ENTSO-E
Balancing Report
2020

entsoe

About ENTSO-E

ENTSO-E, the European Network of Transmission System Operators for Electricity, represents 42 electricity transmission system operators (TSOs) from 35 countries across Europe. ENTSO-E was registered in European law in 2009 and given legal mandates since then.

The role of Transmission System Operators has considerably evolved with the Third Energy Package. Due to unbundling and the liberalisation of the energy market TSOs have become the meeting place for the various players to interact on the market place.

ENTSO-E members share the objective of setting up the internal energy market and ensuring its optimal functioning, and of supporting the ambitious European energy and climate agenda. One of the important issues on today's agenda is the integration of a high degree of Renewables in Europe's energy system, the development of consecutive flexibility, and a much more customer centric approach than in the past.

ENTSO-E is committed to develop the most suitable responses to the challenge of a changing power system while maintaining security of supply. Innovation, a market based approach, customer focus, stakeholder focus, security of supply, flexibility, and regional cooperation are key to ENTSO-E's agenda.

ENTSO-E is contributing to build the world's largest electricity market, the benefits of which will not only be felt by all those in the energy sector but also by Europe's overall economy, today and into the future.

Transparency is a key principle for ENTSO-E, and requires a constant listening, learning and improvement, in the interest of society.

Contents

Executive Summary

Since 2012, the TSOs have been working on the harmonisation of balancing services by proposing EU-wide sets of technical, operational and market rules to govern the functioning of electricity balancing markets. TSOs have contributed to the establishment of the EU's internal energy market (IEM), building more competitive, flexible and non-discriminatory European balancing markets.

The TSOs, in coordination with market players and regulatory authorities, are progressively implementing the European balancing markets in which access to new players (e. g. RES integration), increased efficiency (harmonisation of processes and rules) and competition – while ensuring the security of supply and guarantee of fairness and transparency – are the key levers required to push European and national balancing markets forward.

TSOs have cooperated on such harmonisation efforts not only by proposing sets of rules but through the implementation of a number of projects. Moreover, TSOs have managed to achieve a high degree of standardisation in the balancing markets. TSOs' ambition of harmonisation also has addressed other fundamental aspects of European balancing market design, such as:

- Defining for each platform the point in time when the submission or update of a balancing energy bid starts (i. e. Balancing energy gate opening time) and until when this is permitted (i. e. Balancing energy gate closure time).
- Determining the features of standard balancing products for energy and capacity.
- Narrowing down the number of activation purposes for the activation of balancing energy bids.
- Specifying the rules for price formation of the activation of balancing energy bids.

Despite the substantial number of legal obligations for the development of regulatory proposals and their implementation, TSOs have not limited themselves to mandated tasks and strive for efficiency and transparency. On a voluntary basis, they have worked on the establishment of early projects, even before they were legally mandated. By way of example, these include:

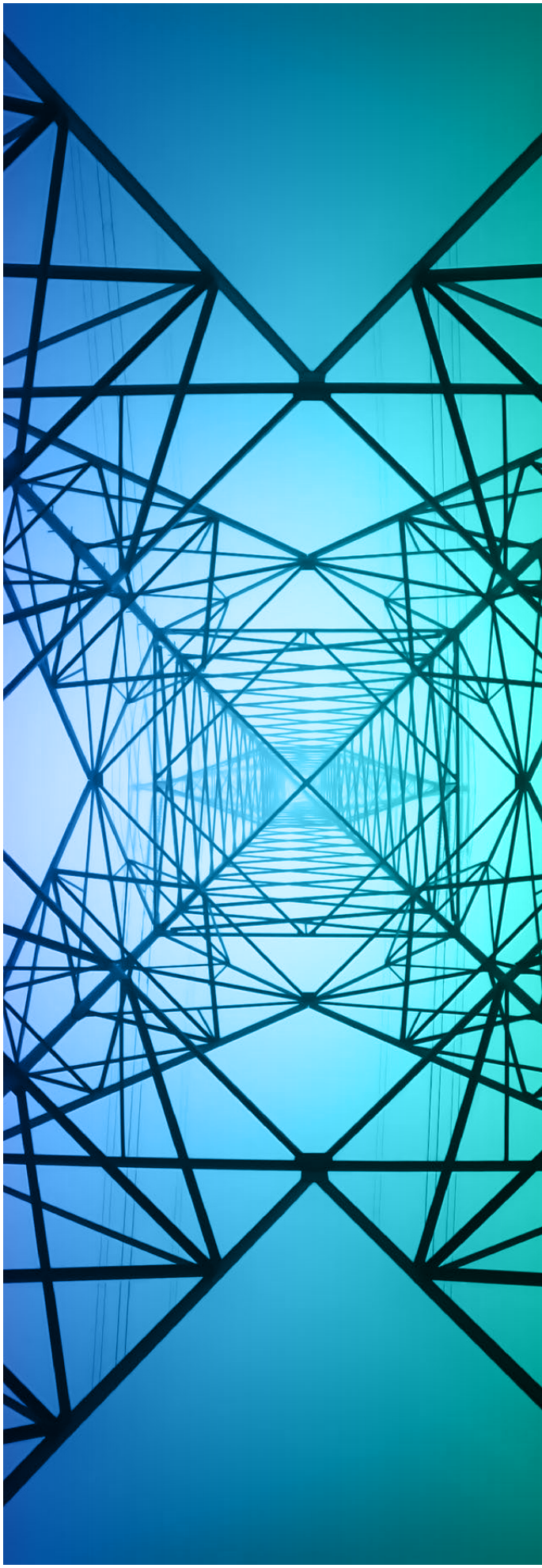
- The establishment of early projects (prior to their being legally mandated) to implement the European balancing energy platforms.
- The establishment of several balancing capacity cooperation agreements, voluntary by nature, in accordance with the EB regulation.
- An investigation to reutilise existing IT solutions in the RR platform for the mFRR platform.
- The organisation of a substantial number of public workshops, European Balancing Stakeholder Group[1] meetings and other interactions with stakeholders, including public consultations – which are not legally mandated, to consider external input and concerns.
- The implementation of a Capacity Management Module (CMM) common to all European balancing energy platforms, increasing operational robustness and transparency.
- The appointing of a single TSO to perform the optimisation and TSO–TSO settlement functions of both the IN platform and the aFRR platform.

1 For more information: **https://www.entsoe.eu/network_codes/esc/#balancing**

- The implementation of a common invoicing (billing) system for all European balancing energy platforms.
- The creation of a dedicated ENTSO-E project team focused on seeking out other cross-platform efficiency opportunities.

There are also a number of achievements to highlight in balancing, between 2018 and 2019, by the TSOs through ENTSO-E:

- Decided to implement a central Capacity Management Module (CMM) common to all European balancing energy platforms, to increase efficiency and transparency.
- Offered one TSO to lead the development of the Capacity Management Module of the European balancing energy platforms.
- Established a single invoicing service common to all European balancing energy platforms to increase efficiency.
- Agreed on the inclusion of the imbalance netting optimisation function algorithm as part of the aFRR algorithm. This decision led to increased efficiency as there is no need to separate the aFRR algorithm in the IT system for the imbalance netting process.
- Accepting responsibility[2] for the implementation of common tasks to all European balancing energy platforms and to adapt its internal organisation to ensure the timely progression of such tasks.
- Established a consistent contractual framework for the mFRR and aFRR platforms.



2 In close cooperation with the MARI project, which is implementing the mFRR platform (i. e. the only all TSO platform).

1 Introduction

For the first time, ENTSO-E is publishing this report in accordance with the obligations derived from the Commission Regulation (EU) 2017/2195 of 23 November 2017 (hereafter **EB regulation**). This report also forms part of the list of reports pursuant to Article 63(2) of the EB regulation (hereafter **EB monitoring plan**).[3]

In addition to these requirements, Article 59(6) of the EB regulation requires for inclusion in this report an executive summary in line with the report that each TSO publishes every two years, pursuant to Article 60(1) of the EB regulation. Thus, the report will cover not only the European aspects of the EB regulation implementation but a summary of the internal developments within each TSO.

To fulfil the requirements above, ENTSO-E has committed to providing a biennial joint report (hereafter **2020 ENTSO-E Balancing report**). Furthermore, this report will provide more details and improve its content along the legal process, and the implementation of the approved legislation.

The reader will review recent developments in European balancing, from general concepts to more detailed aspects. The 2020 ENTSO-E Balancing Report combines three levels of action at pan-European, regional and national levels regarding the design and implementation of balancing markets.

The report is organised into the following four chapters:

- **Chapter 1** introduces the legal basis of this report and stipulates its relevance.
- **Chapter 2** outlines the development of the balancing market, focusing on energy and capacity balancing markets at the pan-European and TSO levels.
- **Chapter 3** describes the performance indicators.
- **Chapter 4** illustrates the national evolution of the balancing markets.
- A **glossary** is included at the end of this report for the reader's convenience.

This report summarises the developments that have occurred since the EB regulation entered into force (i. e. 18 December 2017) until 18 December 2019. Within this period, TSOs have achieved important milestones for the implementation of the guideline on electricity balancing. ENTSO-E and TSOs:

- Succeeded in developing on time all methodological proposals pursuant to the EB regulation requirements.

  - All TSOs submitted to all regulatory authorities in June 2018 a proposal for a methodology on the Imbalance Netting Implementation Framework (hereafter **INIF**), which was followed by two amended proposals in March 2019 and October 2019, pursuant to requests for amendments from all regulatory authorities.

  - All RR TSOs decided on 15 June 2018 to submit a proposal for the Replacement Reserves Implementation Framework (hereafter **RRIF**) to the relevant regulatory authorities, all of whom approved it on 15 January 2019.

  - All TSOs submitted in December 2018 proposals for the Frequency Restoration Reserves with manual activation Implementation Framework (hereafter **mFRRIF**) and Frequency Restoration Reserves with automatic activation Implementation Framework (hereafter **aFRRIF**), which were referred to the Agency for the Cooperation of Energy Regulators (hereafter **ACER**) by all regulatory authorities on 24 July 2019 and resulted in the adoption by ACER of a decision on the aFRRIF methodology on 24 January 2020.

3 ENTSO-E submitted to ACER a first proposal in May 2018 and resubmitted an amended proposal to ACER in September 2019 in response to ACER opinion No. 12/2019.

- The TERRE[4] implementation project launched the RR platform, becoming operational in January 2020.
- The four European balancing energy platforms published the accession roadmaps,[5] which indicate when each TSO plans to accede each platform.
- The lessons learnt from the existing Nordic, Baltic and German-Austrian mFRR balancing energy cooperation agreements, which have established voluntary, will be highly valuable for the implementation of the European mFRR platform.
- IGCC has generated € 128.90 million of social welfare through savings due to netted imbalances during 2018–2019, and a cumulative amount of roughly € 500 million since the start of international cooperation in 2011. The decade-long experience of IGCC in the international cooperation of TSOs and its impressive results demonstrate the effective governance and well-functioning nature of the project.
- The expected net economic benefit of a Nordic aFRR capacity exchange is almost € 53 million per year.

4 Trans-European Replacement Reserves Exchange, see Chapter 3 of this report

5 See Chapter 3 of the 2020 ENTSO-E Market Report.

2 Legal references and requirements

This report ensures the fulfilment of ENTSO-E reporting obligations as outlined in Article 59(2)(a) of the EB regulation. Moreover, the performance indicators agreed upon by all TSOs, and de facto approved by ACER[6], are incorporated in Chapter 4 of this report.

The requirements for ENTSO-E reporting on the detailed European report pursuant to Article 59(2)(a), 59(3), 59(4) and 59(6) of the EB regulation read as follows:

2. The format of the report shall vary as follow:

(a) two years after entry into force of this regulation and subsequently every second year a detailed report shall be published;

3. The report pursuant to paragraph 2(a) shall:

(a) describe and analyse the harmonisation and integration process as well as the progress made in terms of harmonisation and integration of balancing markets through the application of this regulation;

(b) describe the status of implementation projects pursuant to this regulation;

(c) assess the compatibility between the implementation projects and investigate any possible developments that pose a risk for future integration;

(d) analyse the development of the exchanges of balancing capacity and the sharing of reserves and describe possible barriers, prerequisites and actions to further enhance the exchange of balancing capacity and the sharing of reserves;

(e) describe the existing and analyse the potential exchanges of balancing services;

(f) analyse the suitability of standard products with respect to the latest development and evolution of different balancing resources and propose possible improvements of standard products;

(g) assess the need for further harmonisation of standard products and possible effects of non-harmonisation on integration of balancing markets;

(h) assess the existence and justifications for specific products used by TSOs and their effect on the integration of balancing markets;

(i) assess the progress of harmonisation of the main features of imbalance settlement as well as the consequences and possible distortions due to non-harmonisation;

(j) report the results of the cost-benefit analyses pursuant to Article 61.

4. ENTSO-E shall set up performance indicators for balancing markets that will be used in the reports. These performance indicators shall reflect:

(a) the availability of balancing energy bids, including the bids from balancing capacity;

(b) the monetary gains and savings due to imbalance netting, exchange of balancing services and sharing of reserves;

(c) the benefits from the use of standard products;

(d) the total cost of balancing;

(e) the economic efficiency and reliability of the balancing markets;

(f) the possible inefficiencies and distortions on balancing markets;

(g) the efficiency losses due to specific products;

(h) the volume and price of balancing energy used for balancing purposes, both available and activated, from standard products and from specific products;

(i) the imbalance prices and the system imbalances;

(j) the evolution of balancing service prices of the previous years;

(k) (k) the comparison of expected and realised costs and benefits from all allocations of cross-zonal capacity for balancing purposes.

[…]

6. The report pursuant to paragraph 2(a) shall also contain an executive summary in English of each TSO report on balancing pursuant to Article 60.

6 On 9 April 2019, ENTSO-E submitted to ACER the first proposal on performance indicators.
On 1 October 2019, a second version of this proposal was submitted based on the comments received from ACER.

3 European balancing markets

3.1 Load-frequency control and balancing

The security of an energy supply requires the continuous adjustment of power generation and consumption and vice versa. As forecasting errors (e. g. load and renewable generation) and technical disturbances (e. g. power plant outages) cannot be avoided, the TSOs engage in load-frequency control (hereafter **LFC**) processes in order to maintain the system frequency within permissible limits. Figure 1 illustrates the load-frequency control processes in accordance with Commission Regulation (EU) 2017/1485 of 2 August 2017, establishing a guideline on electricity transmission system operation (hereafter SO regulation).

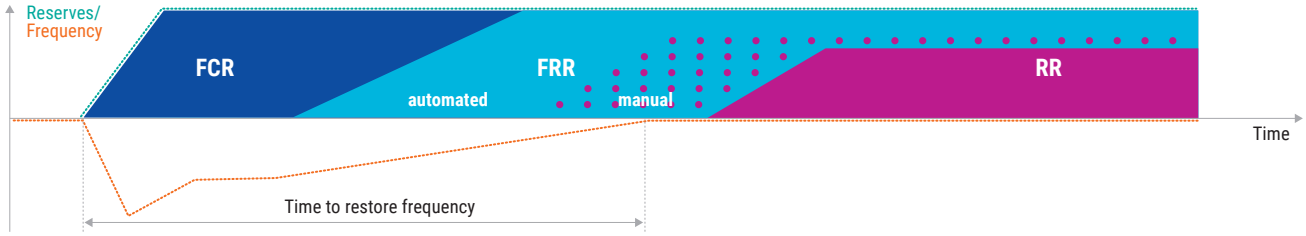


Figure 1 – Load-frequency Control and Balancing Markets

During the first seconds following the occurrence of an imbalance (e. g. a power plant outage), the frequency containment reserves (hereafter **FCR**) are activated in the entire synchronous area with respect to the measured frequency deviation in order to stabilize the frequency at a value below 50 Hertz (in case of generation shortage). The FCR activation is performed in a decentralized way by control devices which are implemented in the respective generating or demand units and activate the FCR pro-rata.

The task of restoring the frequency to 50 Hertz is performed by automatic frequency restoration reserves (hereafter **aFRR**) and manual frequency restoration reserves (hereafter **mFRR**). Because power imbalances lead to additional load flows, which can exceed the available transmission capacity, the imbalances are compensated regionally by TSOs within load frequency control areas[7] (hereafter **LFC areas**). As the basis for these processes, the TSO continuously calculates the deviation between the measured power exchange of the LFC area (corrected by its FCR activation) and its scheduled exchange, which corresponds to the energy import or export obligation of the given area. The resulting value, the so-called frequency restoration control error (hereafter **FRCE**), serves as an input to a frequency restoration controller, which operates with a control cycle of a few seconds and requests aFRR activation until the FRCE reaches zero or all available aFRR are fully activated. Additionally, some TSOs use replacement reserves (**RR**) in order to support or release FRR activation.

This general representation of the load frequency control structure for the example of Continental Europe[8] can be applied to other European synchronous areas. The main differences are the number of the LFC areas (e. g. currently, there is only[9] one LFC area in Ireland, one in Great Britain and in the Nordic area[10]), the existence of aFRR (Great Britain and Ireland currently rely only on mFRR and RR) together with technical requirements for the reserves. The harmonisation of the technical requirements for aFRR, mFRR and RR is one of the core elements of the EB regulation.

In the terminology of the EB regulation, 'balancing capacity' stands for the volumes of the reserves (FCR, aFRR, mFRR and RR) for which market participants commit to submit corresponding balancing energy bids, while the term 'balancing energy' applies to the energy resulting from the activation of aFRR, mFRR and RR.

7 Part of a synchronous area or an entire synchronous area, physically demarcated by points of measurement at interconnections to other LFC areas, operated by one or more TSOs fulfilling the obligations of load-frequency control.

8 Countries within the Continental Europe synchronous area are Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark West (DK1), France, Germany, Greece, Hungary, Italy, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain and Switzerland.

9 The Baltic TSOs are in the process of defining their LFC blocks. For more details see **here**.

10 Countries within the Nordic synchronous area are Denmark (DK2), Finland, Norway and Sweden.

3.2 Implementation of the EB regulation

The EB regulation lays out detailed rules for the integration of balancing energy markets in Europe, with the objectives of fostering effective competition, non-discrimination, transparency and integration in electricity balancing markets and, by doing so, enhancing the efficiency of the European balancing system as well as the security of supply. It applies to all transmission systems and interconnections in the EU except those islands transmission systems that are not yet interconnected (i. e. Cyprus and Malta).

Nonetheless, the necessary regulatory framework with respect to EU electricity balancing was not completed with the approval of the EB regulation on 18 December 2017. Such EB regulation established a guideline on electricity balancing, including its principles and objectives, and set a number of terms and conditions or methodologies with which TSOs shall develop proposals. It is through the approval of such proposals by ACER or the relevant regulatory authorities that the regulatory framework on electricity balancing is complete.

After a consultation with stakeholders and the organisation of public workshops, ENTSO-E and the TSOs have submitted to regulatory authorities several proposals describing, among other aspects, the design of the balancing energy platforms and their respective standard balancing energy products, the harmonisation of imbalance settlement, the characteristics of standard balancing capacity products and the allocation processes of cross-zonal capacity for the exchange of balancing capacity. By the time of the publication of this report, ENTSO-E and TSOs have succeeded in the timely submission of every deliverable mandated in the EB regulation.[11]

3.2.1 Balancing energy market

Based on the EB regulation, TSOs are required to implement four platforms. These are:

- European platform for the exchange of balancing energy from **R**eplacement **R**eserves (**RR**)
- European platform for the exchange of balancing energy from **F**requency **R**estoration **R**eserves with **m**anual activation (**mFRR**)
- European platform for the exchange of balancing energy from **F**requency **R**estoration **R**eserves with **a**utomatic activation (**aFRR**)
- European platform for the exchange of balancing energy from **I**mbalance **N**etting (**IN**)[12]

To achieve the implementation of these four platforms required by the EB regulation, European TSOs have established the following implementation projects:

- **T**rans-**E**uropean **R**eplacement **R**eserves **E**xchange (**TERRE**) is the lead project on the design and implementation of the RR platform.
- **M**anually **A**ctivated **R**eserves **I**nitiative (**MARI**) is the lead project on the design and implementation of the of the mFRR platform.
- **P**latform for the **I**nternational **C**oordination of **A**utomated Frequency Restoration and **S**table **S**ystem **O**peration (**PICASSO**) is the lead project on design and implementation of the aFRR platform.
- **I**nternational **G**rid **C**ontrol **C**ooperation (**IGCC**) is the lead project on the design and implementation of the IN platform.

In addition to these, the Frequency Containment Reserves exchange platform (FCR cooperation) is also being voluntarily implemented across Europe for certain numbers of countries and TSOs.

11 For more information, see Chapter 2 of 2020 ENTSO-E Market Report.

12 Reducing the amount of simultaneous and counteracting aFRR activation of different participating and adjacent LFC areas via imbalance netting power exchange.

3.2.1.1 RR platform – Trans-European Replacement Reserves Exchange (TERRE)

The primary objective of the RR platform is the exchange among TSOs of the activation of reserves from generators, storage and demand response. These are used by TSOs to restore the required level of FCR and FRR due to their earlier usage if additional system imbalances appear following activation. Contrary to FCR and FRR, not all TSOs in the EU use RR products.

Eight members are in the process of implementing this platform. These are ČEPS a.s., National Grid ESO, Polskie Sieci Elektroenergetyczne S.A., Red Eléctrica de España S.A.U., REN – Rede Eléctrica Nacional S.A., Réseau de Transport d'Electricité, Swissgrid AG and Terna-Rete Elettrica Nazionale SpA. For more information see Chapter 3 of the ENTSO-E Market Report 2020.

In January 2020, the first TSO (ČEPS a.s.) and in March 2020 Red Eléctrica de España S.A.U joined the RR platform. The remaining TSOs will join within Q3 and Q4 2020, except Polskie Sieci Elektroenergetyczne S.A., which will join in January 2022.

Functions [13]

- **Activation Optimization Function (AOF)** aims at optimising the activation of the RR balancing energy bids to meet the demand of the TSOs participating in the RR platform.

- **TSO–TSO settlement function** calculates the settlement amount that each RR TSO connected to the RR platform has to bear for the exchange of energy from the RR process.

Standard products[14] and bids

The product exchanged through the RR platform is the standard product for balancing energy defined in the Replacement Reserves Implementation Framework, pursuant to Article 19(1) of the EB regulation[15] that was approved on 15 January 2019 by the following regulatory authorities: Commission de Régulation de l'Energie (CRE) (FR), Entidade Reguladora dos Serviços Energéticos/Energy Services regulatory authority (ERSE) (PT), Autorità di Regolazione per Energia Reti e Ambiente (ARERA) (IT), Comisión Nacional de los Mercados y la Competencia/National Commission for Energy and Prices (CNMC) (ES), Urząd Regulacji Energetyki/The Energy Regulatory Office of Poland (URE/ERO) (PL), Office for Gas and Electricity Markets (OFGEM) (GB) and Energetický Regulační Úřad (ERÚ) - Energy Regulatory Office (ERO) (CZ).

13 If deemed efficient when implementing the methodologies for cross-zonal capacity calculation within the balancing timeframe in accordance with Article 37(3) of the EB regulation, a cross-zonal capacity calculation function may be added.

14 Following the approval of the RRIF on 15 January 2019, no TSO performing the reserve replacement process has, so far, developed a proposal for defining and using RR-specific products.

15 See: https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/nc-tasks/EBGL/EBGL_A19.1_181129_RR %20Implementation_framework_approved.pdf

An illustration of the RR standard product for balancing energy is shown in Figure 2.

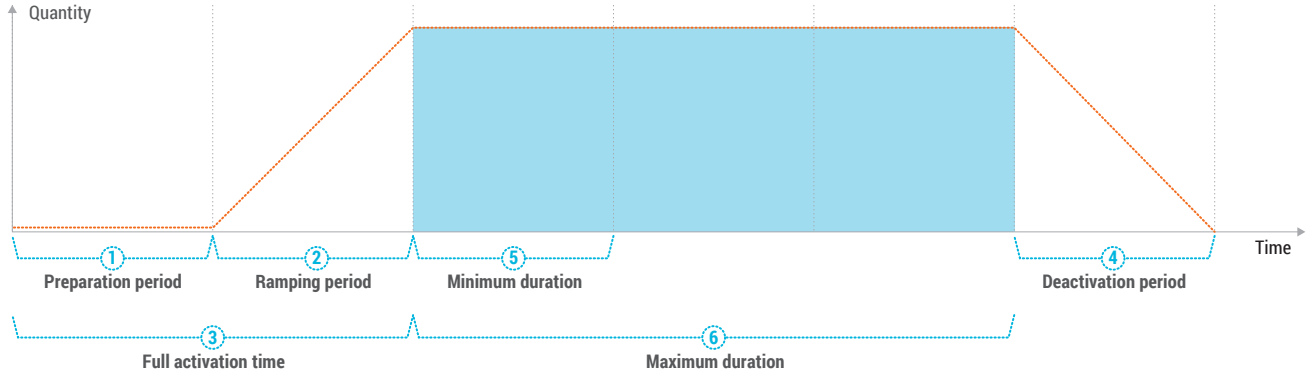


Figure 2 – RR platform: Standard RR balancing energy product characteristics

1. **Preparation period:** The period between the activation request by the connecting TSO, in the case of the TSO–TSO model, or by the contracting TSO, in the case of a TSO–BSP model, and the start of the ramping period. This is depicted in Figure 2 as 1. **It goes from 0 to 30 minutes**

2. **Ramping period:** A period of time defined by a fixed starting point and a length of time during which the input or output of active power will be increased or decreased. This is depicted in Figure 2 as 2 and 4. **It goes from 0 to 30 minutes**

3. **Full Activation Time (FAT):** The period of time between the activation request by the connecting TSO, in the TSO–TSO model, or by the contracting TSO, in the TSO–BSP model, and the corresponding full delivery of requested MW power of the concerned balancing energy bid. This is depicted in Figure 2 as 3. **It is equal to 30 minutes**

4. **Bid granularity:** The smallest volume increment in which the bids can be submitted. **It is equal to 1 MW**

5. **Duration of the delivery period:** The period of time during which the BSP delivers the full requested change of power in-feed to or withdrawal from the connected TSO system. **The duration of the delivery period can be 15, 30 or 60 minutes (5 in Figure 2)**

6. **Validity period:** The period of time during which a balancing energy bid submitted by a balancing service provider can be activated. The validity period is defined by a start time and an end time. **Defined by BSP with respect to the min and max delivery period**

7. **Price and price resolution: The price is given in €/MWh and a resolution of 0.01 €/MWh**

8. **Activation mode:** Scheduled with manual activation

The RR platform accepts inelastic and elastic demand and allows a large variety of bid formats:

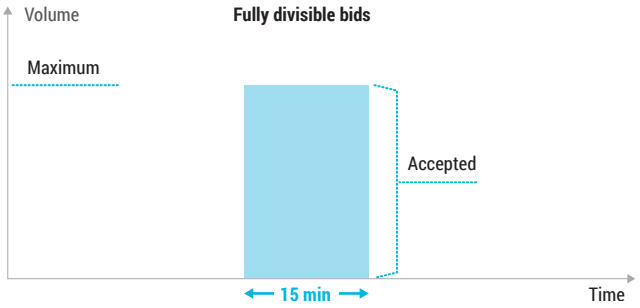


Figure 3 – Fully divisible bids

Fully divisible bids are the balancing energy bids that consist of a single quantity and a single price. The delivery period can be 15, 30, 45 or 60 minutes. It has no minimum quantity (i. e. 0). If the bid is accepted, the accepted quantity will be less than or equal to the offered quantity and greater than zero. If the bid is rejected, the accepted volume will be zero.

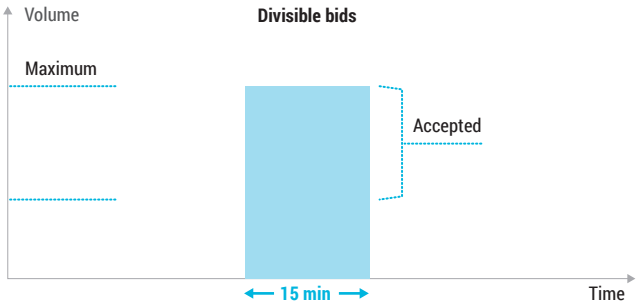


Figure 4 – Divisible bids

Divisible bids are balancing energy bids that consist of two quantities (minimum quantity and maximum quantity) and a single price. Its delivery period is expressed in 15-minute time steps (15, 30, 45 or 60 minutes). The algorithm can accept one part of it in terms of quantity (i. e. greater than zero); however, the same quantity must be accepted for the entire submitted delivery period. The BSPs must define a minimum quantity. If the offer is accepted, then a volume greater or equal to this minimum quantity will always be accepted. If the bid is rejected, the accepted volume will be zero.

Figure 5 – Indivisible bids

Indivisible bids are balancing energy bids that consist of a single quantity and a single price. The delivery period can be 15-minute time steps (15, 30, 45 or 60 minutes). The difference between a divisible and an indivisible offer is that the algorithm can accept only the whole quantity of the indivisible offer.

Exclusive bids are balancing energy bids that satisfy the following condition: only one (or none) of the exclusive offers can be activated; hence, the activation of a sub-offer belonging to an exclusive offer excludes the activation of the other sub-offers belonging to the same exclusive offer. Exclusive offers can either be divisible or indivisible.

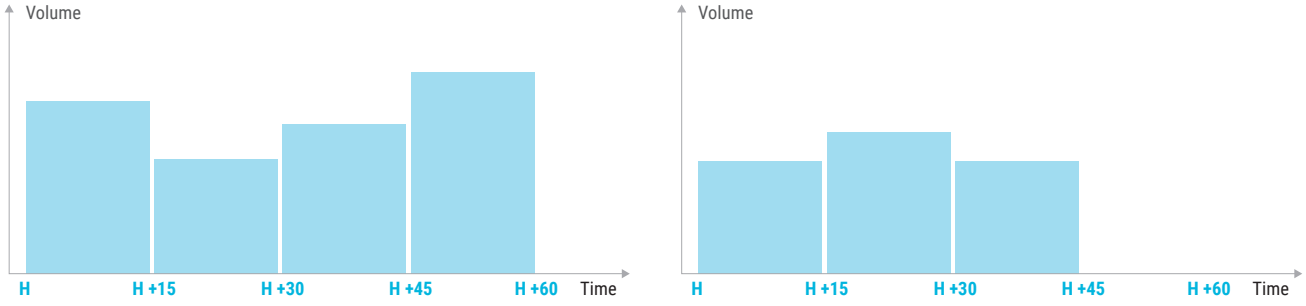


Figure 6 – Exclusive bids in volume

For this category, three different types are distinguished concerning volume, time or a combination of these two.

In volume

- Either fully divisible, divisible or indivisible bids
- These bids can only correspond to a single time step
- Maximum one exclusive bid can be accepted

In time

- Either fully divisible, divisible or indivisible bids
- Bids correspond to different time steps
- Maximum one exclusive bid can be accepted

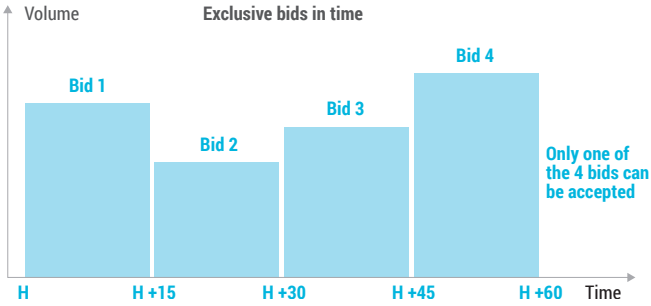


Figure 7 – Exclusive bids in time

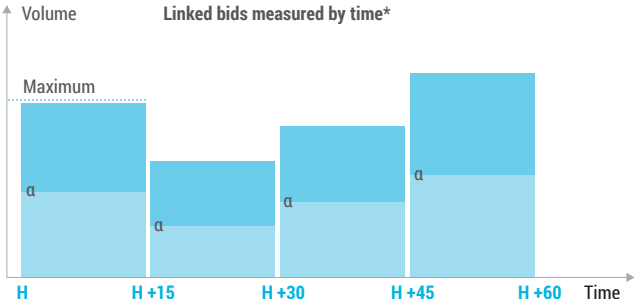


Figure 8 – Linked bids measured by time*

* These can be either fully divisible, divisible or indivisible bids. They can offer different quantities or prices per time step. The explicit links can only link bids (including curve) corresponding to different time steps. The same percentage ratio α will be accepted: α = Accepted volume of each bid/Maximum volume of each bid.

Multi-part bids are balancing energy bids that have variable prices for variable volumes and a single delivery period. The price can either decrease (in case of a downward bid) or increase (in case of an upward bid) as the volume increases.

- Prices only increase or decrease
- Either fully divisible, divisible or indivisible bids
- A multi-part bid can be defined with a start and end point and can last from 15 to 60 minutes. The same volume will be accepted for the whole defined delivery period.

Linking-offer bids are balancing energy bids that satisfy the following condition: a sub-offer of a linking offer is (not) activated if and only if another sub-offer of the same linking offer is (not) activated. For linking offers in volume, the same ratio of two linking offers will always be activated.

Bidding period

The gate opening time (GOT) for the submission of an RR standard product balancing energy bid is 70 minutes before the period concerned by its activation to satisfy the TSO balancing energy need.

The gate closure time (GCT) for the submission of an RR standard product balancing energy bid to the connecting TSO by BSPs is 55 minutes before the period concerned by the activation of the RR standard product to satisfy the TSO balancing energy need. However, during an interim period (until the end of 2020), GCT has been fixed at 60 minutes prior to the delivery period.

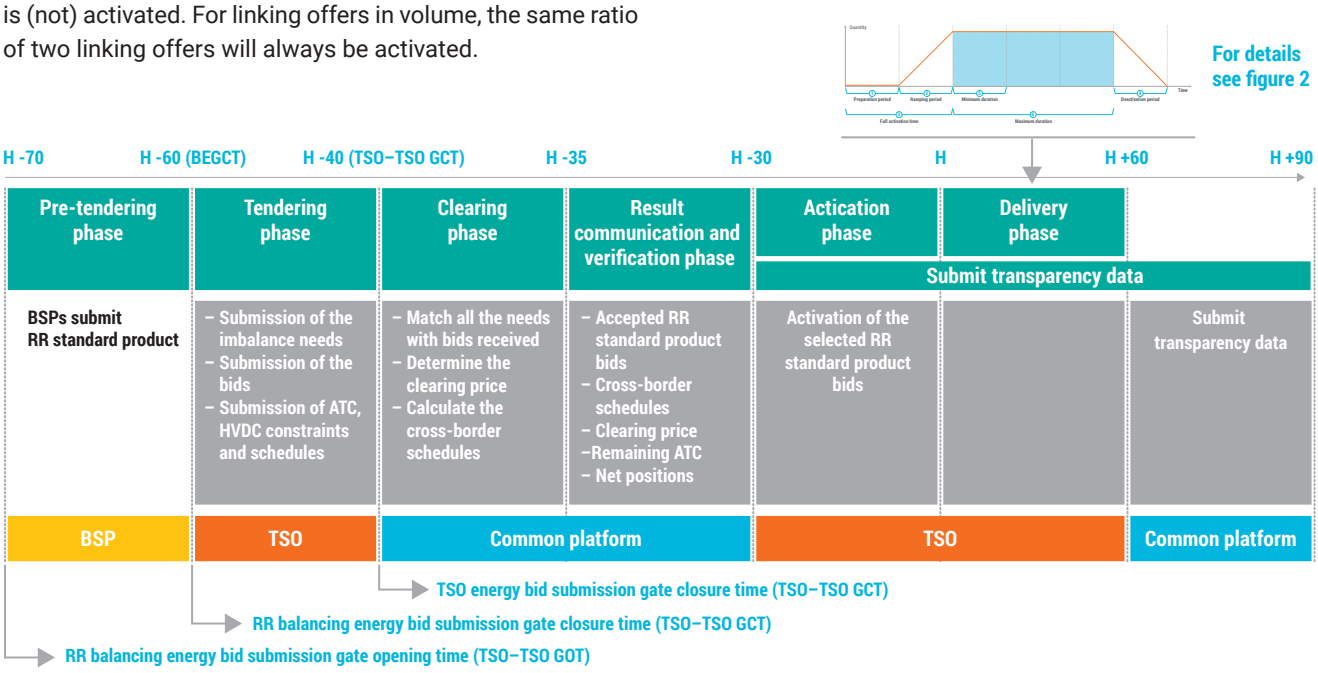


Figure 9 – RR platform: Gate opening and closure times and intermediate phases until the publication of the results

3.2.1.2 mFRR platform – Manually Activated Reserves Initiative (MARI)

The primary objective of this platform is the exchange, among TSOs, of the manual activation of the power reserves available to restore system frequency to the nominal frequency. In terms of scope, this should be implemented by all TSOs.

On 24 July 2019, all regulatory authorities referred the TSOs' implementation framework for mFRR platform (mFRRIF) proposal to ACER. On 24 January 2020, ACER adopted a decision[16] and set the deadline for its implementation at 30 months following the decision (i. e. July 2022). For more information about the mFRR Implementation Framework, see Chapter 3 of the ENTSO-E Market Report 2020.

At the time of writing, the implementation of the mFRR platform considers the specifications included in the document shared by ACER on 24 January 2020, in accordance with ACER decision No. 03 2020.

Functions[17]

- **Activation Optimisation Function (AOF)** aims to provide an optimised activation of the mFRR balancing energy bids to meet of the TSOs' demand aspect of the mFRR platform.
- **TSO–TSO settlement function** will calculate the TSO–TSO amount settlement that each TSO connected to the mFRR platform must bear for the exchange of energy resulting from the mFRR process.

Standard products[18] and bids

The mFRR platform will receive bids[19] that match those of the standard mFRR balancing energy product bids. These energy product bids shall be compliant with the mFRR MTU[20] and will be manually activated via scheduled or direct activation and the following characteristics.

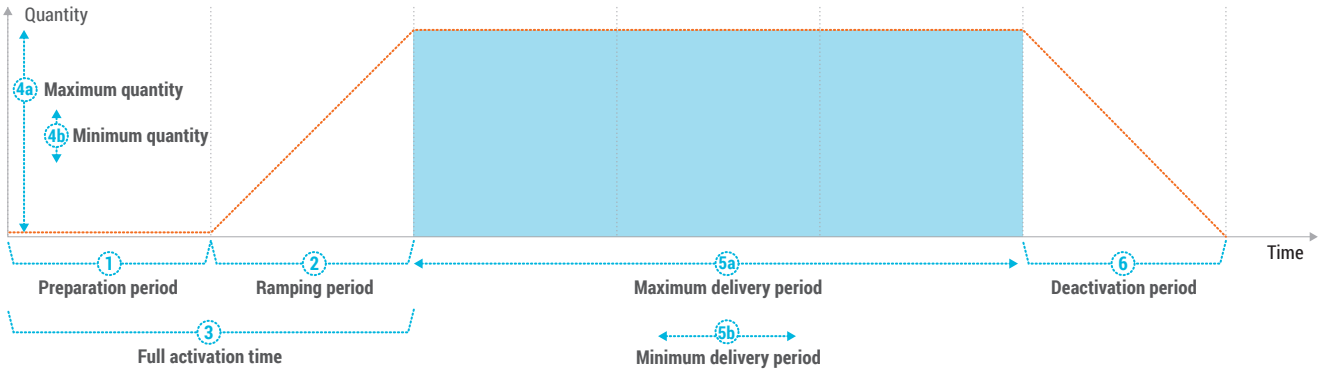


Figure 10 – mFRR platform: Standard mFRR balancing energy product bid characteristics defined in the terms and conditions for BSPs

The mFRR platform defines the following characteristics for the standard mFRR balancing energy product, which shall remain under Terms and Conditions for BSPs:

1. **Preparation period:** The period between the activation request by the connecting TSO, in the TSO–TSO model, or by the contracting TSO, in the TSO–BSP model, and the start of the ramping period. This is depicted in Figure 10 as 1.

2. **Ramping period:** A period of time defined by a fixed starting point and a length of time during which the input or output of active power will be increased or decreased. This is depicted in Figure 10 as 2 and 6.

3. **Full Activation Time (FAT):** The period between the activation request by the connecting TSO, in the TSO–TSO model, or by the contracting TSO, in the TSO–BSP model, and the corresponding full delivery of requested MW power of the concerned balancing energy bid. This is depicted in Figure 10 as 3. **It shall be 12.5 minutes**

4. **Quantity:** The change of power output (in MW) offered in a bid by the BSP and which will be reached by the end of the FAT (4a and 4b in Figure 10)

5. **Bid granularity:** The smallest volume increment for the bids. **It shall be 1 MW**

16 ACER decision No. 03/2020

17 If deemed efficient when implementing the methodologies for cross-zonal capacity calculation within the balancing timeframe in accordance with Article 37(3) of the EB regulation, a cross-zonal capacity calculation function may be added.

18 Following the approval of the mRRIF on 24 January 2020, no TSO has developed, thus far, a proposal for defining and using mFRR-specific products.

19 Converted bids for TSOs applying the central dispatching model.

20 Period of 15 minutes. It starts at 00:00 market time and shall be consecutive and not overlapping.

6. **Duration of the delivery period:** The period of time during which the BSP delivers the full requested change of power in-feed to or withdrawal from the connected TSO system. **The minimum duration of the delivery period shall be 5 minutes (5a and 5b in Figure 10)**

7. **Validity period:** The period of time during which a balancing energy bid submitted by a balancing service provider can be activated. The validity period is defined by a start time and an end time. **Energy product bids shall be compliant with the mFRR MTU (period of 15 minutes) that will be manually activated only. These will begin at 00:00 market time and shall be consecutive and not overlapping.**

8. **Price and price resolution: The price shall be given in €/MWh, and the resolution shall be of 0.01 €/MWh**

9. **Activation mode**

- **Direct activation (DA)** is used for the TSOs to resolve major imbalances within the time to restore frequency[21] to allow for the activation of mFRR bids at any point in time when a large imbalance occurs.
- **Scheduled activation (SA)** is used to replace previously activated aFRR bids or alternatively to handle forecasted imbalances proactively, depending on the TSO's balancing strategy. For the TSOs, this allows the gathering of several demands and the realisation of benefits from the netting demands in opposite directions. For the BSPs, it provides certainty regarding the timing of any activation which would be useful when the capacity is subsequently offered in different markets.

The mFRR platform also allows for the following types of standard mFRR balancing energy product bids:

Direct activatable bid[22]: Activated at any point of time following the point of scheduled activation of the quarter-hour in which the bid is submitted and until the point of scheduled activation of the subsequent quarter-hour.

Scheduled activatable bid: Only activated at one specific point in time, i. e. the point of scheduled activation (e. g. 7.5 minutes before the beginning of the quarter-hour in which the BSPs place the respective standard mFRR balancing energy product bid), with respect to the period of time for which the balancing energy bid is submitted). The BSP receives an activation request 12.5 minutes before expected full activation.

Divisible bid: can be activated partially in terms of power activation according to the bid activation granularity that shall be of 1 MW.

Indivisible bid: cannot be activated partially in terms of power activation according to the bid activation granularity. The volume of an indivisible bid is always activated simultaneously.

Technical linking between bids: The link in consecutive quarter-hours or in the same quarter-hour needed to avoid the underlying asset from performing unfeasible activations.

Economic link bid: Links between bids of a BSP for the purpose of economic optimisation, allowing BSPs to offer more flexibility, to reflect their underlying cost structure in their offered bids and to maximize the opportunity of being activated

An economic link bid can be:

- **Parent-child linking:** When a bid (the child) can only be activated if another specific bid (the parent) is activated as well, not vice-versa
- **Exclusive group order:** When one bid can be accepted from the list of bids as part of the exclusive group order

Bidding period:

BSPs interested in providing a standard mFRR balancing energy product to a mFRR-participating TSO have to submit their offers from D -1 12:00 (gate opening time) to 25 minutes before the beginning of the mFRR MTU[23] of the respective standard mFRR balancing energy product bid (gate closure time).

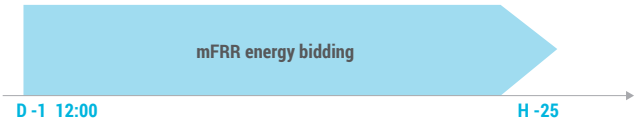


Figure 11 – mFRR energy gate opening and closure times

Before the mFRR platform goes live, certain operational regions have taken the initiative to develop an early implementation with neighbouring countries. In this context, the three voluntary initiatives from the Nordic region, Baltic countries and Germany–Austria are following highlighted.

21 As defined in Article 2(13) of the SO regulation: 'the maximum expected time after the occurrence of an instantaneous power imbalance smaller than or equal to the reference incident in which the system frequency returns to the frequency restoration range for synchronous areas with only one LFC area and in the case of synchronous areas with more than one LFC area, the maximum expected time after the occurrence of an instantaneous power imbalance of an LFC area within which the imbalance is compensated'.

22 Every direct activatable bid is also a scheduled activatable bid.

23 A period of 15 minutes in length. The first mFRR MTU starts at 00:00 market time. The mFRR MTUs shall be consecutive and not overlapping.

Regional implementation: Nordic Balancing Model (NBM)

In January 2019, the Nordic TSOs (Affärsverket Svenska kraftnät, Statnett SF, Fingrid Oyj and Energinet Elsystemansvar A/S) began to implement a voluntary Nordic mFRR energy activation market.

The Nordic TSOs started implementing the Nordic mFRR energy activation market early for two reasons: (1) to modernise the Nordic mFRR market and power system and (2) to comply with the European mFRR market. Also, when participating in the European mFRR market, all TSOs are required to have a backup solution, and the Nordic TSOs are paving the way in this direction by developing a common AOF. This way, when the mFRR platform and the Nordic mFRR energy activation market are operational, the BSPs within the Nordic countries will be connected to their local TSO, and their bids will be activated either by the Nordic AOF or the European platform.

The implementation of the Nordic mFRR energy activation market is planned in three phases. In the preparation phase, internal IT building blocks will be delivered, more analysis and more detailed planning will be performed.

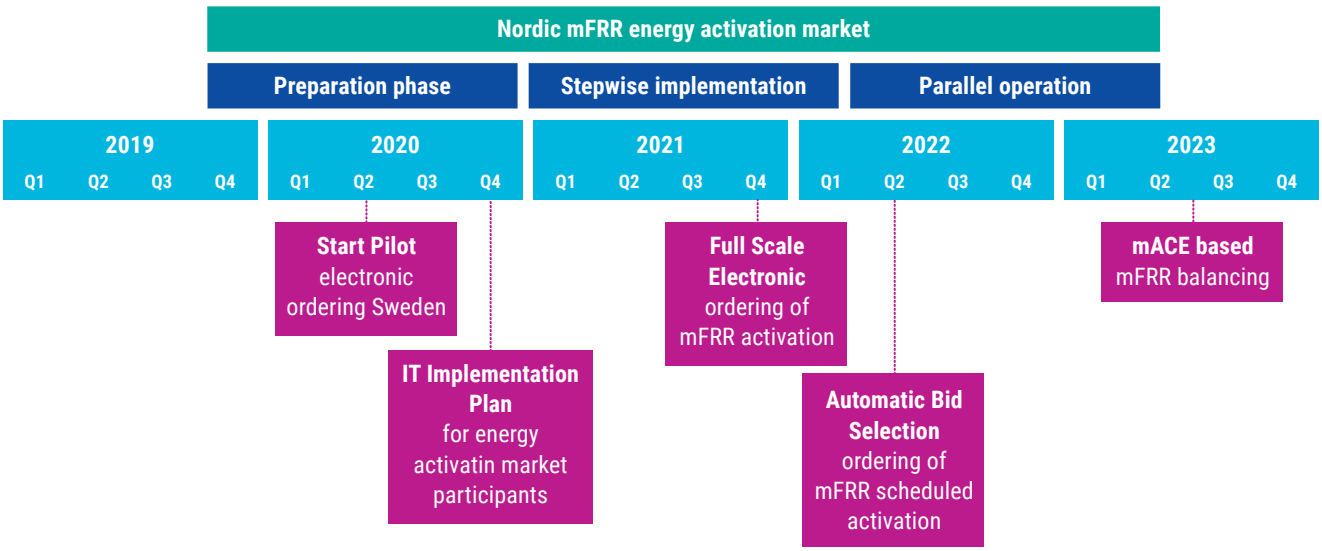


Figure 12 – NBM Roadmap for mFRR

Regional implementation: Common Baltic balancing market[24]

In 2015, the Baltic transmission system operators Augstsprieguma tīkls, Elering AS and Litgrid AB agreed to organize a common balancing market and developed balancing market rules and imbalance settlement rules, which include imbalance pricing. The Common Baltic balancing market started operating on 1 January 2018. More information can be found **here**.

24 Link to **Baltic common balancing market dashboard**

Regional implementation: Gamma[25], common merit order list

The German TSOs 50Hertz Transmission GmbH, Amprion GmbH, TenneT TSO GmbH and Transnet BW GmbH, and the Austrian TSO Austrian Power Grid AG have been developing voluntary cooperation to optimise the activations of mFRR energy bids between the two countries. On 4 December 2019, the project went live.

This project seeks to operate in both countries so long as there are no operational network restrictions across the shared border. To prevent this, the proposed solution is based on a joined merit order list, also called the German-Austrian mFRR Merit Order Activation or Common Merit Order List, abbreviated as CMOL. This project is known under the name GAMMA (German-Austrian Manual Merit Order Activation)[26].

Both the Austrian and German TSOs submit their procured mFRR energy bids to a common optimization system or CMOLS (Common Merit Order List Server), which sorts them according to ascending energy prices. The activation can be triggered by submitting a demand to the CMOLs, which selects the most economical mFRR bids. mFRR exchanges are possible up to a maximum of 280 MW, whilst taking into consideration the operational limitations of the German-Austrian border. The cooperation is based on a TSO–TSO model, meaning that the bids selected by CMOLs are considered firm and will be settled mutually irrespective of the actual physical activation.

As a result, mFRR can be used more economically in both countries, provided there are no operational network restrictions on the shared border to prevent it. The mFRR product and the mFRR bidding rules in Austria and Germany are already harmonised for the most part. The full activation time (FAT) however remains at 12.5 minutes in Austria and 15 minutes in Germany for the time being.

The cooperating TSOs are members of the MARI implementation project, where they contribute the valuable experience, they have gained through the GAMMA cooperation.

25 **https://www.apg.at/en/markt/2019/08/01/GAMMA** and **https://www.apg.at/en/markt/netzregelung/tertiaerregelung/kooperation**

26 See the following references: **50Hertz**, **Transnet BW**, **Amprion** and **APG**

3.2.1.3 aFRR platform – Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation (PICASSO)

The primary objective of this platform is the exchange, among TSOs, of the automatic activation of the power reserves available to restore system frequency to the nominal frequency. In terms of scope, this should be done by TSOs performing the automatic Frequency Restoration Process (hereafter **aFRP**). This means all TSOs of the Continental Europe and Nordic synchronous areas shall implement it jointly.

On 24 July 2019, all regulatory authorities referred the TSOs' implementation framework for aFRR (aFRRIF) proposal to ACER. On 24 January 2020, ACER adopted a decision[27] and set a deadline for its implementation: 30 months following the decision (i. e. July 2022). For more information about the aFRR Implementation Framework, see Chapter 3 of the 2020 ENTSO-E Market Report.

At the time of writing, the implementation of the aFRR platform considers the specifications included in the document shared by ACER on 24 January 2020, in accordance with **ACER decision No. 02 2020**.

Functions[28]

- **Activation Optimisation Function (AOF)** aims at optimising the activation of standard aFRR balancing energy bids and the demand submitted by the TSOs participating in the aFRR platform. The target is to choose most economical and efficient bids under consideration of the available cross-border capacities.

- **TSO–TSO Settlement Function** aims at calculating the settlement amount that each TSO connected to the aFRR platform must bear for the exchange of energy resulting from the aFRP.

Bidding period

BSPs interested in providing a standard aFRR balancing energy product bid to their aFRR-participating TSO have to submit their offers from D-1 12:00 (gate opening time) to 25 minutes before the beginning of the aFRR MTU[29] of the respective standard aFRR balancing energy product bid (gate closure time).

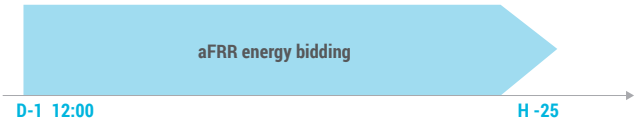


Figure 13 – aFRR energy gate opening and closure times

27 **ACER decision No. 02/2020**

28 If deemed efficient when implementing the methodologies for cross-zonal capacity calculation within the balancing timeframe in accordance with Article 37(3) of the EB regulation, a cross-zonal capacity calculation function may be added.

29 The time period of the AOF optimisation cycle. The first aFRR MTU starts at 00:00 market time. The aFRR MTUs shall be consecutive and not overlapping.

Standard products[30] and bids:

The standard aFRR balancing energy product has the following characteristics:

1. **Full activation time (FAT):** The maximum allowed duration for the full activation or deactivation of a standard aFRR energy bid after the activation request.[31] The compliance of each BSP with the FAT requirement is checked during the prequalification process and is later translated into local monitoring rules. In case of the activation[32] or deactivation of a bid, the BSP has to deliver the requested volume within the FAT to be compliant. **It shall be 5 minutes starting from 18 December 2024**[33]

2. The **deactivation period** shall not be longer than the FAT

3. The **minimum quantity** of the energy bid volume offered. **It shall be 1 MW**

4. **Bid granularity:** The lowest possible increment for offers above the minimum bid size. **It shall be 1 MW**

5. The **maximum quantity** shall be 9,999 MW, mostly an IT limitation

6. **Validity period:** The amount of time during which a bid is valid and firm. This means that activation requests from the TSO to the BSP can only happen within the validity period. A shorter validity period allows a BSP to adapt the price and volume of their bids closer to the boundary conditions given by the market and the fluctuating generation by renewable energy sources. The first validity period of each day shall begin right at 00:00 market time. The validity periods shall be consecutive and not overlapping 15-minute intervals.

7. The **mode of activation** of the standard aFRR balancing energy product bid shall be automatic, due to the nature of the aFRR process. LFCs automatically send the setpoint for the activated bids. During the validity period of their offered bids, the setpoint signals sent to the BSP can constantly change their values, depending on the aFRR demand.

8. **Price and price resolution. The price shall be given in €/MWh and a resolution of 0.01 €/MWh**

30 Following the approval of the aFRR on 24 January 2020, no TSO has developed, so far, a proposal for defining and using aFRR-specific products.

31 According to the requirements set out in Article 159 of the SO regulation.

32 The activation request can be lower than the minimum quantity and minimum granularity.

33 Each TSO shall define the full activation time of the standard aFRR balancing energy product for the time period until 17 December 2024 in their terms and conditions for BSPs in accordance with Article 18 of the EB regulation, respecting the FRR rules pursuant to Article 157(3) of the SO regulation.

3.2.1.4 IN platform – International Grid Control Cooperation (IGCC)

The main goal of this platform is to reduce the overall volume of activated balancing reserves in Europe and the national balancing markets, avoiding the simultaneous activation of the frequency restoration reserve (FRR) in opposite directions, taking into account the respective FRCEs as well as the activated FRR and by correcting the input of the involved FRPs accordingly. In other words, to reduce the inefficient counter-activation of balancing reserves.

As requested by the EB regulation, six months after this regulation entered into force all TSOs performing the imbalance netting process[34] submitted a proposal for an implementation framework for the IN platform (INIF) to the relevant regulatory authorities. For more information about the Imbalance Netting implementation Framework, see Chapter 3 of the 2020 ENTSO-E Market Report.

Functions[35]

- **Imbalance netting process function:** Optimises the exchange of netting energy between the TSOs to avoid counteracting activation of aFRR under consideration of cross-border capacities by the TSOs participating in the IGCC.
- **TSO–TSO settlement function:** Calculates the settlement amount for the exchange of energy from the cross-border energy exchanges due to netting that each TSO connected to the IN platform must bear for the exchange of energy resulting from the imbalance netting process.

The implementation of the process is based on the communication of the power-frequency control of a single TSO, which enables the online balancing of different power imbalances. The aFRR demand for participating LFC areas is reported to the aFRR optimisation system, which returns a correction signal to the secondary controllers or aFRR optimisation systems of each IGCC operational member after each optimisation step. In this sense, the counter-activation of aFRR balancing energy is avoided and, therefore, the use of aFRR is optimised. IGCC has generated € 128.90 million of social welfare through savings due to netted imbalances in 2018 and 2019, and a cumulative amount of roughly € 500 million since the start of international cooperation in 2011.

3.2.1.5 Overview

As a summary of the auction and timing per platform, Figure 14 depicts the relevant processes occurring in the interface between the intraday and balancing timeframes.

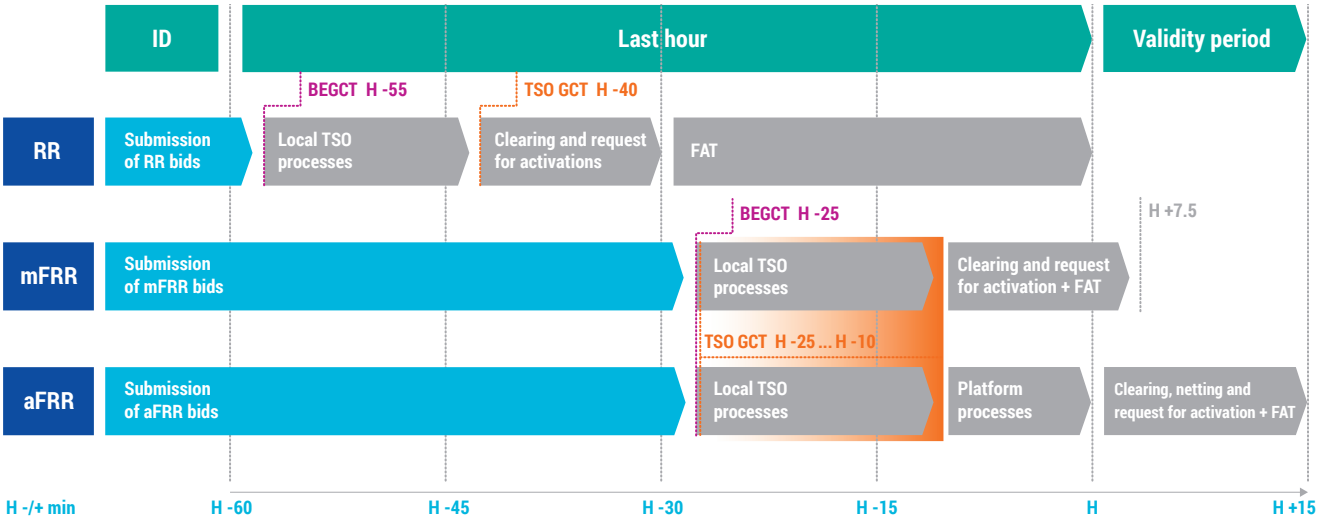


Figure 14 – Balancing energy processes and relevant timings

At the time of writing, all TSOs are in the course of developing, voluntarily, a centralised solution for the management of cross-zonal capacities between the balancing platforms for the exchange of balancing energy, or the imbalance netting process called the Capacity Management Module (CMM). This way, TSOs aim to increase the best usage of the system networks involved in their operational market performance and transparency.

Further, TSOs are assessing how to monitor the business operation of the balancing platforms adequately. At the moment of writing, the Market Supervision Module (MSM), a tool developed by ČEPS a.s., is now part of the RR platform. The MSM collects data from the RR platform to facilitate its monitoring through predefined KPIs. Additionally, the MSM has been defined in compliance with the Regulation on Wholesale Energy Market Integrity and Transparency (REMIT).

34 This is not mandatory for TSOs of the synchronous areas of Ireland and Northern Ireland and Great Britain, as long as they do not implement the aFRR platform in accordance with Article 145 of the SO regulation

35 If deemed efficient when implementing the methodologies for cross-zonal capacity calculation within the balancing timeframe in accordance with Article 37(3) of the EB regulation, a cross-zonal capacity calculation function may be added.

3.2.2 Imbalance settlement harmonisation

In Europe, all market participants shall be responsible for the imbalances they cause in the system ('balance responsibility'). To that end, each market participant shall be responsible for its imbalances or contractually delegate such balance responsibility to a chosen representative. The entities with balance responsibility are referred to as balance responsible parties (hereafter **BRPs**).

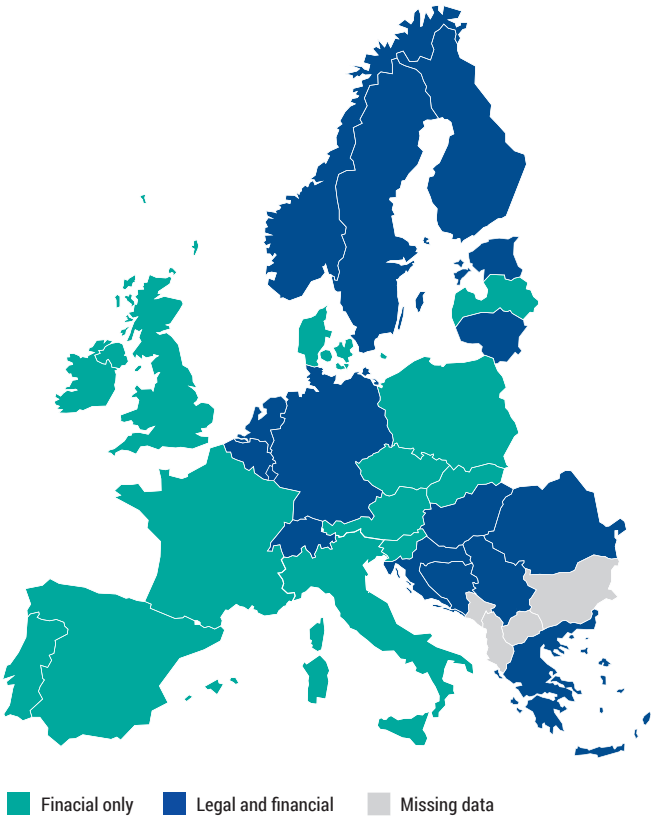


Figure 15 – Nature of the balancing obligation by country (Source: Ancillary Services 2019)

An imbalance settlement is a financial[36] settlement mechanism for charging or paying BRPs for their imbalances. As such, imbalance pricing is designed in each country to incentivise BRPs to be balanced or help the electricity system to be balanced.

A main characteristic when calculating an imbalance price is the imbalance settlement period (hereafter **ISP**), which defines the frequency of the determination and publication of imbalance price signals sent to BRPs. The EB regulation and recast electricity regulation[37] provide clear provisions on the imbalance settlement and, among other, establish a harmonised time unit for which BRPs' imbalances have to be calculated – the ISP shall be harmonised to 15 minutes by 1 January 2021. Derogations to the 15-minute ISP are possible (i. e. until the end of 2024) as well as exemptions per synchronous area (where, if the exemption is granted, the ISP shall be 30 minutes by 2025).

36 In some countries this is a combined financial and legal obligation.

37 Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019.

The EB regulation also defines the general principles of the imbalance settlement processes and, in particular, of imbalance calculation and imbalance pricing. These provisions are to be complemented by an imbalance settlement harmonisation methodology, for which all TSOs have submitted a proposal to the regulatory authorities. ACER is expected to adopt a decision on the imbalance settlement harmonisation (hereafter **ISH**) methodology[38] in June 2020.

Market participants and TSOs will continue adapting their processes and systems to adhere to the imbalance settlement provisions set by the EB regulation and electricity regulation[39] (including the implementation of a 15-minute ISP) and to implement the ISH methodology; this methodology is still subject to the approval process. For more information about this methodology, see Chapter 2 of the 2020 ENTSO-E Market Report.

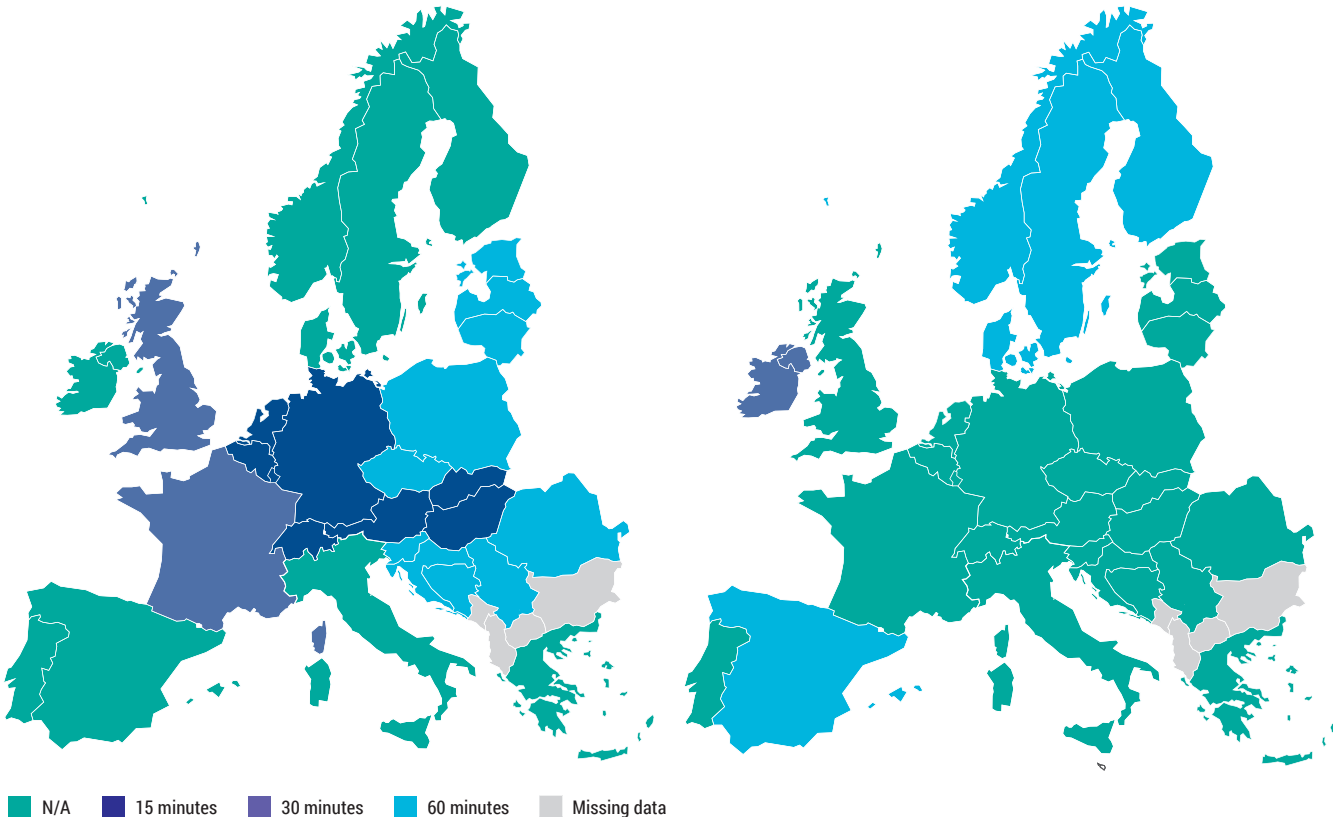


Figure 16* – Imbalance settlement period: One position** (left) or two positions*** (right)

* Ancillary Service Survey 2019 ** BRP energy volume of a scheduling unit used for the calculation of its imbalance. *** BRP energy volume of a scheduling unit used for the calculation of its imbalance. The first is equal to the sum of its external and internal commercial trade schedules from generation, and the second is equal to the sum of its external and internal commercial trade schedules from consumption.

38 Pursuant to Article 52(2) of the EB regulation.

39 Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019.

3.2.3 Allocation of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves

The EB regulation prescribes TSOs to define the allocation process of cross-zonal capacity (hereafter **CZC**) for the exchange of balancing capacity or sharing of reserves through the establishment of cooperation between two or more TSOs. Unlike the balancing energy market, the CZC allocation for exchange of balancing capacity or sharing of reserves:

- seeks to ensure the pre-prepared system for the exchange of cross-zonal capacity and guarantees to the participating parties that the allocation of cross-zonal capacity for the exchange of balancing capacity will be allocated when submitting a balancing energy bid.
- there is no legal obligation in Europe to establish cooperation for the exchange of balancing capacity or sharing of reserves. Nonetheless, TSOs of several regions in Europe are going beyond the legal requirements to reap substantial benefits for consumers, market participants and TSOs.

To this end, TSOs have to define methodologies for the allocation process of cross-zonal capacity for the exchange of balancing capacity or the sharing of reserves based on three processes (i. e. co-optimised allocation, market-based allocation and allocation based on economic efficiency analysis). The methodology proposal for a co-optimised CZC allocation (according to Article 40 of the EB regulation) has been defined by all TSOs, while the regional methodology proposals for market-based CZC allocation (according to Article 41 of the EB regulation) and CZC allocation based on economic efficiency analysis (according to Article 42 of the EB regulation) were voluntarily developed by every Capacity Calculation Region (CCR) interested in potentially implementing such CZC allocation approaches.

Apart from the processes, the main difference between these three CZC allocation approaches is the timeframe in which the contracting period and allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves is carried out.

Process	Allocation of the CZC	Prices used for the CBA
Co-optimised (Article 40 of the EB regulation)	At D-1 12:00	Actual bids/market value of CZC for exchange of energy* Actual bids/market value of CZC for exchange of balancing capacity
Market-based (Article 41 of the EB regulation)	At D-1 12:00 or At ≦ W-1 and > D-1	Forecast bids/market value of CZC for exchange of energy* Actual bids/market value of CZC for exchange of balancing capacity
Inverted Market-based approach (Article 41 of the EB regulation)	At D-1 12:00	Actual bids/market value of CZC for exchange of energy* Forecast bids/market value of CZC for exchange of balancing capacity bids
Economic efficiency analysis (Article 42 of the EB regulation)	At > W-1	Forecast bids/market value of CZC for exchange of energy* Forecast bids/market value of CZC for exchange of balancing capacity

* Day-ahead.

Table 1 – Overview of balancing capacity processes

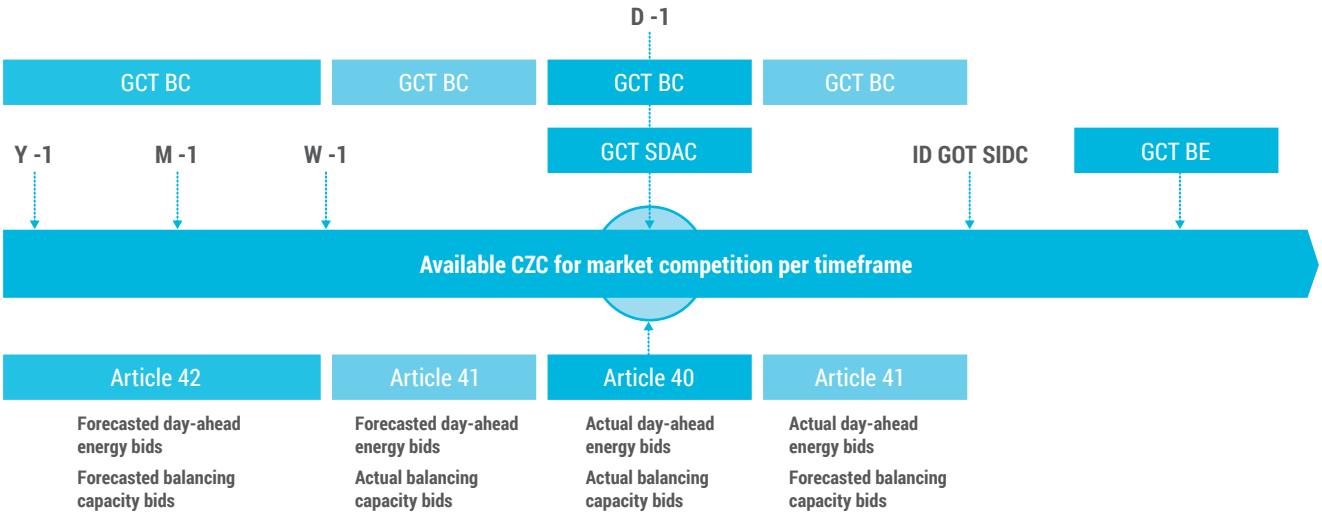


Figure 17 – Possible approaches for allocation of CZC for the exchange of balancing capacity or sharing of reserves*

Key: BC stands for Balancing Capacity, BE stands for Balancing Energy, SDAC stands for Single Day-Ahead Coupling, SIDC stands for Single Intraday Coupling, GOT stands for Gate Opening Time and GCT stands for Gate Closure Time.

Table 2 depicts the status of submission by each CCR, in respect to market-based allocation and allocation based on economic efficiency analysis proposals, tendered by 18 December 2019 to the respective(s) regulatory authority(ies).

CCR	Market-based (Article 41 of the EB regulation)	Inverted market-based approach (Article 41 of the EB regulation)	Economic efficiency analysis (Article 42 of the EB regulation)
Nordic	✓	✗	✗
Hansa	✓	✗	✗
Core	✓	✗	✓
Italy North	✓	✓	✓
Greece-Italy	✓	✓	✓
South-West Europe	✗	✗	✗
Ireland* and the United Kingdom	N/A	✗	N/A
Channel	✗	✗	✗
Baltic	✓	✗	✗
South-East Europe	✗	✗	✗

Key: Submitted no later than 19 December 2019 (✓), Not submitted on 19 December 2019 (✗)

* Ireland and Northern Ireland (i. e. the SEM) do not currently procure balancing capacity or allocate cross-border capacity for the purposes of balancing capacity. In addition, there is no exchange of reserves or allocated cross-zonal capacity to share reserves with Great Britain.

Table 2 – Regional state of play: market-based allocation and allocation based on economic efficiency

Products:

According to the EB regulation, standard products for balancing capacity only need be used if TSOs voluntarily implement balancing capacity cooperation where CZC is allocated. Besides, according to the recast Electricity regulation,[40] TSOs need to procure at least a part of their reserves from standard balancing capacity products.

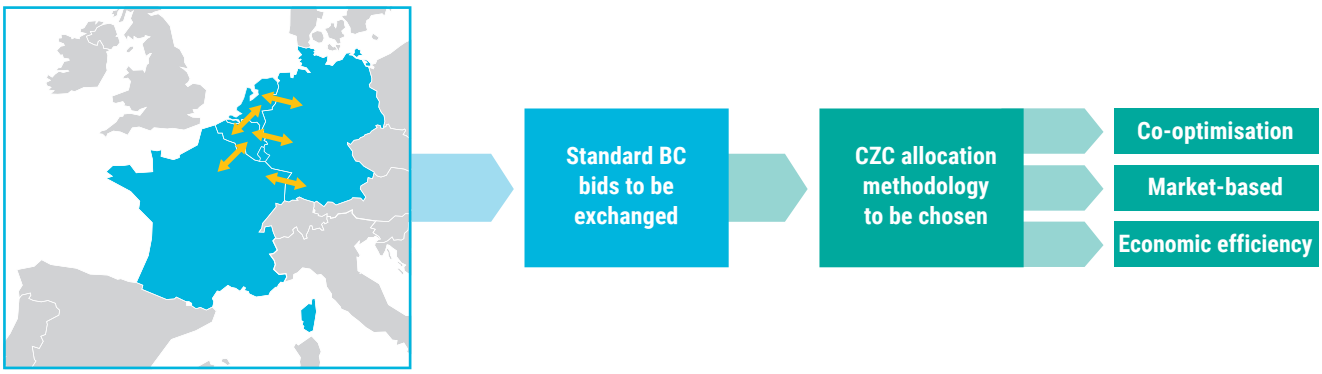


Figure 18 – Balancing capacity products and cross-zonal capacity methodologies

For each contracted standard product for balancing capacity (be it aFRR, mFRR or RR), the qualified BSP for which the bid(s) was(were) selected shall provide corresponding capacity in the form of integrated scheduling process bids or standard balancing energy product bid(s).

Regardless of the methodology implemented, when allocating cross-zonal capacity for the exchange of balancing capacity or sharing of reserves, the objective is always to maximise the economic surplus[41] from the (forecasted or actual) day-ahead bids and the (forecasted or actual) balancing capacity bids.

The standard product for balancing capacity bid has the following characteristics:

- Price unit and resolution: in (€/MW)/h and 0.01(€/MW)/h
- Minimum bid quantity and granularity: 1 MW
- Indivisible bids are allowed, and the bid quantity shall not exceed the value defined by the TSOs exchanging balancing capacity or sharing of reserves
- Location: the smallest of LFC Area or bidding zone in which the providing units or providing groups are connected to the participating TSO

40 Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019.

41 The sum of producer surplus (supply bids), consumer surplus (demand bids) and congestion income.

3.2.3.1 Regional implementation: Nordic Balancing Model (NBM)

The Nordic TSOs (Energinet, Fingrid, Statnett and Svenska kraftnät) submitted methodological proposals for a common aFRR capacity market between the 11 Nordic bidding zones in April 2019 to their respective NRAs. The proposals are in line with the EB regulation and provide the description of common and harmonised rules for the procurement of balancing capacity, as well as the method to determine the value and amount of cross-zonal capacity allowing the exchange of balancing capacity.

The four proposals are:

1. A methodology to establish common and harmonised rules and processes for the exchange and procurement of balancing capacity in accordance with Article 33(1) of the EB regulation.
2. An exemption for not allowing balancing service providers to transfer their obligations to provide balancing capacity in accordance with Article 34(1) of the EB regulation.
3. A methodology for the application of the allocation process of cross-zonal capacity for the exchange of balancing capacity in accordance with Article 38(1)(b) of the EB regulation.
4. A methodology for a market-based allocation process of cross-zonal capacity in accordance with Article 41(1) of the EB regulation.

These methodologies are needed to create a common Nordic automatic Frequency Restoration Reserve (aFRR) balancing capacity market. Denmark, Finland, Sweden and Norway aim to use the most efficient balancing resources to balance the system and ensure that each of the 11 bidding zones has access to the needed aFRR capacity in such a way that activation of the aFRR does not result in exceeding the available transmission capacities between bidding zones.

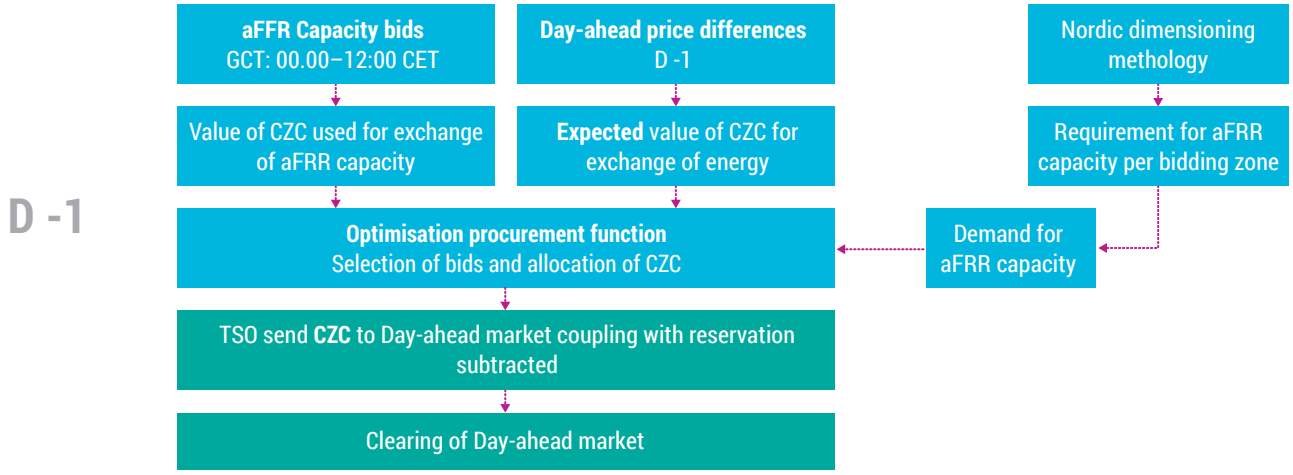


Figure 19 – Scheme of the aFRR capacity market in the Nordic synchronous area

In October 2019, the Nordic TSOs received a request for an amendment[42] to the proposal submitted in April. The main aspects remarked upon were pay-as-clear pricing, transfer of bids among BSPs within the bidding zone and the GCT of D -1. In December 2019, the Nordic TSOs resubmitted an amended proposal.

In February 2020, the Nordic regulatory authorities referred to ACER the proposed TSOs' methodology for an aFRR capacity market in the Nordic synchronous area for the allocation of cross-zonal capacity. Nordic regulatory authorities could not reach an agreement, and ACER has six months to adopt a decision (i. e. August 2020).

The expected net economic benefit of a Nordic aFRR capacity exchange, considering the costs of allocating cross-zonal capacity, **is almost € 53 million per year**.[43]

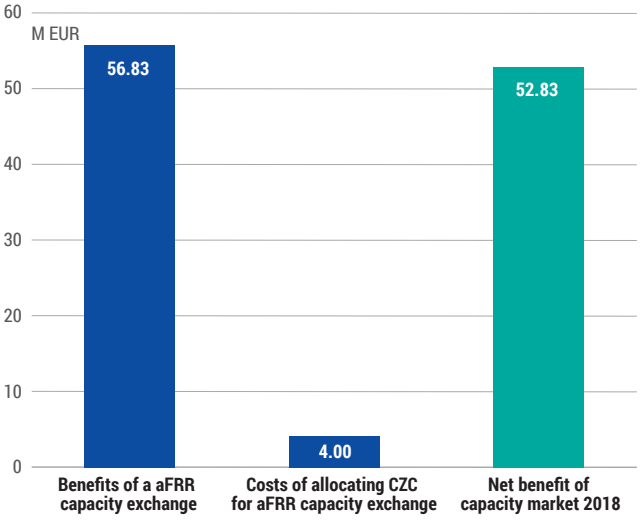


Figure 20 – Expected benefits for aFRR capacity exchange between the Nordic TSOs

42 See here.

43 Explanatory document to the Nordic TSOs' proposal for a methodology for market-based CZC allocation

3.2.3.2 Regional implementation: Germany–Austria aFRR balancing capacity cooperation

The German TSOs 50Hertz Transmission GmbH, Amprion GmbH, TenneT TSO GmbH and Transnet BW GmbH, and the Austrian TSO Austrian Power Grid AG have been cooperating since 31 January 2020 (first delivery date 1 February 2020) to increase their level of cooperation by implementing the first common procurement system in Europe based on the aFRR capacity process. These TSOs already cooperate on imbalance netting (since 2014) and the common activation of aFRR energy bids (since 2016). Therefore, the cooperation on aFRR capacity was the next beneficial step.

The cooperation is based on the cross-border procurement of aFRR by utilising a cost-benefit analysis (CBA) methodology for the allocation of cross-zonal capacity. With this degree of cooperation, the TSOs from Austria and Germany aim to reduce the activation of aFRR balancing energy bids via imbalance netting and to be cost-efficient in their activation and cost-efficient when procuring between the two countries.

The market rules in Austria and Germany were already more or less similar prior to the inception of this cooperation, a good foundation for the project that reduced complications for further harmonisation. Nonetheless, to establish this cooperation, there were challenging targets to reach, such as having independent tendering platforms but one common clearing system that performs bid selection, taking into account the CBA results. The cross-border procurement is limited in the first step to the CBA result or a maximum of +/- 80 MW (+ means export; - means import). The CBA optimisation is based on the value of cross-zonal capacity on the day-ahead market versus the value of cross-zonal capacity for the aFRR market, where every considered bid is represented by:

$$\text{capacity price} + x * \text{energy price}$$

where x represents the individual probability for the activation in both German and Austrian bidding zones. The CBA[44] is performed once per month and reviewed weekly.

The main harmonised market rules are as follows:

- Gate open time: D -7 10:00 a.m. CET/CEST
- Gate closure time: D -1 8:00 a.m. CET/CEST (will shift to 9:00 am CET/CEST at the beginning of July 2020)
- Publication of results: Latest D -1 9:00 a.m. CET/CEST (will shift to 9:30 am CET/CEST at the beginning of July 2020)
- Minimum bid size: 5 MW in Germany–Austria (exceptions for single bids)
- Granularity: 1 MW
- Allocation of the cross-zonal capacity is done monthly

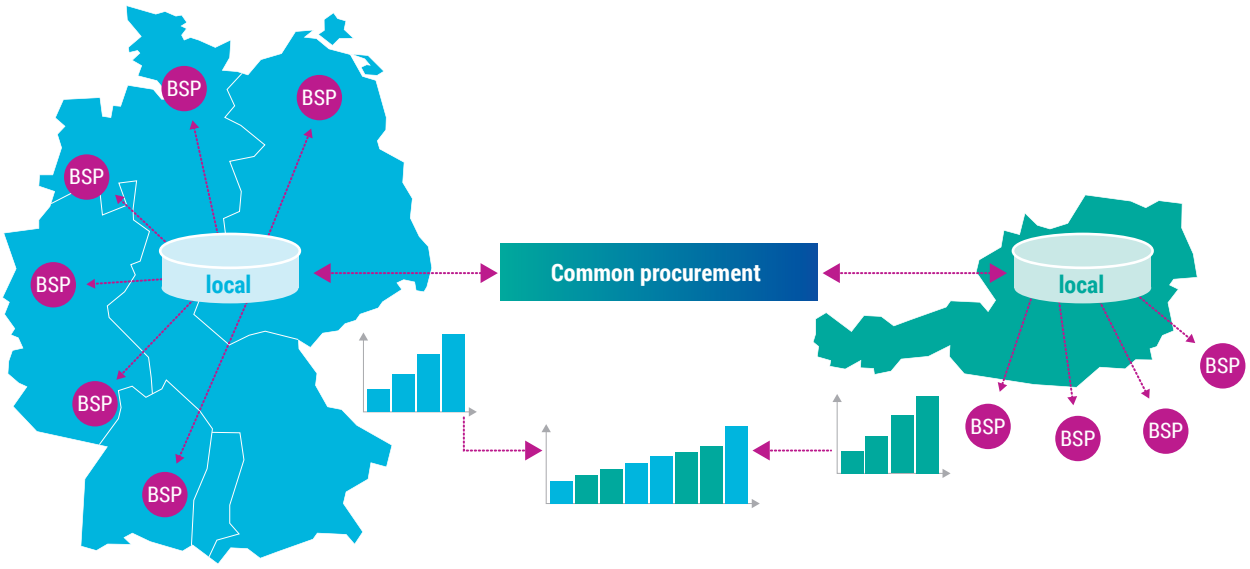


Figure 21 – Schematic diagram of the Germany–Austria aFRR balancing capacity cooperation: TSO–TSO-Model

44 More information to the **CBA and the cooperation it-self**

Benefits

Figure 22 and Figure 23 show the allocation of cross-border aFRR balancing capacity from the Austrian perspective.

In Figure 22, 'export' means that APG has contracted a positive aFRR balancing capacity for Germany. In Figure 23, 'import' means that APG is also providing negative aFRR balancing capacity for Germany.

Figure 24 and Figure 25 describe the development of capacity prices in Austria and Germany respectively.

Both figures show the downward trend in capacity prices after the start of common procurement.

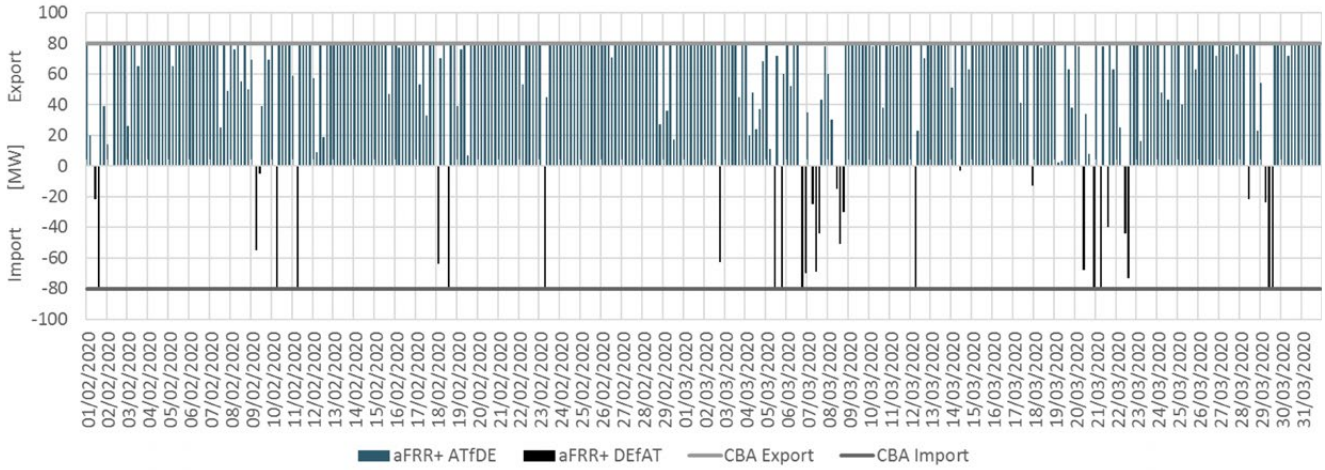


Figure 22 – Allocated cross-border aFRR balancing capacity (positive)

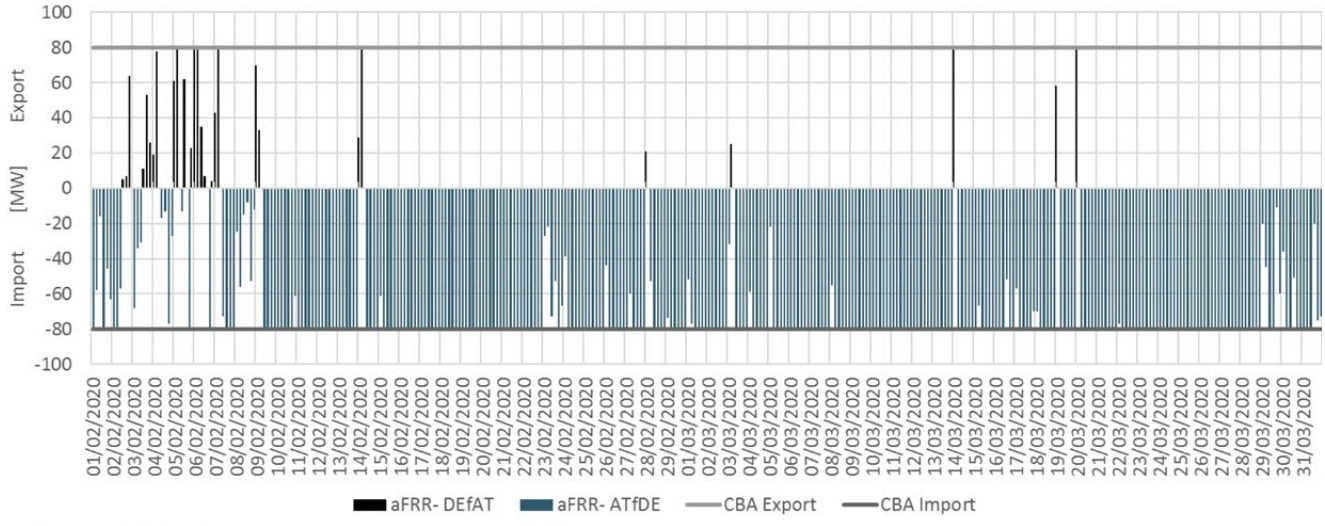


Figure 23 – Allocated cross-border aFRR balancing capacity (negative)

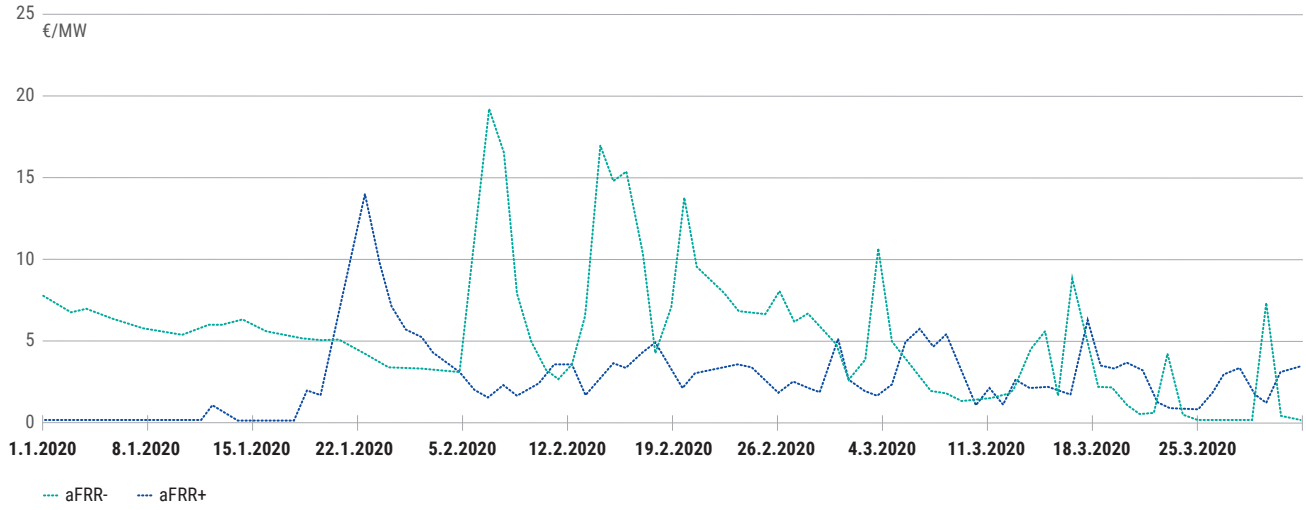


Figure 24 – Average capacity price (€) in Austria

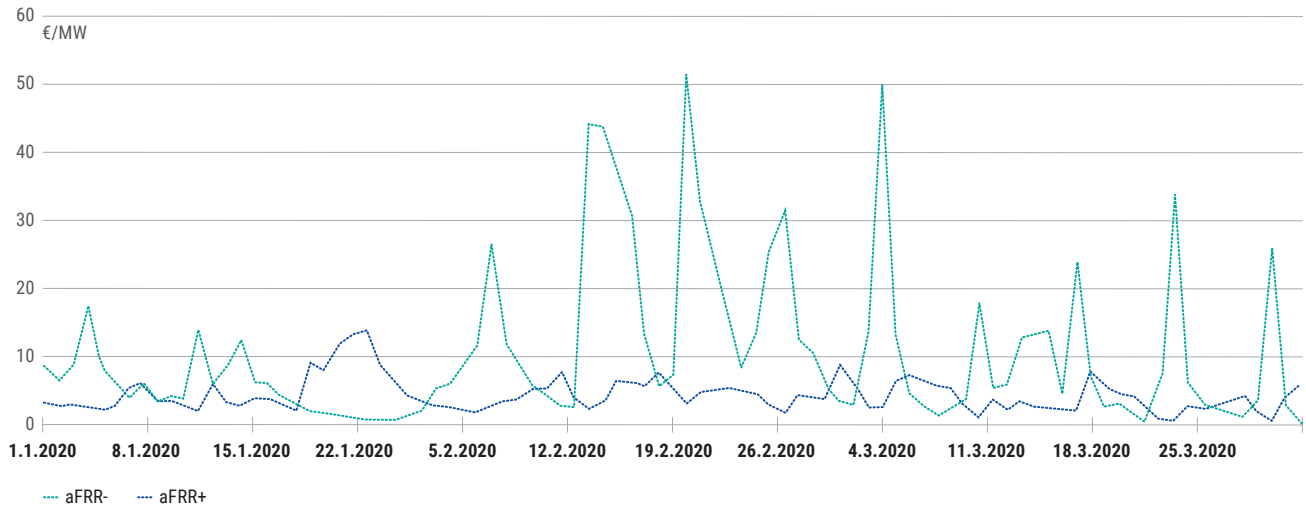


Figure 25 – Average capacity price (€) in Germany

3.2.4 FCR (Frequency Containment Reserve) cooperation [45]

The FCR considers the reserve capacity for reducing or increasing its energy output to contain any possible frequency deviations in a faster and more accurate manner. The main technical requirement for the FCR is an automatic and proportional response to frequency deviations within seconds.

FCR cooperation is not required by EB regulation; however, a voluntary initiative was set up by ten TSOs[46] comprising seven countries[47]. This cooperation has been introduced in coordination with the respective regulatory authorities. The main achievement of this platform is to procure capacity through a common auction based on a common merit order list (CMOL) where the participant TSOs in the FCR cooperation pool consider all the offers received from the BSPs connected to their respective grids.[48]

During the compiling of data for this report, the FCR procurement features have gone through various phases.

FCR Procurement		
	until June 2019	**July 2019 onwards**
Auctions timing	Weekly auctions*	Daily auctions**
	The auction calendar is notified by TSOs to their BSPs in November of the previous year (at the latest)	
	Publication time is 1h after GCT	Publication time at 16:00 CET at the date of GCT
Product	Duration is one week (Monday 00:00 hours to Sunday 24:00h)	Duration is one day (within 24h)
Bids	The Auction Allocation Algorithm can select a part of the volume offered by one bid in Austria, Belgium, Germany, France and the Netherlands	The Auction Allocation Algorithm allows divisible bids together with indivisible bids in all participating TSOs
	Only in Switzerland may indivisible bids be used, with a maximum bid size of 25 MW	Indivisible bids will have a maximum bid size of 25 MW
	Except for Switzerland, submitting of exclusive bids (only one bid of a certain group of bids can be accepted) is not allowed	Exclusive bids will not be allowed in the FCR procurement
	■ The minimum bid size is 1 MW ■ The bid resolution is 1 MW (the result of dividing a bid should be a whole number) in the FCR procurement	
TSO–BSP settlement	The TSO–BSP settlement of the FCR procurement is based on a pay-as-bid mode	The TSO–BSP settlement will be based on pay-as-clear (marginal pricing)***
TSO–TSO settlement	Exporting TSOs bear the costs that they incur if they procure at the national level, hence they pay for the cheapest local bids to cover demand	The compensation between TSOs for imported or exported volumes is first calculated using the CBMP
	The costs of the more expensive bids that were procured additionally are then passed on to the importing TSOs using an 'exported bid average price'	Each importing TSO country has to pay to the exporting TSOs countries the CBMP for the imported volume of FCR. Similarly, the exporting TSOs countries will receive the CBMP for the amount of the volumes they export****

* The auctions took place on Tuesday afternoon with Gate Closure Time (GCT) at 15:00 CET and apply to the next delivery week. The Gate Opening Time (GOT) is Friday before each auction at 12:00 noon CET. ** GOT in D-14.

*** Core shares, also called import limits (which are mandatory according to ANNEX VI SOGL), and the maximum transfer of capacities, also called export limits (which are mandatory according to ANNEX VI SOGL).

**** If the import limit of a country is hit, the country must pay a higher or equal price (LMPi) to BSPs than for compensation to the other (exporting) TSOs (CBMP). Whereas, if the export limit of a country is hit, the country has to pay a lower or equal price (LMPe) to BSPs than it will receive as compensation from the other (importing) TSOs (CBMP). In both cases the difference between the payment to the BSPs and the compensation from TSOs is combined.

Table 3 – Summary of the auction timings, products, bids, TSO – BSP settlement and TSO – TSO settlement

45 More information **here**

46 APG, Elia, Swissgrid, 50Hertz, Amprion, TenneT DE, TransnetBW Energinet (DK1), RTE and TenneT NL.

47 Austria, Belgium, Switzerland, Germany Denmark (Dk1), France and the Netherlands.

48 More information **here**

4 EB performance indicators

4.1 Introduction

Prescribed by the EB regulation from Article 59(4)(a) to Article 59(4)(k), there is a list of 11 requirements upon which ENTSO-E submitted a proposal in October 2019, defining performance indicators, based on the assumptions and certainties at that time, on which these indicators were based. Since then, certain changes have occurred as a result of individual decisions by ACER (namely Nos. 01/2020[49] 02/2020[50] and 03/2020[51]). The TSOs are gradually adopting these decisions. Consequently, a new EB performance indicator proposal will be prepared, and this information will be updated in the next edition of this report (i. e. June 2022).

Indicator on the availability of balancing energy bids, including the bids from balancing capacity (Article 59(4)(a) of the EB regulation)

This indicator is defined as the v**olume of available and unavailable** bids of balancing energy per process and per direction collected by TSOs. The following provisions from EB regulation are considered to distinguish the **unavailable volumes**:

1. Due to internal congestion or operational security constraints within the connecting TSO scheduling area according to Article 29(14) of EB regulation.

2. Collected bids not forwarded to the European platform in accordance with Article 26 of the EB regulation.

3. Balancing energy bids that are not forwarded to the European platforms in accordance with Article 29(10) of the EB regulation.

4. In the case of an unavailable bid pursuant to Article 29(9)(b) of the EB regulation. Such a bid will not be used either by the TSOs nor by the relevant platform.

Monetary gains and savings due to imbalance netting, exchange of balancing services and sharing of reserves (Article 59(4)(b) of the EB regulation)

This indicator is defined as the calculation for each type of exchange of balancing energy (aFRR, mFRR or RR) and for each type of sharing or exchange of balancing capacity. These can be split into two types: monetary savings due to exchange and sharing of balancing capacity due to exchange of balancing energy.

Benefits from the use of standard products (Article 59(4)(c) of the EB regulation)

This indicator is calculated as the ratio between the sum of balancing energy from standard product imported by the TSOs and the traded volume.[52] This indicator will be reported by each of the balancing platforms.

Total cost of balancing (Article 59(4)(d) of the EB regulation)

This indicator is calculated as the sum of balancing capacity procurement cost, balancing energy upward and downward activation costs and TSO–TSO settlement. The last element is split between the cost of the balancing capacity exchange and the balancing energy exchange. This indicator will be reported at the TSO level.

Economic efficiency and reliability of the balancing markets (Article 59(4)(e) of the EB regulation)

This indicator is determined by considering the reliability of balancing energy markets as the level of satisfied competitive TSO balancing energy needs. This is the sum of the satisfied (accepted) volume of competitive needs divided by the sum of the maximum requested volume of competitive needs.

49 On the methodology to determine prices for the balancing energy that results from the activation of balancing energy bids, pursuant to Article 30(1) of EB regulation.

50 On the Implementation framework for the European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation, pursuant to Article 21(1).

51 On the Implementation framework for the European platform for the exchange of balancing energy from frequency restoration reserves with manual activation, pursuant to Article 20(1).

52 Traded volume is the sum of the activated bids in upward direction and satisfied needs in downward direction calculated per platform and not per scheduling area.

Possible inefficiencies and distortions on balancing markets (Article 59(4)(f) of the EB regulation)

This indicator is defined as the total volume of the competitive needs that have not been satisfied due to activation for system constraints purpose, the total volume of uncompetitive needs that have been satisfied because of system constraints. In addition to RRP and FRP process, this also considers the unsatisfied inelastic demand due to lack of resources and the volume of inelastic demand.

Efficiency losses due to specific products (Article 59(4)(g) of the EB regulation)

This indicator is defined as the comparison between the **total annual volume** (MWh) of the **collected** specifically balancing energy bids (upward and downward) for each of the balancing energy process (i. e. aFRR, mFRR and RR) and the **total annual volume** (MWh) of the specific balancing energy bids **converted** to standard energy balancing bids.

The volume and price of balancing energy used for balancing purposes, both available and activated, from standard products and specific products (Article 59(4)(h) of the EB regulation)

This indicator considers the following variables: activated volumes (MWh) of balancing energy, available volumes (MWh) of balancing energy and price (€) of balancing energy.

All these variables are provided per direction, upward and downward; per product, be it standard or specific; per TSO demand; and per type of reserve activated, whether aFRR, mFRR or RR.

Imbalance prices and the system imbalances (Article 59(4)(i) of the EB regulation)

This indicator is defined by imbalance values, the average of net imbalance and imbalance prices. This is provided separately for single and dual pricing. Further, this performance indicator is calculated separately for surplus and deficit.

Evolution of balancing energy prices of the previous year (Article 59(4)(j) of the EB regulation)

This indicator is defined by the volume-weighted average clearing prices over the previous years. These data are provided per balancing process (i. e. RRP and FRP), per direction (i. e. upward and downward) and per type of product (i. e. standard and specific).

The comparison of expected and realised costs and benefits from all allocations of cross-zonal capacity for balancing purposes (Article 59(4)(k) of the EB regulation)

This indicator is defined by the ratio between the benefits and costs. Benefits and costs can be forecasted or actual values depending on the allocation of cross-zonal capacity for balancing purposes. This can be co-optimised (actual day-ahead energy bids and actual balancing capacity bids), market-based (forecast day-ahead energy bids and actual balancing capacity bids) or based on the allocation of economic efficiency (forecast day-ahead energy bids and forecast exchange of balancing capacity bids).

Overview

Table 5 shows an overview of the indicators and their applicability toward the balancing processes defined (viz. balancing platforms and allocation processes).

Performance Indicators	IN platform	aFRR platform	mFRR platform	RR platform	Allocation of cross-zonal capacity for the exchanges of balancing capacity and the sharing of reserves
4.1.1*	N/A	Yes	Yes	Yes	Yes
4.1.2	Yes	Yes	Yes	Yes	Yes
4.1.3	N/A	Yes	Yes	Yes	N/A
4.1.4	N/A	N/A	N/A	N/A	No
4.1.5	N/A	No	Yes	Yes	N/A
4.1.6	N/A	Yes	Yes	Yes	N/A
4.1.7	N/A	Yes	Yes	N/A	N/A
4.1.8	N/A	Yes	Yes	Yes	N/A
4.1.9	N/A	N/A	N/A	N/A	N/A
4.1.10	N/A	Yes	Yes	Yes	N/A
4.1.11	N/A	N/A	N/A	N/A	Yes

Note: Applicable (Yes) | Not applicable (N/A)

* This does not include the cases as laid down in Articles 26, 29(9)(b), 29(10) and 29(14) of the EB regulation.

Table 4 – EB Performance Indicators

4.2 Data collection

The EB Monitoring plan submitted[53] proposed to provide such data on the preceding year (i. e. 2019). As no other reaction occurred after the period stipulated by EB regulation, TSOs consider this de facto endorsed by ACER.

At the time of writing, only the replacement reserve platform is formally operational (beginning January 2020). Thus, the corresponding performance indicators for the RR platform will be included in upcoming editions of this report.

Moreover, the only information available for 2019 coming from a process already in place and required by the EB regulation is the imbalance netting process. To avoid any misunderstanding, the current process is a result of the early implementation of the EB regulation. Its formal date to go live is pending a decision by ACER, which is expected to be adopted in June 2020.

The rest of the balancing processes required by the EB regulation (e. g. manual and automatic FRP) are still under the readiness phase to be operational. Therefore, the information concerning the performance for these processes will be provided in this report based on the operation performance of the previous year (i. e. 2023) in the ENTSO-E Balancing Report 2024.

53 ENTSO-E submitted to ACER a first proposal in May 2018 and resubmitted an amended proposal in September 2019 in response to ACER opinion No. 12/2019.

5 Executive summaries of TSOs

Article 59(6) of the EB regulation requires each TSO to provide, under the scope of this report, an executive summary based on the 'TSO report on balancing' pursuant to Article 60 of the EB regulation.

The following executive summaries outline the development of each TSO in the implementation of the EB regulation since it entered into force between December 2017 and December 2019 at the TSO or multi-TSO level (e. g. Germany or Baltic).

After reading this chapter, the reader will have understood the specific actions implemented by each TSO in connection with the pan-European and regional implementation covered in Section 3 of this report.

Links are provided, when possible, to redirect the reader to the most updated version of the document referenced. To the extent possible, these cross-references will bring the reader to the English version of the original document, when an official translation exists.

In addition to the EB and SO regulations, other regulations are mentioned in these summaries. This is the case of the Commission Regulation (EU) 2017/2196 of 24 November 2017, establishing a network code on electricity emergency and restoration (hereafter **E&R**).

5.1 Sweden (Affärsverket Svenska kraftnät)

Affärsverket Svenska kraftnät (hereafter Svenska kraftnät) is the Swedish TSO. Svenska kraftnät is part of the Nordic synchronous area and together with Fingrid Oyj, Energinet Elsystemansvar A/S (Denmark-West, DK2) and Statnett SF is part of the same LFC block. The LFC areas, scheduling areas and monitoring areas equal four bidding zones (SE1, SE2, SE3 and SE4).

Svenska kraftnät has submitted the Terms and Conditions for BSPs in accordance with Article 18(5) of the EB regulation. These are subject to an ongoing regulatory process and are thus not approved within the scope of this report.

Whereas the terms and conditions for BRPs, in accordance with Articles 18(6) and 18(7) of the EB regulation are already approved and can be checked here:

Terms and conditions for BRPs
Balance agreement
Appendix 1: Affärsverket Svenska kraftnät Balance Responsibility Agreement

During the time span from 18 December 2017 to 18 December 2019, the implementation frameworks for the European platforms have not been approved. Thus, the balancing products, which were used during the scoping period, cannot be defined as specific products. Therefore, this summary does not further address questions related to specific products.[54]

Svenska kraftnät has already accomplished all the settlement principles, pursuant to Articles 44(1)(a) to 44(1)(i) of the EB regulation. Svenska kraftnät uses balance fees and grid tariffs to cover the procurement costs of balancing capacity.

Article 44(1)	Status
(a)	Accomplished
(b)	Accomplished
(c)	Accomplished
(d)	Accomplished
(e)	Accomplished
(f)	Accomplished
(g)	Accomplished
(h)	Accomplished
(i)	Accomplished

Table 5 – Svenska kraftnät status

Balance service fees cover:

- 100 % of the procurement costs of aFRR balancing capacity
- 100 % of the procurement costs of FCR-N balancing capacity
- 66.67 % of the procurement costs of FCR-D balancing capacity

Grid tariffs cover:

- 33.33 % of the procurement costs of FCR-D balancing capacity

54 Article 26(1) of the EB regulation requires that following the approval of the implementation frameworks for the European platforms pursuant to Articles 19, 20 and 21, each TSO may develop a proposal for defining and using specific products for balancing energy and balancing capacity.

5.2 Germany and Luxembourg 50Hertz Transmission GmbH, Amprion GmbH – CREOS Luxembourg S.A., TenneT TSO GmbH and TransnetBW GmbH

The German TSOs published a joint report on balancing covering the previous two calendar years, which is summarized in this section. These are 50Hertz Transmission GmbH (hereafter 50Hertz), Amprion GmbH (hereafter Amprion), TenneT TSO GmbH (hereafter TenneT DE) and TransnetBW GmbH (hereafter TransnetBW), which jointly operate the LFC block DE/DKW/LU[55] as part of the Continental Europe synchronous area. Further, according to the Energy Act (EnWG), each German TSO is responsible for the system operation in its load frequency control area (LFC area).[56]

During the time span from 18 December 2017 to 18 December 2019, the German TSOs consulted and proposed Terms and Conditions for Balancing Service Providers (BSPs) according to all paragraphs of Article 18(5) of the EB regulation. It refers to all providers of frequency control reserves (FCR) and frequency restoration reserves (FRR). A part of the proposed terms and conditions[57] have already been approved by the German regulatory authority Bundesnetzagentur (BNetzA). The remaining terms and conditions are still in the process of approval (reference BK6-18-004)[58]. The proposed Terms and Conditions for BSPs make use of Article 18(7)(e) of the EB regulation, i. e. the exemption from publishing information on prices and volumes of offered but not selected balancing bids due to market abuse concerns pursuant to Article 12(4).

Within the defined LFC areas in the previous paragraph, electricity suppliers and traders form balancing groups that pool their feed-ins, trades and consumer demands. Each balancing group is managed by a balance responsible party (BRP). According to the provisions of Article 18(6) of the EB regulation, the Terms and Conditions for Balance Responsible Parties were revised and consulted. A new standard balancing group contract for BRPs and TSOs has been codified by BNetzA[59] (stipulation BK6-18-061)[60] and entered into force on 1 May 2020.

German TSOs are operational members of the International Grid Control Cooperation (IGCC)[61] which evolves into the imbalance netting platform (IN platform) for Continental Europe as defined by Article 22 of the EB regulation. German TSOs also participate in the Manually Activated Reserves Initiative (MARI)[62], that is the European implementation project to establish the European mFRR platform. Regarding aFRR,

55 Amprion's LFC area consists of the scheduling areas of Amprion and CREOS Luxembourg S. A. TenneT DE's LFC area consists of the scheduling areas of TenneT DE and Denmark-West (operated by Energinet Elsystemansvar A/S).

56 Luxembourg is part of the LFC area Amprion/CREOS Luxembourg S. A. The German TSO report on balancing summarized in this document therefore covers Luxembourg as well.

57 The TSOs' proposal fort the Terms and Conditions for BSP is available **online**.

58 **Terms and conditions for BSPs**

59 The documents related to the standard balancing group contract is available **online**.

60 **Terms and conditions for BRPs**

61 The IGCC settlement rules are available **online**.

62 **MARI project site**

German TSOs take part in the Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation (PICASSO)[63] which is the leading project in the implementation to establish the European aFRR platform, pursuant to Article 21 of the EB regulation.

A common market for procurement and exchange of FCR is operated together with the Austrian, Belgian, Dutch, French and Swiss TSOs. It is organized as a TSO–TSO model.[64]

In 2016, the Austrian and German TSOs established a joint activation of aFRR, which is the early adoption of the requirements of the EB regulation concerning the exchange of balancing energy. In December 2019, this cooperation was extended to mFRR. Thus, Austria and Germany already activate all FRR energy from a common merit order when sufficient cross-border capacity is available.

In February 2020, the Austrian and German TSOs extended their cooperation and established a common procurement of aFRR balancing capacity.

German TSOs have proposed provisions for the suspension and restoration of market activities that comply with Article 36 of the E&R regulation to BNetzA. The proposal is currently undergoing approval (reference BK6-18-289).

German TSOs have proposed a provisions settlement in case of market suspension that complies with Article 39 of the E&R regulation to BNetzA. The proposal is currently undergoing approval (reference BK6-18-289).

Currently, German TSOs do not use specific products in the load frequency control process according to the SO regulation.

The settlement of balancing energy is conducted according to the Electricity Network Access Ordinance (StromNZV)[65]. The imbalance settlement system was last amended in 2019 (stipulation BK6-19-217)[66]. Currently, there are two proposals to further develop the system of settling the balancing energy via the imbalance price. The first proposal concerns the evolution of imbalance price coupling to the market price. Currently, the imbalance price is coupled with the weighted average price of the one-hour product on the intraday market. To better reflect the real-time value of energy, an additional coupling to the weighted average price of the quarter-hour intraday product is proposed. The proposal is currently in the process of approval by BNetzA (reference BK6-19-552)[67]. The next step planned by German TSOs is to establish a scarcity component in the imbalance pricing that creates stronger incentives as imbalances increase. The element will send adequate economic signals that reflect the imbalance and provide an incentive to BRPs to be balanced or help the system to be balanced.

The EB regulation mandates that all TSOs draft a proposal for imbalance settlement harmonization. This proposal[68] was opened for public consultation in summer 2018. German TSOs submitted their proposal to BNetzA (reference BK6-18-197)[69]. As a result of the entry into force of the new ACER regulation, the proposal has been referred to ACER.

Currently, German TSOs do not foresee an additional settlement mechanism separate from the imbalance settlement to settle procurement costs

63 **PICASSO project site**
64 For further information on **FCR cooperation**
65 **Settlement of balancing energy**
66 **Energy price settlement system amendment**
67 **Proposal for imbalance price coupling with the market price**
68 **Imbalance settlement harmonization proposal**
69 **TSO proposal for harmonization**

5.3 Austria (Austrian Power Grid AG)

Austrian Power Grid AG (hereafter APG) is one of the two TSOs in Austria. The other TSO is Vorarlberger Übertragungsnetz GmbH (hereafter VUEN), which is responsible for the westernmost federal state of Austria only.

APG is the LFC block operator of the LFC block APG, which covers the geographical area of Austria. The LFC block APG is part of the synchronous area of Continental Europe. Since VUEN assigned the obligation of organising its LFC area to APG and both LFC areas were merged based on the Austrian Electricity Act, there exists now only one LFC area in Austria, which is congruent with LFC block APG. Thus, the LFC block APG is equal to the LFC area, scheduling area and monitoring area covering the entire country. APG is not a central-dispatch TSO. For the sake of simplicity, APG reports on behalf of both Austrian TSOs.[70]

The local Terms and Conditions for BSPs and BRPs[71] are updated regularly in accordance with Articles 18(5), (6) and (7) of the EB regulation. Between December 2017 and December 2019, this has been necessary for introducing a new model for imbalance settlement price calculation, daily procurement and marginal pricing for frequency containment reserves (FCR), daily procurement and 4 h-products for automatic Frequency Restoration Reserves (aFRR) and manual Frequency Restoration Reserves (mFRR) as well as for preparing the common activation of mFRR and the common procurement of aFRR between Austria and Germany at the beginning of 2020. In addition, between October 2018 and August 2019, the allocation algorithm for procuring aFRR and mFRR was also changed to include information on energy prices. For each update, the terms and conditions were opened to public comment according to Article 5 of the EB regulation and the comments were incorporated accordingly.[72]

Dimensioning

Dimensioning of FRR in APG is based on 15 min average values of the LFC block imbalance (according to Article 3 of the SO regulation) over a period of 12 months and applies the 99 %-criteria as well as the FRCE ranges in accordance with Article 128 of the SO regulation. In the case of substantial changes in the general boundary conditions, dimensioning of the FRR will be adjusted accordingly.

In addition to the statistical approach, the tripping of the largest power plant and load within the LFC block APG are considered a reference incident. The chosen approach resulted in the following optimal dimensioning:

- aFRR: +200/-200 MW
- mFRR: +280/-195 MW

The separation of FRR in aFRR and mFRR at APG is based on the recommended empirical approach in SAFA and applying the ENTSO-E quality criteria to the described dimensioning has proven to be sufficient.

Since in Austria, no specific products are defined, no respective cost/benefit analysis is applied.

FCR capacity and aFRR energy have already been exchanged within security limits and with reference to the defined minimum amount of reserves, which has to be kept within the LFC block. Mutual procurement of aFRR capacity with Germany started only in February 2020. Sharing of FRR has been considered too risky and has therefore not been envisaged.

70 See the **Austrian Electricity Act**

71 See **BRP rules**

72 See **APG homepage**

Balancing cooperation[73]

APG is an operational member of the IGCC and the future imbalance netting platform for RG CE (see Article 22 of the EB regulation). APG also participates in MARI, which is the European implementation project for establishing the European mFRR platform. Regarding aFRR, APG takes part in PICASSO, which represents the implementation project establishing the European aFRR platform (see Article 21 of the EB regulation).

A common market for the procurement and exchange of FCR is operated together with the German, Belgian, Dutch, French and Swiss TSOs. It is organized as a TSO–TSO model.

In 2016, APG and German TSOs established a joint aFRR activation, which is the early adoption of the requirements of the EB regulation concerning the exchange of balancing energy. In December 2019, this cooperation was extended to mFRR. Thus, APG and the German TSOs already activate all FRR energy based on a common merit order, provided sufficient cross-border capacity is available.

In February 2020, APG and the German TSOs extended their cooperation and established a common procurement of aFRR balancing capacity.

Settlement[74]

The settlement processes take into account the general principles of Article 44 of the EB regulation. Imbalance settlement is designed to be reflective of the real-time value of energy as both balancing, and wholesale market prices are considered in imbalance settlement prices. Balancing service providers are provided incentives to be in balance generally or support the system, especially in more difficult situations; therefore, the imbalance situation is reflected in imbalance prices. Financial neutrality is assured based on national legislation and complemented with the installation of an additional settlement mechanism.

The additional settlement mechanism, separate from the imbalance settlement, is in place to settle the procurement costs of balancing capacity (e. g. administrative costs and other costs related to balancing), in accordance with Article 44(3) of the EB regulation. In Austrian national legislation, procurement costs of balancing capacity for frequency containment reserves, aFRR and positive mFRR are regulated, and costs are settled accordingly. An additional settlement mechanism was introduced to settle costs of negative mFRR as the regulation of these costs in Austrian national legislation was no longer consistent with the EB regulation.

73 See **APG homepage**

74 For more information, see **here** and **here**. See system charges **here**.

5.4 Baltic: Lithuania, Latvia and Estonia (Litgrid AB, AS Augstsprieguma tikls and Elering AS)

Litgrid AB (hereafter Litgrid) is the Lithuanian TSO, AS Augstsprieguma tikls (hereafter AST) is the Latvian TSO and Elering AS (hereafter Elering) is the Estonian TSO. All three are part of a synchronous area with separate scheduling regions (EE, LV and LT), monitoring areas (EE, LV and LT) and bidding zones (EE, LV and LT). At the moment of writing, Baltic TSOs are exempted from defining their LFC blocks. After they are fully synchronised with the Continental European synchronous area, they will start implement such agreements. Each controls a scheduling area and monitoring area covering the entire country.

Terms and conditions for Baltic BSPs and BRPs

Litgrid

During the reporting period, the standard conditions for BSPs compatible with Article 18(5) of the EB regulation, were prepared by Litgrid and on 14 June 2018 were sent to the local regulatory authority for approval. The relevant authority approved the standard conditions for BSPs on 3 October 2019, and they have been in force since 01 November 2019. Standard terms and conditions for BSPs can be found **here**.

During the reporting period, the standard conditions for BRPs compatible with Article 18(6) of the EB regulation were prepared by Litgrid. On 14 June 2018, these were sent to the local regulatory authority for approval, which was given according to the standard conditions for BRPs on 27 June 2019. They have been in force since 01 August 2019. Standard terms and conditions for BRPs can be found **here**.

AST

During the reporting period, the standard conditions for BSPs compatible with Article 18(5) of the EB regulation were prepared by AST and on 18 June 2018 were sent to the local regulatory authority for approval. The relevant body approved the standard conditions for BSPs on 30 May 2019, and they have been in force are since 04 June 2019. Standard terms and conditions for BSPs can be found in the **National Grid Code**.

During the reporting period, the standard conditions for BRPs compatible with Article 18(6)(7) of the EB regulation were prepared by AST and on 18 June 2018 were sent to the local regulatory authority for approval. The relevant authority approved the standard conditions for BRPs on 30 May 2019, and they have been in force since 4 June 2019. Standard terms and conditions for BRPs can be found in the **National Grid Code**.

Elering

During the reporting period, the standard conditions for BSPs compatible with Article 18(5) of the EB regulation were prepared by Elering, and on 19 June 2018 were sent to the local regulatory authority for approval. The relevant authority approved the standard conditions for BSPs on 21 May 2019, and they have been in force since 1 October 2019. Standard terms and conditions for BSPs can be found **here**.

During the reporting period, the standard conditions for BRPs compatible with Article 18(6) of the EB regulation were prepared by Elering and on 10 June 2018 were sent to the local regulatory authority for approval. The relevant authority approved the standard conditions for BRPs on 27 February 2019, and they have been in force since 1 May 2019. Standard terms and conditions for BRPs can be found **here**.

Balancing products

Standard balancing energy and capacity products were not defined for the report period. Therefore, no distinction between specific and standard products could be defined. Consequently, no data related to specific or standard products could be evaluated and included in this summary.

EB regulation related settlement rules implementation

During the reporting period, Baltic TSOs established an agreement on the operation and settlement of the Baltic Coordinated Balancing Area (hereafter **CoBA agreement**). The CoBA agreement set the imbalance settlement and balance market rules facilitating the harmonisation of imbalance and balance settlement mechanisms. According to these rules:

- Balancing prices between TSOs and BSPs are concluded as marginal prices, ensuring competition among market participants and providing incentives for BSPs to offer and deliver balancing services to the relevant TSO.
- Imbalance price is calculated including balancing price and target component in accordance to the overall Baltic system ACE (shortage or surplus), ensuring adequate economic signals that reflect the imbalance and provide incentives for BRPs to balance the system.
- The targeted component is concluded by evaluating all Baltic TSOs costs for mFRR balancing and costs related to ACE coverage by an Open Balance Provider. The targeted component is intended to ensure the financial neutrality of all Baltic TSOs.
- Allows each Baltic TSO to have an additional settlement mechanism for imbalance administration costs ensuring that this settlement is separate from imbalance settlement and, therefore, ensuring Baltic TSO neutrality towards the balancing market.

Therefore, the current CoBA agreement in principle is compliant with Articles 44(1)(a) through 44(1)(i) and Article 44(3) of the EB regulation, except for Article 44(1)(e), since Baltic TSOs are excluded from implementing SO regulation, Articles 153, 157, 160 and most of SO regulation, Article 127.

5.5 Czech Republic (ČEPS a.s.)

ČEPS a.s. (hereafter ČEPS) is the TSO of the Czech Republic. It is within the Continental Europe synchronous area. As a member, ČEPS is in charge of the LFC block, which is equal to the LFC area, scheduling area and monitoring area covering the entire country. ČEPS is not a central-dispatch TSO.

The rules for pricing and evaluation of balancing reserve bids and the subsequent evaluation of balancing services are set up in the Terms and Conditions for BSPs[75]. Settlement and invoicing take place after the balancing service evaluation period, followed by an appeal period.

The rules for balancing energy evaluation are described in the Terms and Conditions for BSPs. The volume and price of the positive and negative balancing energy is transmitted to the nominated electricity market operator (OTE) by ČEPS within the terms defined in the Czech Market Rules (secondary legislation)[76].

All new or existing BSPs in the Czech Republic (ČEPS LFC area) shall have:

- Valid Agreement on the Terms of Procurement and Provision of Balancing Services (including Terms and Conditions for BSPs)
- Valid certificate for provision of Balancing Services – prequalification is performed by an independent certification authority according to the procedures defined in the Terms and Conditions for BSPs
- Connection to ČEPS control system and the 'Protocol of the successful completion of point-to-point and functional tests'

The technical requirements for balancing services are defined in the Terms and Conditions for BSPs. Possibilities and conditions of aggregation are described in the Terms and Conditions for BSPs. The consequences of non-compliance are described in the ČEPS Terms and Conditions for BSPs. If the BSP fails to provide the balancing energy, the BSP will not receive payment for the balancing capacity in the relevant business period. If aFRR, mFRR or RR quality parameters of the activated reserves are not respected, the activation is settled as unsuccessful or partially unsuccessful. In the case of mFRR or RR, the total monthly payment for balancing capacity is reduced by 10 % for each failed activation. In the case of mFRR or RR, the total monthly payment for balancing capacity is reduced by 5 % for each activation that partially failed. In the case that the BSP does not provide the balancing capacity for more than 10 % of the business hours, the BSP might be suspended from provision from any balancing services in order to fix the delivery issue as soon as possible.

ČEPS performs weekly, daily and intraday operational planning. The BSPs are obliged to provide the data for the operational planning according to the procedure set by the Terms and Conditions for BSPs. BSPs are also obliged to update the data without undue delay according to the Terms and Conditions for BSPs.

OTE determines the time frame for the settlement of balancing energy with the BSP. The evaluation and settlement of the balancing energy market is described in the Business Terms and Conditions for Electricity issued by OTE.

BRPs are responsible for their imbalance, and they may transfer the imbalance responsibility to another BRP under contract. The Czech Market Rules further define responsibility

75 **Rules for pricing and evaluation of balancing reserves bids**

76 **Czech Market Rules**

for imbalance, applied to each customer's connection or supply point, individual electricity point of delivery or summary of delivery points, and the obligation for the Transmission System Operator or the Distribution System Operator to cover the losses of their system, which is itself a BRP or has transferred imbalance responsibility to another BRP.

The requirement that all BRPs bear financial responsibility for their imbalances and such imbalances are subject to clearance with the market operator, are prescribed by the Energy Act in Section 22 (2) – Electricity Market Participants and PT in Section 18 – Liability for Imbalance.

The rules according to which BRPs may change their plans before and after the closure of intraday electricity trading capacity (as required by Articles 17(3) and 17(4) of the EB regulation) are described in the Czech market rules: § 7 – Intraday Market and § 11 – Settlement of the balancing energy market.

System imbalances are provided by OTE, which monitors the measured values of power, compares them with the contracted power and, in case of discrepancies, calculates the system imbalance.

Information about unused generation capacity is applied in the preparation of corrective measures within regional operation planning. Rules about providing this information are described in the ČEPS Business Portal. Offers of unused generation capacity are not required for BSP to share with ČEPS – it's only voluntary. ČEPS has no specific requirements for BSPs beyond EB regulation. An exemption from publishing information on offered prices of balancing energy or balancing capacity bids due to market abuse concerns pursuant to Article 12(4) is not used. The market rules in Annex 8 define the dual pricing method of imbalance settlement.

There was no usage of specific products in the years 2017 and 2018; therefore, no information on procured or used specific product volumes is available. Until the balancing platforms go live in accordance with Articles 19(5), 20(6) and 21(6) of the EB regulation, ČEPS cannot provide any justification that standard products are not sufficient to ensure operational security to maintain the system balance efficiently, as there is no usage of specific or standard products.

5.6 Croatia (Croatian Transmission System Operator Ltd.)

Croatian Transmission System Operator Ltd. (HOPS) is the sole TSO in the Republic of Croatia and the owner of the entire Croatian transmission network. HOPS is solely responsible for the Croatian LFC area, scheduling area and monitoring area that cover the entire country. The Croatian LFC area is a part of the Continental Europe synchronous area. Together with the Slovenian (ELES) and Bosnian and Herzegovinian TSOs (Nezavisni operator sistema u BiH - NOSBiH), HOPS forms the LFC block Slovenia-Croatia-BiH (LFC block SHB).

According to Article 60 of the EB regulation, each TSO is obliged to publish a TSO report on balancing at least once every two years. Since EBGL came into force in November 2017, this TSO report on balancing contains information about terms and conditions related to balancing in the Croatian power grid and covers the years 2018 and 2019.

In each respective period, all commercial and technical tasks related to balancing in the Croatian Transmission System have been prescribed in the Electricity Balancing Rules (Pravila o uravnoteženju EES-a, HOPS 5/2016), including Amendments to the Electricity Balancing Rules (Pravila o uravnoteženju EES-a, HOPS 3/2017) (hereafter referred to collectively as POUEES).

According to Article 18(1) of the EBGL, HOPS submitted an analysis of the compliance of part of national legislation with the EBGL and the first proposal of new Terms and Conditions for Balancing to the national regulatory authority (Croatian Energy Regulatory Agency, hereafter HERA) in June 2018, with updates in November and December 2018. On 19 February 2019, HERA delivered a negative opinion on the first draft of the Terms and Conditions for Balancing. During 2019, HOPS worked to develop new Rules for Balancing the Power System.

Pursuant to Article 18 of the EB regulation, with prior HERA approval the HOPS Management Board has adopted new Electricity Balancing Rules, effective from 7 December 2019.

Terms & Conditions for responsible parties, pursuant to Article 18(6)(e), (i) and (j), are defined in the local electricity market rules (Official Gazette 22/13, 102/15, 68/18, 52/19 and 36/20) issued by the Croatian market operator (HROTE). Balance responsible parties (BRPs) are required to sign the Balance Responsibility Agreement with HOPS.

According to POUEES, valid for 2018 and 2019, HOPS procures balancing energy through the activation of contracted ancillary services, purchases on market principles and from other transmission system operators.

Balancing services are procured in a transparent and non-discriminatory manner. In the case of the procurement of balancing services from more than one BSP, HOPS activates balancing energy bids according to the respective merit order list.

For most balancing services, during 2018 and 2019, there has been only one BSP, which dominates the provision of balancing services in the Croatian power system. Prices of balancing capacity and balancing energy for the dominant BSP are defined by a methodology that determines prices for the provision of ancillary services (HOPS, 7/2016), which is approved by HERA, and a methodology for determining prices for the provision of balancing services (Official Gazette 85/15), also issued by HERA.

For balancing purposes in 2018 and 2019, HOPS used aFRR and mFRR activation.

According to valid rules for the prequalification process (HOPS 8/2018), published on the HOPS website, to become a valid BSP in the Croatian LFC area, each party goes through a prequalification process to make sure it can achieve the desired response and become eligible. Upon meeting the successful prequalification process, a Balancing Service Agreement is signed. To open the balancing market in June 2018, HOPS introduced a pilot project called the 'Demand-Side Response (DSR) pilot project'. There were five DSR balance service providers for mFRR present at the end of 2019.

The imbalance settlement process is carried out by HROTE in accordance with the Electricity Market Act (Official Gazette 22/13, 95/15, 102/15, 68/18, 52/19) and POUEES. Imbalance settlement prices have been calculated and published by HROTE according to the methodology for determination of prices for balancing energy settlement for the balance responsible parties (Official Gazette 7/16).

In cooperation with Austrian (Austrian Power Grid, APG) and Slovenian (ELES) TSOs, HOPS has participated in Imbalance Netting Cooperation (INC) since 19 April 2016. This mechanism was replaced in February 2019 by the IGCC, in compliance with Article 22 EBGL. The main purpose of the mechanism is to avoid the counter-activation of aFRR. Imbalance Netting across LFC areas enables all participating TSOs to decrease the use of balancing energy and increase system security.

Together with ELES and NOSBiH, HOPS has implemented a practice for the sharing of mFRR in LFC block SHB.

HOPS is a full member of the PICASSO and MARI EU implementation projects for establishing European platforms for the exchange of balancing energy from aFRR and mFRR activation, respectively. The objective of these projects is the implementation of integrated European balancing energy markets in accordance with the requirements set forth by EBGL and the resulting proposals.

5.7 Ireland (EirGrid plc and SONI Limited)

EirGrid plc (hereafter EirGrid) and the System Operator for Northern Ireland Ltd (hereafter SONI) are the TSOs for Ireland and Northern Ireland, respectively. They are part of the Ireland and Northern Ireland synchronous area, which operates a single electricity market (SEM), including a single balancing market covering both jurisdictions. As part of this, EirGrid and SONI are in charge of the LFC block, which is equal to the LFC area, scheduling area and monitoring area covering both jurisdictions.

Prior to going live in October 2018, EirGrid and SONI respectively were undertaking a programme to align the Ireland and Northern Ireland wholesale electricity market (SEM) with the European approach and structure of day-ahead, intraday and balancing markets. While this project created the first balancing market arrangements in the jurisdiction under Article 64 of the EB regulation, Ireland and Northern Ireland had a general derogation against compliance with all aspects of the EB regulation outside of the creation of methodologies until 31 December 2019. From that date, the code entered into force for Ireland and Northern Ireland, and the timelines under EB regulation have begun to take effect.

As a result of this, the TSOs have begun undertaking work to ensure the local terms and conditions related to balancing comply with the EB regulation. This analysis should be complete in early Q3 2020, with the potential for rules and systems changes required afterwards, which may take longer to complete. This will include an analysis to determine:

- Whether or not the aspects related to balancing capacity apply to Ireland and Northern Ireland.
- Whether or not the aspects related to specific products apply to Ireland and Northern Ireland.
- Which aspects of the EB regulation are relevant to the local terms and conditions, focusing on reporting, Balancing Service Providers, Balance Responsible Parties, Central Dispatch, Imbalance Pricing and Settlement and backup processes.
- Whether changes or additions to the local terms and conditions identified are required to align and comply with the requirements under EB regulation.
- Requirements for additional data publication.

As this work is not yet complete, it is not possible to provide the information requested in this executive summary for this iteration of the report. It is intended that the work currently underway will enable the provision of the applicable information for future iterations of the report. There is separate work also underway to investigate future interactions with the arrangements for coupling the European balancing markets, such as TERRE and MARI, which is expected to take longer to complete. An analysis of the exit of the UK (including Northern Ireland) from the European Union will complement this study.

5.8 Bulgaria (Electroenergien Sistemen Operator EAD)

Electroenergien Sistemen Operator EAD (hereafter ESO) is the Bulgarian TSO. ESO is part of the Continental Europe synchronous area. The country is also part of an LFC block equal to the LFC area, scheduling area and monitoring area, which covers the entire country.

ESO is taking part in the final stage for the internal coordination of completely new market rules to implement all requirements of the EB regulation. The process will be finalized by the end of 2020 with the approval of the document, but some period of time to adapt to the rules and prepare for implementation by market participants also will be provided. Taking into account the local procedures and the deadline for preparation of the report by ENTSO-E, we consider that ESO will provide the necessary data at a later stage.

5.9 Slovenia (ELES Ltd. Electricity Transmission System Operator)

ELES Ltd. Electricity Transmission System Operator (hereafter ELES) is the Slovenian TSO. It is within the Continental Europe synchronous area. Within it, ELES shares the same LFC block SHB with HOPS and the Independent System Operator in Bosnia and Herzegovina (hereafter referred NOS BiH). In addition, ELES is solely responsible for the Slovenian LFC area, scheduling area and monitoring area, covering the entire country.

Dimensioning and procurement of reserve capacity

Dimensioning of reserve capacity is described in detail in a report that is prepared every year and sent to the Energy Agency[77]. Reserve capacity requirements are defined based on the operational experiences, where technical requirements defined in the Slovenian Grid Code, ENTSO-E operational handbook for Continental Europe, SO regulation and E&R regulation are considered. Additionally, dimensioning of reserve capacity in Slovenia considers also provisions defined in the operational agreement of LFC block SHB which, among others, defines terms and conditions for reserve sharing between TSOs of the control block of Slovenia, Croatia and Bosnia and Herzegovina.

Based on a statistical analysis of 15-minute average values of the LFC area imbalance over a period of 12 months and a deterministic process of dimensioning aFRR, it was concluded that the required amount of aFRR for Slovenia was ± 60 MW, both for 2018 and 2019.

Dimensioning of mFRR considered both a reference incident of control block SHB, 696 MW and 185 MW respectively for positive and negative direction, and the reserve sharing agreement within LFC block SHB. Thus, the amount of mFRR for Slovenia was in a positive direction 348 MW and 250 MW, and in a negative direction 185 MW and 71 MW for 2018 and 2019, respectively.

Procurement of the reserve capacity was local; no exchange of balancing capacity or common procurement was applied. There was no usage of specific products in the years 2018 and 2019; therefore, no information on procured or used specific product volumes is available. Until the balancing platforms go live in accordance with Articles 19(5), 20(6) and 21(6) of the EB regulation, ELES cannot provide any justification that standard balancing energy products are insufficient to ensure operational security to maintain the system balance efficiently, as there is no usage of specific products.

Costs of procurement of reserve capacity are reimbursed to ELES through grid tariffs; no additional mechanism is in place to settle the procurement costs of balancing capacity, in accordance with Article 44(3) of the EB regulation.

Terms and conditions for BSPs

The Terms and Conditions for BSPs[78] (hereafter **T&C for BSPs**) were developed by ELES in accordance with Article 18 of the EB regulation and entered into force following their approval by the Energy Agency on 2 February 2019. Before the development of T&C for BSPs, the balancing market had been governed by the Energy Act, the Grid Code and the bilateral contract between ELES and the respective BSP.

T&C for BSPs on the ELES balancing market govern and define detailed terms and conditions that:

- Are to be complied with by the BSPs if they wish to participate in the balancing market under the ELES transmission system.
- Are to be used by the TSO in the organisation and implementation of the ELES balancing market, i. e. in acknowledging the technical qualification of BSPs for the provision of services, organisation of auctions, activations of balancing energy, settlement and payment of balancing energy and monitoring the provision of services by BSPs, and imposing sanctions thereupon if such provision of services fails to comply with the provisions of Terms and Conditions for BSP.

The Terms and Conditions for BSPs were drawn up to closely follow the thematic sections defined in Article 18(5) of the EB regulation.

To participate in the ELES balancing market, a BSP must be granted the status of a 'qualified BSP'. This status is obtained by the BSPs that pass the technical qualification process and fulfilled all the conditions of respective auction rules. The T&C for BSPs foresee the equal treatment of BSPs regardless of the technology used or size of the BSP. This also includes demand response and distributed generation. Balancing energy is settled between ELES and BSPs on a 15-minute basis and paid once per month. All BSPs are responsible for their imbalances. Local balancing capacity and balancing energy products are defined in T&C for BSPs; therefore, costs and benefits analysis of specific products is not applicable.

77 Agencija za energijo, Slovenian Regulatory authority.

78 Terms and conditions for BSPs

Imbalance settlement

According to Slovenian legislation, imbalance settlement responsibility is awarded to market operator Borzen, who is responsible for the development of terms and conditions for BRPs[79] (T&C for BRPs). Through this process, the financial neutrality of a TSO regarding balancing energy procurement is guaranteed by reimbursing all types of reported balancing-related energy costs/income ELES has, e. g. aFRR, mFRR, RR and imbalance netting. Thus, there is no additional mechanism in place to settle other costs related to balancing, in accordance with Article 44(3) of the EB regulation.

Since the responsibility for the imbalance settlement process is delegated to the market operator, only some main principles are reported here. T&C for BRPs define a single-position double-pricing imbalance settlement process, where the weighted value average price calculated based on balancing energy costs reported by ELES, per each type and direction of balancing energy respectively, is used as the main component of an imbalance price calculation. The incentivising component for BRPs to be balanced and a component guaranteeing TSO's financial neutrality are included in the final imbalance price. Value of avoided activation, which may be used in cases where there is no activation of balancing energy or activation is in both directions, is defined based on a day-ahead energy price. The imbalance settlement period is one hour.

Suspension and restoration of market activities

Rules for imbalance settlement and the settlement of balancing energy, which shall be applicable for imbalance settlement periods during which the market activities are suspended, are defined in the Rules for Suspension and Restoration of Market Activities and for Settlement in Case of Suspension of Market Activities[80], which were developed in accordance with Articles 36 and 39 of the E&R regulation. These rules are a consistent part of T&C for BSPs as defined in Article 18(2) of the EB regulation.

The rules establish the following:

- Balancing energy is settled according to T&C for BSP.
- All time intervals for which market activities were suspended are exempt from the regular imbalance settlement process as defined in T&C for BRPs.
- Balancing energy and energy delivered to cover the demand during the time intervals when market rules are suspended is settled by market operator Borzen.

79 **Rules on the operation of the electricity market**

80 See **here**

5.10 Denmark (Energinet Elsystemansvar A/S)

Energinet Elsystemansvar A/S (hereafter Energinet) is the Danish TSO. The Danish electricity system consists of two non-synchronous areas: West Denmark (DK1) and East Denmark (DK2).

DK1 is within the Continental Europe synchronous area. As a part of it, Energinet is in charge of the LFC block that is shared with 50Herzt, TenneT DE, TransnetBW and CREOS. The LFC area, scheduling area and monitoring area cover the DK1 area.

DK2 is within the Nordic synchronous area. As a part of it, Energinet is in charge of the LFC block shared with Svenska kraftnät, Statnett and Fingrid. The LFC area, scheduling area and monitoring area cover the DK2 area.

Terms and conditions for BSPs in accordance with Article 18(5) of the EB regulation

- Energinets Terms and Conditions for BSPs: **Forskrift C1: Vilkår for Balanceansvar**
- Energinets reading guide for understanding the Terms and Conditions for BSPs: **Forskrift C1: Vejledning**

Terms and conditions for BRPs, in accordance with Articles 18(6) and 18(7) of the EB regulation

- Energinets terms and conditions for BRPs: **Forskrift C1: Vilkår for Balanceansvar**
- Energinets reading guide for understanding the terms and conditions for BRPs: **Forskrift C1: Vejledning**

Article 26(1) of the EB regulation requires that following the approval of the implementation frameworks for the European platforms pursuant to Articles 19, 20 and 21, each TSO may develop a proposal for defining and using specific products for balancing energy and balancing capacity.

During the time span from 18 December 2017 to 18 December 2019, which is the scope of the 'TSO report on balancing', the implementation frameworks for the European platforms have not been approved and implemented. Thus, the balancing products, which were used during the period under scope, cannot be defined as specific products, making the requirement in question irrelevant.

Ensure that Articles 44(1)(a) to 44(1)(i) of the EB regulation are met

Below, a table can be seen, where Energinet's status regarding Article 44(1)(a) to 44(1)(i) of the EB regulation is summarised.

Article 44(1)	Energinet status
(a)	Accomplished
(b)	Accomplished
(c)	Accomplished
(d)	In progress
(e)	In progress
(f)	Accomplished
(g)	Accomplished
(h)	Accomplished
(i)	Accomplished

Table 6 – Energinet's status

For Article 44(1)(d) of the EB regulation, Energinet is in the progress of facilitating harmonization of imbalance settlement mechanisms with the rest of the EU. However, the harmonization of imbalance settlement mechanisms has already been accomplished with the Nordic countries.

Energinet uses tariffs and grid service fees to cover the procurement costs of balancing capacity, to cover the costs of security of supply and to maintain national and international transmission cables. The 2020 level for the tariffs and grid service fees can be seen below. For historic tariff and fee levels dating back to 2005 see Energinet's webpage[81].

Consumer paid tariffs:

Consumer tariffs	Euro/kWh
Transmission grid tariff	0.0071
System tariff	0.0059
Balance tariff for consumers	0.00025

Current tariffs and fees in Denmark for 2020.

The transmission grid tariff for consumption covers Energinet's costs of operating and maintaining the electricity grid (132/150 and 400 kV grid) and international transmission cables. The system tariff for consumption covers the costs of security of supply and the quality of the electricity supply, including reserve capacity and system operation, among others. The balance tariff for consumers covers a share of Energinet's total costs for ancillary services.

Production paid tariffs:

Production paid tariffs	Euro/kWh
Feed-in tariff	0.0004
Balance tariff for the production	0.00015

Current tariffs and fees in Denmark for 2020.

The feed-in tariff for production covers Energinet's costs of operating and maintaining the electricity grid (132/150 and 400 kV grid) and operating and maintaining international transmission cables.

The balance tariff for production covers a share of Energinet's total costs for ancillary services.

BRP fees:

Fees for balance responsible parties (BRPs)	Cost
Fee for balancing power	0.00013 Euro/kWh
Monthly fee	200.86 Euro/Month

Current tariffs and fees in Denmark for 2020.

The fee for balancing power covers a share of Energinet's total costs for ancillary services.

The monthly fee to actively participate in the ancillary service market covers parts of Energinet's costs for settling balance responsible parties.

81 **Current and historic tariff and fee levels in Denmark**

5.11 Belgium (Elia Transmission Belgium SA/NV)

Elia Transmission Belgium SA/NV (hereafter Elia) is the Belgian TSO. It is within the Continental Europe synchronous area. Within it, Elia is in charge of the LFC block, which is equal to the LFC area, scheduling area and monitoring area, covering the entire country.

Elia has prepared a report to comply with this legal requirement, covering the years 2018 and 2019, which is summarised below:

- No specific products were specified by Elia.
- FCR is dimensioned according to Article 153 of the SO regulation and as specified in the Synchronous Area Operational Agreement.
- FRR products have been dimensioned based on the methodology specified in Elia's LFC Block Operational Agreement, in accordance with Article 119 and Article 157 of the SO regulation. The methodology for dimensioning the FRR balancing capacity is specified in the LFC means, in accordance with Article 32 of the EB regulation[82]. The dimensioning of reserve capacity was based on a probabilistic methodology (based on an extrapolation of historic LFC block imbalances) and a deterministic methodology (based on the dimensioning incident). In 2019, a dynamic dimensioning methodology was implemented for negative (downward) FRR needs determining the reserve capacity needs on a day-ahead basis based on an estimation of the imbalance risks of the next day.
- In 2019, positive (upward) mFRR reserve capacity needs were covered with 50 MW of mFRR sharing. The rest was covered with mFRR balancing capacity. Negative mFRR reserve capacity was covered with mFRR sharing and non-contracted balancing energy bids.
- FCR balancing capacity was exchanged through FCR cooperation, and mFRR reserve capacity was shared with neighbouring LFC blocks. There is no sharing of aFRR, and there is no exchange of aFRR or mFRR balancing capacity.

In addition, it can be noted that:

- The terms and conditions (T&C) for BSPs in accordance with Article 18(5) of the EB regulation have been developed by Elia and were sent for approval under the legal deadline of 18 June 2018. Given the planned design evolutions, it has been agreed that different timelines depending on the product were to be followed. After a request for amendment and resubmission, the T&C BSP mFRR were approved on 20 December 2019. Modified versions of the T&C BSP aFRR and T&C BSP FCR will be submitted for approval in Q2 2020.
- The terms and conditions for BRPs, in accordance with Articles 18(6) and 18(7) of the EB regulation, were first approved by the relevant regulators in May and June 2019. The relevant regulators have approved a request for an amendment introduced by Elia following the integration of an offshore storm mitigation process from October to December 2019.

Reserve capacity requirements	2018		2019	
	Positive	Negative	Positive	Negative
FCR (symmetric)	81 MW		80 MW	
FRR	1190 MW	N.A.	1039 MW	< 1026 MW
aFRR (symmetric)	139 MW		145 MW	
mFRR	1051 MW	N.A.	894 MW	< 881 MW

Table 7 – Reserve capacity requirements

82 For 2018, FRR products were determined by means of Elia's proposal on the methodology to determine the reserve capacity needs and balancing capacity requirements, approved by the relevant regulatory authority in line with the Federal Grid Code in force at the time.

5.12 Finland (Fingrid Oyj)

Fingrid Oyj (hereafter Fingrid) is the Finnish TSO. It is within the Nordic synchronous area. Within it, Fingrid is in charge of the LFC block, which is equal to the LFC area, scheduling area and monitoring area covering the entire country.

Terms and conditions for BSPs, in accordance with Article 18(5) of the EB regulation

Reserve product	Terms and conditions for BSPs
Frequency Containment Reserve for Normal Operation (FCR-N)	Terms and conditions for providers of Frequency Containment Reserves (FCR)
Frequency Containment Reserve for Disturbances (FCR-D)	Terms and conditions for providers of Frequency Containment Reserves (FCR)
Automatic Frequency Restoration Reserve (aFRR)	Terms and conditions for providers of automatic Frequency Restoration Reserves (aFRR)
Manual Frequency Restoration Reserve (mFRR)	Terms and conditions for providers of Manual Frequency Restoration reserves (mFRR)

Table 8 – Terms and conditions for BSPs

Terms and conditions for BRPs, in accordance with Articles 18(6) and 18(7) of the EB regulation

Terms and conditions for BRPs
Balance agreement
Appendix 1, Part 1: Fingrid Oyj's general terms and conditions concerning balance management
Appendix 1, Part 2: Fingrid Oyj's general terms and conditions concerning imbalance settlement
Appendix 2: Fee components and determination of fees

Table 9 – Terms and conditions for BRPs

Definition of specific products and of the time period they were used, in accordance with Article 26(1)(a) of the EB regulation

Article 26(1) of the EB regulation requires that following the approval of the implementation frameworks for the European platforms pursuant to Articles 19, 20 and 21, each TSO may develop a proposal for defining and using specific products for balancing energy and balancing capacity.

During the reporting period, the implementation frameworks for the European platforms were not approved. Thus, the balancing products, which were used during the reporting period, cannot be defined as specific products making the requirement in question irrelevant.

Ensure that Articles 44(1)(a) to 44(1)(i) of the EB regulation are met

Fingrid uses balance and grid service fees to cover the procurement costs of balancing capacity. More information concerning the fee components used in the national imbalance settlement and balance management can be found at the following link: **Fee components and determination of fees.**

Balance service fees cover:

- 10 % of the procurement costs of mFRR balancing capacity
- 100 % of the procurement costs of aFRR balancing capacity
- 100 % of the procurement costs of FCR-N balancing capacity
- 10 % of the procurement costs of FCR-D balancing capacity

Grid Service fees cover:

- 90 % of the procurement costs of mFRR balancing capacity
- 90 % of the procurement costs of FCR-D balancing capacity

Article 44(1)	Fingrid status
(a) Establish adequate economic signals which reflect the imbalance situation	Accomplished
(b) Ensure that imbalances are settled at a price that reflects the real-time value of energy	Accomplished
(c) Provide incentives to balance responsible parties to be in balance or help the system to restore its balance	Accomplished
(d) Facilitate harmonisation of imbalance settlement mechanisms	Accomplished
(e) Provide incentives to TSOs to fulfil their obligations pursuant to Article 127, Article 153, Article 157 and Article 160 of the SO regulation	Accomplished
(f) Avoid distorting incentives to balance responsible parties, balancing service providers and TSOs	Accomplished
(g) Support competition among market participants	Accomplished
(h) Provide incentives to balancing service providers to offer and deliver balancing services to the connecting TSO	Accomplished
(i) Ensure the financial neutrality of all TSOs	Accomplished

Table 10 – Fingrid status

5.13 Greece (Independent Power Transmission Operator S.A.)

Independent Power Transmission Operator S.A. (hereafter IPTO) is the Greek TSO. It is within the Continental Europe synchronous area, where IPTO is in charge of the LFC block equal to the LFC area, scheduling area and monitoring area covering the interconnected system of the country. IPTO applies a central-dispatch model.

Terms and conditions

This section describes the terms and conditions under which the BSPs[83] and BRPs are able to participate in the existing Greek balancing market.

Dispatch process

Interested parties develop with IPTO a transaction contract, which grants the TSO rights and induces the obligations for participants envisaged in the provisions of the System Code[84].

IPTO keeps a Units Registry[85] within which all power generation units are registered under the condition they fulfil the following criteria: (a) hold the required licenses, (b) are located in the Greek Interconnected System, (c) are connected to the System and (d) are not under a RES support scheme. The TSO identifies the technical and functional elements of each unit that constitutes its applicable technical capabilities for a specific dispatch period.

As enunciated in the first paragraph, IPTO applies a central-dispatching model by solving its unit commitment problem with the co-optimization of energy and reserves. IPTO executes the dispatch schedule (DS) for the commitment or de-commitment of dispatchable units and adjusts unit commitment, scheduling, and ancillary service quantities in response to changes in the system such as variation in demand or modifications to interconnection flows.

The production units are subject to optimal re-dispatch in real-time to meet actual system demand. Real-Time Dispatch (RTD) uses the bids of the day-ahead market. The RTD procedure is executed every five minutes and produces an economic dispatch for the next five-minute time interval without performing any unit commitment; the unit commitment status is inherited from the Dispatch Schedule.

Ancillary service obligations

The provision of ancillary services is obligatory for all production license holders unless they are technically incapable according to their technical operating characteristics. RES units and demand response are excluded. The individual ancillary services defined in the System Code are (1) FCR, (2) aFRR, (3) mFRR, (4) Voltage Control and black start capability. Each production unit requires ancillary services 1–4. The black start capability is required only by production units having a production license with a specific obligation.

Non-compliance charges

IPTO imposes non-compliance charges in the event of (a) unlawful submission of declarations, (b) significant systematic demand imbalances, (c) significant adverse deviation in techno-economic declarations and (d) non-compliance with dispatch instructions for balancing energy and ancillary services.

83 Terms and conditions
84 System code
85 Units registry

Rules in case of emergency/specific situations

In case of suspension of offers submission, participants receiving orders under the emergency declaration are obliged to execute them, regardless of objections or financial implications. The TSO is not liable for any damage caused to a participant due to an emergency situation that is not its fault. If the imbalance settlement process is not possible due to an emergency situation, the TSO may postpone the settlement for three days, provided that the weakness is considered temporary and is expected to last beyond that period.

Dimensioning of reserve capacity

IPTO, as a TSO in the Continental Europe synchronous area, follows the dimensioning rules for FCR described in Article 153 of the SO regulation. The reserve capacity for FCR required for the synchronous area shall cover at least the reference incident (3000 MW in the positive and negative direction). The shares of reserve capacity on FCR required for each TSO as an initial FCR obligation shall be based on the sum of the net generation and consumption of its control area divided by the sum of the net generation and consumption of the synchronous area over a period of one year.

Regarding aFRR dimensioning, IPTO determines the size of the reference incident which shall be the largest imbalance that may result from an instantaneous change of active power of a single power generating module, single demand facility or single HVDC interconnector or from tripping of an AC line within the LFC block.

Volumes of available reserves

The technical capability of a unit to provide FCR is a parameter registered among its technical operating characteristics for the provision of balancing services. The total volumes of available FCR for 2018 and 2019 can be seen in Table 12.

Volumes of procured reserves

The volumes of procured FCR, aFRR and mFRR from January 2018–December 2019 can be seen in Table 13. Participants are not compensated for procured mFRR volumes.

Volumes of used balancing energy

The balancing energy used can be separated upwards and downwards. These volumes are calculated as the difference between the instructed and the DAM quantity per dispatch period and unit. The total annual values of used balancing energy (MWh) can be seen in Table 14.

	Total (MWh)	
Years	BE (up)	BE (down)
2018	3.461.376	2.983.031
2019	3.228.454	2.520.261

Table 13 – Annual values of used balancing energy (MWh)

Balancing Capacity	Total [MW]
FCR	652
aFRR	4.886
mFRR	6.274

Table 11 – Available Balancing Capacity (MW)

Years	Total values of procured reserves			
	FCR (MW)	aFRR_UP (MW)	aFRR_DOWN (MW)	mFRR (MW)
2018	525.600	4.453.000	876.000	24.193.949
2019	525.600	4.453.000	6.910.117	24.890.517

Table 12 – Total annual values of procured reserves for years 2018 – 2019

5.14 Hungary (Magyar Villamosenergiaipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság/MAVIR Hungarian Independent Transmission Operator Ltd.)

The Hungarian Independent Transmission Operator Ltd. (hereafter MAVIR) is the Hungarian TSO. It is included in the Continental Europe synchronous area. Within it, MAVIR is in charge of the LFC block which is equal to the LFC area, scheduling area and monitoring area covering the entire country. MAVIR is based on a self-dispatch model.

The terms and conditions related to balancing pursuant to Article 18 of the EB regulation were submitted to the Hungarian regulatory authority by 18 June 2018 and approved by 18 September 2018 with the entry into force of 1 January 2019. It is part of the Hungarian International Network Code (Section 3.1)[86], and defines the terms and conditions for both balancing service providers and balance responsible parties in Hungarian and English version as well.

A BSP can participate in balancing services markets as long as it fulfils the qualification requirements, which consists of a successful prequalification and a valid framework contract for balancing services. In the Hungarian LFC area, there are three types of reserves: FCR, aFRR and mFRR. The dimensioning of reserves is based on the requirements of SOGL.

The procurement of balancing capacity consists of a pre-selection process which concludes with a framework agreement[87], and there is daily bidding based on the agreement. In the case of balancing capacity from FCR, there is no separate procurement for positive and negative direction, and only balancing capacity is settled between BSP and TSO. In the case of balancing capacity from FRR, there is separated procurement for positive and negative direction.

The pre-selection process in 2018 and 2019 was completed in quarter-yearly and weekly auctions, where the rules (i. e. the product resolution) were slightly different, but the basic rules were defined in the Auction Rules and in the Terms and Conditions related to balancing.

The balancing energy market is mainly organised on the daily bidding procedure. BSPs during the daily bidding of balancing services have to provide their bids in hourly resolution; however, quarter-hourly settlement is applied.

During the daily bidding, any qualified BSP can submit the bids for the balancing services, in cases where the already procured amount of balancing capacity is not available, or there is a need for more reserves, there is additional procurement during this bid submission process. In the balancing energy market, BSPs with procured balancing capacity and BSPs without procured balancing capacity have a level playing field: the only evaluation criteria applied is the balancing energy price.

The activation of balancing energy bids is based on merit order list separately for balancing energy bids from aFRR in a positive and negative direction and also for balancing energy bids from mFRR in a positive and negative direction. The pricing of the balancing services market pays as bid. MAVIR participates in the common imbalance netting process with the Czech and Slovakian TSOs with the purpose of avoiding the simultaneous activation of FRR in opposite directions for the region of the three TSOs.

The terms and condition related to balancing include every requirement related to the balancing responsible parties (BRPs),[88] and it defines every rule for scheduling and imbalance settlement. The imbalance settlement period applied in the Hungarian scheduling area is 15 minutes. The imbalance settlement methodology was changed prior to 1 January 2019 as the first step of a continuous approach to the completion of the requirements defined by the EB regulation and the imbalance settlement harmonisation rules. The calculation of imbalance price based[89] on this new methodology completes every requirement defined by Article 52 of the EB regulation. The methodology was created in close cooperation with the electricity market participants with the active support of the Hungarian regulatory authority.

As the Hungarian system is self-dispatch model-based and there is no specific product introduced, there is no information available regarding any cost-benefit analysis and on such volumes.

86 **Hungarian International Network Code (Section 3.1)**

87 **Procurement of balancing capacity framework agreement**

88 **Terms and conditions** related to balancing include every requirement related to the BRPs

89 **Methodology** developed by MAVIR concerning to the calculation of imbalance price

5.15 Great Britain (National Grid Electricity System Operator Limited)

National Grid Electricity System Operator Limited (hereafter NGESO) is the Great Britain TSO. It is within the Great Britain synchronous area. As a part of it, NGESO is in charge of the LFC block which is equal to the LFC area, scheduling area and monitoring area covering the entire country.

On 19 June 2019, NGESO sent a formal proposal to Ofgem under Article 26 of the EB regulation requesting the inclusion of two specific products:

- Short-Term Operating Reserve (STOR)[90]
- Balancing Mechanism (BM) activations for the purposes of energy balancing[91]

At this stage, no decision has been made by Ofgem with regards to our submission under Article 26 of the EB regulation. We are in ongoing discussions with regards to requirements in the Clean Energy Package, which relate to specific balancing products. NGESO has included these two products as the basis for this executive summary; it covers the reporting period of December 2017 to December 2019.

NGESO provides the data contained in this report monthly rather than daily. To that end, we have included STOR and BM activations for the full period, resulting in information for 25 complete months.

5.15.1 Justification for the use of specific products

NGESO needs access to sources of additional or reduced power in the form of increased generation or demand reduction, or decreased generation and demand increase. This enables us to manage differences between electricity supply and demand on Britain's transmission system. These additional power sources available are called 'reserve services'.

There is a range of services with different characteristics which fall into the reserves category. The two services which are categorised as replacement reserve products are Short-term Operating Reserve (STOR) and Balancing Mechanism (BM) activations for energy balancing purposes.

5.15.2 Definition of specific products

5.15.2.1 STOR

STOR allows NGESO to have extra power in reserve when required. It helps meet extra demand at certain times of the day or where there are unexpected losses in generation.

The requirement for STOR is dependent upon the demand profile at any time throughout the year. The STOR calendar year starts in April and is split into six seasons, which specify the availability windows where STOR is required each day.

Capacity contracts are agreed with BSPs via competitive bids under which they are paid when declared available, along with a utilisation payment for delivered energy.

5.15.2.2 Balancing Mechanism (BM) activations for energy balancing

NGESO use the Balancing Mechanism (BM) to balance electricity supply and demand close to real-time and to manage the system and geographic constraints. Where National Grid predicts that there will be a discrepancy between the amount of electricity produced and that which will be in demand during a certain time period, they may accept a 'bid' or 'offer' to either increase or decrease generation (or consumption). The balancing mechanism is used to balance supply and demand in each half-hour trading period of every day. It is used to meet a range of system requirements, and one of these is energy balancing.

Unlike STOR, capacity is not secured ahead of time for BM, but rather BSPs are able to submit bids in real-time. Where a BSP is instructed, they will be paid a utilisation payment for the energy delivered.

90 **Short Term Operating Reserve (STOR)**

91 **Balancing Mechanism (BM) activations** for the purposes of energy balancing

STOR capacity

The table and graph below show the monthly breakdown over the period detailing the monthly actual STOR volumes available vs contracted volumes. An average of 2.45 GW was offered in real-time against an average contracted amount of 4.2 GW.

Month	Actual MW	Contracted MW	Month	Actual MW	Contracted MW
Dec-17	2,646	4,525			
Jan-18	2,648	4,525	Jan-19	2,492	4,248
Feb-18	2,692	4,539	Feb-19	2,554	4,238
Mar-18	2,767	4,539	Mar-19	2,453	4,238
Apr-18	2,179	3,695	Apr-19	1,842	4,208
May-18	2,201	3,739	May-19	2,359	4,318
Jun-18	2,284	3,739	Jun-19	2,520	4,318
Jul-18	2,337	3,739	Jul-19	2,613	4,318
Aug-18	2,430	3,739	Aug-19	2,545	4,318
Sep-18	2,379	3,848	Sep-19	2,593	4,598
Oct-18	2,361	3,870	Oct-19	2,279	4,567
Nov-18	2,348	4,248	Nov-19	2,489	4,601
Dec-18	2,643	4,248	Dec-19	2,606	4,601

Month	Avg Actual MW	Avg Actual MW
All	2,450	2,450

Table 14 – STOR capacity

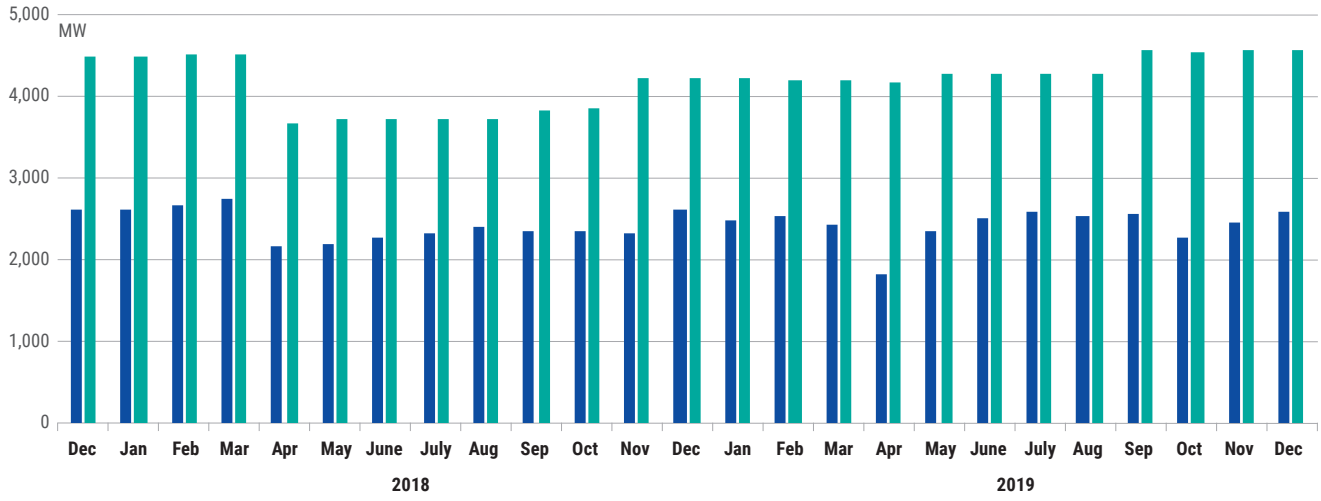


Figure 26 – STOR: Contracted and Available Capacity (December 2017 to December 2019)

STOR utilisation

The utilisation of STOR is shown below over the period in Table 16.

Month	MWh	Month	MWh
Dec-17	45,121		
Jan-18	41,670	Jan-19	21,257
Feb-18	39,822	Feb-19	11,499
Mar-18	68,822	Mar-19	20,795
Apr-18	53,452	Apr-19	27,359
May-18	57,469	May-19	18,475
Jun-18	51,113	Jun-19	32,565
Jul-18	63,772	Jul-19	22,888
Aug-18	55,272	Aug-19	21,954
Sep-18	42,160	Sep-19	10,947
Oct-18	27,615	Oct-19	13,999
Nov-18	21,646	Nov-19	8,685
Dec-18	20,511	Dec-19	6,604
Total	**588,445**	**Total**	**217,026**

Month	Total MWh
All	805,471

Table 15 – Aggregate amount of increases in generation and demand reduction delivered by contracted units

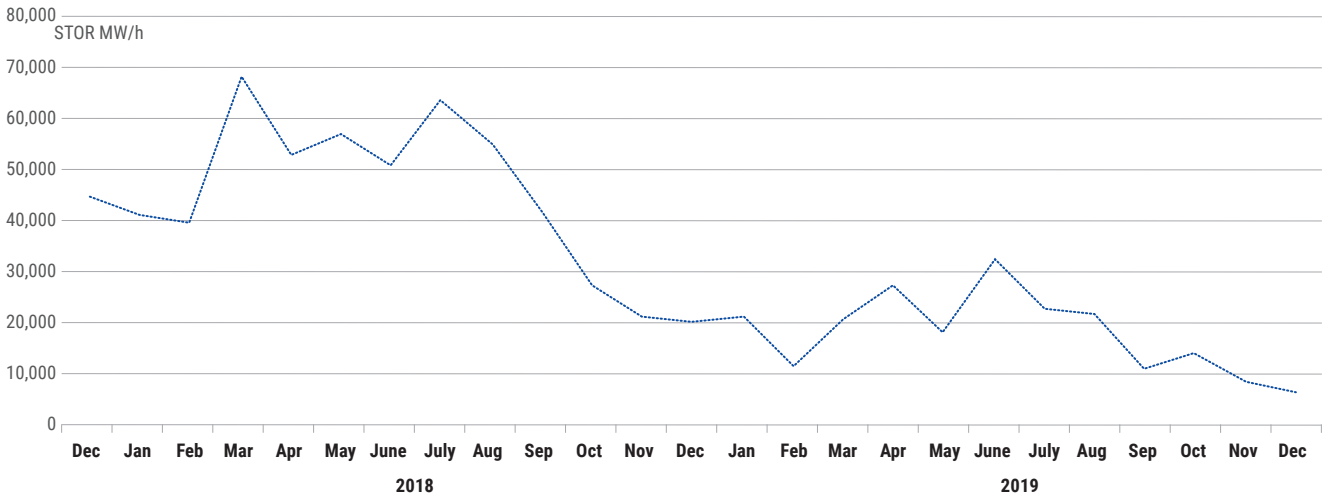


Figure 27 – STOR: Monthly utilisation (from December 2017 to December 2019)

5.15.3 Balancing Mechanism (BM) activations for balancing purposes

The table and graph below detail the monthly volumes of BM activations. They show that NGESO, on average, sold in all periods except October–December 2019, where we bought due to lack of reserves. During the period, a net total of 2,642 Gwh was sold in the BM for balancing purposes.

Month	MWh	Month	MWh
Dec-17	-32,703		
Jan-18	-142,730	Jan-19	-182,240
Feb-18	-160,255	Feb-19	-182,145
Mar-18	-114,052	Mar-19	-121,717
Apr-18	-234,870	Apr-19	-91,992
May-18	-214,304	May-19	-125,100
Jun-18	-116,049	Jun-19	-52,764
Jul-18	-94,895	Jul-19	-106,878
Aug-18	-150,203	Aug-19	-89,343
Sep-18	-106,651	Sep-19	-91,188
Oct-18	-108,868	Oct-19	19,354
Nov-18	-70,776	Nov-19	28,299
Dec-18	-139,447	Dec-19	39,440
Total	**-1,685,803**	**Total**	**-956,274**

Period	MWh	Gwh	Twh
Buy	87,093	87	0.09
Sell	-2,729,170	-2,729	-2.73
All	**-2,642,077**	**-2,642**	**-2.64**

Table 16 – Balancing Mechanism: Monthly volumes of BM activations

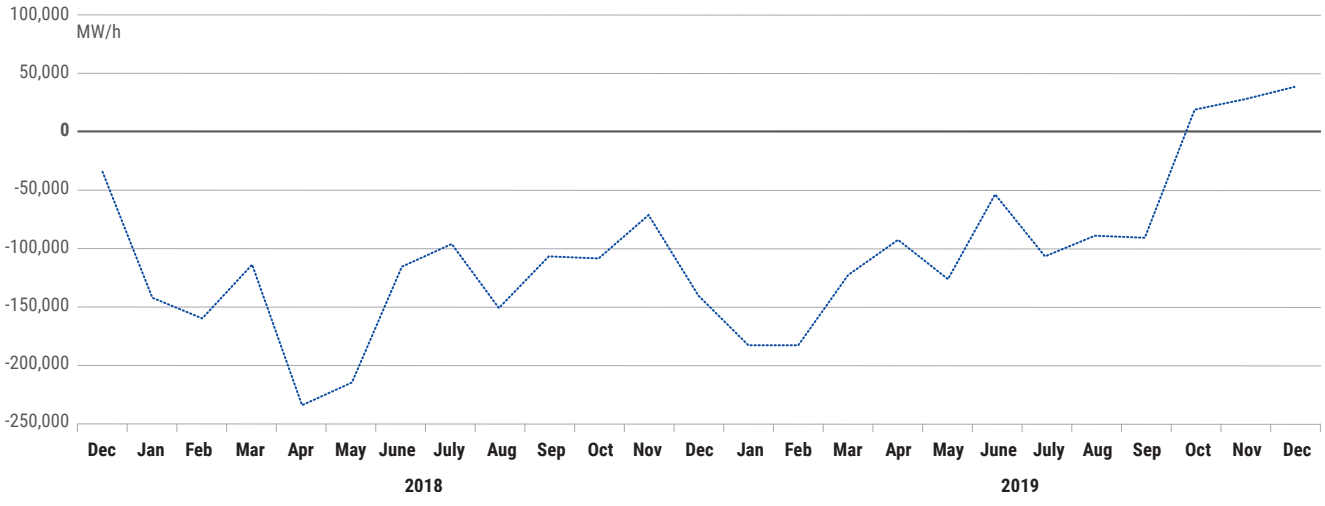


Figure 28 – Balancing Mechanism: Activations for energy balancing (December 2017 to December 2019)

When considering why standard products are not sufficient to ensure operational security and maintain system balance efficiently, it is important to note the unique position of the GB electricity network in comparison to the rest of Europe. GB is an island with a finite amount of (unsynchronised) interconnectivity with the continent. The GB network is its synchronous area, and this – combined with the increased role of renewable generation in the energy mix – means that the Rate of Change of Frequency (RoCoF) is a prevalent issue. Continental European TSOs do not experience this issue on the same scale due to being part of one synchronous area, with a more stable frequency as a result. Traditional generation, which has previously provided inertia, is in decline, and the difference between generation capacity and actual volumes has more of an impact. It is important that we have specific products available, with faster activation times, to provide sufficient levels of reserve in these circumstances.

As a suite of standard products, RR, mFRR and aFRR provide solutions with a range of activation times, from 30 minutes at the slowest (RR) down to 4 seconds at the quickest (aFRR).

However, aFRR is an automatic product, and only TSOs that operate using an Automatic Generator Control (AGC) system are able to implement this product.

A cost-benefit analysis on the use of aFRR on the GB system as required by Article 145.2 of the SO regulation was submitted to Ofgem in September 2019. This assessed whether aFRR/AGC should be implemented in GB. NGESO concluded that the costs would outweigh the benefits. Reasons for this include the high cost of implementing systems – both NGESO and market participants – and the fact that although AGC would reduce frequency deviation, there would be no benefit in costs resulting from this.

As a result, NGESO will not be implementing AGC or the aFRR product, and this means that gaps remain which will need to be filled by specific products that can be activated and deliver energy faster than mFRR (15 minutes) and RR (45 minutes). The activation of these products is often only for short periods, and the BM is required to replace the energy that is provided by these services when they are no longer available or when it is cheaper to do so.

Another thing that separates the GB electricity transmission network from the European network is the number and complexity of geographic constraints, where the transmission system is unable to transmit power to the location of demand, due to congestion at one or more parts of the transmission network. Various factors can cause a transmission constraint, and the status of these can often change quickly in the event of a system fault or an unplanned generation or transmission outage. The complexities of our system mean that we always need to be aware of locational constraints when balancing the system, and this requirement continues to be important. The RR platform will allow us to restrict any bids which would exacerbate these constraints before they are submitted to the algorithm, meaning that they will not be activated. Aside from this, the algorithm will not process geographic data, and we will not know the location of activated volume until minutes before they are delivering volume. The control room will need to forward the provider's bids to the platform along with any restrictions at least 45 minutes before real-time, and the conditions can very easily change once they have been submitted. For this reason, the volume that we have access to via the Balancing Mechanism (for which we have locational information) will continue to be important, to ensure that we do not risk the operational security of the system.

The full activation time (FAT) of the RR product is 30 minutes, which means that successful providers will have 30 minutes notice before they need to deliver the required volume. The System Operator will need to submit what is required from the platform 45 minutes ahead of real-time. Given this long lead time, a total of 75 minutes, a great deal can change between entering the TSO requirements and the volume being delivered, and our requirements may not remain the same. Between NGESO submitting a 'need' to the central RR platform and the moment that energy is delivered there can be a meaningful change to the overall system energy balance. Examples of this might include the instantaneous failure of a large generator; a significant deviation in intermittent generation output (wind or solar) or unforeseen changes in overall demand. It is for these reasons that most of our pure energy balancing actions (via BM, FR and STOR) are taken with only a 15-minute lead time. Therefore, it is important to have products available with shorter lead times (for example, STOR, BM or Fast Reserve) available to respond to changes in system requirements at short notice. Without the ability to react quickly to events on the network, we would not be able to operate the system securely.

Use of the BM for balancing purposes will be important in ensuring that the RR platform can be utilised whilst ensuring that operational security is not compromised. As agreed under Grid Code modification GC0097[92], NGESO will need to maintain the ability to issue BM instructions in parallel with the RRP. In some situations, NGESO may also need to use the BM to unwind RR activations if a system event requires it if, for example, the RR platform activates a unit in the opposite direction to BM actions. More information on how these scenarios will be dealt with can be found in sections 13–15 of the GC0097 Workgroup Report.[93]

It is important to note that the RR platform is not a guaranteed product, and BSPs are not obliged to participate in the market. NGESO holds an operating reserve requirement (ORR) from four hours ahead of real-time to take account of demand forecast errors, plant losses and market imbalances.

92 **Grid Code modification GC0097**

93 **GC0097 Workgroup Report**

Due to the fact that RR volume is uncertain, and it cannot be guaranteed that we will fill our needs, we cannot rely on it to make up the ORR. Furthermore, system needs will be submitted to the platform 45 minutes ahead of real-time, and we will know approximately 35 minutes ahead of real-time whether these needs have been filled. The RR platform will allow TSOs to put price limits on the needs entered to ensure that the actions taken are the most economical in comparison to alternative actions. For these reasons, we need other products available to us in the event that we are not successful in securing the required volume. STOR allows us to guarantee access to a volume in specific windows where we know we may encounter issues. The Replacement Reserves Implementation Framework states that TSOs should not submit inelastic needs greater than the bid volume received from BSPs locally. This further reinforces the need for access to balancing volume through other services.

Through the RR platform, we will have access to energy with an activation period of 30 minutes. The mFRR product will provide us with balancing volume with an activation time of 12.5 minutes. There will be instances, when there is a system event, that volume is required in shorter timescales than this (sometimes required in seconds), and STOR will be needed in these circumstances. Article 127 of the SO regulation sets out targets and requirements for restoring system frequency to within the specified limits. A suite of tools, some with faster response times than that of RR and mFRR, are required to achieve these standards.

Through the Future of Balancing Services work, NGESO is conducting a review of all products and services to ensure that they are fit for purpose for the future. This includes a reform of reserve services, for which stakeholder feedback has told us that we need to create more standardised products with procurement moving closer to real-time, whilst lowering barriers to entry for all technology types. Our commitment to the implementation of the European standard products is a key programme which will allow us to achieve this. We will be ensuring that the European standard products and our new national products fit well together and that the standard products are the primary tools used where possible.

Replacement reserves will form an important part of our balancing strategy. As NGESO employs a proactive strategy, we can forecast imbalance and use RR in the first instance to meet this need. In terms of timelines, NGESO will need to submit the imbalance need to the platform by 45 minutes ahead of real-time. RR will be one of the first tools that is used to secure balancing volume, meaning that we will be endeavouring to procure as much as possible from LIBRA before using other services.

Nevertheless, volume from the RR platform is not guaranteed, and so we will still need to mitigate this risk using other products. Our ability to use RR in this manner is dependent on the accuracy and reliability of our energy forecasts. Better energy forecasts will allow us to submit more efficient volumes to the RR platform and do a less residual balancing with our specific products.

TSOs will have the ability to price the imbalance needs submitted into the RR platform. This allows us to ensure that the actions we are taking are economical, an important aspect of our license condition (C16, paragraph 1). Therefore, we will price our imbalance needs in LIBRA according to the alternative volumes that we have available to us. We will always look to procure the volume from the LIBRA platform when economic to do so.

As well as this, once this new balancing tool is implemented, we will be performing a post-event analysis, which will allow us to identify where our strategy for balancing can evolve and ensure the optimal balancing of the system.

5.16 Poland (Polskie Sieci Elektroenergetyczne S.A.)

Polskie Sieci Elektroenergetyczne S.A. (hereafter PSE) is the Polish TSO. PSE operates an LFC block within the Continental Europe synchronous area. The PSE LFC block is equal to the LFC area, scheduling area and monitoring area covering the entire country. PSE applies a central dispatching model.

The PSE report on balancing prepared according to Article 60 of the EB regulation contains three main parts. The first part of the report presents a description of the basic principles of the balancing market in Poland and contains five specific points. The second part of the report contains an analysis of the mechanism for providing reserve capacity, which consists of explanations divided into four specific points. The third part of the report presents an analysis of the mechanism for balancing energy activation and the settlement mechanism in three specific points.

The first main part of the report describes the electricity market and the balancing market in Poland along with the tasks of PSE. The above items constitute an introduction to the description of the Terms and Conditions for Balancing Service Providers and Balance Responsible Parties following Article 18(5) to 18(7) of the EB regulation. The last two specific points in this part of the report characterise the integrated scheduling process, used by PSE as a TSO applying the central dispatching model, in accordance with Article 18(8) of the EB regulation and provide information on specific products in relation to the requirements of Article 60(2)(a) and Article 60(2)(d) of the EB regulation. References and conclusions from the obligations arising from the individual components of Article 18(5) to Article 18(7) of the EB regulation are presented separately for each of these components. Selected conclusions and observations from the first part of the report are presented below.

In reference to Article 18(5) of the EB regulation, each BSP should have at least one scheduling unit that actively participates in the balancing market and a dedicated IT system used for the communication between the BSP and TSO, e. g. activation of balancing energy. The BSP provides balancing services through the scheduling units. Only the scheduling unit representing a generation unit with appropriate technical capabilities can provide the frequency containment reserve and frequency restoration reserve. The replacement reserve can be provided by both generation and load units.

Referring to Article 18(5)(d) of the EB regulation, each BSP during the prequalification process should deliver documentation confirming the technical capabilities of the scheduling unit to provide given types of reserves. During the operation of the balancing market, BSP submits for each scheduling unit an integrated scheduling process bid.

Referring to Article 18(5)(e) of the EB regulation, each integrated scheduling process bid submitted by the BSP is assigned to the specific scheduling unit. Because the imbalance area is equal to the scheduling unit, the BRP that owns these scheduling units is responsible for balancing all bids provided for that unit. The evaluation of the provisions of balancing services Article 18(5)(f) of the EB regulation is performed based on the real-time measurements.

Referring to Article 18(5)(g) of the EB regulation, PSE uses neither standard nor specific products within the meaning of the EB regulation. Because PSE has not yet joined any of the platforms for the exchange of balancing energy, at present, it only uses local products based on the integrated scheduling process bids submitted by BSPs.

With reference to Articles 18(6)(e) and 18(6)(c) of the EB regulation, the definition of balancing responsibility for each connection is designed in such a way as to avoid any gaps or duplication of balancing liability for different market participants providing services under that connection. Each balancing market participant is a BRP, while the imbalance area is defined on scheduling unit level. The only entity responsible for balancing the interconnections with the transmission systems of other operators is a PSE that bears full responsibility for balancing them.

With reference to Article 18(6)(d) of the EB regulation, each BRP is obliged to deliver to the connecting TSO the information about the energy contracts concluded at the scheduling unit level with other BRPs and the measurement data for each BRP's scheduling unit.

With reference to Article 18(6)(g) of Regulation 2017/2195, one imbalance price is determined for the whole scheduling area; therefore, the imbalance price area is equal to the scheduling area.

With reference to Articles 18(6)(a), 18(7)(a), 18(7)(c), 18(8)(a) and 18(8)(b) of EB regulation 2017/2195, the integrated scheduling process in Poland starts in the day-ahead timeframe and the integrated scheduling process bids are submitted by BSPs no later than 14:30 the day before the electricity supply.

Submission of an integrated scheduling process bid for whole available capacity is mandatory for all generation units actively participating in the balancing market. BSPs do not offer unused generation capacities or other balancing measures after the gate closure time for the cross-zonal intraday market. Nevertheless, the integrated scheduling process bids submitted in the day-ahead market horizon are also valid in the intraday horizon.

Referring to Articles 18(5)(j) and 18(6)(f) of the EB regulation, the settlements of balancing services and imbalance energy are performed for each day of the month. Preliminary settlements data are available in the day d +1, while final ones in the day d +4. Settlements correction is possible in the following months: m +2, m +4, m +15.

The second main part of the report presents an analysis of the mechanism for reserve capacity provision. This analysis covers:

1. The summary analysis of the dimensioning of reserve capacity, including the justification and explanation for the calculated reserve capacity requirements, in accordance with Article 60(2)(b) of the EB regulation.

Capacity reserves are determined for the Daily Coordination Plan (9 %), Daily Technical and Trade Balance (14 %), Monthly Coordination Plan (17 %) and Annual Coordination Plan (18 %).

2. The summary analysis of the optimal provision of reserve capacity, including the justification of the volume of balancing capacity in accordance with Article 60(2)(c) of the EB regulation.

Due to the joint provision of energy and reserves as part of the integrated scheduling process that takes place after the closing of the stock market, the resources providing reserves are not excluded from the energy market. Further, the joint provision of energy and reserves as part of the co-optimization process ensures optimal use of available resources to obtain electricity and ensure the required level of reserves.

3. An explanation and a justification for the procurement of balancing capacity without the exchange of balancing capacity or sharing of reserves in accordance with Article 60(2)(f) of the EB regulation.

Due to the lack of contracting of balancing capacity, PSE does not purchase balancing capacity. Therefore, there is no need to provide explanations for its purchase without exchanging balancing capacity or sharing reserves.

4. Analysis of the opportunities for the exchange of balancing capacity and sharing of reserves in accordance with Article 60(2)(e) of the EB regulation.

PSE does not contract balancing capacities, and sharing its reserves with neighbouring TSOs would be inefficient due to significant uncertainties arising from the lack of a sufficiently coordinated mechanism for the allocation of transmission capacity in the CE region. Unscheduled power flows from Germany, through Poland, the Czech Republic and Slovakia towards Austria, the consequence of the meshed transmission grid in Central Europe, result in the inability to share power reserves due to the dynamic nature of unplanned loop flows and therefore the inability to ensure in advance that transmission capacity is available to provide electricity from shared reserves. Moreover, since PSE acquires reserves in the day-ahead timeframe within the integrated scheduling process, while neighbouring TSOs do it in a longer time horizon, the possibility of reserve sharing is limited.

However, even not sharing reserves, in case of urgent need PSE may provide energy to neighbouring TSOs using operational measures like Agreed Supportive Power/ Emergency Deliveries.'

The third main part of the report contains an analysis of the balancing energy activation and settlement mechanism. The analysis consists of three specific points, which include:

1. Analysis of the efficiency of the activation optimization functions for the balancing energy from frequency restoration reserves and for the balancing energy from replacement reserves in accordance with the Article 60(2)(g) of the EB regulation.

PSE uses efficient operation planning measures, which include IT systems, enabling technically safe and economically optimal operation of this system. Use by the PSE primary, secondary and tertiary power reserves allows PSE to react adequately to the changing conditions affecting the functioning of the Polish power system. Performed by the PSE control activities of frequency and power flows, in particular in cross-border connection lines, result from the need to balance the supply and demand for electricity and to comply with commercial contract terms.

2. Analysis of compliance of balancing energy and imbalance settlements with the requirements of establishing a guideline on electricity balancing in accordance with Article 44(1) of the EB regulation.

The pricing and settlement of balancing services on the balancing market are based on marginal prices and, therefore, faithfully reflect the situation of imbalance and the value of electricity in real-time. Consequently, it provides incentives to the entities participating in the balancing market to keep the system balanced or take actions to restore the system balance.

Marginal pricing mechanisms by settling commodities at the price of the most expensive accepted offer also motivates participants of the balancing market to behave in line with competition rules by creating incentives to provide offers based on short-term marginal costs and to offer balancing services on the market. The settlements are also financially neutral for the PSE, as an entity responsible for balancing energy supply and demand in the Polish power system. Cooperation with neighbouring power systems provides incentives for PSE to meet the obligation to ensure required levels of reserves. Because marginal pricing is used by most TSOs in Europe and is intended to be used for settling the balancing energy exchanged in the European balancing platforms, the mechanism used by PSE should allow for relatively easy harmonization of imbalance settlement mechanisms.

3. Additional settlement mechanisms separate from the imbalance settlement in accordance with Article 44(3) of the EB regulation.

Currently, no additional settlement mechanism separates from the imbalance settlement to settle balancing capacity purchase costs, administrative costs and other balancing costs are used in the Polish balancing market. The lack of this mechanism is related to the fact that PSE does not procure the balancing capacity.

5.17 Spain (Red Eléctrica de España S.A.U)

Red Eléctrica de España S.A.U (hereinafter referred to as 'REE') is the Spanish TSO. It is within Continental Europe (CE) synchronous area, as a part of it. The LFC block which it's equal to the LFC area, scheduling area and monitoring area covering the entire country.

The main ongoing EB regulation actions in the Spanish system are the following:

1. Regulatory and technical SCADA/IT and settlement changes already made for the go-live of both TERRE (go-live already accomplished at Q1 2020) and IGCC platform (go-live scheduled for Q2–Q3 2020).

2. Regulatory and prequalification tests adaptation to allow demand facilities, both in an individual and in an aggregated way, to participate in balancing services markets since Q3 2020 (once approved corresponding operating procedures), and to promote any type of generation technology to provide balancing services. Participation of storage different than pumping units in balancing services markets will require further regulatory changes yet to come in the Spanish regulation.

3. Adaptation of IT, metering (an adaptation of XB metering system to 15 minutes resolution) and settlement systems and the associated regulatory changes are being implemented to evolve towards the financial settlement of the intended exchanges of energy as a result of the frequency containment process and ramping period (CCFR) and unintended exchanges (CCU) (Project FSkar) within Synchronous Area Continental Europe. From a European regulatory point of view, submission of a reviewed FSkar proposal to Regulatory Authorities (adapted to Regulatory authorities' RfA) by TSOs has being carried out in April 2020. This new reviewed proposal shall be approved by Regulatory Authorities by 15 June 2020. Considering that FSkar should be implemented 12 months after the FSkar proposal approval by Regulatory Authorities', expected implementation for FSkar in June 2021.

4. IT system changes to adapt IT scheduling system to 15 minutes granularity. This internal project is key for future participation at MARI platform and future 15 minutes modulation of BSPs' bids participating at RR LIBRA/TERRE platform.

5. Starting a project to adapt the Spanish aFRR scheme towards a common merit order list (CMOL) activation approach instead of the current approach based on a pro-rata activation for the aFRR energy.

6. Update of national regulation to eliminate caps and floors for balancing energy markets. Additionally, a public consultation on the adaptation of Spanish Operating Procedures to the Spanish Terms and Conditions[94] recently approved by the Spanish Regulatory Authorities (CNMC) was launched on 23rd March.

The current Spanish EB regulation roadmap[95] is publicly available (only in Spanish).

94 **Terms and conditions** and the **legal act approving them**

95 **Spanish EB regulation roadmap**

5.18 Portugal (REN – Rede Eléctrica Nacional S.A.)

REN - Rede Eléctrica Nacional S.A. (hereafter REN) is the Portuguese TSO for continental Portugal. It is within the Continental Europe (CE) synchronous area. As a participant, REN is in charge of the LFC block which is equal to the LFC area, scheduling area and monitoring area covering the entire country. REN is not a central-dispatch TSO. Portugal forms the LFC area controlled by REN thus, all balancing reserves are valid for this control area.

Portugal maintains a legal document, Manual de Procedimentos de Adesão ao Gestor Global de Sistema (MPGGS)[96], which defines all the rules for operating as a market agent in Portugal, namely the type of reserves, rules for pricing, evaluation of balancing reserves bids and settlement.

Nevertheless, the terms and conditions defined in Article 18 of the EB regulation have not been approved by the Portuguese regulatory authority.

In relation to settlement and invoicing, it takes place after the balancing service evaluation period, followed by an appeal period, and is REN's responsibility.

Furthermore, all BSPs need to sign a contract with REN, submit to a prequalification test and test the connection to the REN control system to be able to participate in the balancing markets.

The MPGGS define:

- The technical requirements for balancing services and the possibilities and conditions of aggregation.
- The consequences of non-compliance are described in the MPGGS. If the BSP fails to provide the contracted balancing reserves (aFRR), the BSP will be subject to a penalty in the relevant settlement period; and if the BSP fails to provide the balancing energy (RR and mFRR), the BSP will be subject to imbalance. If the BSP does not provide the balancing services according to the technical requirements established in the MPGGS, the BSP might be suspended from provision of any balancing services and has to be subject to a set of prequalification tests to verify compliance.
- BRPs are responsible for their imbalance, and they cannot transfer the imbalance responsibility to another BRP under contract.
- REN computes the imbalance position of each BRP based on the measured values of energy for the consumption, including losses, the measured values of energy for production facilities and the contracted energy on the organized markets, bilateral contracts and balancing services.
- REN defines the financial value for the imbalance of each BRP based on the imbalance position of each BRP over the cost associated with the balancing market.
- Tariffs cover the administrative costs of balancing.
- Regarding imbalance settlement and other balancing capacity costs, economic neutrality is guaranteed.

No exemption is in place regarding the publication of bids (price and quantity) of balancing energy or capacity, in accordance with Article 12(4) of the EB regulation.

Given that the standard products were still in definition or implementation and since the go-live of balancing platforms in accordance with Articles 19(5), 20(6) and 21(6) of the EB regulation hasn't occurred; there was no usage of specific products in years 2017 and 2018, therefore no information on procured or used specific product volumes are available. Until the balancing platforms go live, REN cannot provide any justification that standard products are not sufficient to ensure operational security to maintain the system balance efficiently, as there is no usage of specific or standard products.

96 **Manual de Procedimentos de Adesão ao Gestor Global de Sistema (MPGGS)**

5.19 France (Réseau de Transport d'Electricité)

Réseau de Transport d'Electricité (hereafter RTE) is the French TSO. It is within the Continental Europe (CE) synchronous area and, as a participant, RTE maintains the LFC block which is equal to the LFC area, scheduling area and monitoring area covering the entire country.

5.19.1 The design of the French balancing model

The concept of BRP underpins the French market. In France, BRPs are financially responsible for their imbalances. The French balancing model is based on a decentralised dispatch of power generating units or demand response facilities.

Closer to real-time, the power system is managed in a centralised and proactive way by RTE. The French balancing market relies on a unit-based scheduling process which gives TSOs very detailed forecast information about the status of the power system. To balance the French power system, RTE uses a dynamic system for sizing the balancing capacity required throughout the day.

Supply-demand balance and network constraints are jointly managed. 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.

Balancing the French power system involves pooling all balancing resources. A wide selection of power generating units or demand response facilities, even independently of any contracting process, can formulate bids, thus enabling RTE to access the entire power system's flexibility potential. The balancing bids are submitted by BSPs[97], which play a different role from the role played by BRPs[98], and the activated balancing bids are systematically controlled. These systematic checks ensure the proper functioning of the balancing market:

- By encouraging the suitable delivery of balancing bids.
- By accurately supervising the expected level of reliability for the balancing bids.
- By encouraging BSPs to declare their shortcomings as early on as possible.

Balancing bids can be used to meet the various needs of the power system's short-term management. Bids are not assigned ex-ante and can be used at the best price based on needs.

The balancing market has been open to contributions from balancing resources located abroad since it was created. All types of resources (power generating units or demand response facilities) connect to both the transmission and distribution grids and can play a part in the balancing market.

97 Terms and conditions for BSPs participating in FCR and aFRR (**Link 1**, **Link 2**) and participating in **mFRR and RR**

98 **Terms and condition for BRPs**

5.19.2 Two years of balancing the French system

5.19.2.1 Procurement of reserves

Year	2018				2019			
Balancing process	FCR	aFRR	mFRR	RR	FCR	aFRR	mFRR	RR
Volume procured (MW)	536	645	1,500		527	646	1,500	
Capacity price (k€/MW/year)	113.2	163.8	10.0	5.1	78.7	169.6	12.7	7.6

Table 17 – Procurement of reserves

To respect SO regulation criteria and be able to face any dimensioning incident (1,500 MW) on its grid, (i) RTE has procured on average 530 MW of FCR through a European tender, the FCR cooperation, performed weekly until 1 July 2019 and then daily; (ii) RTE has prescribed daily an average of 645 MW of aFRR to the French stakeholders;, (iii) RTE has jointly procured, only upward, 1,500 MW of mFRR and RR through an annual national tender.

5.19.2.2 Balancing the French system in real-time

In 2018 and 2019, RTE has activated on average 8 TWh of existing products of mFRR and RR, remunerated with the pay-as-bid scheme, for an average price of 69 €/MWh upward and 29 €/MWh downward. FCR and aFRR volumes activated have been remunerated at the day-head spot price.

Since 2010, France has been reforming its electricity market to remove all barriers for the provision of balancing resources from consumer sites. This has resulted in active participation of demand-side management on every reserve. For instance, demand-side management contributes to respectively 15 % of the FCR and, on average, 800 MW of mFRR and RR bids from demand-side management were offered in 2018 and 2019.

RTE continuously aims to remove all the barriers that could prevent the full participation of renewable energy resources. During the past two years, renewables (mainly hydro) represented 57 % of the FCR activated, 48 % of the aFRR activated and 43 % of the mFRR and RR activated.

5.19.2.3 Imbalance settlement

In 2018 and 2019, on average, 146 BRP were active on the French balancing market. The average system imbalance is + 390 MWh for an ISP with a positive imbalance and - 350 MWh for a negative imbalance. On average, the system imbalance is 55 % of the ISP positive and 45 % negative.

RTE has evolved and will continue to evolve to provide, as closely as possible to real-time, information to BRP about their imbalances. The aim is to encourage BRP to be individually encouraged to take appropriate actions before the TSO balancing timeframe and foster a better understanding of their portfolios.

Finally, in 2017 RTE changed its methodology to elaborate the imbalance price. The price reference is now unique: a volume-weighted average price. A mark-up 'k' completes the formula with two objectives (i) give the correct incentives to BRP to be balanced at any time and (ii) to ensure TSO financial neutrality. This method may evolve in the near future to comply with the new European framework adopted by ACER.

RTE has contributed since the beginning to establish a European balancing market

RTE will use in priority standard products to balance the French power system. The use of standard products increases the liquidity of balancing bids at the regional level and boosts the imbalance netting potential between European countries. This small number of standard products ensures liquidity on the platforms and maximize the benefits of sharing balancing energy. However, it does not allow for all imbalances to be reabsorbed. RTE, therefore, proposes to continue, when the platforms are live, to keep using specific mFRR and RR products activated locally under the conditions outlined by the EB regulation.

RTE is actively contributing to European projects establishing a European balancing market (TERRE, MARI, PICASSO, IGCC and FCR cooperation) and the European discussion defining a framework for the exchange of balancing capacity. Apart from FCR cooperation, in which RTE is already member, RTE is interested in participating in such regional cooperation for procuring balancing capacity and will assess the benefits of such participation, especially when the procurement of aFRR, mFRR and RR has evolved locally.

5.20 Slovak Republic (Slovenská elektrizačná prenosová sústava a.s.)

Slovenská elektrizačná prenosová sústava a.s. (hereafter **SEPS**) is the Slovakian TSO. It is within the Continental Europe (CE) synchronous area. As a participant in the CE SEPS has the LFC block equal to the LFC area, scheduling area and monitoring area covering the entire country. SEPS is applying a self-dispatch model.

All balancing reserves are valid for this control area. The rules for pricing and evaluation of balancing reserve bids and the subsequent evaluation of balancing services are set in the Terms and Conditions for BSPs.[99]

There was no usage of specific products in the years 2017 and 2018 and, therefore, no information on procured or used specific product volumes is available.

SEPS performs weekly, daily and intraday operational planning. SEPS is not a central-dispatch TSO.

Dimensioning of reserve capacity is based on the calculation of historical data following requirements determined by EB regulation. Setting the optimal volume of the ancillary services, it is necessary to apply the principle of time breakdown and seasonality while the time breakdown includes months, weeks, days, or hours of the day and the seasonality includes seasons or individual months of the year. When setting the required volumes of the ancillary services, the expected maximum loads of the control area within the monitored time period according to the time breakdown and statistical data according to seasonality to which the time period belongs shall serve as the starting data. To set the required volume of the ancillary services, the data from the most recent five years shall be used. In addition to the statistical approach, the outage of the largest power plant within the LFC block is considered a reference incident. Calculated capacity requirements of FRR were the following:

Year	aFRR±	mFRR3+	mFRR3-	mFRR10+	mFRR10-	mFRR15+	mFRR15-
2018	145	255	135	215	100	120	120
2019	145	255	135	215	100	120	120

Table 18 – Calculated capacity requirements of FRR

The procurement of balancing capacity from FRR with the exchange of balancing capacity or sharing of frequency restoration reserves was not used.

SEPS is a member of the IGCC as of May 2020.

99 See **here** and **here**

5.21 Switzerland (Swissgrid AG)

Swissgrid AG (hereafter Swissgrid) is the Swiss TSO. It is within the Continental Europe (CE) synchronous area. As a member, Swissgrid has an LFC block which is equal to the LFC area, scheduling area and monitoring area covering the entire country. Swissgrid applies a self-dispatch system; thus, it is not a central-dispatch system.

Terms and conditions (T&C) for BSP in accordance with Article 18(5) of the EB regulation are listed below and published on Swissgrid's website[100].

Frequency containment reserves (FCR):

- Framework Agreement for the Supply of Primary Control Power
- Conditions of tender – primary control power
- Technical regulations and procedural rules governing the prequalification of ASP for the supply of primary control power

Automatic frequency restoration reserves (aFRR):

- Framework agreement for the supply of secondary control power
- Conditions of tender – secondary control power
- Technical regulations and procedural rules for prequalification of an ASP for the supply of secondary control power

Manual frequency restoration reserves (mFRR):

- Framework agreement for the delivery of tertiary control power (valid in 2019)
- Conditions of tender – tertiary control power
- Technical regulations and procedural rules for prequalification of an ASP for the supply of tertiary control power

Terms and conditions for BRPs (in accordance with Articles 18(6) and 18(7)) are also published on Swissgrid's website[101] under the category 'legal system'. The current T&C include all the T&C updates needed for the establishment of European platforms for the exchange of balancing energy from replacement reserves and for the imbalance netting process.

The website contains the following documents:

- Balance responsible party contract
- Appendix 1: General balance responsible party regulations
- Appendix 2: Technical balance responsible party regulations
- Appendix 3: Registration form
- Appendix 4: Balancing pooling

Regarding rules for the suspension and restoration of market activities pursuant to Article 36 of the E&R regulation and rules for settlement in the case of market suspension pursuant to Article 39 of the E&R regulation approved in accordance with Article 4 of the E&R regulation, Swissgrid will announce a derogation. Swissgrid has started the design of these rules and expects the implementation to be completed by the end of 2023.

100 **Terms and conditions** for balancing service providers (BSP)

101 **Terms and conditions** for balancing responsible parties (BRP)

5.21.1 Balancing products and key performance metrics of the balancing market in Switzerland

5.21.1.1 Available balancing services

Swissgrid procures balancing services to assure the equilibrium of its control block and to maintain the frequency in the synchronous area CE. Swissgrid determines the required reserve capacity on aFRR and mFRR based on historical records and dimensioning incidents and procures balancing capacity in an auction mechanism. Additionally, BSPs can provide further energy which is compensated at the offered price (pay-as-bid). These mechanisms provide incentives for BSPs to offer and deliver balancing services to the connecting TSO and support competition among market participants.

On average, Swissgrid procured 1,083 MW of upward balancing capacity in 2019, of which 0.34 MW were not available due to unavailability of the BSP. In the downward direction, 856 MW of balancing capacity were available on average in the control block of Swissgrid, and 0.49 MW had not been available due to unavailability of the BSP. Details are provided in Table 20.

	Total volume of available bids (average)	Unavailable bids (average)	Unavailable bids (max)
FCR	61	0	0
aFRR upward	394	0	0
aFRR downward	383	0	0
mFRR upward	628	0.34	30
mFRR downward	412	0.49	66
Total upward	**1,083**	**0.34**	**33**
Total downward	**856**	**0.49**	**66**

Table 19 – Available balancing services; Annual average in MW

Regarding the weekly average over the course of 2019, one can see that the weekly average is similar to the yearly average (Figure 29). Therefore, there were no weeks with significantly reduced availability of balancing reserves in 2019.

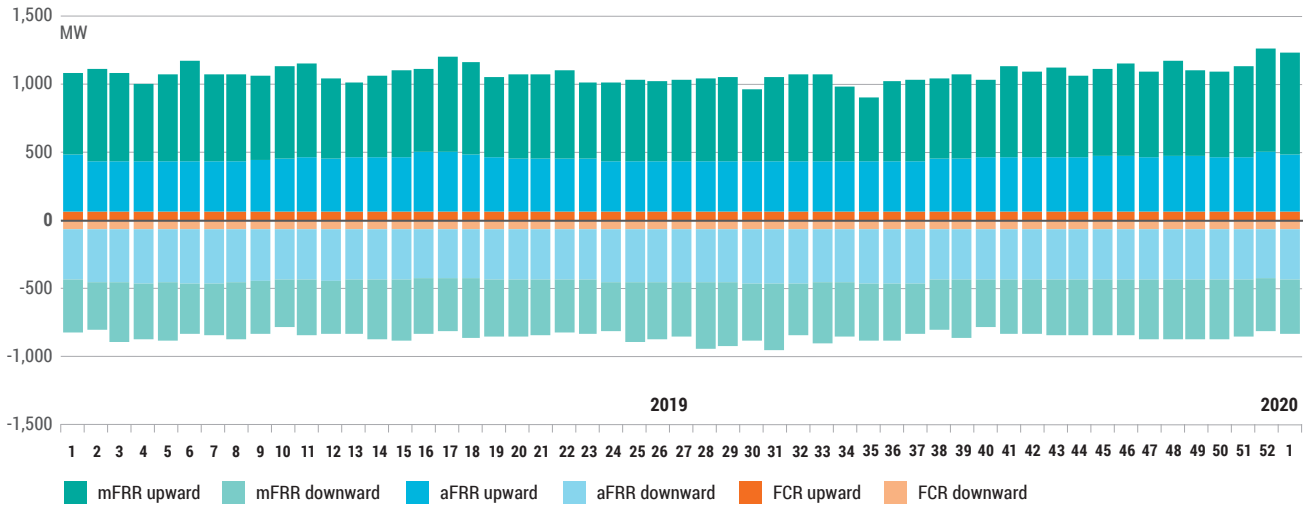


Figure 29 – Availability of balancing capacity bids, including the bids (KPI 3.1, according to Article 59 of the EB regulation)

5.21.1.2 Imbalance netting and the IGCC

The Article 22 of the EB regulation defines the imbalance netting process (IN platform), which is implemented by the IGCC. Swissgrid has been a member of the IGCC, which is to become the future European Platform for the IN process, since March 2012.

According to ENTSO-E: 'Imbalance netting is the process agreed between TSOs of two or more LFC areas that allows avoiding the simultaneous activation of frequency restoration reserves (FRR) in opposite directions by taking into account the respective frequency restoration control errors as well as the activated FRR, and by correcting the input of the involved frequency restoration processes accordingly. IGCC performs imbalance netting of automatic frequency restoration reserves (aFRR)'. Further details can be found on the official **ENTSO-E website on IN**.

In 2019, Swissgrid imported 148.8 GWh of balancing energy from IGCC and exported 179.0 GWh of balancing energy to IGCC. Figure 30 displays the monthly imported and exported energy from and to the IGCC for 2019.

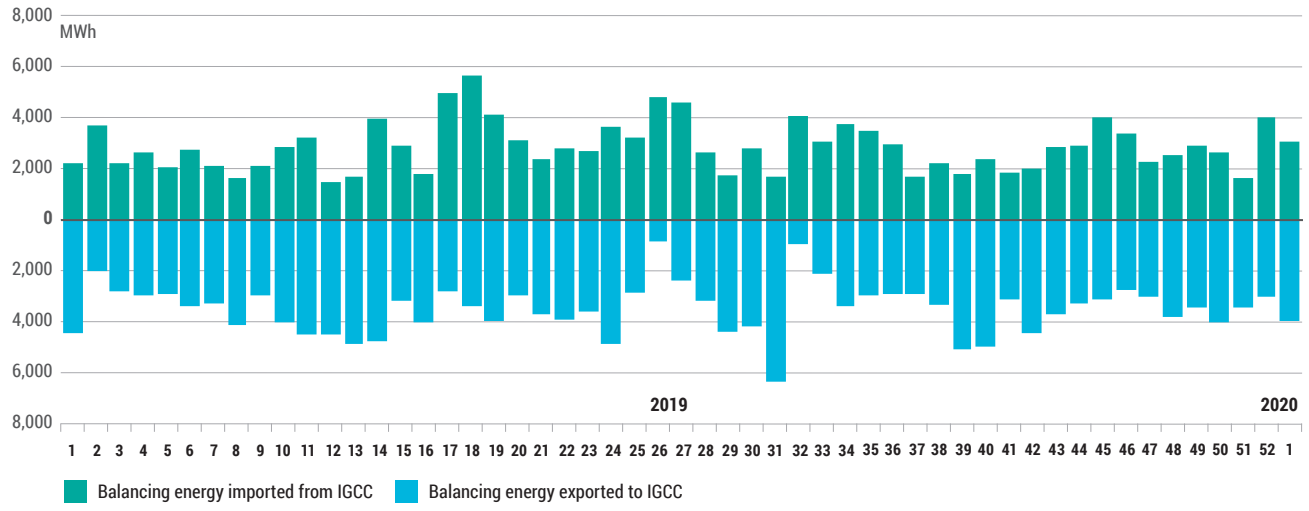


Figure 30 – Monthly imported and exported energy from and to the IGCC (KPI 3.4.d, according to Article 59 of the EB regulation)

5.21.1.3 Activated balancing capacity

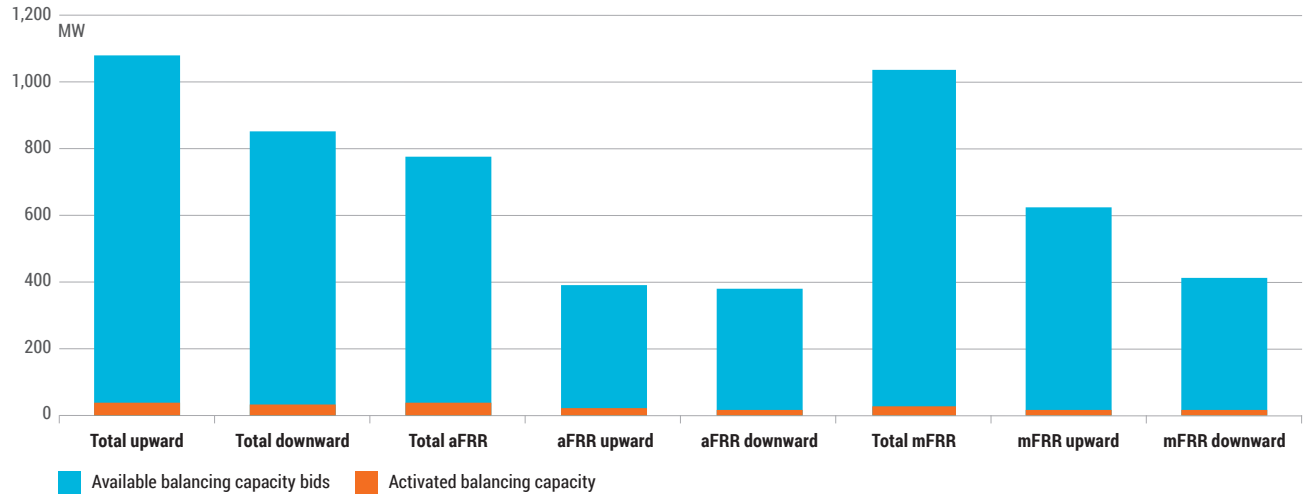


Figure 31 – Available balancing capacity bids versus activated balancing capacity (KPI 3.8 according to Article 59 of the EB regulation)

A further indicator of a well-functioning balancing mechanism is its utilization. In exceptional cases, e. g. loss of a power plant, the total available balancing capacity may be used to reduce the impact of the incident. Figure 31 shows the activated balancing energy compared to the available balancing capacity.

The highest utilization occurs for positive aFRR (secondary balancing energy in Swiss terminology), which is used with an annual average 5.2 % of the available positive aFRR capacity. Separated by direction, 3.3 % of the available positive capacity (of all products) had been used. In the opposite direction, 3.8 % of the available downward capacity (of all products) was used.

5.21.1.4 Balancing energy costs

In 2019, Swissgrid incurred annual total net costs for balancing energy activations of € 22 million. By contrast, the imbalance net revenue amounts to € 43 million. Figure 32 shows for each balancing product the total annual cost or income and the average prices, as well as the total annual cost or income and the average price of imbalance energy for the BRPs in €/MWh. Separate statistics for specific und standard products will be provided in future reports once the standard products have been implemented.

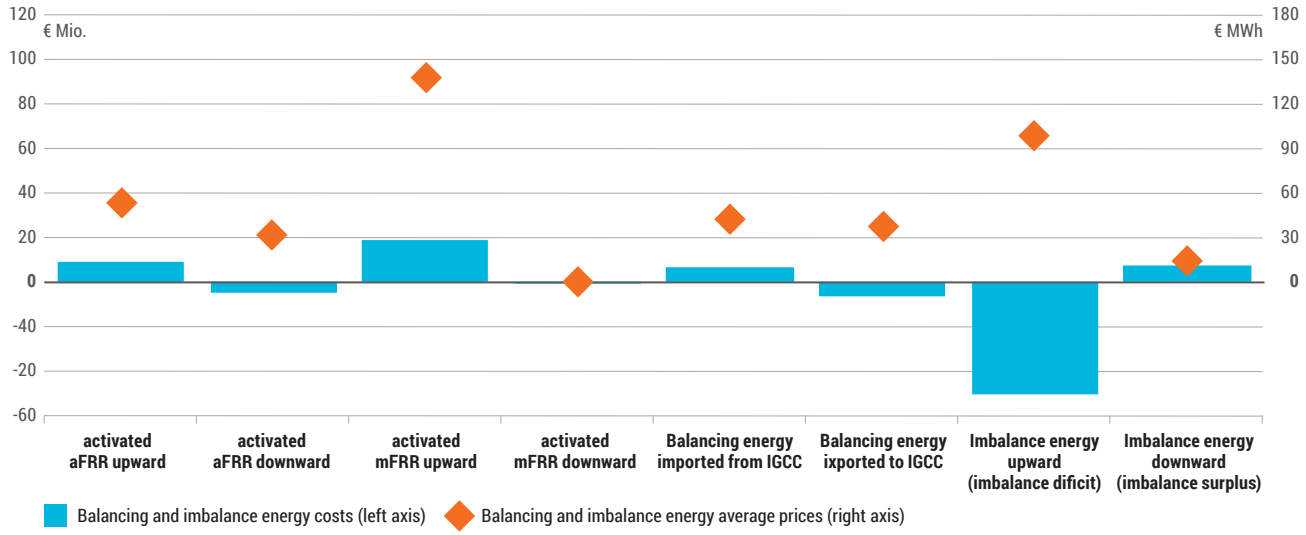


Figure 32 – Balancing product costs and imbalance energy prices (KPI 3.4. a. to c. / 3.9 according to Article 59 of the EB regulation)

5.21.1.5 Settlement principles and imbalance energy price mechanism

The imbalance energy price mechanism in the control block of Swissgrid is a two-price system in which the 15-minute prices for imbalance energy are calculated as a function of the direction of the 15-minute deviation of a BRP. The calculation can be inferred from the following Table 21.

Balancing responsible party	short (deficit)	BRP pays $(A + P_1) \times a_1$	$A = \max(P_{spot}; P_{sek}; P_{ter})$
	long (surplus)	BRP receives $(B - P_2) \times a_2$	$B = \min(P_{spot}; P_{sek}; P_{ter})$

With alpha factors as following:	a_1	1.1
	a_2	0.9
With base price as following:	P_1	1 ct/kWh
	P_2	0.5 ct/kWh

Table 20 – Calculation of imbalance energy prices

Note:

Within the calculation of prices, A and B, the prices of Psek and Pter will only be used if the use of secondary or tertiary control occurred in the relevant direction.

P_{spot} is the Swissix day-ahead spot price for the given 15-minute period.

P_{sek} is the price for aFRR (in Swiss terminology secondary control energy) in the given 15-minute period.

$P_{ter-/+}$ is defined as the weighted average price of the mFRR (in Swiss terminology tertiary control energy) which is procured in the given 15-minute period.

If the price $(A+P_1)$ results in a negative price, the alpha factor α_1 will be replaced by the alpha factor α_2. If the price $(B-P_2)$ results in a negative price, the alpha factor α_2 will be replaced by the alpha factor α_1.

The settlement process at Swissgrid aims to provide incentives to balance responsible parties to be in balance. It avoids distorting incentives for BRPs and BSPs. The price at which imbalances are settled reflects the market prices as it is calculated based on the minimum and/or maximum of the actual market prices of the spot market, aFRR and mFRR (in Swiss terminology secondary or tertiary balancing) prices. Furthermore, the imbalance prices establish adequate economic signals which reflect the imbalance situation of Swissgrid's control block.

The current balance energy prices are published for each 15 minute period on Swissgrid's website in the subsection on balance energy, (**see here**) for each month by the 15th working day of the following month.

5.22 Norway (Statnett SF)

Statnett SF (hereafter Statnett) is the Norwegian TSO. It is within the Nordic (N) synchronous area and, as a participant, the LFC block is shared with the other Nordic TSOs (i. e. Svenska kraftnät, Fingrid, Energinet). In regard to the LFC areas, scheduling areas and monitoring areas, these are equal to the five bidding zones NO1, NO2, NO3, NO4 and NO5.

The Terms and Conditions for BSPs, in accordance with Article 18(5) and 18(7), are subject to an ongoing regulatory process and are thus not approved. See below for Statnett's existing Terms and Conditions for BSPs.[102]

The terms and conditions for BRPs, in accordance with Article 18(6) and 18(7), are subject to an ongoing regulatory process and are thus not approved. See below for Statnett's existing terms and conditions for BRPs.[103]

Article 26(1) of the EB regulation requires that, following the approval of the implementation frameworks for the European platforms pursuant to Articles 19, 20 and 21 thereof, each TSO may develop a proposal for defining and using specific products for balancing energy and balancing capacity.

Article 44(1) of the EB regulation	Status
(a) Establish adequate economic signals which reflect the imbalance situation	Accomplished
(b) Ensure that imbalances are settled at a price that reflects the real-time value of energy	Accomplished
(c) Provide incentives to balance responsible parties to be in balance or help the system to restore its balance	Accomplished
(d) Facilitate harmonization of imbalance settlement mechanisms	Accomplished
(e) Provide incentives to TSOs to fulfil their obligations pursuant to Article 127, Article 153, Article 157, and Article 160 of the SO regulation	Accomplished
(f) Avoid distorting incentives to balance responsible parties, balancing service providers and TSOs	Accomplished
(g) Support competition among market participants	Accomplished
(h) Provide incentives to balancing service providers to offer and deliver balancing services to the connecting TSO	Accomplished
(i) Ensure the financial neutrality of all TSOs	Accomplished

Table 21 – Statnett status

102 **Norwegian terms and conditions for BSPs**

103 **Norwegian terms and conditions for BRPs**

From 18 December 2017 to 18 December 2019, the implementation frameworks for the European platforms were not approved. Thus, the balancing products, which were used during the scoping period, cannot be defined as specific products. Therefore, this summary does not further address questions related to specific products.

Statnett uses balance fees and grid tariffs to cover the procurement costs of balancing capacity.

Balance service fees cover:

- 10 % of the procurement costs of aFRR balancing capacity[104]
- 10 % of the procurement costs of mFRR balancing capacity
- 40 % of the procurement costs of FCR-N balancing capacity
- 40 % of the procurement costs of FCR-D balancing capacity

Grid tariffs cover:

- 90 % of the procurement costs of aFRR balancing capacity
- 90 % of the procurement costs of mFRR balancing capacity
- 60 % of the procurement costs of FCR-N balancing capacity
- 60 % of the procurement costs of FCR-D balancing capacity

5.22.1 Procurement of balancing capacity within the control area and exchange of balancing capacity with neighbouring TSOs

Article 32(1) of the EB regulation states that 'each TSO shall perform an analysis on optimal provision of reserve capacity aiming at minimisation of costs associated with the provision of reserve capacity. This analysis shall take into account the following options for the provision of reserve capacity':

- Procurement of balancing capacity within the control area and exchange of balancing capacity with neighbouring TSOs, when applicable.
- Statnett has in the period from 18 December 2017 to 18 December 2019 procured balancing capacity within its control areas, in the following way:

aFRR	The aFRR balancing capacity is now procured weekly in a national market. aFRR balancing capacity is procured to cope with imbalances within the control area.
mFRR	The mFRR balancing capacity for upward regulation is procured in a national market. The market consists of seasonal and weekly. mFRR balancing capacity is procured to ensure reserves to cover dimensioning incidents and cope with imbalances within the control area.

Table 22 – Statnett balancing capacity

104 Including the cost of balancing energy.

The Nordic TSOs plan to establish common procurement procedures for aFRR and mFRR, to exploit more efficiently the possibility to exchange capacity within the LFC block. Currently, the status for this is a common Nordic aFRR capacity market, according to the Nordic Balancing Model (NBM) Roadmap[105], that will be implemented in 2020. The exact date is unclear due to a comprehensive regulatory process, where the proposal has been sent to ACER for a final decision. According to the NBM Roadmap, a common Nordic mFRR capacity market will be implemented in 2023.

The Nordic TSOs also exchange FCR in bilateral agreements in cases where such an exchange can be performed respecting the operational security limits.

› Sharing of reserves, when applicable.

The Nordic TSOs do exploit the possibility of sharing reserves (within the LFC block) both implicitly in the FRR dimensioning process and explicitly in bilateral agreements, such as the SE–DK sharing agreement.

› The volume of non-contracted balancing energy bids which are expected to be available both within their control area and within the European platforms considering the available cross-zonal capacity.

The European platforms are currently not in operation in the Nordic countries. However, the Nordic TSOs operate a common regulation power market, the mFRR energy activation market, which, to a substantial extent, is based on non-contracted balancing energy bids. A national balancing capacity procurement complements non-contracted balancing energy bids during periods where the non-contracted balancing energy bid volumes are expected to be too low to meet reserve requirements.

5.22.2 Opportunities for the exchange of balancing capacity and sharing of reserves:

The Nordic TSOs (Svenska kraftnät, Statnett, Fingrid and Energinet) intend to establish regional balancing capacity markets for aFRR and mFRR balancing capacity. The purpose of the establishment of a common Nordic market for aFRR and mFRR capacity is to increase socioeconomic welfare on a Nordic level and to increase operational security in the most efficient way.

The regional balancing capacity market is based on the FRR dimensioning process, which will result in FRR volumes per LFC area (equal to bidding zone). This initial LFC area reserve requirement can then be procured in another LFC area, provided that there are available CZCs that can accommodate the exchange.

According to Article 33(4) in the EB regulation, all TSOs can either decide to ensure CZC for the exchange of balancing capacity based on a probabilistic approach or in accordance with one of the three alternative methodologies specified in Article 40 'Co-optimised', Article 41 'Market-based' and Article 42 'Economic efficiency' of the EB regulation.

Based on both theoretical assessments and practical experience, the Nordic TSOs consider that the application of a market-based CZC allocation methodology will lead to a more socioeconomically beneficial use of the CZC in the Nordic region overall.

The proposed methodology for the market-based allocation of CZC in accordance with Article 41 of the EB regulation can be used for both aFRR and mFRR. The details of the market design for an mFRR capacity market is, however, not yet decided.

105 **Nordic Balancing Model (NBM) Roadmap**

5.23 Netherlands (TenneT TSO B.V.)

TenneT TSO B.V (hereafter TenneT NL) is the Dutch TSO. TenneT NL is the single connecting TSO for the Bidding Zone NL, which is equal to the imbalance price area, with only one imbalance area. The balancing market is organized according to self-dispatching model. TenneT NL is responsible for its single LFC block, with only one LFC area – as part of the Continental Europe (CE) synchronous area.

TenneT NL publishes this biennial report on balancing in accordance with Article 60 of Regulation (EU) 2017/2195. This report covers the years 2018 to 2019, with data from 2017 added as reference and reports on:

The status of national implementation of requirements pursuant to the EB regulation, including:

- Terms and conditions for BSPs and BRPs: The National Grid Code[106] has been updated per 18 December 2018.

- Market suspension and restoration rules, and settlement rules in case of market suspension: an update of the National Grid Code to include these rules is in process;[107] no separate imbalance settlement rules are foreseen during the market suspension.

- Accession to the European platforms:[108]
  - Imbalance Netting: Yes, participating in IGCC[109] as of February 2012
  - PICASSO (aFRR): Not yet
  - MARI (mFRR): Not yet
  - TERRE (RR): No

- Introduction of standard and specific balancing energy products: No standard products have been introduced yet, prior to accession to the European platforms for the exchange of balancing energy. TenneT NL defined no specific products for balancing capacity and balancing energy and, consequently, no specific products were approved by the relevant regulatory authorities, nor used by TenneT NL.[110]

- All settlement principles,[111] in place since 2001, comply with Regulation (EU) 2017/2195.

This report covers the years 2017 to 2019 and presents the status of national implementation of requirements pursuant to the EB regulation, including:

- Settlement principles that comply with EB regulation:
  - Single-position BRPs (with 15-minute ISPs).
  - Single imbalance pricing, with only specific ISPs with dual imbalance pricing.
  - All imbalance prices comply with Articles 55(4), (5) and (6) of the EB regulation.
  - Balancing energy bid prices are per ISP and become firm2 ISPs prior to ISP of delivery to allow bid price consistency with all previous wholesale markets
  - Value of avoided activation is defined at mid-price MOL FRR.
  - Balancing energy prices uniform per ISP, for all FRR balancing energy.
  - Finalization within ten working days, including the procedure for BRPs and BSPs to challenge settlement volumes.
  - Financial neutralization TSO is guaranteed in National Grid Code through Article 44(2) of the EB regulation. No financial mechanism with BRPs, separate from imbalance settlement, is implemented or considered.

- The development of:
  - Dimensioning of balancing capacity: For the calendar years covered by this report, the deterministic criterion exceeded the stochastic and probabilistic criteria for the minimally required volumes of frequency restoration reserves, allowing reserve sharing.
  - Provisioning of balancing capacity, including sharing of reserves: Introduction of flow-based market coupling in May 2015 eventually removed the opportunity to use reserve sharing (under normal operating conditions) to fulfil FRR dimensioning requirements, resulting in a significant increase in balancing capacity (FRR) volumes and costs.
  - The efficiency of the frequency restoration process, including FRR activation.

106 National Grid Code
107 National Grid Code current development
108 TTN participates in FCR cooperation
109 IGCC documentation
110 Current aFRR, mFRRsa and mFRRda
111 Imbalance pricing system TTN

5.24 Italy (Terna – Rete Elettrica Nazionale SpA)

Terna – Rete Elettrica Nazionale SpA (hereafter Terna) is the Italian TSO. Terna is part of the Continental Europe (CE) synchronous area. The country is also part of an LFC block which is equal to the LFC area, scheduling area and monitoring area covering the entire country.

In Italy, a central dispatching model is adopted to determine both the unit commitment status and the dispatching level of dispatchable facilities within an integrated scheduling process where commercial and technical data, as well as the start-up characteristics of these facilities, are considered as an input to the process itself, together with the latest control area adequacy analysis and operational security limits.

The central dispatching model is adopted in the Ancillary Services Market, where Terna procures the dispatching resources needed for the secure operation of the Italian electric power system. Particularly, during the scheduling phase of the Italian Ancillary Services Market (named MSD ex-ante), upward and downward integrated scheduling process bids are selected to relieve congestion and ensure the availability of appropriate FRR and RR margins.

During the real-time phase of the Italian Ancillary Services Market (or balancing market), upward and downward integrated scheduling process bids are selected with the aim of maintaining the balance between electricity injections and withdrawals, relieving real-time congestion and ensuring or restoring FRR and, if needed, RR margins. In this regard, the minimum aFRR requirement is calculated for each hourly period and zonal aggregation, as a function of load forecasts and taking into account the safe operation of the interconnection between the mainland, Sicily, Sardinia and, for the islands, the regulating contribution of interconnections.

The mFRR requirement is dimensioned to cover, for each hourly period and each zonal aggregation, the complete reconstitution of aFRR margins and taking into account the unplanned unavailability of thermal production, in case of upward capacity, or hydroelectrical loads, in case of downward capacity, for a quantity at least equal to, respectively, the maximum schedule among all thermal productions or the maximum schedule among all the hydroelectrical loads.

The RR requirement is dimensioned for each hourly period and each zonal aggregation, taking into account the unplanned unavailability of thermal production, in case of upward capacity, or hydroelectrical loads, in case of downward capacity, for a quantity at least equal to, respectively, the maximum schedule among all the thermal production or the maximum schedule among all the hydroelectrical loads, together with the forecast error of electrical demand and intermittent RES production.

In Italy, participation in the Ancillary Services Market is unit-based and mandatory for all dispatchable facilities with maximum power at least equal to 10 MVA and the needed technical requirements to provide ancillary services procured on this market, by remunerating BSPs based on a pay-as-bid pricing rule. Participation in the Ancillary Services Market by aggregation has been introduced, on a voluntary basis, pursuant to Resolution 300/2017/R/EEL[112] of the Italian national regulatory authority. The gate closure time of the scheduling phase of the Italian Ancillary Services Market is set at 17:30 of D -1, after which only temporary variations of technical parameters of dispatchable facilities or the unavailability for the dispatching service can be notified to Terna. Consistently with the adoption of a central dispatching model in the Ancillary Services Market, participation in the RR platform pursuant Article 19 of the EB regulation will take

112 **Resolution 300/2017/R/EEL**

place as follows: Terna will determine for each dispatchable facility upward and downward quantities to be sent to the RR platform by means of a conversion process,[113] compatibly with RR standard product features, dispatchable facilities technical parameters and all system constraints. Moreover, Terna will associate upward and downward prices submitted by BSPs to the converted quantities.

In Italy, all BRPs are financially responsible for their imbalances, which are settled with Terna. A dual imbalance pricing rule is applied for facilities participating in the Ancillary Services Market as well as to import and export points, while a single imbalance pricing rule is applied to all other facilities. Two imbalance price areas are considered in the imbalance settlement which are, respectively, the macro-area composed by Nord bidding zone and the macro-area composed by all other Italian bidding zones. The sign of a given imbalance price area is calculated considering all the scheduled withdrawals and all the scheduled injections within such an area, as well as the energy exchanges between this and neighbouring areas (including energy import and export from foreign countries). The net balance resulting from the imbalance settlement process is charged to the final customer pursuant to Resolution 111/06[114] of the Italian national regulatory authority, guaranteeing the financial neutrality of Terna.

If market activities are suspended according to Annex A.75 of the Italian Grid Code[115], the dispatching resources procured during that suspension are settled at a price proposed by Terna and approved by the Italian regulatory authority. For the imbalance settlement in case of suspension of market activities, the day-ahead price of the relevant period and bidding zone is to be generally applied, but if the day-ahead market is also suspended a price proposed by Terna and approved by the Italian regulatory authority is to be applied.

All details on national terms and conditions mentioned[116] above are publicly available and can be found in the Italian Grid Code and its annexes.

113 Conversion process of the integrated scheduling process bids into mFRR and aFRR standard products has not been defined or included yet in the national terms and conditions for BSPs, considering that mFRR and aFRR platforms will go live within 30 months from ACER Decisions 03/2020 and 02/2020, respectively.

114 **Resolution 111/06** and **Annex**

115 **Annex A.75 to the Italian Grid Code**

116 **National terms and conditions**

5.25 Romania (National Power Grid Company Transelectrica S.A).

National Power Grid Company Transelectrica S.A. (hereafter Transelectrica) is the Romanian TSO. Transelectrica is part of the Continental Europe (CE) synchronous area. The country is also part of an LFC block which is equal to the LFC area, scheduling area and monitoring area covering the entire country. Transelectrica is not a central-dispatch TSO.

As of writing, Transelectrica has submitted to the regulatory authority a **Terms and Conditions Proposal for BSPs** that is in accordance with Article 18(5) of the EB regulation, and is awaiting approval.

Until the approval of the Terms and Conditions for BSPs, these are covered by **Order of the President of the regulatory authority No. 31/2018**. The balancing market is a centralized market and mandatory for all license holders (producers, transmission/distribution, electricity providers) registered by the TSO as participants.

TSO receives payments from BSPs for:

- Downward balancing energy for the frequency restoration process
- Penalties for the partial delivery of energy
- Notified imbalances

TSO sends payments towards BSPs for:

- Upward balancing energy for the frequency restoration process
- Balancing activations

As of writing, Transelectrica has submitted to the regulatory authority a **Terms and Conditions Proposal for BRPs** that is in accordance with Article 18(5) of the EB regulation, and is awaiting approval.

Until approval, terms and conditions for BRPs are covered by **Order of the President of the regulatory authority No. 31/2018**. Each license holder must assume balancing responsibility towards TSO for its entire production, acquisition, consumption, sale, import and export of electricity in order to participate in the national market for electricity by registering as a BSP. Licenses holders can transfer their responsibility towards another BSP; during this time, the agreement with the TSO is suspended.

TSO receives payments from BRPs for:

- Negative imbalances
- Cost redistribution for balancing the system

TSO sends payments towards BRPs for:

- Positive imbalances
- Income redistribution for balancing the system

At the TSO level, the monthly settlement closes with income and cost redistribution.

As of writing, Transelectrica has submitted to the regulatory authority its proposal with **Rules for suspension and restoration of market activities** and is awaiting approval from the relevant authority. The proposal will be implemented in the Terms and Conditions for BSPs and BRPs.

Specific products: Definition of specific products and of the time period in which were used

Article 26(1) of the EB regulation requires that following the approval of the implementation frameworks for the European platforms pursuant to Articles 19, 20 and 21, each TSO may develop a proposal for defining and using specific products for balancing energy and balancing capacity.

During the reporting period, only the Replacement Reserves Implementation framework was approved; the rest of the implementation frameworks for the European platforms were not approved (i. e. aFRRIF, mFRRIF and INIF). Thus, the balancing products, which were used during the reporting period, cannot be defined, as specific products make the requirement in question irrelevant.

Settlement principles

Article 44(1) of the EB regulation	Status
(a) Establish adequate economic signals which reflect the imbalance situation	Accomplished
(b) Ensure that imbalances are settled at a price that reflects the real-time value of energy	Accomplished
(c) Provide incentives to balance responsible parties to be in balance or help the system to restore its balance	Accomplished
(d) Facilitate harmonization of imbalance settlement mechanisms	Accomplished
(e) Provide incentives to TSOs to fulfil their obligations pursuant to Article 127, Article 153, Article 157, and Article 160 of the SO regulation	Accomplished
(f) Avoid distorting incentives to balance responsible parties, balancing service providers and TSOs	Accomplished
(g) Support competition among market participants	Accomplished
(h) Provide incentives to balancing service providers to offer and deliver balancing services to the connecting TSO	Accomplished
(i) Ensure the financial neutrality of all TSOs	Accomplished

Table 23 – Transelectrica status

The market uses deficit and surplus hourly prices, and the settlement period is one hour. Energy producers in the trial period are exempted from negative imbalances.

The additional settlement mechanism, separate from the imbalance settlement, is in place to settle the procurement costs of balancing capacity (e. g. administrative and other costs related to balancing), in accordance with Article 44(3) of the EB regulation.

Transelectrica uses system tariffs to cover costs with balancing capacity, approved by Order of the President regulatory authority No. 87/2013.

GLOSSARY

50Hertz	50Hertz Transmission GmbH (1 of 4 German TSOs)
ACER	Agency for the Cooperation of Energy Regulators
ACE	Area Control Error
ACM	Authority for Consumers and Markets (Dutch NRA)
aFRR	Frequency Restoration Reserves with automatic activation
aFRRIF	Frequency Restoration Reserves with automatic activation Implementation Framework
AOF	Activation optimisation function
APG	Austrian Power Grid AG (1 of 2 Austrian TSOs)
Amprion	Amprion GmbH (1 of 4 German TSOs)
AT	Austria
ATC	Available transfer capability
ARERA	Autorità di Regolazione per Energia Reti e Ambiente (Italian NRA)
AST	AS Augstsprieguma tikls (Latvian TSO)
BE	Belgium
BG	Bulgaria
BRP	Balancing responsible party
BSP	Balancing service provider
BNetzA	Bundesnetzagentur/Federal Network Agency for Electricity, Gas, Telecommunications, Posts and Railway (German NRA)
BZ	Bidding zone
BZB	Bidding zone border
CMF	Capacity management function
CMM	Capacity management module
CCC	Coordinated capacity calculator
CCR	Capacity calculation region
CE	Central Europe
ČEPS	ČEPS a.s. (Czech Republic TSO)
CH	Switzerland
CoBA	Coordinated balancing area
CNTC	Coordinated net transmission capacity
CNMC	Comisión Nacional de los Mercados y la Competencia / National Commission for Energy and Prices (Spanish NRA)
CRE	Commission de Régulation de l'Energie (French NRA)
CREG	Commission de Régulation de l'Electricité et du Gaz (Belgian NRA)
CREOS	CREOS Luxembourg S.A. (Luxembourg TSO)
CZ	Czech Republic
CZC	Cross-zonal capacity
DE	Germany
DA	Direct activation
DK	Denmark
EE	Estonia
ENTSO-E	European Network of Transmission System Operators for Electricity
EB	Electricity balancing guideline: Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing
E-Control	Energie-Control Austria (Austrial NRA)
EU	European Union
Elering	Elering AS (Estonian TSO)
Elia	Elia System Operator SA/BV (Belgian TSO)
ELES	ELES Ltd. Electricity Transmission System Operator (Slovenian TSO)
EMS	Akcionarsko društvo Elektromreža Srbije (Serbian TSO)
Energinet	Energinet Elsystemansvar A/S (Danish TSO)

ERO/ERÚ	Energetický Regulační Úřad (ERÚ) - Energy Regulatory Office (Czech Republic NRA)
ERO/ URE	Urząd Regulacji Energetyki / The Energy Regulatory Office of Poland (Polish NRA)
ERSE	Entidade Reguladora dos Serviços Energéticos / Energy Services regulatory authority (Portugueses NRA)
ESO	Electroenergien Sistemen Operator EAD (Bulgarian TSO)
FAT	Full activation time
FB	Flow-based
FCR	Frequency containment reserves
FCR-D	Frequency containment reserves for disturbance situations
FCR-N	Frequency containment reserve for normal operation
FI	Finland
Fingrid	Fingrid Oyj (Finnish TSO)
FR	France
FRCE	Frequency restoration control error
FRP	Frequency restoration process
FRR	Frequency restoration reserves
FSkar	Financial settlement of kΔf, ACE and ramping period
GB	Great Britain
GCT	Gate closure time
GOT	Gate opening time
GR	Greece
GW	Gigawatt
GWh	Gigawatt hour
HOPS	Croatian Transmission System Operator Ltd (Croatian TSO)
HERA	Hrvatska energetska regulatorna agencija / Croatian Energy Regulatory Agency
HR	Croatia
HU	Hungary
HVDC	High-voltage direct current
ID	Intraday
IEM	Internal energy market
IGCC	International grid control cooperation
IN	Imbalance netting
INIF	Imbalance netting implementation framework
IT	Italy
ISP	Imbalance settlement period
IRE	Ireland synchronous area
IU	Ireland and the United Kingdom
LFC	Load frequency control
Litgrid	Litgrid AB (Lithuanian TSO)
LT	Lithuania
LU	Luxembourg
LV	Latvia
MA	Monitoring area
MARI	Manually activated reserves initiative
mFRR	Frequency restoration reserves with manual activation

mFRRIF	Frequency restoration reserves with manual activation implementation framework
MTU	Market time unit
MW	Megawatt
MWh	Megawatt hour
NE	North Europe
NGESO	National Grid Electricity System Operator Limited (Great Britain TSO)
NOS BiH	Nezavisni operator sustava u Bosni i Hercegovini (Bosnia and Herzegovina TSO)
NTC	Net transfer capacity
NL	Netherlands
NRA	National regulatory authority
Ofgem	Office for Gas and Electricity Markets
PICASSO	Platform for the international coordination of automated frequency restoration and stable system operation
PSE	Polskie Sieci Elektroenergetyczne S.A.(Polish TSO)
PL	Poland
REE	Red Eléctrica de España S.A.U (Spanish TSO)
REN	Rede Eléctrica Nacional, S.A. (Portuguese TSO)
RES	Renewable energy resources
RG	Regional
RTE	Réseau de Transport d'Electricité (French TSO)
RO	Romania
RR	Replacement reserves
RRP	Replacement reserves process
RRIF	Replacement reserves implementation framework
SA	Synchronous areas
SAFA	The Synchronous Area Framework
SE	Sweden
SEPS	Slovenská elektrizačná prenosová sústava, a.s. (Slovakian TSO)
SI	Slovenia
SO	System operation guideline: Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation
SK	Slovakia
Statnett	Statnett SF (Norway TSO)
Svk	Affärsverket Svenska kraftnät (Swedish TSO)
Swissgrid	Swissgrid ag (Swiss TSO)
TenneT DE	TenneT TSO GmbH (1 of 4 German TSOs)
TenneT NL	TenneT TSO B.V. (Netherlands TSO)
Terna	Terna - Rete Elettrica Nazionale SpA (Italian TSO)
Transelectrica	National Power Grid Company Transelectrica S.A. (Romanian TSO)
TransnetBW	TransnetBW GmbH (1 of 4 German TSOs)
TERRE	Trans-European replacement reserves exchange
TSO	Transmission system operator

The terms used in this document are drawn from the definitions included in Article 2 of the EB regulations.

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European Network of
Transmission System Operators
for Electricity