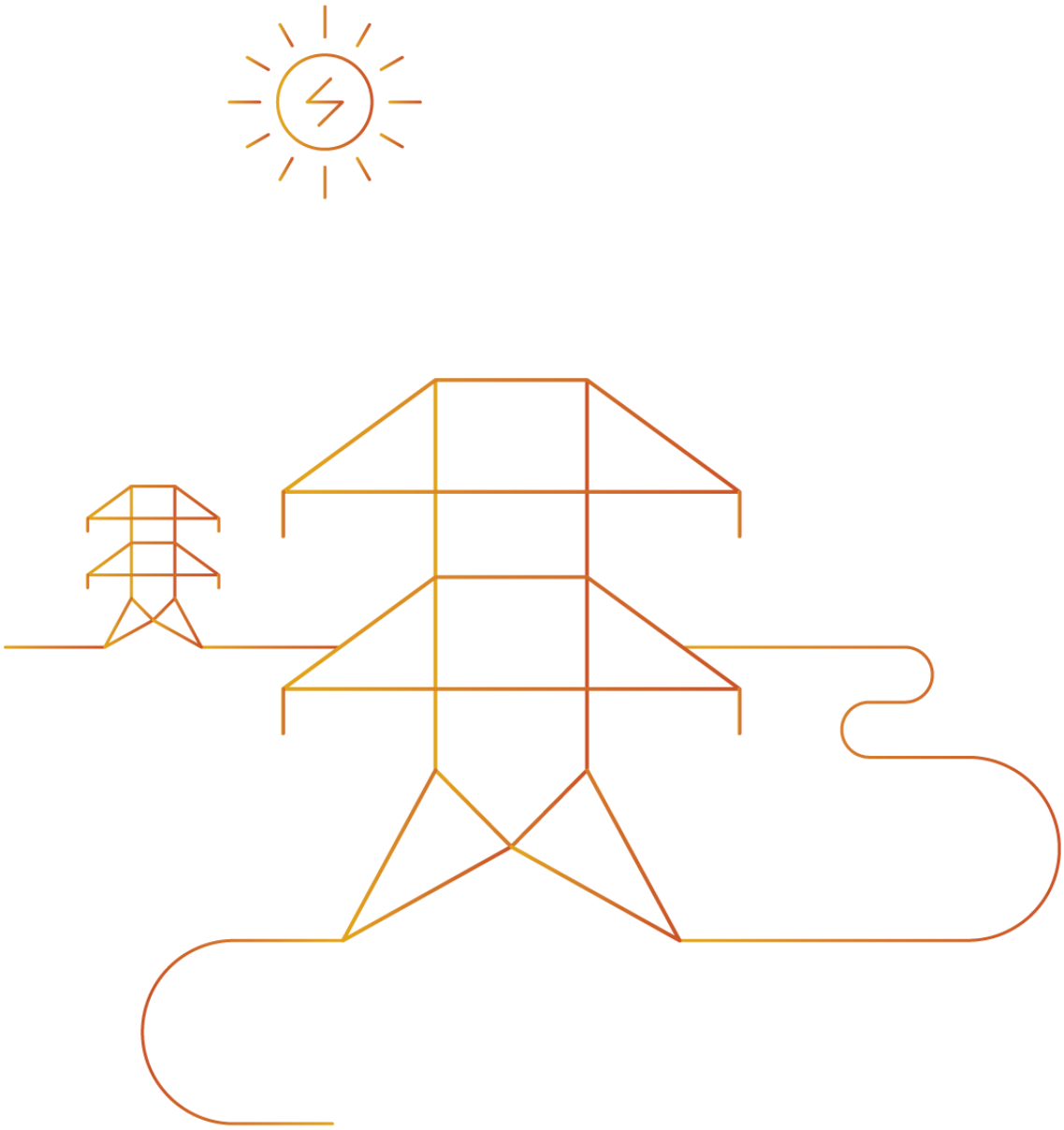


FCR service design note

Market Development

April 2019

Contents

Summary	The Frequency Containment reserve (FCR) is used to stabilize the European frequency after the occurrence of an event leading to a frequency deviation. This note details the characteristics of the FCR ancillary service and gives the needed information for a market player intending to become a FCR supplier. This design note also describes the evolution of the FCR service that is planned in 2020.	
Version	V2.0	
Date	04/2019	
Status	☐ Draft	☒ Final

Document creation and distribution

Author	Raphaël Dufour
Function	Market development
File location	
Distribution	

Previous versions

Version	Date	Author	Comments
V1.0	2016	Thibaut Gérard	The previous design note was divided in 3 notes: the technical design note, the FCR settlement design note and the FCR prequalification design note

1. Executive summary

The Frequency Containment reserve (FCR) (Former R1 reserve) is used to stabilize the European frequency after the occurrence of an event leading to a frequency deviation. The FCR service properties are defined on a national level as well as on an EU level through the regional FCR cooperation.

The design of the FCR service has been improved in the last years in order to facilitate the participation of all types of assets and define the rules related to the qualification of assets and the settlement process for the FCR service. The previous design notes (FCR technical note, FCR prequalification design note and FCR settlement design note) were written to describe this evolution of the design of the FCR service. This design note is an update of these documents and intends to regroup the entire FCR design into one document.

In addition to this update, the evolution of the FCR design for 2020 is described in the design note. In particular, three main elements have a large impact on the FCR service:

- The harmonization of the FCR products and FCR procurement rules on the European level;
- The merge of FCR CIPU and non-CIPU contracts into one contract (Terms and conditions BSP FCR)
- The evolution of the FCR providing group

This document is composed of seven main sections describing the characteristics of the FCR service and highlighting the design changes that are planned for 2020. The following processes related to the FCR product are detailed:

- The description of the technical specifications of the FCR service
- The details of the prequalification process that must be followed by the FCR supplier to be able to offer the FCR service
- The evolution of the FCR procurement process that leads to offering some bids for the FCR service (the FCR obligation)
- The operational process to be followed by the supplier to provide its FCR obligation
- The FCR settlement process used by Elia to check the actual provision of the FCR service
- The metering requirements related to the supply of FCR service
- The data exchange in the context of the FCR service

2. Definitions

Access Point(s)	An Injection Point and/or an Offtake Point to Transmission or Public Distribution Grid;
Availability Test(s)	Test(s) performed by ELIA aiming to confirm availability of the Service during Delivery Periods. Availability Tests can be Capacity Availability or Energy Availability Tests;
Balancing Service Provider or "BSP"	Any natural person or legal entity, as defined in article 2 (6) of the Electricity Balancing Guideline, and with whom ELIA has concluded a Contract to provide Balancing Services;
Contracted FCR Power or "FCR Contracted"	The quantity of the Service (in MW), contracted by ELIA with the BSP for a defined Delivery Period. The quantity of Contracted FCR Power is the result of the procurement of the Service on the Local Procurement Platform and the Regional Procurement Platform.
Delivery Point	A point on an electricity grid or within the electrical facilities of a Grid User, where a balancing or SDR service is delivered – this point is associated with one or several metering(s) and/or measures (as specified in the Federal Grid Code), according to dispositions of the applicable General Framework, that enable(s) ELIA to control and assess the delivery of the Service;
FCR Power	A quantity of the Service expressed in MW;
FCR Power Nominated	The FCR Power nominated by the FCR service provider;
FCR Power Obligation	The quantity of the Service, being the sum of FCR Contracted (in MW) for different Service Types plus any Transfer of Obligations, that the BSP is expected to deliver at a certain time during a Delivery Period;
FCR Power Required or "Preq"	The quantity of FCR Power (in MW) to be supplied by the BSP following a Frequency Deviation;
FCR Power Supplied or "Psup":	The quantity of FCR Power (in MW) supplied by the BSP for a selected Frequency Variation;
FCR Providing Group or "Providing Group"	A conglomeration of Delivery Points that lie within the Control Area of ELIA (not necessarily connected to the ELIA Grid via the same Access Point) having been prequalified together as being capable of supplying one or more FCR Service Types;

FCRmax	The maximum quantity of FCR Power that a BSP can offer in auctions for a certain Service Type. This value is determined by ELIA on the basis of the Prequalification Tests performed and is equal to the sum of FCRmax_PG values of each Providing Group.
Frequency Containment Reserve or "FCR"	The automated and local increase/decrease of active power in reaction to a frequency deviation from the frequency of 50,00Hz. Frequency Containment Reserve has to lead to linear reaction for Frequency Deviations between -200mHz and +200mHz, as described by ENTSO-E;
Frequency Deviation	A deviation (positive or negative) in the Frequency compared to 50,000Hz analysed by ELIA;
Frequency Variation	A change of frequency selected by ELIA for the activation control checks;
Local Procurement Platform or "Local Platform"	Web-based procurement platform on which ELIA will organize, prior to each Delivery Period, its auction to procure a volume of FCR Power as defined in the Dossier Volume;
Regelleistung	The bidding platform www.regelleistung.net through which ELIA participates in the Regional Procurement Platform together with other Participating TSO's;
Regional Procurement Platform or Regional Platform	Procurement platform from which Participating TSO's can procure necessary FCR volumes from BSPs coming from the Control Areas of Participating TSO's. ELIA participates in this platform through Regelleistung;

3. Introduction and Context

The Frequency Containment Reserve (FCR) service is a key service for the operational reliability of the power system of the synchronous area. During the last years, the design of the FCR service has evolved on a national level but also on a European level through the FCR cooperation which is a joint initiative of EU TSO's aiming to procure together FCR services. FCR cooperation members have also worked on the harmonization of the characteristics of the FCR product on a regional level.

The FCR service design has evolved on a national level with the integration of new technologies in the FCR service including energy limited assets like batteries. The settlement and prequalification processes have also been improved. On the EU level, a great step has been achieved with the harmonization of the FCR procurement process on a regional level through the FCR cooperation.

This design note is an update of the previous documents written by Elia (FCR technical note, FCR prequalification design note and FCR settlement design note) that describe the specifications of the FCR products. This document summarizes and gives an update of the elements contained in the previous design notes and highlights the changes which are planned for the coming years. The objective of this document is also to describe the design of the FCR service for 2020 in order to be used as a reference document for the redaction of the new FCR contractual document: the Terms and Conditions (T&C) BSP FCR.

3.1. Design evolution for 2020

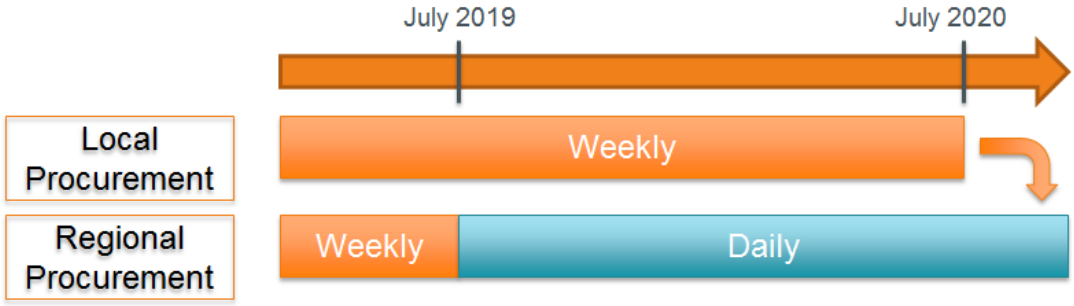
In order to continue improving the FCR service design, some local and regional evolutions will also enter into force in 2020. The main changes for 2020 and their impact on the FCR processes are summarized in the following table:

Evolution for July 2020	Impacted processes of FCR design
Daily procurement on the regional platform	Procurement
Procurement of symmetric FCR 200mHz service only	Procurement Prequalification Technical specification Operation and settlement
Merge of CIPU and non-CIPU contracts into one T&C BSP FCR	Prequalification Operation and settlement
Evolution of the providing group definition	Operation and settlement

3.1.1. Daily Procurement on the regional platform

Following the EU harmonization within the FCR cooperation group, the procurement of the FCR service on the regional platform will evolve from a weekly to a daily process in order to improve the liquidity on the FCR market. This evolution will take place in two steps as described in the document of the FCR

cooperation[1] and in the section 6 of this design note. The local procurement process performed by Elia on the STAR platform, which is currently combined with the aFRR procurement, will not be applied anymore as of July 2020 due to a full merge of the procurement processes into the regional platform. The evolution of both local and regional procurement processes is illustrated in the following figure.



3.1.2. Procurement of symmetric FCR 200 mHz only

Following the EU harmonization within the FCR cooperation group and the impact of the evolution of procurement process described in 2.1.1, the standard symmetric FCR 200 mHz service will be the only product to be procured as of July 2020. The other products that were currently procured by Elia (symmetric 100 mHz, asymmetric up and down products) will no longer be considered in the procurement process. Delivery point currently providing these products can still be used by a FCR supplier but the aggregation has to be performed on the supplier side in order to offer the symmetric FCR 200 mHz service.

3.1.3. Merge of CIPU and non-CIPU contracts into one T&C BSP FCR

The merge of CIPU and non-CIPU contract is a local change that will allow only managing one single contract for the FCR service. This is in line with the planned evolution of other balancing products and results in a simplification of the FCR contractual management. This evolution also allows a FCR supplier to manage all its FCR providing groups/units in one unique portfolio. The prequalification and operational processes as well as the contract management are simplified by merging the contracts into one unique T&C.

3.1.4. Evolution of the providing group definition

The objective of this evolution is to simplify and better use the notion of providing group in the different FCR processes. This local evolution mainly impacts the operational and settlement processes. The objective is to simplify the operational nomination process and to increase the efficiency of the FCR provision by allowing the FCR supplier to use its entire portfolio when splitting its FCR obligation among its FCR providing assets. With the resulting increase of flexibility, the FCR suppliers can better optimize their portfolio closer to delivery.

[1] https://www.entsoe.eu/network_codes/eb/fcr/

3.2. Structure of the design note

Based on the same structure than in the previous design documents, this design note describes the main characteristics of the FCR service. If new elements related to the design evolution in 2020 are described, they are highlighted in the title of the concerned section. In addition to this introduction, this note is divided into the following sections:

- The definitions of the main terms used in this document
- The description of the technical specifications of the FCR service
- The details of the prequalification process that must be followed by the FCR supplier to be able to offer the FCR service
- The evolution of the FCR procurement process that leads to offering some bids for the FCR service (the FCR obligation)
- The operational process to be followed by the supplier to provide its FCR obligation
- The FCR settlement process used by Elia to check the actual provision of the FCR service
- The metering requirements related to the supply of FCR service
- The data exchange in the context of the FCR service

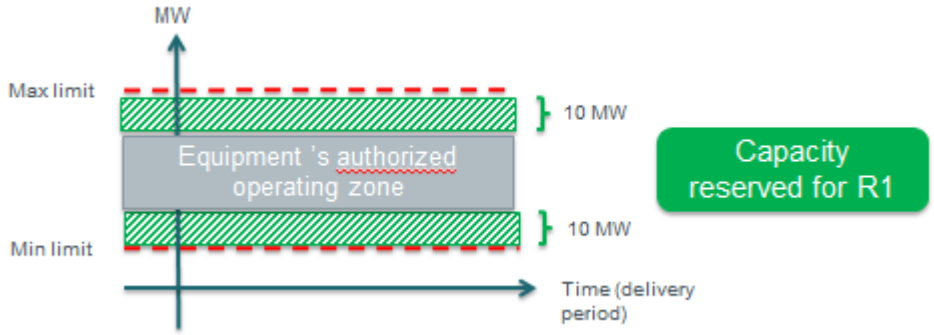
4. FCR technical specifications

4.1. Primary control service or FCR – service description

As defined in Policy 1 of ENTSO-e operational handbook, "the objective of primary control is to maintain a balance between generation and consumption (demand) within the synchronous area. By the joint action of all interconnected parties / TSOs, primary control aims at the operational reliability of the power system of the synchronous area and **stabilizes the system frequency at a stationary value** after a disturbance or incident in the time-frame of seconds, but without restoring the system frequency and the power exchanges to their reference values"

Whatever the technology behind, any equipment offered by a supplier to deliver primary control must reserve at all time during the delivery period a **capacity band (MW)** equivalent to their contractual obligation for the unique use of primary control reaction. By doing so, Elia can respect its obligation to **always have power available to be physically used** to compensate a frequency deviation **after its occurrence**, within the margins defined by ENTSO-e.

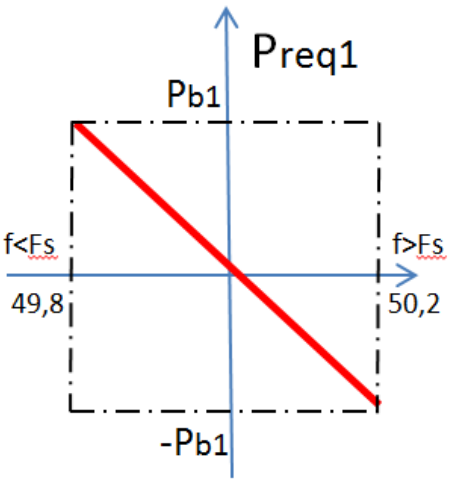
This obligation can be illustrated as on the graph below, for equipment contracted for 10 MW FCR 200 mHz:



Rules organizing the FCR service are defined at European level as well as FCR volume yearly allocated to each TSO, and can be found in published documents on ENTSO-e website.

4.2. NEW Existing services in Belgium

As of July 2020 only the standard symmetric FCR 200 mHz product will be still procured via the regional platform. Up, down and symmetric FCR 100 mHz products will not be procured anymore. The description of this product is presented in the figure below:



For a specific Period and a specific Frequency Deviation, the quantity of FCR to be supplied (upwards or downwards) will be determined via the power/frequency ratio $\lambda 0$ and on the basis of a Frequency Deviation $\Delta f1$ according to the following formula:

$$P_{req1} = - \lambda\ 0 * P_{b1}[BSP, Period] * \Delta f$$

With:

- P_{req1} = the FCR in MW to be supplied (upwards or downwards) for Symmetric FCR 200mHz:
- $\Delta f = F - 50{,}000Hz$
- $Pb1_{[BSP,\ Period]}$ = the Symmetric FCR 200mHz Power Nominated for this quarter-hour;
- λ_0 = the power/frequency characteristic of ENTSO-E, equal to 15000 [MW/Hz]/3000 [MW] = 5 [1/Hz].

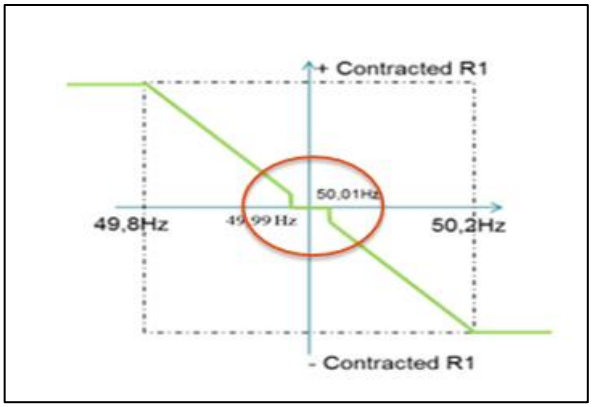
It is possible to combine delivery points that are not able to provide alone the symmetrical 200mHz product into an aggregated group of delivery points providing this service. The aggregation has to be performed by the FCR supplier and the aggregated delivery points have to provide the 200 mHz symmetric service.

When mentioning "FCR service" in this document, it always refers to the symmetric FCR 200 mHz service.

4.2.1. Deadband around 50 Hz

For the symmetrical product FCR 200 mHz, a deadband of 10 mHz around 50 Hz (in which no primary control reaction is allowed) is authorized, as illustrated in the graph below.

This requirement is described in **Annex V of System Operation Guideline** and is in line with other TSOs partners of the regional auction platform.



The introduction of this deadband reflects the evolution of technologies capable of FCR delivery and will benefit to all market parties (limit the losses on the FCR asset, use as part of the energy management strategy…)

4.3. Activation rules

A FCR reserve providing unit or group must automatically react **(linear and proportional reaction)** to frequency deviations measured from **local frequency meters**.

Furthermore, as described **in Art.154 of system Operation guideline**, a FCR supplier will respect the following activation rules:

(a) "The activation of FCR shall **not be artificially delayed** and begin as soon as possible after a frequency deviation"

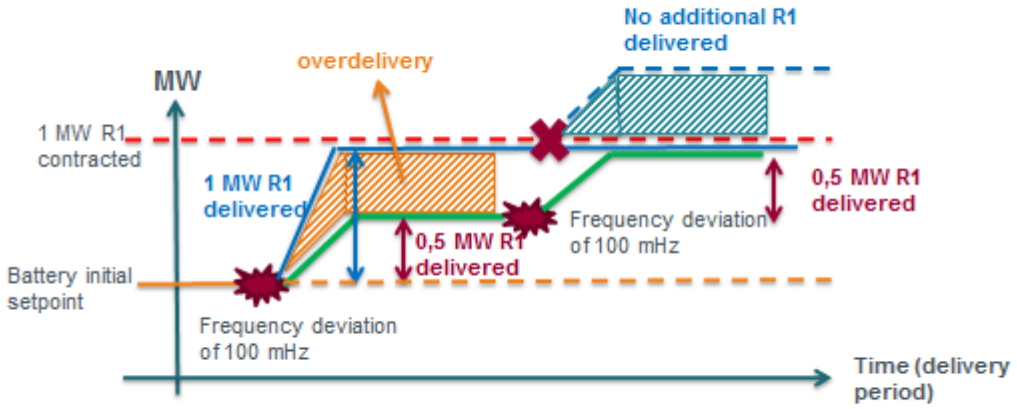
(b) "In case of frequency deviation equal to or larger than 200 mHz, at least 50 % of the full FCR capacity shall be delivered after 15 seconds"

(c) "In case of a frequency deviation equal to or larger than 200 mHz, 100 % of the FCR capacity shall be delivered at 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 at least rise 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 behavior referred to in points (a) to (d) above"

A concrete example on how to interpret the above described rule on proportional and linear reaction is shown hereunder:



In this example, the FCR supplier is contracted for 1 MW of FCR. The upper limit of his reserved FCR band is shown by the red line, while his initial program is illustrated by the orange line.

After the occurrence of a first frequency deviation of 100 mHz (in red), the supplier must deliver a linear reaction for a volume of 0.5 MW (proportion of his contractual obligation of 1 MW for 200 mHz). The green line shows the supplier's correct behavior.

If a supplier deliver more than a proportional reaction (behavior represented by the blue curve), the full FCR capacity will already be used (over delivery) in reaction to a frequency deviation of only 100 mHz. In such a situation, a second frequency deviation in the same direction would not generate additional FCR delivery, which is not compliant with the service description.

4.4. Remuneration of primary control service

The remuneration of primary control service consists only in **the remuneration of reservation** of the contracted primary control power. It is calculated on a monthly basis in function of the unit prices (€/MW/h) obtained in the local FCR auction and €/MW in the regional auction.

There is no remuneration foreseen for the energy supplied (upward or downward).

4.5. Technical requirements specific for assets with limited energy reservoirs

Article 156 of System operation guideline requires from all FCR provider with "FCR providing unit or FCR providing group with an energy reservoir that does not limit its capability to provide FCR to **activate as long as the frequency deviation persists**".

For assets with limited energy reservoirs, more specific requirements are described **in Art 156.9 and 156.10**:

(a) FCR providing units / groups with limited energy reservoirs are **continuously available in normal state**;

(b) For a FCR providing unit with limited energy reservoir, the provider shall activate FCR for as long as the frequency deviation persists unless its energy reservoir is exhausted in either the positive or the negative direction.

(c) As of triggering the alert state (stage 1 or stage 2, see definition in 4.5.1) and during the alert state, each FCR provider shall ensure that they are able to fully activate for at least 15 minutes, and maximum 30 minutes.

(d) A FCR provider shall ensure the recovery of energy reservoirs as soon as possible and within 2 hours after the end of the alert state.

4.5.1. Minimal available energy

The reading of the System operation guideline requirements described in Art 156 gives the following minimal available energy constraints:

1. A FCR provider with assets with limited energy reservoir must always guarantee enough energy to be able to fully **activate for 15 minutes**, **once the alert state is triggered**.

2. A FCR provider with assets with limited energy reservoir must be continuously available in normal state. This signifies, in terms of energy delivered equivalent to a full FCR reaction and for the "worst case scenario" an additional **10 minutes** (for FCR 200 mHz).

These 2 requirements will be verified during the FCR providing unit or the FCR providing group prequalification, along with the supplier's energy management strategy

Please note that the first minimal availability requirement described above is not definitive yet and maybe subject to change. This will depend on a cost-benefit analysis that is currently performed by ENTSO-e members.

As it only concerns the energy requirement when in "alert state", this might mean in the worst case scenario a combined requirement of 30 minutes (first constraint for alert state situation) and 10 minutes (equivalent energy constraint for the worst case scenario of "normal mode" operation), namely **40 minutes.**

4.5.2. Energy management strategy

FCR's main principle is to deliver proportional and linear reaction (physical reaction at delivery or connection point) after the occurrence of a frequency deviation while being available continuously in "normal state".

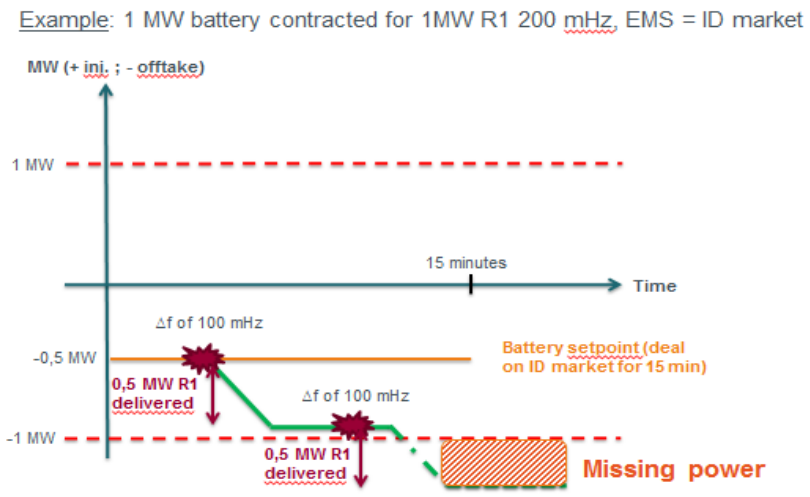
To be able to respect this obligation, a FCR provider using assets with limited energy reservoirs must always have determined a valid charging strategy (ex: use of other assets from his portfolio, intraday electricity market…).

Because there are many technologies capable to deliver FCR service, each of them being specific, and because each supplier's portfolio is unique, Elia will not limit the energy management possibilities to a predetermined list but:

- Elia will request the details of the supplier's proposed energy management strategy;
- Elia will verify the feasibility of the proposed energy management strategy during the prequalification process and in its settlement processes (availability control);
- Elia will monitor the activation of the service to make sure the **linearity** and **proportionality** of delivered primary control is respected and that over delivery is not used as energy management strategy (as explained in 4.3); and
- Elia does not consider the use of the imbalance market as a valid charging strategy.

4.5.3. Power over dimensioning

The example below illustrates that for in some situations, with specific energy management strategies, **the prequalified power for FCR must be lower than the assets installed capacity**.



In this example, the supplier has one battery of 1MW installed capacity, and decides to use the ID electricity market as charging strategy. The deal made on the intraday market for 15 minutes is illustrated by the orange line.

Let's assume the supplier wants to offer 1 MW of FCR power. In some situations, with this configuration he will not be able to respect its full FCR obligation, as illustrated by the green line (expected FCR reaction).

The supplier is responsible for the correct sizing of his assets, knowing the energy management strategy he will apply and the other useful assets he might have in its portfolio.

Elia will verify the feasibility of the supplier's proposal during the prequalification and availability controls to validate the asset's sizing.

5. FCR Prequalification process

5.1. NEW FCR providing groups

The definitions of a FCR reserve providing unit and a FCR reserve providing group are given in the System Operation Guideline (SO GL).

- *'reserve providing unit' means a single or an aggregation of power generating modules and/or demand units connected to a common connection point fulfilling the requirements to provide FCR, FRR or RR;*
- *'reserve providing group' means an aggregation of power generating modules, demand units and/or reserve providing units connected to more than one connection point fulfilling the requirements to provide FCR, FRR or RR;*

The notion of FCR group brings additional potential for a supplier as he can combine delivery points from its portfolio (geographically spread on the BE area) that cannot individually comply with all FCR technical requirements for the symmetric FCR product 200 mHz. The prequalification of delivery points that cannot provide alone the symmetric FCR 200 mHz product can be performed by using a providing group that combines different delivery points in order to provide the FCR service. The individual characteristics of each delivery point (reaction to frequency deviation, supplied power) inside the providing group have to be provided by the FCR supplier during the prequalification. An individual delivery point has to be capable of providing FCR reaction for at least a 50 mHz frequency deviation i.e. a delivery point can only be prequalified if its reaction covers one or several of the following zones of frequency deviations:

Zone	Frequency deviation reaction (mHz)
1	-200 to -150
2	-150 to -100
3	-100 to -50
4	-50 to 0
5	0 to 50
6	50 to 100
7	100 to 150
8	150 to 200

Example of providing group

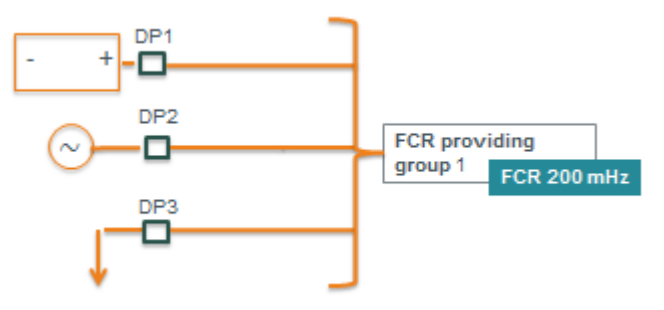
A FCR supplier wants to prequalify a providing group of 6 MW composed of 6 delivery points. The following split per delivery point is chosen:

Delivery Points	Frequency deviation zones	Frequency deviation reaction (mHz)	Prequalified volume (MW)
DP1	4,5	[-50 ; 50]	1
DP2	6	[50 ; 100]	1
DP3	7,8	[100 ; 200]	2
DP4	1,2	[-200 ; - 100]	2
DP5	3	[-100 ; -50]	1
DP6	1 to 8	[-200;200]	2

The information contained in the last two columns has to be communicated to Elia for each delivery point.

Example of providing group combining different assets

A supplier can decide to combine a battery (DP1) with a production unit (DP2) and load (DP3) within 1 FCR group to offer to ELIA the FCR 200 mHz reaction:



5.1.1. FCR group/unit with and without energy limited reservoirs

The possibility to split the required FCR technical reaction on individual assets increases FCR product attraction as well as the variety of technologies that can participate.

Some of these technologies face very specific constraints like having limited energy reservoirs (ex: batteries)[2]. To respect the 100 % availability requirement (FCR product definition), these assets must always reserve a capacity to the unique purpose of applying an **energy management strategy.**

[2] FCR providing units or groups are deemed to have a limited energy reservoir (LER) in case a full continuous activation for **2 hours,** in either positive or negative direction, without impact of the energy reservoir management, might lead to a depletion of its energy reservoir(s)

Example

1 MW battery cannot prequalify 1 MW of FCR volume. An **extra capacity** must always be foreseen by the supplier so it can be used to charge / discharge the asset and therefore guarantee the 100 % availability requirement while leaving the FCR contracted band at all time available for primary control.

As all kind of technologies can be grouped together into one FCR group without restrictions, ELIA will always verify how the 100 % availability requirement is guaranteed by the supplier within the FCR providing group he wants to prequalify.

➔ Each provider needs to present for each FCR group a documented energy management strategy. Its feasibility will be verified by ELIA during the prequalification process;

➔ The provider needs to declare whether its FCR providing group has energy constraints or not;

➔ The provider needs to demonstrate that its proposed energy management strategy has no impact on a third party.

Example of energy management strategy (EMS)
An Energy Management Strategy document should contain at least:

- The description of the connection to the grid
- A single line diagram
- The qualitative description of the chosen charging strategy:
  - Use of additional assets
  - Information on the state of charge operating limits
  - Information on the frequency rate for use of EMS (continuously; each 5 min; each 15 min …)
  - Simulations over 1 year of frequency measurements data with the EMS
- Specific information **for batteries**: State of charge (SoC) setpoint, power band reserved for charging/discharging, SoC energy management strategy, thresholds to trigger the SoC strategy (charging and discharging) etc
- Measurements specifications

Depending on the energy management strategy chosen by the supplier, ELIA will determine whether the FCR providing group must be considered with or without energy limited reservoirs. To do so, ELIA applies the following rule:

➔ If the energy needed to fulfil the 100 % availability requirement of the concerned FCR service type comes from a source external to the delivery point(s) gathered within the FCR providing group (ex: intraday energy market), the FCR providing group is considered as "with energy limited reservoirs".

➔ If not (ex: a CCGT is part of the FCR group and can guarantee the 100 % availability criterion), the FCR providing group is considered "without energy limited reservoirs".

Remarks

The only differences between FCR groups with and without energy limited reservoirs concern:

➔ The maximal number of time ELIA has the right to trigger an availability test (energy related) and;

➔ the authorized reconstitution period of maximum 2 hours during which FCR groups with limited energy reservoir have the right to interrupt, after a ENTSO-e frequency alert state, the delivery of FCR service and use this time to restore their energy.

5.1.2. FCR group definition

Along with its energy management strategy ELIA requires from a supplier for each FCR group additional information as input for operational and settlement processes.

This information has to be communicated to ELIA during the prequalification and contain at least the following aspects:

- **Which assets** (on which delivery points) are part of the FCR reserve providing group;
- **Where** are they situated (behind which access point, TSO or DSO connected, electrical schemes…);
- **Which type of measurement** device will be used, where these devices are situated on the electrical grid, meter's certification...
- What is the **potential individual contribution (upwards & downwards)** of **each delivery point** to the FCR prequalified volume of the FCR group. The **frequency deviation at which each delivery point reacts and the supplied volume** has to be communicated to Elia as described previously.
- What are the technical characteristics of each delivery point (maximal & minimal offtake...)

5.1.3. Use of centralized frequency measurements

In application of SO GL article 154.9, ELIA authorizes the use of centralized frequency measurement for FCR groups with a prequalified FCR capacity < 1.5 MW.

If a supplier decides to prequalify several FCR groups < 1.5 MW using centralized frequency measurement, a different frequency meter must be used for each concerned FCR group for redundancy reasons.

For any other FCR group, ELIA requires as per product definition local frequency measurement on each delivery point within that FCR group.

5.2. NEW Principles ruling a portfolio

The following principles are set by ELIA to determine possible combinations of technologies and assets within one FCR providing group. These rules are only applicable for the prequalification process.

1. The BSP decides how to compose a FCR providing group

2. Each delivery point can be part of only 1 providing group

3. All assets can be grouped within the same FCR group (no distinction between CIPU and non-CIPU assets due to the merging of both contracts).

4. Once a FCR group is prequalified, it cannot be considered as a part of a bigger FCR group.

   The only exemption to this rule concerns FCR groups using centralized frequency measurements (FCR groups < 1.5 MW). Once prequalified as a FCR group, these can be considered as one "virtual delivery point" part of a bigger FCR group.

5.2.1. Evolution of FCR groups in time

The following principles apply for a supplier that wants to add or remove a delivery point to an existing FCR providing group:

5. A supplier can increase the FCR max of a FCR providing group in 2 different ways:
   a. A new prequalification of the complete group including the new delivery point(s) can be done.
   b. A supplier can only prequalify the additional delivery point(s) individually whose prequalified volume will be added to the existing FCR max prequalified volume.

6. If an additional delivery point cannot comply alone with prequalification requirements (when delivery point only provides partial FCR reaction), a prequalification must be done within a FCR group (including this new delivery point) to increase the max FCR of the group.

7. If the supplier does not want to increase its FCR max of an FCR providing group but only add extra flexibility to this group, the additional delivery point(s) can be included to the FCR group without specific prequalification;

8. To remove a delivery point from an existing FCR providing group, ELIA will lower the FCR prequalified volume by the contribution of the concerned delivery point.

The individual potential contribution (upwards & downwards) of each delivery point to the FCR providing group will be given by the supplier to ELIA during prequalification process as part of the documents needed for a FCR providing group (see section 5.1)

If the contribution of a single delivery point cannot be calculated (when delivery point only provides partial reaction), the supplier will do a new prequalification test on the group to determine the new FCR max.

The supplier will also confirm to ELIA that the energy management strategy is not altered by the removal of one delivery point. If the energy management strategy is impacted, ELIA can decide to re-prequalify the concerned FCR providing group.

5.2.2. Sizing of FCR groups

9. The supplier decides how to group delivery points together to build a FCR providing group. However, if individual delivery points part of the FCR group are significant enough (ex: relevant assets or CIPU units), Elia has the right to request additional information specifically related to these units (ex: for congestion and monitoring purposes).

10. For FCR providing groups where maximal prequalified volume of primary control is above 1.5 MW, Elia will require tele-measurements of all individual delivery point composing the FCR providing group.

These individual measurements are needed by ELIA to implement a smart monitoring process to trigger an availability test only when necessary and by doing so limiting at its maximum the impact on the supplier.

For FCR providing groups where maximal prequalified volume of primary control is below 1.5 MW, the supplier can send to ELIA aggregated measurements (as stated in **article 154.9 of System Operation Guidelines**). Nevertheless Elia has always the right to request ex post the individual data from the supplier.

5.3. Prequalification process

In this section, the entire prequalification process is detailed step by step, using the notions reminded in section 5.

The objectives of Elia's prequalification process are to determine supplier's **maximal FCR volume** and for its entire portfolio while verifying the **compliancy with technical and administrative** requirements.

The prequalification process consists in 7 steps and can be schematized the following way:

5.3.1. Step 1 – Become a supplier

A candidate Supplier can apply by submitting a completed application form and the required documents to the applicable service to ELIA. The application form can be found on the ELIA website or requested via email to contracting_AS@elia.be.

After submitting an application form, Elia will reply to the Supplier's request at latest 15 days after reception.

5.3.2. Step 2 – Contract signature

The signature of the T&C BSP FCR is a pre-condition for the next steps of the prequalification.

5.3.3. Step 3 – Pool registration and offline checks

In this step, Elia verifies the contractual requirements on:

- The day-ahead nomination file exchange;
- The intraday nomination exchange;
- The accuracy of measurement chain that will be used for the settlement and verification of the service as well as relevant documentation and certificates in the case of tele-measurements come directly from supplier's equipment;
- The calibration of local frequency measure and the compliancy with frequency meter requirements ;
- FSP / DSO contract if delivery points are located on DSO Grid;
- The documentation on how **energy management strategy** works for the concerned FCR group
- All related information to **FCR providing group** as described in section 5.1.2.

In addition, all needed information (ex: EAN code) to complete the contract is gathered by ELIA during this step.

5.3.4. Step 4 – Online check

Elia will test the supplier's scada connection and make sure:

- Requested real time data can be received by ELIA;
- Availability test (see section 8) can be triggered by ELIA and leads to the corresponding activation (MW).

The table below gives an overview of signals a FCR supplier should be able to send and receive to be prequalified as such.

Signal	Level	Sent by
Test request *This is the test request that ELIA will send to the supplier each time a test should be performed* *This signal also contain the following information:* *- FCR delivery point(s) concerned;* *- Type of test (capacity or energy)* *When receiving this signal, the supplier should active the full FCR prequalified volume for the given FCR delivery point(s), following the test profile provided by Elia.*	Supplier	**ELIA**
Feedback of test request *Each supplier will return a signal to ELIA so that it can be verified if its test request has been received correctly. The value is the mirror of the received signal.*	Supplier	Supplier
Flag for participating in primary reserve *This is a logical signal (0 or 1) that indicates whether the supplier is currently participating in the Primary Control or not.* *- 0: the delivery point is not participating in the Primary Control.* *- 1: the delivery point is participating in the Primary Control.*	CIPU units	Supplier
Measured Power *Measured value of the total power produced/consumed by a delivery point.*	delivery point	Supplier

5.3.5. Step 5 – prequalification tests

As introduced in section 4, Elia's ambition with its 2 prequalification tests is to verify the following requirements:

1) <u>The linearity of the FCR reaction</u>

To verify linearity, ELIA fixes **intermediate steps before full delivery**. Each step corresponds to a frequency deviation block of **50 mHz** and the supplier will each time deliver an **additional** FCR volume of minimum 90 % for at least 2 minutes before going to the next step.

The response time to switch from one step to another is 7.5 seconds (+5 seconds authorized reaction delay). This response time comes directly

from rules fixed by ENTSO-e in the System Operation Guideline (art.154) whereas linear reaction and response time principle of 15 seconds to frequency deviation of 100 mHz and 30 seconds to frequency deviation of 200 mHz are also fixed.

2) The continuous activation at full capacity over a pre-determined duration.

The table below summarizes the minimal duration at full activation **applicable to all FCR groups/units** (with / without energy constraint).

Service type	Frequency deviation of (in mhz, from 50 Hz):	Minimal requirement for alert state mode:	Worst case scenario (energy equivalent to full activation) for normal mode :	Total duration tested at full activation:
FCR symmetric 200 mHz	200 mhZ	15 minutes	10 minutes	25 minutes

3) The reaction time constraint

Following System Operation Guideline (art.154) requirement, the supplier must react within the following timing:

- 50 % of contracted reserve must be delivered when frequency deviation reaches 100 mHz within15 seconds and;
- 100 % of contracted reserve must be delivered when frequency deviation reaches 200 mHz within 30 seconds;

4) The continuous activation while frequency is in normal mode constraint

What are the 2 prequalification tests required by ELIA?

General principles

11. The 2 prequalification tests defined by ELIA (described below) are applicable for each FCR group requesting a FCR prequalification, independent from its technical characteristics. In other words, Elia does not apply specific additional prequalification test for FCR groups with limited energy reservoirs.

12. ELIA will prequalify the FCR group in each direction (upward and downward).

13. Elia will verify that the proposed and documented energy management strategy (Step 3 of the prequalification process) can be used as proposed and therefore confirm its feasibility. To do so, the supplier will apply it by getting back to its initial energy level (ex: initial state of charge of the battery) after the realization of each part (upward and downward) of the prequalification test profile.

Prequalification tests

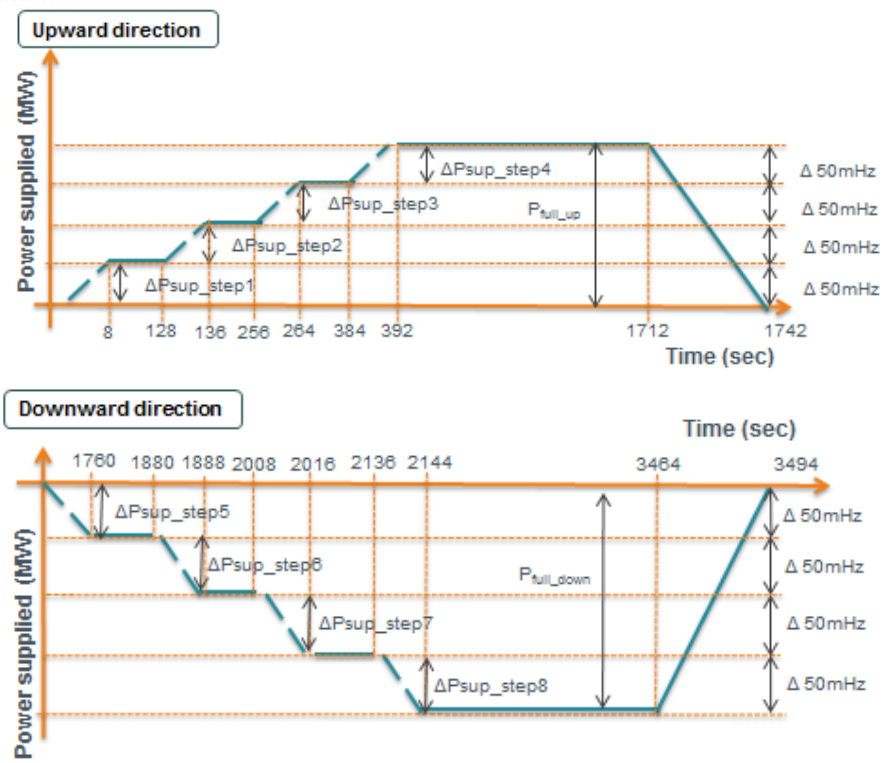
ELIA defines 2 distinct prequalification tests:

- The first prequalification test, called "**synthetic frequency profile**", aims at verifying the first 3 objectives mentioned above;
- The second prequalification test, called "**Follow up of real time frequency**", aims at verifying the 4th objective.

1. Synthetic frequency profile - FCR 200 mHz

The Providing Group must follow the following (indicative) profiles upward and downward following a step-by-step simulated frequency deviation:

- The Providing Group must in 13 seconds (7,5 seconds of required activation time and 5 seconds of tolerance) deliver the volume of each step of 50mHz;
- The Providing Group must maintain its reaction for 2 minutes before going to the next step of 50mHz.
- Once the Providing Group has deployed its maximal supplied power, it must maintain its reaction for 22 minutes.
- The same reaction must be performed in the opposite direction as showed hereby above within 24 hours;



2. "Follow up of real time frequency" test

The supplier will follow the frequency for 4 consecutive hours, as if he was selected for service delivery after an auction. This test will give to ELIA the

guarantee that the supplier can cope with the continuous obligation to deliver FCR while frequency remains in normal mode.

How are organized these prequalification tests?

The supplier takes contact with ELIA and the relevant DSO (if needed) to inform them about his project to prequalify primary control power. Elia, the DSO and the supplier agree on a timing during which the prequalification tests can be organized.

Within the agreed timing, Elia will take contact with the supplier to announce the start of the prequalification tests. From then, the supplier will first start following the relevant synthetic frequency profiles detailed above and once this test is over, continue with the real time frequency follow up over a period of 4 hours.

Once the tests are over, the Supplier sends all relevant data to ELIA for the result analysis.

5.3.6. Step 6 – Test results

Based on the test data, ELIA will determine the maximal FCR volume prequalified for the FCR providing group concerned.

To evaluate the success or failure of the test, ELIA will use the following criteria's defined in section 6.6.1 and 6.6.2.

1. Evaluation of the synthetic prequalification test

ELIA will consider tele-measurements on each delivery point part of the FCR providing group requesting prequalification and gathered via the SCADA connection and apply the following rules:

- The minimal power value at each frequency step of 50 mHz (over a period of 120 seconds) will be taken as reference value for the related step;
- At least 90 % (tolerance margin of 10 % allowed) of the required FCR capacity must be activated at each step to consider the linearity check valid.
- 5 seconds margin is allowed in addition to the required activation time before Elia considers the tele-measurements to determine the minimal value of the step (to cover time-stamp of SCADA transmission data)
- The lowest result for a specific step (of both upward and downward tests) determines the total prequalified FCR volume.

Remark

ELIA considers SCADA tele-measurements for the analysis of the test results **BUT** also requests a report from the supplier proving its ability to react within the required timing, using therefore its local measurements (to avoid time-stamp effect of the scada data transmission)

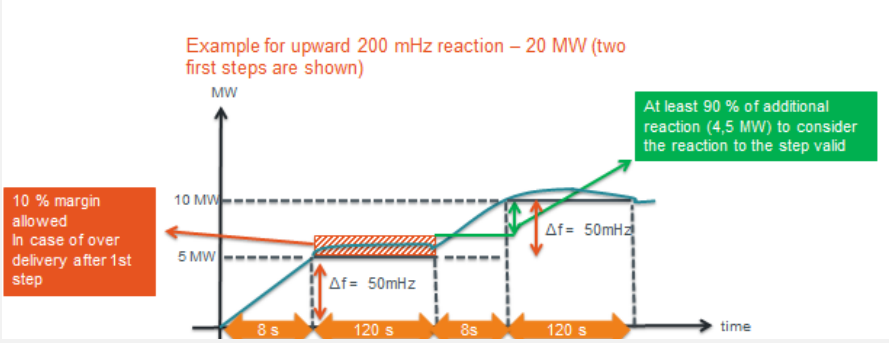
Elia has the right to perform consistency checks between the declared potential contribution (upwards & downwards) and the real contribution

Example of evaluation of synthetic prequalification test

Supplier A wants to prequalify an asset for 20 MW for FCR 200 mHz.

Applying the prequalification test profile described above, the supplier need to deliver 5 MW in answer to a frequency deviation of 50 mHz (2 min. long) before supplying additional volume of 5 MW to reach 10 MW and repeat this step until reaching 20 MW (only the two first steps are shown on the graph below).

To validate the reaction to the second frequency deviation of 50 mHz and reach 10 MW, the supplier needs to deliver at least 4.5 MW (90 % of the expected reaction).



2. For the follow up of real time frequency over 4 hours

ELIA will monitor the FCR reaction of the FCR providing group doing the prequalification over a period of 4 h. During these 4 hours, the supplier will react to frequency locally measured as if he was selected to deliver the FCR service to ELIA.

During that period, ELIA will analyze each frequency deviation superior to 40 mHz and apply the principles valid for its activation control (see section 8.2) to confirm that at least the delivered reaction was equal or above the expected (theoretical) reaction.

If, following to an activation control, it appears the supplier did not deliver at least the expected FCR reaction then ELIA will lower the maximal FCR value prequalified on the concerned portfolio by a volume corresponding to the difference between expected (theoretical) reaction and lowest FCR delivered. The following factor will be used to decrease the maximum prequalified volume:

$$\Delta FCR\max\_PG\_FRF = \min(\frac{Psup\_act}{Preq\_act}; 1)$$

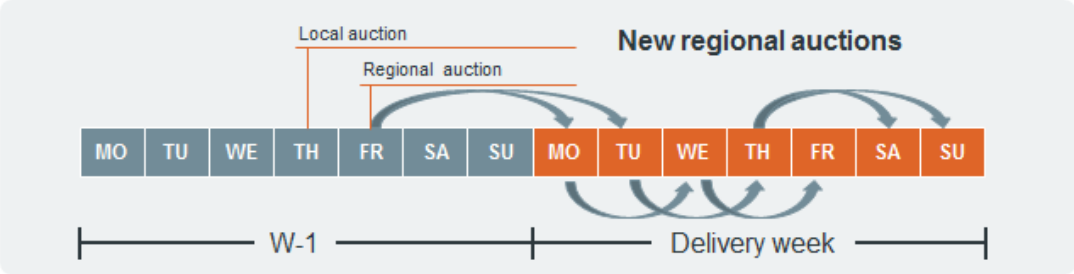
Where:

- P_{req_act}: as defined in section 8.2;
- P_{sup_act}: as defined in section 8.2;

6. NEW FCR procurement process

The provision of the FCR service will evolve from a weekly process which is executed in two steps via a local procurement process and a regional process (through the Regional Procurement Platform (Regelleistung[3]).) to a daily process to be executed only via the Regional Platform. Two steps are foreseen for this evolution:

1. From July 1st 2019, the provision of FCR service will become daily on the regional platform but the auction process will only take place during working days. The local procurement process will still be performed on a weekly basis. This new process is shown on the following figure.

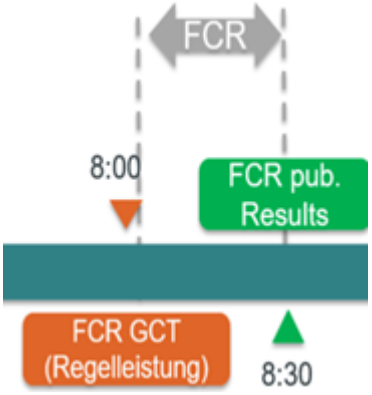


The timings for the new daily regional auction are presented in the table below:

GCT 15:00	Monday	Tuesday	Wednesday	Thursday	Friday
Delivery (D)	Wednesday	Thursday	Friday	Saturday Sunday	Monday Tuesday

2. As of July 1st 2020, the symmetric FCR 200 mHz service will be procured on the regional procurement platform only. The procurement will be performed on a daily basis according to the following timings:
   1. GOT in D-14
   2. GCT at 08:00 CET in D-1
   3. Publication time at 08:30 CET in D-1

   The product duration will be 4h with 6 independent products in a day (0-4h, 4-8h, 8-12h, 12-16h, 16-20h, 20-24h).



   The procurement of the FCR service will be performed according to the rules of the regional platform as the local procurement process will not be used anymore.

[3] https://www.regelleistung.net/ext/

7. FCR Operational Process

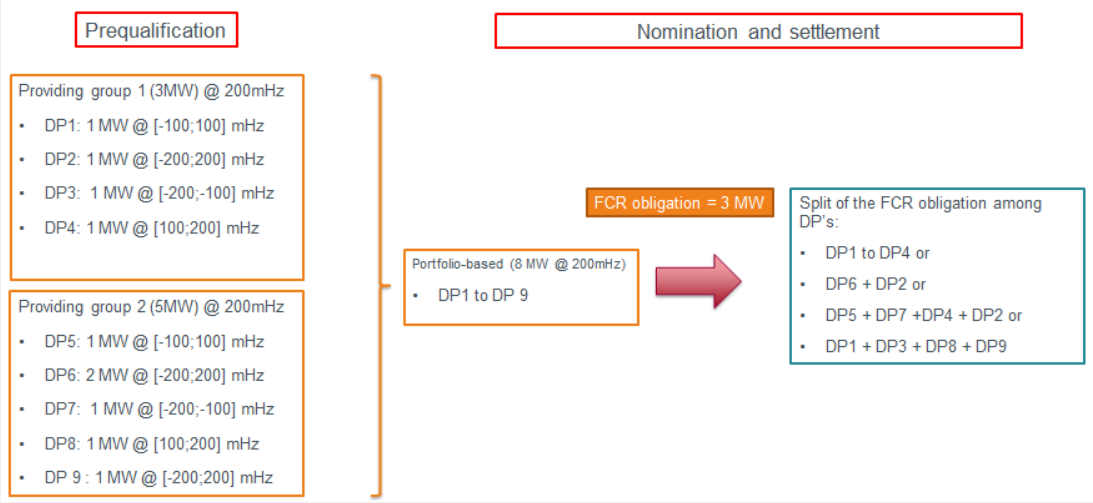
7.1. NEW Nomination process

During the nomination process, the FCR supplier has to send to Elia information on how its FCR Power Obligation (resulting from the procurement process) is split between the different prequalified **delivery points** constituting its portfolio. This information must be sent in day-ahead and can be updated in intraday at latest 45 minutes before the beginning of the first quarter hour concerned by the update.

- The intraday nominations on delivery points will be used as input for the availability control. Only FCR delivery points on which a FCR obligation was nominated might be subject to an availability test.
- The intraday nominations on delivery points level will be used as input for the activation control. In other words, only FCR delivery points concerned by the analyzed frequency deviation and on which a FCR obligation was nominated in intraday will be considered together for the activation control.

Example of operational process

A supplier has prequalified 9 delivery points through 2 providing groups for a total of 8MW of FCR volume. After procurement, he gets a FCR obligation of 3MW. The split of this FCR obligation among the delivery points is portfolio-based so multiple combinations are possible for the supplier. The availability and activation controls will be performed on the nominated delivery points.



The sum of nominated volumes on all delivery points must be equal to the BSP's FCR Power Obligations at all times. The only exception concerns a situation of Forced Outage. If a BSP nominates for a certain quarter-hour of the day a volume inferior to his FCR obligation, or neglects to nominate, ELIA will apply a penalty. If the sum of nominations exceeds FCR Power Obligations the nominations will be considered as void and may not be submitted.

7.2. NEW Exchange of obligations

In order to grant the BSP more flexibility and to allow him to optimize the cost of delivering the Service, for instance but not exclusively when having to carry out

planned or unplanned maintenance, ELIA gives the BSP the possibility to transfer in day-ahead or in intraday for a certain quarter-hour part or all of his FCR Obligations to one or several Counterpart BSP(s) to the date of the performance of the Obligation. This exchange of obligations is performed via the SMART application.

As only one FCR contract will be available per FCR supplier from July 1st 2020, the supplier's portfolio will contain all its delivery points. An intra-portfolio exchange of obligations could then directly be performed through intraday re-nomination and not via the SMART tool as currently done for exchange of obligations between CIPU and non-CIPU units of the same FCR supplier.

8. FCR Settlement Process

8.1. NEW Availability control

The principle of an availability test is to check whether the full contracted capacity is available for activation at any given time. When an availability test is triggered by ELIA, **the rules defined hereunder in sections 8.1.1 to 8.1.9 are applicable**.

8.1.1. Possible availability tests

To verify both capacity and energy requirements, ELIA identifies 2 different test profiles. Both tests are applied by ELIA on the nominated delivery points:

- The **capacity test** aims at verifying that the supplier can effectively deliver at least all its FCR contracted obligation on the nominated delivery points, in both directions. As the objective of this test is to measure the instantaneous power reaction, its duration is very brief (only 120 seconds in each direction at full activation) and will only last long enough so ELIA can register the reaction in its tele-measures.
- The **energy test** verifies that the energy requirement described in section 4.5 can be respected at all time. To do so, ELIA will activate on the nominated delivery points and over a minimal duration of 25 minutes the entire FCR contracted obligation in one direction.

Test profiles are known in advance and will be fixed contractually. They are presented in the section below.

Disclaimer

ELIA currently foresee 2 distinct availability tests but keeps the right to develop additional tests whenever needed.

8.1.2. FCR volumes activated for an availability test

1. ELIA will verify if the contracted volume was effectively available as contractually required.

   To determine the required reaction (MW), ELIA will use the information submitted via the nomination process, in which the supplier announces on which FCR delivery points of its portfolio he will deliver its contracted FCR volume for the next quarter hour.

2. Directly related to principle # 1, ELIA can activate a volume that corresponds to a part of the supplier's contractual obligation by only selecting the FCR volume nominated on some delivery points via the intraday nomination process. In other words, ELIA will not necessarily verify with one availability test the obligation of the FCR service. The test can only be executed for delivery points suppling the 200 mHz service.

3. Directly related to principle # 1 and 2, ELIA will only consider tele-measures of delivery points from delivery points nominated via the

intraday nomination process **and** selected by ELIA for an availability test for the test verification.

8.1.3. Trigger of an availability test

4. ELIA will use its SCADA 2 SCADA connection with the supplier to trigger an availability test. ELIA will send to the supplier, via the Scada connection, the identification of the FCR delivery points concerned by an availability test as well as the type of test (capacity or energy test).

5. Test profiles are known in advance by the supplier and are fixed contractually.

6. The configuration and identification of test signals per FCR delivery points happens during the prequalification process as defined in section 5.3.

8.1.4. Profiles and triggers of availability tests

7. ELIA triggers automatically its availability tests when frequency passes by 50 Hz.

a. Capacity test profile

From the moment when the signal is sent by ELIA, the supplier

i. Cancels his reaction to R2 signals (if any) and stabilizes his injection to the same level as was during the reference period for the test (20 seconds preceding the reception of the test signal) within a delay of 120 seconds;

ii. Activates the full requested power in the upward direction within a delay of 60 seconds starting immediately after the end of the stabilization phase. These 60 seconds cover the time needed to send, treat and start the test signal as well as the authorized timing to reach 100 % of FCR activation (by product definition);

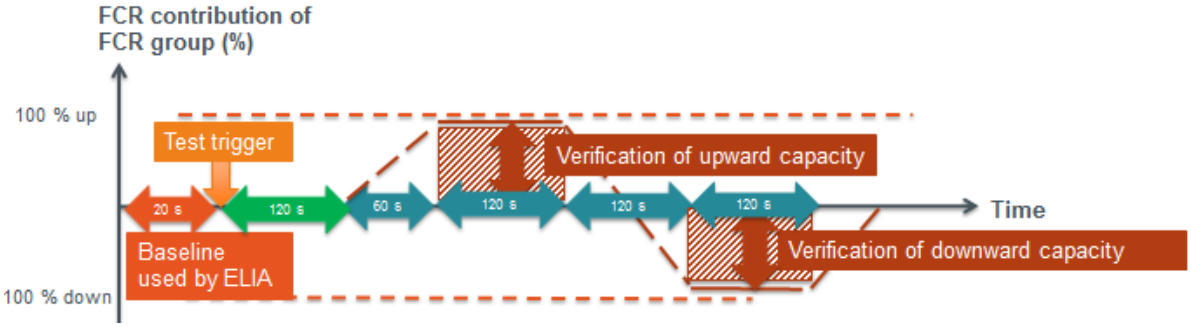
iii. Maintains this reaction for 120 seconds;

iv. Activates his full requested power in the downward direction, within a delay of 300 seconds, starting from the moment of the reception of the signal + 120 seconds;

v. Maintains this power for 120 seconds;

vi. Stops the reaction.

The following figure describes the test profile of the FCR capacity test:



b. Energy test profile

From the moment when the signal is sent by ELIA, the supplier

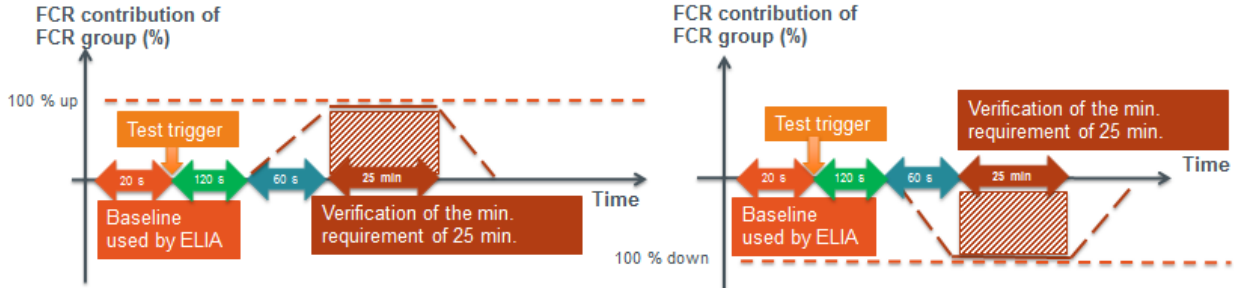
i. Stabilizes his injection or offtake to the same level as was during the reference period for the test (20 seconds preceding the reception of the test signal) within a delay of 120 seconds;

ii. Activates the full requested volume in the upward (or downward) direction within a delay of 60 seconds starting after the stabilization phase;

iii. Maintains this power for 1500 seconds;

iv. Stops the reaction.

The following figure describes the test profile of the FCR energy test (for the two possible directions):

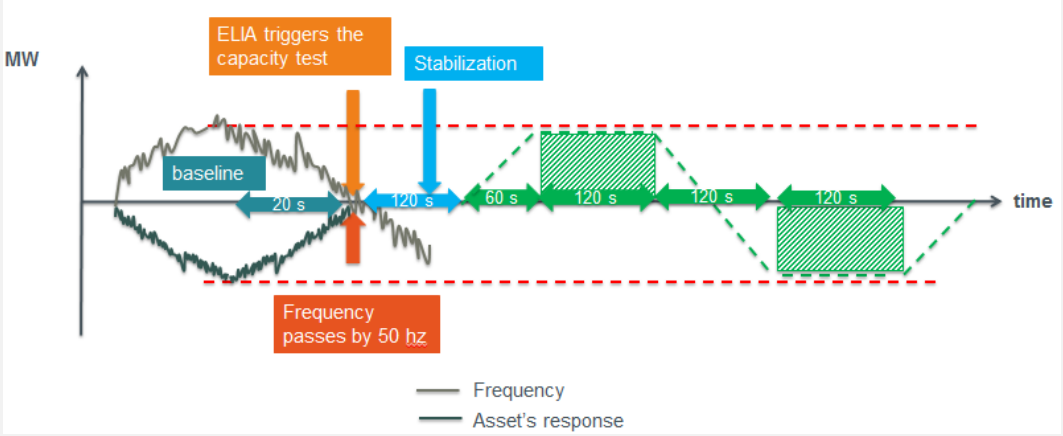


8.1.5. Reference to determine the test success or failure

8. ELIA triggers an availability test when frequency passes by 50 Hz. The reference value used to evaluate test success or failure will correspond to the average power measured on the last 20 seconds before the test signal is sent. In case of an asset with limited energy reservoir, Elia corrects the reference value with the value of the EMS communicated in real-time by the FCR supplier. The EMS is then considered equal to 0 for the whole test duration.

Example of availability test principles

- A supplier has a contract with ELIA for 10 MW FCR 200 mHz.
- The supplier knows in advance the profile of ELIA's capacity test (120 seconds full upward activation followed by 120 seconds full downward activation for FCR 200 mHz).
- At the moment ELIA triggers the capacity test (in orange in the illustration below), the supplier knows:
    - The volume he has to activate (green boxes);
    - The baseline ELIA will use to verify the test success or failure (in dark blue)



8.1.6. Frequency of activation of availability tests

9. ELIA can trigger the capacity availability test maximally 2 times per delivery period.

However, if results of one of the 2 capacity availability tests are negative Elia has the right to organize another availability test.

10. ELIA can trigger the energy availability test maximally:

- 3 times per year in each direction for FCR groups/units with limited energy reservoirs;

- 1 time per year in each direction for FCR groups/units without limited energy reservoirs;

However, if result of an energy availability test is negative, ELIA has the right to organize an additional energy availability test.

11. To limit the impact of an availability test on a supplier, ELIA will adapt its test frequency based on analysis of all available and relevant information (previous test results, individual measurements...). This is the principle of "smart testing".

As a consequence, the frequency of an availability test can be lower than ELIA's contractual right explained in principles 1 and 2.

12. The availability tests are part of FCR contract and no additional compensation is foreseen for these tests. Potential suppliers should consider this when offering FCR reserve products to ELIA during the tendering.

8.1.7. Specific rule only applicable for energy limited FCR providing groups/units

After the realization of an energy availability test, the supplier has the right to reconstitute its energy over a maximal duration of 2 hours as stated in the System Operation guideline. ELIA will not consider this interval of 2 hours for its activation control.

8.1.8. Verification of the test success

ELIA will only verify that **the minimal contractual requirement is met**. In other words, over delivery is authorized and will not be capped.

Independently of the type of test requested (energy test or capacity test), ELIA applies the principles below to evaluate test success or failure.

13. ELIA will gather the tele-measurements of all the nominated delivery points selected by Elia for the test and analyze the aggregated reaction to confirm that:

- The supplier at least delivered its contractual obligation (reaction) in upward direction and;
- The supplier at least delivered its contractual obligation (reaction) in downward direction.

14. ELIA excludes from the sample considered (in each direction whenever relevant) tele-measurement with highest (lowest) value as this can be the result of a data acquisition error or mistake in communication systems and cannot penalize the supplier.

15. ELIA verifies that all tele-measurements are above 90 % of the requested volume.

16. If all tele-measurements are above 90 % of the requested volume, ELIA calculates the moving average (each 10 seconds). As a general principle for both Capacity and Energy Availability Tests, ELIA will consider a test as failed only if more than 15% of these 10 seconds average values are beneath the required volume

17. Missing MW corresponds to the difference between the 100 % of FCR requested volume and the lowest (highest) resulting average value.

18. If more than one tele-measurement is below the 90 % FCR requested volume threshold, ELIA considers the service as not delivered and calculates the moving average (10 seconds) based on all tele-measurements below the 90 % threshold to determine the **missing MW**.

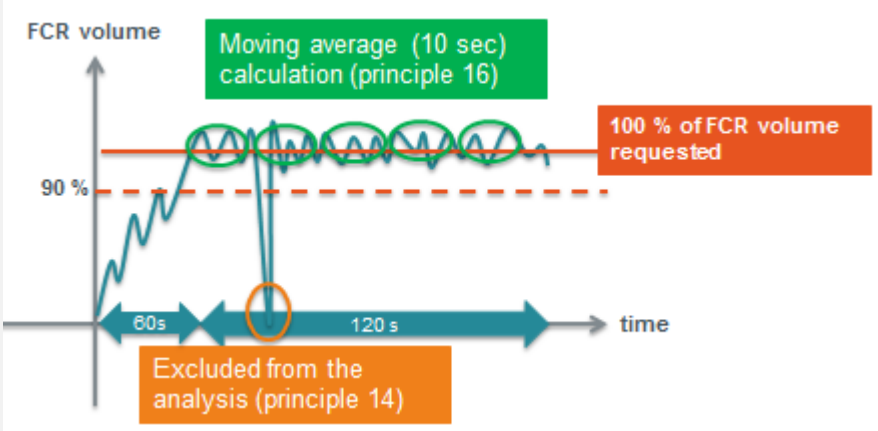
19. For an energy test, ELIA applies the same logic than for a capacity test and calculates the **missing time** as the difference between the activation time required and first moment when moving average (10 seconds) tele-measurements goes below 100 % of tested FCR volume.

Example of principles 14, 15 and 16

The graph below shows the results of a capacity test (upward) for a FCR group.

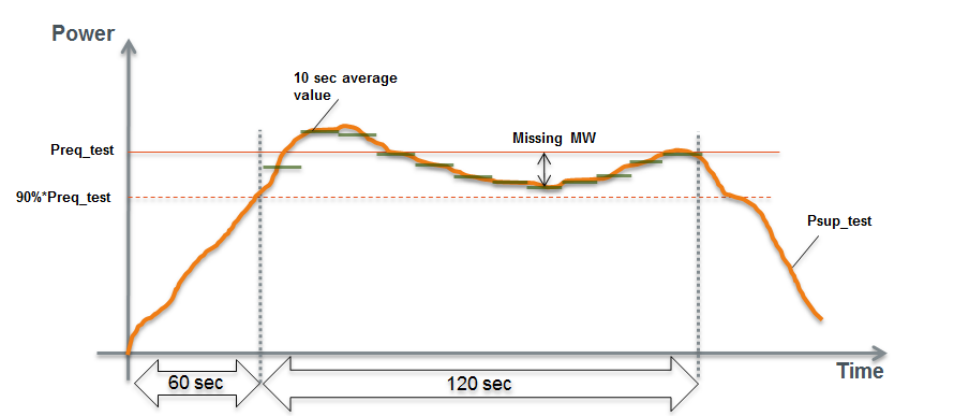
In application of principle 14, ELIA exclude the lowest tele-measurement as this might be the results of an error in the communication system (in orange).

As all tele-measurements left are above 90 % of the requested FCR capacity (principle 15), ELIA applies the principle 16 and calculates the moving average each 10 seconds (in green)



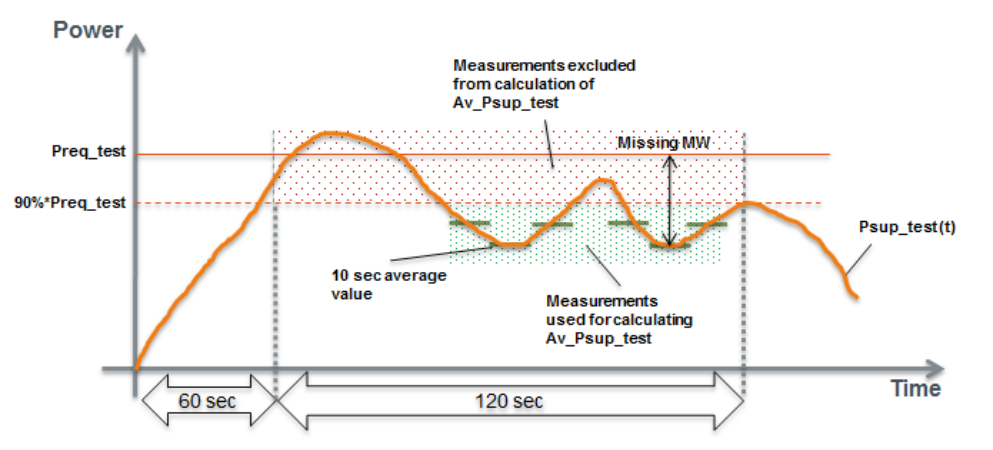
Example of principle 17

Test is successful if at least 85% of the results of moving average are above the 100 % of FCR volume requested (principle 16). If more than 15% of the moving average values are below the 100 % of FCR requested threshold (Preq_test), a penalty is applied on the missing MW (principle 17)



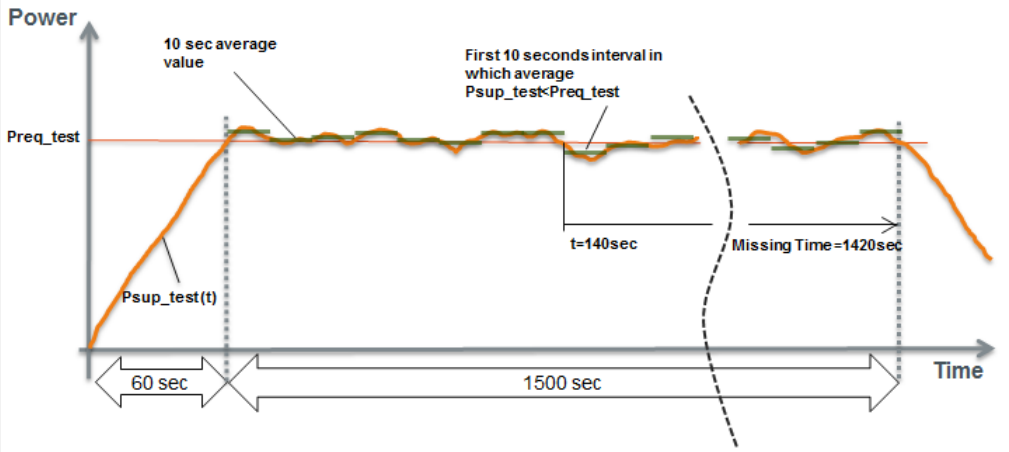
Example of principle 18

The only tele-measurement considered to determine the missing MW (as described in principle 18) are those below the 90 % threshold (green circles)



Example of principle 19

At the first moving average value below the 100 % threshold, ELIA considers the energy test failed and calculates the missing time as the difference between the required time (25 minutes in the example below) and the moment when the average value went below the threshold (in brown).



8.2. What happens in case of forced outage?

Immediately after the occurrence of a forced outage that impacts the supplier's primary control contractual obligation, the supplier quantifies the loss of primary control obligation and communicates it to ELIA via email.

In parallel, the supplier adapts its intraday nomination for the first possible QH, considering the one hour neutralization time.

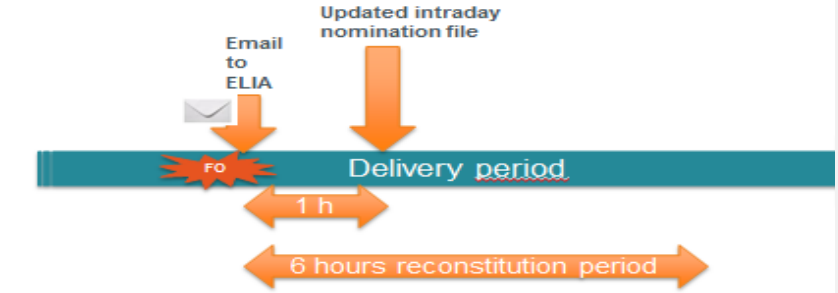
ELIA authorizes a reconstitution time of 6 hours starting from the occurrence of the FO (email) to give the supplier time to find a back-up solution in its portfolio or on the secondary market.

As soon as the intraday nomination has been updated accordingly, ELIA can only trigger an availability test on the remaining contractual obligation available. The supplier will not be remunerated for the MW missing.

If an availability test is triggered during the neutralization time of the intraday nomination file (after the email), it will not be considered valid by ELIA in the ex-post verification.

If, by the end of these 6 hours, no solution has been found by the supplier, ELIA will automatically apply a penalty on the missing volume, as long as there is an unavailable volume left.

Occurrence of FO – example of timing



This missing volume corresponds to the difference between the supplier's contractual obligation and the FCR volume nominated in intraday. ELIA will apply the availability test penalty (described in 8.3) on this missing volume.

On the contrary, if a solution has been found the supplier must adapt its information send for the intraday FCR nomination process so ELIA is aware of the positive evolution of the situation and can organize again its availability test on the whole contracted volume.

The supplier will provide an explanation of the FO reason and details remedial actions – if applicable – foreseen to avoid this in the future.

Remarks

1) Following its principle of smart testing, ELIA will monitor the measurements of FCR groups to detect an uncommunicated FO and trigger an availability test accordingly.

2) Occurrence of FO is rare. The use of this 6 hours reconstitution time must therefore remain exceptional. If Elia observes the occurrence of **several FOs per FCR delivery point** (more than one) over a limited period of time (3 months), Elia will lower the supplier's prequalified FCR volume by the amount of unavailable MW common to all these FO until the supplier proves that a durable solution has been found and implemented to avoid such occurrence in future delivery periods (by re-prequalifying its assets or demonstrating to Elia the solutions applied to recover the concerned assets).

8.3. Computation of the penalty for the new availability test

The following rules are applied to define the penalty associated to the failure of availability tests:

- The penalty is related to the **expected monthly remuneration** (bid price) of the entire volume (MW) of the FCR service;
- Penalty must be proportional ;
- Penalty must be related to supplier's regularity to deliver the service.

Proportionality and regularity principles are applied in combination and not independently.

8.3.1. Proportionality of the penalty mechanism

20. ELIA will increase its penalties in proportion to the failed FCR obligation.

- **For a capacity test**

$$\text{Failed Obligation \%} = \frac{\text{FCR Missing MW}}{\text{Preq\_test}}$$

Where:

- FCR Missing MW: As defined in section 8.1.8
- P_{req_test}: The FCR Power requested in the Availability Test

- **For an energy test**

$$\text{Failed Obligation \%} = \frac{\text{Missing Time}}{\text{Time\_req}}$$

Where:

- Missing Time: As defined in section 8.1.8;
- Test_duration: The duration required by the Energy Availability Test;

21. ELIA fixes 3 thresholds related to the failed obligation:

- If failed obligation =< 20 %; ELIA will use a multiplication factor of 1.3;
- If failed obligation > 20 % and =< 50 %, ELIA will use a multiplication factor of 1.6
- If failed obligation > 50 %, ELIA will use a multiplication factor of 2.

Example of principles 20 and 21

A supplier has won a FCR 200 mHz contract for 10 MW for delivery period 1@ 15 €/MW/h.

ELIA triggers a capacity test on the nominated delivery points delivering the FCR service (volume of 10MW). Results are negative, as only a reaction of 8 MW is effectively metered.

Failed obligation = (10 (volume tested) -8 (volume measured on the nominated delivery points))/10 (FCR 200 mHz obligation)) = 20 %.

➔ A multiplication factor of 1.3 will be applied by ELIA (principle 21).

22. The penalty is related to the expected monthly remuneration (bid price) of the entire volume (MW)

8.3.2. Regularity

23. A multiplication factor Δ related to the regularity will be applied in the penalty. This factor takes into consideration the last 2 Availability Tests (whether they be Capacity or Energy Availability Tests) results:

a. If, considering the last 2 test results (including the test being evaluated), 1 test out of the 2 has failed then Δ = 50 %
b. If, considering the last 2 test results (including the test being evaluated), 2 tests out of the 2 have failed: then Δ = 100 %

A non-compliant reaction to an availability test, if exceptional, could be justified by technical reasons. However, ELIA will specifically monitor multiple and repetitive failures as this means that the assets delivering the primary control service cannot comply with ELIA's 100 % availability requirement.

ELIA will therefore monitor availability test results over several delivery periods and apply the following rules, in addition to the penalty calculated in 8.3.1:

- If, over a period of 3 months (starting from previous availability test) two availability tests on the same FCR delivery points are failed; ELIA will lower the supplier's prequalified volume of the FCR portfolio by the minimal volume of missing MW resulting from each availability test ;

- If, over a period of 3 months (starting from previous availability test) 3 availability tests are failed; ELIA will temporarily exclude the supplier from the local and regional auctions, for a period of 1 month.

Example

In delivery period 1, ELIA does a test on FCR providing group 1 on a volume of 5 MW. Results of this test are negative as there are 3 MW missing.

During the next delivery period, ELIA does another test on the same supplier, on the same FCR providing group 1 for 6 MW. Again, results are negative as 2 MW are missing.

ELIA will apply the regularity principle and lower the supplier's FCR maximal prequalified volume by 2MW (minimal value resulting from both tests)

8.3.3. How is the financial penalty calculated when a FCR group is tested more than once on the same month?

As explained previously, ELIA has the right to trigger an availability test on the same FCR group maximally 2 times / delivery period.

If ELIA effectively realizes more than one availability test on the same FCR group within the same month, ELIA will not apply the financial penalty twice but only calculates it based on the highest calculated missing MW value.

8.4. Activation control

The activation control mechanism consists in selecting a sample of frequency deviations for each delivery period and verifying the supplier's portfolio response to that frequency deviation.

8.4.1. Interval selection

24. ELIA selects maximum 6 frequency deviation for each month, with a maximum of 2 frequency deviation within one delivery period.

25. As presented in principle # 1 (section 5.2.1), supplier will communicate in intraday to ELIA which delivery points are participating to primary control. ELIA will use this information as input for its activation control by only considering the measurements of all delivery points part nominated as "delivering" in intraday.

This will **improve the analysis quality** as non-delivering assets of the supplier's portfolio may sometime create disturbance in the measurements.

8.4.2. Activation control process

The activation control is performed by comparing the FCR Power Supplied or Psup_act (measured as per the method described below) with the FCR Power Requested Preq_act (calculated based on the requirements below). In case the BSP fails to meet the requirements, penalties will be applied as described in 8.4.3

DETERMINATION OF THE FCR POWER SUPPLIED P_{SUP_ACT}

The determination of the Psup_act, for the analyzed Frequency Variation will be made by calculating as follows.

For a reaction required in the upward direction:

$$\text{Psup\_act} = \max(\text{Psup\_after} - \text{Psup\_before}; 0)$$

Where:

- P_{sup_before}: the average value of the summed power measurements (MW) of the nominated Delivery Points over a period of 20 seconds starting exactly 20 seconds before the beginning of the Frequency Variation (as communicated by ELIA for the selected Frequency Variation);
- P_{sup_after}: the highest value of the summed power measurements (MW) of the nominated Delivery Points in a period of 30 seconds starting at the moment when the Frequency Variation reaches its maximum value.

For a reaction required in the downward direction:

$$\text{Psup\_act} = \max(\text{Psup\_before} - \text{Psup\_after}; 0)$$

Where:

- Psup_before: the average value of the summed power measurements (MW) of the nominated Delivery Points over a period of 20 seconds starting exactly 20 seconds before the beginning of the Frequency Variation (as communicated by ELIA for the selected Frequency Variation);
- Psup_after: the lowest value of the summed power measurements (MW) of the nominated Delivery Points in a period of 30 seconds starting at the moment when the Frequency Deviation reaches its maximum value.

If FCR power supplied suffices to meet the FCR power requested, then the supplier's obligations are fulfilled.

Determination of the FCR power requested P_{req_act}

The determination of the FCR Power Required for the analyzed Frequency Variation will be made by calculating the absolute difference between Preq_before and Preq_after:

$$\text{Preq\_act} = \text{Abs}(\text{Preq}_{\text{before}} - \text{Preq}_{\text{after}})$$

- P_{req_before} : the value of P_{req} calculated by using the theoretical formula required for FCR reaction with f_{before}:
  f_{before} = the average value of the frequency (Hz) during a period of 20 seconds before the Frequency Variation starts (as communicated by ELIA for the selected Frequency Variation);
- P_{req_after}: the value of P_{req} calculated by using the theoretical formula required for FCR reaction with f_{after} :

- f_{after} = the average value of the frequency (Hz) during a period 20 seconds from the time that the Frequency Variation reaches its maximum value;

8.4.3. Penalty cap

26. In case of incorrect reaction to an analyzed frequency deviation, ELIA will calculate its penalty based on the monthly remuneration for the FCR service

8.4.4. Penalty formula

For each interval selected, the parameter α is calculated. Alpha corresponds to the following:

$$\alpha = \max((P_{req\_act}-P_{sup\_act})/P_{req\_act};0)$$

The FCR supplier will face to a remuneration reduction Reduction amounting to:

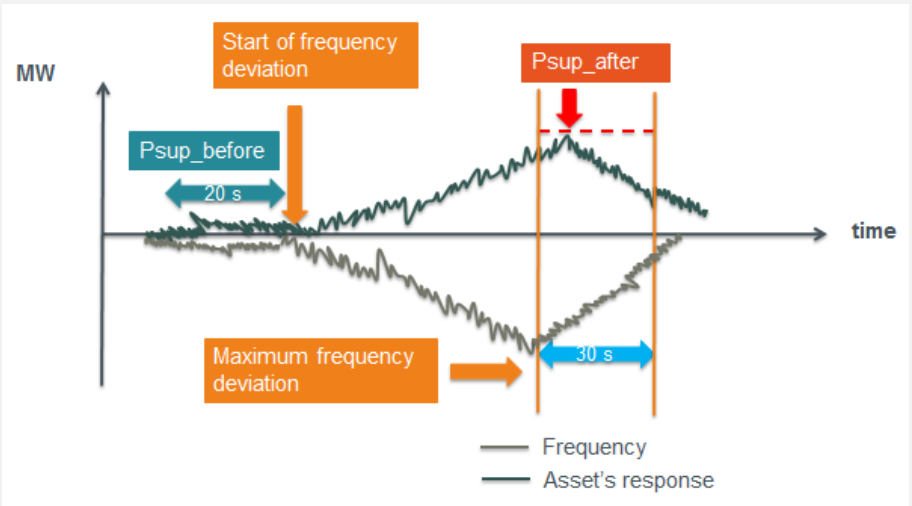
$$Reduction = 0{,}2 * MRSTC * \alpha$$

Where:
MRSTC: The total monthly remuneration received by the supplier

8.4.5. Baseline used for determination of FCR power delivered

27. ELIA will calculate the difference between the average power (MW) over a period of 20 seconds before the start of frequency deviation and the maximal value (MW) measured by ELIA in a period of 30 seconds starting at the moment when the frequency deviation reaches its maximal value.

Example of activation control in the upward direction



9. Measuring equipment's requirements

The following section reminds and details the requirements on tele-measurements and local frequency meters introduced in the technical design note.

1. The supplier must install local frequency meter for each FCR reserve providing unit (i.e per delivery point participating to the FCR service), even though they are part of a FCR providing group. Accuracy of frequency measurements must be better than 10 mHz.

   A delivery point is participating to FCR service when it provides FCR capacity. In other words, for delivery points used as energy management strategy for another delivery point which has energy limited reservoirs, the supplier must only install a frequency meter for the delivery point with energy constraint that delivers FCR capacity.

   As introduced previously, if FCR capacity of FCR providing group is < 1.5 MW, the supplier only needs to install 1 frequency meter for the FCR providing group.

2. The set point of frequency is 50,00 Hz. Local frequency meter must be calibrated accordingly during the prequalification process

3. Elia uses its own frequency measurements for its settlement processes

4. Elia requires power measurement with a maximum resolution of 2" to verify the offered service.

   The measuring equipment needs to have a precision of 1% or better for the whole metering chain (current transformers, energy meter), or a maximum precision margin of 100kW

   In case the measuring equipment for one or more Delivery Points within a Providing Group does not correspond to requested precision, ELIA will calculate an E_{max} factor during the prequalification for the Providing Group by taking into consideration the worst precision among all Delivery Points within the Providing Group. The E_{max} factor is calculated as the difference between the worst measuring precision among all Delivery Points and 1% (requirement by ELIA).

   Remark

   This rule might still evolve in the future due to new requirements imposed by future entry into force of EU guidelines and/or following requirements agreed within the context of regional cooperation for FCR exchange.

5. Elia accepts the use of the real time measurements available at the delivery point (in other words : behind the access point), coming directly from the Supplier's own measurement devices if its characteristics and physical location respects the standards set by Elia and have been verified and accepted during the prequalification process (at step 3 – offline check).

6. Elia requires a measuring equipment compatible with the above mentioned requirements on each delivery point part of a FCR group, no matter the type of FCR group being prequalified (using centralized or local frequency measurements).

10. Data exchange – detailed requirements

The following section gives more precision on ELIA's needed information in day-ahead and in real time. These information's are needed to comply with monitoring obligations from System Operation guidelines as well as input for availability test and settlement of activation control, as introduced in section 8.

As mentioned in the beginning of this document, please be aware that, following the implementation of System operation guideline and other coming European directives (example: IT security and data exchange), the requirements mentioned below may continue to evolve in the future.

10.1. Day ahead and intraday nomination process

10.1.1. Frequency of FCR nominations

ELIA must be informed in day-ahead on how the FCR obligation for each contracted FCR service type is allocated on the supplier's FCR delivery points.

If needed, this information can be updated in intraday by the supplier, up to 45 minutes before the beginning of first QH concerned by this update. For CIPU units the nomination per FCR delivery point needs to be consistent with nomination per CIPU unit.

A FCR nomination is valid for at least 15 minutes or as long as the supplier does not send an updated version.

ELIA will consider last valid nomination received as input for:

- Its availability control;
- Its activation control ; where only nominated FCR delivery points as participating to the FCR service type will be considered (if relevant) for the verification of service delivery.

If a supplier does not foresee changes in its FCR allocation, he must not necessarily send new intraday nomination file each QH.

10.2. Real-time data exchange

10.2.1. Power measurements

Elia requires in real-time power measurements of each delivery point with a resolution of max. 2 seconds. As detailed above in this document, ELIA will continue to require real-time tele-measurements for all delivery points part of FCR providing groups as long as the FCR prequalified volume on this group is above 1.5 MW.

10.2.2. Energy content

To comply with specific requirements of System Operation guideline on FCR groups with limited reservoirs, ELIA will request in real time the energy content of the FCR group/unit with limited energy reservoir.

Moreover, ELIA has the right to request energy content of assets (ex: batteries) part of a FCR group without energy limited reservoir for monitoring and as input for its smart test triggering principle.

10.2.3. Delivery signal (CIPU units)

Today, CIPU units must send a delivery signal via the SCADA (1-0) announcing if the unit is currently participating to primary control service or not. As this is valuable information for ELIA (monitoring and congestion management), the current process will be maintained.

10.3. Ex-post information

For FCR providing groups with FCR maximal volume below 1.5 MW and in application to SO GL requirements ELIA accepts to receive in real-time the **aggregated measurements** (i.e one measurement for the FCR group). In such situations, ELIA can request ex post (ad-hoc) detailed data for each delivery point part of the FCR providing group to verify the consistency of the aggregation done by the supplier.

Elia has also the right to request ex post the contribution per delivery point of FCR providing groups which has delivering FCR obligations.