’s balance and security. This information provides the TSO with a detailed predictive view of the state of the power system. It can use this information to carry out accurate preliminary analyses of network flows so it is able to anticipate and tackle some potentially complex situations affecting the power system, without passing these constraints on to the stakeholders.

1. The French market – like all other electricity markets in Europe – and in accordance with the content of the third “energy” package, is underpinned by the concept of balance responsible party. The BRPs need to be made responsible for balancing their perimeter before real time.

In France, the BRPs are financially responsible for their imbalances through the imbalance settlement price. This price has been developed to incentivise BRPs to balance their portfolio and to reduce the need for the TSO to take actions in real-time.

In some other countries, the BRPs have a physical responsibility or their activities are subject to preventive limitations close to real time. This could result, for example, in a legal obligation to have a balanced perimeter before real time, from the day before for the day after. In comparison, the system implemented in France allows for more freedom in terms of the BRPs’ supply strategies, particularly on the intraday markets.

2. The French balancing model is based on a decentralised dispatch of power generating units or demand response facilities. The market parties are responsible for dispatching available capacity (power generating units or demand response facilities). In other European countries and in the United States, the TSO is solely responsible for dispatching capacity once the day-ahead market is closed.

3. Closer to real time, the power system is managed in a centralised way by the TSO. After intraday cross-zonal gate closure time, only RTE is authorised

to perform operations affecting the power system's balance. The duration of this exclusive TSO action window – or TSO balancing timeframe – is between 1 and 2 hours.

Some European countries – the Netherlands in particular – have chosen a model that involves decentralised management of the power system in which the balancing stakeholders themselves can voluntarily implement balancing measures up to a few minutes before real time.

- 4. The way in which the TSO manages balancing is centralised and proactive.** Based on analysis and forecast information provided by the market parties, the TSO can decide to activate balancing bids ahead of real time, i.e. before any imbalances are actually recorded. Many countries have adopted this approach (the United Kingdom, Portugal, Spain, Denmark, Norway, Sweden, Finland, etc.).

Other European countries, such as Belgium, for example, have chosen a reactive balancing model. This means that the TSO only takes curative measures. Consequently, the TSO mainly uses automatic reserves to balance the system and thus procures a significant quantity of reserves to mitigate against any situations where there are imbalances.

Conversely, a proactive balancing model should reduce the volume of procured balancing capacity. Consequently, the TSO balancing timeframe needs to be wide enough to allow the use of a wide spectrum of balancing resources, instead of "securing" too large a volume of reserves upstream.

5. The French balancing market, like its equivalent in the United Kingdom, relies on **a unit based scheduling process which gives TSOs very detailed forecast information** about the status of the power system. The result is that the TSO can anticipate network constraints and any imbalances in the power system. Scheduling is obligatory for power generating units connected to the transmission grid. It involves transmitting unit based information and is not associated with any kind of financial incentive. Power generating units connected to the public distribution grid as well as demand response facilities can also participate in this.

- 6. In order to balance the French power system, RTE uses a dynamic system for sizing the balancing**

capacity required during the course of the day. This security model, which involves continuously monitoring available margins and risks at various relevant times is referred to as "dynamic margin monitoring". In the event of discrepancy between available margins and the margins required in relation to the risk criteria defined by public authorities, measures are implemented as part of the balancing market in order to increase the balancing capacity available to RTE. This dynamic sizing ensures that the system remains reliable: a low volume of reserves is procured by the TSO ahead of the intraday market, and supplementary balancing capacities are only requested if they are strictly necessary, based on information communicated by the balancing stakeholders and predictive analyses produced by the TSO.

In some other European countries, TSOs ensure that they have enough balancing capacity to balance their power systems, procuring reserves with market parties ahead of the intraday timescale. They therefore do not monitor the effective capacity available on the power system on an intraday basis. This model is referred to as "static reserve dimensioning".

As far as the market parties are concerned, these approaches are distinguished by the difference between the capacity volume procured and reserved by the TSO in order for it to perform its tasks. The European examples show that "static reserve dimensioning" results in a greater volume of balancing capacity being procured by the TSO ahead of the intraday market than "dynamic margin monitoring". By definition, these procured capacities that are dedicated to forming the balancing reserves can no longer be involved in the day-ahead and intraday markets.

Although "dynamic margin monitoring" results in a lower volume of balancing capacity being procured ahead of the intraday market, the TSO needs to have a greater range of action during the day so that it can actually control the available capacities, providing it with the information it needs for such fine control of the system. For it to be effective, predictive analyses are required. This "dynamic margin monitoring" is naturally associated with a proactive approach to balancing and thus a timeframe that is wide enough. Associated with a narrower balancing timeframe, therefore requiring a higher volume of procured balancing capacity, "dynamic margin monitoring" loses its economic relevance.

The scheduling process and “dynamic margin monitoring” should therefore be regarded as a consequence of there being no legal obligation for the BRPs to have a balanced perimeter before real time.

7. Supply-demand balance and network constraints are jointly managed. Many countries have adopted this approach (the United Kingdom, Portugal, Spain, Denmark, Norway, Sweden, Finland, etc.). This results in integrated processes: an action performed for balancing purposes within the balancing market is also analysed against the impact that it has on the grid; bids with the best simultaneous impact on the supply-demand balance of the control area and the power flows on the grid are selected. This approach obviously involves precisely located balancing resources.

Although there are not many of them, a number of other European countries have chosen to separate balancing and network constraints management; balancing bids are not physically located on the grid. In such scenarios, the TSO uses a separate process to resolve grid congestions.

A finely-tuned coordination between balancing management and congestion management allows to optimise power system operation in the short term. This

approach reduces the preventive limitations which are needed to maintain operating margins and which are essential for managing power flows on the grid – the TSO has precise information and levers that are available up to real time in the event of a constraint emerging. A balancing timeframe that is long enough is also required.

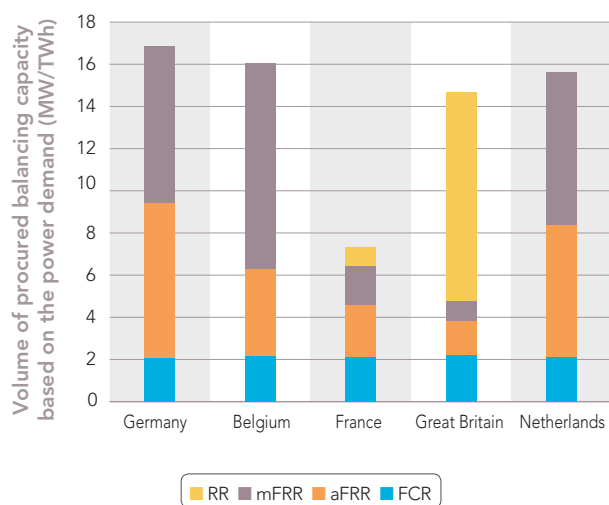
8. The power generating units connected up to the transmission grid have a legal obligation to offer their unused balancing resources on the balancing market. This obligation is an integral part of the scheduling process, as well as the proactive balancing model and the security model. It in no way prevents generators from trading on the market: stakeholders are simply required to provide TSOs with what they have not sold on the markets. This information is regularly updated based on the trades executed on the markets. In addition to the benefits for balancing and congestion management, this obligation serves as an effective means of monitoring market power, particularly as a means of detecting any form of capacity retention.

9. Balancing the French power system involves pooling all balancing resources. In addition to the reserve providing units procured to meet “fast” balancing requirements and the power generating units connected up to the transmission grid obliged to offer their unused balancing resources on the balancing market, the existence of so-called “voluntary” bids means that all capacities (demand response facilities connected up to the public transmission grid and the distribution grids and power generating units connected up to the distribution grids) can provide bids enabling them to make the most of their balancing resources at timeframes that are close to real time, and independently of any contracting process.

With this particular framework, a wide selection of power generating units or demand response facilities can formulate bids thus enabling RTE to access the entire power system’s flexibility potential. RTE can then perform efficient balancing operations and reduce the need to procure reserves.

This helps ensure that France is one of the countries in Europe with the lowest level of procured balancing capacity.

Figure 1 – Procured balancing capacity volumes for a selection of European countries for 2014



Source: Transparency Platform – ENTSO-E
Analysis: RTE

10. The balancing bids are not standardised because they closely reflect the physical capabilities of the assets on which they are based. This means that all balancing resources can be offered on the balancing market. However this lack of standardisation makes it harder for cross-border exchanges.

11. The balancing bids are submitted by BSPs, which play a different role from the role played by BRPs, and the activated balancing bids are systematically controlled. The BSPs have their own responsibilities and receive specific incentives to perform the balancing operations correctly, possibly different from those of the BRPs. As such, the service rendered is specifically checked for each bid activation in accordance with procedures defined in the balancing market terms and conditions.

These systematic checks ensure the proper functioning of the balancing market (i) by encouraging the suitable delivery of balancing bids, (ii) by accurately supervising the expected level of reliability for the balancing bids and (iii) by encouraging BSPs to declare their shortcomings as early on as possible. Furthermore, the distinction between the roles of BSP and BRP combined with the systematic checks allow the participation of BSPs which are independent of the reserve providing units' BRPs.

In some other European countries there is no distinction between the roles of BSP and BRP, and no specific check is performed: a bid that is improperly formulated can result in an imbalance across the BRP's perimeter – it will then not be possible for BSPs that are independent of the reserve providing units' BRPs to be involved.

12. Balancing bids can be used to meet the various needs of the power system's short-term management: supply-demand balance, rebuilding margins and ancillary services, network constraints management. They are not assigned, ex ante, for a specific use. This means that the bids can be used at the best price based on needs, whereas segmentation could result in the best available bids not being used.

13. This bid formation scheme, described in paragraph 8 and the ones immediately following it, is based on the obligation to offer unused

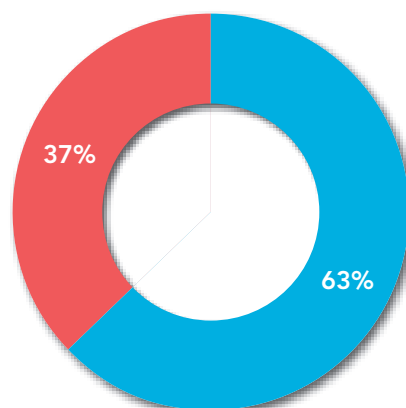
balancing resources, the existence of voluntary bids and bids resulting from various contracting processes carried out by the TSO and on a "non-earmarked" use of bids. The result is a significant amount of bids. This means increased competitive bidding, which – in principle – guarantees economic efficiency.

1.2 The balancing market is open, competitive and extensively cross-border

French electricity markets are often viewed as highly concentrated as a result of there being a dominant operator. However a number of changes to the balancing market terms and conditions have led to a deconcentration of this market. An assessment of the level of competition that now prevails on the French balancing market therefore needs to be provided in this green paper, using traditional tools for measuring the amount of competition among operators on a given market (for example: the Herfindahl-Hirschman index).

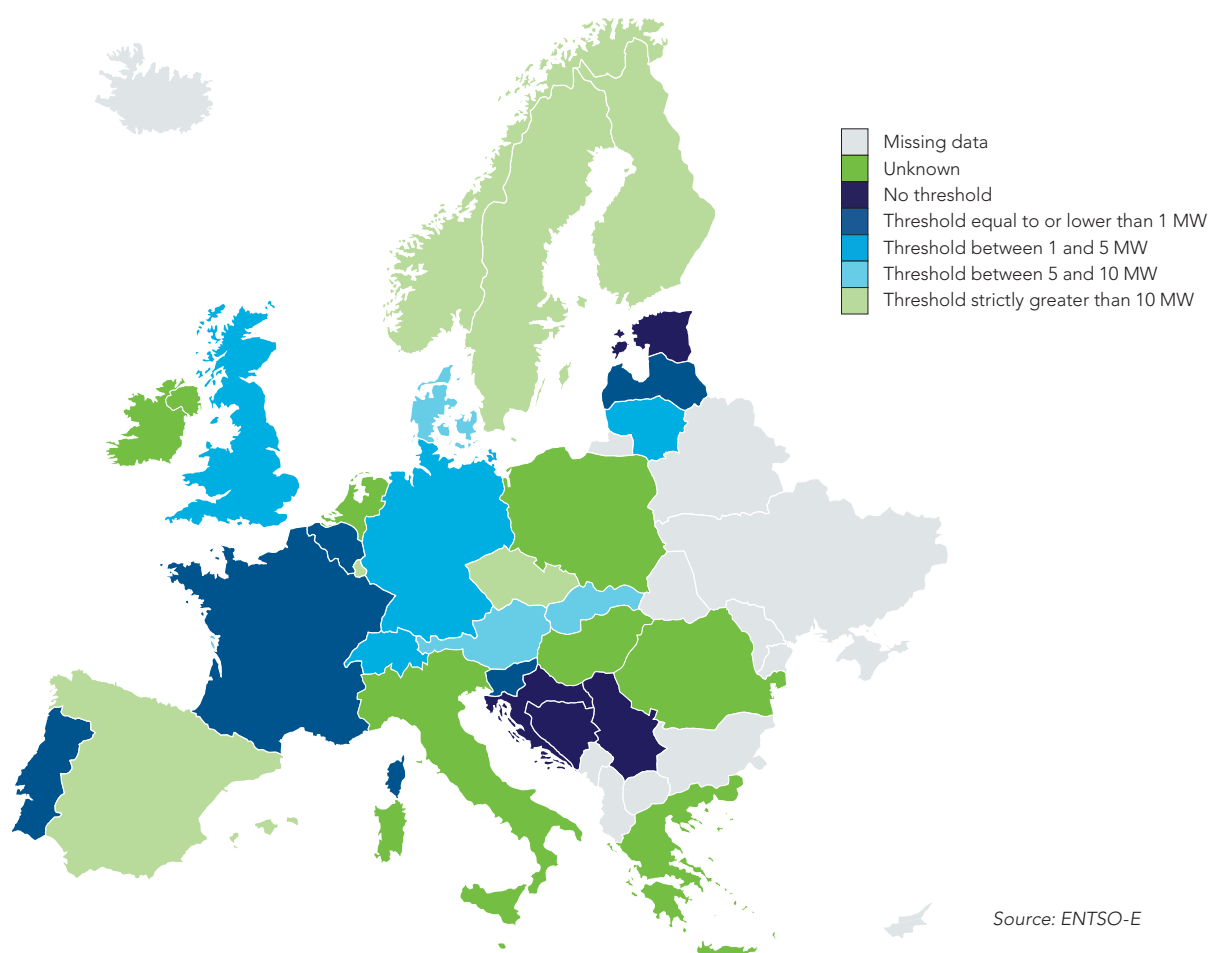
1. The balancing market has been open to contributions from balancing resources located abroad since it was created. These resources currently account for a third of activated balancing bids. Of all the countries in Europe, France – together with the Nordic countries – has the balancing market that is the most open to its neighbours.

Figure 2 – Breakdown of upward activated balancing bids based on geographic origin in 2014



■ Activated balancing bids from resources located in France
■ Activated balancing bids from resources located abroad

Figure 3 – Participation threshold for balancing resources on various European balancing markets



2. All types of resources (power generating units or demand response facilities) connected up to both the transmission and distribution grids can play a part in the balancing market. The fact that the French balancing market is so open can be attributed to the significant regulatory efforts recently carried out on it. These have sought to open up the balancing market to balancing resources, irrespective of their size and type. Since 2010, the rules have changed considerably: all the technical barriers preventing “small units” from entering have been removed. Balancing resources can participate in a unitary fashion (with a participation threshold of 1 MW aligned with best European practices) or in an aggregated fashion (with a dedicated program progressively removing barriers preventing aggregation). These developments have resulted in a gradual deconcentration of the balancing market and improved economic efficiency.

3. Another feature of the French balancing market is that it is a forum for effective competition between a wide variety of stakeholders. This result is the fruit of extensive work on balancing products used by RTE, aiming to allow competition to play a role wherever possible.

By way of an example, the incumbent operator’s (EDF) market share is only 50% of the upward balancing energy market and less than 20% of balancing capacity from reserves with manual activation (mFRR and RR capacity).

In 2012, RTE began efforts to overhaul the contracting procedures in order to ensure greater contributions from new balancing resources (aggregated power generating units or demand response facilities) in the various reserves.

On the one hand, balancing capacity products have been significantly segmented with the adoption of:

- ▶ a temporal division so that BSPs can formulate distinct bids for working and non-working days. This enables them to supply balancing capacity bids for certain specific periods of time (for example, industrial demand response facilities can contribute during the week, since some are not operational at weekends), without having to call upon a secondary market.
- ▶ several balancing capacity products characterised by different usage periods can be offered, allowing a large number of stakeholders to formulate bids and a wide selection of balancing resources to contribute.

On the other hand, the penetration of decentralised power generating units has been encouraged: cogenerators, controllable generating units connected up to the transmission or distribution grids currently contribute to the various reserves.

Special efforts have also been made to incorporate demand response (see below).

These arrangements have opened up the balancing market and reduced the cost of reserves for the community. So the market share of the incumbent operator's generating assets on the mFRR and RR balancing capacity market accounts for less than 20% in 2016, as opposed to 100% up until 2011. Between 2013 and 2016, the mFRR and RR balancing capacity market was significantly deconcentrated, resulting in the HHI² falling from an average of 7800 to 2000. In 2016, there were 9 stakeholders operating on the market, and three of them had an overall market share of nearly 50%. None of these stakeholders has a pivotal role on this market.

1.3 The example of the reform on demand response: a model for opening up the markets to new resources

Since 2010, France has been reforming its electricity market, the aim being to remove all barriers for the provision of balancing resources from consumer sites (often described as demand response facilities), and in particular for specialised service providers in this field, the demand response operators.

2. The Herfindahl-Hirschman index (or HHI) is a measure of the size of firms in relation to a given industry and an indicator of the amount of competition among them. It is defined as the sum of the squares of the market shares of all stakeholders (expressed as percentages) and ranges from 0 to 10,000. The European Commission's guidelines interpret HHI index values as being representative of a certain level of competition on the market: an HHI that is greater than 2000 denotes a market that is considered highly concentrated; between 1000 and 2000, the market is averagely concentrated; less than 1000, the market is not very concentrated.

Figure 4 – Concentration of the balancing energy market in France

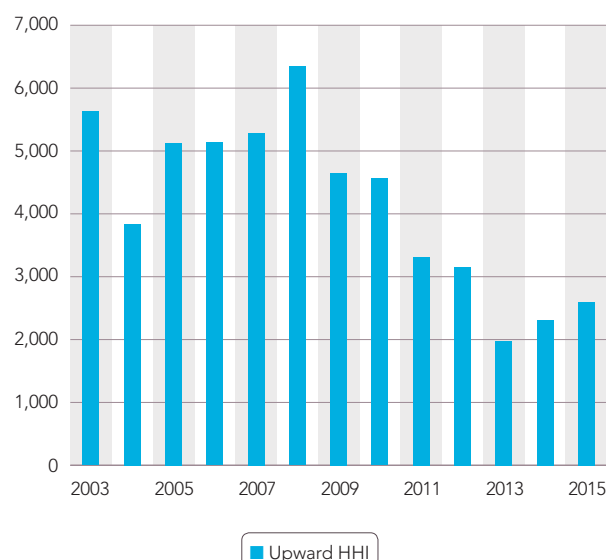
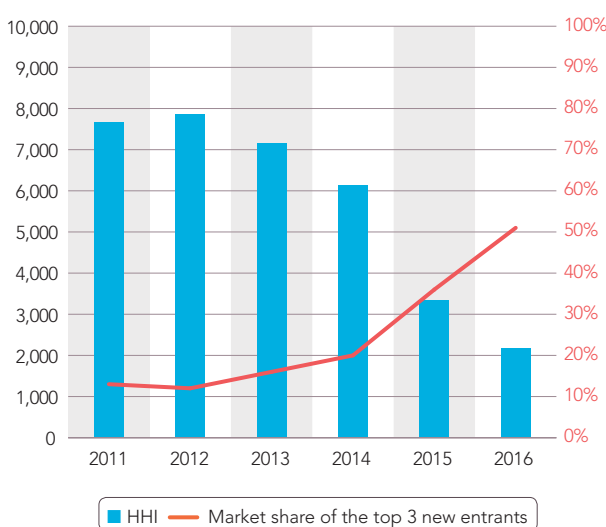


Figure 5 – Concentration of the mFRR and RR balancing capacity market in France



In France, discussions about the balancing market have played a pioneering role in establishing the policy whereby consumers' resources make a direct contribution to electricity markets. RTE has worked with the Competition authority and the French NRA in order

to create a model designed to increase competition between these demand response operators and “traditional” stakeholders on the electricity market. The development of such a model is underpinned by the fact that demand response operators are both competitors of suppliers in accessing balancing resources and producers of electricity for formulating competitive bids on the market.

1. As far as competition between demand response operators and suppliers is concerned, the model that France has developed is based on a regulatory framework that allows demand-response operators to have a fair and direct access to consumers; this is the model which enables consumers or demand response operators to leverage the balancing resources of a consumption site without the approval of their BRP or their supplier. The result is that the independence of demand response operators can be guaranteed in relation to electricity suppliers. In this respect, it encourages competition so that consumers’ balancing resources can be taken advantage of. Currently, similar programmes mainly exist in the PJM zone in the United States.
2. Opening up the markets to demand response operators has led to the creation of a contractual “Chinese Wall” between the activity of the aforementioned operators and the activity of the suppliers, based on the TSO functioning as an intermediary, guaranteeing the demand response operator that its actions are confidential and thus creating conditions for fair competition among all market parties. The TSO is responsible for factoring demand response into market mechanisms (across the perimeters of the BRPs in question) and checking that the curtailment volumes that have been declared and assessed by the demand response operator correspond to the curtailment volumes actually generated. The TSO is in fact the only third party that is able to guarantee that there is indeed an identity between commercial cross-border exchanges and the physical flows within the power system, as well as guaranteeing consistency between the mechanisms used for demand response and all the mechanisms governing the operation of electricity markets.
3. At the same time, RTE has suggested completing this “competitive” reform so that demand response initiatives are able to effectively formulate competitive bids on the markets and so compete with electricity generators. This “technical reform” is just as important

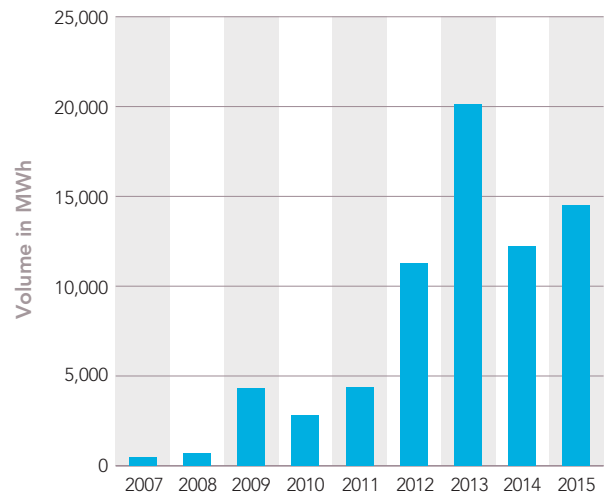
as the first brick forming the model. In particular, it has involved removing all barriers to aggregating balancing resources. This work has made it possible to allow balancing bids aggregating very different consumers. It is therefore resulting in demand response operators being able to aggregate – across a given perimeter and bid – industrial, tertiary and residential consumers connected up to the electricity transmission grid or the electricity distribution grids, and for there to be several different suppliers and BRPs. The DSOs and the TSO are therefore in charge of managing the complexity associated with putting these perimeters together that are made up of heterogeneous reserve providing units and the aggregators have a high level of flexibility in the way in which they put their bids together on the market. This programme has boosted competition between the market parties by facilitating access to the balancing market. For greater flexibility, the legislator has made the TSO a trusted third party, tasked with accurately certifying the curtailment volumes generated at various relevant points and so having useful and reliable information about the consumers involved in demand response and about their consumption curves. This way, it is possible to guarantee that the curtailments assessed on the markets are indeed for reductions in consumption.

4. Significant work has also been carried out on defining products which will effectively enable consumers to contribute to electricity markets (for example: the opportunity offered to market parties to formulate differentiated bids for working and non-working days within the tendering process for balancing capacity bids for mFRR and RR has made it easier for demand response facilities to play a part).
5. And the regulatory framework already enables residential consumers to contribute to balancing, even if there are no smart meters. For this purpose, the law and regulations define a system for classifying the data generated or collected by the demand response operators. The principle involves priority use of the data produced by the system operator, but with the option to use any data collected or produced by demand response operators if it is more relevant (time periods in particular), provided that this data has been qualified beforehand.
6. All aspects of this reform – competitive and technical – have resulted in France having a regulatory framework within which the conditions for fair competition on the

electricity market can be created. In practice, France's electricity market has therefore progressed from being a market that is "open" to demand response to one that is "fit for" demand response. This has been emphasised in particular by the Smart Energy Demand Coalition in its initiative to monitor the way in which demand response is being developed in Europe.

7. This policy has resulted in demand response playing a greater role in the power system – despite particularly unfavourable market conditions (very low wholesale prices). Furthermore, in 2016, the flexibility of consumption sites accounts for up to 40% of the total balancing capacity bids for mFRR and RR and 10% of the total balancing capacity bids for frequency containment reserve.

Figure 6 – Contribution of demand response to the balancing market



The French balancing model largely relies on the empowerment of stakeholders (no restrictions on cross-border exchanges on the intraday markets, financial responsibility) and the markets being given a free rein to operate. As a counterpart, the TSO is continuously informed about the system's status (unit based scheduling starting from day-ahead for power generating units, obligation to offer unused balancing resources for power generating units connected up to the transmission grid, option to formulate balancing bids for demand response facilities and power generating units connected up to the distribution grid outside of all procurement processes), and balancing is performed in a centralised manner in the TSO's exclusive action window.

This model makes it possible to jointly manage balancing and network constraints on the grid: an action taken on the supply-demand balance within the framework of the balancing market is also analysed relative to the impact that it has on the network flows. Thanks to the finely-tuned coordination between balancing and congestion management, the power system is managed in an optimal way.

Successive changes to the balancing market terms and conditions guarantee the effective contribution of all types of resources to balancing the French system. This is one of the advantages of the recent reforms targeting the electricity markets in France. All available balancing resources can now be pooled within the system in order to balance it.

The TSO proactively balances the power system and uses the "dynamic margin monitoring" security model, guaranteeing that the available margins are monitored within the power system.

The combination of these various characteristics has resulted in France having a very low level of procured balancing capacity compared with its neighbours (see Figure 1, page 9).

The factors combine to make the French balancing market an inexpensive system by European standards:

1. the costs associated with balancing operations are low compared with its neighbours (although some of the disparities may be related to structural differences between the markets, these are not sufficient to explain them in their entirety),

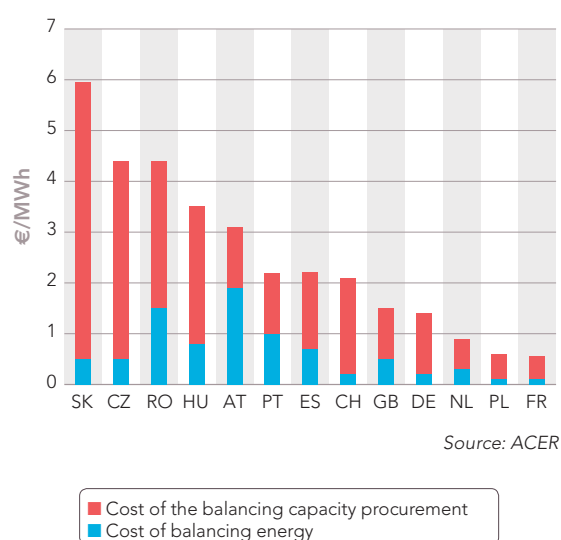
as shown in Figure 7, which represents the cost of balancing per country based on final power consumption (in €/MWh);

2. the costs linked to balancing capacity procurement are low compared to its neighbours (see Figure 1);
3. the costs associated with congestion management (re-dispatching or counter-trading) are also low in France compared to other European countries.

Between 2003 and 2016, the results of this first period of operation and changes to the French balancing model therefore appear to be positive:

- ▶ as far as security is concerned, the technical procedures that have been implemented have helped meet the security criteria defined by the public authorities;
- ▶ as far as the way in which the markets operate is concerned, continued efforts to change the market design have led to an open, competitive and extensively cross-border market;
- ▶ finally, from an economic point of view, balancing costs are moderate in France compared to the costs seen in other European countries, according to the annual market monitoring report published by ACER.

Figure 7 – Balancing costs based on final power consumption in a selection of European countries in 2014



2. TOMORROW'S CHALLENGES

Producing the French electricity balancing target must meet the application target of the European framework (which is in the process of being constructed). This is significantly structured around the future Guideline on Electricity Balancing (hereinafter referred to as the "EBGL"), as well as other European regulations on operating the power system or the way in which day-ahead and intraday markets operate.

It must also be consistent with the other structural changes associated with the energy transition targets at European, national or local level. In particular, it must support the emergence of new balancing resources, by providing innovative market parties with a playing field tailored to their specific features and effective from an economic point of view, while meeting the challenges associated with the power system's secure operation.

2.1 The European integration of the balancing markets is provided for by the third "energy" package and is in the process of being constructed

After the energy markets, balancing is the last key stage involved in the European integration of the electricity markets. The European Commission's target is to move from national or regional markets to a European balancing market, as is the case for day-ahead and intraday markets, such that there is greater liquidity and increased competition among market parties.

Three European regulations – which are either already in force or in the advanced stages of completion – are helping the European Commission to meet this target:

1. the Capacity Allocation and Congestion Management (CACM) regulation came into force on 14 August 2015 and defines the regulatory framework for calculating and allocating cross-zonal interconnection capacities to market parties, as well as the target design for day-ahead and intraday markets. It is in the process of being applied by European TSOs;
2. the Electricity transmission System Operation regulation, recently approved by the Member States during a Cross Border Committee meeting (first stage of the procedure to have the regulation adopted by the European Commission through the comitology process), defines the rules and processes applicable to the TSOs and grid users to guarantee the European power system's security;

3. the EBGL, which is still in the draft phase, defines the principles for creating a European balancing market.

In addition to the principles and targets laid out in these regulations, it seems essential to both clearly define the pathway for reaching this target – the emergence of a European balancing market – and to organize ourselves in order to take on a task of this magnitude.

The pathway: choose the right approach to facilitate the emergence of a European balancing market

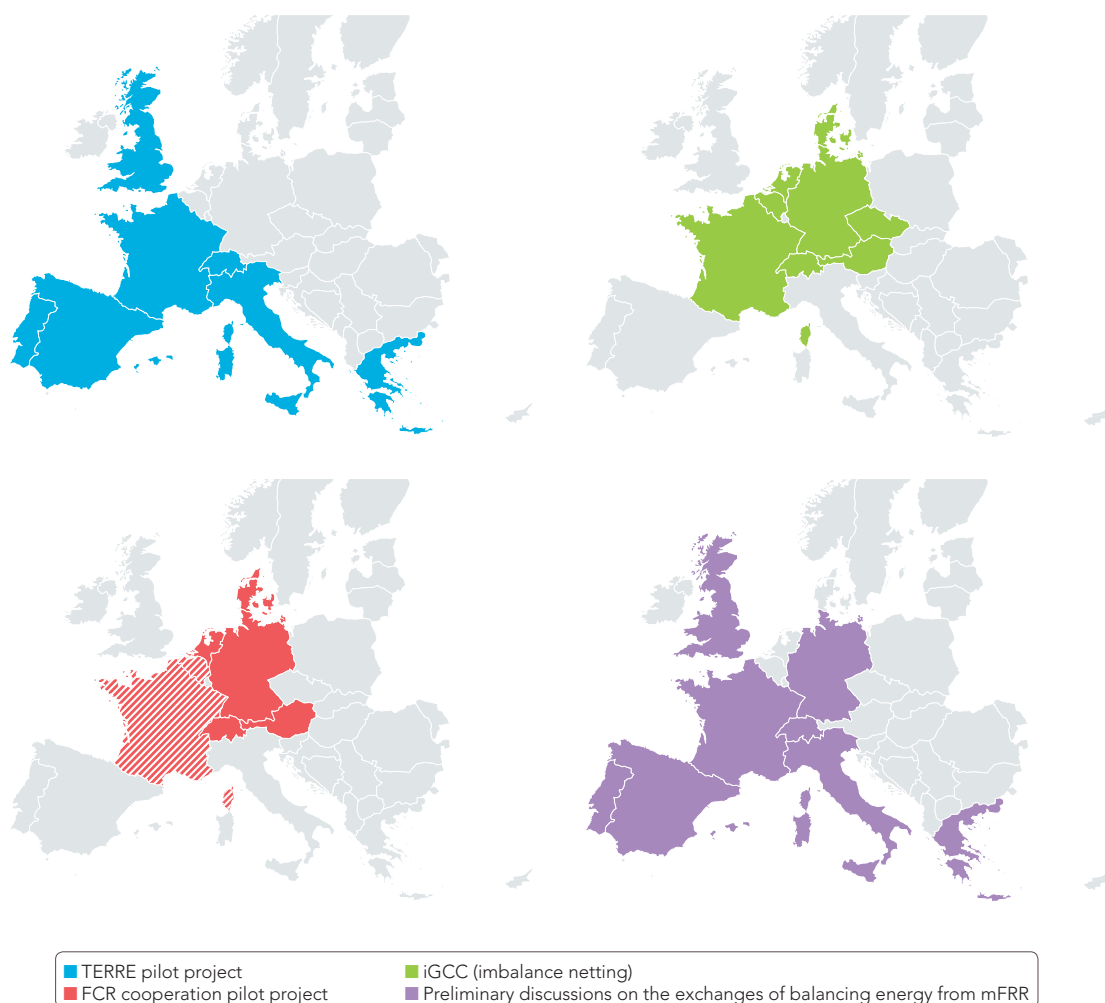
Managing balancing involves principles that differ across various European countries. And this is for reasons that can be as varied as grid structure, the historical characteristics of the domestic market, the energy mix or the features which define consumption. The result is that two major strategies are possible for facilitating the emergence of a European balancing market:

1. either complete harmonisation at regional level of all processes associated with balancing is considered a prerequisite for the emergence of a supranational balancing market. The TSOs therefore begin by establishing a shared balancing management strategy, then once this step is completed, the balancing markets can naturally be coupled. This is the approach that was chosen for coupling the intraday markets in Europe;
2. or TSOs who are ready to share a standard balancing product establish a supranational market for commonly defined products and gradually harmonise – as appropriate and in compliance with regulatory requirements – the processes involved. In this scenario, each standard balancing product can be shared at European level without harmonising all the balancing processes. This is the approach that was chosen for coupling the day-ahead markets in Europe.

The XBID project for applying the target model for intraday timescales has highlighted the complexity of a solution based on the complete harmonisation of processes across the European grid, as well as the time that it will take.

This feedback needs to be taken into account in discussions about which harmonisation philosophy should be selected for building a European balancing market. Indeed, given the substantial existing differences, the complexity of balancing processes and the challenges associated with grid operational security, it is unrealistic to believe that full harmonisation (even if

Figure 8 – Scope of the European projects in which RTE is involved



it is undertaken at regional level and not pan-European) could be performed in a shorter time for balancing than for intraday timescales.

Even if this solution provides balancing processes that are perfectly harmonised at regional level, it runs the risk of splitting Europe into several completely separate regions.

As far as RTE is concerned, the option that involves harmonisation by products has the advantage of being able to be implemented more rapidly, enabling more cross-border exchanges by reducing the pre-requisites for harmonisation. The real challenge is to end up with a European balancing market. To do this, sharing standard balancing products is one of the fundamental prerequisites.

In addition to the pragmatic nature of such a choice, it appears, on first analysis, that a significant portion of

savings could be generated without requiring a move towards full harmonisation.

RTE is therefore proposing to continue the work involved in standardising balancing products. In order to have a liquid market for the various products, it will be necessary to limit their number. RTE therefore suggests defining – to the extent possible – a single standard product by type of reserves: aFRR, mFRR and RR.

Convinced of the benefits involved in establishing a European balancing market, France is already involved in a number of European projects. These include the TERRE pilot project, the frequency containment reserve cooperation and cooperation on Imbalance Netting (International Grid Control Cooperation), as well as preliminary work on the exchanges of balancing energy from mFRR.

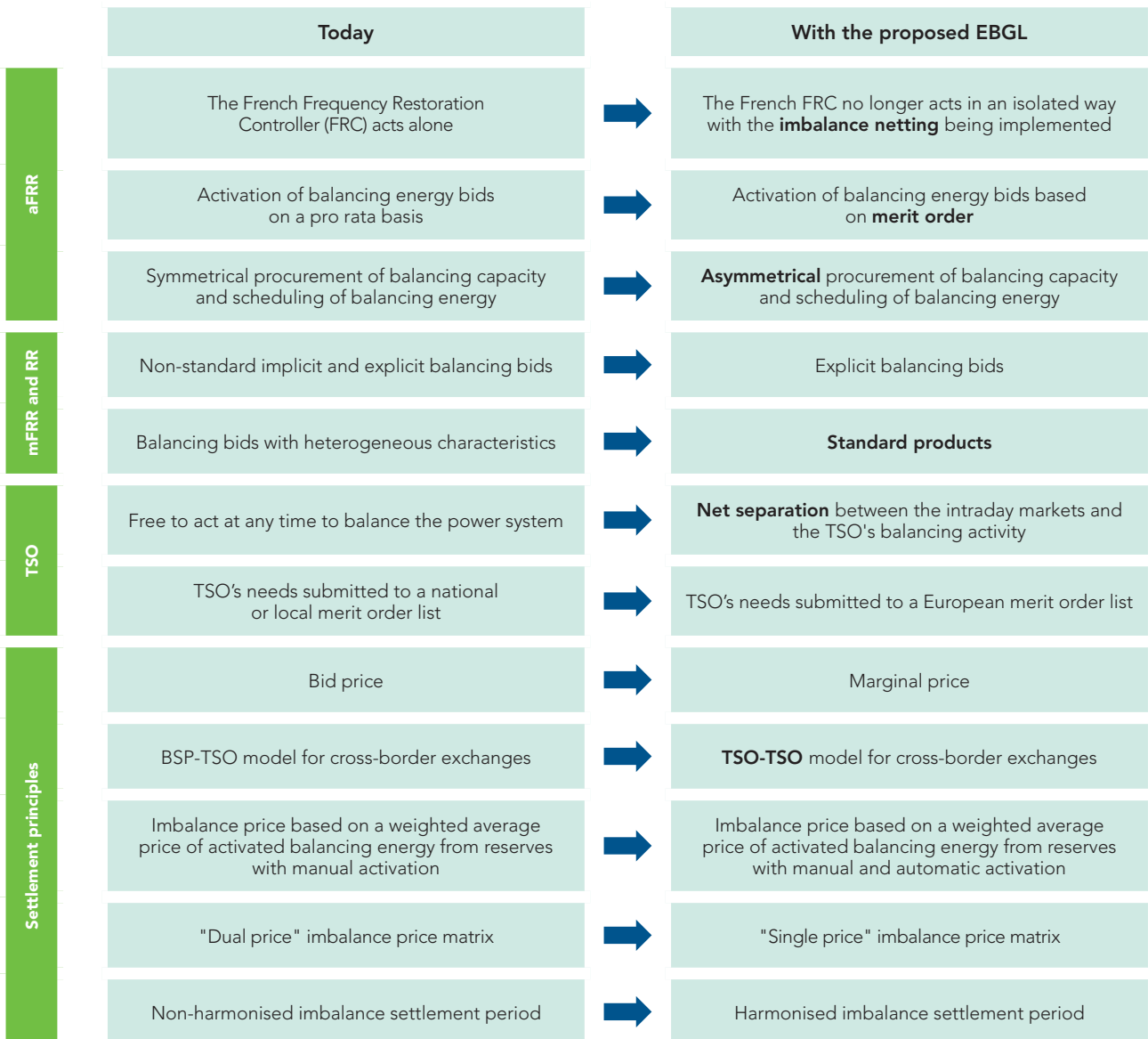
Continuing the work: an effective organisational structure needs to be implemented in order to take up the major challenges ahead

Regardless of the final target of the European balancing market, we must not conceal the extent of future technical changes and their associated costs: the draft EBGL – that in its present form does not require complete harmonisation of balancing processes across European TSOs – already brings structural changes with major technical challenges, together with a work schedule that will need to be spread over the next 10 years. French

balancing stakeholders, Distribution System Operators (DSOs) and RTE will all need to bear very high transition costs, given the wide perimeter affected by these changes.

When it comes to making choices as far as harmonisation is concerned or applying these choices as part of France’s regulatory framework, constructing a European balancing market will mobilise all stakeholders over a long period of time so they can participate in technical debates and complex decision-making processes at European level.

Figure 9 – Major technical changes brought in by the proposed EBGL



Within the framework of European discussions, RTE will take particular care to ensure that costs and benefits are equitably distributed. In fact, this is an essential condition if European integration is to succeed and keep working.

2.2 The balancing market must enable the integration of new balancing resources in accordance with energy transition targets.

In addition to issues to do with the European integration of electricity markets, the power system is considered a vector for the energy transition. In order for it to be able to do this, a level playing field needs to be created – in market rules – that is suitable for the energy transition’s resources – RES in particular. This new market design needs to allow those resources to be properly valued and to actively participate to balancing the power system. Moreover, it will allow that the balance of the system is ensured in the most optimal way.

Following a great deal of regulatory work, France has already put in place an innovative framework that has increased the contribution of demand response facilities to the French balancing market, the results of which are recognised at European level. **Future work should sustain the gains resulting from demand response participation** and should make it possible to continue making changes to the market rules in order to support the development of all balancing resources by providing them with a framework that is appropriate both from a competitive and technical point of view.

Despite the place that they now occupy in the power system and their already identified economic potential, RES – and more specifically wind power generating units – are not participating in the French balancing market. That said, the rules which govern the balancing market in no way prevent them from being involved. So following the example of the initiatives that have been implemented for demand response, specific work will need to be done in order to create a favourable framework within which RES are able to play a part in the balancing market. The green paper identifies a number of obstacles and makes recommendations for changes that will need **to be implemented if RES are to be more effectively integrated into the power system.**

This work will also need to be in line with the wider perspective that the Clean Energy For All Europeans package brings with it, as well as with the discussions being held at European level in a bid to adapt electricity markets to new technologies, particularly to guarantee

that RES are in a position to play a part in the balancing markets and provide the power system with useful services.

It will need to ensure that the electricity market is always able to convey incentives that are coherent with the power system’s physical requirements.

This work is also part of a wider debate about the contribution that all power generating units and demand response facilities make to balancing the power system. In particular, the resources linked up to distribution grids are of increasing value when it comes to balancing, as well as for managing congestion (local congestion in particular). In order to meet this particular requirement, the French energy transition law provides for local authorities to be able to offer DSOs – on an experimental basis and in association with consumers and generators connected up to distribution grids – local balancing services. One of the law’s specific measures reminds consumers and generators that participating in a local balancing service should not prohibit them from participating in the balancing market. The same philosophy needs to be adopted as the one that was historically used for power generating units and demand response facilities connected up to the public transmission grid: system operators’ requirements should not be segmented and all resources should be able to meet the power system’s needs. **Introducing a system whereby resources connected up to the distribution grids are managed in a coordinated fashion is therefore one of the major challenges which govern the way in which balancing will evolve.** The coordination method will need to make it possible to optimise the economic value of resources and effectively address all issues to do with power system management (management of public distribution grids, management of the public transmission grid and management of the supply-demand balance).

Finally, balancing must also take advantage of opportunities afforded by new information and communications technologies, by the advanced functions and features implemented by the data services available to market parties, as well as by the ability to quickly meet the requirements of new balancing stakeholders offering resources based on innovative technologies. For this to be possible, work has to be carried out focusing on several challenges:

1. the interface with European platforms provided by the proposed EBGL, the integration of a growing number

of resources connected up to public distribution grids, the coordinated management of resources between local and national balancing schemes will all result in the balancing processes being highly complex, while the process timeframe dedicated to them will be reduced: **the balancing processes will therefore need to be carried out more rapidly.** It is therefore vital to be able to draw on innovative technologies so as to effectively support these changes;

2. since the balancing incentive for the BRPs is being stepped up, they should be **provided with more information so as to manage their area and receive it faster**, particularly information to do with the opportunities provided by smart meters;
3. the market terms and conditions must be able to evolve quickly so as to meet the requirements of new market parties offering innovative solutions. Otherwise, the timeframe imposed for the application of the EBGL will – in practice – run the risk of preventing any innovation in regulatory production.

2.3 The changes in the balancing market must provide a level of security and economic performance that is at least equivalent to current levels

Neither the commitment to promoting the emergence

of a European balancing market nor the commitment to integrating new balancing resources should obscure the other points in relation to which RTE must remain vigilant: the level of operational security and economic performance.

On the first point, the balancing market – which is the last lever for action before real time to match commercial cross-border exchanges with the physical flows on the grid – should not compromise the level of operational security for which RTE is responsible.

On the second point, the French power system's current balancing process has demonstrated its economic efficiency. **Harmonising these processes at European level must not lead to a decline in economic performance or prevent there from being competition on the balancing market.** On the contrary, although future modifications to the balancing processes must ensure that they can be more effectively integrated at European level, they must also enable these markets to be opened up to all resources willing to provide balancing services. To this end, RTE will take particular care to ensure that all of the work done in France over the last few years to increase competition and encourage contributions from new stakeholders to the balancing market can be seamlessly integrated into the new market terms and conditions resulting from the application of the EBGL.

3. SEVERAL GUIDELINES CAN BE SKETCHED OUT FOR THE FRENCH BALANCING MARKET

This green paper meets several aims:

1. it raises a number of key questions regarding the future design of the balancing market (see above);
2. it lays down a number of broad outlines which will be detailed in the rest of this document. In some cases, several development scenarios are considered.

These details will be further supplemented in a white paper published following feedback from market parties, guidelines from the French NRA, and quantitative analyses of the various possible scenarios by RTE. These scenarios will be assessed using the following analysis grid: (i) influence on security, (ii) overall savings generated by the measure (options to roll it out on a Europe-wide scale, optimising investment signals, minimising over-expenditure on the development of current procedures and practices, etc.), (iii) transparency, (iv) consistency with energy transition targets and (v) impact on competition.

Recommendation 1: sequence the intraday markets and balancing while preserving an exclusive balancing timeframe of at least one hour for the TSO

One of the fundamental features of the French balancing process is the co-existence of the financial responsibility borne by the market parties, via the BRP system, and the centralised balancing management carried out by the TSO as real-time approaches. There are currently no time constraints that dictate when RTE can take action in order to re-establish the balance between supply and demand, although in practice such action tends to be concentrated within a window of two hours before real time.

1. The EBGL and CACM regulation outline the principles of time sequencing and, therefore, of an explicit distinction between the cross-border intraday markets and balancing. Furthermore, the CACM regulation provides that the cross-border intraday markets are not to be closed sooner than an hour before the start of the timeframe concerned. The market parties must be able to adjust their

schedules, declare new transactions for the local market and update their balancing bids at least up to the closure of the cross-border intraday markets. Today, nominations for interconnections are governed by a system of 24 daily gates, closing on the hour, in addition to a one-hour neutralisation leadtime. These procedures are compatible with European regulations; they provide RTE with a balancing timeframe of between one and two hours.

Upon the entry into force of the EBGL, RTE will limit its balancing actions to a timeframe of between one and two hours before real time.

2. In the mid-term, the duration of the balancing timeframe may be reduced. In particular, the number of gates for nominations for interconnections could be brought into line with market periods, which in turn have to be consistent with the imbalance settlement period (this would mean switching from 24 gates – the current number – to 48 for an imbalance settlement period of 30 minutes, or switching from 96 gates for an imbalance settlement period of 15 minutes). In addition to these possible changes, **RTE is in favour of maintaining – in compliance with the CACM regulation – a balancing timeframe of a minimum of one hour in order to enable a joint, centralised and proactive management of the supply-demand balance and network constraints.** A balancing timeframe of less than one hour would have repercussions for balancing and congestion management: it would imply more reserves with automatic activation to manage the supply-demand balance and an increase of the operational margins for congestion management by imposing more preventive restrictions. An increase in this procurement volume would see certain power generating units or demand response facilities, which are currently active on the day-ahead and intraday markets, no longer in the position to offer bids within these timeframes. Indeed they would be “reserved” for balancing the power system. Implementing centralised, proactive and coordinated management of supply-demand balance and network constraints require a balancing timeframe of sufficient length. Even a slight reduction in the balancing timeframe will reduce the participation of certain reserve providing unit on the balancing market. Following this initial qualitative analysis, RTE will quantify different scenarios relating to different balancing timeframe durations in order to provide quantitative analysis on this matter in the white paper.

Recommendation 2: maintain a dynamic dimensioning of the balancing capacity required for balancing the power system

Continuously managing the balancing capacity required for balancing the power system is central to the “dynamic margin monitoring”, which is currently in use. This approach – outlined earlier in this document – is effective from a technical perspective and in particular helps ensure a low volume of procured reserves for balancing the French system. However, it does require that RTE carries out occasional operations – outside of the balancing timeframe – to build margins up again if they are depleted. RTE has asked Microeconomix to evaluate the economic efficiency of this approach.

1. The qualitative analyses conducted by Microeconomix seem to indicate that the current “dynamic margin monitoring” is economically efficient for France. RTE mainly agrees with this analysis. The selected approach therefore involves keeping this model, adapting it to the future EBGL, and carrying out improvements in the areas identified by Microeconomix and RTE.
2. These areas involve the following in particular:
 - ▶ extending and fine-tuning the scheduling process;
 - ▶ maintaining an obligation to offer the unused balancing resources;
 - ▶ for RTE, continuing to conduct operations outside of the balancing timeframe, not for balancing the power system, but in order to finely manage the level of required balancing capacity;
 - ▶ for RTE, having the option – should it be necessary – to make balancing bids unavailable if they are based on reserve providing units with an energy stock constraint³.

Recommendation 3: retain the principle of coordination between balancing and congestion management

In France, the supply-demand balance and network constraints are jointly managed so as to keep costs down. This results in integrated processes: an action taken on the supply-demand balance within the framework of the balancing market is also analysed relative to the impact that it has on the network flows. Bids with the best simultaneous impact on the balance of the control area and flows on the grid are selected.

3. Nowadays, reserve providing units subject to an energy stock constraint can be specifically managed: they must be kept available for the periods of the day during which there is a high risk of tension on the supply-demand balance. This specific management would be kept.

Thanks to the finely-tuned coordination between balancing and congestion management, the way in which the power system is managed in the short term can be optimised. Doing so requires a precise location of reserve providing units and the possibility for the TSO to have a significant set of bids to meet all requirements. In other terms, segmenting the balancing bids based on one of the power system’s specific needs – be they voluntary bids or bids resulting from procured reserves – needs to be avoided. Such fragmentation would result – for the same level of service – in an additional volume of reserves being procured and thus removed from prior market timescales, and subsequently in an increase in balancing costs for the consumer. Implementing this model therefore involves the effective contribution of all resources – both to balancing needs and to managing network constraints on the grid. Many power generating units or demand response facilities connected up to the transmission grid or the distribution grids currently contribute on a regular basis to the balancing market, for national supply-demand balance or for managing congestion on the transmission grid.

This principle of coordinated management of supply-demand balance and network constraints by using the largest possible set of reserve providing units helps ensure the French model’s good economic performance. RTE believes that it should be kept, while adapting it to the changes in the power system. In particular, arrangements have to be made for the way in which RTE’s management of the national supply-demand balance interfaces with congestion on the transmission grid, and the mechanisms used by the DSOs to meet the needs for congestion management on the grids that they operate. This way, reserve providing units will be able to meet all of the power system’s requirements and can be used by RTE or the DSOs jointly, based on their respective requirements. This absence of segmentation means that available resources can be used optimally.

The future model to handle balancing resources could therefore be based:

1. on the ability of BSPs to continue to formulate bids, without segmenting them across different requirements: balancing, rebuilding margins, congestion management;

2. on information being kept about the precise location of the reserve providing units used, such that an action taken within the framework of balancing can also be analysed in terms of the impact that it has on the network flows;
3. on the option for system operators to impose limitations on the activation of balancing resources in the event of constraints: in such circumstances, a specific financial scheme could be defined in order to factor in any losses of opportunities that the market parties might suffer, while returning useful economic incentives;
4. on the implementation of proper coordinated management between RTE and the DSOs of the reserve providing units connected up to the distribution grids, which would enable (i) any potential conflict between local and national needs to be dealt with, and (ii) the use of reserve providing units to resolve transmission grid and distribution grid congestion, or for balancing requirements. Several coordination methods can be investigated in order to meet these aims; these will need to be the focus of specific work with the DSOs, and discussed as part of a dialogue process with the market parties.

Recommendation 4: give the BRPs all the information and leverage required to help balancing the power system

In the future, and in application of the EBGL, the system's balance will rely more heavily on the BRPs. For this, they will need to have the necessary levers, information and incentives in order to balance themselves effectively.

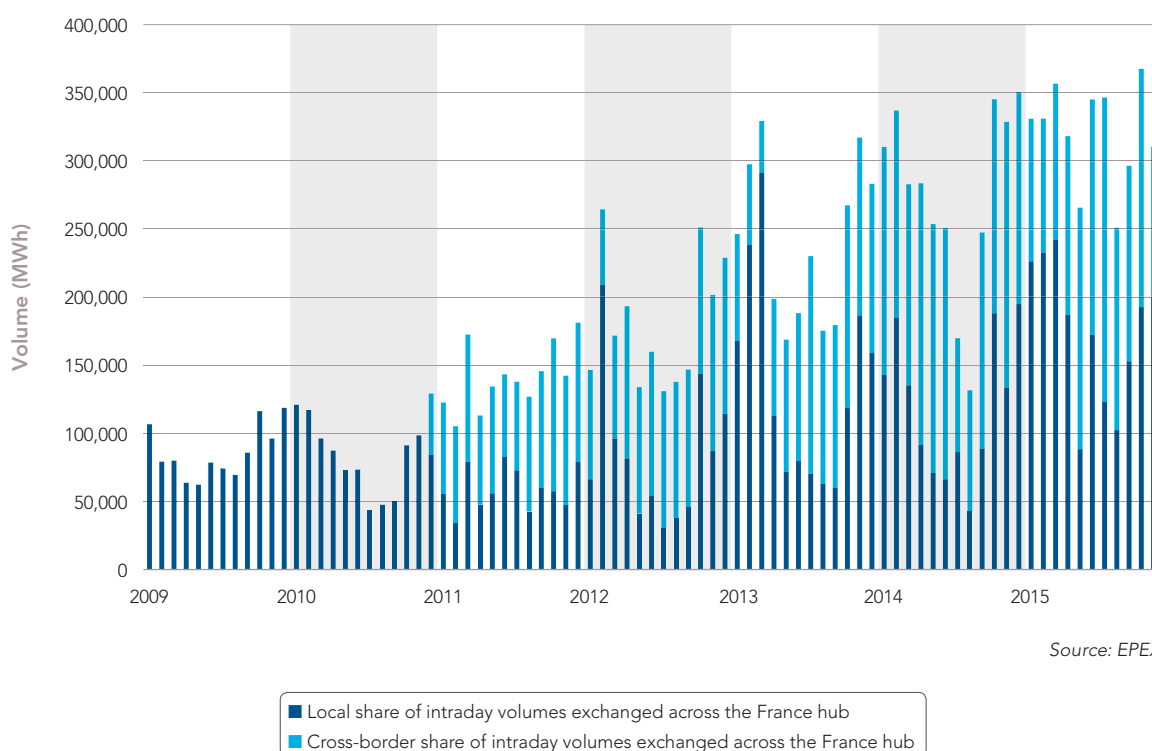
1. **The BRPs must be equipped with the right levers to ensure their flexibility, thanks in particular to a liquid and competitive intraday market at European level.** In recent years, the French intraday market has seen continuous growth, both in terms of participant numbers and volumes. This momentum must be maintained. Aware of this need, RTE is working to ensure the success of the XBID project. But it also wants to enhance other initiatives that enable capacities to be efficiently allocated to interconnections, in particular by extending the principle of implicit or explicit auctions to all borders.

2. **The BRPs must be informed of their imbalances and of any system imbalances as closely as possible to real time.** Improvements to metering and profiling tools, as well as the associated information systems, are needed in order to produce more precise information closer to real time. Today, BRPs can access an initial assessment of their imbalances two weeks after real time at the latest, depending on the nature of the power generating units or demand response facilities across their perimeter. This two-week period must be reduced.
3. **The BRPs must be individually encouraged to take appropriate actions prior to the TSO's balancing timeframe.** This involves the imbalance price being more of an incentive, and encouraging the BRPs to manage their balance by achieving a better understanding of their portfolios. However, in practice, the current normative schemes which concern a significant portion of power consumption in France are not a reflection of consumers' actual consumption.

On the one hand, the method used to set the imbalance price will need to change: it will need to switch to a single price, to take into account the balancing bids paid at marginal price and to adapt the incentive coefficient – “coefficient K” – used in calculating the imbalance price to incentivise stakeholders to balance themselves. Some of these changes are provided for by the latest version of the French balancing market terms and conditions. Others will need to be offered in future versions of these terms and conditions.

On the other hand, the profiling tool could be refined, as recently highlighted by stakeholders within the framework of the Nordic initiative for smart meter management and in the CEER's report on demand response. The use of normative profiles in the allocation process can lead to incorrect energy allocation among the BRPs with profiled sites within their portfolio (52% of today's national consumption is established by a normative approach). Currently, consumption that is estimated on the basis of normative profiles is corrected by an average of 1500 MW per half-hourly period in order to ensure consistency with the energies extracted at the interface between the transmission grid and the distribution grid. The incorporation of metered energies, two years after the timescale, results in a new correction at spot prices, instead of at imbalance settlement prices.

Figure 10 – Increase in intraday volumes exchanged across the France hub



However, the roll-out of smart meters means that suppliers can develop a more diverse range of services and place greater emphasis on the aptitude of consumers to regulate their consumption through a dynamic energy pricing system and by using new information and communication technologies. It is important that these new possibilities be properly taken into account in the methods used to calculate imbalances so that society as a whole gets the full benefit.

4. The reduction of the imbalance settlement period in France from 30 minutes to 15 minutes generates significant costs for system operators and market parties. What emerges from the results of the study carried out by Frontier Economics at ENTSO-E's request is that standardising the imbalance settlement period to 15 minutes does not necessarily result in benefits that are greater than the costs incurred. Thus, and given the relatively low benefits identified for France, RTE is in favour of retaining an imbalance settlement period of 30 minutes. In the event of a decision being taken to harmonise practices across all European countries, setting all their imbalance settlement periods to 15 minutes, this would be more of a political

choice than the result of an economic analysis. RTE would then implement it, but believes that sharing the costs at European level could be useful, since the beneficiaries are not based exclusively in France. Furthermore, the timescale for such a transition will have to be defined in a way that is consistent with the future EBGL, factoring in the constraints affecting all stakeholders, in order to avoid even higher transition costs. When this green paper was published, these points had not yet been subject to European arbitration.

Recommendation 5: give priority to a harmonisation process based on defining a limited number of standard products, rather than systematically harmonising all balancing processes

Balancing is managed in accordance with a set of highly heterogeneous principles across Europe. Given this situation, both of the options detailed in paragraph 2.1 are possible as a means of promoting the emergence of a European balancing market: either complete harmonisation at regional level of all processes involved in balancing, or gradual harmonisation based on the exchange of standard products defined at regional level.

1. The use of standard products to balance the French power system increases the liquidity of balancing bids at regional level and boosts the imbalance netting potential between European countries. Their number will need to be reduced at European level in order to maximise the interest in sharing them. **Initial analysis suggests that achieving this goal would result in a significant share of the benefits associated with Europeanisation being realised: it is not necessary to go down the route of a full harmonisation of balancing processes.**
2. **In concrete terms, this approach involves one standard product being defined per process** (RR, mFRR, aFRR) in order to ensure enough liquidity for the TSO and maximised efficiency for the BSPs:
 - ▶ the RR product, with a full activation time of 30 minutes, will be along the lines of the shared product used for the TERRE initiative;
 - ▶ the mFRR product, with a full activation time of about 15 minutes, must be able to restore the reference frequency within the timeframe outlined in the “Electricity Transmission System Operation” regulation, in other words 15 minutes. Otherwise, the volume of procured reserves with automatic activation will need to be resized;
 - ▶ the aFRR product, with a full activation time of 300 or 450 seconds, should be the subject of a technical feasibility study and economic analysis.
3. The standard products must be defined in order to meet the TSO’s balancing needs as efficiently as possible. Otherwise, greater dependency on specific products would be necessary.
4. It is preferable (i) for timings of the standard products to be complementary, in order to avoid the supply of uncontrolled energy when interconnection scheduling periods are changed, (ii) for the standard products to have strict requirements in terms of their power delivery profile, so that they are capable of balancing the power system, and (iii) for the balancing requirement to be physically covered in the same way, regardless of the location of the balancing bid chosen. Otherwise, more balancing bids will need to be activated to meet initially identical balancing needs and mitigate against certain unwanted effects.
5. This small number of standard products does not allow for all imbalances to be reabsorbed. RTE will therefore continue to use specific products in the form of implicit, and potentially explicit, non-standard bids, under the conditions outlined by the EBGL. At this stage, the

benefits and costs associated with the standardisation of the balancing process have yet to be assessed.

Recommendation 6: encourage BSPs to deliver their bids properly, guaranteeing them fair remuneration and using a systematic control system

The French balancing market currently involves mobilising balancing resources independently of BRPs. This means that balancing is performed by identified stakeholders, such as BRPs, which have a specific incentive scheme for this purpose. This scheme rests on both a dedicated pricing arrangement and systematic checks of the service rendered.

1. The balancing bids settlement principles will be harmonised at European level. The EBGL provides for a general principle involving payment at the marginal price, the exact details of which will be drawn up subsequently. RTE recommends that each platform for exchanges of standard products is based on marginal pricing.
2. The procedures for monitoring the suitable delivery of balancing bids are not harmonised by the EBGL. Insofar as the balancing model will only work (from both a technical and an economic stand point) if the balancing bids are effectively provided by stakeholders, RTE would like to keep a framework operating as an incentive to ensure that balancing is properly carried out. It is therefore preferable to routinely carry out performance controls, together with – if necessary – a specific system for assessing deviations between balancing orders sent by the TSO and balancing bids provided by the BSP.
3. The pricing arrangements for balancing bids must undergo an in-depth review, in order (i) to harmonise them between injection and withdrawal; (ii) to introduce an incentive to deliver the expected power profile; and (iii) to encourage prior warnings of any shortcoming, as early on as possible, in order to enable centralised failure management.
4. In compliance with the above-mentioned European regulations, RTE wishes to introduce a pre-qualification process for all power generating units or demand response facilities participating on the balancing market.

Recommendation 7: adapt the procurement process for balancing capacity bids

The mFRR and RR balancing capacity procurement process has significantly evolved over the last few years

in order to increase market competition. As detailed above, nine stakeholders are currently operating on the balancing capacity market, including three which account for an overall market share of 50%.

1. Further progress could see balancing capacity bids being remunerated at the marginal price on the balancing capacity markets.
2. In application of the EBGL, the timeframes involved in procuring balancing capacity will become shorter than at present. This point is being debated: some stakeholders – industrial stakeholders in particular – have indicated that they would prefer a longer contracting period so as to secure their income and enable them to offer more competitive prices. Procuring balancing capacity on an exclusively short-term basis does not guarantee investment in new reserve providing units, so it would be preferable to also procure a share of total balancing capacity on a medium-term basis.
3. The Europeanisation of balancing capacity procurement must reduce costs for the society as a whole (by increasing competition, switching from national to European level, etc.). RTE will be a driving force in this process. Following the work carried out to define standard products for balancing energy, balancing capacity products will have to meet standardised requirements.

Recommendation 8: make the process of providing balancing services more flexible and dynamic

In order to encourage contributions from power generating units or demand response facilities to balancing, major efforts to reform the balancing market have already been carried out (see above). In particular, the balancing market terms and conditions have been completely overhauled in a bid to promote aggregation. This is one of the key advantages of the system that has been put in place in France.

RTE would like to deepen this work. Several improvements can be looked into and will be discussed as part of dialogue process with the relevant stakeholders: the procedures for offering balancing services could be relaxed, and the aggregates supporting balancing bids could be updated in a more dynamic way.

1. The potential for aggregation already offered by the French model must be maintained and even

developed. It has already proved effective as a means of developing demand response and the participation of resources connected up to the distribution grid.

2. In addition, the potential to develop aggregates that are more dynamically defined than at present and capable of supporting several balancing bids will create more favourable conditions for BSPs.
3. This improved flexibility must be implemented without compromising RTE's ability to finely manage network flows in order to guarantee the system's operational security.

Recommendation 9: integrate RES into the balancing market

Incorporating RES into the balancing market is of genuine economic interest. This is illustrated in the report on the socio-economic value of smart grids, published on 9 July 2015 by RTE and its partners within the framework of the Smart Grid Project and the "New Industrial France" plan.

As part of the white paper on the French electricity balancing roadmap, RTE has pledged to specify all of the savings that could be generated by the incorporation of RES relative to the costs involved. However, starting now with the drafting of this green paper, a number of areas can already be looked into in order to more effectively integrate RES into the balancing market.

1. Currently, regulatory obstacles are preventing RES from contributing to the balancing market: (i) a specific contractual regime prevents certain units from offering their resources to RTE, (ii) current support schemes can lead to certain operators not contributing to the balancing market, to the detriment of general interest and (iii) the regulatory conditions that govern the way in which RES can contribute to balancing depend on the domain of supply voltage, which may create complications.
2. In addition to these issues, RTE suggests bringing in changes to the balancing market terms and conditions so as to facilitate the balancing market's progression from a system that is "open" to the contribution of RES to one that is actually "fit" for RES, in line with the reforms that have been brought in regarding demand response. In particular, efforts targeting issues to do with aggregating renewables' generating units could be looked into in order to make it easier for "smaller" renewable energy generators to access the markets.

3. Regarding the contribution of RES to the balancing market in particular, work will need to be done so that RTE can interact directly – within very tight deadlines – with the relevant generators, while ensuring that it is able to keep the DSOs informed so that they are aware of operations which may also have an effect on their grids (see Recommendation 3). At a time when the balancing timeframes of TSOs are being reduced and all of the processes involved in the power system are being digitised, this is essential.
4. As far as ancillary services are concerned, changes to approval and performance control systems will be investigated (renewables/storage), following feedback about the demand response schemes already in place so as to take the specific characteristics of these providing units into account.
5. In addition to the modifications of the balancing market terms and conditions, wide-scale integration of RES into the power system has an impact on the operation of the grid. Therefore there is a need to increase the level of information of the TSO on the availability of resources, especially the one connected to distribution grids. This information is particularly necessary for conducting detailed predictive analyses of the power system's state, so as to limit the need to procure reserves (which can be potentially costly for French consumers). Within this framework, the scheduling process must be extended to include RES. This issue has already been discussed by the public authorities and market parties as part of efforts to foster energy transition but will need to be developed in a dedicated implementing act. This implementing act must be carried out in consultation with the relevant market parties in order to guarantee a process that is proportionate to the issues at stake, and above all one that does not result in an excessive administrative burden for renewable energies facilities (notably smaller facilities).

Recommendation 10: introduce more flexibility in the consultation process

Future changes to the balancing market terms and conditions will be made as part of a long process (approximately 10 years) and will require all market parties to invest a significant amount of their time. The modifications under consideration are so important – including in terms of how they can be operationally applied – that their implementation could lead to locking-up the discussions on the evolution of balancing market terms and conditions and to prevent any new

“ideas” to emerge if they are not covered by the white paper.

RTE would like to avoid such locking and to formalise the existence of a dedicated process for examining and implementing certain changes to the market rules that are unplanned in the overall schedule. This “fast track” procedure, which is based on a “pass”, must ensure that the balancing market rules remain adapted tools to meet the power system's various challenges.

1. An initial schedule for holding discussions to do with balancing the power system at both European and French level is included in the green paper's appendices. This schedule should provide stakeholders with the information they need to influence the decision-making process at the right level and at the right time. It also provides everyone with an up-to-date overview of the scale of the work involved in reforming the balancing market for the years ahead.
2. RTE is proposing to introduce a “fast track” procedure based on a “pass” for testing certain fast changes to the terms and conditions. This procedure, while needing to be strictly controlled, would encourage innovation by authorising a quick outlet for ideas and would result in concrete feedback when these changes are subjected to the critical analysis of other market parties.
3. RTE believes that this experimental approach could prove to be of much interest. In theory, the scope of the changes involved would need to be defined, together with the procedures for submitting proposals and having them approved by the French NRA, and the specific terms in accordance with which the measures concerned could be implemented and feedback provided, as well as the option to interrupt the test if it does not prove conclusive. These different components serve as guarantees for those market parties not involved in the testing. Past experience acquired to do with demand response participation shows that this type of experiment must be quickly put in place, for limited volumes.
4. The changes listed as part of the “fast track” procedure will need to be incorporated into the balancing market terms and conditions – if the opportunity associated with their widespread application becomes reality. The terms and conditions will therefore still be reviewed on an annual basis.

4. CONCLUSION

The French balancing market, and its accompanying balancing process, are set to undergo major changes. These changes are going to involve a significant amount of work for all stakeholders in order to refine the design of the future balancing market and implement the necessary changes so that the measures in the EBGL can be applied.

To provide a shared overview of the challenges involved, familiarise each party with the main changes and draw up an associated schedule for this work, RTE, working alongside the French NRA, wanted to initiate a dialogue process based on a green paper and further elaborated by a white paper.

1. The green paper sets out to clarify the choices to be made regarding market design, by separating out the different issues and offering qualitative analysis of the different choices. It identifies the broader outlines and defines several scenarios that characterise them.

2. The white paper will be fuelled by feedback from stakeholders on the green paper, by the guidelines of the French NRA, and by economic analysis assessing the issues associated with the various questions in greater detail.

All these documents together aim at establishing a common understanding of the issues with market parties before initiating time-consuming work but work that will need to be completed within very tight deadlines. The green paper also includes a provisional schedule outlining the main milestones involved in the process. This will facilitate preliminary discussions on how the work should be structured, and inform market parties about the various bodies (European or national) involved, as well as the timeframes within which decisions must be taken.

A constructive and collaborative effort involving all stakeholders is the only way to guarantee the successful transition from the existing balancing market to the future one.



Le réseau de l'intelligence électrique

RTE
1, terrasse Bellini TSA 41000
92919 La Défense Cedex
www.rte-france.com