

## Penta SG3

**PENTALATERAL ENERGY FORUM**

*Penta flexibility work stream – Penta SG3 – Technical Background Paper - Balancing*

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# BALANCING

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### Introduction

The potential for balancing resources to be effectively shared between countries can, in the absence of congestions, enhance security of supply and reduce cost, hence there is a strong rationale for developing cross border balancing markets. In addition, with increasing shares of renewable energy in the market, the contribution of balancing services from renewable energy providers will become crucial to keep cost down. The EU Guidelines on Electricity Balancing will ensure that the correct framework will be put in place for this to happen. It is expected to require the establishment of Coordinated Balancing Areas (CoBA) for the exchange<sup>1</sup> of balancing energy, the exchange of balancing capacity, or operating the imbalance netting process, a harmonization of balancing products and improvement on procurement practices to allow wider market participation and increased competition.

### Actual situation

- a. Electricity Balancing Guideline will set a new framework for balancing across Europe

The Electricity Balancing Guideline proposal is currently under discussion between the Commission, ACER and ENTSO-E. The definition of Coordinated Balancing Areas is currently being developed by ENTSO-E and ACER and within the Balancing stakeholder Group and also informally discussed with the European Commission in the pre-comitology process. The Electricity Balancing Guideline will set a framework for the harmonization and will drive this harmonisation for key aspects of balancing.

- b. The pilot projects and on-going studies face the different approaches within the Penta region

Among the early implementation initiatives, the following multilateral initiatives need to be highlighted: TERRE pilot project (with a focus on exchange of replacement reserves, RR, as a first step) and the EXPLORE study (with a focus on exchange of frequency restoration reserves, FRR). There are also bilateral initiatives<sup>2</sup>.

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<sup>1</sup> “Exchange” makes reference to economical relations, whereas “share” refers to relation volume based. Thus, “exchange” goes further than “share”.

<sup>2</sup> For example, there is an ongoing work between RTE and Amprion on the establishment of a common merit order list of mFRR.

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Recently TSOs and NRAs have had a first meeting on the International Grid Control Cooperation (IGCC) Platform project to form an Imbalance netting CoBA across Central Europe. This is an important basis for other CoBAs.

Within the FCR cooperation project, TSOs from Switzerland, Germany, Austria and the Netherlands commonly procure FCR capacities. France, Belgium and Denmark have already expressed their interest: this could also lead to the formation of a single coordinated cooperation across Europe to procure FCR and possibly other balancing capacities.

In all these initiatives, key aspects of balancing are discussed (e.g. ISP, procurement of balancing services, product design) and depend mostly on the TSO approach to balancing.

### *1. TSO approach to balancing*

An important distinction between the different approaches in the pilot projects appears to be that some countries such as France, Spain, Portugal and UK, currently apply a more proactive TSO approach, which is based on a TSO forecast of energy imbalances and in which TSOs have the possibility to start their balancing activities at least 1 hour before real time. Other countries apply a reactive approach, which only counteracts real time power imbalances (Germany acts proactively with regard to the activation of mFRR) and in which the market takes more responsibility for energy balancing until real time.

The objective of the proactive approach is to minimize the overall balancing costs by reducing the average balancing energy price, whereas in the reactive approach, the objective is to minimize the overall balancing cost by reducing the volume of balancing energy.

<b>TSOs approach to balancing</b>	
<b>Proactive</b>	<b>Reactive</b>
France	Austria
Portugal	Belgium
Spain	Germany <sup>3</sup>
UK	The Netherlands

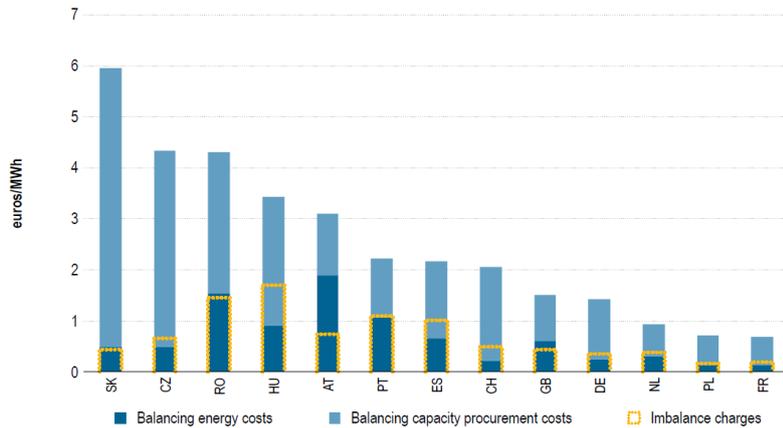
The graphic below provided by ACER show that according to the TSO approach for balancing, the overall costs for balancing per consumed unit of electricity vary a lot from one country to another.

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<sup>3</sup> Pro-active for mFRR activation.

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Figure 99: Overall costs of balancing (capacity and energy) and imbalance charges over national electricity demand in a selection of European markets – 2014 (euros/MWh)



Source: Data provided by NRAs through the ERI, Platts and ACER calculations (2015).

Note: Poland applies central dispatch, and the procurement costs of reserves reported by the TSO are only a share of the overall costs of reserves in the Polish electricity system.

This fundamental difference in the approach is related to the currently applied Imbalance Settlement Period, ISP, (which differs across countries) and its relation with the Time To Restore Frequency (TTRF) of 15 minutes in all Continental European balancing zones.

### 2. Imbalance settlement Price setting

Price setting in balancing markets is different from D-1 and ID markets. Some balancing zones within the penta region use dual pricing for imbalance settlement while others use single pricing. In a dual pricing scheme the imbalance price is dependent on the direction of the BRP imbalance & system imbalance (to positive and negative BRP portfolio imbalances a separate imbalance price is applied) whereas in a single pricing scheme one price is set dependent on the direction of the system imbalance (to both positive as well as negative BRP portfolio imbalances the same imbalance price is applied).

Single pricing schemes allow more market-based transactions, as parties are rewarded if they help to balance the system outside but dependent on the action and prices on the balancing market. For non-dispatchable technologies, such as wind and solar, the single price system is a preferred option, since producers have very limited possibilities to manage imbalances in real time.

Single pricing	Dual pricing
Austria, Belgium, Germany, the Netherlands <sup>4</sup>	France <sup>5</sup> , Poland, Spain, Switzerland, UK

<sup>4</sup> In specific cases, dual pricing can be applied (where the imbalance ramping goes both up and down within one ISP).

<sup>5</sup> France will change for "Single pricing" at the 1st of January 2017.

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### 3. Procurement of balancing services

Balancing energy settlement (between TSOs and BSPs) is currently performed using either pay-as-bid pricing or pay-as-cleared pricing (marginal pricing).

Settlement price for balancing energy	Pay-as-bid	Pay-as-cleared
Frequency restoration reserve (automatic)	Austria, Belgium, Germany, UK	The Netherlands, Poland, Portugal, Spain
Frequency restoration reserve (manual)	Austria, Belgium, France, Germany, Switzerland, UK	Denmark, the Netherlands, Portugal, Spain
Replacement reserve	France <sup>6</sup> , Switzerland, UK	Poland, Portugal, Spain

In order to create a level playing field, it is important to take the different price setting conditions, independent of the generation technology or demand side.

Additionally, there are a number of other very important procurement aspects that will determine the possibility of new players (e.g. demand side management, renewable producers) to compete for the provision of these products. Besides the product design (symmetrical vs asymmetrical, product length) and activation rules, the gate closure time for balancing capacity will impact the participation of various market players, leading to competition and thus having a final impact on balancing prices.

The final pricing methodology for Balancing Energy remuneration - still under development by TSOs - should define whether all products (local or cross border) receive the same or a different price. The final pricing mechanism for the imbalance price is also still under discussions.

It is also important to allow market bids (voluntary balancing energy bids from capacities that are not contracted) to avoid market distortions and increase participation of market players, including from renewable energy producers.

For more information on the pricing schemes and product design the ENTSO-E survey provides a good overview<sup>7</sup>.

<sup>6</sup> Terre bids will be paid with “pay as cleared” prices.

<sup>7</sup>

[https://www.entsoe.eu/Documents/Publications/Market%20Committee%20publications/150127\\_WGAS\\_Survey\\_2014.pdf](https://www.entsoe.eu/Documents/Publications/Market%20Committee%20publications/150127_WGAS_Survey_2014.pdf)

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### *4. Price signal of the ID market versus the use of replacement reserves (RR) by TSOs*

Market parties have argued that the ID market indeed gives a good price signal, although liquidity on this market is still far from optimal in many penta countries. Market parties as well as some NRAs agree that the ID price signal is market-based, with flexibilities accessible to all parties, and not just for the TSO, as is the case with RR. For this reason - in their opinion - the ID market provides more opportunities for them to sell their flexibility than the market(s) for balancing energy, and the latter market only needs to signal the ultimate consequence of not being able to deliver (real time scarcity signal). In their view a TSO-only based solution (proactive approach) would generally be less efficient, and thus more expensive, than an approach in which market parties balance themselves or are allowed to participate in “self-balancing” (supporting the system balance) until very close to real time, on the basis of “real time imbalance prices”.

Some PENTA countries (with ISP and balancing products of 15 minutes) do not see a need to use RR (as liquidity in the ID market decreases by having RR in parallel) and even tend to shorten lead times so that the TSO can rely on the market even more.

Other countries however, such as France, argue that the ID market and the use of RR should not be opposed to each other, but should be seen as complementary. Indeed, the objective of the intraday market is to have equilibrated BRPs (decentralized approach), whereas the aim of balancing markets is to balance the system (centralized approach). Thus it is normal that the balancing market is opened only to one actor (the TSO), and this does not mean that ID offers more opportunity than balancing. As long as the ID Gate closure time is longer than 15 minutes, balancing products with different full activation time (from a few minutes until half an hour) can be used by the TSO to balance the system. Some TSOs do rely on RR to balance imbalances exposed to their relevant area, and argue that the use of RR reduces overall balancing costs (“economic optimization”). Indeed, some of these TSOs usually procure less aFRR capacities than other TSOs, since they can rely on manual reserves which are available to them without being pre-contracted.

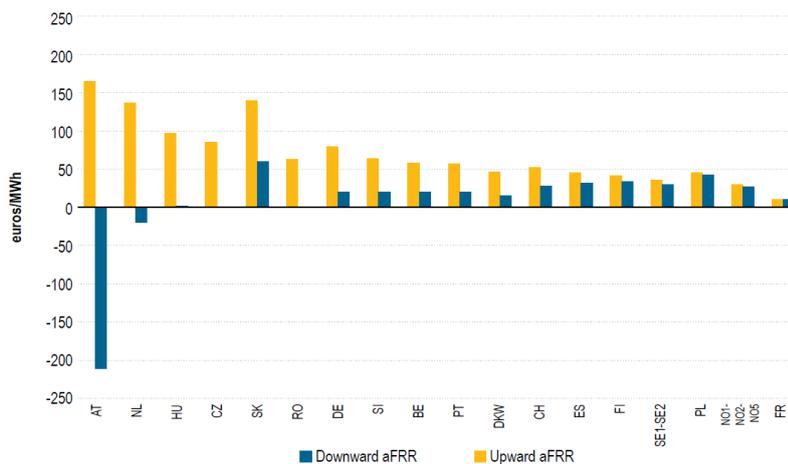
It should be pointed out that operating an ID market close to real time is submitted to pre-requisites like: a liquid ID market, the absence or limited number of grid congestion, the elaboration of a local price signal by the TSO and the ability of BRPs to have enough information to balance the system.

Approaches	Conditions	Impact	Countries
Optimisation of balancing price		Low ID liquidity Reduced balancing costs	ES, FR
Optimisation of balancing volume	ISP 15 minutes, 15 products	Imbalance price volatility, reduced balancing energy volumes	DE, AT, BE, NL

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The graphic below, provided by ACER, shows that according to the approach, countries have very different prices of balancing energy activated from aFRR. It must be noted that for countries using single pricing such prices may also be a reward to some BRPs.

Figure 96: Weighted average prices of balancing energy activated from aFRR (upward and downward activation) in a selection of EU markets – 2014 (euros/MWh)



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.

### c. To what extent should we harmonise our balancing markets?

#### 1. Objective

The level of harmonisation and/or alignment of balancing regimes across borders seems connected to the objective of (eventually) creating a common merit order list of standard balancing products. Such a common “balancing” merit order between countries or within a region would only be realistic in the presence of available cross-border transmission capacity, and in a situation where all prices of balancing products reflect the full marginal cost, and where price setting is done in an open market. Prices should reflect the cost of balancing.

#### 2. Formation of CoBAs

There are important different views between ACER and ENTSOE on the degree of harmonization needed for a number of parameters prior to the implementation of the regional implementation model (RIM) of Coordinated Balancing Areas (CoBAs).

In ACER’s view<sup>8</sup>, the following dimensions need to be harmonized to avoid getting stuck in incompatible regions:

- Standard products for balancing energy & capacity,

<sup>8</sup> “ACER path towards the balancing market integration, 15.1.2016, <https://www.entsoe.eu/about-entsoe/market/balancing-and-ancillary-services-markets/Pages/default.aspx>

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- harmonizing Imbalance settlement period (ISP),
- algorithm principles,
- pricing methods and
- activation purposes.

According to ENTSOE, there is no need to harmonize all the dimensions and starting without complete harmonization seems efficient. The only dimension that must be harmonized is the standard products for balancing energy & capacity (this includes harmonization of GCT). Whereas , at least at the beginning, a complete harmonization of imbalance settlement and imbalance settlement period (ISP) may not be required, an implementation of marginal pricing on the long run is required for pricing. Harmonisation seems not required for activation strategy /balancing scheme. However, market functioning or cross-border impacts on Area Control Error (ACE, a measure of balancing quality) quality and dimensioning and local responsibilities could be affected: it has to be analysed.

All market parties agree that an adaptation and harmonization of balancing products and improvement on procurement practices are needed to allow wider market participation and increased competition.

Thus, concerning CoBA formation , some participants argue that CoBAs should be built around countries which are using the same sets of products and have similar balancing objectives (pro-active vs reactive; economic optimization vs simple price ranking bid selection, equal imbalance settlement period), since within a CoBA intensive TSO-TSO cooperation is required. Other parties argue that it is possible to build a CoBA between countries with different balancing objectives.

In one of the comments to the working paper it was mentioned that in order to ensure a gradual harmonisation of European balancing markets, it makes sense to first prioritise harmonisation between those who already have similarities. “CoBAs should be envisaged where it lowers the overall cost of the system, by leveraging similarities and complementarities in generation mixes”. Some NRAs consider it is mandatory to make proactive and reactive TSOs cooperate at the very first stage of the CoBAs / regional integration development to reach the final achievement of the European integration model.

At the same time it is however deemed important to ensure that different regions do not develop in different directions, as it will make the final harmonisation more challenging. This could be ensured through a clear EC Balancing Guideline that sets requirements for harmonisation of the overall principles. ENTSO-E currently tends to propose a strong central CoBA (including PLEF countries) to ensure timely delivery of the Regional and European Integration Model. Analysis indicated that differing between proactive and reactive TSOs does not significantly reduce complexity as a significant amount of issues remains to be harmonized.

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### *3. Gate closure times for balancing energy*

The issue of different lead times and gate closures of balancing markets is closely linked to the fundamental different approaches as described above. It is also acknowledged that balancing energy gate closure time, is much linked to the ID gate closure regime, to the availability of short term products in the ID market and to the possibility to schedule cross-border trades in the same (short) time unit. According to the draft NC EB, balancing energy gate closure time must be after ID gate closure time. This would imply that a change in intraday gate closure time should be followed by a corresponding change in balancing energy gate closure time so that market participants have the opportunity to get in balance.

There are still differences between gate closure times in national ID market, as compared to cross border gate closure times. There seems to be much support for aligning these cross border ID lead times, in order to allow for further market integration and to better reveal the available flexibility in the region.

In Germany and the Netherlands, it is however possible for unbalanced BRPs to trade with other unbalanced BRPs (within one balancing area) even after real time (with financial incentives after day-ahead market closure) in order to minimize their imbalance price payments. In the Netherlands, the TSO actively provides the current imbalance price more or less instantaneously, so that BRPs can trade in real-time, to adjust their production/consumption based on the provided price signal. In Germany, all organized markets (organized by power exchanges) end 30 minutes before real-time. Afterwards, it is still possible to do bilateral trading (“over the counter” – OTC) until 15 minutes before real-time. The focus is on the netting of risks related to the balancing energy price only without any real market structure. These “day-after” markets are not necessarily organized by power exchanges and represent the only possibility to trade “after real-time” in Germany. In the end, this represents only netting which cannot cause additional (or reduce existing) imbalances.

These exchanges done ex-post are purely financial, and do not impact the balance of the system but only individual BRPs’ balances. Harmonizing national & cross border ID Gate closures could mean for those markets (NL, GER) closing the market longer before real time.

The lead times are probably dependent on what processes the TSO conducts after gate closure, e.g. calculation of congestion, flows and what measures the TSO will have to put in place to deal with this. This means that there is also a close link with the capacity calculation process.

### *4. Balancing responsibility*

It appears to be a common understanding that full balancing responsibility for all market participants is an important prerequisite for a well-functioning electricity and thus balancing market, with equal access for all players and a level playing field for all market players. There is wide agreement that the Balance Responsible Parties (BRPs) play an essential role, and that balancing responsibility for all market participants is an important condition for system balancing, for security of supply and efficient market functioning.

However within the penta region there are still quite different regimes for BRPs, in particular for renewable generators. This issue is currently addressed in the EU context (market design discussion as well as Electricity Balancing guideline). An important consequence of the Electricity Balancing

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guideline is the need to standardize and harmonize to a large extent the national terms and conditions for balancing services providers (BSPs) and BRPs.

Balancing responsibilities for all parties should be accompanied by the existence of markets that allow trading close to real time (Intraday market with short gate closure times) to minimize forecast errors and that provide fair access rules to balancing markets to all market parties.

### *5. Imbalance settlement periods (ISP harmonisation)*

In its Qualified Recommendation ACER prescribes a harmonisation at 15 minutes, equal to the TTRF, subject to the Cost-Benefit-Analysis outcome.

The different ISPs applied across PLEF Members States have been subject to such a CBA on ISP harmonisation, under the guidance of ENTSO-E. This study has assessed four different scenarios<sup>9</sup>, and has shown that, under a range of assumptions, the net benefits of the different planning cases could be either weakly positive or strongly negative. The outcome of this study is intended to feed into the impact assessment undertaken by the Commission for the EB Guidelines.

Nevertheless, the Electricity Balancing Guidelines currently foresee the implementation of a European Integration Model where all TSOs would exchange balancing services in a single CoBA (1 CoBA per product) irrespective of whether they apply proactive / reactive models or Central Dispatch / Self Dispatch systems.

A harmonized ISP of 15 minutes allows for a day ahead market time unit of 15 minutes, thus allowing load serving entities to buy their required profiles at much better resolution, and for generators to sell profiles at much better resolution, than presently possible. This will reduce their exposure to illiquid intraday markets, and will reduce the required volumes of balancing energy, one of the objectives of the reactive TSOs approach. While a shorter and harmonized ISP would allow more flexibility and liquidity in the market, the costs implications are not evident, as shown by the CBA. The draft NC EB currently proposes pay-as-clear pricing for balancing energy (still to be defined: per product, per reserve, or for all products) and proposes that the imbalance settlement price to be paid for imbalances is a single price, unless another approach is shown to be beneficial (temporarily and/or locally), e.g. to prevent oscillation, or in case of congestion.

## Desired solution

The objective at the European level is to reach an integrated European electricity market. By allowing balancing resources to be effectively shared between countries, the network code on Electricity Balancing will increase competition between market participants, thus reducing cost of balancing, and will enhance security of supply, by relying on more capacities to balance the system. Electricity

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<sup>9</sup> (1) All countries go to 15minutes ISP, (2) if change required, move to 15min (countries with 60 minutes ISP move to 15 minutes, countries with 30 minutes ISP remain unchanged), (3) if change required, align with neighbors (countries with 60 minutes ISP move to either 15 minutes or 30 minutes (depending on largest neighbor), (4) all regions to 5 minutes ISP.

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Balancing Guidelines currently foresees the implementation of a European Integration Model (EIM) where all TSOs would exchange balancing services in a single CoBA.

Reaching this integrated electricity market will take time and in the meantime, different scenarios of cooperation can be considered in order to reach, step by step, this desired solution.

### Path to the desired solution

Basically, there are two different balancing models in Europe, and within the Penta region, as described in the “actual situation”, that make the achievement of the European integration model challenging.

There are ongoing discussions on how is it possible to reach the objective. Basically, two scenarios are currently under study regarding a regional implementation model for balancing:

- A scenario (1) in which countries with similar balancing models will work together to implement a regional implementation model.
- A scenario (2) in which countries with different balancing models will form a single region, and will be connected to a unique platform.

The main issue concerning these two scenarios consists on the harmonization of the balancing models (e.g. ISP, imbalance settlement, pricing and activation methodology). Effectively, for some participants, there is a need to harmonize balancing models before to create CoBAs, whereas for other ones it is better to start to work on CoBAs before harmonizing the different parameters.

The scenario (1), from this point of view, is the easiest short term choice, since it does not require a prior harmonization. But the risk linked with this scenario is that Western Europe would be split in two more or less independent regions (PT-ES-FR-UK-CH-IT and AT-BE-DE-NL): the effort for merging those two regions at a later stage to complete the European Integration Model will be huge, especially if regionally harmonized technical requirements for market parties differ. Some participants fear that it will not even be realistically possible, as scenario 1 will consolidate the differences and even further amplify them.

Concerning scenario (2), ENTSO-E currently proposes a strong central CoBA (including PLEF countries) to ensure timely delivery of Regional and European Integration Model. This would be complementary to other initiatives (TERRE, EXPLORE), and would enhance cooperation between countries with different balancing approaches. It would ensure that different regions do not develop in different directions, as it would make the final harmonisation more challenging.