REPORT FOR PUBLIC CONSULTATION

Analysis of the possibility to offer different types of balancing products on DPpg

20th October 2022

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Executive summary

This study presents and assesses existing and potential possibilities to offer (simultaneously) several types of balancing products on the same DPpg delivery point, or to offer with the same DPpg, balancing products while also supplying energy on the DA/ID market with a Transfer of Energy (ToE).

Based on a first assessment of the market's interest for offering specific combinations of products on the same DPpg ("combos"), Elia investigates possible evolutions of market design, either to allow new combinations or to improve the design of existing ones. Elia also assesses the robustness of these evolutions against other design evolutions that are contemplated for the products involved in these combos.

Currently, Elia distinguishes two types of combinability of products, namely the "contractual combo" and the "combo activation":

- Contractual combination ("contractual combo"): a situation where a BSP can use the same Delivery Point DPpg to offer different products. The BSP is allowed to use a same DP in bids for different products, but not necessarily during the same validity period.
- Combination with simultaneous activation ("combo activation"): a situation where a BSP uses the same DPpg to offer different products during the same validity period.

The contractual combos are allowed for all products, including the Transfer of Energy in DA/ID markets, if the DPpg is prequalified under the relevant contracts (BSP contracts and/or FSP Contract DA/ID) and the products are offered by the same BSP/FSP. Elia observes that, except for the combos with FCR, the contractual combos are not (or very rarely) used today.

Although the combo activations are allowed between FCR and all other products, the FCR - aFRR combo activation is the only one used today.

Based on a survey organized by Elia, an international benchmark and bilateral exchanges with market parties, it seems that the combo activation aFRR-mFRR also has some potential, and this despite the very limited use so far of the corresponding contractual combo. Interest has been declared to the combo activation of mFRR with energy supplied to DA/ID although no DPs have yet been registered for participation with ToE to the DA/ID segment.

In the context of this study, Elia interviewed three neighboring TSOs concerning the combinability of their balancing products. The benchmark reveals that contractual combos and (some) combo activations were developed in France, Germany and the Netherlands. Nevertheless, it is difficult to compare the mechanisms developed in those markets with the Belgian situation as the local designs are very different (and sometimes very complex). In addition, the Belgian concept of DPpg is not used in other countries, which makes an accurate comparison even more difficult. Despite these differences, some useful elements can be drawn from the benchmark, such as the confirmation of the higher market potential for the combo aFRR – mFRR and information on the way other TSOs use baselines and do activation control in case of combo activations.

The main part of this study focusses on the combos (activation) for which the market showed the most interest, i.e. FCR-aFRR, FCR-mFRR, aFRR-mFRR and mFRR-ToE DA/ID.

The first analysis relates to the FCR-aFRR combo activation. For this combo, the aFRR activation control includes a correction for the FCR delivered by combo DPs, based on a declarative value from the BSP. On the side of FCR control, no similar correction is foreseen for the aFRR delivered but the FCR activation control being discontinuous, the BSP may request to control another frequency variation, not biased by an aFRR activation. Elia assesses in the study the possibility to improve the design of controls by using a common declarative baseline per DP for the FCR – aFRR combo and the power measurement on this DP. With this data, Elia could compute the total volume delivered on the DP for a given period. In case of combo activation, the question remains on the attribution of volumes delivered to each product. A solution already in use in Germany for several years is to allocate the volumes delivered primarily to FCR (only in case of combo activation of course) and to attribute the discrepancies, if any, to aFRR. This approach and its consequences are further discussed in the study.

For the FCR - mFRR combo activation, one can notice that the characteristics of both products are quite different. The FCR product is considered as a pure capacity product while mFRR is an energy product. Moreover, the activation dynamic is very different between the two products; indeed FCR may fluctuate very quickly (on a second basis) while mFRR is activated on quarter hour basis. The influence of mFRR on the measurement of FCR can therefore be considered as negligible.
Conversely, the influence of FCR on the activation control of mFRR has been scrutinized. The frequency deviation could change direction many times over a validity period, with FCR being activated both upward and downward. In average over the quarter hour, FCR activations would not (significantly) impact the energy delivered for mFRR as positive and negative activations of FCR would (partly) compensate each other. Besides, mainly small frequency deviations are observed on the grid, which only represent small volumes of FCR energy. The influence of such volumes on the mFRR activation control is in the end negligible. Based on these elements, Elia recommends at this stage to not implement changes to the current design. Nevertheless, a further evolution towards an FCR declarative baseline would facilitate the combinability between the two balancing products by allowing a more accurate attribution of volumes between the two products.

The combo activation for aFRR and mFRR is today possible for DPsu but is not allowed for DPpg. Consequently, for this aFRR – mFRR combo, Elia analysed the existing activation controls of both products. For aFRR activation control the BSP needs to send its aFRR baseline one minute in advance. As it knows the mFRR requested several minutes in advance, the BSP can take into account the volume of mFRR delivered on the concerned DP when defining its aFRR baseline, hence the current process for the aFRR activation control allows handling aFRR-mFRR combo activations.
On the other hand, the mFRR baseline is inherently an estimation of the offtake/injection in case no balancing activation would have taken place (i.e. assuming no aFRR has been delivered). Therefore, the mFRR supplied as currently calculated would reflect the total volume of energy delivered, for both the aFRR and the mFRR services. To ensure a correct mFRR activation control if one or more delivery points deliver both services simultaneously, an adaptation of the current mFRR activation control would be needed. In this regard, Elia proposes a design for the mFRR activation control where the calculation of mFRR supplied is corrected by deducting the energy delivered.

Regarding the Transfer of Energy (ToE) in the context of the aFRR – mFRR combo, Elia considered the existing situation and analyzed the robustness of the proposed design against future evolutions of the ToE. The Transfer of Energy has not yet been implemented for aFRR and a single regime (i.e. Opt-out or Pass-through) applies per Delivery Point for all the services to which the point participates. As a result, there is currently no need to calculate the total volume of energy delivered for the Transfer of Energy. In the future, Elia intends to develop an alternative solution to the current ToE, based on local corrections via Exchange of Energy Blocks (EoEB). The proposed design for the mFRR

activation control in case of aFRR – mFRR combo would equally work as of the moment either Transfer of Energy or the alternative design with local corrections (EoEB) is implemented for the aFRR product.

The combo of mFRR and the supply of energy to DA/ID market was analyzed in 2019 as part of a study on Transfer of Energy in DA and ID markets[1]. The conclusions from the study were taken as the starting point for the analysis of the combo mFRR - ToE DA/ID and to propose a consistent design, based on a two-step approach. In a first step, the total volume of energy delivered during the quarter hour(s) of the simultaneous activation is calculated by using a unique baseline. In a second step, this total volume of energy is allocated first to DA/ID and the remaining volume is then allocated to mFRR. The volume allocated to mFRR is then used for the mFRR activation control. Although this combo may bring theoretical benefits, its effective usage and economic viability is highly uncertain. Indeed, more than one year after the go-live of the ToE DA/ID, no DPs have yet been registered for participation to the DA/ID segment. Similarly, the experience with mFRR shows that Elia has not received any non-contracted mFRR energy bid from DPpg in the last years, by extension one can doubt about the market's interest for combo of (non-contracted) mFRR with the supply of energy to DA/ID (for which no capacity remuneration applies either). Based on the above observations, Elia maintains its recommendation not to prioritize the implementation of this combo.

In addition to the study regarding the combos, Elia has also compared the Belgian concepts of "DP_{su}" and "DP_{pg}" (defined in the T&C BSP) with the European concepts of "reserve providing unit (RPU)" and "reserve providing group (RPG)" (defined in the SOGL). From the comparison of the concepts with regards to pre-qualification, activation and monitoring Elia confirms that the Belgian concepts of DP_{su} and DP_{pg} are not equivalent to those of RPU and RPG but considers that the approach and obligations developed in Belgium are nevertheless compliant with the obligations as set forth in the SOGL. The concept of Delivery Point offers additional flexibility to the BSPs in terms of prequalification but also in managing their portfolio compared to a model where RPU and RPG would be defined in a static way. The model currently implemented in Belgium in all balancing services removes entry barriers for market actors.

In conclusion, Elia does not propose to include the European terminology of RPU and RPG in the Belgian design as it will render the Terms & Conditions of balancing services even more complex while the change does not bring added value for the market parties. The change would indeed have a significant impact on all Terms & Conditions, which are built on the concept of Delivery Point. Consequently, significant amendments of these concepts of DPsu and DPpg would prove to be a sizeable effort of Elia but also of market participants in terms of conceptual discussions and implementation, and would likely result in less flexibility for the BSPs.

[1] The study can be found on the Elia website.

1. Introduction

The objective of the present study is to analyse the possibility to offer different types of balancing products (FCR/aFRR/mFRR) and/or to combine the offer of balancing products and the supply of energy in the DA/ID markets through Transfer of Energy (ToE)[2] at a single DPpg delivery point.

1.1 Scope of the study

In this study, Elia will:

- assess the opportunity and technical feasibility of offering a combo on DPpg, based on existing baseline methodologies;
- assess the potential liquidity that these changes would bring on the balancing markets based on
    - the current experience of delivery points DPpg participating to different products
    - a survey of market participants;
- investigate whether such possibilities are offered by neighbouring TSOs, and the contribution to the liquidity of their balancing markets, if relevant;
- compare the concepts of "DPsu" and "DPpg" defined in the Belgian T&C BSP with the concepts of "reserve providing unit" and "reserve providing group" defined in the SOGL.

For the avoidance of doubt, the following topics will not be treated in the current study:

- the combinability conditions for cascading delivery points, i.e. when a delivery point is behind another;
- the simultaneous participation of a DPpg in the balancing and/or DA/ID markets with multiple BSP/FSPs.[3]

Elia will come back on these elements to the WG Balancing in order to determine if an additional study to investigate them would be necessary in the short term (e.g. in 2024).

1.2 Structure of the report

The report is structured into the following chapters:
Chapter 2 explains the concepts and definitions which will be used throughout this study.

Chapter 3 describes the current possibilities and use of combos in the Belgian market and summarizes the feedbacks received from market parties during the survey.

Chapter 4 focuses on the benchmark carried out by Elia in the surrounding balancing markets

Chapter 5 zooms in on possible design changes to offer different types of balancing products (FCR/aFRR/mFRR) and/or to combine on DPpg the offer of balancing products with the supply of energy in the DA/ID markets through ToE. In addition, Elia provides its recommendations on such future evolutions.

Chapter 6 elaborates on the comparison between the concepts of reserve providing unit/reserve providing group (RPU/RPG) defined in SOGL and the concepts of DPsu/DPpg used in the Belgian T&C BSP.

[2] For a short description of the ToE, see section 5.4.3.
[3] On this subject, Elia wants to refer to the conclusion of the study done in 2019 (Transfer of Energy in DA and ID markets)

2. Concepts and definitions

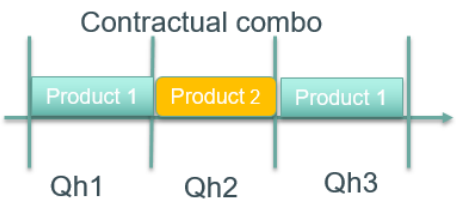
Before entering into the subject of matter, it is important to remind some concepts and definitions which will be used throughout this study.

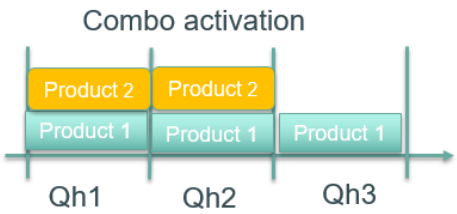
First, we remind the definitions of the delivery points used in the Belgian balancing market, known as DPsu and DPpg

- A Delivery Point DPsu or “DPsu” (‘single-unit’ delivery point) means a Delivery Point for which ELIA receives Daily Schedules;
- A Delivery Point DPpg or “DPpg” means a Delivery Point for which ELIA does not receive Daily Schedules.

In the current market design of balancing products, Elia defines strict rules for the combinability of products (known as “combo”) on the same delivery point DPpg. Currently, Elia distinguishes two types of combinability of products, namely the “contractual combo” and the “combo activation” as explained below:

- **Contractual combination (“contractual combo**”): a situation where a BSP can use the same DPpg to offer different products. The BSP is allowed to use a same DP in bids for different products, but not necessarily during the same validity period.
- **Combination with simultaneous activation (“combo activation”):** a situation where a BSP uses the same DPpg to offer different products during the same validity period.





The contractual combos are possible for all products, including the Transfer of Energy in DA/ID markets (cfr FSP Contract DA/ID). In contrast, combo activations are only allowed under certain conditions described in BSP contract.

It is reminded that only one BSP is allowed per Delivery Point.

For the purpose of this document, the following terms are used:

- a Delivery Point that was activated simultaneously for at least two products (e.g. aFRR and mFRR, or DA/ID and mFRR) during the same validity period is called a “**combo delivery point**” or “**combo DP**”;
- a Delivery Point that did not perform a simultaneous activation and was only involved in delivering one service (e.g. aFRR, mFRR,…) during the validity period in question is called a “**pure delivery point**” or “**pure DP**”.

3. Possibilities and use of combos in Belgium

Before looking at the design and possible improvements related to the combinability of products, and especially the case of combo activations, Elia wants to remind the current situation of combos for DPpg mentioning what is allowed and not allowed in the Belgian market.
Next to this global overview, the interest from market parties for specific combinations and the possible increase of liquidity new combo activations would bring are important to understand, in order to prioritise Elia's investigations and potential proposals for implementation.

3.1 Current use of combos in the Belgian market

The combinability of balancing products is already used in the Belgian market, but not all allowed combinations are equally used. The contractual combos are allowed for all products, including the Transfer of Energy in DA/ID markets, if the DP is prequalified under the relevant contracts (BSP contracts and/or FSP Contract DA/ID).

The table below gives an overview of the combinability of products on DPpg and their usage in Belgium. Both the contractual combo and the combo activations are presented.

Combo	Contractual Combo	Combo activation
FCR and aFRR	Is allowed and used	Is allowed and used
FCR and mFRR	Is allowed and used	Is allowed but not used
aFRR and mFRR	Is allowed but seldom used	Is not allowed
FCR and DA/ID with ToE	Is allowed but not used	Is allowed but not used
aFRR and DA/ID with ToE	Is allowed but not used	Is not allowed
mFRR and DA/ID with ToE	Is allowed but not used	Is not allowed

3.2 Market parties' survey

A survey was sent to all stakeholders of the Workgroup Balancing in May 2022 with the objective to collect their feed-back on their current experience with combos in Belgium and abroad, and on their interest to further develop the combinability of balancing products on DPpg, including indications on the potential increase of liquidity that the opening of new combos activation would bring. The questionnaire sent to market parties is shown in annex 1.

Main feedback from stakeholders in the survey

From the market survey, Elia received some feedback on possible business cases if Elia further opens the combinability of balancing products for delivery points DPpg.

BSPs have implemented a control logic on some assets in order to offer both FCR and aFRR. It is confirmed that this combo activation of FCR and aFRR is valuable for the market parties.

Regarding the combo aFRR and mFRR, the following business cases were provided by market parties:

- delivery point with various assets behind the meter where some assets fit either for aFRR or mFRR;
- the building of back-up pool assets for either aFRR or mFRR can be reduced by sharing them in case of aFRR-mFRR combo (mitigation of risks of unavailabilities);
- for EMS (Energy Management Strategy) purpose (linked to aFRR requirements) offering mFRR free bids in the direction recovering the state of charge would allow to decrease the need to call upon back-up assets.

In terms of combo activations, the table below summarizes the market interest for the various combos based on the bilateral exchanges with market parties and feedback from the survey. The level of interest was defined by Elia considering the concrete business cases received and the estimation of the potential increase in liquidity. Elia finally retained three levels to classify the market interest for combo activations on DPpg: high, medium or low.

Combo	Market's Interest from survey	Considered for the study
FCR and aFRR	high	Elia wants to verify the monitoring of this combo, and to identify needs and propose improvements if relevant.
FCR and mFRR	Medium	Elia wants to verify the monitoring of this combo, and to identify needs and propose improvements if relevant.
aFRR and mFRR	High	Elia will propose a design to allow this combo.
FCR and DA/ID with ToE	Low	As currently, the combo is allowed but not used (in general ToE DA/ID is not used today), Elia proposes to keep the current design.
aFRR and DA/ID with ToE	Low	As currently ToE DA/ID is not used and on the other hand no ToE is available in aFRR yet, this combo will not be studied in detail in the framework of this incentive. However, Elia will summarize the conclusions of the 2019 study on ToE for DA/ID markets in which this combo has been analyzed and will make a link with the similar combo between aFRR and mFRR that is studied in detail in this study.
mFRR and DA/ID with ToE	Medium	This combo has been analyzed in the 2019 study on Transfer of Energy for DA/ID markets. Elia will re-assess the design proposed in this study as well as the study's

		conclusions related to the effective usage and the economic viability for developing this combo.

During the public consultation of this report, Elia invites market parties to provide additional input and concrete information (i.e. potential additional liquidity resulting from the enabling or re-designing of combo) on their interest for existing or new combos on DPpg delivery points in order to prioritize potential implementations of such combos. Based on this, the implementation plan will be established in the final report.

4. Benchmark of combos in other TSOs areas

4.1 Introduction

In order to assess the benefits of combo in balancing markets for smaller assets, Elia realized a benchmark in the surrounding balancing markets. Elia first questioned other European TSOs about the possibilities of combinability of balancing products in their market and their contribution to the liquidity if applicable. To be able to draw from foreign experience conclusions that would apply to the Belgian situation, the comparison has to be made preferably with similar market organizations (i.e. allowing the pooling of assets) and to consider the same category of assets (i.e. below 25 MW). It is also important to identify specific design elements of the other markets that would influence any conclusion.

Elia received feedbacks from 50Hertz Transmission (depicting a situation applicable in the entire Germany), RTE (France) and TenneT (The Netherlands).

4.2 Overview in Germany

4.2.1 Contractual combos

German TSOs authorize the contractual combos for the balancing products (FCR/aFRR/mFRR) under the condition that the BSP owns a valid balancing contract for each product and that units which would deliver the service are prequalified for each balancing product.
There is no similar concept to “transfer of energy” and therefore no combinability between balancing products and the supply of energy to DA/ID markets.

Market situation

In Germany, units offering balancing services are prequalified for each balancing services (FCR/aFRR/mFRR). Portfolio activation is possible. On the other hand, there is no concept similar to DPsu or DPpg, making a distinction on the obligations applying to large and small units.

The table below shows the distribution of units (in total 11780 units) from German balancing market having prequalified in one or multiple balancing products and the ratio offered in contractual combos. Note that large units (that would qualify as “DPsu” in Belgium) are also included in the percentage, and are the units using the most the combinability of products in practice.

Types	Percentage of units offering the service (April 2021)
FCR	23%
aFRR+	56%
aFRR-	69%
mFRR+	62%
mFRR-	71%
FCR+ & aFRR+	6%
FCR+ & aFRR-	6%
FCR+ & mFRR+	6%
FCR+ & mFRR-	6%
aFRR+ & mFRR+	52%
aFRR+ & mFRR-	50%

aFRR- & mFRR+	50%
aFRR- & mFRR-	50%
FCR & aFRR & mFRR	6%

4.2.2 Combo activations

The simultaneous activations of balancing products is authorized in Germany. The activation control of balancing products is supported by a strict prequalification process. Currently the prequalification process encompasses several steps of compliance, one of them is the operating test by which compliance with the requirements with regard to product characteristics (e.g. the required dynamic properties) of FCR, aFRR and/or mFRR are evaluated. Additionally the correct recording and transmission of the measurement values required as real-time data from the BSP to the TSO is assessed, including the baseline. Thanks to these different steps in the prequalification process, German TSOs can rely on the received real-time data to achieve their monitoring of balancing service, which facilitates, in the end, the control of the combo activation.

In case of underdelivery during a combo activation, the discrepancy is attributed entirely to one pre-defined product, as described in the German rules “PQ Bedingungen” (cfr https://www.regelleistung.net/ext/download/PQ_Bedingungen_FCR_aFRR_mFRR_en).

Control of activation of simultaneous balancing services

The difference between the measurement and the baseline represents the provision of balancing reserve. The German TSOs have defined rules for the control of activation when several balancing products are delivered during the same validity period. These rules foresee that, in the case that the total balancing energy delivered is insufficient, the difference between the actual provision of balancing reserve and the requested one (i.e. the “error”) is allocated as follows:

- If only one balancing reserve type is being provided, then the error is to be entirely attributed to this balancing reserve type
- If FCR and mFRR, but not aFRR, are being provided, the error is attributed to the FCR
- If in addition to FCR and/or mFRR, aFRR is also being provided, the error is attributed to the aFRR.

Illustration of error attribution with multiple services in German market

(Source: **https://www.regelleistung.net/ext/download/PQ_Bedingungen_FCR_aFRR_mFRR_en**)

The table shown below illustrates all seven possible marketing combinations. A blue background in one of the cells in the three columns on the far left means that the balancing reserve type in question is marketed, held and provided by the TU/RPU/RPG. For the sake of simplicity, only the positive balancing direction is considered and no units are specified; for the purpose of the description the unit "MW" is assumed below. Also for simplification, it is assumed below that the operating point in all combinations shown is 0 MW. The numerical values in the table follow the generally applied leading sign convention: The infeed has a positive sign; the same is true of a request (setpoint) for positive balancing reserve and overfulfilment of an activation for positive balancing reserve as well as underfulfilment of an activation for negative balancing reserve. Correspondingly, power consumption has a negative sign; the same also applies to a request (setpoint) for negative balancing reserve and underfulfilment of an activation for positive balancing reserve as well as overfulfilment of an activation for negative balancing reserve.

Table 5: Illustration of the error allocation in the provision of balancing reserve

FCR POS	aFRR POS	mFRR POS	COMB.	Actual	FCR POS Setpoint	aFRR POS Setpoint	mFRR POS Setpoint	FCR POS Actual	aFRR POS Actual	mFRR POS Actual	FCR POS Error	aFRR POS Error	mFRR POS Error	COMB.	FCR POS	aFRR POS	mFRR POS
			1	+5	+10			+5			-5			1			
			2	+5		+10			+5			-5		2			
			3	+5			+10			+5			-5	3			
			4	+10	+10	+10		+10	0		0	-10		4			
			5	+10	+10		+10	0		+10	-10		0	5			
			6	+10		+10	+10		0	+10		-10	0	6			
			7	+15	+10	+10	+10	+10	-5	+10	0	-15	0	7			

In the case of combination 1, the TU/RPU/RPG only provides FCR_POS (blue designation on left). The actual infeed is assumed to be +5 MW. Because the actual balancing reserve value essentially corresponds to the actual infeed minus the operating point, the FCR actual value in this example is +5 MW. For the sake of assumption, this actual value stands in relation to a setpoint of +10 MW. Because the activation error is fundamentally determined as the difference between the actual balancing reserve value and the setpoint, this results in an activation error (under-provision) of 5 MW, which is displayed according to the leading sign convention as -5 MW. The attribution of the error to a specific balancing reserve type is indicated in the three columns on the far right of the table with a red background colour. (Also on the far right, an activation considered to be "correct" - for the sake of assumption - is indicated with a green background colour.) In the case of combination 1,
the entire error is attributed to the FCR (FCR_POS). Combinations 2 and 3 illustrate the cases of exclusive provision of aFRR (aFRR_POS) and mFRR (mFRR_POS), respectively.

In combination 4, the TU/RPU/RPG simultaneously provides FCR (FCR_POS) and aFRR (aFRR_POS). In this case, there is no division of the error; rather, the entire error is attributed to the aFRR (aFRR_POS) (red indication on right), while the requested FCR (FCR_POS) is considered to be correctly provided for the sake of assumption (green indication on right). In the cases of combinations 6 and 7, the entire activation error is attributed to aFRR (aFRR_POS) as well.

In the case of combination 5, the TU/RPU/RPG is used for the simultaneous provision of FCR (FCR_POS) and mFRR (mFRR_POS). The example illustrates that in this case, the entire activation error is attributed to the FCR (FCR_POS). The mFRR (mFRR_POS) is considered to be provided correctly.

The requirements for determining the actual balancing reserve value, which are highlighted in the table with a yellow background, are of significant importance (especially with regard to the billing of the balancing energy) for the BSP since the determination of the actual balancing reserve values also determines the error attribution. The simple examples given above illustrate the currently applied rules. In the spring of 2018, the German TSOs submitted a proposal on the future determination of the actual balancing reserve values for consultation. The TSOs will revise the corresponding requirements and after another round of consultation and finalisation of the rules, they will be described in the PQ conditions as well.

4.2.3 Conclusion

It is confirmed that the contractual combo and the combo activation are in force in the German balancing market, and settlement rules concerning the process of control are published on the Regelleistung website. Mainly the large units are using the possibility to combine balancing products.

The implemented solution for the activation control in Germany is based on strict requirements concerning real-time data sent by the BSP which are controlled during the prequalification process. After compliance of the BSP to prequalification requirements, the real-time data received allow the TSO to monitor the delivery of all balancing products.

German TSOs defined rules for the activation where the discrepancy is attributed to only one product in case of activation of multiple products. This concept of allocation of the discrepancy to a specific product was considered and analysed in the context of the combo FCR and aFRR. This is further developed in the section related to the improvements of the FCR – aFRR combo.

The German market has no similar concept to the Transfer of Energy , therefore no comparison with Belgian market could be made with the combo (contractual combo or combo activation) between balancing products and ToE in DA/ID.

4.3 Overview in France

4.3.1 Contractual combos

The contractual combo is allowed in the French balancing market. There is no limitation for the use of the combo between balancing products or between balancing products and the supply of energy to DA/ID markets. The conditions to participate in multiple services is for the BSP to have valid contracts with RTE and furthermore to commit to not degrade the service offer of the balancing products. In addition, assets that would deliver the balancing service must be qualified for each balancing product.

Specificity of the French balancing market

For large generation units (above 50 MW), RTE has developed an implicit system for aFRR and mFRR reserve management. RTE receives the programs from the market actors containing the offers of aFRR and mFRR volumes as well as the operating point(s) of the generation unit. RTE can then adapt the aFRR/mFRR offer volumes according to the chosen operating point. This "implicit" system offers an accurate view of the operating points for all major assets in the French market but on the other hand, does not allow the aggregation of different types of assets.

Aggregation of assets is limited on RTE grid especially for large units. It should also be noted that today, aggregation is almost impossible between injection and offtake. On DSO grids there are no such restrictions except that the BRP should be the same for all assets in the portfolio but in practice there are no cases of portfolio activation combined with contractual combos.

4.3.2 Combo activations

The simultaneous activation of several balancing products on the same unit is authorized in France. The controls of the delivery are always done after the supply of the different services, each product being monitored separately with the use of a correction factor which takes into consideration the influence of the other product in case of combo activation. Specifically for the combo activation of FCR and aFRR, RTE has developed its own specific algorithm in order to control the correct delivery of both products.

In the process of controls, RTE considers different baselines depending on the size of the asset. For the large assets, RTE uses the production programs (schedules) as the reference for the baseline. For small power units or demand side assets, there are two possible baseline methods that can be used by the BSP: either the (average) measured value 30 min before real-time or historical consumption profile on typical days.

In the paragraphs below, the specific activation control applied by RTE is summarized.

Control of the activation of the multi-service offer between aFRR and mFRR:

When a combo activation aFRR and mFRR has been delivered, RTE performs the control on each product-specific meter.

To check mFRR delivery, RTE uses the meters with a 10 minutes granularity. From this measured energy, RTE deducts the theoretical energy of aFRR requested; the remaining energy on the delivery point is assigned to the delivery of the mFRR energy.

To control the aFRR, RTE uses real-time measurement, which allows monitoring the dynamics of the aFRR service provision. RTE determines the actor's power set point and neglects the effect of the manual mFRR reserves when controlling.

Control of the activation of the multi-service offer between FCR and aFRR:
In the case of a combo activation between FCR and aFRR, RTE only uses real-time measurement.

First RTE, will determine the theoretical profile of the combo between FCR and aFRR based on among other things the schedule and the FCR and aFRR requests. The control consists in determining the deviation from the expected theoretical profile (FCR and aFRR) and the measurement via specific algorithm developed by RTE. Any deviation between the measurement and the profile gives rise to penalties for each product.

4.3.3 Conclusion

It is confirmed that the contractual combos and the combo activation are allowed in France. All combinations of balancing products are possible and also combination between balancing products and DA/ID markets but the combos of multiple products apply to single units, as aggregation of assets is limited on the French market. Large units contribute to a large extend to the balancing volume used by RTE. On DSO grids, there is no restriction in aggregation but the contractual combos within a portfolio is never used. The comparison with the scope of this study on delivery points DPpg (small units) is therefore limited.

One could observe that similar concepts in activation control, being the correction factor used in case of aFRR -mFRR combo, will be proposed by Elia as well. On the contrary, specific controls developed by RTE to compute the deviation for the FCR - aFRR combo, could not be easily transposed as such in a new design for combo on DPpg in Belgium, as the solution developed by RTE is highly complex.

4.4 Overview in The Netherlands

4.4.1 Contractual combos

TenneT authorizes in the Netherlands the contractual combos for the balancing products (FCR/aFRR/mFRR) under the conditions that BSP owns a valid balancing contract for each product and that all assets which would deliver the service are qualified for each balancing product.

There is no concept of Transfer of Energy in the Dutch balancing market, and therefore no possible combo between balancing products and the supply of energy to DA/ID markets. The Connection Party (responsible for the connection point) manages the trades at the connection point.

4.4.2 Combo activations

Concerning the simultaneous activations of balancing products, only the combo activation of FCR and aFRR is authorized in the Dutch market. No other combo activation is allowed nor are currently under development.

In particular, concerning the combinability between aFRR and mFRR, the prequalified assets could be used in aFRR and mFRR bids (contractual combos) but bids for different products cannot be activated at the same time. The reason is that the current penalty schemes for aFRR and mFRR do not permit to properly assign the penalty on each balancing product if they are activated at the same time.

4.4.3 Conclusion

It is confirmed that the contractual combos of balancing products are authorized in the Dutch balancing market. However, the only authorized combo activation is between FCR and aFRR; no other combo activation is allowed, nor under development.

The comparison with Dutch market does not provide additional elements for the creation of Elia's proposal in the context of this study.

The Dutch market has no similar concept to the Transfer of Energy, therefore no comparison with Belgian market could be made with the combo (contractual or activation) between balancing products and ToE in DA/ID markets.

4.5 Conclusions from benchmark

Elia interviewed three neighboring TSOs concerning the combinability of their balancing products. The benchmark reveals that contractual combos and (some) combo activations were developed in neighboring countries (i.e. France, Germany, and The Netherlands). Nevertheless, it is difficult to compare the mechanisms in those markets with the Belgian situation as:

- the overarching design may be different ;
- some combo activations have been facilitated by creating exceptions on ad hoc basis, leading to a very high complexity ;
- the concept of DPpg as such is not used in other countries.

Nevertheless, some general concepts related to the activation controls are similar to Elia's design in case of combo, like the correction factor applied in the activation control of one product to reflect the influence of the simultaneous delivery of another one, or the use of unique baseline (master baseline used in the context of mFRR and the supply of energy to the DA/ID market).

It appears through the interviews with the neighboring TSOs that the use of combo activations on small units is very seldom.

Next to that, the most frequent case of multiple-products prequalification in Germany is for the combination aFRR/mFRR, which gives an indication that the corresponding combo activation may also be the most interesting for market parties.

5. Combinability of balancing products

5.1 Introduction

This chapter focuses on the combo activations and solutions to authorize or to improve the combo activations. The term “combo” should be understood in this chapter as “combo activation” unless stated otherwise.

Elia identifies the following challenges regarding the combo activation of delivery points DPpg

- Elia needs to determine a methodology for calculating the volume delivered to each service; this could result in complex activation control.
- In case of Transfer of Energy, the total volume delivered per Delivery Point needs to be calculated and this volume should correspond to the sum of the volumes delivered for the different services.
- Finally, the proposed design for combo activation should prevent arbitrage opportunities by the market actor through manipulation of declarative values (e.g., in case of a global underdelivery, it should be avoided that the BSP can arbitrage between the penalties for both products).

5.2 FCR and aFRR

This section describes the current situation and the proposed changes to improve a simultaneous activation of a delivery point DPpg for both the FCR and the aFRR services.

This section is divided into the following subsections:

- Current situation of FCR – aFRR combo
- Improvements proposed for FCR – aFRR combo
- Elia’s recommendations for FCR – aFRR combo

5.2.1 Current situation of FCR – aFRR combo

For the contractual combo to be allowed, the current obligations for the BSP are the following:

- The BSP must own valid contracts for both FCR and aFRR. All Delivery Points DPpg that would participate in both FCR and aFRR markets need to be specified in the annex 4 (List of delivery points DPpg) of the BSP contracts FCR and aFRR or listed in the FSP-DSO contract;

Below articles extracted from the respective BSP contracts FCR and aFRR require in addition that the concerned DP must be in the portfolio of the same BSP for the two products:

- **BSP contract FCR**: art II.4.2 (combinability conditions) *A Delivery Point providing FCR Service can participate to a contract for aFRR and/or a contract for mFRR at the condition that the BSP is the same party.*
- **BSP contract aFRR**: art II.5.2 (combinability conditions) *A Delivery Point providing aFRR Service can participate to a contract for FCR and/or a contract for mFRR at the condition that the BSP is the same party*

Under the conditions above, a Delivery Point can already today provide both the FCR and the aFRR services during the same validity period (combo activation). Elia observes that some DPpg are currently offered simultaneously in both markets as permitted by the BSP contracts.

The next paragraphs verify if the current activation controls of both products as described in the respective BSP contracts are sufficient to verify the actual power delivery in case of a simultaneous activation of FCR and aFRR.

aFRR activation control

In the current formula of the activation control of aFRR, a correction factor for FCR activation is already foreseen. This correction factor, known as "FCR correction", represents the FCR power delivered by the Delivery Points participating to the provision of the aFRR service and is sent today by the BSP as defined in the BSP contract aFRR. BSP only sends the FCR correction in case a DP offers both services.

The extract from the BSP contract aFRR below reminds how the *aFRR supplied* is computed:

The aFRR Supplied (in MW) is determined per Time Step "ts" as follows:

$$aFRR\ Supplied(ts) = \sum_{participating\ Delivery\ Points} [DP_{baseline}(ts) - DP_{measured}(ts)] - FCR\ correction(ts)$$

where the participating Delivery Points are all Delivery Points included in an aFRR Energy Bid or Supporting aFRR Providing Group for the concerned Time Step "ts" , compliant with Art.II.12.5 and for which the parameter $DP_{aFRR}(ts)$ is equal to 1.

As a conclusion, the aFRR activation control includes a correction for the FCR delivered by combo DPs. However, this correction is based on a declarative value from the BSP and could hence be improved.

FCR activation control

No correction is foreseen in the FCR activation control in case a DP is used in combo activation with aFRR.

Today the FCR activation control is discontinuous and is performed by calculating the difference between the FCR Requested and the FCR Supplied for a maximum of 6 frequency Variations per month, and in the same way a maximum of 2 frequency Variations per CCTU. Additionally, the BSP may request Elia to perform the activation control on a different frequency variation, at the condition it can show that it was impacted by a rapid power change not related to the delivery of FCR during the initially selected variation (see BSP Contract FCR annex 12). This rapid power change clause could be used in case an aFRR activation influences the FCR activation control, mitigating the risk for the BSP to be penalized in case of combo activation.

So, even though the risks are mitigated, the current FCR activation control process does not properly consider the influence of aFRR activations.

In addition, Elia is considering future evolutions of the FCR and aFRR services:

- The introduction of a declarative FCR baseline similar to the aFRR baseline
- The introduction of continuous activation control in FCR
- The provision of incentives for BSPs to react faster in the aFRR service, currently evaluated in the framework of the study on aFRR activation methods. This might further increase the risk of rapid power change polluting the FCR activation control.

5.2.2 Improvements proposed for FCR – aFRR combo

As explained in the previous section, the activation control in case of combo activations could be improved to:

- Avoid, when possible, the possibility of arbitrage between penalties of different products through the use of a declarative value (e.g. FCR correction) received from the BSP.
- Properly consider the influence of aFRR in the FCR activation control.

The proposal developed in the present section requires the implementation of a declarative FCR baseline identical to the aFRR baseline, i.e. a baseline sent by the BSP for each DP. It takes into account the feedback received from market parties during and after the stakeholder workshop of the 22nd of September.

The proposal is to perform an integrated activation control for aFRR and FCR. For pure aFRR or pure FCR DPs, Elia would control the power delivered based on the difference between measured value and baseline, like is currently done in aFRR. For the combo DPs, the measured values and baselines would be identical for aFRR and FCR, raising the question of the attribution of volumes delivered to each product. The main principle would be to allocate the volumes delivered first to FCR and the remaining volume to aFRR, according to following process:

1. The FCR supplied on the pure FCR delivery points is computed

$$FCR_{\text{supplied on pure FCR DP}} = \Sigma_{\text{pure FCR DP}} (DP_{\text{baseline}} - DP_{\text{measured}})$$

2. The remaining FCR power to be supplied on the combo DPs ("$FCR_{\text{to be supplied on combo DPs}}$") is deducted

$$FCR_{\text{to be supplied on combo DPs}} = FCR_{\text{requested}} - FCR_{\text{supplied on pure FCR DP}}$$

3. The total volume delivered on the combo DPs of the BSP is computed

$$\text{Volume combo DPs} = \Sigma_{\text{combo DP}} (DP_{\text{baseline}} - DP_{\text{measured}})$$

4. The FCR activation control is performed by verifying that the volume delivered by combo DPs covers the $FCR_{\text{to be supplied on combo DPs}}$

$$FCR_{\text{supplied on combo DPs}} = \min(\text{Volume combo DPs}; FCR_{\text{to be supplied on combo DPs}})$$

5. The volume attributed to aFRR is computed by subtracting from the total volume delivered on the combo DPs, the FCR volume delivered on combo DPs

$$aFRR_{\text{supplied on combo DPs}} = \text{Volume combo DPs} - FCR_{\text{supplied on combo DPs}}$$

6. The aFRR supplied on the pure aFRR delivery points is computed

$$aFRR_{\text{supplied on pure aFRR DP}} = \Sigma_{\text{pure aFRR DP}} (DP_{\text{baseline}} - DP_{\text{measured}})$$

7. The aFRR activation control is performed, summing up the $aFRR_{\text{supplied on combo DPs}}$ and the $aFRR_{\text{supplied on pure aFRR DP}}$.

The process is illustrated in the numerical example below, where the following assumptions are made:

- FCR Requested is 5MW, aFRR Requested is 10MW
- 2MW are delivered by pure FCR DPs, 9MW by combo DPs and 1MW by pure aFRR DPs

Step	Computation	Power
1	$FCR_{\text{supplied on pure FCR DP}}$	2 MW
2	$FCR_{\text{to be supplied on combo DPs}}$	5 MW – 2 MW = 3 MW
3	Volume of combo DPs	9 MW

4	FCR activation control	9 MW > 3 MW ➔ FCR activation control is ok
5	aFRR supplied on combo DPs	9 MW – 3 MW = 6 MW
6	aFRR supplied on pure aFRR DP	1 MW
7	aFRR activation control	10 MW – 6 MW – 1 MW = 3 MW ➔ aFRR activation control results in 3 MW underdelivery

It is to be noted that these high-level principles will need to be further developed, in order to address at least the following:

- Cases of opposite directions of aFRR Requested and FCR Requested
- Definition of the tolerance band in the FCR activation control and combination of FCR and aFRR tolerance bands

In addition, the implementation of a common activation control would require a coordination in the timings for the amendment of the T&C BSP aFRR and T&C BSP FCR.

5.2.3 Elia's recommendations for FCR – aFRR combo

The high-level principles of an improved design is proposed for the combo activation between FCR and aFRR with the implementation of a common activation control. The proposal is based on the precondition that a declarative FCR baseline is implemented.

5.3 FCR and mFRR

This section describes the current situation and the changes to improve a simultaneous activation of a delivery point DPpg for both the FCR and the mFRR services.

This section is divided into the following subsections:

- Current situation of FCR – mFRR combo
- Improvement proposed for FCR – mFRR combo
- Evolutions of FCR and mFRR products

5.3.1 Current situation of FCR – mFRR combo

For the contractual combo to be allowed, the current obligations for the BSP are the following:

- The BSP must own valid contracts for both FCR and mFRR and all Delivery Points DPpg, that would participate in both FCR and mFRR markets, need to be specified in the annex 4 (List of delivery points DPpg) or listed in the FSP-DSO contract.

Below articles extracted from the respective BSP contracts FCR and mFRR require in addition that the concerned DP must be in the portfolio of the same BSP for the two products:

- **BSP contract FCR**: art II.4.2 (combinability conditions) *A Delivery Point providing FCR Service can participate to a contract for aFRR and/or a contract for mFRR at the condition that the BSP is the same party.*
- **BSP contract mFRR**: art II.5.2 (combinability conditions) *A Delivery Point providing mFRR Service can participate to a contract for FCR and/or a contract for aFRR at the condition that the BSP is the same party.*

Under the conditions above, a Delivery Point can already today provide both the FCR and the mFRR services during the same validity period (combo activation).

Today Elia observes that few DPpg are in the pool of the BSP for both services which allows to use the contractual combo. Presently, based on the feedback received by Elia from the market parties, there are no business cases for combo activation between FCR and mFRR.

The objective of this section is to verify if the current activation control of both products as described in the respective BSP contracts are sufficient to verify the actual delivery of the power or energy in case of a simultaneous activation of FCR and mFRR.

FCR activation control

Looking at the characteristics of both products, we observe that:

- The FCR product is considered as a pure capacity product while mFRR is an energy product;
- The activation dynamic is very different between the 2 balancing products; indeed FCR may fluctuate very quickly (on a second basis) while mFRR is activated on quarter hour basis.

In the current formula of the FCR activation control, no correction factor is foreseen which would take into account the influence of an mFRR activation. On the other hand, the FCR activation control is currently performed over a maximum of 6 frequency variations per month. Therefore, the probability of an activation control of FCR with a simultaneous activation of mFRR is relatively low.

Additionally given current framework for FCR, the BSP may request to be controlled on another frequency variation in case it can motivate this request by showing it was impacted by a rapid power change not related to the delivery of FCR.
In the end, considering the very different characteristics of both products, one can conclude that the influence of mFRR on the measurement of FCR could be considered as negligible.

mFRR activation control

In the current formula of the mFRR activation control, no correction factor is foreseen to take into account the influence of FCR activation.

The mFRR activation control looks at the energy delivery during the quarter hour of activation. One can observe that an FCR activation would negatively impact the activation of mFRR if the FCR Request is on average opposite to the direction of the mFRR activation. On the other hand, if FCR and mFRR activations are on the same direction there is a risk of counting both activations in the mFRR activation control.

Nevertheless, on a quarter hour period, the frequency deviation could change direction many times with FCR being activated both upward and downward. In average over the quarter hour, FCR activations would not (significantly) impact the energy which is delivered for mFRR, as positive and negative activations of FCR would (partly) compensate each other in terms of delivered energy.

Finally, small frequency deviations, which are the most observed in the grid, would only represent small volume of energy due to the short time and small amplitude of FCR activations. The influence of such volume on the mFRR activation control is considered as negligible.

5.3.2 Improvements proposed for FCR – mFRR combo

Regarding the impact of mFRR activation on FCR control and with the current FCR control method, Elia does not consider necessary to develop a specific modification of existing FCR activation control method.

Regarding the impact of FCR activation to the mFRR control, Elia analysed the option to add a correction factor linked to FCR activation in the mFRR activation control by computing the FCR correction component. The complexity induced by a correction factor that properly identifies the share of FCR energy delivered would lead to important implementation efforts, while the resulting improvement of the mFRR activation control would be very limited (as explained in section 5.3.1). It is proposed therefore to not add a correction factor linked to FCR activation in the mFRR activation controls at this point.

If concrete business cases demonstrate a significant negative influence of the FCR on the mFRR controls, Elia could investigate solutions to mitigate the mutual influence.

5.3.3 Evolution of FCR and mFRR products

Elia analyses below the impact of the possible future evolutions of FCR and mFRR on the FCR - mFRR combo.

Evolution of the FCR baseline: declarative baseline from BSP

- In case the FCR baseline is not calculated anymore by Elia but rather provided by the BSP, the contribution of mFRR could be taken into account in the provided baseline, which would allow a more accurate FCR activation control on the Delivery Point with combo activations.
- The use of a declarative FCR baseline would decouple the products FCR and mFRR by design and both products could be monitored separately, if in addition a FCR correction would be introduced in the mFRR activation control.

This evolution could improve therefore the combinability of the balancing services.

Evolution of the FCR activation control: continuous activation control instead of discrete control

- The evolution of the FCR baseline is necessary for the implementation of an FCR continuous control, as the FCR baseline will facilitate the monitoring of each service as explained above. The change of the FCR activation control to a continuous control does not impact the combinability of the balancing services.

On the evolution of mFRR product, Elia confirms that the new T&C mFRR will have no impact on the combinability of the balancing services.

5.3.4 Elia’s recommendations

At this stage, Elia recommends to not implement changes to the current design.

Nevertheless, the further evolution towards a FCR declarative baseline would facilitate the combinability between the two balancing products by allowing a more accurate attribution of volumes between the two products.

5.4 aFRR and mFRR

This section describes the current situation and the changes required in the design in order to enable a simultaneous activation of a delivery point DPpg for both the aFRR and the mFRR services.

This section is divided into the following subsections:

- Current situation of aFRR – mFRR combo
- Improvement proposed for aFRR – mFRR combo
- Evolutions of aFRR and mFRR products

5.4.1 Current situation of aFRR – mFRR combo

For the contractual combo to be allowed, the current obligations for the BSP are the following:

- All Delivery Points DPpg, that would participate in both aFRR and mFRR markets, need to be specified in the annex 4 (List of delivery points DPpg) of the BSP contracts aFRR and mFRR or listed in the FSP-DSO contract.

Below, the extracts of the BSP contract aFRR and mFRR related to the combinability conditions are presented:

- **BSP contract aFRR:** *art II.5.2 (combinability conditions) A Delivery Point providing aFRR Service can participate to a contract for FCR and/or a contract for mFRR at the condition that the BSP is the same party.*
  Annex 9: [..] Any Delivery Point DP_{PG} included in an aFRR Energy Bid for a certain quarter-hour cannot be included in a mFRR energy bid or supporting mFRR Providing Group for the same quarter-hour;

- **BSP contract mFRR:** art II.5.2 (combinability conditions) *A Delivery Point providing mFRR Service can participate to a contract for FCR and/or a contract for aFRR at the condition that the BSP is the same party.*
  Annex 9: *[..] If one Delivery Point DP_{PG} is included in a mFRR Energy Bid for a certain quarter-hour, the concerned Delivery Point cannot be included in an aFRR energy bid for the same quarter-hour;*

In addition to the above rules, for a given delivery point, the same market regimes (ToE, Pass-through, Opt-out) apply for both products (i.e. market situation with Transfer of Energy or market situation without Transfer of Energy) as described in Section 9 of the Rules on the organization of Transfer of Energy.

The combo activation for aFRR and mFRR is currently only allowed for DPsu, not for DPpg.

The next paragraphs verify if the current activation controls of both products, as described in the respective BSP contracts, are sufficient to verify the actual delivery in case of a simultaneous activation of aFRR and mFRR.

aFRR activation control

The extract from the BSP contract aFRR below reminds how the aFRR Supplied is computed:

The aFRR Supplied (in MW) is determined per Time Step "ts" as follows:

$$aFRR\ Supplied(ts) = \sum_{participating\ Delivery\ Points} [DP_{baseline}(ts) - DP_{measured}(ts)] - FCR\ correction(ts)$$

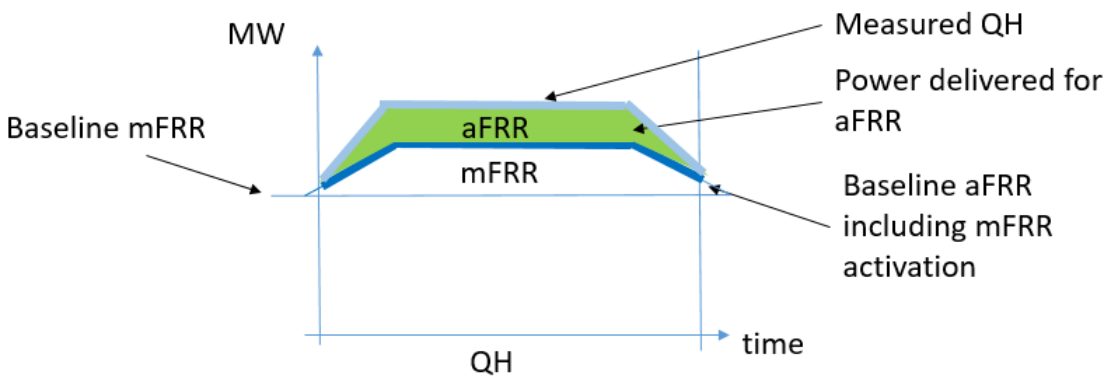
where the participating Delivery Points are all Delivery Points included in an aFRR Energy Bid or Supporting aFRR Providing Group for the concerned Time Step "ts" , compliant with Art.II.12.5 and for which the parameter $DP_{aFRR}(ts)$ is equal to 1.

For the sake of this section, considering an aFRR-mFRR combo (without FCR), the aFRR delivered by a given DP can be calculated as follows:

$$DP\ aFRR\ power\ (ts) = DP_{aFRR}(ts) * (DP_{baseline}(ts) - DP_{measured}(ts))$$

The aFRR baseline per DP is sent by the BSP to Elia 1 minute before the time step to which it applies. As the BSP receives its mFRR requested several minutes (currently 3 minutes) before the start time of an activation, it can include in its aFRR baseline the volume of mFRR it plans to deliver with the concerned DP. By doing this, the aFRR baseline reflects the offtake/injection of the Delivery Point in a given time step "ts" in case only the mFRR activation would have taken place.

Based on this observation, Ela considers that the current aFRR activation control process allows handling aFRR-mFRR combo activations.



mFRR activation control

The contribution of a single Delivery Point activated for mFRR to the mFRR Supplied in a given quarter hour "k" is currently calculated as follows (in line with Section 12.C of the BSP Contract mFRR):

Upward activation:

$$DP\ mFRR\ Supplied(k) = \min\begin{cases} DP_{mFRR,max,up} \\ DP_{baseline}(k) - DP_{measured}(k) \end{cases}$$

Downward activation

$$DP\ mFRR\ Supplied(k) = \max\begin{cases} DP_{mFRR,max,down} \\ DP_{baseline}(k) - DP_{measured}(k) \end{cases}$$

The mFRR baseline for DPpg is calculated using a different method compared to the aFRR baseline. The BSP has the choice between using the last QH or the High X of Y baseline methodology. The mFRR baseline is to be considered as an estimation of the offtake/injection in case no balancing activation would have taken place (i.e. neither aFRR, nor

mFRR activation). This is an inherent difference with the aFRR baseline. Therefore, the $DP\ mFRR\ Supplied$ as currently calculated reflects the total volume of balancing energy delivered (i.e., for both the aFRR and the mFRR services).

To avoid that a same balancing energy volume is counted twice (once in the aFRR activation control and once in the mFRR activation control), and to ensure a correct mFRR activation control in case one or more delivery points deliver both services simultaneously, an adaptation of the current mFRR activation control is needed.

5.4.2 Improvements proposed for aFRR-mFRR

As explained in the previous section, the current aFRR activation control process allows the proper monitoring of aFRR delivery in case of aFRR – mFRR combo.

Concerning the control of mFRR when a DPpg delivers both services, an improvement is needed as mentioned above. In this regard, Elia proposes a design where the calculation of $DP\ mFRR\ Supplied$ considers the power delivered and allocated to aFRR, as follows for a given quarter hour "k":

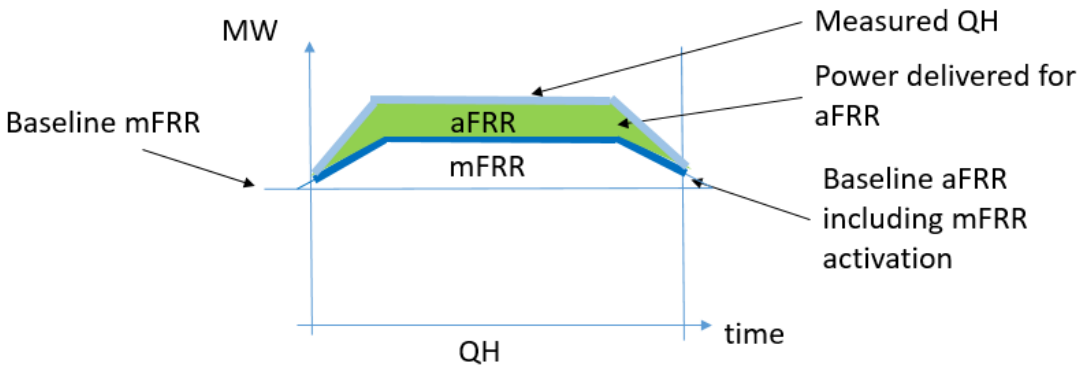
Upward activation

$$DP\ mFRR\ Supplied(k) = \min\begin{cases} DP_{mFRR,max,up} \\ DP_{baseline}(k) - DP_{measured}(k) - average_{(k)}\ (DP\ aFRR\ power(ts)) \end{cases}$$

Downward activation

$$DP\ mFRR\ Supplied(k) = \max\begin{cases} DP_{mFRR,max,down} \\ DP_{baseline}(k) - DP_{measured}(k) - \ average_{(k)}\ (DP\ aFRR\ power(ts)) \end{cases}$$

with $DP\ aFRR\ power\ (ts)$ as decribed in Section 5.4.1 and shown on the figure below.



The data needed to compute $DP\ aFRR\ power\ (ts)$ are already gathered and used by Elia in the context of the aFRR activation control, so no new data would be required.

Below, two numerical examples of the control of aFRR - mFRR combo are provided.

Examples of aFRR - mFRR combo

In these examples, the sign convention is the one used in the BSP contracts.

Power Measured: The net active power, i.e. the difference between gross offtake and gross injection, measured at a Delivery Point. Net offtake from the Elia Grid is considered as a positive value, net injection into the Elia Grid is considered as a negative value.

Case 1:

Combo activation with one DP; the aFRR and mFRR requested are in the same direction. It is assumed that the delivery point would have an injection of 0 MW in case no aFRR and mFRR activation would have taken place.

		aFRR	mFRR
aFRR/mFRR requested		5 MW	10 MW
Baselines	DP1	-10 MW	0 MW
Power Measured by Elia	DP1	-15 MW	
Volumes allocated to the different services	DP1	(-10-(-15))= 5 MW	(0-(-15))-(-10-(-15))= 10 MW
Control		OK	OK

Case 2:

Combo activation with one DP; the aFRR and mFRR requested are in opposite directions. It is again assumed that the delivery point would have an injection of 0 MW in case no aFRR and mFRR activation would have taken place.

		aFRR	mFRR
aFRR/mFRR requested		5 MW	-10 MW
Baselines	DP1	10 MW	0 MW
Power Measured by Elia	DP1	5 MW	
Volumes allocated to the different services	DP1	(10-(5)) = 5 MW	(0-5) - (10-(5)) = -10 MW
Control		OK	OK

The proposed approach also works in case the BSP uses, in its energy bids, a pool of delivery points which is a mix of pure DPs (delivering either aFRR or mFRR) and combo DPs. This is illustrated with an example in the next section.

Illustration of cases with a mix of pure DPs and combo DP for aFRR - mFRR combo

In the tables below, we illustrate the cases of activation controls of aFRR and mFRR products with pure delivery points (DP 1 and DP 3 are pure delivery points) and one combo DP (DP2 in this example) taking into consideration the proposed correction explained in current sections.

DP 1 and DP 3 are Pure delivery points
DP 2 is a combo delivery point

Case 1:

Combo activation with multiple DPs (mix of pure DPs and one combo DP); the aFRR and mFRR requested are in the same direction. The DP 2 is the common delivery point for the delivery of aFRR and mFRR services.

		aFRR	mFRR
aFRR/mFRR requested		5 MW	10 MW
Baselines	DP1	0	/
	DP2	-2 MW	0
	DP3	/	0
Power measured by Elia	DP1	-3 MW	/
	DP2	-4 MW	
	DP3	/	-8 MW
Volumes allocated to the different services	DP1	(0-(-3))= 3 MW	/
	DP2	((-2-(-4))= 2 MW	(0-(-4))-(-2-(-4)) = 2 MW
	DP3	/	(0-(-8)= 8 MW
Total supplied		5 MW	10 MW
Control		OK	OK

Case 2:

Combo activation with multiple DPs (mix of pure DPs and one combo DP); the aFRR and mFRR requested are in opposite directions. The DP 2 is the common delivery point for the delivery of aFRR and mFRR services.

		aFRR	mFRR
aFRR/mFRR requested		5 MW	-10 MW
Baselines	DP1	0	/
	DP2	3 MW	0
	DP3	/	0
Power measured by Elia	DP1	-3 MW	/
	DP2	1 MW	

	DP3	/	7 MW
Volumes allocated to the different services	DP1	(0-(-3))= 3 MW	/
	DP2	(3-(1))= 2 MW	(0-1) - (3-(1)) = -3 MW
	DP3	/	(0-7)= -7 MW
Total supplied		5 MW	-10 MW
Control		OK	OK

Case 3:

In this last example, we illustrate a situation where there is an underdelivery during a combo activation aFRR - mFRR; the aFRR and mFRR requested are in the same direction. The DP 2 is the common delivery point for the delivery of aFRR and mFRR services.

		aFRR	**mFRR**
aFRR/mFRR requested		5 MW	10 MW
Baselines aFRR / Baselines mFRR	DP1	0	/
	DP2	-2 MW	0
	DP3	/	0
Power measured by Elia	DP1	-3 MW	/
	DP2	-2 MW	
	DP3	/	-8 MW
Volumes allocated to the different services	DP1	(0-(-3))= 3 MW	/
	DP2	((-2-(-2))= 0 MW	(0-(-2))-(-2-(-2)) = 2 MW
	DP3	/	(0-(-8)= 8 MW
Total supplied		3 MW	10 MW
Control		Underdelivery of 2MW for aFRR	OK

Impact of sequential activations on mFRR baseline

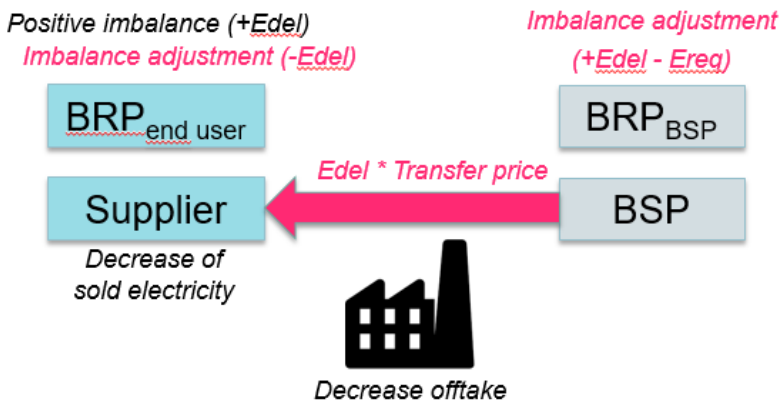
In addition to the interactions in case of the activation of a delivery point for both the aFRR and mFRR services during the same quarter hour, another mechanism could impact the mFRR activation control in case of sequential aFRR and mFRR activations. Specifically, the mFRR baseline (Last QH or High X of Y) could be impacted in case the delivery point would participate in aFRR activations in the moments during which the measured offtake/injection of the delivery point is used to calculate the mFRR baseline. In order to neutralize the effect of a preceding aFRR activation on the computation of the mFRR baseline, Elia proposes a design in which the mFRR baseline is corrected by considering the $DP\ aFRR\ power\ (ts)$ during the relevant quarter hours.

Elia wants to draw attention on the fact that the aFRR – mFRR combo, and in particular this possible future process of mFRR baseline correction, adds significant complexity for the implementation, and this for both Elia and for BSPs that would want to calculate their mFRR baseline in order to ensure that the requested volume is effectively delivered. While a more thorough analysis of the required implementations will be presented as part of the implementation plan in the final study report, Elia has already identified certain complexities related to the correction of the mFRR baselines. It is expected that such implementation could require significant modifications of the common tools developed in collaboration with DSOs (i.e., the Flexhub) in addition to Elia internal tools used for the activation control, considering that these common tools do currently not contain the data on the delivered aFRR volumes that would be required to perform the baseline corrections. Moreover, it must be noted that modifications of these tools are also required for other foreseen evolutions and hence a prioritization of different evolutions is expected to be required. For this exercise, Elia reiterates the importance of receiving information from market parties regarding the concrete interest and corresponding volumes that would actively participate to both the aFRR and mFRR service during the same period.

5.4.3 Transfer of Energy

Up to this point, the aFRR - mFRR combo has been analyzed from the perspective of the activation control. In this section, the possible impact on the processes related to the Transfer of Energy (ToE) between the BSP/BRP_{BSP} and the supplier/$BRP_{grid\ user}$ is analyzed. This to ensure the feasibility of the proposed design for the current situation and to ensure robustness of the solution in case of future evolutions related to the ToE.

The ToE framework is a centralized and regulated compensation framework to “transfer energy” between the BSP and the BRP_{BSP} on the one hand, and the Supplier and the $BRP_{grid\ user}$ on the other hand (in case these would be different parties). As such, the ToE framework ensures a fair compensation for the BSP/Supplier and its BRP in case of the activation of flexibility. Also, the ToE framework ensures that demand-side flexibility can be valorized independently of the choice of Supplier and BRP.



A schematic overview of the ToE mechanism is illustrated in the figure above. The main steps in the Transfer of Energy settlement process are the following:

1. Calculation of the volume of energy effectively delivered: Edel = Baseline – measured offtake/injection
2. Correction of perimeters with the delivered volume
3. Determining the transfer price (performed by the CREG)
4. Data exchange to enable the BSP and the Supplier to perform their settlement

In the context of this study, particularly the first step is relevant. Specifically, in case of ToE, it is important that the total volume of energy delivered can be calculated and subsequently used in the ToE process (note that this takes the assumption that there is a single contractual regime per Delivery Point, as is the situation today).

Current situation with respect to Transfer of Energy

The DPpg that are participating or want to participate to both aFRR and mFRR are participating under a market situation without Transfer of Energy (i.e., under an Opt-out or Pass-through Regime).
This because:

- Transfer of Energy has not yet been implemented for aFRR; and
- A single regime applies per Delivery Point for all the services to which the point participates.

As a result, there is currently no need to calculate the total volume of energy delivered for the Transfer of Energy framework as it does not apply to Delivery Points participating to aFRR. As such, the proposed design for the mFRR activation control (cfr Section 5.4.2) is sufficient to enable a combo activation for DPs not operating under a ToE Regime.

Robustness of the proposed design with the introduction of ToE/ Exchange of Energy blocks in aFRR

As presented during the CCMD workshops, Elia intends to develop an alternative solution to ToE based on local corrections via Exchange of Energy Blocks (EoEB). Both the alternative design with local corrections (EoEB) and the current ToE framework would face the same requirements with respect to combo activations, namely that the total volume delivered per delivery point would need to be calculated.

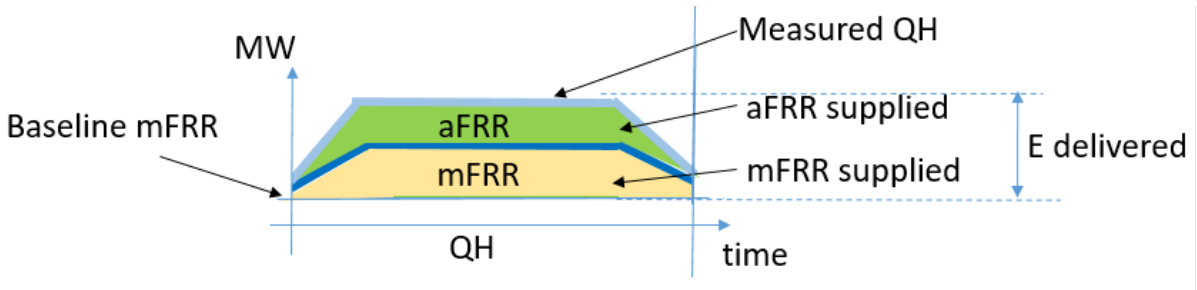
In case of a combo activation aFRR- mFRR, the total volume delivered per Delivery point and per quarter hour (k) can be calculated as follows:

$$DP\ Energy\ Delivered\ total\ (k) = DP_{baseline}(k) - DP_{measured}(k)$$

With the proposed correction factor applied for calculating $DP\ mFRR\ Supplied(k)$ (see section 5.4.2), the total volume delivered per Delivery Point and per quarter hour can also be calculated as the sum of the volumes allocated to mFRR and aFRR in the respective activation controls, as follows:

$$DP\ Energy\ Delivered\ total\ (k) = \ average_{(k)}(DP\ aFRR\ power(ts)) + DP\ mFRR\ Supplied\ (k)$$

This is illustrated in the schematic below:



In conclusion, the proposed design for the mFRR activation control would equally work as of the moment Transfer of Energy or the alternative design with local corrections based on exchange of energy blocks (EoEB) is implemented for the aFRR product. Moreover, to enable this combo, the additional complexity related to ToE or the alternative design seems limited.

5.4.4 Elia's recommendations

A design for the combo activation of aFRR and mFRR on a DPpg has been proposed taking into consideration the single contractual regime for one DPpg (i.e., opt-out or pass-through regime).

Elia considers that enabling this combo might have a positive impact on liquidity in both market segments but requests a confirmation of the concrete interest and corresponding volumes from the market parties.
Additionally, Elia also identified some risks in the complexity of implementation namely with the proposed solution relative to the correction of the mFRR baselines which should be further assessed in the implementation plan.

5.5 mFRR and energy supplied to DA/ID markets with ToE

This combo has been analyzed in 2019 as part of a study on Transfer of Energy in DA and ID markets[4]. More specifically, Elia performed a study in 2019 of which the main focus was on the design of a Transfer of Energy mechanism ("ToE") for the participation to the DA and ID markets and an assessment of the market interest and potential for this market segment.

However, the study additionally performed an analysis on the necessary design adaptations to enable a combined activation of DPpg to the DA/ID market on the one hand and the different balancing products (FCR, aFRR or mFRR) on the other hand. The conclusions from the study of 2019 will be taken as the starting point for the analysis of the combo mFRR and DA/ID markets. However, this analysis will re-assess the validity of the proposed design and the conclusions related to the effective usage and economic viability of the development of this combo.

5.5.1 Proposed design for Combo of mFRR and energy supplied in DA/ID market

In terms of the design of this combo, a proposal has been made in the 2019 study.

This design is based on two steps:

[4] The study can be found on the Elia website.

1. In a first step, the total volume of energy delivered during the quarter hour(s) of the simultaneous activation is calculated. In order to do so, the High X of Y* Baseline (i.e., the baseline applicable in case of DA/ID activations) is used (i.e., this baseline serves as a so-called "**master baseline**").

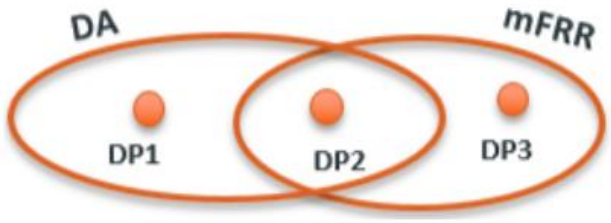
   Reminder: Regarding the process of control and the use of baselines, it should be noted that when a combo activation does take place for 15 minutes products (mFRR, DA/ID), the calculation of the total delivered volume per delivery point has to be done based on one and unique reference baseline therefore one single **master-baseline** is adopted.

2. In a second step, this total volume of energy delivered is allocated to the DA/ID and the mFRR activation based on a priority list. More specifically, the volume is first allocated to DA/ID and the remaining volumes are allocated to mFRR. The volume allocated to mFRR is subsequently used for the mFRR activation control[5].

The design for this mFRR – DA/ID combo is illustrated with an example below

Illustration of Combo activation between supplied of energy to DA/ID and mFRR

Let's assume a FSP has three Delivery Points as in the figure below.



Further assume that the FSP uses DP1 and DP2 for a DA/ID trade, assuming a reduction of offtake of 10 MW in its portfolio corresponding to a DA/ID sell of electricity. This can be represented as $E_{requested\_DA/ID}$ = 10 MW.[6]

In addition, we assume that the FSP uses DP2 and DP3 to supply energy for a requested upward mFRR activation (corresponding to a request to reduce the offtake by 10MW on DP2 and DP3 combined. This corresponds to an $E_{requested\_mFRR}$ = 10 MW.
We further assume that the FSP provides the required notifications to Elia indicating the volumes supplied by each DP for each service.

For the delivery points used by the FSP (as notified to Elia in the FSP notifications), Elia will first calculate the total delivered volume per delivery point:

- For DP1 (DA/ID only), the baseline of the corresponding service is High X of Y*. Using this baseline, a total volume of 3 MW is calculated by Elia.

[5] Note that there is no activation control for DA/ID activations.
[6] Note that, in contrast to mFRR, there is no volume of energy requested by Elia for DA/ID activations as the DA/ID activations are initiated on behalf of the FSP. However, $E_{requested\_DA/ID}$ can be calculated by summing up the declared volumes to be delivered by the Delivery Points used in the DA/ID activation, as notified by the FSP to Elia in the FSP Notification messages. Following a review of the 2019 study, Elia proposes to use the first FSP Notification for this calculation, and to only enable combo activations if the first FSP Notification is provided sufficiently in advance. This in order to limit the possibilities for manipulations of the Notification messages in order to circumvent the mFRR activation control in case of combo activations.

- For DP3 (mFRR only), the baseline of the corresponding service is “Last Qh” or High X of Y. Using the baseline selected by the BSP, a total volume of 4 MW is calculated by Elia.
- For DP2 performing a combo activation, the High X of Y* baseline is used (the master baseline has to be used in case of combo activation). Using this baseline, a total volume of 15 MW is calculated by Elia.

These volumes are then used for the ToE-related processes (i.e., perimeter correction of the involved BRPs and information exchange to inform the BSP and the Supplier on the volume they need to settle).

In a second step, Elia allocates the total volume delivered by each of the delivery points to the different services. The volume of the DPs that are activated for one service only (DP1 and DP3) are first fully allocated to that service. In this illustration, DP1 delivers 3 MW that is fully allocated to the DA/ID service, and DP3 delivers 4 MW that is fully allocated to the mFRR activation.
For the combo DP (DP2), Elia uses an algorithm that is based on a priority order, in which the total volume delivered is first allocated to the DA/ID service until the requested volume for the DA/ID service is delivered, and the remaining volume is allocated to the mFRR service (the algorithm to allocate the volume to the different services is also referred to as the “Tetris-algorithm”, see annex 2).

Applying this approach to this illustration, the result is that the volume of DP2 (15 MW) is first allocated to the DA/ID service.

- The volume allocated to the DA/ID service (Edel_DP2_DA/ID) equals 7 MW (Edel_DP2_DA/ID = E_requested_DA/ID – Edel_DP1_DA/ID = 10MW -3MW = 7MW).
- The remaining volume of DP2 is allocated to the mFRR service (Edel_DP2_mFRR) and equals 8 MW (Edel_DP2_mFRR = Edel_DP2 – Edel_DP2_DA/ID = 15 MW – 7 MW = 8 MW)

The mFRR activation control is then done by summing the volumes allocated to mFRR on all DPs in the energy bid and comparing this result to the requested volume. In this example, the FSP succeeds the mFRR activation control as the total mFRR Supplied equals 12 MW (DP3 delivered 4 MW that is fully allocated to mFRR and 8 MW of DP2 was allocated to the mFRR service), which exceeds the requested volume of 10 MW. The below table summarizes the illustration.

		DA/ID	**mFRR**
$E_{requested}$ for DA/ID and mFRR		10 MW	10 MW
Volumes notified by the FSP	DP1	4 MW	/
	DP2	6 MW	7 MW
	DP3	/	3 MW
1. Total volumes calculated by Elia	DP1	3 MW	/
	DP2	15 MW	
	DP3	/	4 MW
2. Volumes allocated to the different services	DP1	3 MW	/

	DP2	7 MW	8 MW
	DP3	/	4 MW
Total supplied		10 MW	12 MW

Following a re-assessment of the design, Elia still considers that the design proposed in the 2019 study, and explained in above paragraph, is the best solution for this combo activation.

5.5.2 Prioritization of the development of this combo

Following the study in 2019, Elia recommended the implementation of ToE for DA/ID markets. On the other hand, Elia did not recommend to implement the combo functionality between DA/ID and mFRR at that time considering that:

- The combo adds significant complexity, both for the mFRR activation control and for the Transfer of Energy calculations.
- The combo was considered to bring theoretical benefits, but the effective usage and economic viability of the combo was highly uncertain:
    - The participation to DA/ID markets in general was uncertain.
    - The experience with non-contracted mFRR provided indications of a limited interest to offer volumes in absence of a capacity payment. Specifically, Elia experienced that it did receive almost no non-contracted mFRR energy bids related to DP_{PG} and that the volumes that were offered in the capacity auctions that were not (fully) awarded were not offered as non-contracted mFRR energy bids. By extension one can doubt about the market's interest for combo of mFRR with the supply of energy to DA/ID for which no capacity remuneration applies either.

Following these conclusions, ToE for DA/ID market has been implemented and participation to the DA/ID markets via the ToE mechanism has been possible since July 2021. However, the design to enable a combo between DA/ID and mFRR, as presented above, has not been implemented. Correspondingly, it was not allowed to use a DPpg in a DA/ID activation for a certain quarter hour in case this DPpg was also included in an mFRR energy bid for that quarter hour. Recent experiences have confirmed Elia's doubts on the effective usage and economic viability of this combo. Specifically, more than one year after the go-live of ToE DA/ID, and despite very high electricity prices, no DPs have yet been registered for participation to the DA/ID segment. Similarly, the experience with mFRR, where Elia has not received any non-contracted mFRR energy bid from DPpg in the last years, provides further indications of an absence of participation of DPpg in products without a capacity payment.

Based on the above observations, Elia maintains its recommendation not to prioritize the implementation of this combo.

5.6 FCR or aFRR and energy supplied to DA/ID market with ToE

5.6.1 Combo activation between aFRR and DA/ID

For the combo aFRR and DA/ID with ToE, it is important to note that ToE is not yet implemented for the aFRR market segment. Considering that a single regime (market situation with or without Transfer of Energy) applies to a single delivery point, delivery points that participate to aFRR and DA/ID markets would currently participate under a market situation without Transfer of Energy (opt-out regime or a pass-through regime).

As long as there is no ToE (or alternative mechanism) implemented for aFRR, it only needs to be guaranteed that the aFRR activation control can be correctly performed in case of a combo activation[7]. Similar to the combo between aFRR and mFRR, Elia considers that there is no problem with the aFRR activation control because the FSP can consider the DA/ID activation when submitting its aFRR baseline.

From the moment ToE or an alternative mechanism (e.g. EoEB) is implemented for the aFRR market segment, Elia considers that a design similar to the one proposed for the aFRR - mFRR combo could be envisioned.
However, given that there is no ToE or alternative mechanism for the aFRR market segment in place for the moment, and that Elia has observed no participation of DPs with ToE for the DA/ID market segment, Elia proposes not to prioritize the development of this combo.

5.6.2 Combo activation between FCR and DA/ID

A combo activation between FCR and DA/ID (via ToE)[8] is allowed, because a combo activation is not considered to affect the FCR activation control. In addition, the combo is also not considered to significantly impact the calculations of the total volume delivered as used for the ToE processes, as FCR is not considered to be an energy product.
As such, the combo is allowed and Elia considers that there are no needs for changes in the current design.

5.7 Conclusions

The table below presents the conclusions on the analysis of the combinability of the balancing products and balancing products with the supply of energy in DA/ID markets and Elia's recommendations for each combo activation.

Combo	Market Interest from survey	Elia's recommendations
FCR and aFRR	high	A design to have a robust framework for this combo has been proposed. However, Elia identified significant complexity for the implementation of the controls. Moreover, new design of controls in case of combo would be needed for the possible future evolutions in FCR.
FCR and mFRR	Medium	A design was analyzed but no concrete improvements is proposed at this point in time.
aFRR and mFRR	High	A design has been proposed to enable this combo Elia considers that enabling this combo might have a positive impact on liquidity in both market segments but would like a

[7] Note that there is no activation control for DA/ID activations.
[8] Note that, conform article 19bis of the Electricity law, ToE is not applicable to the FCR market segment and would hence only apply to the DA/ID activations.

		clear confirmation of the concrete interest and corresponding volumes from the market parties, in order to set the right priorities when proposing an implementation plan.
FCR and DA/ID with ToE	Low	This combo is allowed and Elia does not propose changes to the current design.
aFRR and DA/ID with ToE	Low	Elia would not propose changes in the current design at this point as ToE is not implemented yet for aFRR market segment.
mFRR and DA/ID with ToE	Medium	A design has been proposed to enable this combo but on one hand the combo adds significant complexity, both for the mFRR activation control and for the Transfer of Energy calculations and on the other hand the potential increase of liquidity is uncertain due to no participation of FSP in DA/ID market. Elia proposes not to proceed with the implementation of the design at this point.

6. Comparison of SOGL concepts of RPU/RPG and Belgian concepts (DPsu & DPpg)

6.1 Introduction

In addition to the study regarding the combos in the previous chapters of this incentive, Elia has also to compare the Belgian concepts of "DP_{su}" and "DP_{pg}" (defined in the T&C BSP) with the European concepts of "reserve providing unit" and "reserve providing group" (defined in the SOGL).

First, the definitions of Reserve Providing Unit (RPU) and Reserve Providing Group (RPG) in the European legislation and the Belgian concepts are explained. Secondly, the concepts will be compared with regards to pre-qualification, activation and monitoring in Belgium.

6.2 Definitions

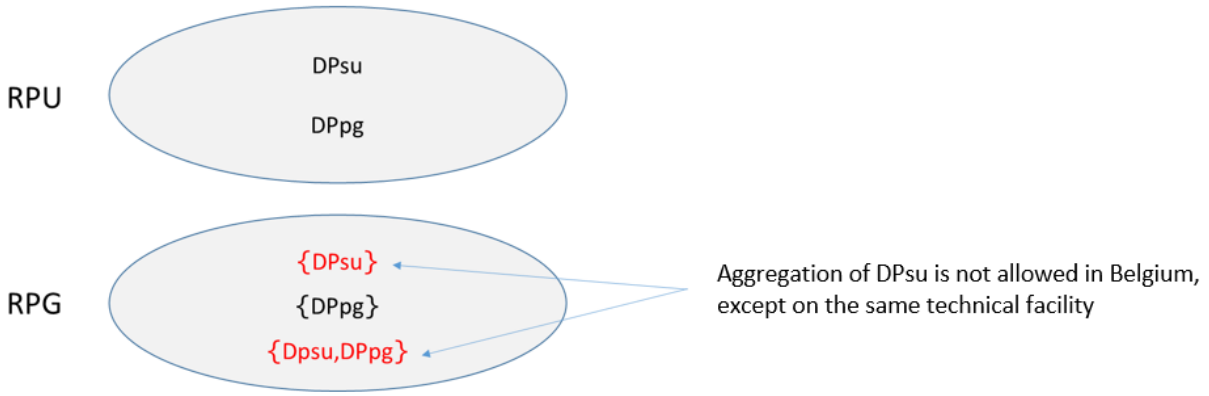
In Belgium, the concept of Delivery Point is used and can be divided into 3 categories:

- a Delivery Point “single unit” or DP_{su}, is a Delivery Point for which Daily Schedules are provided and which has to be offered as a single unit for the provision of a balancing service.
- a Delivery Point “providing group” or DP_{pg} ,is a Delivery Point for which Daily Schedules are not provided and which can be part of a pool to provide a balancing service. If a DP_{pg} is capable of providing a balancing service on its own, it may or may not be pooled.

In a European context, the SOGL (art 3.10 and 3.11) defines the concepts of Reserve Providing Unit (RPU) and Reserve Providing Group (RPG) respectively as a single or an aggregation of power generating modules and/or demand units fulfilling the requirements to the relevant balancing service. The difference between RPU and RPG in the regulation lays in the way of connecting to the grid, via a single connection point (RPU) or multiple connection points (RPG). For the sake of clarity, a RPU can be part of an RPG.

Those RPU and RPG can be aggregated up to form a (larger) RPG, but cannot necessarily be disaggregated. Per definition, an RPU cannot be disaggregated into sub-groups, such as a Technical Unit as these sub-groups would still be behind the same connection point and would therefore collectively constitute a RPU. An RPG can in some cases be disaggregated into RPUs but can also contain Technical Units that have to be grouped with entities located behind other connection points to provide balancing services.

The following mapping provides an overview of the correspondence between the Belgian and European concepts.



In the SOGL, all obligations regarding the provisions of balancing services are put on the level of RPU and RPG in the minimal technical requirements and prequalification process of FCR (SOGL Art. 154-156), of FRR (SOGL Art. 158-159) and, of requirement for RR (SOGL Art. 161-162). The minimal technical requirements define on a high-level the product characteristics in terms of activation as well as its monitoring. Therefore, to demonstrate that the Belgian model is compliant with the SOGL, the prequalification, activation and monitoring of the activation will be analyzed.

SOGL
• *Art. 3.10: 'reserve providing unit' means a single or an aggregation of power generating modules and/or demand units connected to a common connection point fulfilling the requirements to provide FCR, FRR or RR;* • *Art. 3.11: 'reserve providing group' means an aggregation of power generating modules, demand units and/or reserve providing units connected to more than one connection point fulfilling the requirements to provide FCR, FRR or RR."*
T&C BSP FCR
• *Delivery Point: A point on an electricity grid or within the electrical facilities of a Grid User, where a Balancing Service or strategic reserve service is delivered. This point is associated with one or several metering(s) and/or measures, according to dispositions of the BSP Contract, that enable(s) ELIA to control and assess the delivery of the balancing Service;* • *DPsu: Delivery Point for which ELIA receives Daily Schedules (in MW), in accordance with the CIPU Contract and that has to be offered as a single unit in balancing Energy Bid;* • *DPpg: Delivery Point for which ELIA does not receive Daily Schedules and that can be pooled in Providing Group(s) when offered in balancing Energy Bid(s);* • *Virtual Delivery Point: A Delivery Point, that is an aggregation of Technical Units, which has a $DP_{FCR,cb}$ inferior to 1,5MW;*

6.3 Prequalification

SOGL Art. 3. (146) defines 'prequalification' as "*the process to verify the compliance of a reserve providing unit or a reserve providing group with the requirements set by the TSO*".

The prequalification processes, as described in the T&Cs of all balancing products, aims to determine whether a Providing Group[9] is compliant with the product requirements as defined by Elia, in order to determine a maximum volume of

[9] Providing group: Any subset of Delivery Points (DPsu & DPpg) part of the Pool of the BSP.

balancing capacity, which can be offered in capacity auctions. The Belgian model therefore does not compel BSPs to offer balancing capacities with the same combination of Delivery Points used during prequalification.

As such, the prequalification processes are clearly in line with the definition of the SOGL. A Providing Group may per definition be a single unit, capable of providing the balancing service on its own, like a Reserve Providing Unit. A Providing Group may as well be a number of Technical Units, which together are able to provide the balancing service, similarly to a Reserve Providing Group. For example:

- For Delivery Points DP_{su}, the prequalification test is performed at the level of the Technical Unit for each operating mode[10] of the Technical Unit. In case of multiple operating modes, ELIA will consider the maximal result of the different prequalification tests to determine the maximal power for each capacity product.
- For Delivery Points DP_{pg}, the prequalification test may be performed on a Providing Group of one or several Delivery Points, e.g.:
    - One DP_{pg} could correspond to a standalone grid scale battery
    - Several DP_{pg} could correspond to a standalone grid scale battery, with supporting assets for the performance of the Energy Management Strategy.

SOGL foresees that new Technical Units can be added to the portfolio of a BSP via the prequalification process. This possibility obviously applies in Belgium. The Belgian concept of Delivery Point additionally offers few other flexibilities for the BSP to manage its portfolio, which decrease entry barriers:

- Possibility to remove a pre-qualified Delivery Point without having to pre-qualify again the rest of the Providing Group. The prequalified volume is however adjusted accordingly.
    - A very strict interpretation of SOGL could suggest that the whole RPG would be invalid and therefore require a new prequalification.
- Possibility to add a Delivery Point to a portfolio without having to prequalify it, in order to support already prequalified assets in providing the balancing service in a reliable manner. In such a case, no increase of prequalified volume is foreseen.
    - SOGL does not explicitly foresee this possibility.

Thus, the Belgian approach allows an efficient portfolio management by means of pooling.

6.4 Activation and Monitoring

The SOGL seems to suggest a prequalification with RPU and RPG which should remain constant in terms of combination of Technical Units. The monitoring of those RPU and RPG is then theoretically facilitated since they are fixed. In the Belgian T&C BSP as previously explained, the prequalification is a mean to ensure that the BSP has the necessary flexibility in its portfolio to provide a certain volume of balancing services. In Belgium, the fact that a specific subset of Technical Units is capable of delivering the service is not controlled in the prequalification process, but the actual provision of the balancing service is controlled through several mechanisms in accordance with the Belgian T&Cs BSP. In Elia's view, prequalifying separately each possible RPG (i.e. each possible combination of technical units that would deliver the service) would be a very heavy process for both the BSP and Elia, without actually ensuring that the prequalified combination will always adequately deliver the service in the future.

[10] For instance, in case a CCGT may participate as a CCGT or as an OCGT, two prequalification tests should be performed: one for the OCGT operating mode and one for the CCGT operating mode.

6.5 Measurement devices for activation and monitoring

While not clearly defined in SOGL, the verification of the proper provision of the balancing services is intuitively based on the measurement on the connection point to the grid, while in the case of a Delivery Point the verification may be based on measurement at the grid level as well as within the facilities of a grid user. The BSP has the flexibility in Belgium to select the location of measurement as long as the proper verification of the provision of the service is possible and that the activation has an impact on the power or energy measured at the connection point. This allows the BSP to offer assets which would otherwise not be able to provide balancing services.

In SOGL, the obligations on the activation of the balancing services are defined on a RPU and RPG level similarly to the prequalification (in 154 (6-7) for FCR and in Art. 158(1)(d, f, g, i) for FRR). However, the monitoring of activation may require additional information at a level below the RPU and RPG to ensure a clear verification of activation, as specified in Art.154 (8-11) for FCR and in Art. 158(1)(e) for FRR. In Belgium, by design the Delivery Point and related requirements encompasses all obligations and is used to monitor the activation.

SOGL

- *Art. 154 (6): Each FCR providing unit and each FCR providing group shall comply with the properties required for FCR in the Table of Annex V and with any additional properties or requirements specified in accordance with paragraphs 2 and 3 and activate the agreed FCR by means of a proportional governor reacting to frequency deviations or alternatively based on a monotonic piecewise linear power-frequency characteristic in case of relay activated FCR. They shall be capable of activating FCR within the frequency ranges specified in Article 13(1) of Regulation (EU) 2016/631.*

- *Art. 154 (7): Each TSO of the CE synchronous area shall ensure that the combined reaction of FCR of a LFC area comply with the following requirements:*
  (a) the activation of FCR shall not be artificially delayed and begin as soon as possible after a frequency deviation;
  (b) in case of a frequency deviation equal to or larger than 200 mHz, at least 50 % of the full FCR capacity shall be delivered at the latest after 15 seconds;
  (c) in case of a frequency deviation equal to or larger than 200 mHz, 100 % of the full FCR capacity shall be delivered at the latest after 30 seconds;
  (d) in case of a frequency deviation equal to or larger than 200 mHz, the activation of the full FCR capacity shall rise at least linearly from 15 to 30 seconds; and
  (e) in case of a frequency deviation smaller than 200 mHz the related activated FCR capacity shall be at least proportional with the same time behaviour referred to in points (a) to (d).

- *Art. 154 (8): Each reserve connecting TSO shall monitor its contribution to the FCP and its FCR activation with respect to its FCR obligation, including FCR providing units and FCR providing groups. Each FCR provider shall make available to the reserve connecting TSO, for each of its FCR providing units and FCR providing groups, at least the following information:*
  (a) time-stamped status indicating if FCR is on or off;
  (b) time-stamped active power data needed to verify FCR activation, including time-stamped instantaneous active power;

(c) droop of the governor for type C and type D power generating modules as defined in Article 5 of Regulation (EU) 2016/631 acting as FCR providing units, or its equivalent parameter for FCR providing groups consisting of type A and/or type B power generating modules as defined in Article 5 of Regulation (EU) 2016/631, and/or demand units with demand response active power control as defined in Article 28 of Regulation (EU) 2016/1388.

- *Art 154 (9): Each FCR provider shall have the right to aggregate the respective data for more than one FCR providing unit if the maximum power of the aggregated units is below 1,5 MW and a clear verification of activation of FCR is possible.*
- *Art 154 (10): At the request of the reserve connecting TSO, the FCR provider shall make the information listed in paragraph 9 available in real-time, with a time resolution of at least 10 seconds.*
- *Art 154 (11): At the request of the reserve connecting TSO and where necessary for the verification of the activation of FCR, a FCR provider shall make available the data listed in paragraph 9 concerning technical installations that are part of the same FCR providing unit.*

- *Art 158 (1): The FRR minimum technical requirements shall be the following:*

  (d) a FRR providing unit or FRR providing group for automatic FRR shall have an automatic FRR activation delay not exceeding 30 seconds;

  (e) a FRR provider shall ensure that the FRR activation of the FRR providing units within a reserve providing group can be monitored. For that purpose, the FRR provider shall be capable of supplying to the reserve connecting TSO and the reserve instructing TSO real-time measurements of the connection point or another point of interaction agreed with the reserve connecting TSO concerning:

  (i) time-stamped scheduled active power output;

  (ii) time-stamped instantaneous active power for:

  — each FRR providing unit,

  — each FRR providing group, and

  — each power generating module or demand unit of a FRR providing group with a maximum active power output larger than or equal to 1,5 MW;

  (f) a FRR providing unit or FRR providing group for automatic FRR shall be capable of activating its complete automatic reserve capacity on FRR within the automatic FRR full activation time;

  (g) a FRR providing unit or FRR providing group for manual FRR shall be capable of activating its complete manual reserve capacity on FRR within the manual FRR full activation time;

  (i) a FRR providing unit or FRR providing group shall fulfil the ramping rate requirements of the LFC block.

Additionally, the granularity on a Delivery Point level facilitates the combination between balancing services as well as with other services. If the prequalification of “frozen” RPU and RPG was required, the combination of services would only be possible if the RPU and RPG in the two (or more) services are exactly the same (i.e. have a complete overlap in terms of combination of Technical Units).

6.6 Level of monitoring

As a reminder, the Belgian model allows that a Delivery Point within an energy bid is the reference for the delivery of balancing services, regardless of its prequalification as part of an RPU or RPG. The obligations defined in the European

legislation at the level of RPU and RPG are nonetheless respected as they are translated to obligations on groups of Delivery Points.
Each balancing service has a specific way to notify which Delivery Points need to be considered for the verification of the service provision:

- FCR: all Delivery Points in the energy bids
- aFRR: all Delivery Points in the energy bids, in combination with the participation signal
- mFRR: all Delivery Points in the energy bids, which are additional confirmed through a real-time communication at the time of activation.

There is however one limitation compared to the SOGL which currently subsists which is that DP_{su} may not be combined together with other DPs. This limitation should disappear with the later phase of the iCAROS project. The Belgian concept encompasses by design the requirements for FCR (SOGL Art.154 (8-11)) and FRR (SOGL Art. 158(1)(e)) of monitoring and control, while facilitating the access to medium and low voltage and behind the meter participation.

While the SOGL defines implicitly RPU and RPG as a static (combination of) technical unit(s), the Belgian model redefines the concept of RPG in a dynamic way, which brings more flexibility to the BSPs.
For example, in Belgium, a standalone battery which has initially been prequalified alone as a DP_{pg} may be combined with other assets to provide a balancing service. The BSP needs to provide the list of Delivery Points in the energy bid. With a model using static RPU and RPG on the contrary, the battery would be initially prequalified as a RPU and would need one or several prequalification(s) as RPG to be offered with other assets.

6.7 Availability test & activation control

To ensure a proper monitoring of the provision of balancing services, Elia has put in place, on one hand, the availability tests to ensure the BSP is capable to deliver the full capacity of the balancing service and on the other hand, activation controls to ensure that the capacity is delivered following the specificities of the balancing service. The only required information is which Delivery Points need to be considered for activation control.
Should the BSP use in its bids combinations of DPs that are not able to adequately deliver the service (and that were possibly not used in the prequalification process), this will be detected by Elia through these controls and penalized accordingly.

6.7.1 Availability test

The availability tests ensure that the BSP is capable to fulfil the capacity obligation from the capacity auctions, i.e. the ability to deliver partly or fully the capacity of the balancing services with the combination of Delivery Points. Elia will typically request that the BSP demonstrates that it has the capability to provide the balancing service at the level of power contracted by Elia. In case of failure of such tests, a series of penalties ensue.

6.7.2 Activation control

Elia effectively controls the activation of the balancing services ex-post to ensure that the characteristics of the balancing services are well respected with the combination of Delivery Points declared in the bid. The characteristics are typically the requested power or energy, the Full Activation Time, etc.

6.8 Conclusion

As demonstrated, while the Belgian concepts of DP_{su} and DP_{pg} are not equivalent to RPU and RPG in terms of terminology, but they are compliant with the obligations as set forth in the SOGL.

The concept of Delivery Point offers additional flexibilities to BSP in terms of prequalification but also in managing their portfolio compared to a model where RPU and RPG are defined in a static way. The currently implemented model in all balancing services removes entry barriers for market actors.

In conclusion, Elia does not propose to include the European terminology of RPU and RPG in the Belgian design as it will render the Terms & Conditions of balancing services, even more complex while the change does not bring added value for the market parties. Moreover, the Belgian concepts of DPsu and DPpg are used in other services than balancing e.g. scheduling and outage planning. The change would indeed have a significant impact on all Terms & Conditions, which are built on the concept of Delivery Point. Consequently, the current implementations are aligned with the concepts of DPsu and DPpg and significant amendments of these concepts would prove to be a sizeable effort of Elia but also of market participants in terms of conceptual discussions and implementation.

Annexes

ANNEX 1: STAKEHOLDER QUESTIONNAIRE

Combinability of balancing products (Combo) on delivery points DP_{pg} – stakeholder Questionnaire

Introduction

In the current market design of balancing products, Elia defines strict rules for the allowed combinability of balancing products (known as “combo”) on the same delivery point DPpg. Currently, Elia distinguishes two ways of combinability of products, namely “contractual combo” and “ combo activation” as explained below

- **Contractual combination (“contractual combo”)**: the same Delivery Point DPpg can be part of the portfolio of the same BSP for different balancing products, however the DPpg cannot be offered to perform a simultaneous delivery cross products for the same quarter hour.
- **Combination with simultaneous activation (“combo activation”)**: the DPpg is offered for the same quarter hour for multiple products, allowing a simultaneous activation on one Delivery Point on the same moment.

The contractual combos are possible for all products, including the Transfer of Energy in DA/ID markets (FSP Contract DA/ID). On the other hand, combo activations are only allowed, under the conditions described in BSP contract, for the combo’s FCR - aFRR and FCR - mFRR.

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Elia’s study on combinability of products

The study aims to:

1. To assess the opportunity and technical feasibility of offering combo on DPpg, based on existing baseline methodologies.
2. To assess the potential increase in liquidity that the combo of products could bring in the market.
3. To develop an implementation plan for the proposed changes.

Objectives of the questionnaire

The goal of this questionnaire is to receive feedback from market parties regarding the combinability of balancing products (FCR/aFRR/mFRR) and the transfer of energy in DA/ID market (FSP contract DA/ID) on delivery point DPpg, as input for the transversal study within the context of Elia’s incentive for 2022.
What is of interest for this study is, among other things, to identify which combo of products would open opportunities and create additional volumes with the existing or new assets in the balancing market.
The feedback of this survey will also serve as input for discussions in a workshop.

Please note that your responses to this questionnaire will not be published as part of the study and will be treated as confidential if that is your preference (refer to question 0.4)

Questionnaire

Part I: Contact details and confidentiality

Question	Answer
0.1 Organisation	
0.2 Contact person, position	
0.3 Contact details	
0.4 Would you like your answers to be treated as confidential?	☐ Yes ☐ No

Part II: Your experience with the combinability of products

Please fill in the boxes for combo products that are applicable to your situation and please provide examples where possible. Recommendations if any should be put in the answer's box.

Combo activation	Questions	Answer
1) FCR with aFRR or mFRR (This combo is authorized under certain conditions specified by Elia)		
	1.1 If you use this combo today, do you identify elements to improve?	
2) aFRR with mFRR		
	2.1 What main benefits do you expect from opening the combinability of aFRR and mFRR on DPpg?	
	2.2 How often would this combo be used (daily/weekly/monthly/quarterly)?	
	2.3 How do you intend to offer volume in both markets?	
	2.4 Which type of assets (injection or offtake) would participate in such combo?	
3) FCR/aFRR/mFRR with ToE in DA/ID markets		
	3.1 Which combo would be relevant in your business with your current assets in the market?	
	3.2 Do you have an example of business case of combo of products?	
	3.3 What main benefits do you expect from opening the combinability of FCR/aFRR/mFRR and ToE in DA/ID markets on DPpg?	
	3.4 How often would this combo be used (daily/weekly/monthly/quarterly)?	
	3.5 How do you intend to offer volume in both markets?	
	3.6 Which type of assets (injection or offtake) would participate in such combo?	

4) Use of contractual combos with ToE in DA/ID markets		
	4.1 Do you have in your portfolio today any flexibility, that you intend to use in the DA/ID markets within the existing framework (contractual combo)?	
5) Experience of combos in foreign markets		
	5.1 Do you use combinability of products in foreign markets where it is already possible? if yes, which kind of combo ?	

ANNEX 2: RECAP TETRIS-APPROACH

Source: **Transfer of Energy in DA and ID markets**

The Tetris-approach allows to split the delivered volume of a Combo Delivery Point that was activated simultaneously for a given period for two products and attribute this delivered volume separately to the services in which it participated. An adequate calculation to split the delivered volume is key in order to correctly:

- Perform the activation and availability controls [11]for those products procured or activated by Elia;
- Perform the perimeter corrections of the BRPsource(s) and BRPbsp;
- Publish the aggregated (upwards and downwards) delivered volumes on a quarter-hourly basis and per metering direction (injection or offtake). Those publications are key to allow the financial compensation between FSP and Supplier(s) for a market situation with ToE.

The **basic principles** for the calculation of these delivered volumes of flexibility for Combo activations are the following:

- The delivered volume of flexibility is currently allocated to the different products according to a fixed and predetermined order. First the delivered volume per Delivery Point is allocated to the non-reserved mFRR (free bids), then to reserved mFRR Standard and finally to reserved mFRR Flex.
- For each of the bids (products) the delivered volume is calculated in accordance with the following **two steps:**
    1. In a **first step**, the delivered volumes of the "Pure Delivery Points[12]" are allocated to the relevant bid;
    2. In a **second step**, if the sum of the delivered volumes of Pure Delivery Points is smaller than the requested volume, the delivered volumes of Combo Delivery Points are addressed to fill in the remaining missing volume of each bid.

Both steps are applied on each bid based on the predetermined order as explained in previous bullet-point. This approach allows to allocate volumes accurately per product while respecting the notification of the FSP; Pure Delivery Points that were only notified in one single product will not affect the other product and Combo Delivery Points are allocated based on a pre-determined priority order.

This approach was:

- Consulted between April 2018 and July 2018 via the Working Group Balancing (link **R3 2018 design note**);
- Publicly consulted between June 2018 and July 2018 on the ToE-rules (**link ToE rules**).

[11] Elia performs an availability control for those product which are contracted and receive a reservation fee

[12] We refer to 'Pure Delivery Points' for those Delivery Points that did not perform a simultaneous activation and were only involved in delivering one service (ex. aFRR, mFRR,…) during the ISP in question.

ANNEX 3: GLOSSARY

Balancing Services	As defined in article 2(3) of the EBGL;
Baseline	Value (in MW) representing an estimation of the average power on a quarter-hourly basis of the power that would have been measured on the considered Delivery Point without an activation;
BRP_{BSP}	The Balance Responsible Party, appointed by the BSP, to take in its balancing perimeter the responsibility for the energy volumes requested by ELIA to the BSP for each quarter-hour of a mFRR Service activation. In case Transfer of Energy applies, the supplied energy is allocated to its balancing perimeter in accordance with the ToE Rules;
BRP_{source}	The Balance Responsible Party of the Access Point of the Grid User;
Delivery Point or „DP“	A point on an electricity grid or within the electrical facilities of a Grid User, where a Balancing Service is delivered. This point is associated with one or several metering(s) and/or measures, according to dispositions of the BSP Contract, that enable(s) ELIA to control and assess the delivery of the Balancing Service;
DP_{aFRR}	Binary value indicating whether a Delivery Point is participating to the provision of the aFRR Requested. The value is set to 1 if the Delivery Point participates to the provision of the aFRR Requested and 0 otherwise
Delivery Point DP_{SU} or “DP_{SU}”	Delivery Point for which ELIA receives Daily Schedules (in MW), in accordance with the CIPU Contract and that has to be offered as a single unit in mFRR Energy Bid;
Delivery Point DP_{PG} or “DP_{PG}”	Delivery Point for which ELIA does not receive Daily Schedules and that can be pooled in Providing Group(s) and that can be pooled in Providing Group(s) when offered in balancing services
$DP_{mFRR,max,up}$	The maximum mFRR Power (in MW) that can be supplied by a Delivery Point upwards. This value is positive;
EoEB	Exchange of Energy Blocks
Flexibility Service Provider Or FSP	As defined in article 2, 64° of the Electricity Act; the FSP may offer balancing services as BSP, strategic reserve services as Strategic Reserve Provider (SRP) or the DA/ID Flexibility Service as FSPDA/ID;
Opt Out Regime	As defined in the ToE Rules. In case all concerned parties are the same entity, this is considered as an implicit Opt Out;
Opt Out Arrangement	Arrangement, according to which the BSP, the BRP_{BSP}, the $BRP(s)_{source}$ and Supplier(s) of a Delivery Point jointly agree to enter in an Opt-Out Regime;
Pass-Through Regime	As defined in ToE Rules;
Power Measured or “Pmeasured”	The net active power, i.e. the difference between gross offtake and gross injection, measured at a Delivery Point. Net offtake from the Elia Grid is considered as a positive value, net injection into the Elia Grid is considered as a negative value;
Providing Group	Any subset of Delivery Points part of the Pool of the BSP;
Technical Unit	A device or aggregation of devices connected directly or indirectly to the synchronous electrical network that produces and/or consumes electricity;
Technical Facility	A complete set of Technical Unit(s) that are operationally linked, and that, combined together in one or several Operating Modes, can consume or generate electricity on its own.

Time Step or „ts“	A period of 4 seconds corresponding to the granularity of data exchange
Validity Period	As defined in article 2(33) of the EBGL;