PUBLIC CONSULTATION

Technology-neutral framework for the use of Units that cannot be activated following the FRR processes

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Content

Executive summary

In line with European regulation, specific procedures are put in place for taking exceptional balancing measures to manage exceptional balancing situations in which **the available FRR means might not be sufficient to cover the operational risks of the grid**. **As part of these measures, Elia can activate units that face technical limitations** preventing their participation to the balancing markets ("slow units"). In this regard, **Elia currently relies on the flexibility from slow-starting DP_{SU} (typically CCGTs)** that is made available via the framework of the T&C Scheduling Agent.

In this context, **this study:**

- **analyzes the potential benefits of developing a framework to enable slow units of all technologies/types** (i.e., DP_{PG} on top of the currently available flexibility from DP_{SU}) to participate to **the exceptional balancing measures; and**
- **proposes a design of the contractual and operational framework for enabling the participation of all technologies.**

Potential benefits

Based on an evaluation of the techno-economic potential of DP_{PG} to contribute to the exceptional balancing measures, and an assessment of the potential benefits that could be achieved by developing a framework to open up the exceptional balancing measures to all technologies, the following conclusions are made:

- The **potential for reducing the costs of the exceptional balancing measures by developing a framework to enable the participation of all technologies is estimated to be very limited**. This follows in first instance from the fact that **activations of the exceptional balancing measures are currently highly exceptional** and are expected to remain highly exceptional in the coming years. Second, activations of DP_{PG} need to be relatively inexpensive in order to be more cost-efficient than starting up a CCGT, i.e., 10-125 €/MWh depending on the duration and the purpose of the actvation). As these activation costs are (significantly) lower than the vast majority of upward mFRR energy bid prices from DP_{PG} observed today, **Elia estimates the potential volumes that could be made available by DP_{PG} at a lower cost than the start-up of a CCGT to be limited**.
- The **potential benefit of further increasing system security by developing a framework to open the exceptional balancing measures to all technologies is assessed to be limited in the coming years**. This conclusion mainly results from the fact that **Elia does not see an immediate need to call additional volumes as part of the exceptional balancing measures** in order to be able to ensure system security. In addition, the **additional volumes that could be attracted by opening up the exceptional balancing measures are highly uncertain**, as the limited experiences with other services that target or have targeted flexibility from slow units of the type DP_{PG} (i.e., participation of explicit flexibility to the DA and ID markets and the Winter product) did not provide evidence of significant volumes to be available. In this regard, **Elia invites market parties to provide concrete indications of volumes flexibility that could be made available by**

slow units of the type DP_{PG} as well as the **constraints faced by these assets that prevent a direct participation to mFRR**.

Taking into consideration that i) the potential benefits for implementing a technology-neutral framework in the coming years are expected to be low, ii) the potential additional volumes that could be attracted are highly uncertain, and iii) the implementation of a technology neutral framework requires resources from both Elia and the market parties that cannot be spent on other projects, **Elia considers that the development of a technology-neutral framework to enable the participation of all technologies to the exceptional balancing measures does currently not have a high priority**. For this reason, **Elia does not recommend implementation at this point.**

However, the relevance of extending the current framework for exceptional balancing measures might increase in the future (e.g., with the further increase of offshore wind generation) and needs to be re-evaluated. In this regard, **Elia specifically invites stakeholders to share their views regarding the robustness of the conclusions of the current study in the medium term future in light of upcoming changes in the Belgian electricity system and markets**.

Contractual and operational framework

Despite the recommendation not to target implementation at this point**, the study proposes an operational and contractual framework for opening up the exceptional balancing measures to all technologies**. This proposal intends to serve as a basis **for an eventual implementation at a later moment**. The **proposed design involves maintaining the existing contractual framework based on the T&C Scheduling Agent for DP_{SU}, and establishing a new contractual framework for enabling slow units of the type DP_{PG} to participate to the exceptional balancing measures**. The proposed bid properties for the flexibility offered by slow units of the type DP_{PG} in the context of the new contractual framework aim to enable FSPs to reflect the specific constraints faced (such as a full activation time and the maximum activation duration). The introduction of this new contractual framework would only require minor changes to the current procedures for the exceptional balancing measures, as described in the LFCBOA.

Terminology

Access Point	As defined in Article 2 §1 (29) of the Federal Grid Code for an access to the transmission grid of ELIA. For an access to the ELIA Grid other than transmission grid, or to a Public Distribution Grid, or to a CDS: a point, defined by physical location and voltage level, at which access to the ELIA Grid other than transmission grid, or to a Public Distribution Grid, or to a CDS is granted, with a goal to injecting or taking off power, from an electricity generation unit, a consumption facility, a non-synchronous storage facility, connected to this grid.
Automatic Frequency Restoration Reserves or **aFRR**	As defined in Article 3(99) of the SOGL.
Balancing Perimeter	All injection and offtake allocated to a BRP as defined in Articles 15 and 20 of the BRP Contract.
Balancing Services	As defined in Article 2(3) of the EBGL.
Balancing Service Provider or **BSP**	As defined in Article 2(6) of the EBGL.
Balance Responsible Party or **BRP**	As defined in the EBGL.
BRP_{FSP}	The Balance Responsible Party appointed by a Flexibility Service Provider to take the balancing responsibility for an activation by this Flexibility Service Provider for the duration of the activation.
BRP_{Source}	The Balance Responsible Party of the Access Point of the Grid User.
CDS	Closed Distribution System, as defined in Article 2 §1 3° of the Federal Grid Code.
CDS Operator or **CDSO**	A natural or legal person appointed by the relevant authority as the operator of the CDS.
Contract with Valorization of the Deviation or **Pass-Through Contract**	Contract by which the Grid User nominates his expected programme before real time (mostly day-ahead) and by which the difference between his nomination and his actual programme is invoiced/reimbursed to him by his Supplier at an agreed rate that is based solely on the tariff for imbalances.
DA	day-ahead.
Delivery Point	A point on an electricity grid or within the electrical facilities of a Grid User where a volume of flexibility is delivered.

Delivery Point DP_{PG} or **DP_{PG}**	Delivery Point for which ELIA does not receive daily schedules.
Delivery Point DP_{SU} or **DP_{SU}**	Delivery Point for which ELIA receives daily schedules (in MW), in accordance with the T&C Scheduling Agent.
Elia Grid	The electricity grid to which ELIA holds the property right or at least the right of using and operating it, and for which ELIA has been appointed as system operator.
EBGL	Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guide-line on electricity balancing.
Federal Grid Code	The Royal Decree of 22 April 2019, as amended where applicable, establishing a grid code for operating and accessing the electricity transmission system.
FRCE	Frequency restoration control error, as defined in Article 3(43) of the SOGL.
Frequency Restoration Reserves or **FRR**	As defined in Article 3(7) of the SOGL.
Frequency Restoration Reserves with Manual Activation or **mFRR**	Frequency Restoration Reserves (FRR) that can be activated manually.
Flexibility Service Pro-vider or **FSP**	As defined in Article 2, 64° of the Electricity Act.
FSP-DSO Contract	An agreement between a FSP and DSO allowing the FSP to provide a flexibility ser-vice with the Delivery Points listed in the corresponding FSP - DSO Contract.
Grid User	As defined in Article 2 §1 (57) of the Federal Grid Code for a Grid User connected to the ELIA Grid or to a Public Distribution Grid; or as defined in Article 2 §1 (58) of the Federal Grid Code for a Grid User connected to a CDS.
Grid User Declaration	The official declaration of the Grid User provided to ELIA, containing proof of the agreement between the FSP and the Grid User to provide a flexibility service at one (or more) specific Delivery Point(s).
ID	intraday
Load –Frequency Con-trol Block or **LFC Block**	As defined in Article 3 (18) of the SOGL.
LFCBOA	LFC block operational agreement ELIA, in accordance with Article 119 of the SOGL.
mFRR Service	The Balancing Service that is governed by the BSP Contract mFRR, comprising only the provision of mFRR Energy Bids or both the provision of mFRR Capacity and mFRR Energy Bids.
Opt-out Arrangement	Arrangement according to which the FSP, the BRP_{FSP}, the $BRP(s)_{Source}$ and Sup-plier(s) of a Delivery Point jointly agree to enter in an Opt-out Regime.
Opt-out Regime	As defined in the ToE Rules.
Public Distribution Grid	As defined in Article 2, 49° of the Federal Grid Code.

Rules for the Organization of the Transfer of Energy or **ToE Rules**	The set of rules, as defined by Article 19bis §2 of the Electricity Act, proposed by Elia and approved by the CREG, that lay down the principles for Transfer of Energy.
SOGL	Commission Regulation (EU) 2017/1485 of August 2nd, 2017, establishing a guideline on electricity transmission system operation.
Supplier	As defined in Article 2 15°bis of the Electricity Act.
T&C Scheduling Agent	Terms and Conditions for scheduling agents pursuant to pursuant to Article 46, Article 49 and Article 52 of SOGL and Article 249 of Federal Grid Code.
Transfer of Energy	As defined in Article 19bis section 2 of the Electricity Act.

1. Introduction

In normal situations, Elia relies on Balancing Services offered by balancing service providers in order to manage residual imbalances in the system. These Balancing Services, such as aFRR and mFRR Services, are made available from all types of assets that can meet the technical requirements corresponding to the service. However, **in exceptional circumstances, the available FRR means might not be sufficient to cover the operational risks**. In line with the requirements stipulated in Articles 119, 152 and 157 of the SOGL, **specific procedures for taking exceptional balancing measures are put in place** in the LFCBOA to manage such exceptional balancing situations that are not expected to be resolved with the available FRR means. **As part of the exceptional balancing measures, Elia can activate Units that cannot be activated in compliance with the FRR processes ("slow units")**. In this regard, Elia currently relies on the flexibility from non-running, slow-starting DP_{SU} (typically CCGTs) available via the framework of the T&C Scheduling Agent.

After Elia temporarily introduced, in response to an acute adequacy concern in the winter of 2018-2019, a product to attract additional volumes of flexibility that did not match the technical or regulatory framework of the products available at that time (i.e., the so-called "Winter product"), market parties requested to analyze whether this product could be converted in a permanent product for balancing.

In this context, **this study analyzes the possibilities and the added value for developing a technology-neutral framework for the exceptional balancing measures** by enabling the participation of slow units of all technologies/types (i.e., DP_{PG} as well as DP_{SU}). The specific **objectives** of this study are to:

1. Describe the existing possibilities for all types of slow units to contribute to balancing the system, and the situations in which this could occur.
2. Assess the necessity and added value of developing a framework for opening up the exceptional balancing measures to the participation of all technologies (i.e., DP_{PG} on top of the currently available flexibility from DP_{SU}).
3. Propose a contractual and operational framework for opening up the exceptional balancing measures to all technologies.

The remainder of this document is structured as follows:

- **Section 2** describes the **current possibilities for slow units to contribute to balancing** and the circumstances in which this can occur. In addition, this section provides an overview of the Winter product that was temporarily introduced in the winter of 2018-2019.
- **Section 3** analyzes the **potential benefits that could be achieved by developing a framework to enable the participation of all technologies to the exceptional balancing measures**. In particular, the opportunities for reducing the costs related to the exceptional balancing measures as well as the possible benefits for further increasing system security are assessed.

- **Section 4** presents an assessment of how DP_{PG} could technically contribute to balancing the system as part of the exceptional balancing measures and an **evaluation of the corresponding techno-economic potential for DP_{PG}.**
- **Section 5** presents a **proposal for the design of the contractual and operational framework for opening up the exceptional balancing measures to DP_{PG}** that could form the basis for an eventual implementation.
- **Section 6** provides an overview of the **conclusions and recommendations** of the study.
- **Section 7** finally discusses the impact assessment of the implementation of the proposed contractual and operational framework, and the considerations that are considered in the final implementation plan.

The present document is the first version of a **report** that will be submitted to the CREG **on December 23, 2021**. As such, the present public consultation is an opportunity to **collect stakeholders' views** on the conclusions and recommendations of the study in general, and to receive market parties' views regarding the robustness of the conclusions of the current study in the light of upcoming changes in the Belgian electricity system (e.g., nuclear phase out and further increase of offshore wind generation) and markets. The stakeholders' feedback will be considered for the finalization of the study.

2. Current and past opportunities for slow units to contribute to balancing

The aim of this section is to provide an overview of the current possibilities for slow units to contribute to balancing. To this end, Section 2.1 first provides a general overview of the different options for these units to contribute to balancing. Next, Section 2.2 looks into detail into the current procedures for exceptional balancing conditions with the purpose of enabling a better understanding of the circumstances that can lead to an activation of slow units and describes the applicable contractual framework. For completeness and given the contextual relevance for this study, Section 2.3 finally discusses the temporary opportunities introduced in the winter 2018-2019 for slow units of the type DP_{PG} to contribute to ensuring adequacy via the so-called Winter product.

2.1 Overview of the options for slow units to contribute to balancing

Figure 1 provides a schematic overview of the different ways in which (some) slow units can contribute to balancing the system.

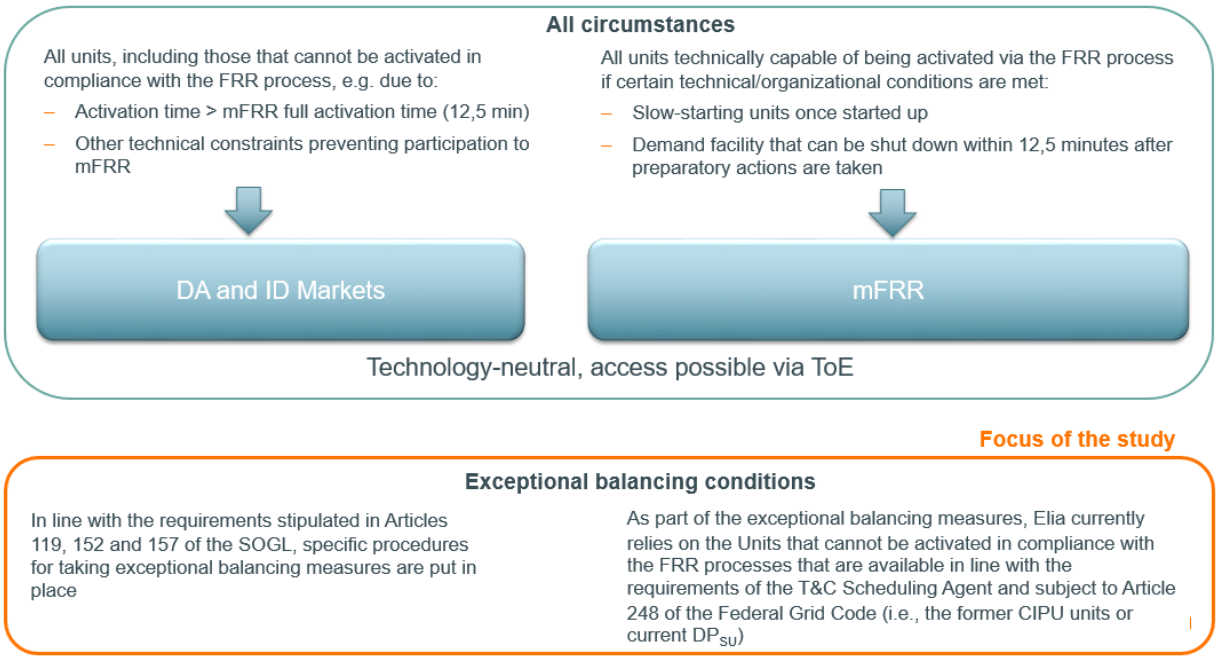

Figure 1: Overview of options for slow units to contribute to balancing the system

As shown in Figure 1, a first way slow units could contribute to balancing the system is by avoiding high residual imbalances by participating to the day-ahead (DA) and/or intraday (ID) markets, or by contributing to balancing the BRP's Balancing perimeter. The flexibility valorized in this way is not governed by strict technical requirements, such as a full activation time. Moreover, the valorization of flexibility in the DA/ID markets allows flexibility service providers (FSPs) to perform their own planning in order to consider for instance the minimum duration of an activation. Valorization of the flexibility of slow units in the DA/ID markets is possible for all technologies. In addition, since July 2021, access of DP_{PG} to day-ahead and intraday markets is possible independent of the Supplier and the BRP via the Transfer of Energy framework.

A second way slow units could contribute to balancing the system is by providing Balancing services such as mFRR. In contrast to participation to the DA and ID markets, strict technical requirements do apply for participation to mFRR (e.g., full activation time requirements). Note that we consider the term "slow units" or "Units that cannot be activated in compliance with the FRR processes" to reflect assets that face technical and/or organizational limitations restricting them in a given moment in time, and in absence of preparatory actions, from being activated via the FRR processes. As such, it is not excluded that a slow unit could, in certain moments in time and/or after taking preparatory actions, effectively be activated in compliance with the FRR processes. An example is a slow-starting generation unit (e.g., a CCGT) that cannot be activated in compliance with the FRR processes when it is not running, but could do so after it has been started up. Similarly, it could be theoretically possible that a demand facility can generally not be shut down within the full activation time required for mFRR (e.g., due to organizational constraints), but that this would be possible after certain preparatory actions would be taken. The mFRR Service is open to all technologies, and access is possible independent of the Supplier and BRP via the Transfer of Energy framework.

The options discussed above hold during all circumstances. In addition to these options, in exceptional balancing conditions, Elia may activate slow units as part of dedicated procedures for taking exceptional balancing measures. At the moment, these procedures rely exclusively on slow units that are available in line with the requirements of the T&C Scheduling Agent and subject to Article 248 of the Federal Grid Code. Specifically, this thus relates to PGM, ESD or PPM of the type B, C and D that are available in line with the requirements of the T&C Scheduling Agent (thus, the former "CIPU units" or current DP_{SU}). The focus of this study is on the framework for the exceptional balancing measures. For this reason, the next section provides a detailed overview of the current procedures and contractual framework.

2.2 Current framework for exceptional balancing measures

This section provides an overview of:

- the current procedures and corresponding circumstances within which Elia may request the activation of slow units in accordance with the Balancing Rules and the LFCBOA[1]; and
- the current contractual framework for activating slow units.

2.2.1 Procedures for taking exceptional balancing measures

The LFCBOA contains three different procedures for taking exceptional balancing measures, as part of which Elia may make use of flexibility from slow units. These measures all concern balancing situations that are not expected to be resolved with available FRR following the dimensioning methodology (as also specified in the LFCBOA)[2]. An overview of the three different procedures is shown in Figure 2, and provided below:

- The operational procedure in case of exhausted FRR, in accordance with Article 152(18) of the SOGL, and Article 12 of the LFCBOA;
- The escalation procedure, in accordance with Article 157(4) of the SOGL and Article 13 of the LFCBOA;
- Measures to reduce the FRCE, in accordance with Article 152(16) of the SOGL and Article 7 of the LFCBOA.

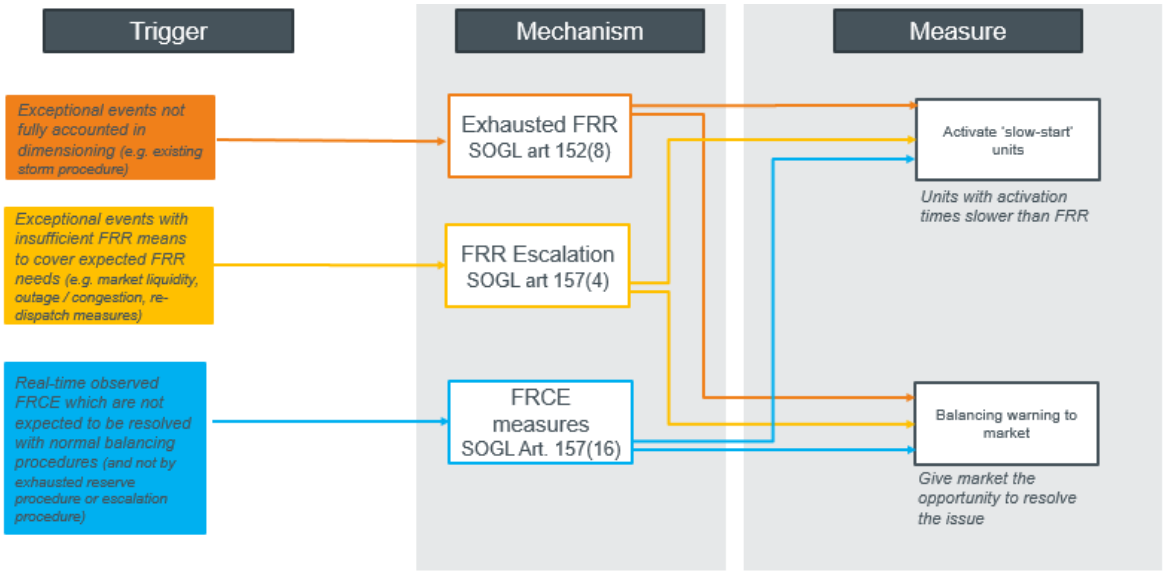

Figure 2: Overview of the procedures for taking exceptional balancing measures

[1] Note that in this study, the LFCBOA version that has recently been publically consulted is taken as a starting point. An overview of the public consultation can be found via the following **link**.
[2] It is to be noted that Elia's reserve dimensioning is only designed to cover reasonable risks (being 99.0% if the expected LFC block imbalance risk and the dimensioning incident), and situations can still occur resulting in a high uncovered LFC block imbalance and corresponding impact on the Area Control Error.

Exhausted FRR and escalation procedure

The operational procedure in case of exhausted FRR describes the preventive actions Elia shall take in case Elia detects the risk of facing an exceptional event that is not fully accounted in the dimensioning of the FRR reserves and leads to a situation where the active power reserves are expected to be insufficient for Elia to control the FRCE. An example is a large storm event for which – after considering the mitigation measures communicated by the impacted BRPs – it is expected that one or more BRPs would not be able to keep the balance in their portfolio up to a point where the estimated available FRR means would be insufficient to ensure secure system operations. Therefore, preventive actions from Elia could be required to reduce the imbalance risk to a level manageable by the FRR means for the concerned delivery period.

The escalation procedure describes the preventive actions Elia shall take in case Elia detects a severe risk of insufficient reserve capacity on FRR in the LFC block, related to cases where the available FRR means are insufficient to cover the dimensioned FRR needs. This can for instance be the result of a lack of liquidity in the FRR market, outages of reserve providing units or groups, internal congestions preventing the activation of balancing energy bids in certain zones and/or the activation of balancing energy bids for congestion management purposes.

Although the circumstances for the exhausted FRR procedure and the escalation procedure are quite different, the operational procedure and preventive actions taken by Elia are similar. A schematic overview of the different steps is shown in Figure 3.

Specifically, Elia shall take the following actions:

1. Detect an upcoming event not fully accounted for in the dimensioning, e.g., a storm event (only applicable for the exhausted FRR procedure).
2. Determine the residual risk:
    a. For the exhausted FRR procedure, the residual risk corresponds to the possible loss of injection/increase of off-take following the event (if applicable corrected with mitigation measures taken by BRPs) that is not covered by the available balancing means
    b. For the escalation procedure, the residual risk corresponds to the dimensioned needs that are not covered by the available balancing means

    In case the residual risk exceeds a certain threshold, Elia will send a balancing warning to market parties, asking BSPs to submit additional non-contracted balancing energy bids, and informing BRPs such that they can adapt their portfolio accordingly. At the same time, Elia will perform a preliminary selection of the slow units that could be activated to resolve the risk.
3. Continuously update the residual risk taking into account information updates (e.g., new forecasts, mitigation measures communicated by BRPs or additional balancing energy bids submitted)
4. In case the residual risk exceeds a certain threshold at the latest possible moment to request the activation of slow units in order to mitigate the excessive residual risk, Elia will request the activation of one or more slow-starting units in order to increase the availability of FRR balancing energy bids.

5. Activate aFRR and/or mFRR balancing energy bids following the normal processes in real-time to resolve imbalances.

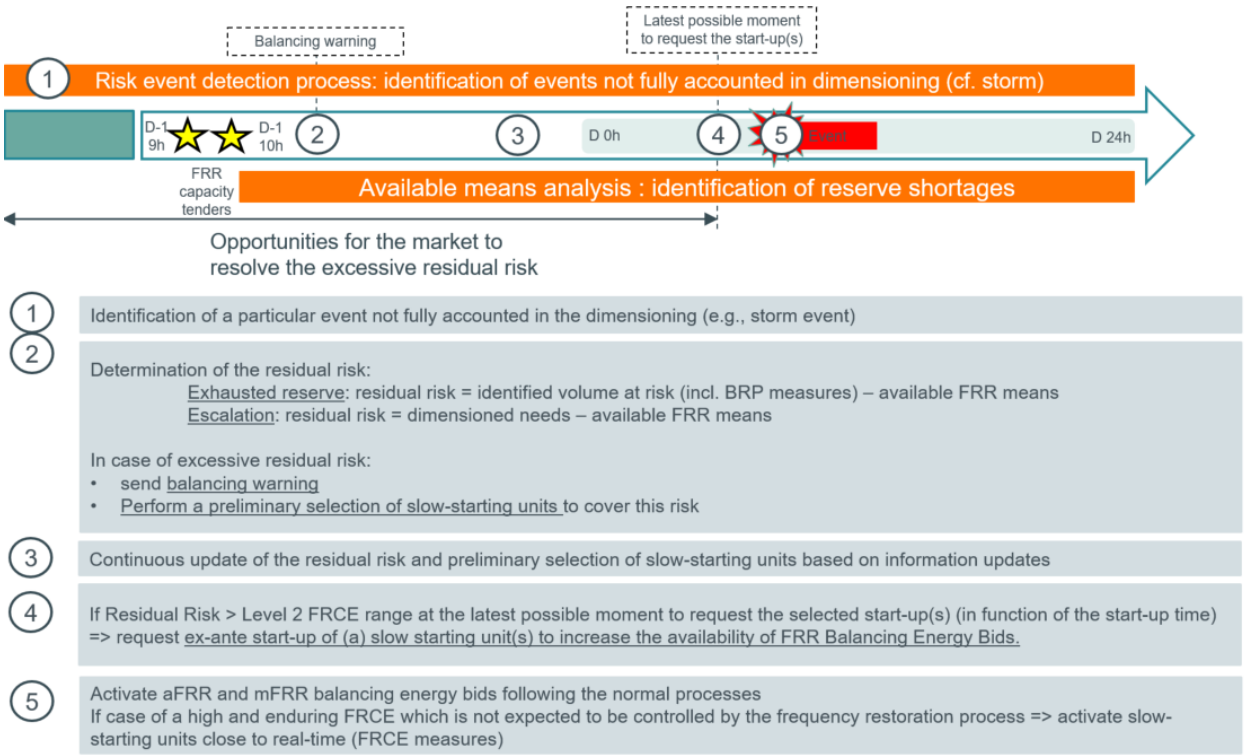

Figure 3: Overview of the procedures for the exceptional balancing measures

It is to be noted that the objective of activating slow units in the exhausted FRR procedure and the escalation procedure is to increase the availability of balancing energy bids that can be activated via the regular FRR processes. This is illustrated in Figure 4.

A typical example of such an activation is the start-up of a CCGT facing a start-up time that exceeds the full activation time of mFRR. When the unit is activated following the exceptional balancing measure and scheduled at a level below its maximum power, this unit can (and has to) provide the remaining margin between the maximum power and the scheduled power as balancing energy bids. This will therefore increase the available balancing means during the period where a residual risk is identified. In addition, additional upward flexibility can be made available through the compensation of the generated electricity related to operating the unit at its minimum power.

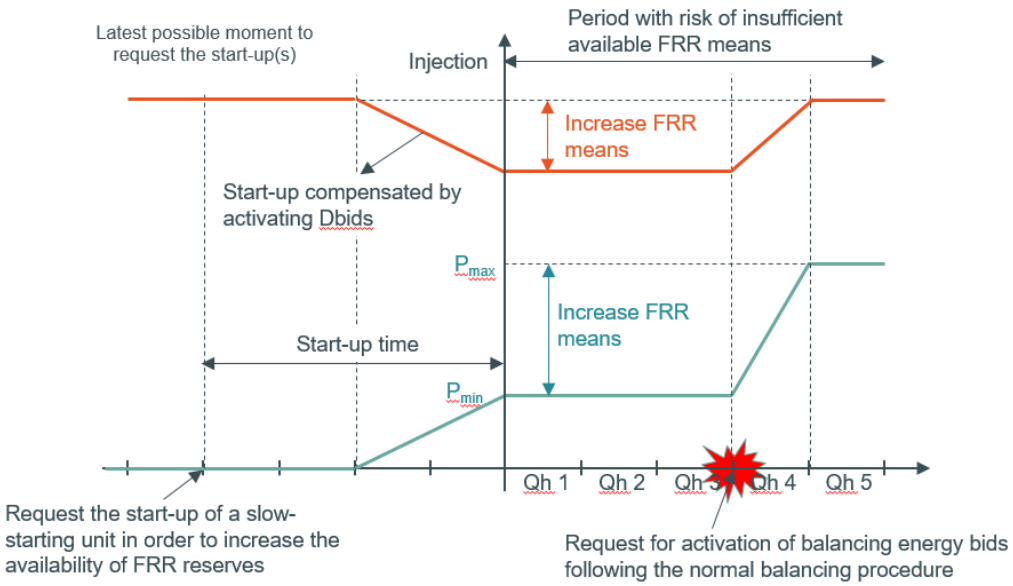

Figure 4: Illustration of the activation of a slow-starting generation unit in order to increase the availability of FRR means in the exhausted FRR procedure and/or the escalation procedure.

It is worth to highlight that the operational procedures aim to avoid activating slow units as much as possible in order to provide the market with maximal opportunities to handle the risk before intervening. In this regard, there are opportunities for market parties to resolve the excessive residual risk before an activation is requested by Elia. Market parties can first of all contribute to reducing the residual risk by valorizing flexibility as part of BRP portfolio management by increasing the injection or reducing the load within the BRP's Balancing perimeter (e.g. offshore BRPs potentially facing a significantly short position due to the cut-off of offshore wind parks during a storm event) and/or by buying/selling additional volumes on the day-ahead or intraday markets. In addition, those units that in some moments, and possibly after taking preparatory actions can offer mFRR, could submit (additional) mFRR Balancing energy bids. The balancing warning could provide an additional incentive to market parties as it provides an indication of the need for additional balancing resources and possibly elevated balancing prices and imbalance tariffs.

Measures to reduce the FRCE

In contrast to the operational procedure in case of exhausted FRR and the escalation procedure, the measures to reduce the FRCE are taken after the activation of FRR (aFRR and mFRR) following the regular processes (and are hence taken close to real-time), and only in exceptional circumstances in case of an elevated FRCE that is not expected to be controlled by the regular frequency restoration process. As part of the measures to reduce the FRCE, Elia can request the activation of slow units. Note that, in contrast to the exhausted FRR procedure and the escalation procedure, the purpose of activating a slow-starting unit in this measure has as objective to increase the energy injected into the grid (or reduce the energy withdrawn from the grid). For this reason, there is also no compensation of the additional energy injected performed on other units.

Table 1 finally provides an overview of the characteristics of a request to activate a slow unit for the different procedures for taking exceptional balancing measures.

Table 1: Overview of the use of slow units as part of the exceptional balancing measures

Procedure	Circumstances/trigger	Objective of the activation	Activation request	Compensation performed
Exhausted FRR procedure	Risk of insufficient FRR means following an event not fully accounted in the dimensioning of the FRR needs	Increase the availability of FRR means	Ex-ante (preventive)	Yes
Escalation procedure	Available FRR means not adequately covering the dimensioned FRR needs	Increase the availability of FRR means	Ex-ante (preventive)	Yes
Measures to reduce FRCE	Observed high FRCE (ACE) that is not expected to be controlled by the regular frequency restoration process	Increase energy injected/reduce energy withdrawn from the grid	Close to real-time (curative)	No

2.2.2 Contractual framework for the activation of slow units

As specified in Article 8 §2 of the Balancing Rules, the settlement of activations of the currently used slow units (i.e., the DP_{SU}) is done via the T&C SA (replacing the former CIPU contract). In correspondence to the modalities of the T&C SA, this implies that:

- the costs related to the start-up of the unit under consideration are remunerated; and
- the perimeter of the BRP is corrected with the energy volume corresponding to the requested redispatch.

Note that in case slow-starting units are requested to start-up to their minimum power ex-ante, the additional Balancing energy bids that are submitted[3] once the units have been started up are activated and remunerated in accordance with the T&C BSP aFRR/mFRR.

2.3 Past experience related to the Winter product

2.3.1 Context

In the winter of 2018-2019, an urgent, unexpected need for additional capacity appeared following the unavailability of certain nuclear power plants. At that moment, flexibility could no longer be procured in the framework of Strategic

[3] Note that units subject to Article 226 §1 of the Federal Grid Code are obliged to put their remaining available upward or downward power at the disposal of TSO in the form of balancing energy bids.

Reserves. As a result, market parties indicated to be technically capable of mobilizing additional volumes of flexibility, but indicated to have no way of valorizing this flexibility as they did not match the technical, legal or regulatory framework of the products available at that time.

Different reasons, varying per industrial site, existed for the difficulty of valorizing the flexibility for the products available at that time[4]:

- Technical restrictions preventing providing mFRR Services, such as:
  - Not capable of being activated within the full activation time required for mFRR;
  - Long preparation period needed (similar to slow-starting units);
  - Constraints regarding the minimum duration of an activation;
  - Constraints regarding the maximum number of activations for the winter period (e.g., the winter period);
- Flexibility could only be valorized in the day-ahead and intraday markets via the grid users' own supplier and BRP (i.e., there was no Transfer of Energy for DA and ID markets available).

For this reason, Elia temporarily introduced the product "Slow Tertiary Control Non-Reserved Service by Non-CIPU Technical Units" (also known as the "Winter product") as a quick alternative for the Strategic reserves. The ad hoc contract targeted flexibility on DP_{PG} (former non-CIPU Technical Units) that were not capable of delivering mFRR services due to some of the above-mentioned constraints.

2.3.2 Overview of the product

The Winter product was implemented as a subcategory of the mFRR products[5] as a pragmatic solution considering:

- the urgency at that time (existing tools and requirements could be re-used)
- the business requirements (the mFRR framework was the only one in which DP_{PG} could offer flexibility with application of Transfer of Energy at that time).

However, it has to be emphasized that the intention of introducing the Winter product was to resolve an adequacy concern and not a balancing concern.

[4] It has to be noted that the market and products have evolved since the winter of 2018-2019, thereby removing certain of the barriers for participation experienced during that time. Most notably:
- Participation to DA/ID markets is possible independent of the supplier and BRP of the grid user since the go-live of Transfer of Energy for day-ahead and intraday markets
- mFRR capacity is now offered on a 4-hourly instead of a monthly granularity. Correspondingly, mFRR capacity auctions are now held on a daily instead of a monthly basis.

[5] Specifically, the product non-CIPU free bids at that time ("bids on Bidladder", current non-contracted mFRR Energy bids) was extended with a new service level agreement ""Slow Tertiary Control Non-Reserved Service"".

The winter product considered a longer lead time for activation compared to mFRR and allowed certain constraints. As such, this new product was designed to be similar to slow-starting CIPU units.

Figure 5 provides an overview of the process starting with the identification of a scarcity risk and possibly ending with the activation.

Figure 5: Overview of the process for the Winter product.

This process is summarized below:

- **Submission of bids** (Step 1-3 in Figure 5): following the identification of a scarcity risk during a given period (typically 3-4 hours), Elia called for the submission of bids from slow non-CIPU units for this period. This call for bids happened roughly 10 hours before the period for which the scarcity risk was identified. The gate closure time for the submission of bids was two hours after the call for bids. The main bid properties were the offered volume (MW), the fixed price (€/MW) and the variable price (€/MWh). Delivery points already providing mFRR were not allowed to be used as part of the Winter product.
- **Selection of bids** (Step 4-5 in Figure 5): the selection of bids considered both the fixed price and the variable price. The selected bids were requested to start their preparation 5 hours before the start of the period of the identified scarcity risk. Between the gate closure time and this moment, the selected bids could still be cancelled. In addition, the volume of the bid could be adapted by +/- 20% until 1,5 hour before the start of the period for which the scarcity risk was identified.
- **Activation of bids** (Step 6-7 in Figure 5): if the need for activation was confirmed 1 hour before real time, the required selected bids were activated. An activation could take place within the period for which the scarcity risk was identified (as communicated at the moment of the call for bids) and had a minimum duration of 1 hour.
- **Settlement:** In case the selected bids were requested to start the preparation, the offered volume was remunerated at the fixed price of the bid, and this regardless of whether an actual activation was later requested. In addition, in case the selected bids were requested to be activated, the energy volume requested to be activated was remunerated at the variable price.

2.3.3 Experience

Despite the interest of stakeholders, only a few MW have effectively been offered for the Slow Tertiary Control Non-Reserved Service by Non-CIPU Technical Units.[6] Due to the fact that adequacy circumstances evolved positively, no activation has finally taken place.

[6] There might be several reasons for the limited volumes effectively offered such as the limited period for which this product was available. In addition, certain volumes of flexibility eventually did find their way to the markets directly via the BRPs. Therefore, the text only reflects a factual statement regarding the volumes offered for the Winter product. The fact that very limited volumes were offered is not seen by Elia as a proof that there would be a limited potential.

3. Benefits of enabling all types of slow units to participate to the exceptional balancing measures

As discussed in Section 2.2, the current procedures for exceptional balancing measures target the flexibility available from DP_{SU} (former 'CIPU units') that cannot be activated following the FRR processes. This section analyzes the potential benefits for society related to developing a framework for opening up the exceptional measures to units/delivery points of the type DP_{PG} (on top of the currently available flexibility from DP_{SU}).

The potential benefits such a technology-neutral framework can be twofold:

1. Reducing the costs related to the measures taken in exceptional circumstances: in case the activation of (some) of the additional volumes of flexibility made available from DP_{PG} comes at a lower cost than the activation of the flexibility currently made available from DP_{SU} (for instance, starting up a slow-starting unit), the costs related to the measures taken in exceptional circumstances could be reduced.
2. Improving system security: enabling the participation of delivery points of the type DP_{PG} to the exceptional balancing measures potentially allows obtaining additional volumes of flexibility. The added value in this regard is dependent on both the need for Elia to be able to call additional volumes of flexibility as part of the exceptional measures, and the additional volumes that could effectively be made available.

This section assesses both potential benefits. To this end, this section analyzes the current experience with the use of exceptional measures and their associated costs, as well as the need for Elia to be able to call additional volumes of flexibility during exceptional circumstances. Considering that the triggers and circumstances that can lead to an activation of flexibility from slow units substantially differ for each of the different procedures described in the LFC-BOA (i.e., exhausted FRR procedure, escalation procedure and measures to reduce FRCE), the assessment in this section is performed separately for the different procedures.

3.1 Exhausted FRR procedure

In the exhausted FRR procedure, one or more slow-starting unit(s) can be started up as a last resort action in case of a risk of depleting reserves following events not fully accounted for in the dimensioning of the FRR needs. A typical example is a large storm event where, after taking into account the information received from BRPs with respect to planned measures to mitigate the storm impact, it is expected that one or more BRPs will not be able to keep the balance in their portfolio up to a point where the estimated available FRR means would be insufficient to ensure secure

system operations. Elia can request the start-up of a slow-starting unit in such a situation in case the expected generation drop following the event (e.g., offshore storm) that is not expected to be covered via mitigation measures exceeds the available balancing means[7] with a certain threshold during two or more consecutive 15-minute periods.[8]

The storm risk procedure has been in operation as of January 2020. Since this period, several storms have taken place for which a significant drop in the offshore generation has been forecasted. Table 2 presents for each storm with a significant forecasted generation drop the following data:

- the maximum forecasted generation drop;
- the maximum forecasted generation drop that was not covered by BRP mitigation measures[9];
- the available balancing means[10];
- the total available volume of flexibility[11].

[7] As specified in Article 12 of the LFCBOA, the available balancing means consist of the procured balancing capacity, the sharing of reserves and the volume of non-contracted balancing energy bids expected to be available. Note that, as discussed in Section 2.2, the LFCBOA that has recently been publically consulted is taken as a starting point for this study. This version of the LFCBOA, including a more detailed description of the procedures and triggers can be found via the following **link**.

[8] Note that the request to activate a slow-starting unit is only performed at the latest point in time for Elia to take action while taking into account the latest available information. A more detailed description of the procedure and trigger is described in the LFCBOA (**link**). Note that, as discussed in Section 2.2, the LFCBOA that has recently been publically consulted is taken as a starting point for this study.

[9] The data shown in Table 2 only consider the mitigation measures declared by BRPs directly via the storm tool. For technical reasons, particularly in the first months in operation, some mitigation measures that sometimes represented significant volumes were provided to Elia via email exchange rather than via the storm tool. These volumes are not taken into account here.

[10] The available balancing means reported in Table 2 consist of the contracted capacity (both aFRR and mFRR), non-contracted balancing energy bids and reserve sharing. The non-contracted bids for DP_{SU} are based on the calculations as part of the implicit bidding process. This includes the available hydro capacity but does not consider energy-related constraints and only partially accounts for the inability of slow-starting units to be activated as part of the FRR processes. For reserve sharing, a volume of 250 MW is considered in line with the reserve dimensioning. The data in this column is thus similar to the data used to determine the trigger for potentially requesting the start-up of a slow-starting unit in the exhausted FRR procedure.

[11] The total flexibility available reported in Table 2 is based on the data of available volumes of flexibility, as also published on the Elia website (**link**). This data considers contracted capacity (both aFRR and mFRR), non-contracted incremental flexibility (excluding those from hydro assets but including the incremental flexibility that can be provided by slow-starting units) as well as the possibilities for reserve sharing (inter-TSO).

Table 2: Overview of storms with the highest forecasted generation drop

Date (and storm)	Maximum forecasted generation drop [MW][12]	Maximum forecasted generation drop not covered by BRP mitigation measures [MW][9]	Available balancing means [MW][10]	Total flexibility available [MW][11]
9/2/2020 - Ciara	1409	1250	1876	2549
16/2/2020 - Dennis	1119	1119	2270	2808
23/2/2020	898	898	2305	3210
25/9/2020- 26/9/2020 - Odette	785	678	2067	1731
27/12/2020 - Bella	854	333	2277	3242
11/3/2021	523	517	2389	3094

By comparing the maximum forecasted generation drop not covered by BRP mitigation measures to the available balancing means at the same moment, it can be observed that the available balancing means have up to now always significantly exceeded the maximum forecasted generation drop not covered by BRP mitigation measures. As a result, after more than 1,5 year in operation, the storm risk procedure has not yet resulted in the start-up of a single slow-starting unit. Based on this experience, Elia does not expect the exhausted FRR procedure to result in the need to activate slow-starting units in the coming years or only in highly exceptional cases.

In case the generation drop not covered by BRP mitigation measures would nevertheless exceed the available balancing means, there tend to be significant additional volumes available that could be used on assets currently participating to the procedure, as can be observed from the last column in Table 2. Therefore, Elia does not see an immediate need to be able to call additional volumes of flexibility (i.e., on top of the volumes of flexibility from slow units of the type DP_{SU} that can already be made available via the existing framework) for the exhausted FRR procedure in order to ensure system security.

As discussed in the Adequacy and Flexibility Study for Belgium for the period 2022 to 2032[13], with the further increase of the offshore generation, it becomes increasingly important that storm situations are adequately managed as they can pose important balancing challenges. In this regard, Elia has been and will continue to discuss the need for specific measures to deal with these events with all concerned stakeholders and the regulator.

3.2 Escalation procedure

In the escalation procedure, one or more slow-starting unit(s) can be started up as a last resort action in case the dimensioned FRR needs are not adequately covered. As discussed in Section 2.2, this can be due to:

[12] Note that the actual observed drop in generation can differ from the generation drop forecasted by Elia.
[13] The Adequacy and Flexibility Study for Belgium for the period 2022 to 2032 is available via this **link**.

- a lack of liquidity in the FRR market, and/or
- outages of reserve providing units or groups, and/or
- internal congestions preventing the activation of balancing energy bids in certain zones and/or resulting in the activation of balancing energy bids for congestion management purposes.

At the moment, there is no lack of liquidity observed in the FRR markets. Specifically, there is no recent experience with insufficient liquidity leading to the inability to guarantee the availability of the dimensioned volumes. This is further illustrated in Figure 6, which shows for the period January-July 2021 the minimum and average volumes of non-awarded mFRR balancing capacity bids. From this figure, it can be observed that there currently is sufficient liquidity in the mFRR market. Moreover, Elia expects sufficient flexibility to remain available. Finally, based on the prequalified volumes, Elia expects additional volumes to be offered in case a second mFRR capacity auction would need to be organized.

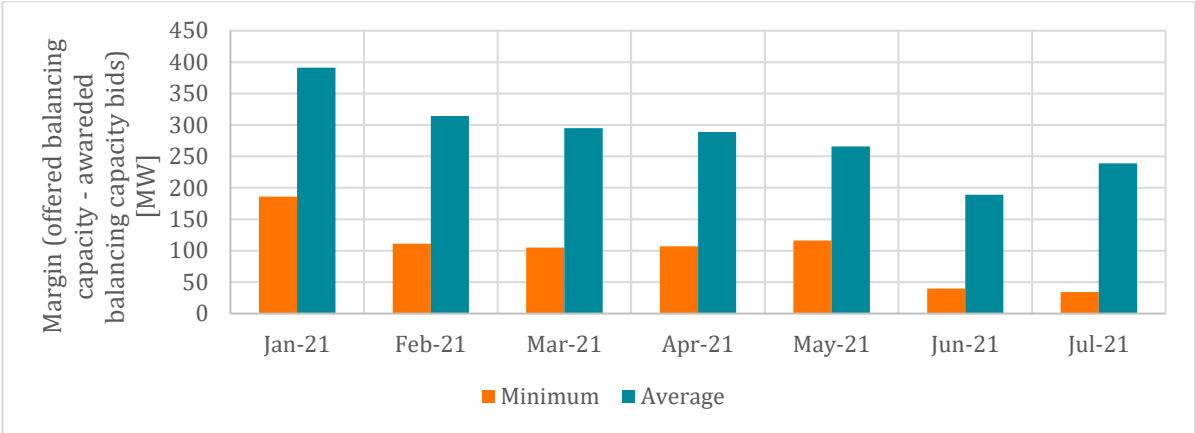

Figure 6: Overview of the non-awarded mFRR balancing capacity bids

Aside from a potential lack of liquidity, internal congestions could also lead to a situation in which some offered or contracted volumes cannot be activated for balancing purposes resulting in insufficiently covering the dimensioned FRR needs. However, at the moment, there are no structural congestions[14] in the grid that could compromise covering the dimensioned FRR needs (on a regular basis).

Based on this experience, Elia does not expect the escalation procedure to result in the need to activate slow-starting units in the coming years or only in highly exceptional cases. In addition, Elia does not see a current need to be able

[14] Note that in addition to structural congestions, maintenance of parts of the network can also lead to congestion risks.

to call additional volumes of flexibility (i.e., on top of the volumes of flexibility from slow units of the type DP_{SU} that can already be made available via the existing framework) for the escalation procedure.

3.3 Measures to reduce the FRCE

As part of the measures to reduce the FRCE, one or more slow-starting unit(s) can be started up as a last resort action in case of an elevated FRCE that is not expected to be controlled by the regular frequency restoration process. The operational procedure for taking measures to reduce the FRCE, as proposed in the LFCBOA, is not yet in operation. Therefore, there is no direct experience with the use of exceptional balancing measures as part of this procedure.

Nevertheless, an assessment is made regarding the quality of the FRCE. Figure 7 presents an overview of the number of the events experienced in the last 2 years for which the FRCE exceeded the level 2 FRCE range and/or 25% of the reference incident of the synchronous area for a certain duration.

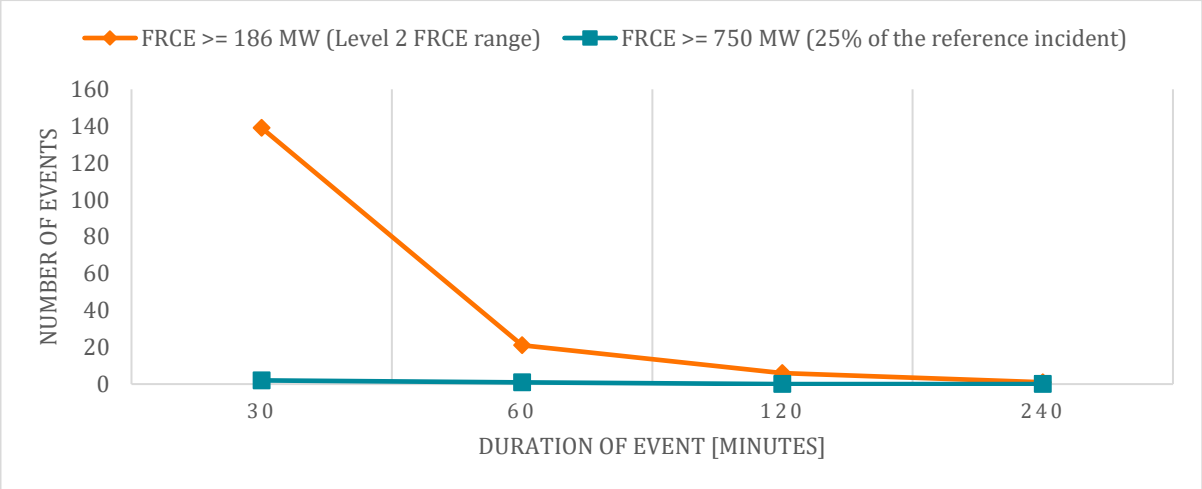

Figure 7: Overview of events with high FRCE values

As can be observed from the figure above, there have been limited situations with high FRCE values. Moreover, in cases where the FRCE did become relatively high, the FRCE was controlled via the regular frequency restoration processes within a reasonable time. For almost all situations, the FRCE was restored to a reasonable level in less time than the time required to start up slow-starting units. In addition, it must be noted that at the moment a high FRCE is observed, it is uncertain whether the high FRCE will be sustained for a longer period. More importantly, the cases where the FRCE did become relatively high for a given period did not result from a lack of available FRR means for controlling the FRCE. In this regard, Elia does not expect the measures to reduce the FRCE to result in the need to activate slow-starting units in the coming years, or only in highly exceptional cases.

3.4 Cost of activating slow-starting units

As discussed in Section 2.2.2, in case a slow-starting unit is requested to be started up within the framework of the T&C SA, the start-up costs are remunerated. These start-up costs differ depending on each unit, and are dependent on the fuel and CO_2-prices at that moment. However, as an order of magnitude, the start-up costs of a CCGT with a nominal power of around 400 MW is around 30k€.

3.5 Conclusions

The current experience shows that in the past years, no slow-starting units have been requested to be started up for balancing purposes. This highlights the highly exceptional nature of the exceptional balancing measures. When looking into the short-term future (coming years), Elia does not have indications of trends or changes in the system that could lead to a more frequent use of the exceptional measures. Moreover, Elia would like to emphasize that even in case of possible changes that could have a significant impact on the system in later years (e.g., strong increase in the offshore generation, nuclear phase-out), the exceptional measures should remain to be used only in highly exceptional cases. In addition to the highly exceptional activations of slow units, the cost of the measures that would need to be taken, i.e., the start-up costs of one or more slow-starting CCGT, are relatively limited. Given the above elements, a first conclusion is that the overall costs related to the exceptional balancing measures are limited. A direct consequence is that the potential to reduce the costs of the exceptional measures by developing a framework for all technologies is inherently also limited, and this regardless of the additional volumes of flexibility that could be made available and the associated costs. Moreover, based on this, Elia expects the business case for market parties that want to valorize flexibility by participating on a voluntary basis to the exceptional measures to be limited.

A stronger motivation for developing a framework for opening up the exceptional balancing measures to all type of technologies could be to further increase system security by increasing the liquidity of the exceptional balancing measures. The benefit in this regard is dependent on both the potential volumes that could be made available and the needs for additional volumes. In the coming years, Elia does however not see a need to be able to call additional volumes of flexibility (i.e., on top of the volumes of slow units available via the current framework). This need might change over time (e.g., with the further increase of offshore wind generation) and could be re-evaluated. In this regard, Elia invites stakeholders to share their views regarding the robustness of the conclusions of this section in the medium term future in light of upcoming changes in the Belgian electricity system (e.g., nuclear phase out and further increase of offshore wind generation) and the electricity markets.

4. Techno-economic potential for DP_{PG} to contribute to the exceptional measures

As discussed in Section 2.2, the current procedures for exceptional balancing measures target the flexibility from available from DP_{SU} (former 'CIPU units') that cannot be activated following the FRR processes. The potential benefits of developing a framework for opening up the exceptional measures to DP_{PG} have been discussed in Section 3. These potential benefits are dependent on the techno-economic potential for DP_{PG} to contribute to the exceptional balancing measures (on top of the currently available flexibility from DP_{SU}). For this reason, the section presents an assessment of how DP_{PG} could contribute to the exceptional balancing measures and the corresponding volumes that could be made available, as well as reflections with respect to the costs of those additional volumes.

4.1 Possibilities for DP_{PG} to contribute to the exceptional balancing measures

The procedures for exceptional balancing measures foresee two distinct purposes for the activation of slow units (see Section 2.2):

1. Ex-ante activation in order to **increase the availability of FRR means** that can be activated via the regular FRR processes in response to an anticipated risk of insufficient power reserves.
2. Close to real-time activation in order to **increase the energy injected/reduce the energy withdrawn** from the grid in response of an observed high FRCE (ACE) that is not expected to be controlled by the regular frequency restoration process.

Increasing the availability of FRR means could be achieved in two different ways with different technical requirements associated:

a) Increase the FRR means by directly providing (additional) FRR energy bids
b) Increase the FRR means indirectly by freeing up additional FRR means on other assets

Provision of (additional) FRR energy bids is a possibility only for those delivery points that, as least under certain conditions (e.g., after taking certain preparatory actions) are capable of providing FRR services during the identified period with an excessive risk of insufficient FRR means. This is similar to the additional FRR means that are made available on a slow-starting unit itself after it is first started up to its minimum power output (i.e., the start-up could be considered as a preparatory action). Figure 8 provides an illustration of a theoretical case in which a demand facility could provide FRR services after a certain preparatory actions are taken.

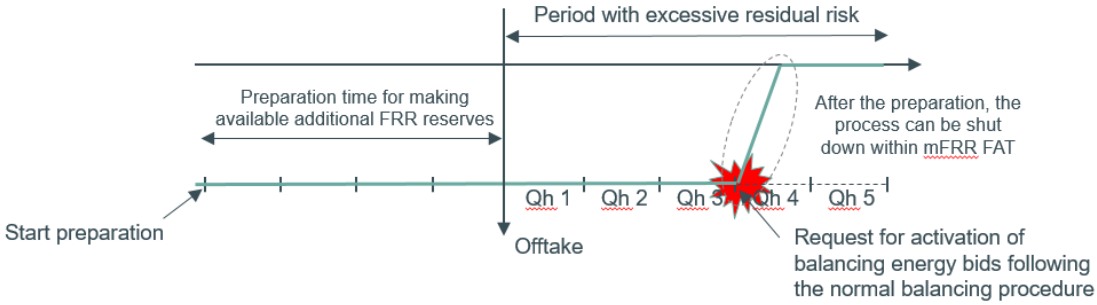

Figure 8: Illustration of a theoretical case in which a demand facility can provide FRR reserves directly after a certain preparation period.

Delivery points of the type DP_{PG} that can realize an increase in the energy injected into the grid or a reduction of the energy withdrawn from the grid but not compliant with the FRR requirements, can still contribute indirectly by freeing up additional FRR means on other assets. For instance, a decrease of the offtake of a demand facility could be compensated by a reduction of the power output on a generation unit, thereby increasing the available upward FRR means, as illustrated in Figure 9. This is identical as how the compensation of a start-up of a slow-starting unit to its minimum operating point also indirectly contributes to increasing the available FRR means. It is to be noted that the reduction of the offtake/increase of injection that is not compliant with the FRR requirements does not have to be performed by the same party on which the compensation is performed. The focus in this study is on the activation that enables freeing up additional FRR reserves via the compensation, and not on the compensation action itself. The compensation itself is proposed to be performed via the same process as the process for compensating redispatching bids (incl. the activation of slow-starting units) for which a framework is in place.

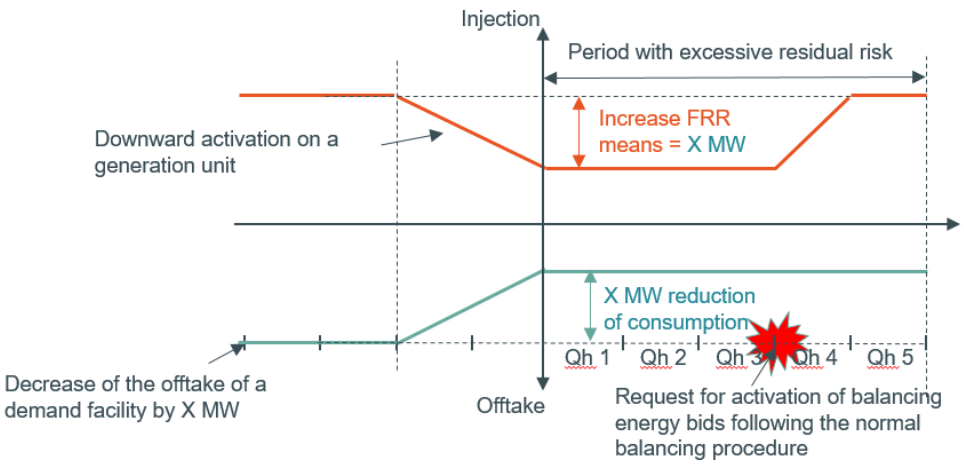

Figure 9: Illustration of a theoretical case in which a demand facility indirectly contributes to increasing the available upward FRR means by reducing its offtake in order to free up additional FRR means on a generation unit.

In addition to contributing to increasing the available FRR means, all delivery points of the type DP_{PG} that can realize a change in active power (increase of the injection or decrease of the offtake) but not compliant with the FRR requirements could also contribute to reducing a high observed FRCE. However, as these actions are taken close to real-time, it is important that the response is sufficiently fast. For comparison, the start-up of a CCGT typically takes about two hours.

4.2 Assessment of the techno-economic potential for DP_{PG}

4.2.1 Flexibility not compliant with the FRR requirements

Potential volumes

The flexibility that is targeted in this context (i.e., the flexibility on slow units of the type DP_{PG}) is similar to the flexibility that was targeted by the Winter product. As discussed in Section 2.3, only a few MW were offered in the context of the Winter product. However, as this product was only available for a short period, no strong conclusions can be drawn based on this experience regarding the potential volumes of flexibility that could be made available by slow units of the type DP_{PG}.

Since July 1, 2021, with the go-live of the Transfer of Energy framework for DA and ID markets, an FSP (and its associated BRP_{FSP}) can valorize the flexibility of DP_{PG} in the DA and/or ID markets independent from the supplier and the BRP. This provides a current option for the valorization of flexibility of slow units of the type DP_{PG}. However, at the time of writing, there are no delivery points registered for this service yet. As such, there is no evidence yet of significant volumes of flexibility from slow units of the type DP_{PG} to be available via this mechanism. However, as this option has only recently become available, the experience is too limited for drawing strong conclusions regarding the potential volumes that could be made available.

Based on the above, it can be concluded that there is still a large uncertainty regarding potential volumes of flexibility that could additionally be attracted from slow units of the type DP_{PG} to participate to the exceptional balancing measures. This because there is limited relevant experience and corresponding data with products having similar requirements. From the limited experience that is available, there is no direct evidence to indicate that significant volumes could be made available. In this regard, Elia invites market parties to provide concrete indications of volumes flexibility that could be made available by slow units of the type DP_{PG} as well as the constraints faced by these assets that prevent a direct participation to mFRR.

Cost of the measure

Aside from the potential volumes that could be made available, it is also worth looking into the cost of activating flexibility from slow units as part of the exceptional balancing measures. To this end, a distinction is made between the two potential purposes of activating the flexibility from slow units.

First, in case the slow units are activated ex-ante with the objective of increasing the available FRR means, the cost of making available additional volumes of FRR means is considered (expressed in €/$MW_{additional\ FRR}$/h). Figure 10 compares the cost of additional FRR means indirectly made available by activating slow units of the type DP_{PG}[15] to the cost of additional FRR means made available by requesting the start-up of a slow-starting CCGT.[16]

[15] The calculation of the cost per additional MW of FRR made available by activating slow flexibility is based on the following equation:

$$Cost\ of\ additional\ FRR\ \left[\frac{€}{\frac{MW}{h}}\right] = variable\ cost + compensation\ cost.$$

In Figure 10, two values for the variable cost of the slow flexibility are considered, namely 200 €/MWh and 500 €/MWh. For simplicity, it is assumed that there is no fixed cost related to the activation of the slow flexibility. The compensation is assumed to involve a negative cost (i.e., cost saving or payment to Elia) of 60€/MWh. Note that this value is rather high and reflects a favorable condition for the cost of additional FRR provided by slow units of the type DP_{SU} relative to the cost of additional FRR from a slow-starting CCGT. Sensitivities have been performed to this value, but these do not significantly change the conclusions drawn here.

[16] The calculation of the cost per additional MW of FRR made available by starting up a CCGT is based on the following equation:

$$Cost\ of\ additional\ FRR\ \left[\frac{€}{\frac{MW}{h}}\right] = \frac{start{-}up\ cost + (generation\ cost + compesation\ cost) * Pmin * activation\ duration}{Pmax * activation\ duration}.$$

Note that the total volume of additional FRR made available (i.e., the maximum power output) consists of both the FRR made available on the CCGT itself (i.e., the difference between the maximum and minimum power output), and the FRR indirectly made available on other assets via the compensation mechanism (i.e., the minimum power output). Further note that, in addition to the start-up cost and the costs to keep the unit running at its minimum operating point, the cost related to the compensation of the activation of the unit is also considered. With respect to the different parameters, the following assumptions are taken: a minimum and maximum power of respectively 190 MW and 430 MW, a start-up cost of 33k€ and a generation cost of 60€/MWh. The compensation is assumed to involve a negative cost (i.e., cost saving or payment to Elia) of 60€/MWh consistent with the calculation of the cost of additional FRR provided by slow units of the type DP_{PG}.

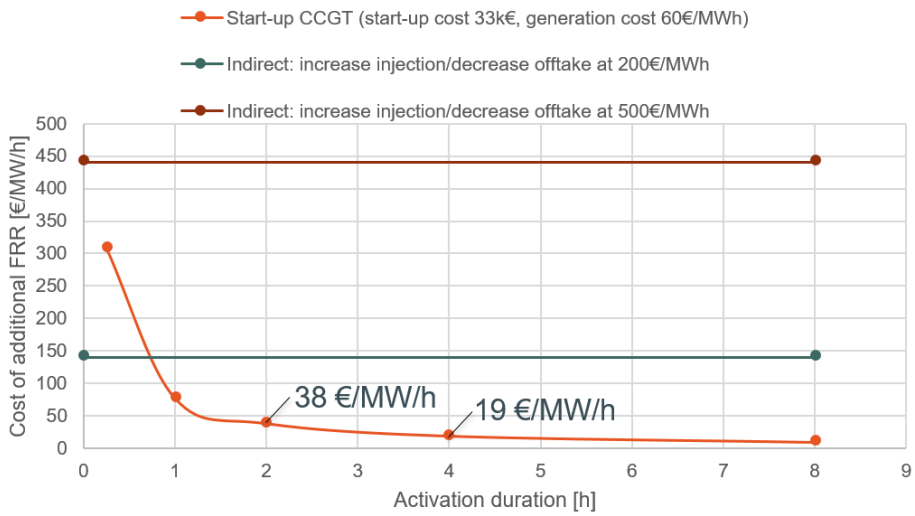

Figure 10: Cost of additional FRR made available

From this figure, it can be concluded that the activations of the slow units of the type DP_{PG} should be relatively inexpensive in order to form a less expensive measure than the activation of a slow-starting CCGT (i.e., around 10-80 €/MWh depending on the duration of the period for which additional FRR means are required).[17] This is (significantly) lower than the vast majority of mFRR energy bid prices from DP_{PG} observed today.

Second, in case the slow units are activated close to real-time with the objective of reducing a high observed FRCE, the cost of a change in energy injected/withdrawn from the grid is considered (expressed in €/MWh). Figure 11 compares the cost of increasing the energy injection / reducing the energy offtake by activating slow units of the type DP_{PG} to the cost of additional energy injection by requesting the start-up of a slow-starting CCGT.[18]

[17] Note that in case the compensation would reflect a positive cost (or a smaller negative cost), the slow flexibility from DP_{PG} should be activated at even lower cost in order to be a less expensive solution that starting up a CCGT.

[18] The calculation of additional energy injection by requesting the start-up of a slow-starting CCGT is based on the following equation:

$$Cost\ \left[\frac{€}{MWh}\right] = \frac{start-up\ cost + generation\ cost * Pmax * activation\ duration}{Pmax * activation\ duration}.$$

With respect to the different parameters, the following assumptions are taken: maximum power of 430 MW, a start-up cost of 33k€ and a generation cost of 60€/MWh.

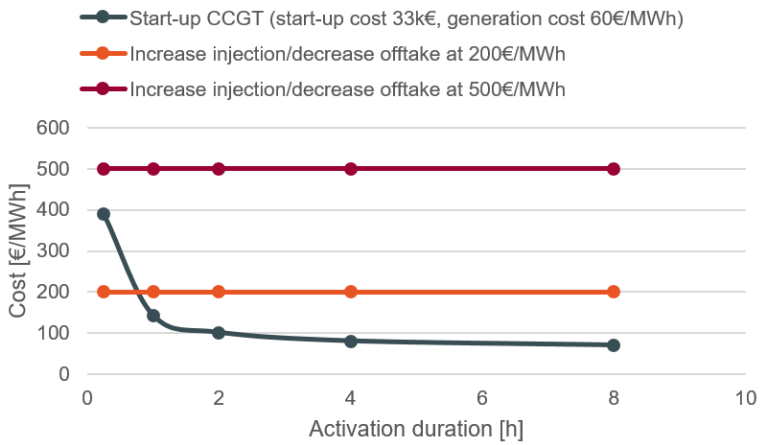

Figure 11: Cost of a change in energy injected/withdrawn from the grid

From this figure, it can again be concluded that the activations of the slow units of the type DP_{PG} should be relatively inexpensive in order to form a less expensive measure than the activation of a slow-starting CCGT (i.e., around 80-125 €/MWh depending on the duration of the period for which additional FRR means are required). This is (significantly) lower than the vast majority of mFRR energy bid prices from DP_{PG} observed today.

Based on the above, Elia expects that the flexibility that could be made available by slow units of the type DP_{PG} does not provide a significant potential for reducing the cost of the exceptional balancing measures. It is therefore doubtful that DP_{PG} would make a significant business case out of their participation to exceptional balancing measures (i.e., on top of the fact that activations in the framework of the exceptional measures are and should remain highly exceptional, making the economic potential for valorizing this flexibility via the exceptional measures limited to begin with).

4.2.2 Flexibility compliant with the FRR requirements

Potential volumes

Delivery points of the type DP_{PG} can participate and are providing significant volumes of FRR Services already today. Currently, it can however be observed that the volumes corresponding to DP_{PG} that are offered but not awarded in the mFRR capacity auctions tend not to be offered as non-contracted mFRR energy bids.[19] Possibly, some of the

[19] There can be several reasons why bids offered in the mFRR capacity auction are not offered as non-contracted mFRR energy bids in case they are not awarded in the capacity auction. First, given that mFRR energy bids from the majority of DP_{PG} tend to be toward the end of the merit order for activation, the chances of being activated is small in normal situations. In addition, it could be that there are preparation costs for making the volumes available that are not certain to be recovered via the energy remuneration. This can be the case in particular for DP_{PG} that are near the end of the merit order for mFRR activation. Second, FSPs might prefer to valorize this flexibility in the ID markets or as reactive balancing.

Delivery Points of the type DP_{PG} can only provide FRR in case specific conditions are met or after taking certain preparatory actions. As such, there might be some additional volumes related to DP_{PG} that could be attracted. However, currently, the majority of the volumes offered in the mFRR capacity auction that correspond to DP_{PG} tend to be awarded. As such, the potential volumes that could be attracted from DP_{PG} that can be activated in compliance with the FRR processes is estimated to be limited.

Moreover, Elia believes that such volumes should be valorized via the existing mFRR framework, and expects that these volumes would be made available (if not awarded during the capacity auction) as non-contracted mFRR energy bids in critical moments during which there is a significant risk of insufficient FRR means or significant imbalances in the system. In such moments, prices for mFRR balancing energy (as well as the imbalance tariffs) could become very high and provide the required incentives for making additional volumes available. The balancing warnings sent as part of the exceptional balancing measures furthermore provides a clear signal towards the market of the periods in which there is such a risk.

For the above reasons, the contractual and operational framework presented in Section 5 exclusively focuses on the additional flexibility that could be made available from DP_{PG} that cannot comply with the FRR requirements.

5. Contractual and operational framework for the participation to the exceptional measures

As discussed in Section 2.2, the current procedures for the exceptional balancing measures target the flexibility from available DP_{SU} (former "CIPU units") that cannot be activated following the FRR processes. Sections 3 and 4 respectively discussed the potential benefits of developing a framework for opening up the exceptional balancing measures to DP_{PG} and the techno-economic potential for DP_{PG} to contribute to the exceptional balancing measures. From these sections, it was concluded that the added value of developing a framework for opening up the exceptional measures to DP_{PG} is expected to be limited in the coming years, and that there is a large uncertainty regarding potential volumes that could be additionally obtained. Nevertheless, this section presents a proposal for the design of a contractual and operational framework for opening up the exceptional balancing measures to DP_{PG} (former 'non-CIPU units') that could form the basis for an eventual implementation.

5.1 Need for a new contractual framework for DP_{PG}

The current framework based on activation of redispatch bids provided within the T&C Scheduling Agent is suitable for the assets currently targeted by the exceptional balancing measures (i.e., the DP_{SU}). However, this contractual framework is not considered suitable for the flexibility that could be made available by slow units of the type DP_{PG}. This for the following reasons:

- Requiring all DP_{PG} to assign a scheduling agent that has to sign the T&C Scheduling Agent[20], with corresponding obligations[21], might form an undue barrier for being able to contribute to balancing the system as part of the exceptional balancing measures;
- The T&C Scheduling Agent foresees a cost-based remuneration for the activation of redispatch bids. As a result, this framework would not provide a direct financial incentive for DP_{PG} to participate to the exceptional balancing measures on a voluntary basis.

[20] Note that the T&C Scheduling Agent is currently restricted to SPGM/ESD/PPM of Type B, C and D that provide MW schedules. Opening up the T&C Scheduling Agent to voluntary participation of demand facilities is targeted in phase 2 of the ICAROS project. Further note that demand facilities do not have a legal obligation to provide schedules in accordance with Article 248 of the Federal Grid Code. In contrast, the SPGM/ESD/PPM of type B will be obliged to provide scheduling information, but will be offered the choice to either provide MW schedules or ON/OFF schedules, and corresponding redispatch bids (in line with the planned ICAROS design for ICAROS phase 2).
[21] The obligations likely include the structural provision of scheduling information and redispatch bids. The specific obligations will be further developed as part of the design for phase 2 of the ICAROS project.

For the above reasons, it is proposed, in case of implementation, to establish a new contractual framework for enabling slow units of the type DP_{PG} to participate to the exceptional balancing measures while maintaining the existing contractual framework based on the T&C Scheduling Agent for slow units of the type DP_{SU}.

5.2 Contractual framework and operational process for DP_{PG} participating to the exceptional balancing measures

This section presents a proposal for the operational framework and the contractual framework for DP_{PG} that would participate to the exceptional balancing measures. The proposal reflects a first proposition by Elia, and contains important principles. The contractual elements will be further elaborated and discussed as part of the process of developing the contract.

5.2.1 Operational process

The current procedures for the exceptional balancing measures, as specified in the LFCBOA (and presented in Section 2.2), can be largely maintained. Relatively minor changes would be required to open the exceptional balancing measures to all type of assets. A high-level overview of the exceptional balancing measures is shown in Figure 12, where the required changes with respect the current measures are indicated in orange.

1 Identification of a particular event not fully accounted in the dimensioning (e.g., storm event)

2 Determination of the residual risk:
Exhausted reserve: residual risk = identified volume at risk (incl. BRP measures) – available FRR means
Escalation: residual risk = dimensioned needs – available FRR means

In case of excessive residual risk:
- send balancing warning
- Initiate a "Call for Bids" for DP_{PG}
- Perform a preliminary selection of mitigation measures to cover this risk (consisting of start-ups from DP_{SU} and/or bids from DP_{PG})

3 Continuous update of the residual risk and preliminary selection of mitigation measures based on information updates

4 If Residual Risk > Level 2 FRCE range at the latest possible moment to request the selected start-up(s) from DP_{SU} (in function of the start-up time) and/or activate the selected bids from DP_{PG} (in function of the required activation time) => request ex-ante start-up of (a) slow starting unit(s) and/or activation of the selected bids from DP_{PG} to increase the availability of FRR Balancing Energy Bids.

5 Activate aFRR and mFRR balancing energy bids following the normal processes
If case of a high and enduring FRCE which is not expected to be controlled by the frequency restoration process => activate slow-starting units and/or bids from DP_{PG} close to real-time (FRCE measures)

Figure 12: Overview of the changes required in the current procedures for the exceptional balancing measures

The proposed operational process for the DP_{PG} participating to the exceptional balancing measures consists of the multiple steps. First, a call for bids will be issued for the period for which an excessive residual risk is detected. In this call for bids, FSPs are invited to submit bids related to slow units of the type DP_{PG} (hereafter referred to as "slow-flexibility bids"). Note that the call for slow-flexibility bids is complementary to the balancing warning, in which BSPs are asked to submit additional non-contracted aFRR/mFRR balancing energy bids.

In response to the call for bids, FSPs are invited to submit slow-flexibility bids. In line with the design for redispatching bids, updates of submitted bids are possible until 45 minutes before real-time, but submitted bids are firm in case a request for activation is sent before the gate closure time.

Second, a (preliminary) selection of the submitted bids is made. The residual risk and the preliminary selection of mitigation measures to take as part of the exhausted FRR or the escalation procedure is continuously updated based on the latest information (e.g., additional balancing energy bids submitted by BSPs, additional mitigation measures taken by BRPs, new forecasts and/or additional "slow-flexibility" bids from DP_{PG}). As such, the preliminary selection reflects an internal process and is not directly visible to the FSP/SA. In line with the current procedures for the exceptional balancing measures, Elia will strive towards techno-economic efficiency by taking into account the duration and magnitude of the definite risk, the constraints and costs related to the activation of slow-starting units of the type DP_{SU}[22] as well as the technical constraints and costs related to the activation of the slow-flexibility bids provided by DP_{PG}[23].

Finally, the request for activation will be send to the SA/FSP at the latest moment to request the activation of the concerning mitigation measures. The activation can be requested during (a part of) the period for which the excessive residual risk was identified while taking into account the specific constraints of the bid[23].

5.2.2 Conditions for participation to the exceptional balancing measures.

The conditions for FSPs to participate to this new service are proposed to be similar to the conditions for FSPs to participate the DA/ID markets, as specified in the FSP Contract DA/ID[24]. Specifically, this involves that the FSP needs to comply with the conditions set forth in the open qualification procedure, needs to assign a BRP_{FSP} and must successfully complete a communication test.

Similarly, the conditions for participation of Delivery Points to this new service would be similar to the conditions set forth in the contracts for other services (e.g., FSP Contract DA/ID, BSP Contract mFRR). Specifically, the conditions for Delivery Points comprise:

[22] As of ICAROS phase 1, all technical constraints and costs will be integrated via the redispatch bid properties.
[23] As indicated via the bid properties as presented in Section 5.2.3.
[24] The FSP Contract DA/ID can be accessed via this **link.**

- compliance with the metering requirements and, in case of submetering, completion of a submeter commissioning test;
- the provision of a Grid User Declaration (only applicable in case the FSP is not the Grid User);
- the provision of a CDSO declaration for Delivery Points located within a CDS or the inclusion of the Delivery Point in a FSP-DSO Contract in case the Delivery Point is connected to the distribution grid;

In addition, in case the FSP is a different party than the Supplier and/or the BRP_{FSP} is a different party than the BRP_{source} (i.e., in case there is no implicit opt out), participation of Delivery Points to this service requires either that the Delivery Point is linked to an Access Point that is included in a Pass-Through Contract or that a proof is provided of the existence of an Opt-out Arrangement between the FSP, the BRP_{FSP}, the Supplier(s) and the $BRP(s)_{Source}$. The Transfer of Energy mechanism is not available for this service.

Finally, slow units of the type DP_{PG} that offer their flexibility as part of the new contractual framework cannot be part of the pool of Delivery Points registered for participation to mFRR and/or aFRR Services.

5.2.3 Bid properties

The proposed bid properties for the flexibility offered by slow units of the type DP_{PG} in the context of the new contractual framework aim to enable FSPs to reflect the specific constraints faced. This in order to maximally avoid that potential volumes of flexibility would not be able to meet pre-defined requirements, and hence not be made available. This is also in line with the findings of Section 3, where it was argued that the largest benefit from developing a framework for opening up the exceptional balancing measures would likely come from an increased system security by making available additional volumes.

Next to the ability to reflect technical constraints via the bid properties, it is also important that the bidding process and the overall process for participation should not be overly complex in order to avoid high implementation and/or operational efforts, and this both for FSPs and for Elia. This is particularly important as it is difficult to justify high implementation and/or operational efforts considering that the exceptional measures are expected to be activated only in highly exceptional cases.

Based on these two considerations (i.e., allowing FSPs to reflect technical constraints and keeping the process for participation as simple as possible), the following bid properties are proposed:

- Bid volume [MW]: non-divisible volume of incremental flexibility that can be provided;
- Fixed price [€] : fixed price for the activation of the bid;
- Variable price [€/MWh] : variable price for the activation of the bid;
- Full activation time [h]: time required before the offered Volume can be fully delivered
- Maximum activation time [h]
- Start time: start of the period within the period with excessive residual risk for which the flexibility can be made available

- End time: end of the period within the period with excessive residual risk for which the flexibility can be made available
- List of Delivery Points

5.2.4 Remuneration

Activated bids are settled following a paid-as-bid remuneration, taking into account the fixed and variable bid price and the duration of the activation (i.e., activation remuneration [€] = Fixed price [€] + Variable price [€/MWh] * Volume [MW] * effective activation duration [h]). There is no capacity reservation foreseen for slow units to participate to the exceptional balancing measures.

The perimeter of the BRP_{FSP} would be corrected with the requested volume (similar to the approach used for mFRR and redispatching). The Baseline High X of Y*, as also used for FSPs participating to the DA/ID markets is proposed to be used to determine the volume of flexibility effectively delivered as part of the activation control that will be foreseen.

Finally, in terms of the impact on the imbalance tariffs, similar rules would apply for the activation of slow units of the type DP_{PG} as for the activation of slow units of the type DP_{SU}.

6. Conclusions and recommendations

In exceptional circumstances, the available balancing means might not be sufficient. In such cases, and as part of the exceptional balancing measures, Elia can activate Units that cannot be activated in compliance with the FRR processes ("slow units"). Currently, the exceptional balancing measures rely exclusively on the flexibility made available from DP_{SU} (i.e., the former CIPU units) in the framework of the T&C Scheduling Agent, and that cannot be activated via the FRR processes. This typically relates to the activation of CCGTs. In this study, Elia analyzes the possibilities and the need for creating a technology-neutral framework by opening up the exceptional balancing measures to DP_{PG} (i.e., on top of the flexibility already available from DP_{SU}).

To this end, an assessment is made of the techno-economic potential of DP_{PG} to contribute to the exceptional balancing measures, and the added value that could be created by enabling the participation of DP_{PG}. Specifically, the study has looked into the added value both in terms of possible reductions of the costs of the exceptional balancing measures, and in terms of the further increase of system security.

A first conclusion is that the savings that could potentially be achieved by reducing the costs of the exceptional balancing measures are expected to be very limited. This mainly because activations of the exceptional balancing measures are currently highly exceptional, and are expected to remain highly exceptional in the coming years. In addition, the additional volumes that could be made available at a lower cost than starting-up slow-starting units are estimated to be limited.

The benefits for further increasing system security are dependent on both the additional volumes that could be realized by developing a framework for opening up the exceptional balancing measures to DP_{PG}, and the needs for Elia to acquire additional volumes. For the latter, a **second main conclusion is that there is no urgent need to be able to call additional volumes of flexibility for the exceptional balancing measures** (i.e., **on top of the flexibility available from slow units of the type DP_{SU}**). In addition, based on the limited experiences with services in which flexibility that does not comply with the FRR requirements could be offered, such as the Winter product and the participation of DP_{PG} to day-ahead and intraday markets, there is no clear evidence that there are significant volumes that would additionally be made available. Therefore, a **third conclusion is that there is a large uncertainty regarding the additional volumes that would be made available** in case the exceptional balancing measures would be opened up to all technologies.

Taking into consideration that i) the potential benefits for implementing a technology-neutral framework in the coming years are expected to be low , ii) the potential additional volumes that could be obtained are highly uncertain, and iii) the implementation of a technology neutral framework requires resources from both Elia and the market parties that cannot be spent on other projects, **Elia considers that developing a technology-neutral framework for the exceptional balancing measures by opening it up to participation of DP_{PG} does currently not have a high priority**. For this reason, **Elia does not recommend implementation at this point.**

However, the relevance of extending the current framework for exceptional balancing measures might increase in the future and would need to be re-evaluated. For instance, with the further increase of the offshore generation, storm situations can impose important balancing challenges that need to be adequately managed. In this context, Elia has been and will continue to discuss the need for specific measures to deal with these events with all concerned stakeholders and the regulator. Via the current public consultation, Elia also invites stakeholders to share their views regarding the robustness of the conclusions of the current study in the medium term future in light of upcoming changes in the Belgian electricity system and markets

Although Elia does not recommend an implementation at this point, the study does propose an operational and contractual framework for opening up the exceptional balancing measures to all technologies. This proposal is intended to serve as a basis for an eventual implementation at a later moment. The proposed design involves maintaining the existing contractual framework based on the T&C Scheduling Agent for slow units of the type $DP_{SU,}$ and establishing a new contractual framework for slow units of the type DP_{PG}. The proposed bid properties for the flexibility offered by slow units of the type DP_{PG} in the context of the new contractual framework aim to enable FSPs to reflect the specific constraints faced (such as a full activation time and the maximum activation duration). Finally, the introduction of this new contractual framework would only require minor changes to the current operational procedures for the exceptional balancing measures.

7. Implementation plan

The implementation of the proposed technology-neutral framework for the exceptional balancing measures (as described in Section 5) would require **IT developments and adaptations of operational processes at Elia side, as well as new processes to be put in place for FSPs** that would like to offer flexibility from DP_{PG} as part of the exceptional balancing measures**.**

In addition, the development of a framework to enable the participation of all technologies to the exceptional balancing measures would **require creating a new contract for the flexibility offered by slow units of the type DP_{PG}** in the framework of the exceptional balancing measures and require **small amendments to the LFCBOA and the Balancing Rules**. In order to avoid an excessive number of revisions of the different regulated documents (with associated public consultations), Elia would strive to synchronize the required modifications for an eventual implementation as much as possible with other modifications of these documents. In this regard, the proposed design described in Section 5 enables an early discussion with the different stakeholders, thereby possibly enabling a faster implementation at the moment the benefits for an implementation are more significant (or are expected to become more significant in the near term future).

Elia will consider these different constraints when discussing a more comprehensive implementation plan in the final report of this study.

Appendix A: Regulatory Framework

This appendix provides an overview of the relevant articles or sections of the regulatory framework.

SOGL

- Article 119 (LFC block operational agreements) (1): “By 12 months after entry into force of this Regulation, all TSOs of each LFC block shall jointly develop common proposals for:
  - (g) operational procedures in case of echausted FRR or RR in accordance with Article 152(8);
  - (k) the escalation procedure defined in accordance with Article 157(4) and, if applicable, the escalation procedure defined in accordance with Article 160(7);
  - (r) measures to reduce the FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16).”
- Article 152 (System states related to system frequency)
  - (8): “All TSOs of a LFC block shall specify operational procedures for cases of exhausted FRR or RR in the LFC block operational agreement. In those operational procedures the TSOs of a LFC block shall have the right to require changes in the active power production or consumption of power generating modules and demand units.”
  - (12): “If the 1-minute average of the FRCE of a LFC block is above the Level 2 FRCE range at least during the time necessary to restore frequency and where the TSOs of a LFC block do not expect that FRCE will be sufficiently reduced by undertaking the actions in paragraph 15, TSOs shall have the right to require changes in the active power production or consumption of power generating modules and demand units within their respective areas to reduce the FRCE as specified in paragraph 16.”
  - (13): “For the CE and Nordic synchronous areas, where the FRCE of a LFC block exceeds 25 % of the reference incident of the synchronous area for more than 30 consecutive minutes and if the TSOs of that LFC block do not expect to reduce sufficiently the FRCE with the actions taken pursuant to paragraph 15, the TSOs shall require changes in the active power production or consumption of power generating modules and demand units within their respective areas to reduce the FRCE as specified in paragraph 16.”
  - (16): “The TSOs of a LFC block shall specify, in the LFC block operational agreement, measures to reduce the FRCE by means of changes in the active power production or consumption of power generating modules and demand units within their area.”
- Article 157 (FRR dimensioning) (4): “All TSOs of a LFC block shall have sufficient reserve capacity on FRR at any time in accordance with the FRR dimensioning rules. The TSOs of a LFC block shall specify in the LFC block operational agreement an escalation procedure for cases of severe risk of insufficient reserve capacity on FRR in the LFC block.”

Federal Grid Code

- Article 226 §1:
    - Dutch version:
        - “De aanbieder van balanceringsdiensten stelt het beschikbare opwaartse of neerwaartse actieve vermogen onder de vorm van aanbiedingen van balanceringsenergie ter beschikking van de transmissienetbeheerder, voor:
            - 1° elke elektriciteitsproductie-eenheid of productiepark in de regelzone bedoeld in artikel 35, § 2, eerste lid, beschouwd als bestaande of nieuwe, overeenkomstig artikel 35, §§ 7 en 8, van het type C of D volgens de classificatie van artikel 35, § 2, derde lid, en waarvan het nominale vermogen voor de toegang tot het net hoger is dan of gelijk is aan 25 MW;
            - 2° elk asynchroon opslagpark in de regelzone, beschouwd als bestaand of nieuw overeenkomstig artikel 35, § 9, en van het type C of D overeenkomstig de classificatie van artikel 35, § 4.”
    - French version:
        - “Le fournisseur de services d'équilibrage tient à disposition du gestionnaire de réseau de transport sous forme d'offres d'énergie d'équilibrage la puissance active disponible à la hausse et à la baisse sur :
            - 1° toute unité de production d'électricité ou parc de générateurs de la zone de réglage visés à l'article 35, § 2, alinéa 1er, considéré comme existant(e) ou nouveau(nouvelle) conformément à l'article 35, §§ 7, et 8, de type C ou D conformément au classement l'article 35, § 2, alinéa 3, et dont la puissance nominale pour l'accès au réseau est supérieure ou égale à 25 MW ;
            - 2° tout parc non-synchrone de stockage dans la zone de réglage, considéré comme existant ou nouveau conformément à l'article 35, § 9, et de type C ou D conformément au classement de l'article 35, § 4. »
- Article 248:
    - Dutch version:
        - §1: “De transmissienet- of CDS-gebruiker of de derde die hij aanduidt als programma-agent voor elke elektrische installatie die het voorwerp uitmaakt van een verplichte programmering zoals bedoeld in artikel 246, § 1, houdt het actief vermogen dat op die installatie opwaarts en neerwaarts beschikbaar is ter beschikking van de transmissienetbeheerder opdat die onder meer de corrigerende acties van redispatching kan uitvoeren. De inschrijving voor dat vermogen wordt vergezeld van een prijsopgave die voldoet aan de criteria, die vastgelegd worden in de in artikel 249 bepaalde modaliteiten en voorwaarden die van toepassing zijn op de programma-agenten en verloopt volgens de regels vastgelegd in dezelfde modaliteiten en voorwaarden.”

        - §2: “Elke netgebruiker kan op vrijwillige basis aan de transmissienetbeheerder de beschikbaarstelling van actief vermogen vanaf één of meerdere verbruikerseenheden, zoals bepaald in artikel 2.4 van de Europese netwerkcode DCC, voorstellen. En dit op voorwaarde dat hij beantwoordt aan de technische specificaties voor beschikbaarstelling van vermogen en aan de deelnemingsvoorwaarden voorzien in de modaliteiten en voorwaarden van toepassing op de programma-agent zoals bedoeld in artikel 249. Daarvoor moet hij ook hetzij programma-agent worden van zijn verbruikseenheid/eenheden van waaruit hij vermogen ter beschikking wil stellen, hetzij een derde aanduiden om die functie te vervullen overeenkomstig artikel 110.3 van de Europees richtsnoeren SOGL.”
    - French version:
        - §1: “L'utilisateur de réseau de transport ou utilisateur de CDS ou le tiers qu'il désigne comme responsable de la programmation pour toute installation électrique faisant l'objet d'une programmation obligatoire telle que visée à l'article 246, § 1er, tient à disposition du gestionnaire de réseau de transport la puissance active disponible à la hausse et à la baisse sur cette installation en vue notamment de permettre au gestionnaire de réseau de transport d'effectuer des actions correctives de redispatching. L'inscription pour cette puissance est accompagnée d'une offre de prix répondant aux critères établis dans les modalités et conditions applicables aux responsables de la programmation visées à l'article 249 et se fait selon des règles stipulées dans ces mêmes modalités et conditions.”
        - §2: “Tout utilisateur de réseau peut, sur base volontaire, proposer au gestionnaire de réseau de transport la mise à disposition de puissance active à partir d'une ou plusieurs unités de consommation telles que définies à l'article 2.4 de la ligne directrice européenne DCC. Et ce à condition de répondre aux spécifications techniques de mise à disposition de puissance et aux conditions de participation prévues dans les modalités et conditions applicables aux responsables de la programmation visées à l'article 249. Il doit pour ce faire également soit devenir responsable de la programmation de son/ ses unité(s) de consommation à partir de laquelle/ lesquelles il souhaite mettre de la puissance à disposition, soit désigner un tiers pour assurer cette fonction conformément à l'article 110.3 de la ligne directrice européenne SOGL.”
- Article 246 §1:
    - Dutch version: “Elke installatie die valt onder de categorieën beschreven in artikel 242, § 2, 1° en 2°, moet het voorwerp uitmaken van de informatie die aan de transmissienetbeheerder wordt verstuurd betreffende de programmering van de productie of van het verbruik van de installatie.”
    - French version: “Toute installation faisant partie des catégories décrites aux 1° et 2° de l'article 242, § 2, doit faire l'objet de l'envoi au gestionnaire de réseau de transport d'informations relatives à la programmation de production ou de consommation de l'installation.”

Balancing Rules

- Article 8 (Additional resources in exceptional circumstances):
    - §1: “In exceptional circumstances and in compliance with Article 13, Elia may use additional resources as described in §2 and §3.”
    - §2: “Units with Technical Limitations
        1. In accordance with article 7(2) of the LFC BOA Elia may, under exceptional circumstances, activate reserve providing units or reserve providing groups that cannot be activated via the FRR processes (hereafter referred to as “Units with Technical Limitations”), via a separate measure as described in Article 13(1).
        2. Elia makes use of the Units with Technical Limitations that, in application of article 226 §1 of the Federal Grid Code, put the remaining available active power at the disposal of Elia (being all generation units and asynchronous storage units with a nominal power of 25MW or more, regardless of their responsiveness in accordance with the requirements of the balancing products).
        3. The activation of Units with Technical Limitations for the purpose of balancing is settled via the modalities of the CIPU Contract.”
- Article 13 (Activation of additional resources in exceptional circumstances):
    - §1: “If the volumes activated in accordance with Article 11 and Article 12 are not sufficient, Elia may activate Units with Technical Limitations in accordance with article 7 of the LFC BOA and with Article 8(1).
        - Elia activates Units with Technical Limitations striving towards techno-economic efficiency, i.e. at the lowest cost taking into account system constraints, and therefore the availability and the technical properties of the concerned units aiming at the lowest cost for activation.”

LFCBOA

- **Article 7 (Measures to reduce the FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16) of the SOGL)**:
    1. Under the measures to reduce the FRCE, Elia mitigates close to real time a high and enduring FRCE which is not expected to be controlled by the frequency restoration process as defined in Article 143 of the SOGL, nor by means of the mitigation measures as part of the operational procedures for exhausted FRR (cf. Article 12) and/or of the escalation procedure for FRR (cf. Article 13). The measures to reduce the FRCE are activated if Elia observes:
        a. as specified in Article 152(12), the 1-minute average of the FRCE of a LFC block going above the Level 2 FRCE range at least during the time necessary to restore frequency and where the TSOs of a LFC block do not expect that FRCE will be sufficiently reduced by undertaking the actions as specified in Section B-9-1 of the synchronous area operational agreement in accordance Article 152(15) of the SOGL ;

b. as specified in Article 152(13), the FRCE of a LFC block exceeding 25 % of the reference incident of the synchronous area for more than 30 consecutive minutes and where the TSOs of that LFC block do not expect to reduce sufficiently the FRCE with the actions taken pursuant to Article 152(15) of the SOGL and specified in Section B-9-1 of the synchronous area operational agreement.

2. Within this procedure, Elia may :
    a. publish a balancing warning communication asking all BSPs to submit additional FRR non-contracted balancing energy bids and informing all BRPs such that they can adapt injections and off-take in their portfolio accordingly;
    b. activate remaining energy on FRR balancing energy bids which is available but which could no longer be selected for activation on the balancing energy exchange platforms;
    c. activate units subject to the Terms and Conditions Scheduling Agent, in line with Article 248 of the Federal Grid Code, and that cannot be activated via the FRR processes. Elia will strive towards techno-economic efficiency by taking into account the maximum and minimum output, start-up time, start-up costs and other technical constraints if relevant;
    d. request changes in the active power production or consumption of power generating modules and demand units within their area.
3. The flexibility activated by Elia via this procedure is limited to the capacity needed to bring the large FRCE back to an acceptable level (i.e. below the conditions specified in Article 152(12) and 152(13) of the SOGL).
4. Elia shall prepare, at least on annual basis, an overview with a list of events following the triggers specified in paragraph 1, as well as a short motivation on the use of one or more measures specified in paragraph 2.
5. At the latest 15 working days after the use of one of the measures specified in paragraph 2(b), 2(c) or 3(d), Elia shall prepare a report containing a description and justification for this action and submit it to the CREG. The report shall at least contain:
    a. A description of the exceptional event;
    b. The result of the evaluations carried out in accordance with paragraph 1, including the values of the parameters mentioned and the timing of those evaluations;
    c. The energy activated per unit and per 15 minute balancing energy market time unit and the attained techno-economic efficiency in accordance with paragraph 2, including a justification for deviating from the techno-economic optimum, if applicable;
    d. The lessons learned from the exceptional event and, if relevant :
        i. concrete recommendations that could ease the management of the following exceptional events;
        ii. actions Elia intends to take, or is taking, in order to verify or enforce the compliance of market parties with their contractual obligations towards Elia.”

- **Article 12 (Operational procedures in case of exhausted FRR in accordance with Article 152(8) of the SOGL)**:"
  1. As referred to in Article 152(8) of the SOGL, Elia specifies the operational procedures for cases of exhausted FRR. In this operational procedure Elia has the right to require changes in the active power production or consumption of power generating modules and demand units.
  2. The operational procedure described in paragraph 1 shall be activated only when Elia detects an exceptional event which has not been fully taken into account in the FRR needs.
  3. As from the detection of an upcoming exceptional event specified in paragraph 2(a), for each 15 minute balancing energy market time unit during which the exceptional event is expected to impact the FRCE in the LFC Block, Elia continuously evaluates the residual risk by subtracting (b) and (c) from (a), with :
     a. the volume at risk, which is calculated as the possible loss of injection / increase of off-take following the event, corrected with mitigation measures if applicable. For sea storm events, the calculation method is described in Appendix 6 of the BRP Contract. For yet unidentified events, a description of the calculation method to cover the volume risk will be submitted to the National Regulatory Authority within one year after the event.
     b. available balancing means which are calculated as the sum of :
        i. the procurement of balancing capacity within control area and exchange of balancing capacity with neighbouring TSOs, when applicable pursuant to article 32(1)a of the EBGL,
        ii. sharing of reserves, when applicable pursuant to Article 32(1)b of the EBGL,
        iii. the volume of balancing energy bids which are not contracted by Elia and which are expected to be available both within its control area and within the European platforms taking into account the available crosszonal capacity pursuant to Article 32(1)c of the EBGL.
     c. the expected impact of the operational procedures for the alert state due to a violation of system frequency limits, as specified in the synchronous area operation agreement pursuant article 152(10) SOGL and article 152(15) SOGL.
  4. When during two or more consecutive periods specified by the 15 minute balancing energy market time unit, the residual risk, as calculated in paragraph 3, exceeds the Level 2 FRCE range, for these periods, Elia may:
     a. publish balancing warning communication with the aim of :
        i. asking all BSPs to submit additional FRR non-contracted balancing energy bids;
        ii. informing all BRPs such that they can adapt injections and off-take in their portfolio accordingly;
     b. activate units which are available in line with requirements of the T&C Scheduling Agent, in line with Article 248 of the Federal Grid Code, and that cannot be activated via the FRR processes. Once these units are activated, they facilitate the availability of balancing energy bids on these units via the FRR processes. These units shall be activated at the latest point in time

for Elia to take action while taking into account the latest available information following the balancing warnings and the communications with BRP contributing to the residual risk specified in paragraph 3, Elia will strive towards techno-economic efficiency by taking into account the duration and magnitude of the definite risk and the maximum and minimum output, start-up time, start-up costs and other technical constraints if relevant.

5. The units determined for activation are effectively activated taking into account the start-up time of the selected units in order to control the FRCE during the periods with definite risk as specified in paragraph 4, or if not possible, as soon as possible after the beginning of the anticipated event. The units remain activated for the entire period of the definite risk. The activation period can be shortened or prolonged depending on the calculation described in paragraphs 3.
6. Elia shall prepare, at least on annual basis, an overview with a list of events following the triggers specified in paragraph 3, as well as a short motivation on the use of one or more measures specified in paragraph 2.
7. At the latest 15 working days after the activation of units following the measure described in paragraph 4(b), Elia shall submit a report containing a description and justification for this action to the CREG. The report shall at least contain:
    a. a description of the exceptional event;
    b. the result of the evaluations carried out in accordance with paragraph 3, including the values of the parameters mentioned and the timing of those evaluations;
    c. the result of the evaluations carried out in accordance with paragraph 4, including the timing of the evaluations;
    d. the energy activated per unit and per period specified by the time to restore frequency and the attained techno-economic efficiency in accordance with paragraph 5 and 6, including a justification for deviating from the techno-economic optimum, if applicable;
    e. any actions Elia intends to take, or is taking, in order to verify or enforce the compliance of market parties with their contractual obligations towards Elia;
    f. the lessons learned from the exceptional event and, if relevant, concrete recommendations that could ease the management of the following exceptional events."

- **Article 13 (Escalation Procedures in accordance with Article 157(4) of the SOGL)**: "
    1. As referred to Article 157(4) of the SOGL, Elia ensures to have sufficient reserve capacity on FRR at any time in accordance with the FRR dimensioning rules. In cases of severe risk of insufficient reserve capacity on FRR in the LFC block, and only under exceptional circumstances, Elia uses the escalation procedure.
    2. The operational procedure described in paragraph 1 can only be used if the FRR means required to cover the FRR needs following the dimensioning of FRR are not available.
    3. Elia evaluates on a continuous basis for each period specified by the 15 minute balancing energy market time unit, the residual risk by subtracting (b) from (a), with :
        a. FRR needs as calculated in the FRR dimensioning (Title 3) and.

b. available balancing means which are calculated as the sum of :
    i. the procurement of balancing capacity within control area and exchange of balancing capacity with neighbouring TSOs, when applicable pursuant to article 32(1)a of the EBGL,
    ii. sharing of reserves, when applicable pursuant to Article 32(1)b of the EBGL,
    iii. the volume of balancing energy bids which are not contracted by Elia and which are expected to be available both within its control area and within the European platforms taking into account the available crosszonal capacity pursuant to Article 32(1)c of the EBGL.

c. the expected impact of the operational procedures for the alert state due to a violation of system frequency limits, as specified in the synchronous area operation agreement pursuant article 152(10) SOGL and article 152(15) SOGL.

4. When during two or more consecutive periods specified by the 15 minute balancing energy market time unit, the residual risk, as calculated in paragraph 3, exceeds the Level 2 FRCE range, for these periods, Elia may:
    a. publish balancing warning communication with the aim of :
        i. asking all BSPs to submit additional FRR non-contracted balancing energy bids;
        ii. informing all BRPs such that they can adapt injections and off-take in their portfolio accordingly;
    b. activate units which are available in line with requirements of the T&C Scheduling Agent, in line with Article 248 of the Federal Grid Code, and that cannot be activated via the FRR processes. Once these units are activated, they facilitate the availability of balancing energy bids on these units via the FRR processes. These units shall be activated at the latest point in time for Elia to take action while taking into account the latest available information following the balancing warnings and the communications with BRP contributing to the residual risk specified in paragraph 3, Elia will strive towards techno-economic efficiency by taking into account the duration and magnitude of the definite risk and the maximum and minimum output, start-up time, start-up costs and other technical constraints if relevant.
5. The units determined for activation are effectively activated taking into account the start-up time of the selected units in order to control the FRCE during the periods with definite risk as specified in paragraph 4, or if not possible, as soon as possible after the beginning of this period. The units remain activated for the entire period of the forecasted event. The activation period can be shortened or prolonged following the updated evaluations as referred to in paragraph 3.
6. Elia shall prepare, at least on annual basis, an overview with a list of events following the triggers specified in paragraph 3, as well as a short motivation on the use of one or more measures specified in paragraph 4.
7. At the latest 15 working days after the activation of units following the measure described in paragraph 4(b), Elia shall submit a report containing a description and justification for this action to the CREG. The report shall at least contain:
    a. a description of the exceptional circumstances;

b. the result of the evaluations carried out in accordance with paragraph 3, including the values of the parameters mentioned and the timing of those evaluations;
c. the result of the evaluations carried out in accordance with paragraph 4, including the timing of the evaluations;
d. the energy activated per unit and per period specified by the time to restore frequency and the attained techno-economic efficiency in accordance with paragraph 5 and 6, including a justification for deviating from the techno-economic optimum, if applicable;