ELIA

EXPLANATORY NOTE ON THE PUBLIC CONSULTATION OF THE PROPOSAL OF AMENDMENTS OF THE T&C BSP FCR

Content

Practical information

This note serves as an explanation for the current consultation on the proposal for amendments to the Terms and Conditions for balancing service providers for the Frequency Containment Reserve Service (hereafter referred to as “T&C BSP FCR”). The purpose of this consultation is to obtain comments from the market parties. At the end of the public consultation, Elia will send a consultation report to the CREG and will publish a non-confidential version on its website.

All responses to this public consultation will be made public on Elia’s website, except those comments for which market parties ask to treat their contribution as confidential. However, all responses to this public consultation will be submitted to the relevant regulatory authorities in the context of the official approval procedure for the T&C BSP FCR.

Elia invites all stakeholders to submit any comments and suggestions they may have on the documents submitted for consultation. The consultation period runs from **18th of October until the 18th of November** 2024. All responses must be submitted via the online form on the Elia website. The proposal for amendments to the T&C BSP FCR is available for consultation on the Elia website.

1. Introduction

This proposal for amendments to the Terms and Conditions for balancing service providers for the Frequency Containment Reserve Service (T&C BSP FCR) consists of:

- Amendments relative to data exchange with third parties
- Amendments relative to the Additional properties
    - Amendments relative to the prequalification of non-compliant units
    - Amendments relative to the rated to prequalified power ratio for LER DPs
    - Amendments relative to the introduction of Reserve Mode for LER DPs
    - Amendments relative to frequency measurement and controller

These amendments have been discussed with stakeholders during a dedicated workshop[1] that took place on 21st of June 2024.

[1] The slides of the workshop can be found here: **20240621 workshop wg balancing (elia.be)**

2. Proposed amendments

2.1 Proposed amendments relative to data exchanges with third parties

Currently, the T&C BSP FCR describes the requirements for real-time communication between the BSP and Elia. However, in practice, the BSP is not necessarily the owner of the real-time data and a third-party must be introduced. For example, a BSP can contract volume through a technology provider with a pool of LV units. In this case, the technology provider may collect and delivers the individual measurement data to Elia. The BSP does not handle any individual unit data.

In this regard, the proposal for amendment describes the process for the BSP to appeal to one or several third parties with respect to the delivery of measurement data to Elia.

The amendment describes that the BSP must sign and send the declaration to the contractual responsible at Elia. This declaration can be found in **Annex 11.E** of the T&C BSP FCR.

This leads to amendments in **Annex 11.E.**

2.2 Proposed amendments relative to the Additional Properties

On 30th of June 2021, all NRAs of the Continental Europe Synchronous Area have approved the Additional properties of FCR (hereafter, referred to as “Additional Properties”) in accordance with Article 154(2) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (“SO Regulation”). This methodology introduces common additional properties of the

FCR required to ensure operational security in the Continental Europe Synchronous Area (SACE).

The details of the Additional Properties have been presented and discussed during the incentive study of 2022[2].

2.2.1 Proposed amendments relative to the prequalification of non-compliant units

SO Regulation Art. 154.7 defines the FCR technical minimum requirements, which determine the acceptable range of the normal FCR activation: *"Each TSO of the CE synchronous area shall ensure that the combined reaction of FCR of a LFC area comply with the following requirements:*
a) the activation of FCR shall not be artificially delayed and begin as soon as possible after a frequency deviation;

b) in case of a frequency deviation equal to or larger than 200 mHz, at least 50 % of the full FCR capacity shall be delivered at the latest after 15 seconds;

c) in case of a frequency deviation equal to or larger than 200 mHz, 100 % of the full FCR capacity shall be delivered at the latest after 30 seconds;

d) in case of a frequency deviation equal to or larger than 200 mHz, the activation of the full FCR capacity shall rise at least linearly from 15 to 30 seconds; and

e) in case of a frequency deviation smaller than 200 mHz the related activated FCR capacity shall be at least proportional with the same time behaviour referred to in points (a) to (d)."

In addition to the SO Regulation, the Additional Properties Art. 3.2 completes the requirements:
"Each TSO shall ensure that the activation of FCR providing units and FCR providing groups:

[2] **20220429_Public consultation on the Analysis and implementation of the FCR evolutions in accordance to article 154(2) of SOGL (elia.be)**

a) is not artificially delayed and begins as soon as possible but no later than 2 seconds after a frequency deviation; and

b) rises at least linearly."

The Additional Properties also provide a possibility for the BSP to derogate to the expected FCR activation for assets which can demonstrate a technical limitation, and if approved by the TSO:
"When one of the requirements a) or b) cannot be met, the FCR providing group or FCR providing unit shall provide technical evidence to the reserve connecting TSO. The reserve connecting TSO assesses these justifications and decides whether or not the unit or group can be qualified to provide FCR. A refusal to be qualified shall be duly motivated by the reserve connecting TSO. The motivated decision shall be communicated to the FCR provider and relevant regulatory authority."

In this regard, the proposal for amendment of the T&C BSP FCR describes the possibility for BSPs to request a derogation with the TSO. This request must be performed before prequalification as the BSP should provide sufficient evidence of the technical limitations of the asset.

This leads to amendments in **Art. II.11.**

2.2.2 Proposed amendments relative to the derogation to the rated to prequalified power ratio for LER DPs

The Additional properties also introduces new guidelines regarding the FCR capacity which can be prequalified for assets with a limited energy reservoir (LER) and the possibility to deviate from this default.

New concepts

The SO Regulation uses the concept of Limited Energy Reservoir without defining it. Elia proposed a definition in its last review of the T&C BSP FCR, which needs to be adapted with the Additional Properties.

The Additional Properties pursuant to the definition in Art. 3.5 state:

"FCR providing units or FCR providing groups are deemed as LER FCR Providing Units or LER FCR Providing Groups in case a full continuous activation for a period of 2 hours in either positive or negative direction might, without consideration of the effect of an Active Energy Reservoir management, lead to a limitation of its capability to provide the full FCR activation […], due to the depletion of its energy reservoir(s) taking into account the Effective Energy Reservoir effectively available".

This new definition is different from Elia's definition of Delivery Point with Limited Energy Reservoir[3] (DP LER). Firstly, the time constraint is changed from the time frame contracted by Elia to 2 hours. Secondly, the definition of the T&C BSP FCR foresees that even with the use of the Energy Management Strategy (EMS), the DP LER is not able to provide the full FCR activation. Finally, the introduction of the definition of the Effective Energy Reservoir pursuant to the Additional Properties Art. 2.2(d) brings clarity on what can be considered as "effective". The energy reservoir to be considered shall be the one "which can effectively be used for energy feed/absorption". If part of a reservoir is reserved for other purposes (e.g. self-consumption of home batteries, provision of other services …) and cannot be used for FCR activation, then this part shall not be taken into account.

The proposed amendments adapt the concept of Delivery Point with limit energy reservoir (DP LER);

> *Delivery Point with Limited Energy Reservoir = As defined in Article 2(2) of the Additional Properties. A Delivery Point part of a Providing Group for which the full activation of FCR for a period of 2 hours in either positive or negative direction might, without consideration of the effect of an Active Energy Reservoir*

[3] As defined in T&C BSP FCR of 01/07/2020 Art. II.1 (23): A Delivery Point for which the full activation of FCR for the time frame contracted by ELIA might, even in case of an active energy reservoir management, lead to a limitation of its capability to provide the full FCR activation due to the depletion of its energy reservoir(s) taking into account the effective energy reservoir(s) available at the beginning of that time frame.

Management, lead to a limitation of its capability to provide the full FCR activation due to the depletion of its energy reservoir(s) taking into account the Effective Energy Reservoir effectively available. In case a Delivery Point is registered to deliver both FCR and aFRR Service and is defined as a Delivery Point with Limited Energy Reservoir in accordance with article II.1 of the T&C BSP aFRR, it is considered a Delivery Point with Limited Energy Reservoir in the BSP Contract FCR.

And introduce the concept of the Effective Energy Reservoir:

Effective Energy Reservoir = As defined in article 2(2) of the Additional Properties: the energy reservoir of a storage device which can effectively be used for energy feed/absorption;

The Prequalified power ratio

The amendments also include the rationale for the prequalified power ratio for LER DPs. The Additional Properties Art. 3.5 states: "[…]

- For prequalification, the TSOs shall require that: To enable an Active Energy Reservoir Management, LER FCR Providing Units or LER FCR Providing Groups may prequalify a power for FCR limited to 0.8 of the rated power (i.e. a ratio of rated power to prequalified power of at least 1.25:1); a deviation from this requirement is possible in case an alternative solution with an equivalent effect as in guaranteeing a continuous FCR provision while applying an Energy Reservoir Management. Any lead time for the charging process needs to be considered for Active Energy Reservoir management. […]"

This ratio ensures that the FCR from FCR Providing Unit or Groups with limited energy reservoirs are continuously available during Normal State. This ratio allows stand-alone batteries to fulfill this obligation.

For example, a battery with a rated power of 1.25 MW can at maximum pre-qualify 1 MW for the provision of FCR according to the ratio. Thus 0.25 MW of the battery may

be used in the Energy Management Strategy (EMS) to charge the battery when necessary. If the frequency deviation remains at +/- 50 mHz indefinitely and therefore remains in Normal State, the battery shall produce 25% of the contracted FCR Service. With 0.25 MW of charging capacity, the battery is capable at all times to fulfill its obligation.

If the Frequency Deviation reaches above +/- 50 mHz continuously, it will cause the triggering of Alert State[4] and the asset must be able to deliver a full activation of the FCR Obligation during a period of 25 minutes from the moment the Frequency Deviation first exceeds the +/-50 mHz limit.

Considering the ratio rated power/prequalified power has been set to ensure that the FCR Providing Unit or Group is able to fulfill the above-mentioned obligation, Elia considers that any DP LER may be prequalified with a ratio between [1;1.25] if the BSP demonstrates that the obligation is still fulfilled. The BSP should demonstrate this in their Energy Management Strategy (EMS).

This leads to amendments in **Article II.1 & Article II.7.**

2.2.3 Proposed amendments relative to the introduction of Reserve Mode for LER DPs

The Additional Properties Art. 3 introduces a new operating mode, the Reserve Mode for which: *"[…], LER FCR providing units (either single or belonging to a LER FCR providing group) that are prequalified for the first time after the entry into force of the Additional Properties and are technically capable (especially inverter-connected assets) shall ensure that close to the upper or lower bounds of the energy reservoir the remaining capacity is sufficient for keeping a proper response on short-term frequency deviations*".

[4] The system switches from Normal State to Alert State if the frequency deviation is ≥50 mHz for 15 minutes or ≥100 mHz for 5 minutes.

So, the rationale for Reserve Mode is to ensure that Delivery Points with LER can maintain the provision of limited FCR activation based on short-term frequency deviations during Alert State and avoid depleted energy reservoirs. Without Reserve Mode, the LER would stop providing FCR, when its reservoir reaches its physical limits. With LER penetration increasing in the Synchronous Area, this introduces a risk during these extreme events. By introducing Reserve Mode, the BSP can guarantee a limited level of FCR delivery based on the zero-mean frequency during Alert Mode.

In this regard, the proposal for amendment of the T&C BSP FCR defines the concept of Reserve Mode:

Reserve Mode = As defined in article 2(2) of the Additional Properties: activation of active power response depending on short-term frequency deviations in relation to the mean frequency deviation;

The amendment also describes the process of shifting between Normal Mode and Reserve Mode by defining thresholds. When the Synchronous Area Continental Europe enters into Alert State (or Emergency State), and the LER DPs reach or exceed the upper (SoC_{max}) or lower (SoC_{min}) limit of their energy reservoir, these LER DPs shall switch to the Reserve Mode. These thresholds are defined by the amount of energy required to provide continuously FCR for a time interval equal to the local Full Activation Time (FAT) of aFRR:

$$SoC_{min} = \frac{P * t_{FAT}}{C}$$

$$SoC_{max} = 1 - SoC_{min}$$

Where:

- C is the energy capacity of the DP LER in MWh;
- P is the provided FCR Power corresponding to a frequency deviation of ±200 mHz, in MW;
- t_{FAT} is the Full Activation Time of aFRR in h, defined by Elia as 5 min.

The transition from Normal Mode to Reserve Mode is therefore initiated at instant $t_{start} = t(SoC \leq SoC_{min} \,|SoC \geq SoC_{max})$, in Alert State, and lasts t_{FAT}.

When the system is back to Normal State, the transition from Reserve Mode to Normal Mode is initiated when the State of Charge is restored, i.e. at instant $t_{restore} = t(SoC_{min} < SoC < SoC_{max})$.

Furthermore, the amendment describes the reaction function to be used by the DP LER during Reserve Mode, where the DP LER shall react to the zero-mean frequency Δf_{zm}:

$$\Delta f_{zm}(t) = \Delta f(t) - \frac{1}{t_{FAT}} \sum_{k=0}^{N_{FAT}-1} \Delta f(t - k * ts)$$

Where:

- ts is the Time Step;
- $N_{FAT} = \frac{t_{FAT}}{TS}$ is the number of timesteps in the time period of the Full Activation Time of aFRR.

As the transitions from one state to the other are linear, the reaction function is given by:

$$f_{reaction}(t) = \Delta f_{zm}(t) * T + (1 - T) * \Delta f(t)$$

Where:

- $f_{reaction}$ is the reaction function that provides the frequency deviation to which a BSP must react;
- Δf_{zm} is the zero-mean frequency which represents the short-term frequency deviation, determined with 3 decimals;
- $\Delta f = F - 50Hz$ is the frequency deviation, determined with 3 decimals;
- T is the weighting function that defines the operating mode.
    - In Normal Mode, $T = 0$;
    - In Reserve Mode, $T = 1$;
    - During transition from Normal Mode to Reserve Mode:

$$T = \begin{cases} 0 & t < t_{start} \\ \dfrac{t - t_{start}}{t_{FAT}} & t_{start} < t < t_{start} + t_{FAT} \\ 1 & t > t_{start} + t_{FAT} \end{cases}$$

    - During transition from Reserve mode to Normal Mode:

$$T = \begin{cases} 1 & t < t_{restore} \\ 1 - \dfrac{t - t_{restore}}{t_{FAT}} & t_{restore} < t < t_{restore} + t_{FAT} \\ 0 & t > t_{restore} + t_{FAT} \end{cases}$$

This leads to amendments in **Art. II.11** and **Annex 11.B.**

The BSP must successfully demonstrate its Reserve Mode control before the participation of its first Providing Group with Reserve Mode in a prequalification test, by providing Elia with a simulation of their FCR delivery in a frequency scenario covering both Normal Mode and Reserve Mode FCR Delivery, and the transition period.

This simulation must be carried out using a template and must be as close as possible to the actual behavior during operations. The template is made available in the file “FCR Reserve Mode Simulation Template” which is published on the ELIA website and is available on demand by e-mail to the contractual responsible as mentioned in Annex 15.

Additionally, Elia will investigate introducing an extra control on Reserve Mode during the prequalification test so the BSP can demonstrate that Reserve Mode is implemented. This additional control could be included once Elia introduces Continuous Activation Control for FCR.

This leads to the addition of **Art. II.6** & **Annex 6.**

2.2.4 Proposed amendments relative to Frequency Measurement and Controller

One of the risks of decentralized assets with a centralized control model that relies on a central frequency measurement, is the inappropriate FCR activation of assets during a system split. A system split in a synchronous area is a separation of the synchronous area in two or more areas of different frequencies due to the generation and load

repartition. This usually happens due to the outage of multiples transmission network elements (in cascade), linking the areas.

In case of system split, the main risk linked to a Centralized FCR Controller with a unique frequency measurement is that the assets are not reacting correctly to the local frequency but rather to a frequency measurement made in another area. For example, if the frequency measurement is in an under-frequency area, all assets located in an over-frequency area will further deteriorate the frequency of their area. If there are several under-frequency areas in the system split, the FCR activation may still not be proportionate to the right local frequency deviation.

The following figure shows a part of the Belgian grid. Each of the squares represents a decentralized asset. The green line represents the fault-line, dividing Belgium into two zones with a different frequency, a system split.

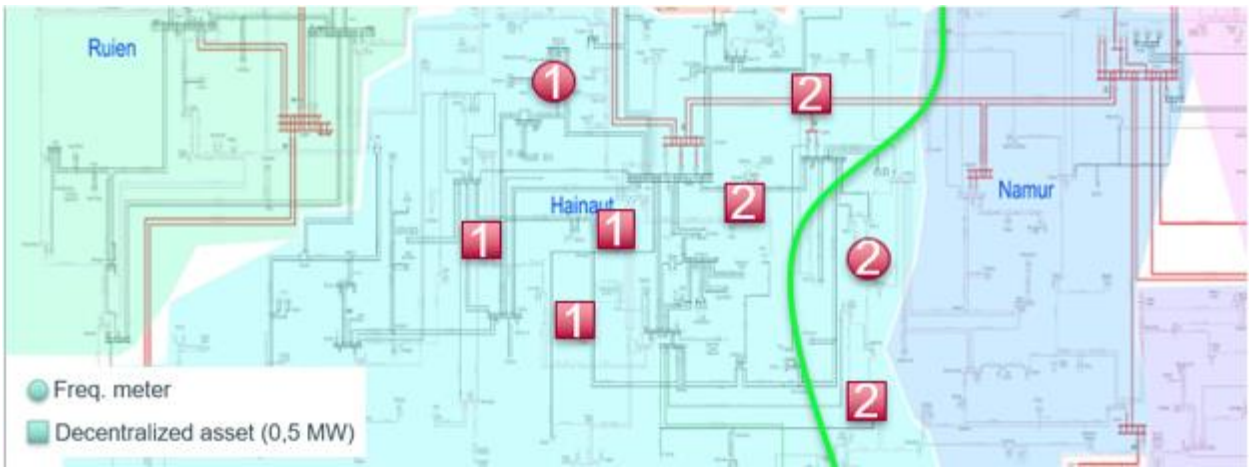

Figure 1: Illustration of part of the Belgian grid

If the BSP is using a centralized control, with only one frequency measurement (e.g. meter 1), the asset on the right of the green line will react to an inaccurate frequency and therefore its FCR delivery will be incorrect, worsening the situation.

The Additional properties therefore introduce requirements on frequency measurement and control. The study concludes that FCR providing groups shall implement one of the following approaches:

- Decentralized frequency measurements per connection point. In this approach, the FCR Providing Unit uses local frequency measurements to determine the FCR Requested. Since local frequency measurements are used, there is no risk of incorrect FCR delivery during a system split scenario.
- A centralized FCR controller with decentralized frequency measurements per connection point to be used as a fallback in case of an error in the centralized control or in case of a system split affecting the perimeter of the group. In this approach a central FCR controller is used to determine the reaction of the FCR Providing Units or Group. However, the BSP implements an observation function, which uses local frequency measurements to detect a system split in the perimeter of the group. Each DP linked to the centralized FCR controller has a frequency meter to provide the observation function with input.
- An alternative solution in which the decentralized frequency measurements can be shared amongst delivery points in the same electrical zone as defined by Elia[5], provided the total contribution of the assets reacting to one measurement point does not exceed 1.5 MW. This approach differs from the second approach by not including a local frequency meter at each DPs but sharing frequency meters between DPs in the same electrical zone up to a shared capacity of 1.5 MW. As frequency measurements must be local, meaning that a frequency meter must be installed at the site of each Delivery Point, with an exception for Virtual Delivery Points and Technical Units used as part of the Energy Management Strategy which are not performing the FCR Service, the third approach is only viable for Virtual Delivery Points.

The following figure shows part the Belgian grid divided into several electrical zones, with a different color identifying each of the zones. Each of the colored bubbles

[5] At the moment of submitting the Rules the number of zones is ten: 380, Hainaut East, Hainaut West, Langerbrugge East, Langerbrugge West, Ruien, Merksem, Stalen, Liège and Schaerbeek.. However this number can change if Operational Security Analysis indicates a need or if requested by market parties. If this need is detected Elia will present its analysis to the impacted market parties before adapting the number of Electrical Zones. Before implementing the update of the number of Electrical Zones the impacted market parties will be informed of the moment from which the update will apply.

represents a local frequency measurement. The green line represents a system split. If the BSP introduces the alternative solution in the example, two frequency meters are required, as the BSP has 6 assets of 0.5 MW in the Hainaut electrical zone.

As mentioned before, in case of a system split, there is an intrinsic risk that some of the assets are reacting improperly. If the BSP uses the alternative solution, it must introduce a second meter. In this case, the two assets, having a Centralized Controller using frequency measurements of meter 2, to the left of the system split are not reacting properly. This means the improper FCR activation is limited to 1 MW. If only frequency meter 2 was used for all assets in this electrical zone, the improper activation of FCR would be 2.5 MW. By capping the volume steered by one centralized frequency measurement, the amount of improper FCR activation is limited in case of a system split.

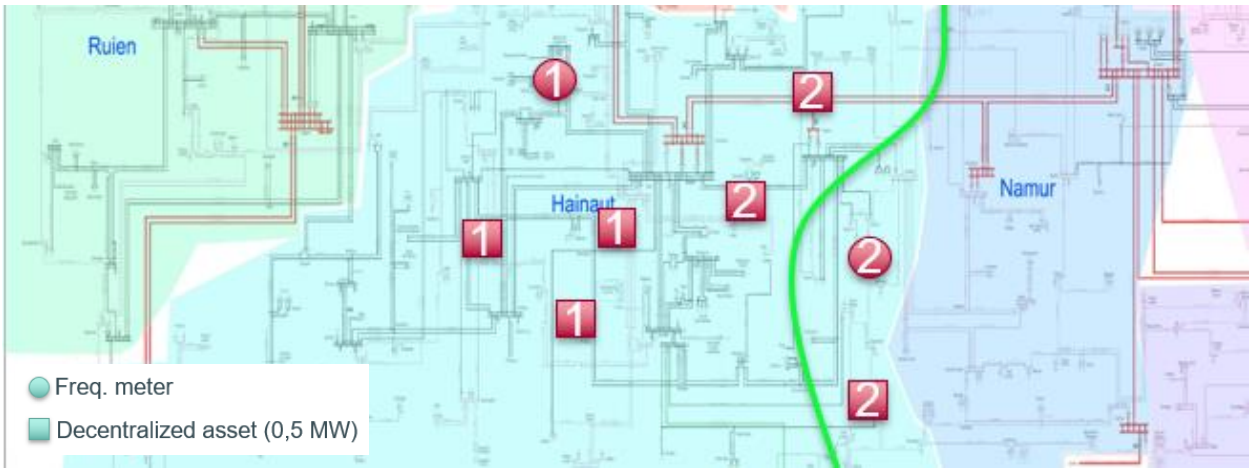

Figure 2: Illustration of part of the Belgian grid

In this regard, the proposal for amendment of the T&C BSP FCR specifies the frequency measurement requirements for Delivery Points to comply with the requirements for provision of the FCR service in case of system split.

To this purpose, the BSP needs to demonstrate that its proposed system split countermeasures are effective and shall use as much as possible local frequency measurement. The required information for the system split countermeasures is described in the document “FCR System Split Countermeasures Requirements” which is published on the ELIA website and is available on demand by e-mail to the contractual responsible.

This leads to amendments in **Art. II.3** and **Annex 2.E.**

2.3 Other amendments

Next to the amendments described above, several smaller amendments to the T&C BSP FCR have been included in this proposal for amendment.

Firstly, in **Annex 8.B**, the auction calendar is adapted to include the FCR Gate Opening Time of D-7 instead of the previously used D-14. This change was publicly consulted between 25 May and 25 June 2021[6] as part of the Amended TSOs' proposal for the establishment of common and harmonized rules and processes for the exchange and procurement of Balancing Capacity for FCR in accordance with Article 33 of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing and approved by all respective regulatory authorities.

Secondly, the wording of penalties is adapted to incentives to better represent the purpose of the procedure and structures.

Lastly, throughout the T&C BSP FCR, a number of amendments have been performed in order to be coherent with the recent amendments and structure of the T&C aFRR and T&C mFRR.

[6] **Amendment to the TSOs' proposal for the establishment of common and harmonised rules and processes for the exchange and procurement of Balancing Capacity for FCR in accordance with Article 33 of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing - European Network of Transmission System Operators for Electricity - Citizen Space (entsoe.eu)**