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IMPACT ASSESSMENT

Accompanying the document

Commission Regulation (EU) No .../... establishing a Guideline on Electricity Balancing

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TABLE OF CONTENTS

GLOSSARY AND ACRONYMS

ACER	The Agency for the Cooperation of Energy Regulators, a European Union Agency that was created by the Third Energy Package to further progress the completion of the internal energy market both for electricity and natural gas.
Balancing	The situation after markets have closed (gate closure) in which a TSO acts to ensure that demand is equal to supply, in and near real time.
Balancing services	Balancing services refer to either or both balancing energy and balancing capacity.
Balancing energy	Energy activated by TSOs to maintain the balance between injections and withdrawals in real time.
Balancing capacity	All resources procured by TSOs ex ante which are available for balancing purposes. It refers technically to the balancing reserves.
Balancing Guideline	Commission Regulation establishing a Guideline on Electricity Balancing, one of the legal acts to be adopted under Article 8(6) of the Electricity Regulation (EC) 714/2009.
Balancing zone	Balancing zone defines the size of the network area for which the balancing capacities are being procured. It refers technically to the Load-Frequency Control block.
BRPs	Balance responsible parties, such as producers and suppliers, keep their individual supply and demand in balance in commerical terms.
BSPs	Balancing Service Providers, such as generators or demand facilities, balance out unforeseen fluctuations on the electricity grid by rapidly increasing or reducing their power output.
Control area	A coherent part of the interconnected system, operated by a single TSO responsible for load-frequency-control for physical loads and generation units connected.
Cross-border balancing	Exchange of balancing services between control areas and/or between bidding zones.
Electricity Directive	Directive 2009/72 of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, OJ L 211, 14.8.2009, p. 55–93. Together with the Electricity Regulation, the Electricity Directive sets the main parts of the legal framework for the EU's electricity markets.

Electricity Regulation	Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity repealing Regulation (EC) No 1228/2003, OJ L 211, 14.8.2009, p. 15–35. Together with the Electricity Directive, the Electricity Regulation sets the main parts of the legal framework for the EU's electricity markets.
ENTSO-E	European Network of Transmission System Operators for Electricity. ENTSO-E was created by the Third Energy Package to further progress the completion of the internal energy market for electricity.
EU Target Model	Term refering to the current design of the EU's electricity markets. The EU target model is based on two broad principles: (i) the development of integrated regional wholesale markets, preferably established on a zonal basis, in which prices provide important signals for generators' operational and investment decisions; and (ii) market coupling based on the so-called 'flow-based' capacity calculation, a method that takes into account that electricity can flow via different paths and optimises the representation of available capacities in meshed electricity grids.
FCR	Frequency Containment Reserves are supplied by BSPs (generators, storage, demand response) and they are used by TSOs to maintain frequency stable within a given synchronous area (e.g. continental Europe). This category typically includes automatically activated reserves with the activation time up to 30 seconds.
Florence Forum	The Florence Forum was set up to discuss the implementation of the internal electricity in Europe. The participants are national regulatory authorities, Member States, the European Commission, transmission and distribution system operators, electricity traders, consumers, network users, and power exchanges.
FRR	Frequency Restoration Reserve are supplied by BSPs (generators, storage, demand response) and they are used by TSOs to restore system frequency and power balance after sudden system imbalance occurrence (e.g. the outage of a power plant). Those reserves replace FCR if the frequency deviation lasts longer than 30 seconds. This category includes operating reserves with an activation time typically between 30 seconds up to 15 minutes. FRR can be distinguished between reserves with automatic activation (aFRR) and reserves with manual activation (mFRR).
Gate closure	The moment when contracts are frozen. After gate closure, no trading is allowed anymore. At this point, parties are expected to adhere to the physical data submitted to the System Operator and to the contracted volumes submitted before gate closure.
Imbalances	Deviations between generation, consumption and commercial

	transactions (in all timeframes – commercial transactions include sales and purchases on organised markets or between BRPs) of a BRP within a given imbalance settlement period.
Imbalance netting	The process by which TSOs of two or more balancing zones agree to offset opposing imbalances between adjacent areas. Imbalance netting is intended to prevent the counteracting activation of balancing energy. The process result in an effective energy exchange from an area with an energy surplus to one with shortage, subject to available cross-border capacity.
Imbalance settlement	A financial settlement mechanism aiming at charging or paying BRPs for their imbalances.
Imbalance settlement period	The imbalance settlement period is the time unit used for computing BRPs' imbalances.
IGCC	The International Grid Control Cooperation initiative is a cooperation between TSOs that deals exclusively with Imbalance Netting for aFRR reserves under residual transmission constraints at the borders.
Merit order list	In the balancing markets a merit order list is a list of all valid balancing bids submitted by BSPs and sorted in order of their bid prices used for the activation of balancing energy bids.
METIS	A modelling tool used by the Commission, described in more detail in Annex 4.
NTC	Net Transmission capacity is the transmission capacity available for commercial transactions across borders. The NTC value is calculated as the total transfer capacity minus the transmission reliability margim.
NRAs	National Regulatory Authorities.
Pay-as-bid	Market clearing practice in which each offers received the amount bided.
Pay-as-cleared	Market clearing practice in which all selected offers received the amount offered by the highest selected offer.
Power exchange	Power exchanges facilitate the trading of electricity at wholesale level, often for delivery the next day or at even shorter intervals (intra-day). They cooperate with TSOs in optimising interconnection capacity in the contex of market coupling.
RR	Replacement Reserve Replacement reserves are reserves from BSPs (generators, storage, demand response) used by TSOs to restore the required level of FCR and FRR due to their earlier usage. Contrary to FCR and FRR, not all TSOs in the EU use RR. This category

	includes operating reserves with activation time from several minutes up to hours.
RPM	The Regulating Power Market initiative is a cooperation between the Nordics that deals with the exchange of mFRR products.
Third Package	A package of legislation adopted in 2009 comprising the Electricity Directive (2009/72/EC), the Electricity Regulation (714/200/EC), the ACER Regulation (713/2009/EC) as well as similar legislation concerning the gas markets.
TSO	Transmission system operator, the entity that operates the high voltage network in a given area and that also interconnects with neighbouring electricity systems.
Transmission capacity	The transmission capacity, also called total transfer capacity (TTC), is the maximum transmission of active power in accordance with the system security criteria which is permitted in transmission cross-sections between the subsystems/areas or individual installations.

1. INTRODUCTION

This Impact Assessment has been compiled in support of a draft Commission Regulation establishing a Guideline on Electricity Balancing: the 'Balancing Guideline'.

Electricity balancing covers all actions performed by a Transmission System Operator[1] ('TSO') to ensure that total electricity demand is equal to (*'in balance with')* total electricity supply at any given moment. Balancing is thus essential to ensuring the well functioning of wholesale electricity markets, given their bearing on system stability and security of supply.

With the progressive liberalization of electricity markets, markets for the procurement and activation of energy for the purposes of balancing have generally remained more fragmented and less competitive. The draft Balancing Guideline aims to obviate to this.

As all secondary legal acts, the scope and mandate of the proposed Guideline flows from primary acts. Specifically, the proposed Guideline follows from the Electricity Regulation (EC) 714/2009 part of the so-called 'Third Energy Package'[2].

The standard process for the adoption of electricity Network Codes and Guidelines places the European Commission at the end of a long development phase that involves heavily National Regulatory Authorities ('NRAs') and Transmission System Operators; the former acting within the Agency for the Cooperation of Energy Regulators[3] ('ACER') and the latter within the European Network of Transmission System Operators for Electricity[4] ('ENTSO-E').

For the draft Balancing Guideline, such process kicked off in 2012. Most recently, the Commission received on 15 July 2015 from ACER a positive recommendation for the adoption of the proposed Guideline that is the object of this Impact Assessment. Such a prolonged timeline is to be considered as standard, as the draft Balancing Guideline was discussed in parallel to the adoption of a number of other Network Codes and Guidelines on other aspects of electricity markets.

Crucially, the final adoption phase of the draft Balancing Guideline is now concomitant to the launching of an initiative for the revision of the basic acts included in the Third Energy Package. A Consultative Communication by the Commission in July 2015 began a process that should result in an updated Market Design package by the end of 2016. A separate Impact Assessment on Market Design has been submitted at the same time.

With a view to possible revision of primary legislation, there was thus a need to ensure agreement between any future Market Design rules and the draft Balancing Guideline, as the

1 TSO is the entity that operates the high voltage network in a given area and that also interconnects with neighbouring electricity systems.

2 A package of legislation adopted in 2009 comprising the Electricity Directive (2009/72/EC), the Electricity Regulation (714/200/EC), the ACER Regulation (713/2009/EC) as well as similar legislation concerning the gas markets.

3 ACER is a European Union Agency that was created by the Third Energy Package to further progress the completion of the internal energy market both for electricity and natural gas.

4 ENTSO-E is the European Network of Transmission System Operators for Electricity that was created by the Third Energy Package to further progress the completion of the internal energy market for electricity.

latter remained an implementing act of the former. The interplay between the two initiatives (Market Design and Balancing Guideline) is fully explained under Section 2.1.4, accompanied by a fuller explanation of the reasons justifying such a distinction.

The remainder of this document is devoted to a presentation of the general policy context in which the draft Balancing Guideline comes to light – from the Energy Union Framework to the Third Energy Package - as well as a deeper treatment of balancing markets and how they fit with the current electricity market model (the so called 'EU target model'[5]).

After having presented the reader with sufficient background information on the specificities of balancing markets and the policy context informing a proposal for a draft Balancing Guideline, this Impact Assessment will move – as customary – to spelling out in details both problems and options to address objectives.

2. POLICY CONTEXT AND SCOPE OF THE INITIATIVE

2.1. Policy context

2.1.1. The Energy Union Framework Strategy of February 2015

The European Commission's 'Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy' of February 2015 set out to create an ever-more integrated energy market as a prerequisite to the creation of a true Energy Union. The aim is to set the conditions for a reliable and affordable energy for all, to apply the efficiency first, and solidarity principles and to make the European Union the world leader in renewable energy.

A revised Energy Union governance system will secure the implementation of the internal energy market and the delivery of the 2030 Energy and Climate Framework and it will deepen the cooperation between Member States - including at regional level - and between the Member States and the European Commission.

These commitments take a heightened significance on the back of the climate agreement reached at the 21st meeting of the Conference of the Parties 21 ('COP 21') in December 2015, and the ratification of the agreement at EU level. These commitments come on top of biding EU Energy and Climate Objectives to 2020 and 2030.

Achieving the EU's climate and energy goals will require a further evolution in the design of the European electricity market, in order to adapt it to the set of new and upcoming challenges that have emerged since the adoption of the latest package of legislation in the area, the so-called 'Third Energy Package'.

It is worth outlining major such challenges to be addressed:

- Significant, ever-growing shares of generation from renewable, decentralised and variable energy sources;

5 Term refering to the current design of the EU's electricity markets. The EU target model is based on two broad principles: (i) the development of integrated regional wholesale markets, preferably established on a zonal basis, in which prices provide important signals for generators' operational and investment decisions; and (ii) market coupling based on the so-called 'flow-based' capacity calculation, a method that takes into account that electricity can flow via different paths and optimises the representation of available capacities in meshed electricity grids.

- Lack of sufficient interaction between the electricity wholesale and retail market, depriving consumers of the possibility to participate actively in the energy transition;
- Lack of investment signals particularly in some Member States; and
- Recourse to national approaches to address the above challenges; based on solutions that risk fragmenting and undermining the functioning of the internal energy market even more.

To address such issues, the European Commission is currently reviewing the Third Energy Package and aims to submit a package of new legislative measures by the end of 2016 ('Market Design initiative'). The main policy objectives of the Market Design initiative are set out in the Communication (COM (2015) 80 final) launching a public consultation on an energy market design of 15 July 2015.

For the purposes of this Impact Assessment, it is important to understand the context and scope of Market Design reform to the extent to which it touches upon balancing markets provisions; so that the overlap with the draft Balancing Guideline is readily seen.

2.1.2. The Third Energy Package: Network Codes and Guidelines

The Third Energy Package was adopted in 2009 with the aim to further liberalize and integrate Europe's energy markets.

Key changes included mandatory unbundling of energy suppliers from network operators; strengthening the independence of NRAs; the establishment of ACER; cross-border cooperation between TSOs and the creation of ENTSO-E as well as increased transparency in retail markets.

Crucially for the purpose of the draft Balancing Guideline, the Third Energy Package also provided the European Commission with competencies to address the need for more harmonised electricity rules via the adoption of specific implementing acts ('Network Codes and Guidelines'), adopted under comitology rules.

The Third Energy Package has set out a framework for developing Network Codes and Guidelines with a view to harmonising, where necessary, the technical, operational and market rules governing the electricity grids. Under this framework, ACER, ENTSO-E and the European Commission have a key role and need to work in close cooperation with all relevant stakeholders on the development of Network Codes and Guidelines. The areas in which Network Codes and Guidelines can be developed are set out in Article 8(6) of the Electricity Regulation (EC) 714/2009. Once adopted, these Network Codes and Guidelines become binding Commission Regulations, directly applicable in all Member States.

The adoption of Network Codes and Guidelines is an important building block of the internal energy market, as beyond general principles, the bulk of market integration cannot take place without an extensive degree of mutual agreement on a number of highly technical subjects.

A number of electricity Network Codes and Guidelines have accordingly been approved on a regular basis, aimed at removing the main legal and technical obstacles resulting from fragmented national electricity transmission rules. Network Codes and Guidelines can notably be adopted to harmonise rules for cross-border electricity trade and for the safe and stable operation of the integrated European electricity grid[6].

6 The electricity grids of Member States do not operate in isolation, they are interconnected. Electricity always follows the path of least resistance, which means that physical flows are unaffected by political

The Network Code process is defined in Articles 6 and 8 of the Electricity Regulation and it can be essentially divided in two phases: (i) the development phase; and (ii) the adoption phase. At each of the two phases and in-between phases, the European Commission, ACER and ENTSO-E consult their draft proposals with stakeholders.

Figure 1 below illustrates the main stages of the Network Code development process:

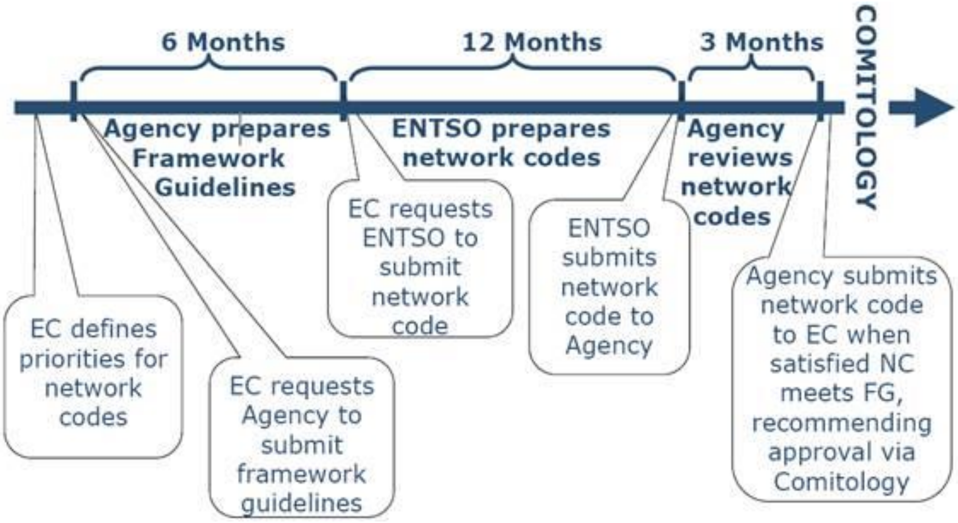

Figure 1: Main stages of the network code development process

The development phase ends with a recommendation for adoption by ACER to the Commission. At this point the Commission launches the adoption phase, as illustrated in **Figure 2**:

Figure 2: Network code adoption phase

Once adopted, Network Codes and Guidelines are acts implementing the Electricity Regulation (EC) 714/2009.

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borders. Three main categories of Network Codes or Guidelines exist: (i) those establishing market rules *for different timeframes*; (ii) those establishing rules for the safe *connection* of generators and electricity consumers *to the transmission grid*; (iii) and those establishing rules for the safe and efficient *operation of transmission networks*.

2.1.3. ACER Recommendation 03/2015 and link with other Network Codes

It is within the context and the process outlined above, that ACER adopted on 20 July 2015 a recommendation[7] ('*ACER Recommendation 03/2015*') supporting the adoption by the European Commission of a Regulation establishing a Guideline on Electricity Balancing[8]. The Agency's recommendation kicked off the adoption phase by the Commission. The scope of the initiative and substantive content is explained below under Section 2.2.

It is important to state at this point that the draft Balancing Guideline closely follows the line taken by ACER under all aspects of Balancing. One notable exception concerns the geographical approach of the Guideline: whereby ACER proposed a regional approach for exchanging balancing energy[9] as a first step, the proposal endorsed by this Impact Assessment opts for a European-wide approach for exchanging balancing energy. This is further explained below, but it needs to be said that the move to a European-wide approach follows the same line taken by closely related Guidelines that have already been adopted in the meantime.

The draft Balancing Guideline in fact relates closely to two previously adopted Guidelines bearing on electricity trading rules. These are: *(i) a Regulation establishing a Guideline on capacity allocation and congestion management* ('CACM') which introduces binding rules for so-called 'market coupling' as it affects short-term wholesale trading (so-called 'day-ahead' and 'intraday' trading)[10]; and (ii) *a Regulation establishing a Guideline on forward capacity allocation* ('FCA')[11], which provides for harmonised rules for 'forward' electricity trading, that is, trading for delivery in the longer term.

Taken together, the Balancing, CACM and FCA Guidelines complement and expand upon the legislation of the Third Energy Package.

2.1.4. Link with the Market Design initiative

This Impact Assessment is concomitant to a parallel Impact Assessment bearing on a review of electricity Market Design rules. The latter is aimed at amending legal provisions of the so-called Third Energy Package above cited. It is thus necessary to better explain the linkages between the two initiatives.

Before explaining such linkage, it is worth reminding that the Market Design initiative, at the time of writing, is set to be adopted concomitant to a new framework for the 'Energy Union Governance'. For clarity, it should be highlighted that the measures to be proposed under the draft Balancing Guideline would not have a direct link with the initiative on Governance. The main reason being that balancing rules remain at too technical and detailed level to be the object of high-level reporting and coordination under the Governance initiative as envisaged.

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7 ACER Recommendation 03/2015 on a Network Code on Electricity Balancing (July 2015): http://www.acer.europa.eu/official_documents/acts_of_the_agency/recommendations/acer%20recommendation%2003-2015.pdf

8 It should be noted, for the sake of clarity, that ACER's Recommendation was originally aimed at the development of a Balancing *Network Code.* Due to the nature of the subject (market rules rather than purely Network Codes) and the less technical nature (Network Codes tend to be much more technical and directly prescriptive), the Commission later converted the proposed Network Code on Balancing into a *Guideline* on Balancing. There is no difference as concerns their legally binding effect and direct applicability.

9 Energy activated by TSOs to maintain the balance between injections and withdrawals in real time.

10 Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a Guideline on capacity allocation and congestion management (OJ L 197, 25.7.2015, p. 24).

11 Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a Guideline on forward capacity allocation (OJ L 259, 27.9.2016, p. 42).

Market Design provisions will instead interact with those to be included in the draft Balancing Guideline, although the scope of the Market Design review is much larger than the single topic of Balancing. Although the economic and technical impetus for integrating balancing electricity markets is one, balancing provisions are being divided between the two initiatives. The question is raised as to how to divide balancing provisions between the two initiatives (that is, between Market Design and the Balancing Guideline).

From a purely legal perspective, at present the letter of the law leaves a margin of discretion as to whether balancing provisions should be part of secondary legislation or its implementing measures. The Third Energy Package explicitly states that Network Codes shall cover 'balancing rules including network-related power rules', with the caveat that Network Codes and Guidelines measures should be designed to amend non-essential elements of the Electricity Regulation.

In practice, this leaves some discretion as to which provisions to include under which initiative. Remaining within the remit of the current legal framework, the following criteria and points of considerations have been followed:

- In line with a longer envisaged adoption process for new Market Design rules, measures under the draft Balancing Guideline should be technically and logically prior to those envisaged under the Market Design initiative.
- Further, it should be noted that the adoption process of the draft Balancing Guideline follows a long period of many years of deliberation amongst stakeholders. Years of discussions and practical experience, have led Member States and TSOs to unanimously ask for implementing a number of measures which are agreed upon by all stakeholders – that is, to go for 'quick wins' that advance market integration. On such widely agreed upon issues, waiting for the end of the legislative process for the adoption of Market Design rules, would mean delaying implementation by several years, with all the foregone opportunity costs associated.
- On the other hand, politically contentious provisions, i.e. regional approach to balancing reserves, would be included under the Market Design initiative. A pre-requisite for a regional approach to balancing reserves is the possibility to exchange balancing energy across borders. The sense would be to harvest the 'low-hanging fruits' as much as possible.

In any event, the likely adoption of the Market Design initiative will likely result in the further amendments of several of the Network Codes and Guidelines that have already been adopted. The idea to retain is that, beyond the logical order in which provisions are drafted, there is a degree of interplay and continuous feedback among legislative provisions.

2.2. Scope of the initiative

2.2.1. The EU Target Model in electricity

To achieve an integrated electricity wholesale market in Europe, NRAs led a work stream on the EU Electricity Market Target Model in 2008 and came to end in 2010. This work was preceded by a project, started in 2007 and led by TSOs and power exchanges[12], on how to organise the electricity market at different timeframes.

12 Power exchanges facilitate the trading of electricity at wholesale level, often for delivery the next day or at even shorter intervals (intra-day). They cooperate with TSOs in optimising interconnection capacity in the contex of market coupling.

The final outcome of such efforts was the adoption of the 'EU Target Model' in electricity. The EU Target Model foresees a specific cross-border market design for each of the timeframe of the market as those move closer to 'real-time'; the moment electricity has to be delivered.

These markets are, in order of timeframe: forward, day-ahead, intraday, and balancing markets as illustrated in **Figure 3.**

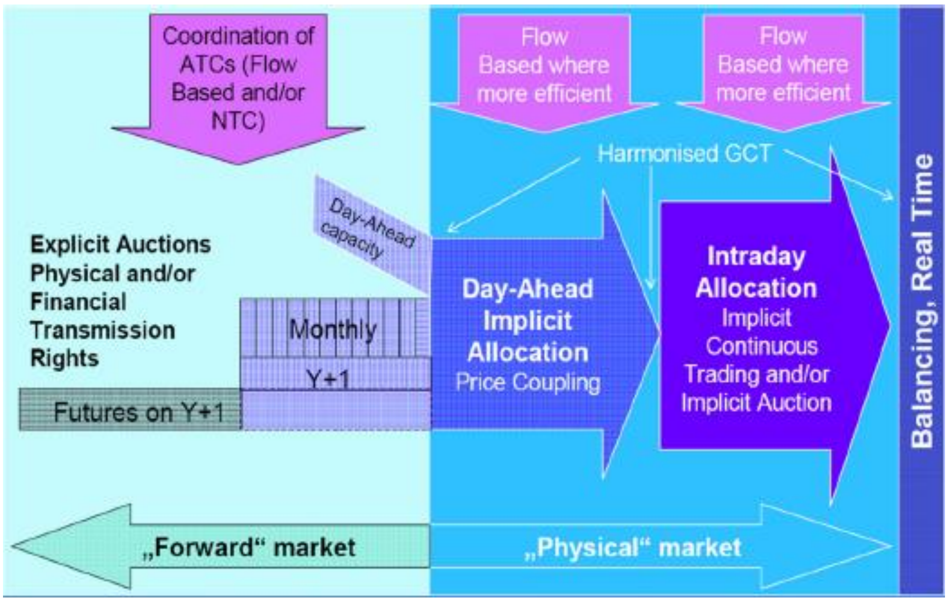


Figure 3: The EU Target Model in electricity

The EU Target Model for electricity trading consists notably of the following elements:

- For longer timeframes (i.e., longer than day-ahead), a single European platform for the explicit allocation of cross-border transmission capacities. Physical transmission rights ('PTRs') and/or financial transmission rights ('FTRs') on cross-border interconnections are to be auctioned by TSOs in case a relevant liquid forward derivatives market does not exist;
- For the day-ahead timeframe, the implicit allocation of cross-border transmission capacities through a single European price coupling process, replacing explicit auctions. Implicit market coupling implies that all order books from power exchanges (all bids and offers) are to be aggregated and optimized in one algorithm that calculates prices and flows, subject to the available transmission capacity between market areas. Price differences can still occur due to bottlenecks between different market areas (congestion on interconnections);
- For the intraday timeframe, a single platform where electricity and the corresponding cross-border capacities are traded in one (i.e., implicit capacity allocation) on a continued basis;
- For the balancing timeframe, European-wide balancing platforms where all TSOs would have access to different types of balancing products while taking into account the available transmission capacity between market areas.

The EU Target Model requires a 'flow-based' method to be used for capacity calculation and allocation. Flow-based means that capacity is calculated and allocated taking into account the meshed nature of the transmission network and all possible paths through which electricity is flowing in it. The flow-based calculation algorithms will thus optimise directly the commercial power flows taking into account the limitations of the network. In other words, the values on available transmission capacity will be calculated as part of the market algorithm itself, i.e. simultaneously (and not ex-ante based on expected flows). The EU Target Model is based on zonal pricing and requires efficient price-zones reflecting actual system constraints.

CACM has implemented key features of the EU Target Model, notably day-ahead and intraday market coupling, flow-based market coupling, and it has also introduced a structured bidding zone review process. FCA has harmonised rules for longer-term capacity allocation. The draft Balancing Guideline, which is analysed in this impact assessment, will set out harmonised rules for balancing.

2.2.2. The concept of balancing in electricity

Balancing refers to the situation after markets have closed ('gate closure') in which a TSO acts to ensure that demand is equal to supply. A number of stakeholders are responsible for organising the electricity balancing market:

- TSOs keep the overall supply and demand in balance in physical terms at any given point in time. This balance guarantees the secure operation of the electricity grid at a constant frequency of 50 Hertz.
- Balance responsible parties ('BRPs') such as producers and suppliers; keep their individual supply and demand in balance in commercial terms. Achieving this requires the development of well-functioning and liquid markets. BRPs need to be able to trade via forward markets and at the day-ahead stage. They also need to be able to fine-tune their position in the same trading day (e.g. when wind forecasts or market positions change).
- Balancing service providers ('BSPs') such as generators or demand facilities, balance out unforeseen fluctuations on the electricity grid by rapidly increasing or reducing their power output. BSPs receive a capacity payment for being available when markets have closed ('balancing capacity'[13]) and an energy payment when activated by the TSO in the balancing market ('balancing energy'). Payments for balancing capacity are often socialized via the transmission network tariffs, whereas payments for balancing energy usually shape the price that BRPs who are out of balance have to pay ('imbalance price').

The liberalisation of the electricity market introduced the concept of balancing as a competitive market, where the demand and supply for balancing services[14] are met. Thus, the balancing market is characterised by the two core components: the procurement of balancing services and the settlement of imbalances[15], as illustrated in **Figure 4**. These two components are further described below.

13 All resources procured by TSOs ex ante which are available for balancing purposes. It refers technically to the balancing reserves.

14 Balancing services refer to either or both balancing energy and balancing capacity.

15 Deviations settled by a TSO between generation, consumption and commercial transactions of a BRP within a given period.

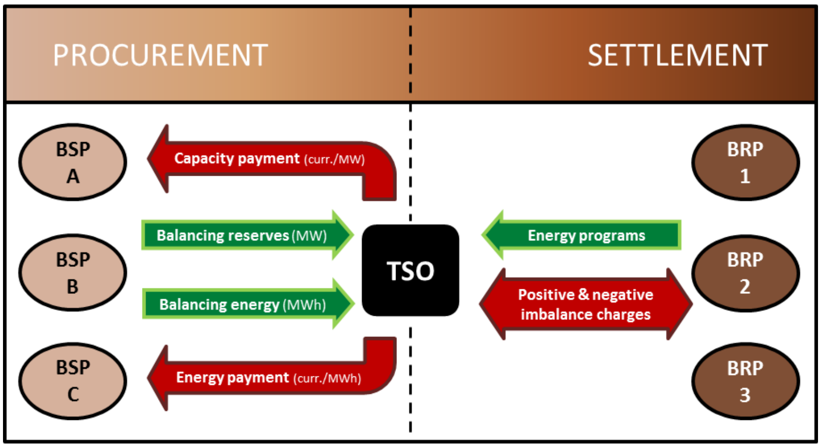


Figure 4: General description of typical balancing markets

2.2.3. Procurement of balancing services

Due to the physics of electricity, this must be produced and transmitted as it is consumed, which means that the electricity system must always strike a balance between what is generated and what is demanded at any given moment in time. Further, any disturbance caused by the failure of a single component in the system is transmitted across the entire system almost instantaneously.

Balancing markets are fundamental in keeping demand and supply matched in real time. Being responsible for the safe and secure operation of electricity systems, TSOs manage the physical equilibrium on the grid by securing a set of balancing services to cope with deviations in the supply or the demand of electricity. TSOs can secure balancing services by means of both contracted and non-contracted services delivered by BSPs over different timescales.

In the act of balancing, TSOs need to ensure that they will always be able to activate a sufficient amount of energy to balance the deviations between supply and demand in real time. In other words, the TSO must be in the position to be able to call upon any BSPs to make demand and supply meet. On their side, BSPs must be able to meet the necessary technical requirements to deliver such a service.

If TSOs are faced with the risk that they will not have enough offers for balancing energy from BSPs in real time, they can hedge this uncertainty by securing in advance a sufficient amount of power capacity available in their control area[16]. An option, giving the TSOs the possibility to activate a certain amount of balancing energy within a certain timeframe, is defined as 'balancing capacity'. It is typically defined as the available generation or demand capacity that can be either automatically or manually activated to balance the system in real time. The TSOs usually check and/or conclude contracts to guarantee they have access to these balancing reserves ahead of real time.

Hence, TSOs can procure balancing energy in real time from balancing resources which were secured in advance as balancing capacity, or by other balancing resources that are offering balancing energy on a voluntary basis, subject to their availability in real time.

16 A coherent part of the interconnected system, operated by a single TSO responsible for load-frequency-control for physical loads and generation units connected.

In order to deal with disturbances in system operation, TSOs may rely on three types of reserves (see **Figure 5**): Frequency Containment Reserve[17] (FCR), Frequency Restoration Reserve[18] (FRR) and Replacement Reserve[19] (RR).

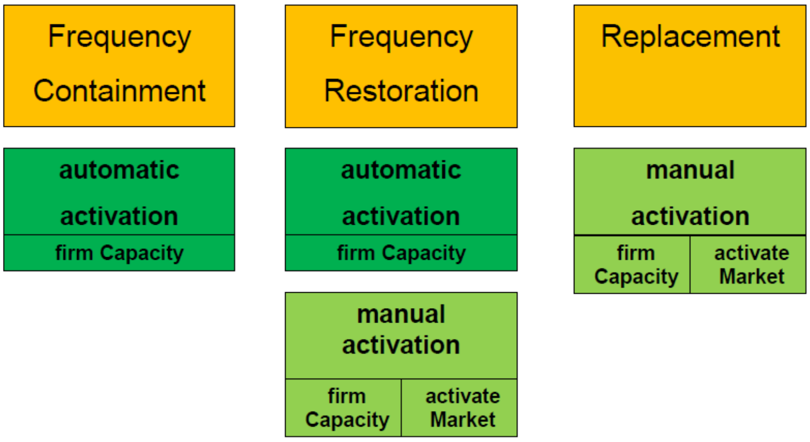


Figure 5: Different kinds of balancing reserves and sourcing

A balancing market is typically organised by the TSO, which acts as a single buyer, and BSPs submit upward and downward balancing energy and capacity bids. In accepting these bids, the TSO can therefore ensure an overall balance in supply and demand in real time.

2.2.4. Settlement of imbalances

In a liberalised market, the market players also have an implicit responsibility to balance the system through the balance responsibility of market participants, the so-called 'BRPs'. In this respect, the BRPs are financially responsible for keeping their own position (i.e., the sum of electricity delivered, electricity taken and electricity trades) balanced over a given timeframe – the imbalance settlement period[20] ('ISP'). The remaining short and long energy positions in real time are described as the BRP's negative and positive imbalances respectively[21]. Depending on the state of the system, an imbalance charge is imposed per settlement period on the BRPs that are not in balance. This defines the imbalance settlement[22], which is a core

17 Frequency Containment Reserves are supplied by reserve providers (generators, storage, demand response) and they are used by TSOs to maintain frequency stable within a given synchronous area (e.g. continental Europe). This category typically includes automatically activated reserves with the activation time up to 30 seconds.

18 Frequency Restoration Reserve are supplied by reserve providers (generators, storage, demand response) and they are used by TSOs to restore system frequency and power balance after sudden system imbalance occurrence (e.g. the outage of a power plant). Those reserves replace FCR if the frequency deviation lasts longer than 30 seconds. This category includes operating reserves with an activation time typically between 30 seconds up to 15 minutes. FRR can be distinguished between reserves with automatic activation (aFRR) and reserves with manual activation (mFRR).

19 Replacement Reserve Replacement reserves are reserves from reserve providers (generators, storage, demand response) used by TSOs to restore the required level of FCR and FRR due to their earlier usage. Contrary to FCR and FRR, not all TSOs in the EU maintain RR. This category includes operating reserves with activation time from several minutes up to hours.

20 ISP is the time unit used for computing BRPs' imbalances.

21 If a participant has a short position, this means that the difference between the contractual value and metered position has contributed to a deficit of electricity flowing into the system. If a participant has a long position, this means that the difference between the contractual value and metered position has contributed to a surplus of electricity flowing on to the system.

22 Imbalance settlement is the financial settlement mechanism aiming at charging or paying BRPs for their imbalances.

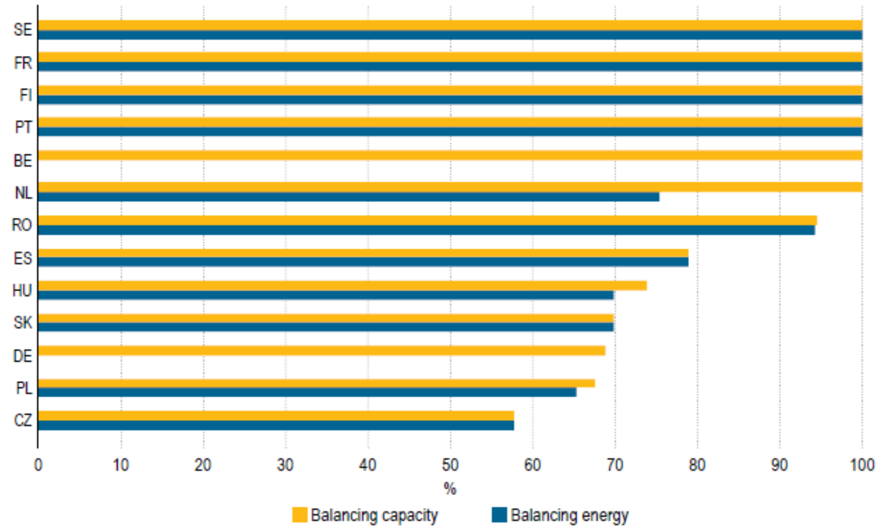
element of balancing markets. It typically aims at recovering the costs of balancing the system and may include incentives for the market to reduce imbalances – e.g. with references to the wholesale market design – while transferring the financial risk of imbalances to BRPs.

3. PROBLEM DESCRIPTION

Balancing has been historically entrusted to individual TSOs, as the single entities with sufficient information on system frequency, national generation, consumption and network topology to efficiently balance the system. Being designed according to historical national specificities (generation portfolios, significant presence of internal congestions and level of interconnections with foreign markets) these systems can significantly differ from one country to another. The wide variety of balancing market designs existing in Europe is generally perceived as an important barrier for their integration and cause unnecessary complexities for cross-border trade (see ENTSO-E surveys on ancillary services in Europe[23]).

Electricity balancing covers all the actions and activities performed by a TSO to ensure that in a control area, total electricity withdrawals equal total injections in real time. These activities, which are simultaneously performed in all control areas and between control areas, contribute to ensuring the balance and stability in a synchronous area. Balancing mechanisms are not only technical arrangements set out to ensure system stability but also have implications on competition as procuring balancing services normally entails commercial arrangements with imbalances levied on the market through settlement mechanisms.

ACER's market monitoring reports revealed high levels of concentration within national balancing markets. The competition in the procurement of balancing services can be constrained when the upward and downward balancing products are simultaneously procured or when TSOs procurement periods are relatively long. This partly explains the relatively high concentration in the procurement of balancing services as illustrated in **Figure 6** showing the cumulative market shares of the three largest suppliers in balancing services from aFRR.



Source: Data provided by NRAs through the ERI (2014).

23 See ENTSO-E 2016 survey on ancillary services: https://www.entsoe.eu/Documents/Publications/Market%20Committee%20publications/WGAS%20Survey_04.05.2016_final_publication_v2.pdf?Web=1

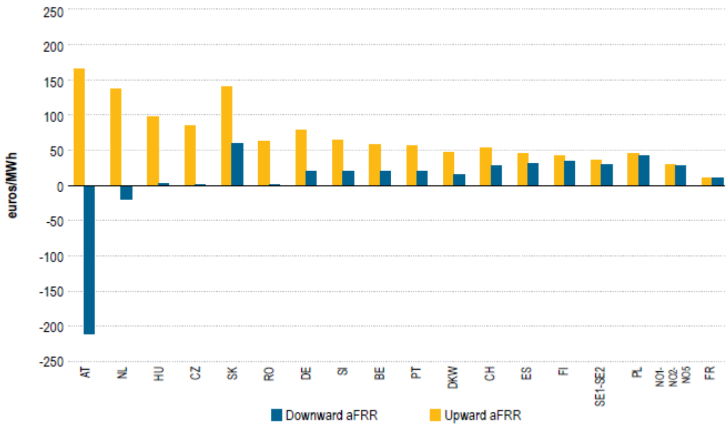
Figure 6: Level of concentration (CR3) in the provisions of balancing services from aFRR – 2014 (%) (Source: ACER market monitoring report 2015)

The high concentration level in the balancing markets confirms the urgent need to integrate balancing markets, not least as a way of increasing the number of market participants and thereby reducing the scope of market power. ACER further identifies the possibility that the concentration in balancing market could be decreased through a higher degree of cross-border integration, a reduction in entry barriers (e.g. for RES which would be able to offer balancing services) and an improvement in market efficiency. This could be done through the introduction of more competition between BSPs and increased liquidity in balancing energy trading.

3.1. Driver 1: Inappropriate balancing prices and consistency with other timeframes

Distortions in the balancing market have significant impacts on the functioning of the wholesale markets that are more and more integrated. Relevant price signals are important to enhance the efficiency of balancing markets as they have a direct impact on the volume of residual imbalances to be balanced by TSOs. A consistent balancing market design is in particular essential to ensure well-designed and liquid intraday markets, where market participants are able to optimise and bring their position into balance by closing trades throughout Europe. This can only be achieved with settlement rules providing imbalance prices that are sufficiently high to incentive BRPs to balance their portfolio through intraday participation.

As illustrated on **Figure 7**, large disparities exist in balancing energy prices in Europe, including significant price differences between neighbouring countries (e.g.: there is a price spread of more than 80 EUR/MWh between Austrian and Hungary). These differences are significantly higher than in the preceding timeframes (forward, day-ahead and intraday markets). The significant level of price dispersion across Member States suggests that important efficiency gains can be obtained from a further exchange of balancing energy, subject to available cross-border capacity and security limits. Moreover, the presence of considerably high average prices needs to be carefully considered. On the one hand, this can be due to balancing energy prices reflecting the real value of flexibility, which would allow setting adequate incentives (through cost-reflective imbalance charges) for BRPs to correct imbalances in the less costly preceding markets. On the other hand, Figure 7 suggests that competition in balancing energy markets is often limited, partly as a result of highly concentrated balancing markets. This is confirmed in Figure 6, which shows that the cumulative market shares of the three largest suppliers are above 70% in most countries, a frequently higher concentration that in the overall wholesale market.



Source: Data provided by NRAs through the ERI (2014).

Note: The prices shown for the Netherlands are based on the activation of both balancing energy from aFRR and mFRR as a 'cross-product marginal price' is applied.

Figure 7: Weighted average prices of balancing energy activated from aFRR – 2014 (EUR/MWh) (source: ACER market monitoring report 2015)

The high balancing energy prices due to a lack of competition effectively create barriers to market entry for suppliers, who face imbalance price risk and/or high network charges (to the extent that balancing costs are included in the costs of the network). This is especially problematic for network users who cannot adjust their generation close to real time (e.g. RES) and adversely impacts the level of competition in other segments of the electricity market, such as retail markets. This, combined with a low degree of integration, enables generators to heavily influence the balancing market outcome.

The large disparities in the balancing energy prices observed in Europe suggest that further integration of national balancing markets would deliver efficiency gains. The value of further harmonisation of national designs is estimated at several hundred M€ per year. As national grids and electricity markets have become more interconnected, the interest in cross-border balancing has grown.

3.2. Driver 2: Non-optimal usage of cross-border transmission capacity

An integrated cross-border balancing market is intended to maximise the efficiency of balancing by using the most efficient balancing resources while safeguarding operational security. However, the exchange of balancing energy across borders is currently limited.

As illustrated in **Figure 8**, the markets with a relatively high cross-border exchange of balancing energy include Estonia, Lithuania and the Czech Republic, with respectively 44%, 21% and 12% of the total activated balancing energy for upward mFRR in 2014. The cross-border exchange of balancing energy from reserves of other types is marginal.

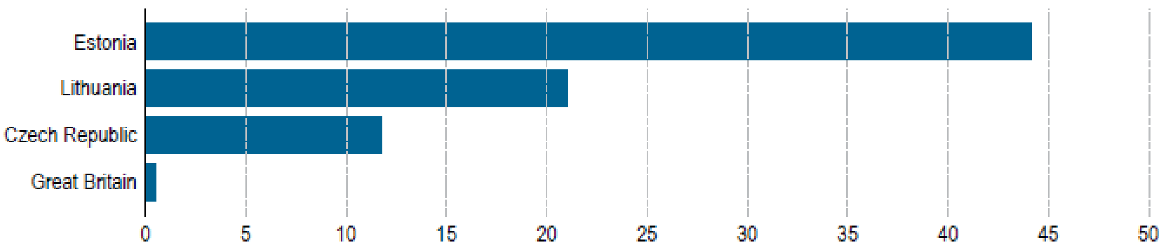


Figure 8: EU balancing energy activated abroad as a percentage of the amount of total balancing energy activated (upward) from mFRR in national balancing markets (source: ACER market monitoring report 2015)

However, it should be noted that in the Nordic region, balancing energy markets are currently integrated through the Regulating Power Market[24] ('RPM'). Moreover, an increased utilisation of imbalance netting[25] has been recently observed in Europe. In **Figure 9**, the imbalance netting currently covers an important share of the needs of balancing energy in several European markets.

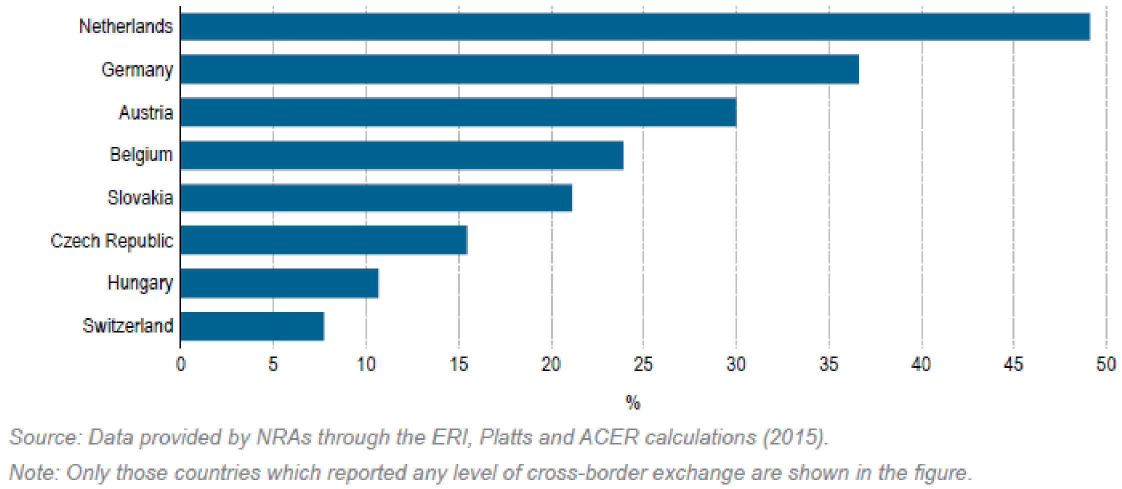


Figure 9: Imbalance netting as a percentage of the total needs of balancing energy (activated [plus avoided activation due to netting) from all types of reserves in national balancing markets – 2014 (%) (Source: ACER market monitoring report 2015)

While imbalance netting is important in itself, it accounts for only a part of the potential efficiency gains from the exchange of balancing energy, and in a wider sense, from balancing market integration. In the 2013 ACER market monitoring report, the potential benefits from imbalance netting and a further exchange of balancing energy were estimated at slightly more than 500 M€ for a selection of 15 European borders. Based on the recent estimated, efficiency gains calculated for the whole of Europe could be as high as 1.3 B€ annually.

The exchange of balancing services across European borders is currently limited, particularly the cross-border activation of balancing energy. The use of cross-border transmission capacity for balancing can be significantly improved compared to the day-ahead timeframe as shown in **Figure 10**. There is also room for improving exchange of balancing energy in the other direction of the congestion as the need of balancing energy in real time is not always in the direction of the congestion (thus contrary to day-ahead and intraday flows).

24 RPM is a cooperation between the Nordic TSOs for the exchange of mFRR products.

25 The process by which TSOs of two or more balancing zones agree to offset opposing imbalances between adjacent areas. Imbalance netting is intended to prevent the counteracting activation of balancing energy. This process results in an effective energy exchange from an area with an energy surplus to one with shortage, subject to available cross-border capacity.

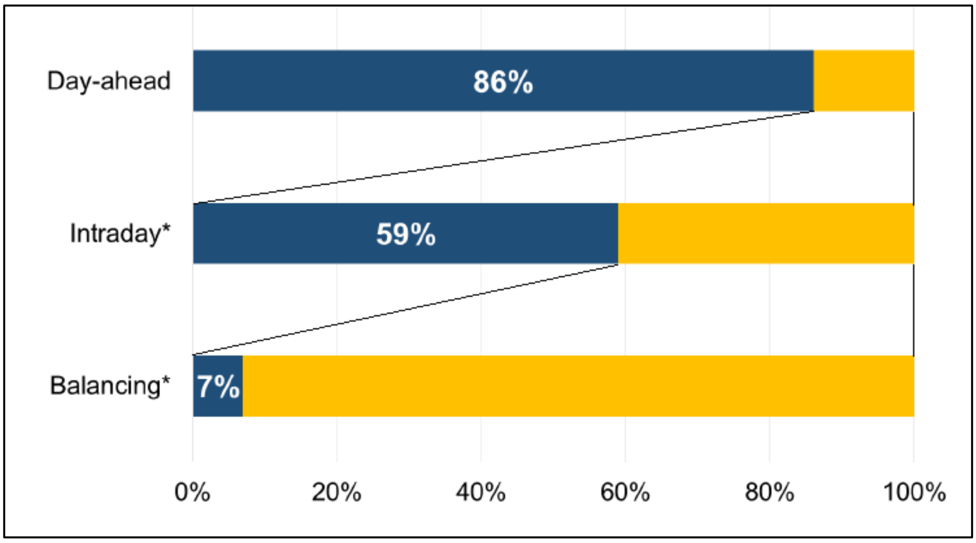


Figure 10: Level of efficiency (% use of commercial capacity available in the 'economic' direction) in the use of interconnectors in Europe (source: ACER presentation market monitoring report 2015, slide 12)

4. SUBSIDIARITY

The Electricity Regulation and its Annex contain already some basic rules on balancing. The right of the EU to provide a more detailed regulation on electricity balancing in the form of a binding Guideline is set out in Articles 8(6) of the Electricity Regulation.

The Commission's initiative to adopt a Commission Regulation establishing a Guideline on Electricity Balancing is fully in line with the principle of subsidiarity. The draft Balancing Guideline addresses the inefficient use of the European electricity transmission network by means of improving coordination, harmonisation and transparency of balancing markets, maximising the usage of available cross-border transmission capacity for balancing purposes and enhancing, at the same time, the system security and the integration of electricity markets to promote competition. This approach is consistent with the Electricity Regulation, which in Article 8(7) states that Network Codes shall be developed to address cross-border network issues and market integration issues.

In addition, the draft Balancing Guideline sets the minimum degree of harmonisation necessary to achieve the EU Target Model in electricity. The Guideline leaves the implementation of the rules therein to TSOs and NRAs.

5. OBJECTIVES

5.1. General objectives

The general objectives of the EU energy policy are security of supply, sustainability and competitiveness. Increasing amounts of renewable electricity, in particular from wind generation, and other changes to achieve a low carbon economy requires that the electricity system is able to integrate more volatile and more distributed production sources. The system needs to be able to contribute to more efficient use of electricity and transmission capacities.

5.2. Specific objectives

The specific objectives are to safeguard a balance between electricity supply and demand at the lowest possible cost to customers so as to complete the integration of the internal electricity market. To this end, balancing should be carried out less on a national level and more cross-border; to allow for the different resources available to be used in a more effective way, bring down costs and enhance security of supply.

6. POLICY OPTIONS

The functioning of balancing markets could be improved by addressing the causes for the lack of competition for balancing services, namely:

- By harmonising the pricing methodology for balancing energy; and
- By using cross-border transmission capacity for exchanging balancing energy.

To this end, the following policy options are being considered:

- **Baseline:** no further EU action
- **Option 1:** harmonisation of the pricing methodology for balancing energy
    - **Option 1.A:** pay-as-cleared methodology
    - **Option 1.B:** pay-as-bid methodology
- **Option 2:** usage of the cross-border transmission capacity for exchanging balancing energy
    - **Option 2.A:** only cross-border exchanges
    - **Option 2.B**: cross-border and national exchanges
    - **Option 2.C:** enforcing regional regulated entities performing the tasks of supranational balancing operators

In all following scenarios, FCR and RR are excluded from the analysis. FCR is not covered by the present initiative and RR is not used on a European level. Thus the different options only relate to FRR (automatic and manual).

6.1. Baseline: No further EU action

The baseline scenario consists of a voluntary approach to let the system evolve without a binding European regulation in place. This way, currently on-going experiences will be free to develop further and integrate, if deemed appropriate by the participating parties. However, fragmented (and possibly incompatible) projects may be implemented across Europe. Some countries may decide not to share their internal resources or to integrate balancing markets with their neighbours. This would result in a situation where expensive resources are often activated in some countries while less expensive resources located in other countries are not being offered to neighbours, allegedly for security reasons.

As regards the estimation of potential costs and benefits, the baseline assumes no further EU action on cross-border exchange of balancing energy. These assumptions likely result in an overestimation of the benefits and the costs since it disregards the possible implementation of regional initiatives, which could emerge even if in case the EU takes no further action.

Voluntary cooperation is, however, unlikely to provide for appropriate levels of harmonisation or certainty to the balancing market. Current initiatives such as RPM and the International Grid Control Cooperation initiative[26] ('IGCC') and their possible extension are

26 Cooperation between TSOs from Austria, Belgium, the Czech Republic, Denmark, Germany, the Netherlands and Switzerland that net aFRR activation under residual transmission constraints at the borders.

therefore not part of the baseline. The current EU regulatory framework contains very limited rules on balancing markets in a manner that allow to strengthening this market.

Stakeholders' opinions:

The Florence Forum[27] in March 2016 stresses the importance of balancing markets for a well-integrated and functionning EU internal energy market. Most stakeholders agree with the need to speed up the development of integrated short-term (balancing and intraday) markets and cross-border balancing markets, and provide for clear legal principles on non-discriminatory participation in these markets.

6.2. Option 1: Harmonisation of the pricing methodology for balancing energy

In existing European balancing markets, the procurement of balancing energy products is generally based on the following pricing methods:

- Pay-as-cleared methodology: the participating BSPs receive the same remuneration, equivalent to the price of the highest activated balancing energy bid;
- Pay-as-bid methodology: the participating BSPs receive a remuneration equivalent to the price they bid;
- Administrative (non-market based) pricing in some specific cases.

Effective balancing energy prices encourage suppliers to balance their positions, which will reduce the imbalances left for the TSO to manage and hence the overall cost. Other features from the imbalance settlement such as the imbalance settlement period have also an impact on the choice of the pricing methodology for balancing. Such methodology is a key element for building effective electricity markets and ensuring pricing consistency across the day-ahead, intraday and balancing timeframes.

6.2.1. Sub-Option 1.A: Pay-as-cleared methodology

The pay-as-cleared methodology depicts a transparent and plain pricing mechanism. The price represents a clear reference for all BSPs on the price of the marginal unit of balancing energy and would thus incentivise them to offer all the balancing resources at their disposal. As the clearing price is determined by the last accepted bid, energy or capacity shortage can be indicated appropriately. This has also a positive effect on the incentives on BRPs to keep the system in balance in particular in case of shortages. This methodology would allow reflecting scarcity for the remuneration of the participants in the balancing market – i.e. the payment that a participant receives for providing a balancing service to be the same payment that someone who is out of balance has to pay is introduced.

The possibility to significantly influence the market price by withholding of capacity could be considered as a drawback of this methodology, however it has been shown that such behaviour is possible in case of market power exercise, which in turn cannot be prevented by any of the two pricing methodology. Another drawback for pay-as-cleared is also that it may at best lead to equal costs compared to the pay-as-bid but very unlikely to lower costs.

27 The Florence Forum was set up to discuss the creation of true internal electricity in Europe. The participants are national regulatory authorities, Member States, the European Commission, transmission and distribution system operators, electricity traders, consumers, network users, and power exchanges. Conclusion from March 2016: https://ec.europa.eu/energy/sites/ener/files/documents/Conclusions%20-%20Florence%20Forum%20-%20Final.pdf

Another possible drawback is that it could lead to a very complex estimation in systems with very frequent internal congestions and central dispatch systems.

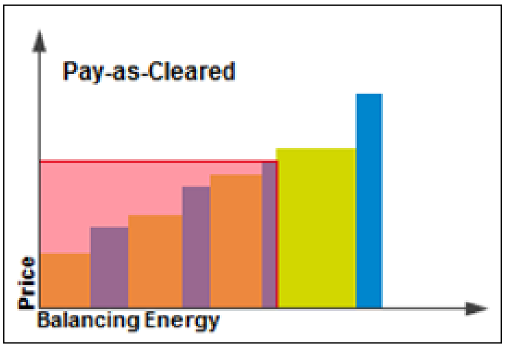


Figure 11: Pay-as-cleared methodology

6.2.2. Sub-Option 1.B: Pay-as-bid methodology

As the overall market price cannot be influenced by single bids, the pay-as-bid methodology might create a lower incentive for BSPs to withhold capacity or deviate from their marginal costs. Bidding strategies in general might be different when pay-as-bid methodology is applied, as BSPs are in general trying to guess the market price and bid just below this expectation.

However, a major drawback of this methodology is that it does not provide a clear signal on the price of the marginal unit of balancing energy and thus does not provide a clear signal and incentives to BRPs to be balanced, in particular in case of shortages. In highly concentrated markets, furthermore, the price of the last accepted bid could be estimated by BSPs with great market share and bidding prices could be set close to this theoretical market clearing price with the effect that pay-as-bid and pay-as-cleared methodologies lead to the same result.

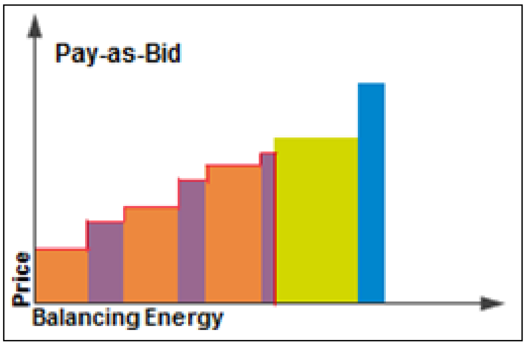


Figure 12: Pay-as-bid methodology

6.2.3. Summary of the identified Sub-Options under 1

Option 1.A: pay-as-cleared methodology		**Option 1.B: pay-as-bid methodology**	
PROS	**CONS**	**PROS**	**CONS**
Gives a transparent and plain price building and imbalance price calculation	May result in higher procurement costs and imbalance settlement prices	BSPs get the price they bid	Does not define a clear market reference price

Provides more efficient dispatch and more responsive balancing market; More appropriate for standardized products	On European scale the incentives on BRPs in one control area might influence the incentives on BRPs in another control area and overreaction of BRPs to create imbalances	Withholding of capacity may not influence the whole market price	Shortage of balancing services may not be clearly revealed by the market.
Creates a level playing field, and requires less effort for BSPs to prepare bids (smaller providers) and gives them accurate price signals	Possibly high complexity of price formation with continuous or sequential activation of bids, activation duration smaller than settlement period and in case of frequent congestions or in central dispatch market	Deviations from marginal costs may be less profitable.	BSPs try to guess the market price, which is more challenging for smaller BSPs
Can lead to higher profits for BSPs, which incentivises participation and investments in balancing resources (including demand response)	Higher risk of strategic bidding and market power in smaller areas and in scarcity moments (e.g. conventional generation)	Is more appropriate when products cannot be sufficiently standardised.	Does not provide the correct incentives to BRPs to be balanced
Consistent with the auction based model (day ahead)	Unit with marginal or negative marginal costs capture some extra revenue	Consistent with the continuous trading model (long-term, intraday)	Consistent with the auction based model (day ahead)

Stakeholders' opinions:

Feedback received from stakeholders during the consultation process (see Annex II) strongly supports the pay-as-cleared methodology ('marginal pricing'). Most stakeholders emphasize that such pricing approach is key to create positive incentives for market participants, to develop self-balancing, reduce imbalances and costs for society.

6.3. Option 2: Usage of cross-border transmission capacity for exchanging balancing energy

6.3.1. Option 2.A: Binding regulation only on cross-border exchanges

The Option 2.A foresees all TSOs to join the current IGCC initiative. The approach of imbalance netting is to exchange the imbalances with opposite signs in a controlled manner in order to avoid counteracting activation of balancing energy. Such netting can also be obtained between separate synchronous zones linked with DC interconnectors. The model consists of an exchange of information of control zone imbalances and automatic netting of opposing energy imbalances in real time, subject to available transmission capacity. In that way, aFRR needed to restore the balance in the power system is reduced leading to a higher efficiency and cost savings while the security of the power system is elevated due to a lower amount of required control actions.

Additionally, a limited set of balancing energy would be identified and participating TSOs would be required to share these products with other TSOs. Such exchanges would likely involve surplus resources that are temporarily not needed to meet the local security criteria and/or balancing expectations, to be exchanged after the gate closure time of the cross-border intraday market provided that sufficient transmission capacity is available. TSOs would identify available surplus resources of balancing energy in their local balancing market and offer them directly to other TSOs which would then have the possibility to activate balancing energy locally or cross-border.

It can take different forms:

- The local TSOs act as an intermediary between the BSPs in its area and the requesting TSO. From a market point of view, such model is equivalent to a BSP-TSO model;
- The local TSO is an active provider of balancing services, and acts as the commercial counterpart to the requesting TSO, which has no direct link with BSPs.

POSSIBLE BINDING SOLUTION: BSP-TSO MODEL

A BSP-TSO model enables a BSP to provide balancing services directly to a requesting TSO situated in another control area, if sufficient cross-border capacity is available after the gate closure time of the cross-border intraday market. The providing BSP is responsible for building the balancing product, as well as notifying the change in generation and/or consumption schedules (and possibly interconnection capacity acquisition) to both the requesting TSO and the local TSO, with respect to the rules for scheduling generation, consumption and cross-border exchanges.

The providing BSP needs to comply with the balancing rules that are established in the control area it is bidding, and the financial settlement is foreseen with the requesting TSO.

Such scheme may be based on two different designs:

- BSPs are allowed to bid in one market only and they need to identify themselves in advance what is the best possible allocation of their resources among different control areas, based on the available information;
- BSPs are allowed to bid in both systems. In this case the TSOs would use the balancing energy bids on the basis of a defined allocation process.

The involved TSOs have agreed procedures for the event of acceptance of a bid/offer:

- For a proper assessment of the impacts of cross-border exchanges, the decision process is based on transparent rules for scheduling generation, consumption and cross-border exchanges;
- For security reasons, the local TSO (in the control area where is located the providing BSP) has the possibility to veto the change in the BSP's program and inform the requesting TSO that the offer is not available.

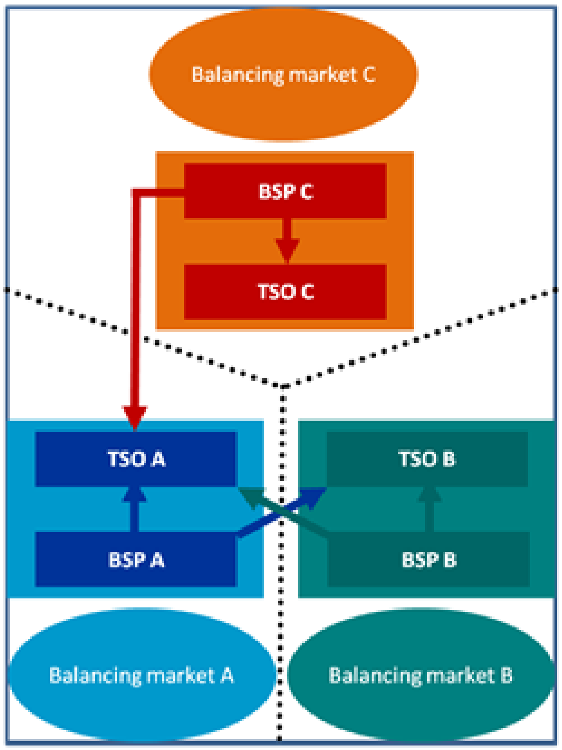


Figure 13: BSP-TSO model for cross-border exchanges of balancing energy (source: ACER initial impact assessment 2012)

Possible binding solution: TSO-TSO model without Common Merit Order List[28]

The bids in the balancing markets become available for activation for other TSOs by decision of the providing TSO after defining the amount of balancing energy that can be exchanged based on security criteria and/or balancing expectations as well as available cross-border capacities. The providing TSO can offer the not needed bids directly to other TSOs or it can compile new products to be exchanged across the border. The ability to activate bids and offers across the border will depend on the availability of cross-border capacity. TSOs thus identify available surpluses of balancing energy and offer them directly or through aggregation to be traded on a specific common pool that gathers offers and bids from the providing TSOs. This common pool represents an additional merit order list complementing the local merit order list. The requesting TSOs can thus decide to activate the most economically advantageous bid or offer from local merit order list of from the specific merit order list. The energy is delivered and settled at a given price, depending on the retained rules.

In practice, exchanges could be implemented twofold:

- Through blocks of energy pre-scheduled before a fixed deadline. One concrete example is the balancing mechanism implemented between France and GB based on standard products of one hour duration;
- Through a flexible product directly activated via continuous process without fixed deadline: TSOs share bids and activate exchanges on a continuous basis. For instance, this flexible product may be designed to implement exchanges of manually activated reserves with a 15 minutes activation lead-time and duration.

28 In the balancing markets a merit order list is a list of all valid balancing bids submitted by BSPs and sorted in order of their bid prices used for the activation of balancing energy bids.

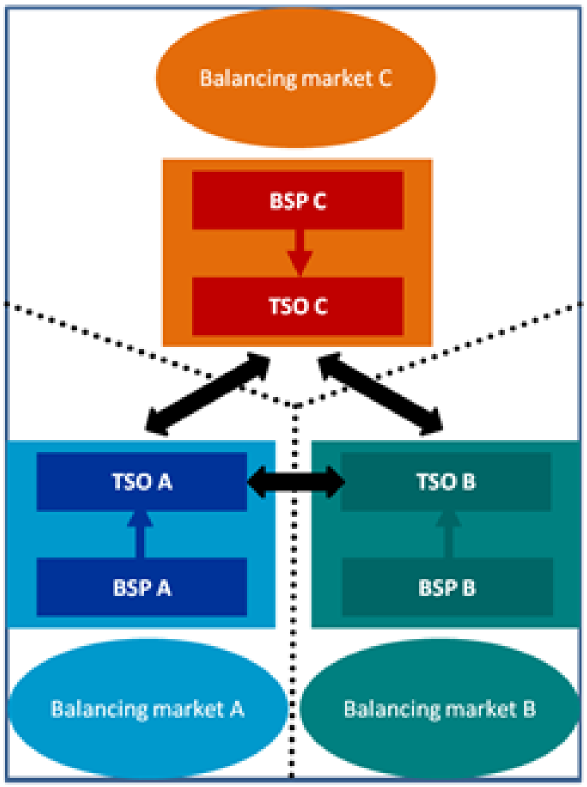


Figure 14: TSO-TSO model without Common Merit Order list for cross-border exchanges of balancing energy (source: ACER initial impact assessment 2012)

6.3.2. Option 2.B: Binding regulation on cross-border and national exchanges

The Option 2.B assumes a far-reaching standardisation of balancing products and some coordination of operational processes. Therefore, it would result in a higher level of coordination between European TSOs. However, such coordination still relies on the concept of local responsibilities within individual balancing zones (or 'control blocks'), which consist of one or more control areas but do not necessarily cover more than one Member State. Thus, the approach is compatible with the current operational security principles.

This option involves setting up a binding European framework to ensure that the harmonisation of key elements is addressed with the aim to facilitate the development of standard balancing products that would be used locally and cross-border by all TSOs. Standard products would be developed and progressively shared between all TSOs on European-wide balancing platforms. In order to minimise the cost of balancing energy, all bids and offers that are available in each control area would be gathered in a single list and resources would be activated according to a merit order subject to operational security limits and available transmission capacities after the cross-border intraday market.

POSSIBLE BINDING SOLUTION: TSO-TSO WITH COMMON MERIT ORDER LIST

The TSOs share their balancing resources and optimise their activation in order to minimise the cost of balancing by gathering in a common list balancing bids and offers that are available in their control areas, and activate them according to a merit order list subject to operational security constraints including the availability of cross-border transmission capacities. This exchange of standardised balancing energy products between TSOs is based on the activation of the cheapest available bids provided by the BSPs on a common program time unit basis. The TSOs may be allowed to deviate from the merit order list if congestion impedes cross-border exchange of balancing energy or other operational security limits that prevent the activation of the cheapest bids.

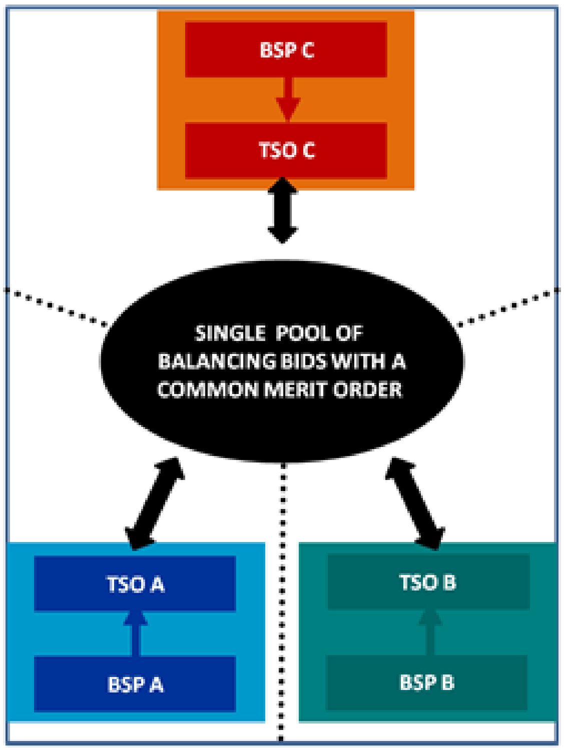


Figure 15: TSO-TSO model with Common Merit Order list for cross-border exchanges of balancing energy (source: ACER initial impact assessment 2012)

STANDARDISATION OF BALANCING PRODUCTS

A limited set of standard products will have to be identified and used both locally and across borders. To enable participation of specific balancing resources and new technologies, specific products may still be defined locally, and the TSOs would be able to convert them into standard products in order to share them on the common merit order list. Key elements of the national market design are likely to be harmonised such as the imbalance settlement period as well as the roles and responsibilities of BSPs and BRPs. Some elements may remain outside the scope of harmonisation requirements, where it is considered that they do not impede the development of the cross-border exchanges of balancing energy. This exchange of standard products between TSOs is based on the activation of the cheapest bids provided by the BSPs on a common list. The TSOs may be allowed to deviate from the list if congestion impedes cross-border exchange of balancing energy or other operational security limits that prevent the activation of the cheapest bids.

6.3.3. Option 2.C: Binding regulation enforcing regional regulated entities performing the tasks of supranational balancing operators (discarded)

The Option 2.C would result in a significant evolution of the current design in which European electricity systems are operated. This would have a major impact on the current design of system operation procedures and responsibilities. This Option involves setting up a binding European framework to ensure that all Member States implement a single regional market design for balancing energy.

Several supranational regulated entities would be responsible for the balancing market design and would operate balancing activities in real time in cooperation with national TSOs. This would enable TSOs to reduce the security margin on transmission lines, thus offering more transmission capacity to the market and allowing for more cross-border exchanges of balancing energy.

This option is building on the options proposed by the ACER initial impact assessment on electricity balancing[29], but considers a regional approach as foreseen in the Market Design Impact Assessment with the establishment of Regional Operational Centres ('ROCs'). The same assumption regarding the number and the geographical scope of the regions used for cooperation in reserve sizing and procurement (see **Annex IV**) is taken for the establishment of regional regulated entities performing the tasks of supranational balancing operators.

However, it should be noted that there is currently no legal basis in the Third Energy Package to support a shift of real-time system operation procedures and responsibilities to regional regulated entities. Therefore this option has been discarded. It was, nevertheless, decided to further present the different impacts as qualitative and quantitative results were provided by the study supporting this Impact Assessment[30].

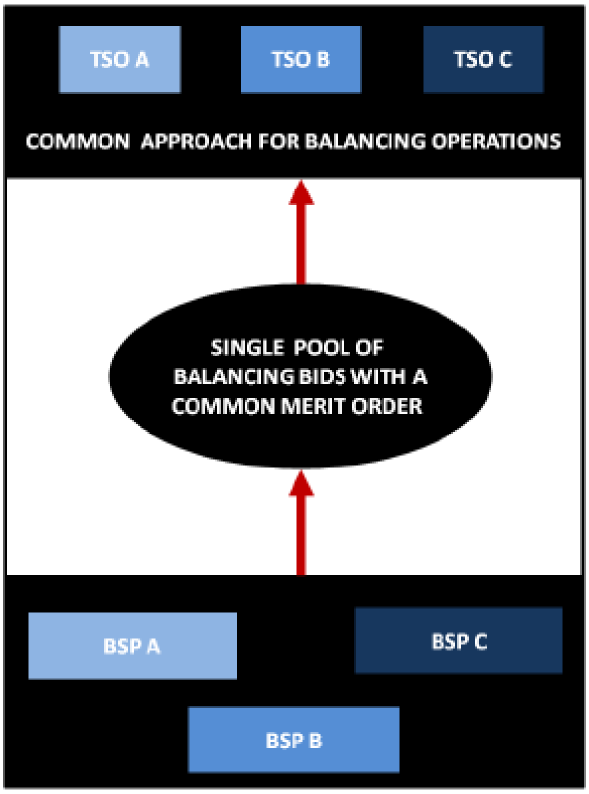


Figure 16: Regional regulated entities performing the tasks of supranational balancing operators (source: ACER initial impact assessment 2012)

6.3.4. Summary of the identified Sub-Options under 2

	Option 2.A	Option 2.B	Option 2.C

29 Acer Initial Impact Assessment on the Framework Guidelines on Electricity Balancing (Sept. 2012): http://www.acer.europa.eu/official_documents/acts_of_the_agency/framework_Guidelines/framework%20Guidelines/framework%20Guidelines%20on%20electricity%20balancing.pdf

30 Artelys report on 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016).

Imbalance netting	Required	Required	Required
Exchange of surpluses (BSP-TSO or TSO-TSO)	Required	-	-
Common Merit Order (CMO)	Possible	Required	Required
Standardisation of products	Cross-border only	Required	Required
Harmonisation of the pricing methodology	Cross-border only	Pay-as-clear	Pay-as-clear
Transfer of real-time balancing tasks	-	Possible	Required

Stakeholders' opinions:

Most stakeholders are in favour of a binding regulation on both cross-border *and* national exchanges of balancing energy. In March 2016, the FlorenceForum stressed the importance of balancing markets for a well-integrated and functioning EU internal energy market and encouraged the Commission to swiftly bring the Regulation establishing a Guideline on Electricity Balancing to Member States.

7. ASSESSMENT OF THE IMPACTS OF THE POLICY OPTIONS

Wrong incentives can be given by the possibility to arbitrage between balancing markets and day ahead or respectively intraday markets. To avoid such incentives the methodology for pricing balancing energy should be designed in a way that balancing energy prices and imbalance settlement prices reflects that the prices for positive or negative imbalances are settled around the real time value of energy. One way to achieve this is through efficient competition and to allow BSPs to change their balancing bids close to real time.

Therefore, our assessment has revealed that Option 1.A ('pay-as-clear' methodology) is a prerequisite for the operationalization of any of the Sub-Options under 2. Such methodology is therefore the most appropriate in order to use the cross-border transmission capacity available after the cross-border intraday gate closure for the exchange of balancing energy.

7.1. Baseline: No further EU action

The main assumptions used in the optimal dispatch model (METIS[31]) used to assess the activation of balancing energy are the following:

(a) National dimensioning of aFRR and mFRR reserves (probabilistic approach);

(b) National procurement of balancing aFRR and mFRR reserves;

(c) RES participation to balancing;

(d) No imbalance netting;

(e) No cross-border exchange of balancing energy.

31 METIS is a bottom-up optimal dispatch model using an hourly time resolution for the day-ahead dispatch. The resolution for the generation and dispatch of imbalances has been increased to 5 minutes. Technical characteristics of the generation technologies (ramping, min off time, min power, etc.) are used to constrain the ability of power plants to participate to the provision of aFRR and mFRR.

The baseline assumes no further EU action on cross-border exchange of balancing energy. It assumes that imbalances are not netted, and that there are no cross-border exchanges of balancing energy.

In order to develop the cost estimates, a review of the literature with the aim of identifying data points relevant to each of the costs was performed. In many cases costs were scaled to reflect the fact that the proposed integration covers 30 European countries; but the data points themselves covered a far smaller number of countries or states. To achieve this, a scaling methodology was developed based on disaggregating data points into fixed and per country components and scaling up the per country components.

7.2. Impact of Sub-Option 2.A: Binding regulation on cross-border exchanges

The main assumptions used in the optimal dispatch model (METIS) used to assess the activation of balancing energy are, in addition to the baseline, the following:

(a) Imbalance netting across Europe (even between countries belonging to different synchronous areas),

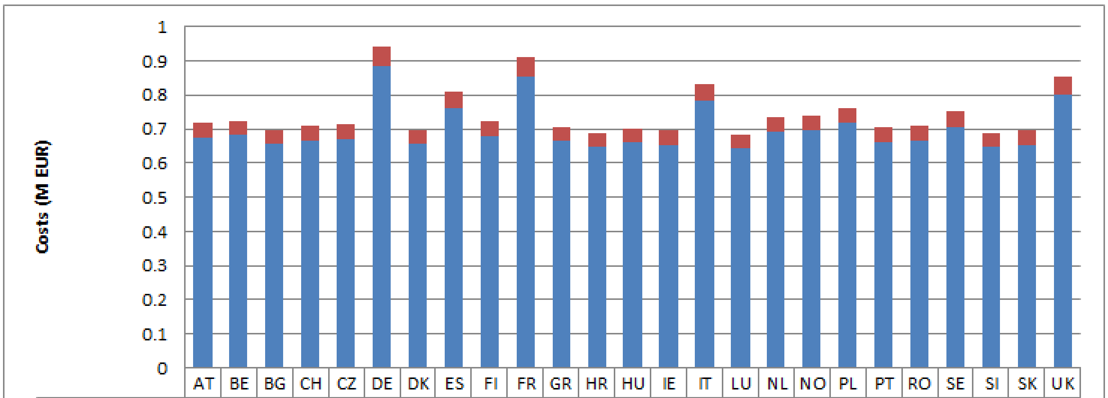
(b) Interconnection capacity available for balancing given by the residual capacity after day-ahead market clearing.

7.2.1. Economic impacts

COSTS

In general, costs associated with implementation of various policy options can be incurred, either: 1) on a one-off basis, reflecting costs incurred at the time of establishing the relevant platform; or 2) on an on-going basis, reflecting any annual costs associated with operating the platform where these may exist. In addition, costs can be either fixed or variable. Here the key distinction is that variable costs vary with number of countries where the particular design is being implemented.

Under Option 2.A, total costs of implementation will fall in the range of €18.1 – 20.7 million on a one-off basis, and €0.7 – 1.3 million on an on-going basis. As illustrated in **Figure 17**, the implementation costs would not particularly affect a specific Member state.



	AT	BE	BG	CH	CZ	DE	DK	ES	FI	FR	GR	HR	HU	IE	IT	LU	NL	NO	PL	PT	RO	SE	SI	SK	UK
On-going costs	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1
One-off costs	0.7	0.7	0.7	0.7	0.7	0.9	0.7	0.8	0.7	0.9	0.7	0.6	0.7	0.7	0.8	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.8

Figure 17: Geographical distribution of the costs under Option 2.A (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

BENEFITS

Allowing TSOs to net their imbalances has several effects. First the activation costs associated with the provision of upwards and downwards balancing energy decrease. Second, fuel costs related to the upward regulation are avoided. Finally, the benefits associated with downward regulation (e.g. diminution of fuel costs and of GHG emissions) are cancelled by the netting. The combination of these effects results in generating around 212 M€ of savings per year compared with the baseline. As illustrated in **Figure 18**, most of the Member States would directly benefit from the imbalance netting with an annual saving of around 56 M€ for France. Neutral or negative impacts (e.g.: Hungary or Poland) need to be carefully considered as settlement between TSOs related to imbalance netting (i.e. the way the benefits generated by imbalance netting are redistributed) and cross-zonal exchange of balancing energy (i.e. the payment of the TSO of zone X to the TSO of zone Y for the provision of balancing energy) are not modelled. However, the implementation of settlement mechanisms among TSOs would result in a redistribution of savings that benefit all countries.

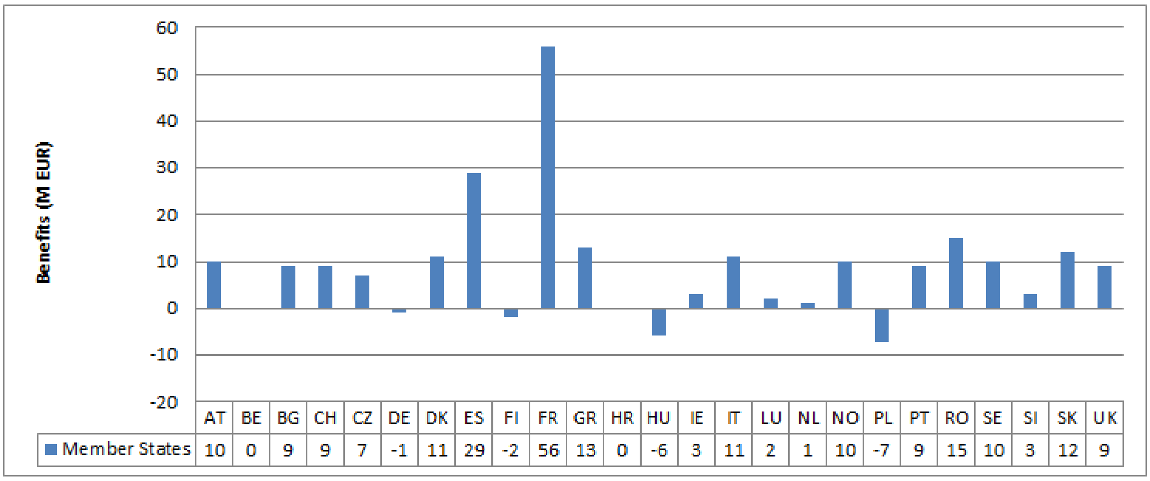


Figure 18: Geographical distribution of the benefits under Option 2.A (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.2.2. Administrative impacts

The total costs under Option 2.A are associated with two key aspects, and are summarized in the **Figure 19** below. First set of costs is associated with the development of a common technical controller, and a settlement process and system for imbalance netting. The second set of costs pertains to establishing the infrastructure to provide for TSO-TSO trading and settlement arrangements. These costs are associated with standardizing product design on a limited basis, and establishing regional trade and settlement processes.

	Fixed		Per country		Total	
	One-off	Ongoing	One-off	Ongoing	One-off	Ongoing
Imbalance netting	€360 – 590k		€130 – 210k		€4.3 – 6.9m	
TSO-TSO trading	€1.2m	€60 – 120k	€420k	€ 20 – 40k	€13.8m	€660k – 1.3m

Figure 19: Estimation of the costs under Option 2.A (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.2.3. Environmental and social impacts

The assessment has shown that the total activation of energy for balancing purposes only represents a few per cent from the total demand of energy (see **Figure 20**). Hence the environmental and social impacts were considered as negligible as the energy used by TSOs to balance the grid is marginal compared to the total demand of energy.

	Baseline	Option 2.A
Total demand of energy	3490 TWh	3490 TWh
Total demand of balancing energy	37.0 TWh	37.0 TWh
Imbalance netting	-	18.6 TWh
Share of cross-border activation[32]	-	-
Total activation of balancing energy	**36.8 TWh**	**18.4 TWh**

Figure 20: Total activation of balancing energy under Option 2.A (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.3. Impact of Sub-Option 2.B: Binding regulation on cross-border and national exchanges

The main assumption used in the optimal dispatch model (METIS) used to assess the activation of balancing energy is, in addition to Option 2.A, cross-border exchange of balancing energy across Europe (even between countries belonging to different synchronous areas).

7.3.1. Economic impacts

COSTS

Under Option 2.B, total costs of implementation will fall in range of €76.1 – 96.4 million on a one-off basis, and €1.8 – 4.6 million on an on-going basis. As illustrated in **Figure 21**, the implementation costs would mainly affect the bigger Member States such as Germany, Spain, France, Italy and UK. This is due to the fact that the costs incurred at a supra-national level have been apportioned among Member States based, in part, on each State's modelled share of total electricity consumption.

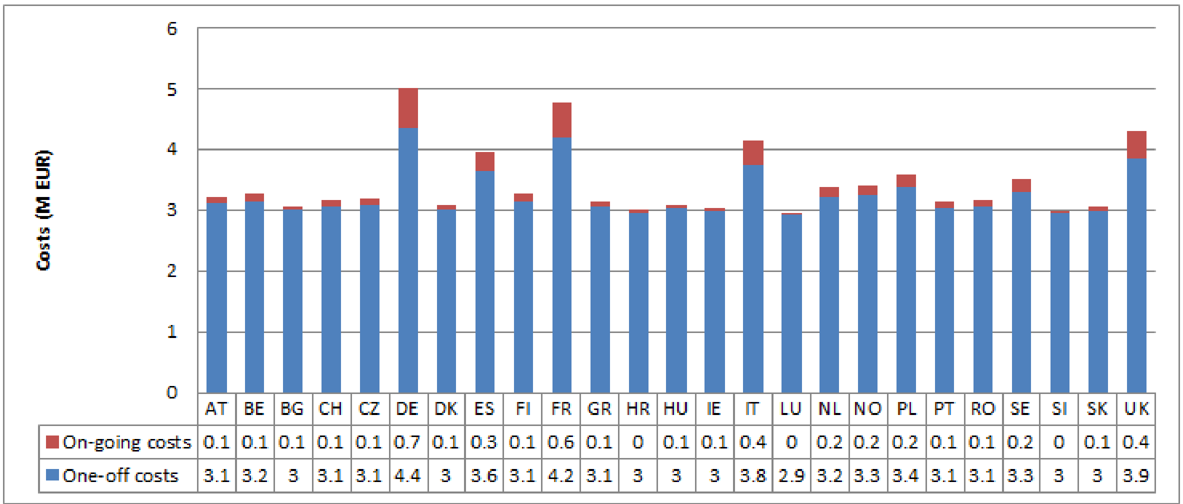


Figure 21: Geographical distribution of the costs under Option 2.B (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

BENEFITS

32 This indicator does not take imbalance netting into account.

In this Option TSOs are not only allowed to net their imbalances, but also to exchange balancing products. The exchange of balancing products results in a more cost-efficient utilisation of resources: the most expensive of the available units are used for downward regulation, while the cheapest ones provide upward regulation. The combined effects of imbalance netting and cross-border exchange of balancing energy result in savings of around 479 M€ per year compared with the baseline. As illustrated in **Figure 22**, most of the Member States would directly benefit from the exchange of balancing energy on European-wide balancing platforms. Member States such as Germany, Spain, France, Italy, Slovakia and UK would save more than 40 M€ annually. Neutral or negative impacts (e.g.: Hungary or Slovenia) need to be carefully considered as settlement between TSOs related to imbalance netting (i.e. the way the benefits generated by imbalance netting are redistributed) and cross-zonal exchange of balancing energy (i.e. the payment of the TSO of zone X to the TSO of zone Y for the provision of balancing energy) are not modelled. However, the implementation of settlement mechanisms among TSOs would result in a redistribution of savings that benefit all countries.

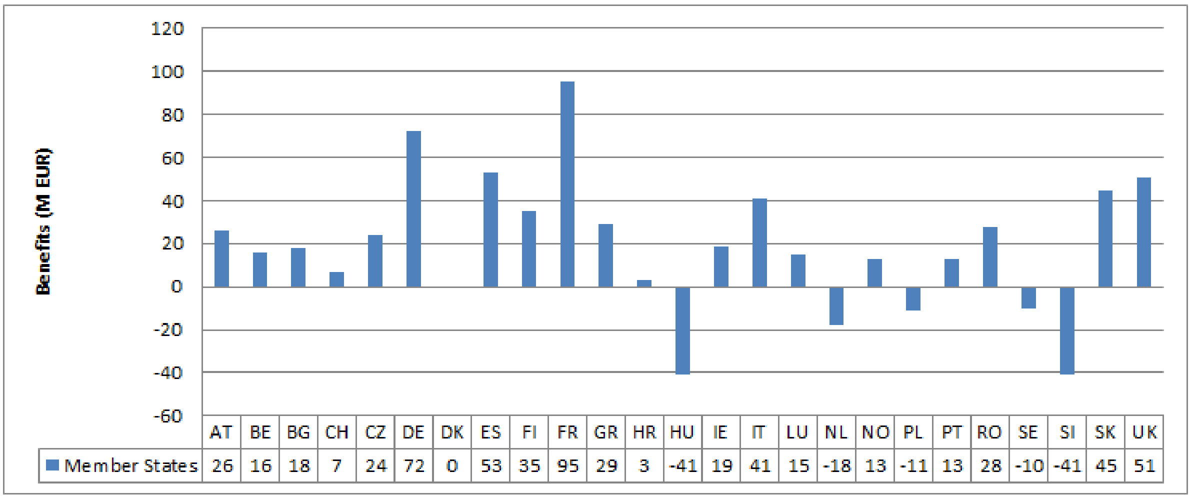


Figure 22: Geographical distribution of the benefits under Option 2.B (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.3.2. Administrative impacts

The total costs under Option 2.B are associated with two key aspects, and are summarized in the **Figure 23** below. First set of costs is associated with the development of a common technical controller, and a settlement process and system for imbalance netting. The second set of costs pertains to establishing European-wide balancing platforms, including provisions for clearing process and algorithms, hosting, maintenance and support.

	Fixed		Per country		Total	
	One-off	Ongoing	One-off	Ongoing	One-off	Ongoing
Imbalance netting	€360 – 590k		€130 – 210k		€4.3 – 6.9m	
Europe-wide exchange	€2.8 – 10m	€1.8 – 4.6m	€2.3 - 2.65m		€71.8 – 89.5m	€1.8 – 4.6m

Figure 23: Estimation of the costs under Option 2.B (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.3.3. *Environmental and social impacts*

The assessment has also shown that the total activation of energy for balancing purposes only represents a few per cent from the total demand of energy (see **Figure 24**). Hence the environmental and social impacts were considered as negligible as the energy used by TSOs to balance the grid is marginal compared to the total demand of energy.

	Baseline	Option 2.B
Total demand of energy	3490 TWh	3490 TWh
Total demand of balancing energy	37.0 TWh	37.0 TWh
Imbalance netting	-	18.6 TWh
Share of cross-border activation[33]	-	53%
Total activation of balancing energy	**36.8 TWh**	**18.4 TWh**

Figure 24: Total activation of balancing energy under Option 2.B (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.4. Impact of Sub-Option 2.C: Binding regulation enforcing regional regulated entities performing the tasks of supranational balancing operators (discarded)

The main assumption used in the optimal dispatch model (METIS) used to assess the activation of balancing energy is, in addition to Option 2.B, increase by 15% transmission capacity available for balancing to account for the lower security margins required under a model where regulated entities would perform the tasks of supranational balancing operators.

7.4.1. *Economic impacts*

COSTS

Under this Option, total costs of implementation will fall in range of €125.5 – 274.2 million on a one-off basis, and €27.9 – 39.9 million on an on-going basis.

BENEFITS

Increasing the transmission capacity by lowering the security margins result in a greater level of imbalance netting and additional cross-border exchanges of balancing energy compared with Option 2.B. This Option generates annual savings of the order of 817 M€ per year compared with the baseline. As illustrated in **Figure 25**, Germany would benefit the most with potential savings of more than 150 M€ annually. Neutral or negative impacts (e.g.: Hungary or Slovenia) need to be carefully considered as settlement between TSOs related to imbalance netting (i.e. the way the benefits generated by imbalance netting are redistributed) and cross-zonal exchange of balancing energy (i.e. the payment of the TSO of zone X to the TSO of zone Y for the provision of balancing energy) are not modelled. However, the implementation of settlement mechanisms among TSOs would result in a redistribution of savings that benefit all countries.

33 This indicator does not take imbalance netting into account.

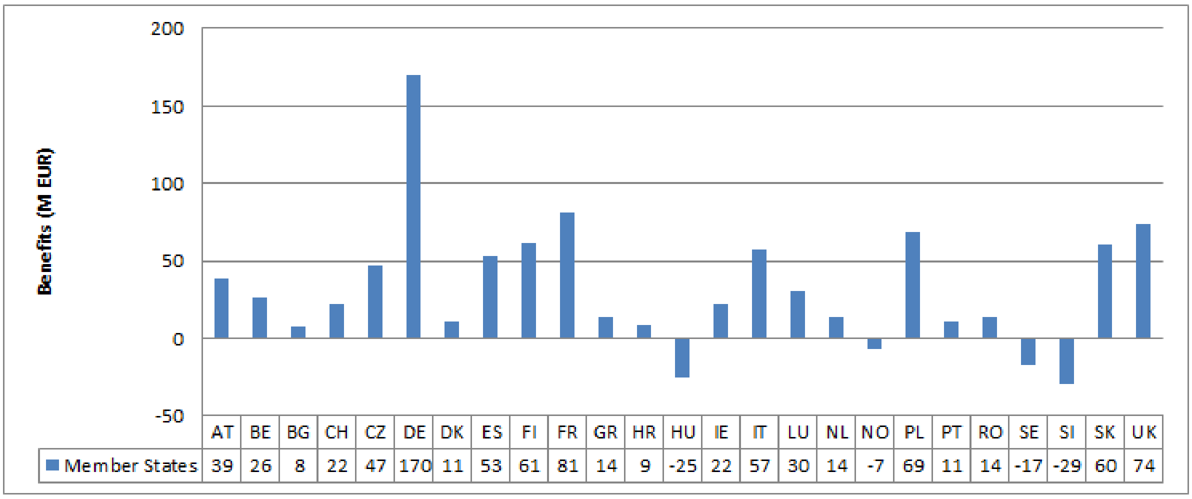


Figure 25: Geographical distribution of the benefits under Option 2.C (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.4.2. *Administrative impacts*

The total costs under this Option are associated with three key aspects, and are summarized in the **Figure 26** below. First set of costs is associated with the development of a common technical controller, and a settlement process and system for imbalance netting. The second set of costs pertains to establishing regional-wide balancing platforms, including provisions for clearing process and algorithms, hosting, maintenance, and support. The third set of costs relate to the establishment of regulated entities performing the tasks of supranational balancing operators, one for each of five identified regions, responsible for co-operating with national TSOs. Associated cost categories for developing such a supranational operator include, administrative costs, technical investment required to centralize SCADAs, and managerial costs relating to establishing regional agreements on funding and responsibilities.

	Fixed		Per country		Total	
	One-off	Ongoing	One-off	Ongoing	One-off	Ongoing
Imbalance netting	€360 – 590k		€130 – 210k		€4.3 – 6.9m	
Europe-wide exchange	€2.8 – 10m	€1.8 – 4.6m	€2.3 - 2.65m		€71.8 – 89.5m	€1.8 – 4.6m
Supranational Balancing Operators	€9.9 – 35.6m	€5.5 – 7.7m			€49.4 – 177.8m	€25.4 – 35.3m

Figure 26: Estimation of the costs under Option 2.C (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

7.4.3. *Environmental and social impacts*

The assessment has shown that the total activation of energy for balancing purposes only represents a few per cent from the total demand of energy (see **Figure 27**). Hence the environmental and social impacts were considered as negligible as the energy used by TSOs to balance the grid is marginal compared to the total demand of energy.

	Baseline	Option 2.C
Total demand of energy	3490 TWh	3490 TWh
Total demand of balancing energy	37.0 TWh	37.0 TWh

Imbalance netting	-	23.3 TWh
Share of cross-border activation[34]	-	70%
Total activation of balancing energy	**36.8 TWh**	**13.7 TWh**

Figure 27: Total activation of balancing energy under Option 2.C (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

8. COMPARISON OF THE POLICY OPTIONS

Option 2.A is by far the cheapest. Imbalance netting is expected to only incur minor transitory costs. The costs associated with TSO-TSO trading are also expected to be minimal and predominantly one-off. Option 2.B is more expensive due to the significant one-off cost of creating European-wide balancing platforms for exchanging balancing energy. This cost, combined with the one-off and on-going costs of setting up five regional regulated entities performing the tasks of supranational balancing operators, means that Option 2.C is materially more expensive again.

On the benefits side, Option 2.A captures the benefits of allowing TSO to net their imbalances taking into account the network constraints (212 M€). Option 2.B introduces the possibility to activate balancing energy cross-border, meaning that cheaper resources displace the more expensive ones (479 M€). Finally, in Option 2.C, the introduction of five regional regulated entities performing the tasks of supranational balancing operator is assumed to decrease the need for security margins and that, as a result, more cross-border transmission capacity will be available to net imbalances and exchange of balancing energy, leading to savings of 817 M€ compared to baseline.

Although the assumptions of the baseline likely result in an overestimation of the costs and benefits, all the Sub-Options under 2 investigated in this impact assessment are overall hugely beneficial in terms of Net Present Values ('NPV'): the benefits clearly outweigh the on-going costs. Their adoption, by increasing the flexibility of the power system, strengthening TSOs cooperation and pulling additional resources in the market, would lessen the overall cost of the power system.

	Option 2.A		Option 2.B		Option 2.C (discarded)	
	One-off	On-going	One-off	On-going	One-off	On-going
Costs	18.1–20.7M€	660k–1.3M€	76.1–96.4M€	1.8–4.6M€	125.5–274.2M€	27.2–39.9M€
Benefits	-	212 M€	-	479 M€	-	817 M€
NPV[35]	1.7 B€		3.8 B€		6.5 B€	

34 This indicator does not take imbalance netting into account.

35 The Net Present Value (NPV) is computed using a 4% discount rate on an indicative 10-year duration. This should not be interpreted as the benefits over a 10-year period (the capacity mix and demand would be different).

Figure 28: Summary of the costs, benefits and NPV of the different Sub-Options under 2 (source: Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves' (October 2016))

9. CONCLUSION

The assessment has revealed that Option 1.A (*'pay-as-cleared' methodology*) is a prerequisite for the operationalization of any of the Sub-Options under 2 and that Option 1.A and the Sub-Options under 2 are thus complementary. Although Option 2.C is expected to bring the biggest benefits, there is currently no legal basis in the Third Energy Package to support it and it has therefore been decided not to proceed with this Option.

Therefore, the Commission Services are of the view that Sub-*Option* 2.*B (binding regulation on cross-border and national exchanges)* in combination with Option 1.A (*'pay-as-cleared' methodology)* is the appropriate approach to achieve the objectives identified in this assessment, i.e. to implement efficient balancing rules for electricity cross-border trade in Europe.

10. MONITORING AND EVALUATION

The core indicators of progress concerning implementation and operation of cross-border balancing trade in Europe are:

- The time to reach the European-wide balancing platforms taking into account the intermediate steps;
- The efficiency of the use of interconnectors for the balancing timeframe;
- The monetary gains and savings due to cross-border balancing;
- The economic efficiency and reliability of the balancing markets;
- The evolution of balancing service prices of the previous years.

Article 9(1) of Electricity Regulation tasks ACER with the monitoring and analysis of the implementation of the Network Codes.

Pursuant to Article 8(8) of said Regulation, ACER can be assisted in performing this duty by ENTSO-E. ENTSO-E has also a duty to make available all information required by ACER necessary to monitor the implementation of the Network Codes. This obligation has been further developed in the draft Balancing Guideline, which states that ACER will determine a list of the information to be communicated by ENTSO-E. In turn, in application of Article 4 of the Electricity Regulation, TSOs are obliged to cooperate with ENTSO-E. The draft Balancing Guideline restates this provision.

Article 37 of Directive 2009/72/EC foresees very broad monitoring rights and duties for NRAs. Similarly, Article 19 of Electricity Regulation states that regulatory authorities shall ensure compliance with the Regulation and the Guidelines adopted pursuant to Article 18.

In addition, the proposed Guideline provides for specific provisions concerning monitoring of the effectiveness and efficiency of the implementation, and establishes a stakeholder committee whose task will be to discuss and give advice regarding the development of the European-wide balancing platforms, also in view of possible future amendments of the proposed Guideline.

11. LIST OF ANNEXES

(1) Annex I: Procedural information

(2) Annex II: Stakeholders consultations

(3) Annex III: Who is affected by the initiative and how

(4) Annex IV: Analytical models used in preparing the impact assessment

(5) Annex V: Summary of the link with the Market Design initiative

Annex I: Procedural information

Lead DG: DG Energy

Agenda planning/Work Programme references

- AP 2013/ENER/050[36];
- Commission Implementing Decision (EU) 2012/413 on the establishment of the annual priority lists for the development of Network Codes and Guidelines for 2013[37];
- Commission Implementing Decision (EU) 2013/442 on the establishment of the annual priority lists for the development of Network Codes and Guidelines for 2014[38];
- Commission Implementing Decision (EU) 2014/713 on the establishment of the annual priority lists for the development of Network Codes and Guidelines for 2015[39];
- Commission Implementing Decision (EU) 2015/1960 on the establishment of the annual priority lists for the development of Network Codes and Guidelines for 2016[40].

Organization and timing

The EU Electricity Target Model has been developed in a collaborative process including all main stakeholders during 2008 – 2009 in the Project Co-ordination group ('PCG') and during 2010 in the Ad Hoc Advisory Group ('AHAG'). The work continues as monitoring of the implementation of the target model, from 2011 onwards the group was renamed ACER Electricity Stakeholders Advisory Group ('AESAG').

According to the process defined in the Third Energy Package, the Commission sets annual priorities for the work on Network Codes. ACER has six months to prepare the Framework Guidelines, after which ENTSO-E has 12 months to prepare the network code. In January 2012, the European Commission requested to ACER the Framework Guidelines on electricity balancing which were adopted in September 2012. ACER also prepared an initial impact assessment for the choices they have made in the Framework Guidelines on electricity balancing[41]. The basis for the Framework Guidelines has been the EU Electricity Target Model.

In December 2013, ENTSO-E delivered the network code on electricity balancing to ACER that was rejected in March 2014. In August 2014, ENTSO-E submitted a new version of the network code[42] with supporting document to justify their choices for the code. In July 2015, ACER issued an Opinion recommending the adoption of the network code[43], however with some amendments.

36 http://ec.europa.eu/smart-regulation/roadmaps/docs/2013_ener_050_network_code_balancing_en.pdf
37 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D0413&from=EN
38 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0713&from=EN
39 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0713&from=EN
40 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015D1960&from=EN
41 http://www.acer.europa.eu/official_documents/acts_of_the_agency/framework_Guidelines/framework%20Guidelines/framework%20Guidelines%20on%20electricity%20balancing.pdf

42 https://www.entsoe.eu/Documents/Network%20codes%20documents/NC%20EB/140806_NCEB_Resubmission_to_ACER_v.03.PDF

43 http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2003-2015.pdf

This Impact Assessment was discussed in the Inter-Service Group (ISG) on Network Codes on 24 September 2015, 20 January 2016 and 15 July 2016 and revised in the lights of comments made by other services, including the Secretariat-general. Not all DGs did participate in each ISG. This Impact Assessment comes into play before the Electricity Cross-Border Committee gives its opinion on the Guideline that is then submitted for scrutiny to the European Council and the European Parliament.

Consultation and expertise

All main stakeholders affected by the proposed Regulation (TSOs, regulators, industry and consumer associations etc.), were intensively involved in the development of the EU Electricity Target Model. Most of the stakeholder participation took place directly in the working groups that were preparing the target model for electricity and in workshops during the code development. During the preparation of the Framework Guidelines and subsequently during the development of the network code, several public consultations were organised by ACER and ENTSO-E.

External expertise

The Commission used three consultant studies as input to the impact assessment:

- Booz & Co report 'Benefits of an Integrated European Energy Market', July 2013[44]
- Mott McDonald report 'Impact Assessment on European Electricity Balancing Market', March 2013[45]
- Artelys report 'Integration of Electricity Balancing Markets and Regional Procurement of Balancing Reserves', October 2016

ENTSO-E also performed three additional studies as early implementation of the draft Balancing Guideline:

- E-Bridge report on the impact of merit order activation of automatic Frequency Restoration Reserves and harmonised Full Activation Times, February 2016[46]
- Frontier Economics report on the costs and benefits of a change to the imbalance settlement period, April 2016[47]
- Public consultation document for the design of the Trans European Replacement Reserves Exchange, March 2016[48]

Impacts are thus evaluated based on the work of our own studies by consultants and, partly, by ENTSO-E as early implementation of the draft Balancing Guideline.

44 https://ec.europa.eu/energy/sites/ener/files/documents/20130902_energy_integration_benefits.pdf

45 https://ec.europa.eu/energy/sites/ener/files/documents/20130610_eu_balancing_master.pdf

46 https://www.entsoe.eu/Documents/MC%20documents/balancing_ancillary/151224_Report_Study_merit_order_aFRR_and_harmonising_FAT_vs_0_1_draft_selection_for_BSG_meeting_on_15_January.pdf

47 https://www.entsoe.eu/Documents/Network%20codes%20documents/Implementation/CBA_ISP/ISP_CBA_Final_report_29-04-2016_v4.1.pdf

48 https://consultations.entsoe.eu/markets/terre/supporting_documents/20160307_TERRE_Consultation_FV.pdf

RSB opinion (16/09/2016)

Comments	Modifications made
(1) The report should clarify the context and the scope of the initiative in view of the parallel, more comprehensive review of electricity market design. This review also addresses balancing markets.	*To take into account this comment, we have restructured the order of paragraphs in order to give more prominence to a treatment of interlinks between the Market Design initiative and the current proposal for a Balancing Guideline. Sections 2.1.3 and 2.1.4 in particular have been devoted to an extensive treatment of such linkages with the Market Design initiative as well as other Network Codes and Guidelines. In discussing such linkages, we have also provided extensive rationales on the reasons for splitting some of the balancing provisions between the Guideline and the Market Design initiative.*
(2) Since the Electricity Balancing Guideline stem from the empowerment in the Third Energy Package, any elements that go beyond 'technical specifications' should be left out of the Guidelines' scope. For example, the option of establishing Independent System Operators requires a fundamental modification to the EU electricity market organisation. As such, this option should be discarded. The impact assessment should indicate whether the scope of the initiative is also determined by non-legalistic factors, such as a desire to codify an existing consensus view among market participants.	*In line with the comment made, we have reformulated the option concerning a proposal for an Independent System Operator (ISO). Accordingly, the current options do not foresee the creation of such a body. The Option2.C now foresees the creation of regional regulated entities performing the tasks of supranational balancing operators. It should be noted that the tasks performed by an ISO go way beyond balancing activities. At any rate, we note that our Impact Assessment concludes that such an option is not however a preferred one, since we conclude that the legal basis in the Third Energy Package for such an option is too thin to rely upon. Referring to non-legalistic considerations, we also judge that the issue remains too contentious – especially amongst TSOs – for us to push the letter of the law and codify a supposed consensus within the specific scope of the current draft Balancing Guideline. This is without prejudice to larger considerations on the topic as these are made in the separate Market Design Impact Assessment.*
(3) The report should feature stakeholder views more prominently. This applies especially to politically sensitive issues, to shed light on possible reasons why further market integration appears to proceed at a slow pace.	*We have strived to further integrate stakeholders' opinions across the Impact Assessment. That said, it should be noted that – given the process to which Network Codes and Guidelines are submitted – stakeholders views have already been extensively incorporated into the ACER opinion, which forms the basis for the Commission proposal on the Guideline. To the extent that the Commission proposal*

	reflects the consensus reached with ACER's opinion, a further detailed description of stakeholders' views on the Commission proposal would be duplicating information that is already widely available under ACER's stakeholders' consultation process. As it concerns the perceived slowness of progress towards market integration, this has to be accounted mostly by the high complexity and historical differences in national balancing markets, as we have strived to show throughout this Impact Assessment. We see no particular ground for an in-depth discussion of potentially politically sensitive issues, given the overarching top-level consensus on the finalities of the proposed Balancing Guideline. In line with the division of tasks between the Guideline and the Market Design initiative (as explained above) issues of a more political nature are being treated under the Market Design Impact Assessment.
(4) The impact assessment expects significant efficiency gains in the power sector. The geographical distribution of these gains and the impact on the power sector in the different Member States should be presented, as far as possible.	*In response to the comment, this version of the Impact Assessment now integrates the geographical distribution effects of the Options considered.*
(5) There is much scope to improve the structure of the report so that it reflects the natural, logical line of thinking, from defining the context, describing the problems, setting the objectives, proposing the solutions and assessing which one is the best. The report would be clearer if there were fewer jargon expressions. A glossary of technical terms would make the report more reader-friendly.	*In order to make the Impact Assessment more reader-friendly and to ensure widest possible access from a generalist readership's point of view, we have considerably reviewed the structure of the report to make it follow a more logical sequence. In addition, the language used in the report has been reviewed throughout, also with a view to use technical language only to the extent that this is necessary, as no synonyms exist in the English vocabulary to address such topics. Whilst all efforts have been made to clarify the language, it is inherent in the highly technical nature of the subject treated that a certain degree of specialist language is used. A glossary of terms, already present under the original submission, has now been further expanded and placed upfront the report, so as to appear at the very beginning of the document for ease of reference throughout the Impact Assessment.*

Annex II: Stakeholders consultations

The elaboration of these rules according to the Third Energy Package provisions requires extensive public consultations of all concerned parties. ACER and ENTSO-E do these public consultations.

The description of the public consultations is accessible here:

- http://www.acer.europa.eu/en/Electricity/FG_and_network_codes/Pages/Balancing.aspx
- https://www.entsoe.eu/major-projects/network-code-development/electricity-balancing/Pages/default.aspx

The minimum Commission standards were all adhered to.

The number of public consultations and workshop are described below:

ACER consultations[49]

- Public workshop on Framework Guidelines on Electricity Balancing – 24/10/2011
- Public consultation on draft Framework Guidelines on Electricity Balancing – 25/04/2012
- Public workshop on the Network Code on Electricity Balancing – 30/01/2014
- Call for comments on the revised version of the Network Code on Electricity Balancing – 03/12/2014

ENTSO-E consultations[50]

- 1st Stakeholder Advisory Group Meeting – 11/10/2012
- 2nd Stakeholder Advisory Group Meeting – 10/12/2012
- 3rd Stakeholder Advisory Group Meeting – 26/02/2013
- 4th Stakeholder Advisory Group Meeting – 23/09/2013
- 1st public stakeholder workshop **-** 07/05/2013
- 2nd public stakeholder workshop – 17/07/2013
- 3rd public stakeholder workshop – 23/10/2013

Balancing Stakeholder Group meetings[51]

- 1st Balancing Stakeholder Group Meetings – 18/03/2015
- 2nd Balancing Stakeholder Group Meetings – 23/09/2015
- 3rd Balancing Stakeholder Group Meetings – 15/01/2016
- 4th Balancing Stakeholder Group Meetings – 13/04/2016
- 5th Balancing Stakeholder Group Meetings – 30/06/2016
- Next Balancing Stakeholder Group Meetings planned for 07/12/2016

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49 http://www.acer.europa.eu/en/Electricity/FG_and_network_codes/Pages/Balancing.aspx

50 https://www.entsoe.eu/major-projects/network-code-development/electricity-balancing/Pages/default.aspx

51 https://www.entsoe.eu/about-entso-e/market/balancing-and-ancillary-services-markets/Pages/default.aspx

Annex III: Who is affected by the initiative and how

Affected party	**How are they affected?**
Member States	Member State authorities define the country's overall policy regarding energy mix and power grid investments.
National regulatory authorities (NRAs)	NRAs approve the methodology for the activation of balancing energy. They are also responsible for any impact on TSOs' tariffs and how cross-border infrastructure is allocated.
Transmission System Operators (TSOs)	TSOs analyse system's state and propose the methodology for the activation of balancing energy in their control areas. Harmonising the activation of balancing energy at European level implies a need for strong governance between TSOs. Existing physical constraints would still need to be taken into account. Major impacts are expected on the current design of system operation procedures and responsibilities. Cost allocation and remuneration would have to be agreed, requiring the development of a clear and robust framework of responsibilities between TSOs.
Generators	Generators, as Balancing Service Providers, would have additional opportunity to participate in the balancing market even though significant operational impact might increase. Such framework would, however, allow the participation of renewable energy sources in the balancing market potentially leading to a sharp decrease of balancing energy cost.
Suppliers	Suppliers, as Balance Responsible Parties, will be subject to imbalance costs. Imbalance prices will be coupled therefore allowing for increase competition of suppliers across borders.
End consumers	End consumers will be able to participate in balancing markets via demand response aggregators allowing for stronger supplier's competition.

Annex IV: Analytical models used in preparing the impact assessment

For assessing the benefits of specific market design measures and their effect to power system operation and market functioning, a new optimization software – METIS - was used. For transparency reasons, all deliverables related to METIS, including all technical specifications documents and studies, will be published on the website of DG ENER[52].

Global Description

METIS is an on-going project[53] initiated by DG ENER for the development of an energy modeling software, with the aim to further support DG ENER's evidence-based policy making, especially in the areas of electricity and gas. The software is developed by a consortium (Artelys, IAEW, ConGas, Frontier Economics) and a first version has been already delivered at the DG ENER premises.

METIS is an energy modelling software covering with high granularity (in geographical space and time) the whole European power system and markets. For the scope of this impact assessment, simulations adopted a Member State level spatial granularity and an hourly temporal resolution of year 2030 (8760 consecutive time-steps year), capturing also the uncertainty related to demand and RES power generation.

The software replicates in detail the market participant's decision processes, as well as the operation of the power system. For each day of the studied year, all market time frames were modelled in detail: day-ahead, intra-day, balancing. Moreover METIS also simulated the sizing and procurement of balancing reserves, as well as imbalances.

METIS works complementary to long-term energy system models (like PRIMES from NTUA and POTEnCIA from JRC). For instance, it can provide hourly results on the impact of higher shares of intermittent renewables or additional infrastructure built.

Uncertainties regarding demand and RES power generation are captured thanks to weather scenarios taking the form of hourly time series of wind, irradiance and temperature, which influence demand (through a thermal gradient), as well as PV and wind generation. The historical spatial and temporal correlation between temperature, wind and irradiance are preserved.

Main characteristics of the power market module

> **Calibrated Scenarios –** METIS has been calibrated to a number of scenarios based either on ENTSO-E TYNDP or PRIMES scenarios. METIS versions of PRIMES scenarios include refinements on the time resolution (hourly) and unit representation (explicit modeling of reserve supply at cluster and MS level). Data provided by the PRIMES scenarios include: demand at MS-level, primary energy costs, CO_2 costs, installed capacities at MS-level, interconnection capacities.
>
> **Geographical scope –** In addition to EU Member States, METIS scenario incorporates ENTSO-E countries outside of EU (Switzerland, Bosnia, Serbia, Macedonia, Montenegro and Norway) to model the impact of power imports and exports on the MS.

52 Once operational, the envisaged link is expect to be the following: https://ec.europa.eu/energy/en/data-analysis/energy-modelling/metis

53 http://ec.europa.eu/dgs/energy/tenders/doc/2014/2014s_152_272370_specifications.pdf

Market models –METIS market module replicates the participants' decision process. For each day of the studied year, the generation plan (including both energy generation and balancing reserve supply) is first optimized based on day-ahead demand and RES generation forecasts. Market coupling is modeled via net transmission capacity[54] ('NTC') constraints for interconnectors. Then, the generation plan is updated during the day, taking into account updated forecasts and asset technical constraints. Finally, imbalances are drawn to simulate balancing energy procurement.

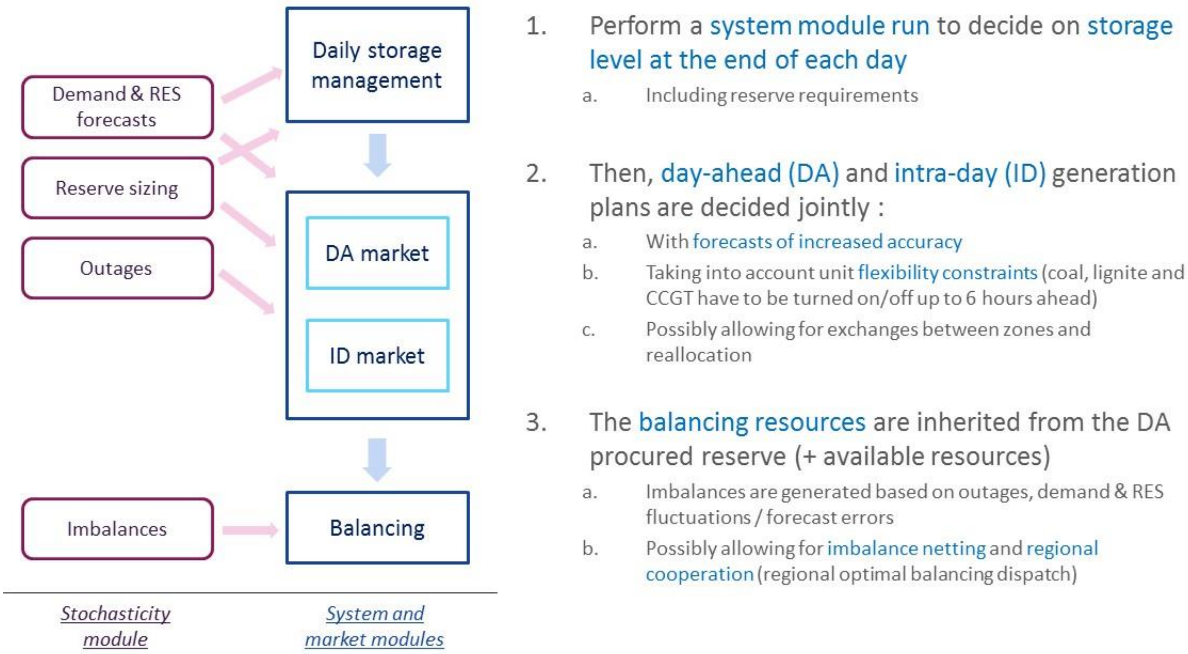

Figure 27: Simulations follow day-ahead to real-time market decision process (source: METIS)

Imbalances – Imbalances are the result of events that could not have been predicted before gate closure. METIS includes a stochasticity module, which simulates power plant outages, demand and RES-e generation forecast errors from day-ahead to 1-hour ahead. This module uses a detailed database of historical weather forecast errors (for 10 years at hourly and sub-national granularity), provided by ECMWF, to capture the correlation between MS forecast errors and consequently to assess the possible benefits of Imbalance Netting. The stochasticity module will be further extended to include generation of random errors picked from various probability distributions either set by the user or based on historical data.

Reserve product definition – METIS simulates FCR, aFRR and mFRR reserves. The product characteristics for each reserve (activation time, separation between upward and downward offers, and list of assets able to participate…) are inputs of the model.

Reserve dimensioning – The amount of reserves (FCR, aFRR, mFRR) that has to be secured by TSOs can be either defined by METIS users or computed by METIS stochasticity module to assess the required level of reserve to ensure enough balancing resources are available under a given probability. Hence, METIS stochasticity module can take into account the statistical cancellation of imbalances between MS and the potential benefits of regional cooperation for reserve dimensioning.

54 NTC is the transmission capacity available for commercial transactions across borders.

Balancing reserve procurement – Different market design options can be also compared by the geographical area in which TSOs may procure the balancing reserves they need. METIS has been designed so as to be able to constrain the list of power plants being able to participate to the procurement of reserves according to their location. The different options will be translated in different geographical areas in which reserves have to be procured (national level or regional level). Moreover, METIS users can choose whether demand response and renewable energy are allowed to provide balancing services.

Region 1
Austria
Belgium
Czech Republic
Denmark
France
Germany
Hungary
Luxembourg
Netherlands
Poland
Slovakia
Slovenia
Switzerland

Region 3
United Kingdom
Ireland

Region 4
Portugal
Spain

Region 2
Estonia
Finland
Latvia
Lithuania
Norway
Sweden

Region 5
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
FYR of Macedonia
Greece
Italy
Malta
Montenegro
Romania
Serbia

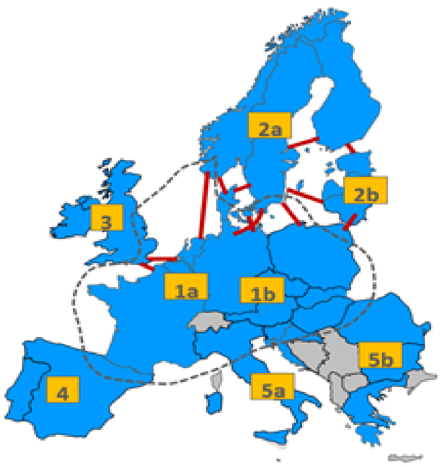

Figure 28: Regions used in Option 2.C for the establishment of regional regulated entities performing the tasks of supranational balancing operators (source: METIS)

Balancing energy procurement – The procurement of balancing energy is optimized following the same principles as described previously. In particular, METIS can be configured to ban given types of assets, to select balancing energy products at national level, to share unused balancing products with other MS, or to optimize balancing merit order at a regional level.

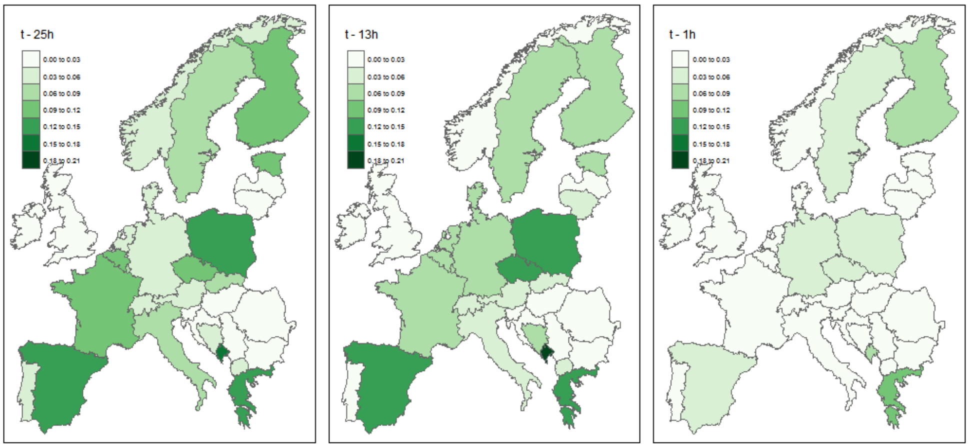

Figure 29: Simulations follow day-ahead to real-time market decision process (source: METIS)

Annex V: Summary of the link with the Market Design initiative

Draft Balancing Guideline

- European-wide balancing platforms with merit order activation of balancing energy;
- Standardisation of balancing products;
- Harmonisation of the imbalance settlement periods to 15 minutes within 3 years (with exemption);
- Market-based and close to real time procurement of balancing capacity;
- Possibilities for two or more TSOs to exchange balancing capacity.

General provisions (both Balancing Guideline and Market Design initiative)

- Separate process for the procurement of balancing energy and balancing capacity;
- Pay-as-cleared methodology ('marginal pricing') for balancing energy prices;
- No balancing energy price floors or caps below the value of lost load;
- Balancing energy gate closure time as close as possible to physical delivery and, in any cases, not longer than the cross-zonal intraday gate closure time (60 minutes);
- Methodologies for the allocation of cross-zonal transmission capacity for the exchange of balancing capacity;
- Separate procurement for upward and downward balancing products;
- Publication of close to real-time information on current balancing state, imbalance price and balancing energy price.

Market Design initiative on Electricity Balancing

- Regional operational centers to determine the daily balancing reserve needs based on probabilistic methodogies;
- Regional operational centers to facilitate the procurement of balancing capacity on regional level;
- TSOs to contract for a maximum of one day in advance balancing capacity;
- No self-provision by TSOs;
- Harmonisation of the imbalance settlement periods to 15 minutes by 1 January 2025.