European Network of
Transmission System Operators
for Electricity

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Explanatory document to all TSOs' proposal to further specify and harmonise imbalance settlement in accordance with Article 52(2) of Commission Regulation (EU) 2017/2195 of 23 November 2017, establishing a guideline on electricity balancing

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DISCLAIMER

This document is submitted by all transmission system operators (TSOs) to all NRAs for information purposes only accompanying the all TSOs' proposal to further specify and harmonise imbalance settlement in accordance with Article 52(2) of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing. This explanatory document does not in any case represent a firm, binding or definitive TSOs' position on the content.

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Contents

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1. Introduction

This document gives background information and rationale for the all TSOs' proposal to further specify and harmonise imbalance settlement in accordance with Article 52(2) of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (hereafter referred to as "EBGL"). The all-TSO proposal is hereafter referred to as "imbalance settlement harmonisation proposal". The Art 52(2) of the EBGL contains a non-exhaustive list of subjects to further specify and harmonise, and Art 52(3) of the EBGL allows to distinguish between self-dispatching models and central dispatching models.

Imbalance settlement is applied throughout all European systems, and represents an annual value of approximately € 3.6 10^9, based on an imbalance cost estimation of € 1 per MWh consumed (see Annex A).

Current imbalance settlement methodologies are non-uniform and may distort a level playing field for BRPs (and BSPs), at least between different countries. Current methodologies are deeply embedded in business processes and sytems of TSOs, BRPs and BSPs, as are expected imbalance prices and imbalance cashflows of market participants, TSOs and grid users.

The general objective of imbalance settlement is to ensure that BRPs support the system balance in an efficient way and to incentivise market participants in keeping and/or helping to restore the system balance, according to the EBGL recital 17, rephrased in EBGL Art. 44(1)(c): the imbalance settlement shall provide incentives to BRPs to be in balance or help the system to restore its balance.

This all TSOs' proposal takes into account this dual, if not ambiguous, objective of imbalance settlement in the EBGL, and has to take into account explicitly unharmonised elements that are established in the EBGL (see also Annex B), inter alia, the difference between self-dispatching models and central dispatching models, the choice of a TSO performing the reserve replacement process or not, the absence of a uniform definition of TSO demand for balancing energy, NRA methodologies to ensure financial neutralisation of TSOs as a result of settlement processes, the calculation of the activated volumes of balancing energy as metered or as requested volumes, and tariffication structures and tariffs, that all affect a level playing field for market particpants across Europe.

The imbalance settlement harmonisation proposal does not address nor harmonise any additional rights and obligations of balance responsible parties established in national terms and conditions, or in connection agreements, that are not imposed by or in scope of the EBGL.

Imbalance pricing and settlement is just one of the elements of market design. Transparency and equal access to information before, during and after the ISP of delivery, all contribute to a level playing field within and across nations. No imbalance settlement harmonisation proposal can ensure by itself a level playing field across Europe for BRPs (and BSPs) given the limitations above-mentioned.

1.1. Interpretation and scope of the imbalance settlement harmonisation proposal

The imbalance settlement harmonisation proposal contains a proposal per subject, and each proposal will mention the applicability to either self-dispatching models, central dispatching models, or both. In this explanatory document, the order of subjects from the EBGL Art. 52(2) will be maintained. In this explanatory document, the description of each proposal will explain the subjects of further specification and harmonisation and elaborate on the rationale followed by TSOs for selection of the individual proposals in the imbalance settlement harmonisation proposal.

The implementation of the articles of the all TSO proposal should be done by each TSO by amending their national terms and conditions such that they will be in line with the requirements of the proposal. In case there is a need for particular implenetation, it will be addressed in this explanatory document.

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2. The All TSOs' proposal

2.1. Article 2: Definitions

The imbalance settlement harmonisation proposal provides a list of definitions of terms that:

a) are not specified explicitly in EBGL, and

b) are necessary for and used in the proposal and this explanatory document.

2.1.1. Legal Proposal

A concept for which additional explanations to the definition might be helpful is *scheduling unit*, applicable to central dispatching models.

'Scheduling unit' means a unit representing a power generation module, a demand facility or a group of power generating modules or demand facilities for which a position, an imbalance adjustment, an allocated volume, an imbalance and an imbalance settlement are determined in a central dispatching model;

2.1.2. Applicability

The definition of 'scheduling unit' applies to central-dispatching model only.

2.1.3. Legal Background

EBGL Article 49(2) states the following:

> *"for imbalance areas where several final positions for a single balance responsible party are calculated pursuant to Article 54(3), an imbalance adjustment may be calculated for each position".*

EBGL Article 54(3)(c) states the following:

> *"in a central dispatching model, a balance responsible party can have several final positions per imbalance area equal to generation schedules of power generating facilities or consumption schedules of demand facilities".*

2.1.4. Alternatives

There are no alternatives for this definition in EU Directives or Regulations.

2.1.5. Argumentation

The scheduling unit (SU) is a way to represent physical resources for the needs of the following processes in the central dispatching model: system planning, real-time system operation and settlements. Scheduling unit may consist of set of one or more resources. The configuration of the SU is determined by the TSO in consultation with the relavant DSOs (if needed, i.e.: if the physical resources of the SU are located in the distribution network) and the Balancing Responsible Party of this unit. In some central-dispatching models, cross-border import and export points are treated as respectively generating facilities and demand facilities.

As part of the processes implemented on the Balancing Market, the following values are determined for each Scheduling Unit for each ISP:

a) Position – as the declared by BRP energy volume of a scheduling unit used for the calculation of its imbalance;
b) Imbalance adjustment – as all volumes activated by connecting TSO for at least the following purposes: balancing, congestion management, required reserve level re-building, system defence plan instructions and TSO-TSO remedial actions;
c) Allocated volume – as all injections and withdrawals of a set of resources attributed to that scheduling unit;

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d) Imbalance – as the difference between the allocated volume attributed to that scheduling unit and the final position of that scheduling unit, including any imbalance adjustment applied to that scheduling unit;
e) Imbalance settlement – as the product of the imbalance and imbalance price.

2.2. Article 3: Calculation of an imbalance adjustment

2.2.1. Applicability

The imbalance settlement harmonisation proposal for specification of imbalance adjustment calculation applies to both self-dispatching models and central dispatching models.

The application of imbalance adjustments to a BRP depends on the number of positions and, hence, imbalances that a BRP has, which may differ according to self-dispatching models and central dispatching models.

2.2.2. Legal background

EBGL Article 52(2)(a) requires a proposal to further specify and harmonise, at least:

> *"the calculation of an imbalance adjustment pursuant to Article 49 and the calculation of a position, an imbalance and an allocated volume following one of the approaches pursuant to Article 54(3)".*

EBGL Article 52(2)(a) gives a non-exhaustive list of items to be specified and harmonised, a.o.: imbalance adjustments to a BRP.

EBGL Article 49(1) requires all TSOs to apply an imbalance adjustment for each activated balancing energy bid, i.e.: balancing energy, which is specified in proposal Article 3(1)(a).

EBGL Article 49(3) requires all TSOs to apply an imbalance adjustment for any volume activated for other purposes than balancing, which is specified in proposal Article 3(1)(b). This refers to the activation of balancing energy bids for other purposes than balancing, but also to redispatch actions, remedial actions, margin restoration and others that do not activate balancing energy bids; hence the absence of 'balancing energy' in this component (b).

The non-exhaustive list of items to be specified and harmonised, exemplified by the phrase "at least" in EBGL Article 52(2)(a), allows for a harmonised specification of other imbalance adjustments in proposal Article 3(2). Since curtailment and emergency and restoration procedures are out of the scope of this proposal, these adjustments should be allowed, but cannot be made mandatory, hence the word "may".

2.2.3. Argumentation

Imbalance adjustment of balancing energy serves a dual purpose:

a) Without imbalance adjustment, balancing energy delivered would end up as imbalance for one or more BRPs, thus weakening any incentive to deliver balancing energy.
b) With imbalance adjustment, non-delivery of balancing energy would end up as imbalance for one or more BRPs, thus enhancing incentives to deliver balancing energy.

The determination of balancing energy volume is unharmonised by the EBGL, as it allows its determination using either requested or metered volume, in accordance with EBGL Article 45(1)(a) and since settlement of balancing energy is subject to separate proposal, the imbalance settlement harmonisation proposal shall use the volumes of balancing energy determined by the TSO to be settled between TSO and concerned BSP in accordance with EBGL Article 45(3) as input for the imbalance adjustment.

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This guarantees that all trades between BRPs, and all trades between TSOs and BSPs, are accounted for, without gaps and overlaps, in the total allocated volumes, representing all physical injections and withdrawals from BRPs. It ascertains equality of volumes settled in balancing energy imbalance adjustments, which enables direct comparison of balancing energy value and imbalance value by price comparison.

The harmonised approach within this proposal contributes to a level playing field for BRPs and BSPs across Europe.

The proposal's Art. 4 ensures the obligation of the TSO to inform the BRP on the imbalance adjustment, and thus the right of the BRP to be informed, thus contributing to a level playing field for all BRPs. When developing the imbalance settlement harmonisation proposal, differencies between the imbalance settlement practices among the TSOs were surveyed (see Annexes C and D) and found to vary amongst the TSOs. The finalisation time of the initial settlement and the billing date for the imbalances are important features from the BRPs' point of view, as it is having a straight effect to the BRPs' cashflow. The EBGL is not requiring harmonisation for the finalisation time of imbalance settlement and as the changes for finalisation time would probably need changes with the data delivery deadlines with DSOs, the current time schedule for harmonisation of imbalance settlement set by the EBGL might be too tight and the all TSOs' proposal for imbalance settlement harmonisation is not harmonising the finalisation times. It should be noted that in the future it would be beneficial to have a harmonised maximum period and different possibilities for it should be analysed.

2.3. Article 4: The calculation of a position, an imbalance and an allocated volume

2.3.1. Applicability

The EBGL Article 52(3) states that the proposal pursuant EBGL Article 52(2) may distinguish between self-dispatching models and central dispatching models. The all TSOs' proposal Article 4 takes into account self-dispatching models as well as central dispatching models. However, due to the differences between these two models, Article 4 distinguishes between them.

For the calculation of a position, all TSOs propose to apply a single final position for self-dispatching models pursuant to Article 52(3)(a) of the EBGL ensuring that there is no discrimination between production and consumption. For a central dispatching model, the solution shall be applied based on Article 54(3)(c) such that each scheduling unit shall have a single position as, in a central dispatching model, one BRP can have several scheduling units and therefore several positions and several imbalances, i.e. one per scheduling unit.

2.3.2. Legal background

EBGL Article 52(2)(a) requires a proposal to further specify and harmonise at least:

"the calculation of an imbalance adjustment pursuant to Article 49 and the calculation of a position, an imbalance and an allocated volume following one of the approaches pursuant to Article 54(3)"

A breakdown in individual components results in a proposal to further specify and harmonise the calculation of:

a) an imbalance adjustment, pursuant EBGL Article 49, and

b) a position;

c) an imbalance; and

d) an allocated volume,

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following one of the approaches pursuant EBGL Article 54(3).

2.3.3. Alternatives

The calculation of an imbalance is already exclusively defined by the EBGL.

The EBGL states in 52(2)(a) that the calculation of a position in the self-dispatching model shall be done following one of the approaches pursuant to Article 54(3), which are:

a) balance responsible party has one single final position equal to the sum of its external commercial trade schedules and internal commercial trade schedules

b) balance responsible party has two final positions: the first is equal to the sum of its external commercial trade schedules and internal commercial trade schedules from generation, and the second is equal to the sum of its external commercial trade schedules and internal commercial trade schedules from consumption

For the central-dispatching model the balancing guideline is not giving such a choice as for the self-dispatching model, instead Article 54(3)(c) states that:

c) in a central dispatching model, a balance responsible party can have several final positions per imbalance area equal to generation schedules of power generating facilities or consumption schedules of demand facilities.

2.3.4. Argumentation

The proposal to apply a single position for self-dispatching models contributes to a level playing field on the following counts:

- The choice of a single position ensures that for imbalance settlement in self-dispatching model, all connections are treated equally, by:
    - removing the requirement for BRPs to distinguish between connections on load, generation or storage;
    - eliminating the requirement for TSOs to verify such distinctions;
    - simplifying the allocation process.
- In a self-dispatching model, the single position enables easier control of imbalances by BRPs.
- For ancillary service markets, single position for self-dispatching model simplifies determining the imbalance adjustment for aggregated bids, as their volume can be treated as whole instead of dividing the bid volume in the imbalance adjustment for consumption and production.
- Single position is simple and, as shown in ENTSO-E's Survey on Ancillary Services Procurement and Electricity Balancing Market Design for year 2016, single position is already used by majority of the Member States.

The proposed use of a single position for imbalance settlement in self-dispatching model concentrates on the use of information for the purposes of calculating the imbalance and not the actual notification process. The actual notification process is considered out of scope of the EBGL, thus the imbalance settlement harmonisation proposal does not address the actual notification processes currently used. However, a simplified notification process is regarded as beneficial to new entrants, but may require IT changes for TSOs and existing BRPs which may not bring significant benefit and result in costs to implement that will fall eventually to the consumers but not changing the financial results for BRPs.

The proposal to apply for central dispatching models a single position for scheduling unit while one BRP can have several scheduling units per imbalance area is motivated by following reasoning: the adoption of

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one final position per scheduling unit for imbalance settlement purposes ensures more control of the security of the system by the TSO, as in central-dispatching model security of the system is strongly impacted by the locational distribution of scheduling units and their imbalances over the grid.

The adoption of one final position per scheduling unit for imbalance settlement purposes does not anyhow prevent aggregation of resources in the ancillary services market for balancing and other services provision. It should be noted that with the single imbalance pricing system, which is the default for pricing in the EBGL, there is no financial difference for BRPs in a self-dispatching model whether there is only one or two final positions and consequently for case of financial results there is no need to make any distinction. Also in a central-dispatching model with a single imbalance pricing system, there would be no financial difference for BRPs in cases where it has one, two or even several scheduling units with separate final positions per imbalance area, provided that these scheduling units are located in the same imbalance price area. Put differently, imbalances compensation of different scheduling units would not be made through "volume effect" but through the uniform "price effect".

It should also be noted that the locational information about generation and load distribution in the grid is important for TSOs from a security of supply point of view, but out of scope of the EBGL as far as the self-dispatching model is concerned with respect to imbalance settlement. The guideline on electricity transmission system operation ("SOGL") deals with the organisation, roles and responsibility of physical schedules exchange that are outside the scope of the EBGL for self-dispatching models, so there is no need to mention them in the proposal for position harmonisation. Instead, as this separation of the responsibility for reporting on physical schedules from the imbalance settlement process is a major change for some TSOs and may impact on how the quality on production and consumption schedules are ensured, this separation should therefore be duly considered when drafting the agreements between TSO and BRPs.

For central dispatching models, locational information over scheduling units distribution in the grid is important for TSOs from a security of supply point of view and the EBGL explicitly recognizes this just allowing the possibility of several final positions at the scheduling unit level per BRP per imbalance area. In central dispatching models indeed the TSO determines scheduling units' commitment and dispatch through direct instructions within an integrated scheduling process that uses integrated scheduling process bids containing as input not only commercial data, but also complex technical data of individual scheduling units including their locational distribution in the grid and the latest control area adequacy analysis and the operational security limits which take into account locational grid constraints.

The allocated volume is specified by the all TSO proposal to be calculated from the data provided to that purpose as a netted volume of energy volumes physically injected or withdrawn from the system and attributed to a balance responsible party. Volumes can be determined as metered volumes per ISP as the result of the metering process (component a) or as assigned volumes per ISP (component b) in case that injections and withdrawals are not metered with granularity of ISP. Examples of injections and withdrawals that are not metered with granularity of ISP is injections or withdrawals that are metered with lesser granularity or no granularity (non-smart household meters), for which profiling is used. Another example is gridlosses, which are calculated and not directly metered.

The inclusion of a correction to the allocated volume (component c) is due to national terms and conditions for demand side response that allow independent aggregators to operate demand side response actions, in day ahead, intraday and balancing, on consumption sites without the consent of the site's BRP.
In this model (described in ENTSO-E position on market design for demand side response), there is a need to adjust the BRP's allocated volume so that it is not financially impacted by the third party's activity. This adjustment needs to be included in the allocated volume calculation.

This proposal's Article 4 ensures the obligation of the TSO to inform the BRP on the allocated volumes and the calculated imbalance, and thus the right of the BRP to be informed, thus contributing to a level playing field for all BRPs When developing the proposal for imbalance price harmonisation, differencies between the imbalance settlement practices among the TSOs were surveyed (see annexes C & D) and found to vary

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amongst the TSOs. The finalisation time of the initial settlement and the billing date for the imbalances are important features from the BRP's point of view, as it may affect the BRP's cashflow. EBGL is not requiring harmonisation for the finalisation time of imbalance settlement and as the changes for finalisation time would probably need changes with the data delivery deadlines with DSO, the current time schedule for harmonisation of imbalance settlement set by EBGL might be too tight and the all TSO proposal for imbalance settlement harmonisation is not harmonising the finalisation times. It should be noted that in the future it would be beneficial to have a harmonised maximum period and different possibilities for it should be analysed.

2.3.5. Particular implementation

TSOs using a self-dispatching model currently applying the single position per balancing responsible party pursuant EBGL Art. 54(3)(a) for calculating the imbalance of a BRP will continue with the current practice. TSOs currently applying the calculation of two imbalances per balancing responsible party shall change their position calculation by implementing the use of single position.

The implementation of single position shall be done no later than the implementation of the use of single imbalance pricing for all imbalances and the implementation of the 15-minute imbalance settlement period. All TSOs are required to apply a 15-minute imbalance settlement period pursuant EBGL Art. 53(1) by three years after EBGL entry into force, except for TSOs granted with a derogation pursuant EBGL Article 53. For the TSOs that are not yet applying the 15-min ISP, as well as for those needing to change to single pricing and single position, require changes in their IT systems. In case the TSO is granted a derogation from EBGL Art. 53(1), the timing for implementation of single pricing and single position may not coincide with the implementation of 15-minute ISPs and thus may bring to the TSOs as well as to the stakeholders inefficiencies when the implementation of the IT changes cannot be done at the same time. Linking the single position implementation with single pricing and implementation of 15-minute imbalance settlement period gives a practical benefit to implement these changes at the same time.

The change to the single position shall be implemented by requesting amendments in order to make terms and conditions developed in accordance with the EBGL Article 18 and consistent with the EBGL Article 54(3)(a). The request for amendments shall be done following the approach pursuant to the EBGL Article 6(3).

TSOs applying central dispatching model shall continue calculating the position pursuant to the EBGL Art. 54(3)(c).

2.4. Article 5: Main components used for the calculation of the imbalance price for all imbalances

2.4.1. Applicability

The all-TSO proposal for main components used for the calculation of the imbalance price for all imbalances applies both for self-dispatching and central dispatching models.

2.4.2. Legal background

The EBGL Article 52(2)(b) requires a proposal to further specify and harmonise, at least:

> *"The main components used for the calculation of the imbalance price for all imbalances pursuant to Article 55 including, where appropriate, the definition of the value of avoided activation of balancing energy from frequency restoration reserves or replacement reserves."*

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The objectives for imbalance settlement are set by the EBGL recital 17:

> *"The general objective of imbalance settlement is to ensure that balance responsible parties support the system's balance in an efficient way and to incentivise market participants in keeping and/or helping to restore the system balance. This Regulation defines rules on imbalance settlement, ensuring that it is made in a non-discriminatory, fair, objective and transparent basis. To make balancing markets and the overall energy system fit for the integration of increasing shares of variable renewables, imbalance prices should reflect the real-time value of energy."*

2.4.3. Alternatives

The all-TSO proposal for main components used for the calculation of the imbalance price for all imbalances lists the price and volume components that may be used for imbalance price formation. The list of prices and volumes is an exhaustive list of the main components that TSO may use when forming the imbalance price. The list should be understood such that TSOs have to use at least one of these main components but are not obliged to use all of these prices as some components are not applicable to certain TSOs, but TSOs shall not use any other main components outside of the ones mentioned in the proposal.

The possible use of other components is not in the scope of the imbalance settlement harmonisation proposal and thus left for the consideration of the national NRAs.

The following sections presents different alternatives for the list of prices and volumes to be considered as the main components in the calculation of imbalance prices.

Energy prices

As alternative any subset the following prices has been considered as main components for the imbalance price calculation:

- Prices resulting from integrated scheduling process bids
- Prices for balancing energy resulting from the aFRR standard product CMOL
- Prices for balancing energy resulting from activation of aFRR specific products
- Prices for balancing energy resulting from the mFRR standard product CMOL
- Prices for balancing energy resulting from activation of mFRR specific products
- Where applicable, prices for balancing energy resulting from the RR standard product CMOL
- Where applicable, prices for balancing energy resulting from activation of RR specific products
- Price for intended exchange of energy as a result of IN process
- Price for unintended exchanges
- Price for energy resulted from FCR
- Price for energy resulted from MEAS

Other components for calculation of the imbalance price

Besides the components that result from the prices related to energy, there are also other possible additional components that could be considered as main components for imbalance price:

- Balancing capacity costs
- Administrative costs

Volumes

Volumes to be taken into account in determination of imbalance price serve two purposes: in case of volume weighted average price, where volumes are used in the calculation method; and in case of marginal price, when a 0 MWh volume removes the corresponding price from the list from which a marginal price is determined.

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- **The requested and fulfilled need**
  This option refers to the need for balancing volume requested by a TSO for its imbalance price area and further fulfilled by standard or specific product. In context with the development of the European balancing platforms, the TSO requests are fulfilled by the clearing process resulting from the common merit order list. In case if the netting processes are integrated to the balancing platforms, this choice would also include the requests that are fulfilled by the intended exchange of energy from the respective platform. This choice would also mean that the balancing price effect is mitigated to reflect better the local imbalance situation for TSOs as each TSO have their own total amount of fulfilled needs.

- **Locally activated volumes**
  This option refers to the bids selected by the clearing process and activated within the imbalance price area. For the areas where balancing is done locally, this solution would be reflecting the local imbalance. In common balancing markets, this choice would not be feasible one, as it does not tell anything about the actual imbalances inside imbalance area, given that the activated energy inside the imbalance area can be carried out for other TSO's need.

- **Activated volumes within uncongested area**
  If for the common balancing platforms, cross-border marginal price is applied, it means that the balancing price is reflecting the balancing need of that area. If the imbalance settlement is seen as a part of balancing markets and not as and separate mechanism, it could be argued that the imbalance price and balancing prices should be reflecting the imbalance situation and activated energy price from the same area. However, this choice would not tell about the imbalance of the local imbalance area, but instead about the imbalance of possible larger area, where the balancing price is formed. This approach is following similar principles as the day-ahead and intraday market coupling.

2.4.4. Argumentation

This section discusses the given boundary conditions for imbalance price and further explains the alternatives for main components and gives rationale why certain components are included in the list and why certain components are excluded.

Boundary conditions applying to imbalance price

A basic principle for calculating imbalance prices is the use of a single price for positive and negative imbalances for each imbalance price area within an imbalance settlement period according to EBGL Art. 52(2)(c), unless for that imbalance price area and imbalance settlement period dual imbalance pricing is applied pursuant EBGL Article 52(2)(d).

The minimum boundary conditions for the imbalance price are set by the EBGL Article 55, which requires that the imbalance price for negative/positive imbalance shall not be less/greater than respectively weighted average price for positive/negative FRR or RR activations. Based on this requirement, the imbalance price and balancing energy prices resulting from FRR and RR cannot be decoupled. Thus, the obvious choice regarding the main components for the calculation of the imbalance price calculation shall be linked to the pricing of balancing energy resulting from FRR or RR in the respective imbalance settlement period. The components (b) and (c) ensure this coupling to the boundary condition, and being directly related to the balancing process itself are the best market based approximation of real time value of energy. As the requirement by EBGL Art 55(4) and (5) are only the minimum requirements, it leaves also other alternatives that can be taken into account as the final main components in the imbalance price calculation. Even in case other main components than balancing price is used for imbalance price calculation, the boundary condition shall not be compromised.

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Energy prices

As the imbalance price should reflect the real time price of energy, the logical non-exclusive alternatives for the main component are the energy prices that TSOs are facing as a result of balancing processes inside their control area. Prices relevant to the real-time balancing processes are listed in the energy price alternatives.

Taking into account exclusively the prices from mFRR, aFRR and RR to the imbalance price calculation follows the minimum requirement for the imbalance price. These are also the prices that in the future will have the harmonised pricing methodology according to Article 30 of EBGL. This harmonised pricing method is required by Whereas 14 to create positive incentives for market participants in keeping/or helping to restore the system balance of their imbalance price area. As this requirement should be guaranteed by the balancing pricing method to be developed pursuant Art 30 in EBGL, it is well justified that these prices are brought to the imbalance price.

As the imbalance price is linked to the balancing prices for FRR and RR, it should be noted that there is ongoing development of common European balancing platforms pursuant to EBGL Articles 19, 20 and 22. The balancing price will be determined in these platforms in the future and the pricing for these balancing products is out of scope of the imbalance price calculation. However, the following assumptions are made based on the requirement of Article 30 and the current development of the balancing platforms:

- The activation of balancing energy is not as default local. With the common balancing platforms, when there is free capacity, the TSO A's need can be fulfilled by activation from TSO B's control area.
- The balancing energy pricing is assumed to be based on cross-border marginal pricing.

These assumptions made above indicates that the balancing energy can be activated also in other areas than the TSO's own control area. Balancing energy is activated on the area of connecting TSO and imported to the requesting TSO. Thus the balancing needs of the TSO may also be fulfilled by exchange of balancing energy between TSOs. This exchange of energy is noted in EBGL as intended exchange of energy from the reserve replacement process or from the frequency restoration process with manual or automatic activation. By the EBGL Article 50(6) the settlement rules for the intended exchange of energy should take into account the balancing prices of FRR and RR. Thus the requesting TSO can use the intended exchange to balance its imbalance areas, and the prices should take into account the balancing prices, it is also justified that the price of intended exchange resulting from RR, mFRR and aFRR is included in the main component of imbalance price calculation.

Before the European platform for aFRR is in function, the balancing needs may also be fulfilled by imbalance netting resulting from the imbalance netting platforms and as this is also price that TSO is faced for balancing the imbalances, it is considered as one of the main components for the imbalance price. For this intended exchange of energy between TSOs a proposal for harmonised settlement rules according to Art 50(1) will be developed. In case the energy price of intended exchange is differing from the balancing price, this energy price may be taken into account as a main component of imbalance price provided this does not harm the boundary condition of EBGL Article 55. Prices and volumes of intended exchange of energy as a result of the imbalance netting process in accordance with the Article 50(1)(d) of the EBGL shall only be taken into account if they do not harm the boundary condition of Article 55 mentioned above.

For the other energy prices that are a result of balancing actions, there are no harmonisation requirements. To take these into account as harmonised main components for the imbalance price would lead to a situation, where the final pricing logic would not be clear, as there is no harmonisation for the products energy price itself. For example for FCR the energy price can be predetermined and there is often no merit order list for this product, which prevents its price to reflect market based real-time energy price. Also in case of unintended exchange there is no actual market based energy price. Thus the alternatives for FCR – prices and price for unintended exchange are not included in the main components.

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Additional price components

Besides the prices that result from the prices related to the energy, also other possible additional components that could be considered as main components for imbalance price were discussed.

- **Balancing capacity costs and administrative costs**

TSOs procure the capacity for balancing and paying BSPs for the balancing capacity causes balancing related costs for TSO. However as these costs are related to capacity, and their procurement is independent from actual activated energy, adding these costs to the imbalance price would distort the signal of real-time value of energy. These costs can be collected through the additional settlement mechanism separate from imbalance settlement pursuant EBGL Article 44(3), but not a part of this proposal.

- **Administrative costs**

Costs related to the processes needed for running the imbalance settlement. These costs do not depend on the volume of imbalances and thus should not be added to the imbalance price. As the balancing costs above, also the administrative costs can be collected through the additional settlement mechanism separate from imbalance settlement, but not a part of this proposal

- **Regulated markup in case of scarcity**

The imbalance can be seen as a price that reflects the real-time value of energy, in scarcity situations the use of scarcity adder in imbalance price could be seen as reflecting the real-time value of consequences of load shedding. In case when there is a scarcity situation, it might occur, that depending on the balancing price bids, that there might be in scarcity situations regulated markup in case of scarcity. Especially in case of the load shedding, the real-time value of energy should reflect the local Value of Lost Load in the imbalance price area when the involuntary load reduction takes place and the price should be also reflected to this value when the probability of load shedding is high. Scarcity adder can also be used in case the strategic reserves are activated.

It should be noted that when scarcity price is applied only to the imbalance price, it will decouple imbalance price from balancing energy prices and that will affect the value of imbalance adjustment in relation to the imbalance value itself. It should also be noted that when scarcity adder is applied to imbalance price, it will create financial surplus for TSO.

All-TSO proposal article 5(2) includes the possibility to use the scarcity component in case the TSO identifies a need for stronger incentives in scarcity situation. Designing and applying such a component shall be a national choice and is left under consideration of national NRA.

Determination of the volumes that may be used when calculating the imbalance price

Volues to be taken into account in determination of imbalance price serve two purposes:

- In case of volume weighted average price;
- In case of marginal price, a 0 MWh volume removes the corresponding price from the list from which a marginal price is determined.

In the imbalance price calculation TSO may need to know which activated energy volumes should be used to indicate the volumes that shows what part of the balancing was used for TSO's need. When balancing is done only locally, it is more straightforward to determine, that all activated balancing energy inside the imbalance area was for the local need. In case of only local balancing, the TSO has at the same time the role of requesting and connecting TSO and thus the balancing energy activated is used by the same TSO. In this case, the balancing energy price also reflects the local imbalance situation.

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In the future pursuant to development of common European balancing platforms the balancing energy may be activated in one TSO's area for the need of another. This means that the requesting and connecting TSOs can be different ones. Also as the balancing is done in larger market area than the local imbalance area, the balancing price reflects the activations needed for whole area where activations can be done instead the local imbalance area. This brings an inconsistency, if imbalance price is wanted to reflect the local imbalances, as the balancing price is a main component of imbalance price. The choice, whether to let the imbalance price to reflect the imbalance situation of the same area that the balancing price is reflecting or if the effect of balancing price is wanted to be mitigated to reflect a bit better the local imbalance situation, it can be done by determining which volumes are taken into account when determining the imbalance price.

There is no explicit requirement for TSOs to harmonise this issue and EBGL is not clear to what volumes it refers in the Article 55 for energy activated for calculation of the minimum requirement. However it should be noted, that there are several options how the volumes to calculate the minimum requirement could be chosen in terms of the processes, type of the product and how the activation takes place from the common merit order lists of the balancing platforms developed in accordance with EBGL Art 19, Art 20 and Art 21.

The detected mutually exclusive options to consider which volumes are possible to consider in imbalance price calculation are:

- **The requested and fulfilled need**
  This option refers to the need for balancing volume requested by TSO for its imbalance price area and further fulfilled by standard or specific product. In context with the development of the European balancing platforms, the TSO requests are fulfilled by the clearing process resulting from the common merit order list. In case if the netting processes are integrated to the balancing platforms, this choice would also include the requests that are fulfilled by the intended exchange of energy from the respective platform. This choice would also mean that the balancing price effect is mitigated to reflect better the local imbalance situation for TSOs as each TSO have their own total amount of fulfilled needs.

- **Locally activated volumes**
  This option refers to the bids selected by the clearing process and activated within the imbalance price area. For the areas where balancing is done locally, this solution would be reflecting the local imbalance. In common balancing markets this choice would not be feasible one, as it does not tell anything about the actual imbalances inside imbalance area, as the activated energy inside the imbalance area can be carried out for other TSOs need. This option is not seen feasible in the future with the common balancing platforms.

- **Activated volumes within uncongested area**
  If for the common balancing platforms the cross-border marginal price is applied, it means that the balancing price is reflecting the balancing need of that area. If the imbalance settlement is seen as a part of balancing market and not as and separate mechanism, it could be argued that the imbalance price and balancing prices should be reflecting the imbalance situation and activated energy price from the same area. However, this choice would not tell about the imbalance of the local imbalance area, but instead about the imbalance of possible larger area, where the balancing price is formed. This approach is following similar principles as the day-ahead and intraday market coupling.

The all-TSO proposal is to refer to the volumes of requested and fulfilled need of the TSO, as the use of locally needed volumes reflects better the imbalances of the imbalance area.

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2.5. Article 6: Definition of the value of avoided activation of balancing energy from frequency restoration reserves or replacement reserves

2.5.1. Applicability

The proposal for the definition of the value of avoided activation (VoAA) of balancing energy from frequency restoration reserves or replacement reserves ('the value') applies to both self-dispatch and central dispatching models. There are two proposals: one for single imbalance pricing; and one for dual imbalance pricing models.

2.5.2. Legal background

The EBGL Article 52(2)(b) requires a proposal to further specify and harmonise at least:

> *"The main components used for the calculation of imbalance price for all imbalances pursuant to Article 55 including, where appropriate, the definition of the value of avoided activation of balancing energy from frequency restoration reserves or replacement reserves".*

The EBGL Articles 55 (4)(b) and 55(5)(b) set out when the value of avoided activation of balancing energy from frequency restoration reserves or replacement reserves is used.

The EBGL Article 55 (4)(b) requires that:

> *'The imbalance price for negative imbalance shall not be less than….*
> *(b) in the event that no activation of balancing energy in either direction has occurred during the imbalance settlement period, the value of avoided activation of balancing energy from frequency restoration reserves or replacement reserves'.*

The EBGL Article 55 (5)(b) requires that:

> *'The imbalance price for positive imbalance shall not be greater than* […] *(b) in the event that no activation of balancing energy in either direction has occurred during the imbalance settlement period, the value of avoided activation of balancing energy from frequency restoration reserves or replacement reserves'*

The EBGL Article 44 (1) requires that:

> *The settlement processes shall:*
> *(a) establish adequate economic signals which reflect the imbalance situation;*
> *(b) ensure that imbalances are settled at a price that reflects the real time value of energy;*
> *(c) provide incentives to balance responsible parties to be in balance or help the system to restore its balance;*
> *(d) facilitate harmonisation of imbalance settlement mechanisms;*

2.5.3. Alternatives

The value of avoided activation is only used when there are no activations of balancing energy in either direction in the imbalance price area. There are two situations in which this might happen in an imbalance price area:

a) when the imbalance price area is in balance;
b) when the imbalance price area is not initially in balance but the TSO has only used imbalance netting with neighbouring TSO(s) to bring it back into balance.

There are multiple different choices to determine imbalance price in these cases to reflect the value of avoided activation:

a) Regulated fixed price
b) Persistency – where the price for an ISP is set to be equal to that of the preceding ISP

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c) Day-ahead price
d) Intraday price
e) Merit order lists

2.5.4. Argumentation

TSOs have rejected options (a) to (d) on the basis that they have no regulated fixed price or a limited relationship to actual balancing market conditions required by the EBGL Article 44(1)(a) and 44(1)(b), thus not truly reflecting the VoAA in an imbalance settlement period. Therefore, option (e) (merit order lists) is left as the best option to meet the requirements of Article 44(1).

The approach to the VoAA is consistent with the approach for imbalance price in Article 5 of the imbalance settlement harmonisation proposal. The prices that should be used to calculate the value of avoided activation are specified, but not how they should be used to give the value.

The calculation of the VoAA uses the same components as Article 5 of the imbalance settlement harmonisation proposal. The only difference is that the components in Article 5 are based on the actual activations of energy made by the TSO, whereas for VoAA there are no activations. The price components for VoAA are those available to the TSO but not activated. As an example, the TSO may choose to specify the VoAA as the average of the 'cheapest' bids available to it in the upwards and downwards directions.

In an efficient balancing market, the VoAA serves as a default (reference) imbalance price, giving all BRPs equal knowledge on what to expect. In an efficient balancing market, settlement of balancing energy comes at societal loss.

For a given imbalance area and ISP, the difference between the actual imbalance price and the VoAA determines how incentivised BRPs are to minimise their imbalance. Relating the VoAA to the MOL better links it to the real-time value of energy, and creates a more accurate reference point for BRPs.

The EBGL Article 52(2)(d) requires a definition of conditions and methodology for applying dual imbalance pricing for all imbalances. If a TSO is using dual imbalance prices, in the event of no activations taking place they may require two values of VoAA. One to give a reference imbalance price for shortage, and one for surplus. However, the TSO can set a single value of avoided activation by setting the two values as equal.

2.5.5. Particular implementation

The implementation of the value of avoided activation shall be a prerequisite for implementation of Article 5 in the imbalance settlement harmonisation proposal on main components of the imbalance price.

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2.6. Article 7:The use of single pricing

2.6.1. Legal Proposal

(1) Each TSO shall implement the use of single imbalance pricing in accordance with Article 55 of the EBGL for all imbalances not later than application of the ISP of 15 minutes in accordance with Article 53 of the EBGL, with the exemption stated in paragraph 2 and, where applicable, taking into account a derogation granted in accordance with the Article 62(2)(d) of the EBGL.

(2) Each TSO may apply dual pricing when a proposal from that TSO to its relevant NRA for the definition of conditions and methodology for applying dual pricing in accordance with the Article 8 of this imbalance settlement harmonisation proposal has been accepted by that NRA.

2.6.2.Applicability

In accordance with EBGL Article 52 (3) the proposal pursuant EBGL Article 52 (2) may distinguish between self-dispatching models and central dispatching models.

The propopsal for the use of single pricing does not make a distinction between self-dispatching models and central dispatching models.

2.6.3.Legal background

In accordance with EBGL Article 52 (2) (c) the use of single pricing is prescribed for all imbalances.

The EBGL Article 52(2)(c) requires a proposal to further specify and harmonise at least:

> *The use of single imbalance pricing for all imbalances pursuant to Article 55, which defines a single price for positive imbalances and negative imbalances for each imbalance price area within an imbalance settlement period;*

2.6.4.Alternatives

The alternative to single imbalance pricing is dual imbalance pricing. The conditions and methodology for applying dual pricing are proposed in the all TSO proposal Article 8.

2.7. Article 8: Definition of conditions and methodology for applying dual pricing

2.7.1.Applicability

The EBGL Article 52(2)(d)(i) states that the conditions may be proposed by a TSO to its relevant regulatory authority. The proposal is therefore only applicable to the imbalance pricing if the TSO choses to do so and after a regulatory authority approval.

The EBGL Article 52(4) states that "*The proposal pursuant to paragraph 2 shall provide an implementation date no later than eighteen months after approval by all relevant regulatory authorities in accordance with Article 5(2) ".*

The EBGL Article 55(3) states that each TSO shall determine the imbalance price for (a) each imbalance settlement period and (b) its imbalance price areas. In case of dual pricing , there will be two prices per (a) imbalance settlement period and per (b) its imbalance price area. Depending on the conditions for which application of dual pricing is requested this may be some ISPs (condition (b) and (c) or all ISPs conditions (a)(d) and €.

The boundary conditions of EBGL Article 55 (4), (5) and (6) apply, regardless of application dual imbalance price.

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2.7.2. Required justification for proposing dual pricing

The general objective of imbalance settlement (EBGL) is to ensure that balance responsible parties support the system's balance in an efficient way and to incentivise market participants in keeping and/or helping to restore the system balance. EBGL defines rules on imbalance settlement, ensuring that it is made in a non-discriminatory, fair, objective and transparent basis. To make balancing markets and the overall energy system fit for the integration of increasing shares of variable renewables, imbalance prices should reflect the real-time value of energy.

Based on the general objectives as stated in EBGL, the TSOs applying for dual pricing shall provide to its relevant NRA a justification that considers at least the following aspects:

- The impact on the financial outcome of the settlement processes (included in EBGL Title V) for the TSO;
- Impact on the incentives for BRPs and related consequences for operational security;
- Non-discriminatory and transparent market design;
- Cross-border market aspects.

2.7.3. Condition a) ISPs longer than 15 minutes

The EBGL stipulates a harmonisation of the imbalance settlement period to 15 minutes but permits different implementation paces, with an ultimate year for implementation (including exemption and derogation) set to 2025. Implementation of single pricing follows a different time plan. The imbalance pricing scheme may however create a BRP incentive structure that is better suited for shorter or longer imbalance settlement periods why the TSO should be allowed to link the implementation plans. Single pricing incentivises the BRP to self-regulate to support system balance while the dual pricing incentivises the BRP to keep balanced positions. The different pricing schemes will consequently trigger different BRP behavior and are therefore closely linked to the precondition for system operation and the possibilities for the TSO to ensure efficient balancing.

A single imbalance pricing scheme are generally beneficial and supports system operation when the triggered BRP self-regulation is moderate and the incentive is confined in a short imbalance settlement period. A too strong BRP response reinforced by a long valid response time (long ISP) results in balancing energy oscillations which will impact negatively on system operation and/or create economical inefficiencies. In congested grids the consequences for system operation may be even more inefficient since the BRP response is based on the system balancing state which neglects bottlenecks. Hence any change in imbalance pricing schemes must be carefully assessed before being implemented.

The implementation of 15-minute imbalance settlement period and the introduction of a single imbalance pricing scheme and the implications for system operation should be carefully assessed before separate implementation is required. Separate implementation may also be in conflict with the EBGL general objective with the imbalance settlement, which is to ensure that balance responsible parties support the system's balance in an efficient way.

A TSO should be allowed to link implementation of a single pricing regime to implementation of 15-min ISP since the incentives created by the single pricing regime may only be beneficial together with a short imbalance settlement period.

<u>Considerations</u>

Application of the condition will result in an interim period where TSOs with longer imbalance settlement periods are allowed to apply dual pricing, thus hampering the harmonisation process. Imbalance pricing is however not subject to full harmonisation under the EBGL and the negative consequences are therefore limited.

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Application of dual pricing may limit the possibilities for demand side response participation and may therefore be economically inefficient / prevent efficient use of flexibility.

Consequences

The condition may only be applied in imbalance price areas (and by TSO) with ISP longer than 15 minutes.

2.7.4. Condition b) Balancing energy activated in both directions in one ISP

Real-time information feedback loop on system balance state combined with single pricing may result in a strong self-regulation behavior which in its extension trigger oscillations in system balance, thus negatively impact on operational security. The oscillation may occur when the self-regulation response overcompensates for the system imbalance which in turn triggers an opposite self-regulation response.

Real-time information on system balancing state reflects the current need for positive of negative balancing energy. The balancing state will however not reflect local congestions inside a bidding zone why strong self-regulation behavior may be counterproductive and impact on the operational security.

A dual pricing scheme may provide a dampening effect without removing beneficial self-regulation behavior.

Delay publication of Real-time information on system balancing state may also be used in combination or as an alternative mitigation measure. EBGL, article 12.3 states that:

Each TSO shall publish the following information as soon as it becomes available:

(a) information on the current system balance of its scheduling area or scheduling areas, as soon as possible but no later than 30 minutes after real-time;[…]

Considerations

Restricted market access to real-time information (i.e. information published with a time shift less than a few minutes) and applying dual pricing in order to dampen the effect of self-regulation will however hamper the incentives for market participants to restore the system balance and benefit from, as well as influence the real-time value of energy. Those aspects should therefore be thoroughly considered and weighed towards the anticipated negative effects on operational security.

Consequences if not applying

This is a condition that each TSO may choose to propose to its NRA based on the above described argumentation and considerations. The condition should only be applied if it can be justified and full harmonisation (applied by all TSOs) should not necessarily be pursued.

The consequences if the condition is not applied by all TSOs are deemed limited and TSO specific justifications whether to apply or not apply the condition is more important for efficient market functioning than full harmonisation.

2.7.5. Condition c) The event of no activation in either direction

Cross-border marginal pricing decouples balancing energy prices and therefore imbalance prices from the local system state. The local system state in an ISP may not require support actions by the BSPs while pricing incentives that result from cross-border marginal price setting may incentivise BSPs to support the system. Especially extreme prices of balancing energy resulting from the common platforms can incentivise uncoordinated action of BRPs. Dual pricing in ISPs with no clear direction can mitigate this effect.

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Considerations

If the net sum of all imbalances in an imbalance area lies within a threshold near a balanced state in the imbalance area, a single price will set an incentive to BSPs to react while it is not justified from the operational security point of view. A dual pricing within a threshold does set a strong incentive to BSPs to keep in balance and not react to the price signal. The local circumstances and specifities of the market are to be considered when proposing to the local NRA the threshold within which to apply dual pricing. Each TSO may choose to propose to its NRA the application of dual pricing for given ISPs.

Consequences

Cross-border marginal pricing price incentives may result in BSPs' actions that do not reflect the local system state. Application of dual pricing that is transparently communicated to the market participants via the publication of real-time information on system balancing state provides BSPs with the information when to keep in balance. Application of dual pricing under the above condition assures that the local system state is reflected.

2.7.6. Condition d) Specificities of local electricity markets

Considerations

These are conditions that TSO may choose to propose in cases where TSO can show to its NRA that the market size and its local specificities (a small number of dominant market players, practically only one dominant BRP who is in the position to balance itself close to (or in) real time) may greatly influence the size and the direction of system imbalance and therefore influence the real time value of balancing energy and imbalance prices. In addition, such dominance and market power may lead to an abuse of the balancing market. In such a cases the detrimental effect on the local market is deemed higher than the loss of the efficiency due to non-harmonisation to a single pricing.

Consequences

Application of dual pricing under these conditions will reduce abuse of market power.

2.7.7. Condition e) Costs of balancing energy used to balance the system (excluding the balancing capacity) are entirely to be covered by BRPs causing the imbalance

The dual pricing mechanism which implements a method of precise price correction provides the needed spread between the price for negative and positive imbalances which allows fine tuning of the prices and with that the right amount of resources to cover the costs of balancing.

Considerations

Application of the condition will allow a TSOs to apply dual pricing, thus hampering the harmonisation process. Imbalance settlement, including pricing is however not subject for full harmonisation under EBGL and the negative consequences are therefore limited.

Consequences

If the condition is not applied by a TSO, then the sum of financial income and expences collected from BRPs may not be sufficient to cover the costs of balancing the system.

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3. Abbreviations

The following abreviations have been employed in this document:

BRP	Balancing Responsible Party
TSO	Transmission System Operator
DSO	Distribution System Operator
NRA	National Regulatory Authority
ISP	Imbalance Settlement Period
aFRR	Automated Frequency Restoration Reserves
HVDC	High Voltage Direct Current
MEAS	Mutual Emergency Ancillary Services

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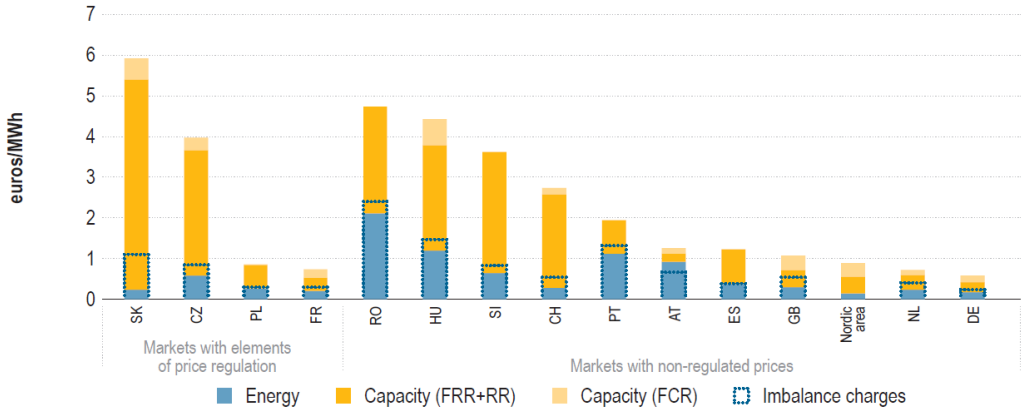
4. Appendices

A. Estimation of imbalance charges

The ACER market monitoring report over 2016 the contribution of imbalance charges was calculated in a significant sample of ENTSO-E countries to be around 1 €/MWh per MWh consumed. With total consumption in all ENTSO-region at about 3600 TWh/a, this accounts for an annual value of approximately 3.6 10^9 €

Figure 1 - Overall costs of balancing (capacity and energy) and imbalance prices over national elctricity demand in a selection of European markets - 2016 (€/MWh) - from ACER Market Monitoring Report 2016.



Source: Data provided by NRAs through the EW template (2017) and ACER calculations.

Note 1: The overall costs of balancing are calculated as the procurement costs of balancing capacity and the costs of activating balancing energy (based on activated energy volumes and the unit cost of activating balancing energy from the applicable type of reserve). For the purposes of this calculation, the unit cost of activating balancing energy is defined as the difference between the balancing energy price of the relevant product and the DA market price. Imbalance charges applied in the Nordic market are not included in the figure, as data were not available for all Nordic countries.

Note 2: The procurement costs of reserves reported by the Polish TSO comprise only a share of the overall costs of reserves in the Polish electricity system. This is due to the application of central dispatch in Poland, which makes it difficult to disentangle the balancing and redispatching costs.

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B. Harmonised elements of balancing market arrangements in accordance with the EBGL

Definition/Methodology	Harmonised	Localized	Remarks
Standard product FRR, RR	X		
Specific product FRR, RR		X	
TSO Demand RR		X	
TSO Demand mFRR		X	
TSO Demand aFRR	X		Principles in SOGL
Balancing energy volume		X	
Balancing energy price per direction*	X		Number of prices: RR: 0 or 1; FR: 0, 1 or more
Balancing energy specific product		X	
Imbalance volume	X		
position	X		
adjustment		X	depends on balancing energy volume
allocated volume	X		
Neutralization TSO		X	NRA responsibility
Imbalance price per direction*		X	Number of prices 1, default single, main components
* for a given imbalance area, for a given ISP			

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C. Survey Outcomes on Value of Avoided Activation of Balancing Energy

- In 17 countries, the default value of avoided activation of balancing energy is the corresponding day ahead or intraday market price; in 2 of these countries as a function of those prices.
- In 4 countries, regulated fixed price is used.
- In 2 countries, persistency is applied (last hour, average over a month).

D. Survey Outcomes on Finalisation of Volume Data

For imbalance a wide range of finalisation moments are reported.

- Shortest within 14 days of day of delivery (6 countries).
- Longest after more than one year (may include reconciliation process with supplier role though).

An additional 14 countries finalise imbalance volume within 3 months after month of day of delivery (taking comments into account).

Some answers suggest finalisation over billing period (month) rather than per day-of-delivery. For balancing energy processes finalisation time is equal or shorter.

In about half of the countries, all FRR and RR as requested values. In the other half metered (measured) values for at least part of volumes aFRR and/or mFRR.

- 1 country will change to requested next year
- aFRR not applicable to 5 responding countries

(In 17 countries, with FCR not determined)

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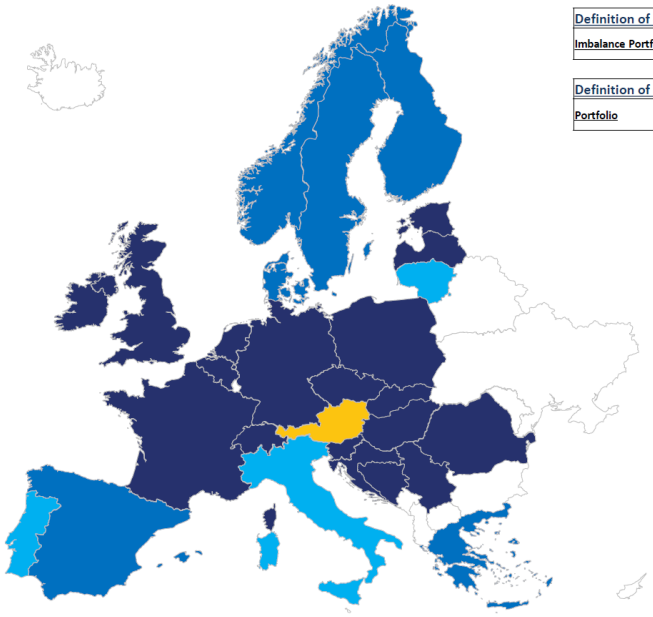
Figure 2 Imbalance Settlement - Number of Imbalance Portfolios - from WGAS Survey



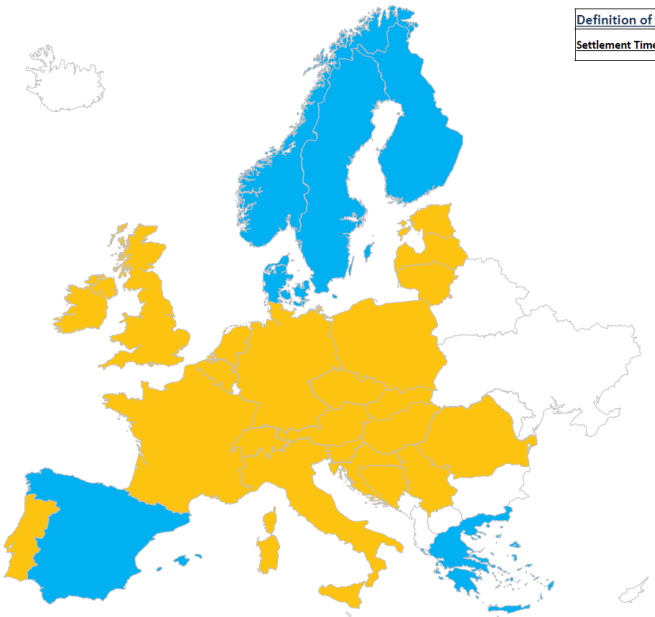
Definition of question	
Imbalance Portfolios	A fundamental property of local market design is the number of Imbalance Volumes to be calculated, attributed and charged to BRP's (Market) per settlement time unit.

Definition of answer	
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.

Key:
- Missing data
- N/A
- 1 portfolio
- 2 portfolios
- > 2 portfolios

entsoe Page 108

Figure 3 - Imbalance Settlement - Settlement Time Unit (if 2 volumes; generation) - from WGAS Survey



Definition of question	
Settlement Time Unit	The unit of settlement that is applied to the quantities in which the time series is expressed.

Key:
- Missing data
- N/A
- 15 min
- 30 min
- 1 hour
- x > 1 hour

entsoe Page 111

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