FINAL REPORT

Incentive on Prequalification, Control, and Penalties for the aFRR and mFRR Services

December 23rd, 2023

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Acronyms used in this document

aFRR	Automatic Frequency Restoration Reserve
CCMD	Customer Centric Market Design
CCTU	Capacity Contracted Time Unit
CP	Capacity Price
CREG	Commission for Electricity and Gas Regulation
DP	Delivery Point
DP_{PG}	Delivery Point Providing Group
DP_{SU}	Delivery Point Single Unit
GCT	Gate Closure Time
GU	Grid User
ID	Intra-Day
LER	Limited Energy Reservoir
LFC	Load Frequency Control
mFRR	Manual Frequency Restoration Reserve
MOL	Merit Order List
MP	Market Party
NC DR	Network Code on Demand Response
PC	Public Consultation
PQ	Prequalification
QH	Quarter-hour
RES	Renewable Energy Sources
SOGL	System Operation Guideline
T&C	Terms and Conditions
ToE	Transfer of Energy
Ts	Timestep
WD	Working Day
WS	Workshop

Executive Summary

This report presents and assesses the existing designs of the prequalification, control, and penalties of the aFRR and mFRR services, followed by new design proposals considering stakeholders' inputs. The goal of the incentive study was to gain attention on all topics within scope, and make sure that all perspectives are considered. So, this report combined with the consultation report, serves as a basis for future design discussions.

For the **prequalification (PQ) process**, Elia proposes 3 design changes to:

- reduce the PQ test time window;
- enable the prequalification of an asymmetric volume in aFRR;
- facilitate a BSP switch.

These changes will help to unlock additional flexibility, while keeping enough assurance that Elia can rely on the volume contracted in the capacity auctions. The current ex-ante PQ test, improved with the above-mentioned changes that lower entrance barriers and facilitate the process in case of switch, is seen by Elia as the simplest and most efficient way to verify the requirements linked to the participation to the FRR capacity auctions, resulting in an increase of the BSP's prequalified volume. As such, the options for an ex-post prequalification or an ex-post validation were disregarded.
Elia will keep improving the PQ process of its balancing products, in line with the future Network Code on Demand Response, and Customer Centric Market Design discussions, to lower the entry barriers as much as possible and to unlock additional flexibility while maintaining PQ requirements in such a way that Elia can rely on the contracted volume to meet its reserve needs.

For the **penalty for MW Made Available**, Elia presents 2 new design proposals, a stepwise penalty formula and a flat-rate penalty formula. Both designs:

- remove the quadratic evolution of the penalty;
- penalize to the same amount a given missing volume regardless the number of CCTUs it is spread over;
- simplify the penalty formula.

These changes are intended to incentivize the BSP to declare their unavailability at all times, giving Elia a better view on the real availability of the assets. The detailed advantages and risks of both penalty designs are described in the present report. Additional discussions will take place before initiating the public consultations on the T&C BSP aFRR & mFRR amendments to introduce these changes.

For the **penalty for activation control aFRR**, Elia proposes to:

- decouple the penalization based on the energy and the capacity remunerations;
- modify the granularity for each penalty component, moving to quarter hourly and weekly granularities for energy and capacity respectively.

Decoupling the penalty results in 2 separate penalties: one assessing the compliance of the BSP regarding its activations which is proportional to energy remuneration in case of discrepancy and the other assessing the compliance of the BSP regarding its capacity obligations (which is proportional to capacity remuneration in case of discrepancy). This decoupling also avoids penalizing the BSP's capacity remuneration in case of an energy discrepancy

linked to a non-contracted energy bid activation. This will avoid de-incentivizing BSPs to submit non-contracted bids. In addition, the capacity penalty scheme allows to no longer penalize BSP proportionally to its capacity remuneration in case of overdelivery.
As for the quarter hourly and weekly **granularities for energy and capacity** respectively, Elia has concluded that they correctly address the feedback that a given discrepancy at a certain time may affect the remuneration of another period. The proposed changes would allow Elia to fairly penalize the BSP in case of discrepancies.
Additional discussions on the penalty on activation control will take place before initiating the public consultations on the T&C BSP aFRR amendments to introduce these changes.

On the **aFRR availability test**, Elia proposes to allow baseline modification during the test at the condition that it is duly justified by the BSP.

Regarding the **implementation plan** of the elements of design discussed in this incentive, the main changes are proposed to be implemented in the version of the relevant T&C BSP after the implementation and go-live of the PICASSO, MARI and iCAROS (phase 1) projects, for which the scope is fixed and regulated documents are in a stage where major changes cannot be included anymore. This will allow to pursue the still open discussions, as requested by the stakeholders, in 2024.
Elia has identified 2 points that can proactively be included in the upcoming revision of the T&C BSP aFRR: the reduction of the PQ test time-window, and the possibility to modify the baseline during an aFRR availability test.

Market Parties have been invited on multiple occasions to express their views: bilateral exchanges took place early 2023, followed by 2 workshops, a public consultation, and a 3rd workshop in which Elia discussed the integration of the various reactions of Market Parties or the motivation to not integrate certain reactions if necessary.

1. Introduction

The objective of this final report is to present new design proposals on the prequalification process, the penalty[1] for aFRR/mFRR MW Made Available, and the penalty for activation control aFRR following the reactions of stakeholders on the report submitted for public consultation in September 2023 and the discussions during the 3rd workshop on 24th November 2023.

Market Parties have been invited on multiple occasions to express their views on the context of this incentive study, from bilateral exchanges taking place at the start of 2023, the detailed feedbacks on the report submitted for public consultation, and the organization of 3 workshops (two organized before the public consultation and one after). Elia has also considered the older feedbacks from the latest public consultations on T&C BSP aFRR and T&C BSP mFRR, from 2019 to 2022.

Elia understands from the responses to the public consultation and the new feedbacks received during the 3rd workshop that additional discussions are required, triggered by the insights provided in this incentive study. As discussed during the last workshop, this report, together with the related consultation report, intends to provide all elements and arguments deemed relevant for these future discussions.

Since the adaptation of the T&C BSP aFRR and T&C BSP mFRR are not in the scope of the incentive (as reminded in Section 1.1), Elia confirms that these discussions will take place before initiating the public consultations on the T&C BSP amendments to introduce design changes discussed in the present study.

1.1 Scope of the Incentive

The incentive consists, for aFRR and mFRR balancing services, of:

- For prequalification
  - Description of existing prequalification requirements and criteria, prequalification processes (including timing and preparatory steps at the BSP);
  - Identification, in consultation with Market Parties, of potential barriers to participate to the aFRR and mFRR balancing services stemming from the current prequalification design and a qualitative assessment of the impact of prequalification requirements on market development.
- For control and penalties
  - Identification of the parameters and criteria used in the existing checks and penalties associated with participation in the aFRR or mFRR service and relating to compliance with the obligations resulting from the offer of balancing capacity (“Missing MW’ and “MW not made available”) and to activation control (the aspects related to the activation control of mFRR which are introduced in the new design, and which therefore require feedback after connection to MARI are **not** part of the incentive);
  - Identification and assessment of the impact of each of the elements identified above on the participation of market players in operational and/or financial terms, in consultation with market players.
- For the 2 parts, on the basis of the list of obstacles to the participation and their impact

[1] The term “penalty” used in the study refers to the notion of “incentive” according to article 44(1)(h) of EBGL.

- Identification, in consultation with Market Parties and with the CREG, of the priorities that will be addressed within the framework of the incentive;
- For those topics identified as priorities, identification, and analysis of alternative approaches to facilitate market participation and proposal to modify the approach, including any preconditions to be met before implementation.

The possible adaptation of the T&C BSP aFRR or mFRR and the implementation of the resulting modifications are **not** part of the incentive.

The goal of the incentive was to gain attention on all topics within scope, and make sure that all perspectives are considered. So, this report combined with the consultation report, serves as a basis for future design discussions (on penalty for MW Made Available and penalty activation control aFRR) and afterwards the modifications to the respective T&C's. To facilitate future discussions, Elia has made proposals on how to modify the current prequalification and penalty designs.

1.2 Incentive Roadmap

Figure 1 provides the incentive roadmap. The roadmap consists of:

- A first proposal for priorities that was presented during the 02/02 WG BAL, confirming the scope of the incentive with the Market Parties.
- Bilateral exchanges between interested Market Parties and Elia, to give MPs the opportunity to update their position on the prequalification process, control, and penalties for aFRR and mFRR since the Public Consultations on the PfAs of the T&Cs for opening the balancing markets to all technologies, market parties, and voltage levels (Q1 2020 for aFRR and Q4 2019 for mFRR), and/or to express new feedback/concerns.
- 2 workshops organized between early May and late June, in which Elia fixed the scope of the incentive based on Market Parties' feedback on the design improvements related to the prequalification process as well as those related to the penalty schemes. Between the two workshops, Elia has given Market Parties the opportunity to give additional feedback on the first high-level new design proposals presented during the **1st workshop**, to consider this feedback for the preparation of the **2nd workshop** in which a more in-depth proposal for the new penalty schemes was presented.
- A **3rd workshop** with Market Parties, to discuss the integration of the various reactions of Market Parties or the motivation to not integrate certain reactions. Elia also wanted, with this workshop, to better understand Market Parties' feedback and have a discussion on their reactions. The workshop took place on 24th November.
- This final report to be submitted to CREG at the latest on 23/12, including recommendations, the consultation report, an implementation plan if applicable, and the report of the 3rd workshop.

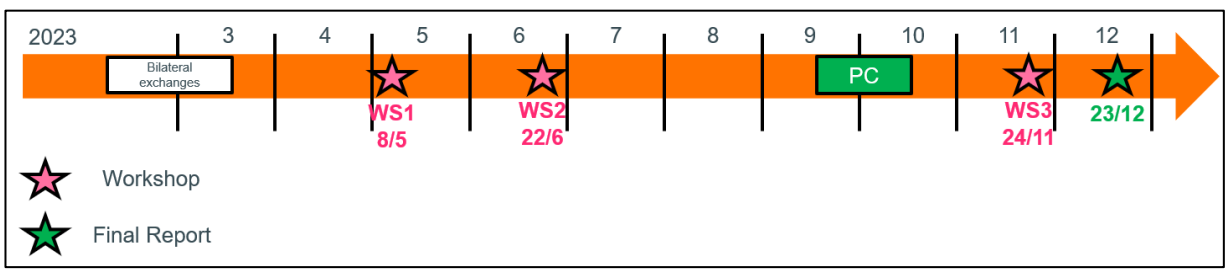

Figure 1 – Incentive roadmap

1.3 Structure of the Report

The report is structured in the following chapters:

Chapter 1 describes the scope of the incentive and the associated roadmap.

Chapter 2 details the Onboarding and Prequalification process. Firstly, the current ("AS IS") design is recalled, followed by the discussion of the market feedback. Afterwards, the new prequalification design is presented and the PQ design alternatives as suggested by Market Parties are discussed. To conclude, Elia explains its recommendations.

Chapter 3 is related to the Control and Penalties. There are two penalties discussed in the framework of this incentive: the penalty for MW Made Available, and the penalty for activation control aFRR. For each of the penalties, the AS IS design is first recalled, then the market feedback and potential design issues are discussed. Finally, the new proposed penalty schemes are presented.

Chapter 4 relates to the aFRR availability test and the situation that may arise when the BSP is requested to freeze its baseline during the test.

Chapter 5 presents the implementation plan, which takes the time and resource availability on both Elia and stakeholders' sides into account, as well as several dependences with other on-going balancing projects.

Chapter 6 provides a conclusion for the incentive report.

2. Onboarding and Prequalification

2.1 AS IS Design

For a Balancing Service Provider (BSP) to be allowed to participate to either the automatic Frequency Restoration Reserve (aFRR) or manual Frequency Restoration Reserve (mFRR) services, certain conditions need to be met regarding the BSP and the Delivery Points it manages. These conditions can be found in the respective T&C BSP FRR.

Before participating to energy and/or capacity auctions of an FRR product, the BSP must do what is informally known as the "Onboarding Process". Figure 2 summarizes the main steps of this process.

A BSP must first sign the BSP contract, then perform a communication test. It then needs to register its Delivery Points (DPs). To do so, the BSP must have a Grid User (GU) declaration containing proof of the agreement between the BSP and the Grid User to provide the FRR Service at one (or more) specific Delivery Point(s). Each of the DPs must have the proper measurement equipment as well as an Energy Management Strategy (applicable for the Limited Energy Reservoir (LER) assets). In addition, the BSP must provide Elia with a Proof of Transfer or Energy (ToE) regime for each of the DPs in its Pool[2].

Once the BSP has successfully gone through the described process it can start participating in the FRR Energy Market. **However, if the BSP intends to participate to capacity auctions, it must perform one or two additional steps**, depending on the product:

- For aFRR, a baseline test is first required on each Delivery Point or on a Providing Group consisting of several Delivery Points. Afterwards, a prequalification test must be performed to determine the increase of the maximum volume the BSP may offer in aFRR capacity auctions.
- For mFRR, only a prequalification test must be performed to determine the increase of the maximum volume the BSP may offer in mFRR capacity auctions.

Figure 3 describes the typical timeline of a PQ test, both for aFRR and mFRR.

The goal of the PQ test is to determine the increase of the maximum volume the BSP may offer in capacity auctions. For Elia, the goal is to verify that the BSP is capable to steer the DP(s) used during the PQ test in accordance with the product requirements and that the BSP can deliver *at least once* the maximum volume it wishes to offer in capacity auctions.

For both aFRR and mFRR, the following common features regarding the PQ test can be listed:

- The PQ test is **not** remunerated.
- An energy bid for prequalification is submitted for the **24 hours of the day of the test,** which means that the PQ test can be triggered at any time during that day.

[2] No feedback was received from Market Parties on the Onboarding Process as a whole, which is why the current design is not explained in depth in this document.

- DP_{SU}'s are tested in accordance with their operating mode[3]. In case of multiple operating modes, Elia will consider the maximum result of the different PQ tests to determine the maximum volume that can be offered in the relevant capacity market(s).
- For DP_{PG}'s, the PQ test may be performed per DP (individually) or by Providing Group (the Providing Group may comprise already-PQ DPs or be constituted of new DPs only) as long as the maximum prequalified power is lower than 50 MW.
- A DP can only participate in one PQ test (Up, Down, or combined).
- The activation profile to follow depends on the type of product (aFRR Up, Down, combined, mFRR Standard,…).

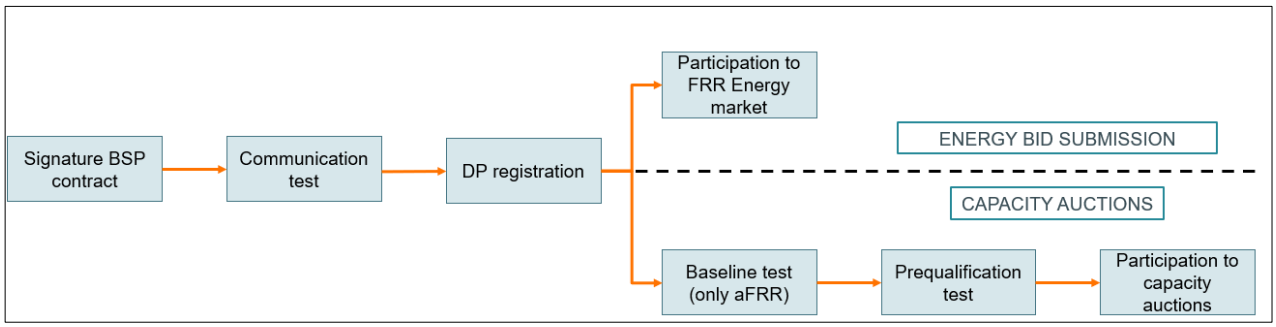

Figure 2 - High-level onboarding process

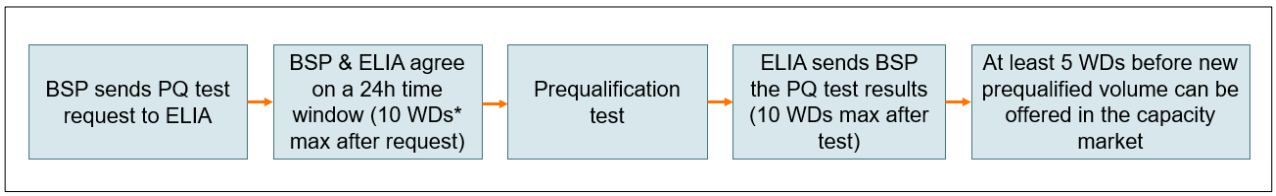

*Figure 3 - High-level PQ test timeline - * WD = Working Day*

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

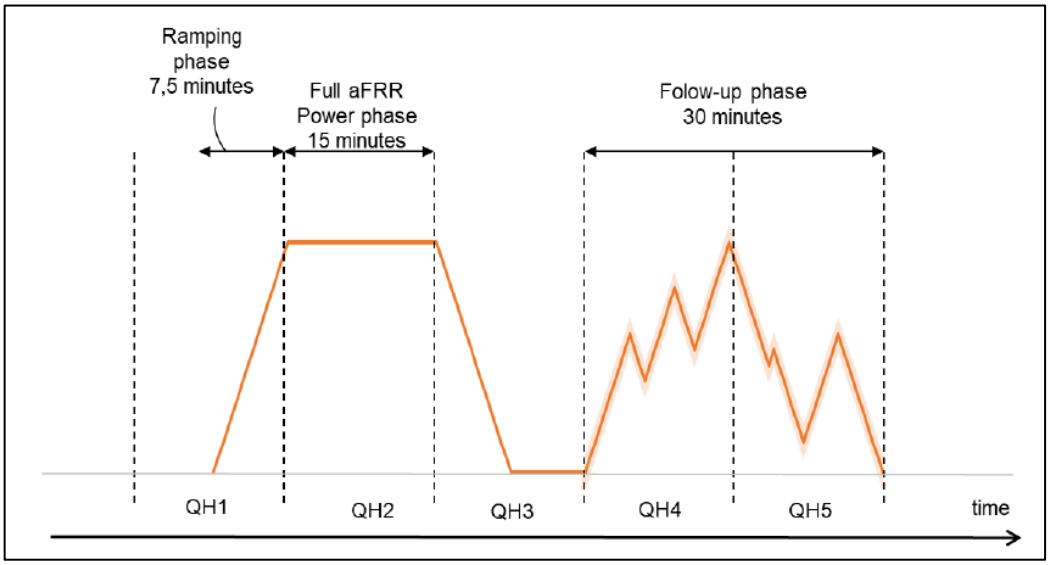

Figure 4 – Prequalification test related to aFRR Up

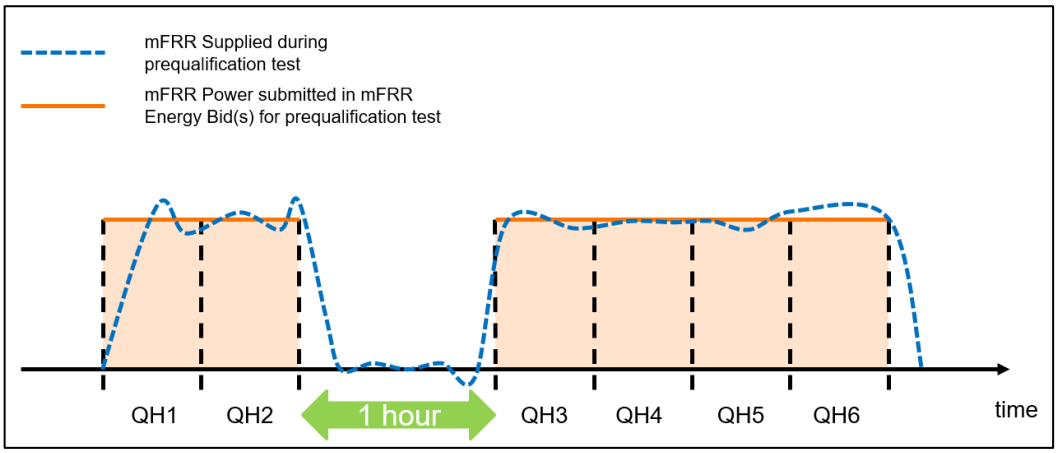

Figure 5 – Prequalification test related to mFRR Standard

Figure 4 and Figure 5 illustrate the PQ test profiles to follow for aFRR Up and mFRR Standard, respectively. Criteria to assess the success of the PQ test and the determination of the maximum volume related to the DP(s) depend on the product and may be found in the relevant T&C BSP FRR. No specific feedback having been given by market participants regarding these profiles before the start of the incentive study nor during the scoping period, they have not been considered in the list of barriers to be investigated and **are not subject to modifications in the framework of this incentive.**

Modalities in case of a Pool Modification

Whenever a BSP is willing to modify its Pool of DPs, the maximum value it can bid in capacity auctions may vary based on the rules hereunder:

1. **Addition of new DP(s):** a PQ test must be performed to increase the maximum volume to offer in capacity auctions.
    a. For DP_{PG}, the BSP may:
        i. Perform a new PQ test on the overall Pool (old DPs and new ones)
        ii. Perform a PQ test on one new DP at a time, or consisting only of the new DP_{PG}
    b. For DP_{SU}, a PQ test per operating mode must be performed
2. **Removal of DP(s):** a PQ test is not mandatory to remove a DP from a Pool (however a BSP can do a new PQ test on the complete Pool, if preferred). The maximum volume that can be offered in capacity auctions is adapted accordingly.
3. **DP switch from one BSP to another:** a PQ test consisting in the same rules as Point 1. above must be performed by the new BSP. Before the organization of the said PQ test, DP registration must be completed by the new BSP. Note that metering information, EMS,… can already be sent prior to the transfer.

2.2 Market Feedback

The main stakeholder feedbacks on prequalification, control, and penalties from the Public Consultations on T&C BSP FRR and bilateral meetings between the Market Parties and Elia, which took place early 2023, are listed below. In the section thereafter, Elia's position on these feedbacks is given. It must be noted that **no specific comments were received on the onboarding process itself.**

1. **Increase competition by facilitating BSP switch**
    a. Some Market Parties are concerned with the general lead time of the BSP switch;
    b. Some MPs consider a new PQ test as unnecessary.
2. **Facilitate PQ process for industrial processes and intermittent RES that struggle at being available for 24h**
    a. There are industrials able to offer their flexibility but only 8h/day 5 days/week, e.g.
    b. For wind farms, e.g., maximum volume that can be offered as aFRR may vary a lot in 24h.
    c. A battery willing to prequalify the complete volume between maximum injection and maximum offtake cannot do so as it would lead to a depletion of the energy reservoir (to maintain the base-line at the required level for a long period, waiting for the start of the test).
3. **Allow prequalification of an asymmetric volume**
    a. Today, a BSP cannot prequalify an asymmetric volume on the same DP, as a DP can only be part of one PQ test, which must be either for upward, downward, or symmetrical capacity.
4. **Some Market Parties would like an ex-post prequalification instead of an ex-ante PQ test, or even the removal of the prequalification process as a whole**

2.3 Elia's Reaction and New Design Proposal

2.3.1. Elia's position

1. **Increase competition by facilitating BSP switch**

   Elia wants to foster competition between BSPs in order to lower the overall costs related to ancillary services and to give the Grid Users the opportunity to choose the BSP that best meets their expectations and needs, preventing any lock-in effect. In this regard, Elia is willing to facilitate the BSP switch process for DPs for which the individual contribution following the first PQ test can be assessed.

2. **Facilitate PQ process for industrial processes and intermittent RES that struggle at being available for 24h**

   Elia will need additional flexibility in the future and is convinced both RES and industrial processes will play a key role. To unlock additional flexibility and give Market Parties the opportunity to valorize "intermittent" flexibility, Elia is willing to shorten the time window requirements of the PQ test.

3. **A DP can only be part of one PQ test**

   Again, to help Market Parties valorize as best as possible the flexibility within their portfolio, Elia is ready to allow asymmetric prequalification. This enables the possibility for a DP to have a different maximum upward and maximum downward volume.

4. **Some Market Parties would like an ex-post prequalification instead of an ex-ante PQ test, or even the removal of the prequalification process as a whole**

   First, Elia would like to remind Art. 159 of SOGL on the "FRR prequalification process", and more specifically Art. 159 §2:

   > *"A potential FRR provider shall demonstrate to the reserve connecting TSO […] that it complies with the FRR minimum technical requirements in Article 158(1), the FRR availability requirements in Article 158(2), the ramping rate requirements in Article 158(1) and the connection requirements in Article 158(3)* ***by completing successfully the prequalification process of potential FRR providing units or FRR providing groups****, described in paragraphs 3 to 6 of this Article."*

   This article discards de facto the willingness of Market Parties to remove the prequalification process. The question remains whether an ex-ante prequalification test is necessary.
   Elia relies on balancing capacity to secure system needs and therefore considers important that the actual contribution of a DP is demonstrated at least once before it participates to the capacity auction. This is not a guarantee but gives some (minimum) comfort to Elia as a TSO to rely on the DP. This comfort will be renewed later, if necessary, via availability tests.

   The option to go for an ex-post prequalification was discussed with several Market Parties and their feedback was mostly negative as there is a structural difference between the test environment and the operational environment they are using. Additionally, the PQ test is not remunerated, but it is not penalized either in case of failure. Thus, it allows the BSP to split its portfolio between the DPs in which the BSP is confident to supply the service, and those that haven't been tested yet. Should the prequalification be done via correct activation of energy bids, a failed prequalification would entail the energy remuneration linked to the already prequalified DPs. Moreover, the design criteria linked to an ex-post PQ would need to be very strict to cover

all eventualities, and as such the ex-post PQ would not often happen and probably for only a small part of the volume the BSP wishes to prequalify.

Elia also studied the extreme case (such as that used in the Netherlands by TenneT NL) where the BSP is given total freedom on the period it performs the PQ test and must warn the TSO ex-post that it ran a PQ test successfully. One of the issues encountered is that Elia needs a blocking window to prevent imbalance in BRP_{source} portfolio. If it is the BSP that organizes the test on its own, Elia cannot warn the BRP_{source} of the activation within its portfolio, leading to a possible significant imbalance in its portfolio. Additionally, Elia would like to keep a minimum "surprise" effect by setting the time-window to 4h so that there is still unpredictability on the exact moment of the start of the PQ test.

In conclusion, Elia is not comfortable, at this stage, with removing completely the PQ test as it remains a guarantee that the BSP is capable to steer the DP(s) used during the test in accordance with the product requirements. For the reasons mentioned above, Elia is not in favor at this stage of an ex-post prequalification.

In the framework of the discussions regarding the Network Code on Demand Response (NCDR), Elia will look in the future at a potential harmonization of the PQ process in the EU, and a facilitation of such process for small units (cf. CCMD).

2.3.2. New design proposal

In this section is presented Elia's new design proposal on prequalification for participating to aFRR and mFRR capacity auctions. It can be split up into three points:

1. the reduction of the PQ test time-window
2. the allowance of asymmetric PQ tests
3. and the BSP switch facilitation.

The reasoning behind these changes is twofold:

1. the ownership of the prequalified volume will shift from the BSP to the Grid User (when possible);
2. amend the prequalification process to lower barriers to the participation of new and existing technologies to capacity auctions.

2.3.2.1. Reduction of the PQ test time-window

Elia understands the comments from the market parties on the 24h availability that is required to perform a PQ test, jeopardizing Market Parties to valorize their flexibility and putting it at Elia's disposal in the FRR capacity auctions.

To resolve this, **Elia proposes to reduce the time-window during which the PQ test can be triggered, from 24h to 4h** (not necessarily a given CCTU). This change will ease the prequalification for all actors, reducing associated costs. Besides, the 4-hour window is deemed sufficient for the test to remain unpredictable (i.e., the BSP cannot precisely plan the delivery and still has to react timely to the signal of the TSO).

The newly prequalified volumes will be valid for all CCTUs (just like the AS IS design). As it is the case today, **BSPs are expected to consider the actual availability of the volume in their capacity and energy bidding strategies: if they do not, they expose themselves to penalties resulting from availability tests and/or activation controls.**

Figure 6 illustrates an example of such time-window reduction. The example uses a theoretical wind power generation but holds true for any generation or consumption technology. In the AS IS design, the BSP is only guaranteed

to prequalify 15 MW if it complies with all requirements of the test. If the BSP was willing to prequalify more, it would be more likely to fail the test. **In the new design proposal, the BSP may choose, in agreement with Elia, a 4h time-window that creates the opportunity to maximize the expected capacity to be prequalified.**

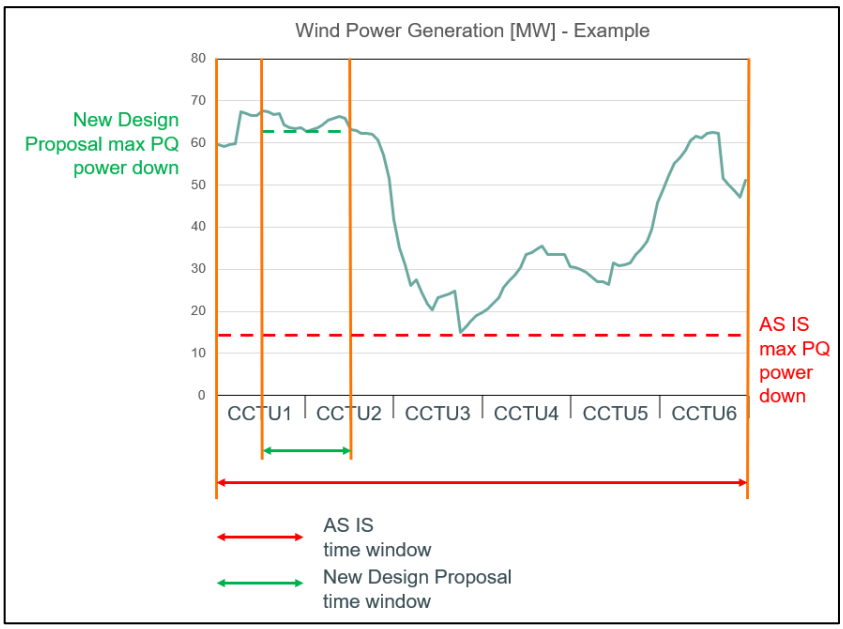

Figure 6 – Illustration of the PQ test time-window reduction

2.3.2.2. Asymmetric PQ tests

In the AS IS design, it is not allowed to prequalify asymmetric upward and downward capacities. In order to allow the possibility to associate a DP with different upward and downward prequalified powers, Elia proposes to run 2 independent PQ tests in a row, not necessarily in a predefined order.

Figure 7 compares the AS IS vs TO BE designs for a 25 MW / 100 MWh battery that is willing to prequalify 50 MW Up and 25 MW aFRR Down.

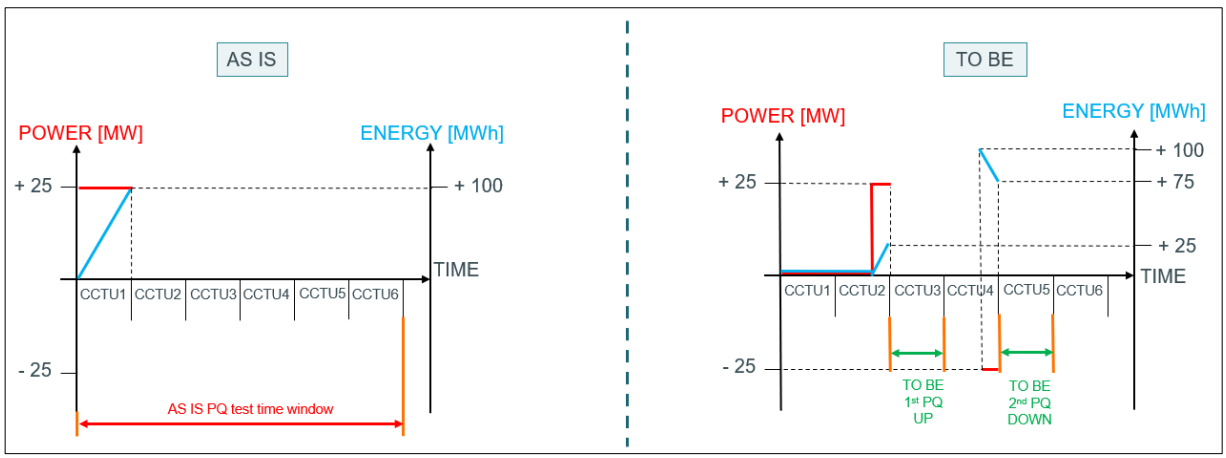

Figure 7 – AS IS vs TO BE asymmetric PQ tests

2.3.2.3. BSP switch facilitation

One of the most important points of the market regards the challenge for a Grid User to change BSP. With the AS IS design, when a DP goes from one BSP portfolio to another, a new PQ test must be performed to allow the new BSP to increase the maximum volume it can bid in capacity auctions. This may lead to some lock-in effects as the organization of a PQ test can be costly. Moreover, if both BSPs are able to steer the asset in the same way, the 2nd PQ test does not provide much additional information or assurance for Elia.

Therefore, Elia considers the transfer of prequalified volume from the previous BSP to the new one ("BSP switch facilitation")**.** However, such BSP switch facilitation would not be always straight-forward **and this is why Elia restricts this possibility to the DPs individually prequalified and to the DPs prequalified in a group for which Elia can clearly determine the specific contribution of the transferred DP.**

With that in mind, Elia proposes to ease the BSP switch for prequalified DPs for which the individual contribution during the PQ test can be determined. In all other cases, a new PQ test must be performed before increasing the maximum volume that can be offered in FRR capacity auctions after a BSP switch.

When the individual contribution of the DP can be assessed, the new BSP is allowed to immediately increase the maximum volume it can offer in FRR capacity auctions accordingly. The prequalified volume ownership will therefore shift from the BSP to the GU, except when the PQ test was done via a synthetic profile, i.e., when the individual contribution of each DP taking part in the PQ test cannot be determined.

It is of Elia's knowledge that the majority of DPs that were used in PQ tests belong to the former case, therefore answering market feedback.

2.4 Reactions following PC and Elia's Position

Following the public consultation and the 3rd workshop, Elia's new design proposal on the PQ process is welcomed by all BSPs. However, the relevance of the PQ test is still challenged by some stakeholders, and two alternatives are identified. The first one is to go for an ex-post PQ, i.e., that the BSP willing to increase its prequalified volume for capacity auctions can do so via the correct activation of energy bids. The second one is to go for an ex-post validation, i.e. limit the prequalification to an IT/communication test beforehand, and allow the BSP to bid as much volume as it wants in the capacity auctions, arguing that the activation control penalties should sufficiently incentivize BSPs to correctly deliver the service.

Elia's position on the two alternatives is presented below.

1. <u>Ex-post prequalification</u>

In case an ex-post PQ is used, defining criteria to have sufficient confidence in the ability of the BSP to deliver the service with the additional volume it wishes to prequalify becomes complex. Additionally, it may take a long time before the market conditions make it so that Elia can assess the multiple requirements that are tested during the current PQ test, making the ex-post PQ quite challenging and lengthy. For instance, for the aFRR PQ test, Elia tests the ability of the BSP to follow the 4s-signal (in the Follow-up phase). In real-life operation, it may happen that the whole volume of the energy bid to be tested is requested, and as such only the ramp-up and ramp-down phases are assessed, which is deemed insufficient by Elia to prequalify the volume. As for the mFRR PQ test (activations in QH 1 and 3 but not in QH 2), the occurrence of PQ conditions in real-life operation would be even more seldom.

Elia acknowledges that the PQ test is only an image of one particular moment, but it allows Elia to assess the contribution of the DPs used during the test, which may not be the case with the activation of energy bids.

2. Ex-post validation

As a general principle, Elia needs to test the volume to be prequalified at least once before it can rely on it in the capacity auctions. If there was no PQ test, Elia would need to take the risk of unavailable volumes into account in the contracted capacity means, as there is no sufficient assurance that the capacity is actually available.
Besides, Elia reminds that the PQ test is not remunerated, but it is not penalized either in case of failure. This allows BSPs to clearly divide their portfolio between the DPs that are already prequalified and for which the BSP and Elia are confident they are able to deliver the service, and the others that are yet to be prequalified. Keeping the possibility for an ex-ante PQ test seems therefore important for some Market Parties. The multiplication of PQ processes would further increase the complexity of the market design, which is another major concern of market parties.

2.5 Elia's Recommendations

At this stage, Elia recommends keeping the current ex-ante PQ test and to adapt it as described in Section 2.3.2. Elia relies on its contracted reserves and the ex-ante PQ test seems currently the simplest and most efficient way for both Elia and BSPs to test the requirements leading to an increase in the prequalified volume of the BSP.
Furthermore, in the framework of the future Network Code Demand Response (NC DR), a future PQ process harmonization among all TSOs is foreseen, and for which an ex-ante PQ test for all balancing products (aFRR and mFRR) is the currently described approach. The discussions on NC DR are still ongoing and Elia will actively keep improving the PQ process for balancing products, in line with the future NC DR and CCMD discussions.
The proposed changes will however help to unlock additional flexibility and foster competition between BSPs, while keeping enough assurance that Elia can sufficiently rely on the volume contracted in the capacity auctions.

3. Penalties

3.1 Introduction

To ensure a good quality of the FRR services, Elia utilizes several controls with their associated penalties on multiple timeframes. The controls and penalties in the scope of this incentive[4], together with the products on which each penalty applies and the goal of the control, are given in Table 1.

In order to give Market Parties the right incentives to deliver the service with a sufficient level of quality, a hierarchy between the different penalties is needed. For instance, the penalty for MW Made Available should be lower than the penalty linked to a failed availability test or the activation control, in order to incentivize the BSP to adequately report its unavailabilities. This way, Elia has the best view on the available capacity before requesting it in real time and can engage the BSP in a discussion in case of availability issues.

Elia also wants to remind that BSPs should strive for a compliance of 100% as Elia's reserve needs calculations are made with the assumption that 100% of the contracted capacity is available. Should that no longer be the case, reserve needs would need to increase, resulting in a higher cost for the end user eventually.

In the following sections of this chapter, for each penalty considered, the AS IS design is first reminded. Then, market feedback is described along with Elia's position on the matter. Finally, the new design proposals for each considered penalty are presented.

[4] There were no concerns or feedbacks expressed on the Penalty for aFRR/mFRR Missing MW (due to a failed availability test) following the 1st workshop, so the current design is not recalled in this report. For an in-depth explanation, please refer to the relevant T&C BSP FRR.

Table 1 – Goal of the different penalties

	Context/ Control	Penalty	Products on which the penalty applies	Goal
Closer to RT	**Submission of aFRR/mFRR Contracted Energy Bids**	**Penalty for aFRR/mFRR Made Available**	aFRR or mFRR **contracted** bids	✓ **The goal of this penalty is to ensure that the capacity awarded in the capacity auction is available via contracted energy bids.** ✓ The penalty scheme should give the BSP the incentive to adequately report its unavailabilities.
	Availability control	**Penalty for aFRR/mFRR Missing MW**	aFRR or mFRR **contracted** bids	✓ **The goal of this penalty is to ensure that the balancing capacity bids are reliable, i.e., that the capacity obligation is fulfilled. It makes particularly sense for contracted bids seldomly activated (end of mFRR MOL, e.g.).** ✓ This penalty should give a strong incentive to provide awarded capacity to Elia, and should be rather high as it is a punctual test (max 12 times/year).
	Activation control for aFRR	**Penalty for aFRR Energy Discrepancy**	All aFRR energy bids	✓ **The goal of this penalty is to ensure that the balancing energy bids are reliable.**

3.2. Penalty for MW Made Available

3.2.1. AS IS design

The penalty principle for MW Made Available is the same for both aFRR and mFRR. To avoid any confusion and redundancy, only the AS IS design for aFRR is explained below.

After the capacity auction Gate Closure Time (GCT), all aFRR Awarded leads to an obligation to submit contracted energy bids in the energy auction of the corresponding CCTU, for a volume equal to the aFRR Awarded (in both directions). If Elia observes that the aFRR Made Available per aFRR Capacity Product is lower than the aFRR Obligation for a quarter-hour, Elia applies penalties per aFRR Capacity Product as described below.

The penalty is calculated in the following way:

$$P_{aFRR\ Made\ Available}(Month\ M) = \sum_{All\ CCTU\ of\ Month\ M} P_{aFRR\ Made\ Available}(CCTU)$$

$$P_{aFRR\ Made\ Available}(CCTU) = \#CCTU_{non-compliant} * MW_{not\ made\ available} * CP_{WA}$$

Where:

- **All CCTU of Month M**
  - All CCTU of Month M for which the BSP has a positive aFRR Obligation for the concerned aFRR Capacity Product;
- **#CCTU$_{\text{non-compliant}}$**
  - The number of CCTU for which a penalty related to the aFRR Made Available for the concerned aFRR Capacity Product applies for the period comprised between Day D-29 until Day D (i.e., 30 Days), where Day D is the date of the concerned non-compliance with aFRR Made Available;
- **MW$_{\text{not made available}}$**
  - This value, in MWh, is determined as follows:
    i. For each quarter-hour of the concerned CCTU, the difference between the aFRR Obligation for the concerned aFRR Capacity Product and the corresponding aFRR Made Available is determined;
    ii. The differences established in point (i) for each quarter-hour are summed;
    iii. The sum established in point (ii) is divided by 4 to obtain the MW_{not} made available.
- **CP_{WA}**
  - The weighted average of capacity prices corresponding to all aFRR Capacity Bids of the concerned aFRR Capacity Product awarded to the BSP for the period comprised between Day D-29 until Day D (i.e., 30 Days), where Day D is the date of the concerned non-compliance with aFRR Made Available. The weight is the aFRR Awarded for the concerned aFRR Capacity Bid.
  - In case no aFRR Capacity Bid has been awarded to the BSP for the period comprised between Day D-29 until Day D (i.e., 30 Days), where Day D is the date of the concerned non-compliance with aFRR Made Available, CP_{WA} is equal to the average price of the capacity auction corresponding to the CCTU for which the non-compliance is observed.

Example:

- In Month M, a BSP is awarded 10 MW in aFRR capacity auctions, in the upwards direction, for every CCTU of the month, and CP_{WA} = 20 €/MW/h;
- For CCTU3 of Day D-5, BSP is remunerated 10 MW * 4h * 20 €/MW/h = 800 € and submits the aFRR Made Available as illustrated in Figure 8, and listed in Table 2;
- BSP has already 2 non-compliant CCTUs earlier in the month.

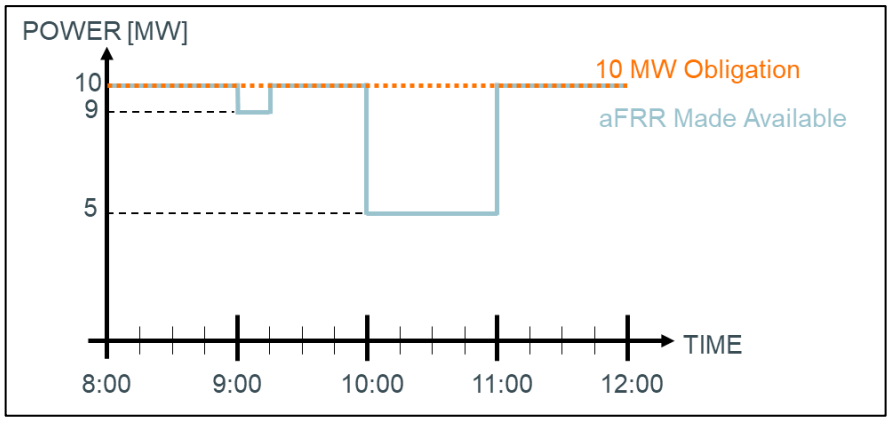

Figure 8 – aFRR Made Available of the BSP for CCTU3, Day D-5

Table 2 – aFRR Made Available of the BSP for CCTU3, Day D-5, and $MW_{not\ made\ available}$ calculation

Non-compliant QHs of CCTU2	9:00-9:15	10:00-10:15	10:15-10:30	10:30-10:45	10:45-11:00
aFRR Obligation [MW] (1)	10	10	10	10	10
aFRR Made Available [MW] (2)	9	5	5	5	5
(1) – (2)	1	5	5	5	5
$MW_{not\ made\ available}$ [MWh]	= ¼*(1+5+5+5+5) = 5.25				

The penalty for the non-compliance of the Obligation linked to that CCTU is therefore equal to:

$$\begin{aligned} \boldsymbol{P_{aFRR\ Made\ Available}(CCTU3, Day\ D-5)} &= \sharp\ \boldsymbol{CCTU_{non-compliant}} * \boldsymbol{MW_{not\ made\ available}} * \boldsymbol{CP_{WA}} \\ &= \boldsymbol{3} * \boldsymbol{5.25} * \boldsymbol{20} \\ &= \boldsymbol{315}\ € \end{aligned}$$

For the sake of clarity, the penalty settlement occurs monthly, while the rolling-window to calculate the $\#CCTU_{non\text{-}compliant}$ and CP_{WA} extends from one month to another (so it does not start again at the start of the next month).

3.2.2. Market Feedback

The main feedbacks that Elia received on the penalty for MW Made Available following the public consultations on the T&C BSP aFRR and mFRR (before the launch of this incentive), and the bilateral exchanges between the stake-holders and Elia are summarized below:

1. The penalty evolves quadratically after each non-compliant CCTU in the rolling window, due to the $\#CCTU_{non\text{-}compliant}$ factor. This means that several non-compliant CCTUs lead to a large penalty, which may create situations where the BSP can arbitrate between penalties, i.e., it may prefer to not report the una-vailabilities and rather take the risk to be tested (via an availability test) or be activated (via activation control).
2. The penalty linked to a given non-compliant CCTU is function of previous non-compliant CCTUs in the rolling window. For instance, the penalty is greater for 10 times 1 MW not made available than 1 time 10

MW not made available. Also, an asset outage may impact the remuneration of other assets in the pool of the BSP.

3. Other feedbacks received:
    a. Some BSPs suggest introducing a flat rate;
    b. The rolling window is too large, some BSPs preferring a rolling window as small as possible, as it results in overly conservative trading behavior, even after the BSP resolves an unavailability issue, leading to reduced liquidity and ultimately higher costs for the system;
    c. The penalty formula is too complex and raises difficulties in explaining it to BSP's customers.

3.2.3. Elia's position

1. **Quadratic evolution of the penalty & incentive not to declare unavailabilities**

    Elia agrees with the observation that the quadratic evolution of the penalty leads to significant penalties after a few non-compliant CCTUs. The fact that some BSPs would not declare all unavailabilities because they would rather take the risk to be tested or activated is very troublesome for Elia as Elia would miss an important information for the operation of the system. Such arbitrage between the different controls and their associated penalties should be avoided**.** On the other hand, a too low penalty for MW Made Available would not give the BSP the incentive to respect its Obligations, jeopardizing the relevance of the FRR capacity auctions. The point is that the BSP should have sufficient confidence in the availability of its assets (or sufficient incentives to find back-up solutions).

    To respond to these points**, Elia proposes below two alternative designs that aim at avoiding penalty levels that provide wrong incentives, while ensuring responsible behavior of the BSPs in the capacity auctions.**

2. **Penalize missing volume independently of the number of CCTUs concerned**

    Elia agrees that a given missing volume over the month should be penalized to the same amount, independently of the number of CCTUs that missing volume is spread over. This is currently not the case, due to the $\#CCTU_{non\text{-}compliant}$ factor in the penalty formula. With the current penalty scheme, there is a significant difference between, e.g., 2 FOs and a few "small" unavailabilities leading to the same missing volume. To level the playing field and improve the market functioning, Elia proposes to re-design the penalty for MW Made Available to associate a given missing volume to the same penalty level (within a given timeframe).

3. **Other feedbacks**

- Elia deems it useful to keep the progressivity in the penalty to make the distinction between a BSP having one unavailability from time to time (due to a Forced Outage, e.g.), and a BSP structurally failing to respect its Obligations.
- If the rolling window is too short, Elia expects the BSP to not have the incentive to respect its Obligations, as a given unavailability would not significantly impact the BSP's remuneration, or at least not over a sufficiently long period. This would lead to an overly risky behavior from the BSP in the beginning of the rolling window, which would oblige Elia to apply more severe penalties than today for the same amount of missing volume, which is undesired. On the other hand, Elia does not want a too long time-window either as it would lead to an overly conservative behavior from the BSP, leading to lower liquidity in the market.
- Elia is conscious of the complexity of the penalty schemes and considers such complexity in the new penalty scheme proposals. Elia strives to design a *simple* penalty formula while considering the intrinsic

complexity of the balancing markets, preventing gaming or arbitrage opportunities from BSPs and at the same time giving BSPs the right incentives to deliver the service properly.

3.2.4. New design proposals

In the following sections, two new penalty design proposals are detailed. The proposals are the “flat-rate” penalty and the stepwise penalty. Both penalty proposals address the market feedback on design complexity and quadratic evolution, and penalize to the same amount a given missing volume regardless the number of CCTUs it is spread over.

3.2.4.1. Stepwise penalty proposal

Elia initially proposed in the report for public consultation a penalty for MW Made Available that depends on the average compliance level (as defined hereunder), in order to make the distinction between BSPs having a small incompliance from time to time, and BSPs having structural problems in respecting their obligations. The penalty scheme is as follows:

$$\boldsymbol{Penalty_{aFRR\ Made\ Available}(Month\ M)} = \sum_{\boldsymbol{All\ CCTU\ of\ Month\ M}} \boldsymbol{Penalty_{aFRR\ Made\ Available}(CCTU)}$$

Where $Penalty_{aFRR\ Made\ Available}$ (CCTU) magnitude depends on the *average compliance* level the BSP is in during the day of the given CCTU. Based on the average compliance level, the penalty formulas are the following:

$$\boldsymbol{Level\ 1: Penalty_{aFRR\ Made\ Available}(CCTU) = 1.5 * MW_{not\ made\ available} * CP_{CCTU}}$$

$$\boldsymbol{Level\ 2: Penalty_{aFRR\ Made\ Available}(CCTU) = 3 * MW_{not\ made\ available} * CP_{CCTU}}$$

When the average compliance of a BSP is between 100 and 95%, it would be penalized at penalty level 1. BSPs having an average compliance lower than 95% would go to penalty level 2.

The average compliance of the BSP, for Day D, in each direction, is calculated in the following way:

$$average\ compliance_{up}(D) = \frac{\sum_{Qhs\ in\ last\ 15D}^{Qhs\ in\ future\ 15D} min\left(Nominated\ volume_{Qh_{up}}, Obligation_{Qh_{up}}\right)}{\sum_{Qhs\ in\ last\ 15D}^{Qhs\ in\ future\ 15D} Obligation_{Qh_{up}}}$$

Where:

- Qhs in last 15D are all the Qhs of all the CCTUs for which BSP has had an Obligation, in the given direction, in the last 15 Days before Day D
- Qhs in future 15D are all the Qhs of all the CCTUs for which BSP will have an Obligation, in the given direction, in the future 15 Days after Day D
- $Nominated\ volume_{QH\_up}$ is the last volume the BSP has made available in the given Qh, in the given direction
- $Obligation_{Qh\_up}$ is the Obligation of the BSP for the CCTU comprising the given Qh, in the given direction

For the sake of clarity, the average compliance of Day D, in each direction, also comprises the Qhs of day D, if applicable.

By using a rolling-window that considers unavailabilities in both past and future, Elia wants to avoid that a BSP would adapt its bidding based on its average compliance (e.g. taking more risks knowing that its compliance is close to 100% and that the chance to reach the penalty level 2 is very low).
The motivation for choosing the 1.5 and 3 penalty factors is the following: the hierarchy of penalties is better than in the as-is situation, as BSPs would remain incentivized to declare unavailabilities in their portfolio regardless of past performance. Elia has calculated the average compliance of the BSPs with the data of 2022 and has noticed that BSPs have an excellent average compliance distribution, as BSPs are often at 100% compliance and the threshold of 95% is actually rarely hit. It is to be noted that the simulation did not consider a possible change in the BSPs behavior: with this new penalty design, BSPs would be better incentivized to report unavailabilities in their portfolio (by submitting lower volumes of energy bids) as, on the one hand, the new penalty for the capacity underdelivery in the aFRR activation control would take away a larger share of the capacity remuneration of the BSP than with the current design, and on the other hand, the new design proposal for the penalty for MW Made Available would prevent too large penalty levels, thanks to the removal of the $\#CCTU_{non\text{-}compliant}$ factor.
The advantages of this calibration are the following:

1. Incentives are correct, leading a.o. to a possible improved image of the availability of energy bids, thanks to the hierarchy with the activation control.
2. Avoids very high penalties in some cases.
3. Incentivizes BSP to keep a high average compliance (thanks to the 2 penalty levels).

3.2.4.2. Flat-rate penalty proposal

One of the designs that Elia proposes for the penalty for MW Made Available, applicable for both aFRR and mFRR, is the following. Note that the formulas are presented for aFRR but are the exact same for mFRR.

$$\boldsymbol{Penalty_{aFRR\ Made\ Available}(Month\ M)} = \sum_{\boldsymbol{All\ CCTU\ of\ Month\ M}} \boldsymbol{Penalty_{aFRR\ Made\ Available}(CCTU)}$$

For each non-compliant CCTU, Elia proposes to introduce a flat-rate penalty as follows:

$$\boldsymbol{Penalty_{aFRR\ Made\ Available}(CCTU)} = \boldsymbol{1.5 * MW_{not\ made\ available} * CP_{CCTU}}$$

Where:

- $MW_{not\ made\ available}$ is the difference between the Obligation and MW Made Available of the given CCTU, in MWh
- CP_{CCTU} is the weighted average capacity price of the volumes awarded to the BSP for the concerned CCTU

With this penalty scheme, the design complexity is significantly lowered while ensuring that the BSP is both incentivized to respect its obligations and incentivized in submitting the unavailabilities it may face. **Elia would then monitor the compliance of each BSP to verify that BSPs do not abuse the flat-rate penalty scheme. If quality degrades and availability becomes worrisome for Elia, bilateral discussions with the BSP and potential additional actions would take place.**

3.2.5. Elia's recommendations

Elia considers both design proposals to address market feedback described in section 3.2.2 because:

1. The way the penalty evolves in case of significant non-compliances is no longer quadratic. As such, Elia expects the penalty amount related to a failure to respect a given Obligation to not reach the level of penalties that would provide an incentive to not report an unavailability. The new design proposals are only in function of the number of MW not made available linked to that CCTU and the weighted average capacity price of the CCTU, thus suppressing the $\#CCTU_{non\text{-}compliant}$ factor.
2. For a given missing volume, the penalty is not function of the number of CCTUs the missing volume is spread over.
3. The designs proposed are simpler than that of today.

The flat-rate penalty has the following advantages:

- Design simplicity
- The penalty should not reach levels that incentivize BSP not to report unavailabilities.

The challenge of the flat-rate proposal is to give the BSP enough incentive to meet its contractual capacity obligation at all times.

Following feedback from stakeholders on the progressivity of the penalty and on the calibration of the factors, Elia proposes to continue the discussion with the stakeholders before initiating the public consultation son the T&C BSP aFRR & mFRR that will include the change linked to the penalty for MW Made Available.

3.3. Activation Control aFRR

Elia continuously controls the quality of aFRR delivery via the activation control aFRR, for contracted and non-contracted energy bids. The goal of the activation control is to ensure that the aFRR energy bids are reliable to meet Elia's needs to balance the Belgian LFC block.

3.3.1. AS IS design

The penalty resulting from aFRR Energy Discrepancy is calculated on a monthly basis as follows:

$$aFRR\ Energy\ Discrepancy\ penalty(M) = 1.3 * \frac{aFRR\ Energy\ Discrepancy(M)}{aFRR\ Energy\ Requested(M)} * remuneration(M)$$

For a detailed explanation of all the factors in the formula and how they are calculated, please refer to the T&C BSP aFRR. Only the remuneration factor is explained below as it is significantly impacted in the new design proposal. Figure 9 illustrates what the aFRR Energy Discrepancy consists of.

Determination of remuneration(M)

The monthly remuneration is the sum of the monthly capacity remuneration and the monthly absolute value of the energy remuneration, i.e.:

$$remuneration(M) = remuneration\ aFRR\ Awarded + |remuneration\ aFRR\ Requested|$$

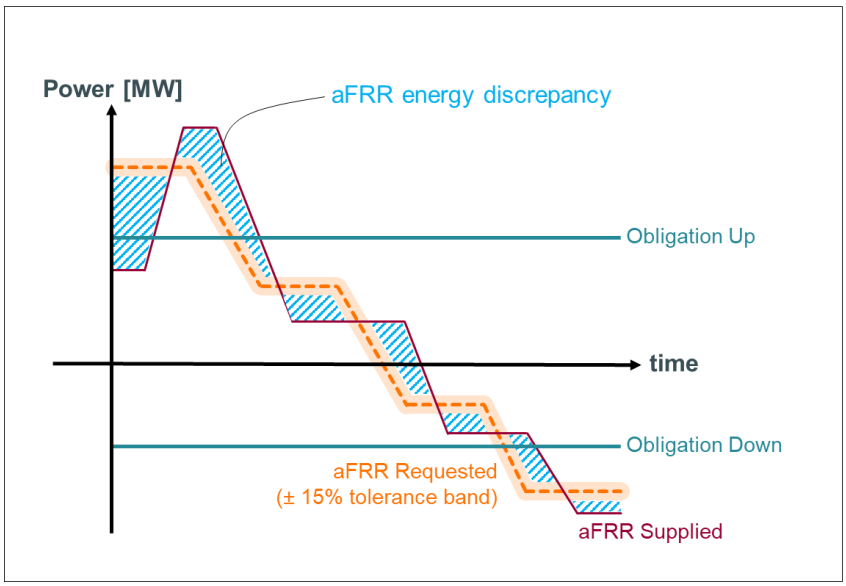

Figure 9 – Illustration of the AS IS activation control aFRR design

3.3.2. Analysis of AS IS design and market feedback

Below may be found the main feedback that Elia received on the penalty for activation control aFRR following the Public Consultations on the T&C BSP aFRR and mFRR, and the bilateral exchanges between the stakeholders and Elia in the framework of this incentive. A more in-depth explanation for each feedback point is given afterwards.

1. The monthly granularity does not capture the value of the service at the time of the **discrepancy and may lead to situations of arbitrage when large price spreads occur during a given month.**
2. The capacity remuneration is **affected even in case of overdelivery.**

In addition to those feedbacks, Elia identified **one additional area of improvement regarding the AS IS design of the activation control aFRR:**

3. **A discrepancy linked to non-contracted bids impacts capacity remuneration.**

These 3 elements are discussed below:

1. Monthly granularity

   To illustrate the point on monthly granularity, one may consider the following theoretical example:

   A BSP has 10 MW of aFRR Up on all CCTUs of the 1st and 4th weeks of Month M with:

   - High capacity and energy prices at the start of the month

- Low capacity and energy prices at the end of the month
- 100% activation of all the energy bids

The remuneration of the BSP is calculated in Table 3.

Because the penalty for activation control aFRR is function of the remuneration of the whole month, the BSP may be incentivized to bid less capacity or energy at the end of the month to avoid that a discrepancy at the end of the month influences the high remuneration of the beginning of the month.

Consider 0% failed activation for week 1, and y% for week 4. The resulting penalty linked to activation control aFRR is explained in Table 4.

If one plots the penalty as function of the share in failed activation in week 4 (Figure 10), it can be seen that the BSP loses all remuneration of week 4 due to a failed activation of 32% during week 4. If the failed activation is greater, it loses remuneration of week 1.

Elia is of the opinion that a penalty resulting from a failed activation, during a given time period (CCTU or QH, e.g.), should be as much as possible function of the energy requested, the energy discrepancy, and the remuneration of *the given time period*.

Table 3 - Remuneration of BSP

Period	# of CCTUs	Volume awarded per CCTU [MW]	Capacity Price [€/MW/h]	Capacity Remuneration [k€]	Energy Price [€/MWh]	Energy Remuneration [k€]
WEEK 1	42	10	200	200 x 10 x 4 x 42 = 336	350	350 x 10 x 4 x 42 = 588
WEEK 4	42	10	50	50 x 10 x 4 x 42 = 84	150	150 x 10 x 4 x 42 = 252

Table 4 - Penalty for activation control aFRR after week 1 and after week 4

Period	Remuneration (M) [k€]	aFRR Energy Requested (M) [MW]	aFRR Energy Discrepancy(M) [MW]	Penalty activation control [k€]
WEEK 1	336 + 588 = 924	10 x 4 x 42 = 1680	0	/
WEEK 1 + WEEK 4	924 + 84 + 252 = 1260	1680 + 10 x 4 x 42 = 3360	0 + y% x 1680	**1.3 x (0 + y% x 1680) / 3360 x 1260**

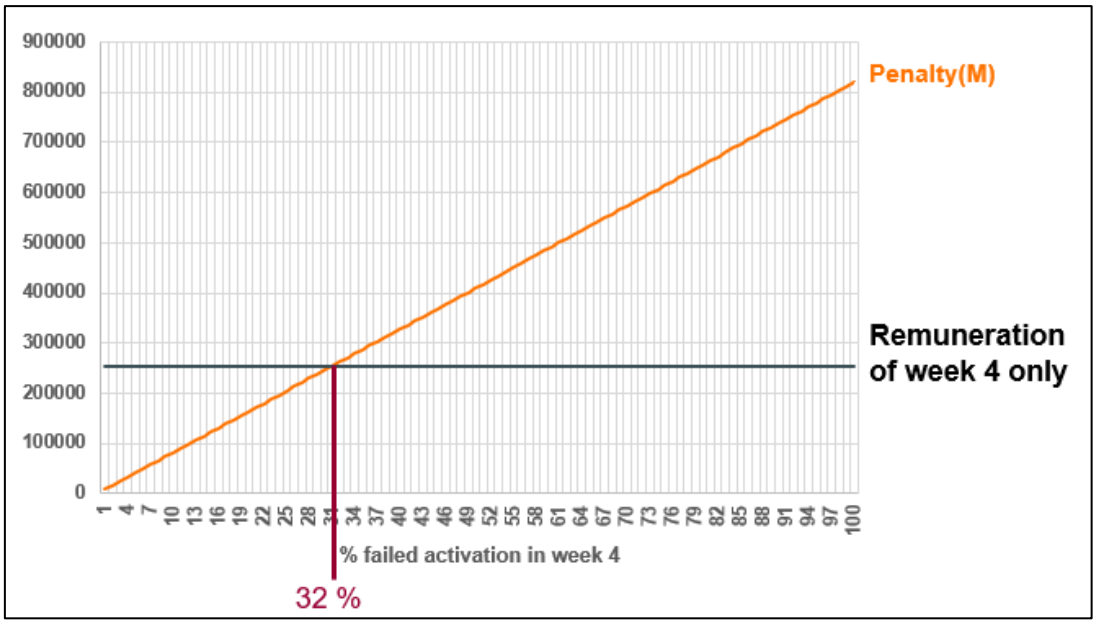

Figure 10 - Penalty as function of share of failed activation in week 4

2. Overdelivery penalizes capacity remuneration

Consider a BSP having a 10 MW Obligation for a CCTU of a given day. During the CCTU, in a given Time Step, Elia requests the BSP to activate 5 MW, but the aFRR Supplied is 7 MW instead. In the current aFRR energy discrepancy calculation, the BSP is penalized proportionally to capacity remuneration and energy remuneration. However, the BSP, for this Time Step, has met its Capacity Obligation since it delivered (at least) the volume requested by Elia during that Time Step.
In this regard, in case of overdelivery, it would make most sense to only penalize the BSP for the energy component and to remove the capacity component from the penalty. This point is included in the new design proposal of the activation control aFRR, which is described further in the report.

3. Non-contracted bids discrepancy impacts capacity remuneration

Consider a BSP, in Month M, having some remuneration linked to aFRR Awarded, i.e., following capacity auctions. Later in the Month, for a given CCTU, the BSP has no Capacity Obligation and submits non-contracted energy bids. In the AS IS design, if the BSP has an Energy Discrepancy during that CCTU, the calculation of the penalty related to that Energy Discrepancy will be impacted by the capacity remuneration from the beginning of the month**, even though the BSP had no Capacity Obligation during the given CCTU. While Elia believes it's important to set the framework for the development of more non-contracted Energy Bids in aFRR, the current penalty linked to activation control aFRR doesn't provide the right incentives to BSPs to submit additional non-contracted Energy Bids.**

3.3.3. New design proposal

Elia still considers that (costly) availability tests should be avoided if sufficient information is available from the activation control to assess the respect of the BSP's capacity obligations. This allows to avoid unnecessary costs and system disturbances (i.e. creation of a system imbalance) related to the (unremunerated) availability tests. Such information is currently available for aFRR, whose entire merit order is activated frequently.
Nevertheless, the penalties related to this activation control can be improved to address the points identified above.

The new design for the penalty for activation control aFRR that Elia proposes in the framework of this incentive may be summarized in two points:

1. Decoupling of the capacity and energy controls and penalties.
2. Change the granularity of the penalty related to energy to 1 quarter hour and the granularity related to capacity to 1 week.

With these two major changes, Elia is confident that the new design addresses the main points initially highlighted by the Market Parties or identified by Elia.
Hereunder is first presented the energy penalty, followed by the capacity penalty along the definitions of new quantities that had to be defined with the introduction of the capacity penalty. Then, the calibration of the penalty factors is explained.

3.3.3.1. Energy penalty

The proposal for the energy penalty is similar to the current design, with two main changes:

1. Change from monthly granularity to quarter-hour granularity for the penalty calculation (the control is still continuous).
2. In terms of remuneration, the new energy penalty formula is function of the value of the energy remuneration of the corresponding quarter hour (remuneration aFRR Requested).

In the current design, the energy remuneration is calculated by taking the absolute value of the sum of the QH energy remunerations over the month, which means that negative remunerations compensate positive ones, resulting in a lower absolute remuneration, and therefore a lower penalty for a given discrepancy. In the new design proposal, **this effect is canceled due to the QH granularity of the energy discrepancy penalty. However, it can lead to disproportionate penalties when the BSP has a significant share of QHs with a negative remuneration, as it is the sum of the absolute values of the QH energy remunerations that is considered in the new design proposal.**
To mitigate this effect, Elia proposes to lower the energy penalty factor from **1.25** to **0.25** for QHs where BSP pays Elia to be activated, as illustrated in Figure 11.

- **For the activations where Elia pays the BSP**, Elia must recuperate the remuneration linked to the undelivered volume (factor 1), and an additional penalty is needed on top to incentivize the BSP to deliver the service (factor 0.25).
- **For the activations where BSP pays Elia**, there is no remuneration for Elia to recuperate, and only a 0.25 penalty factor is needed to correctly incentivize the BSP to deliver the service.

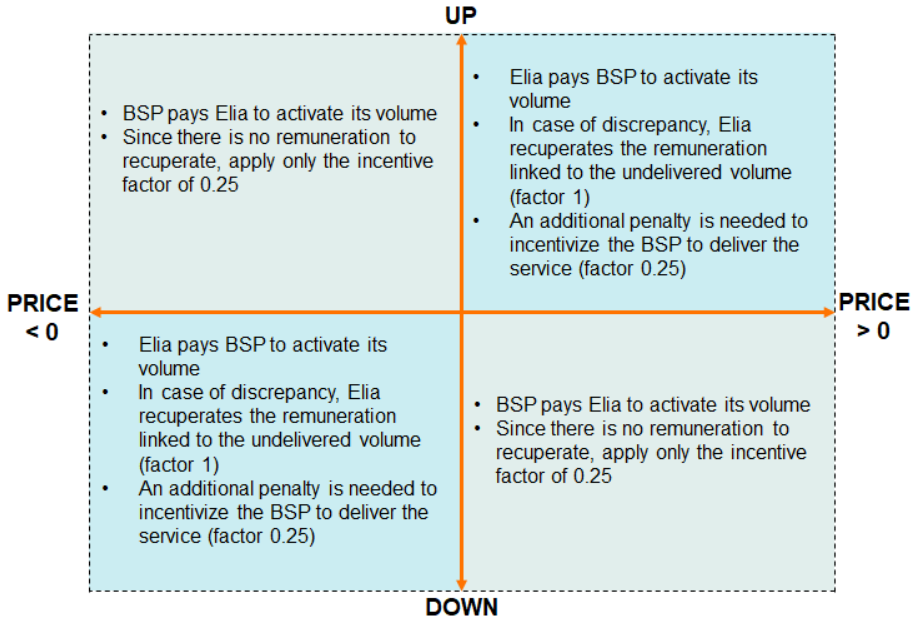

Figure 11 - Illustration of the different possible energy remunerations and the rationale for their resulting penalty factor

The aFRR Energy Discrepancy penalty, for a given QH, **when the remuneration from the BSP perspective is positive**, is therefore as follows:

$$aFRR\ Energy\ Discrepancy\ penalty(QH) = \mathbf{1.25} * \frac{aFRR\ Energy\ Discrepancy(QH)}{aFRR\ energy\ requested(QH)} * |remuneration\ aFRR\ Requested(QH)|$$

The aFRR Energy Discrepancy penalty, for a given QH, **when the remuneration from the BSP perspective is negative**, is therefore as follows:

$$aFRR\ Energy\ Discrepancy\ penalty(QH) = \mathbf{0.25} * \frac{aFRR\ Energy\ Discrepancy(QH)}{aFRR\ energy\ requested(QH)} * |remuneration\ aFRR\ Requested(QH)|$$

The 2 cases can be covered in the following single formula, allowing not to have multiple penalty formulas depending on the sign of the remuneration:

$$aFRR\ Energy\ Discrepancy\ penalty(QH) = \frac{aFRR\ Energy\ Discrepancy(QH)}{aFRR\ energy\ requested(QH)} * (0.75 * |remuneration\ aFRR\ Requested(QH)| + 0.5 * remuneration\ aFRR\ Requested(QH))$$

3.3.3.2. Capacity penalty

With the decoupling between capacity and energy controls, there is a need to introduce a new penalty linked to capacity only, with the introduction of two new concepts: the aFRR Capacity Requested and the aFRR Capacity Underdelivery, of which the definitions are presented hereunder.

The aFRR Capacity Discrepancy penalty, for a given week W, is as follows:

$$aFRR\ Capacity\ Discrepancy\ penalty(W) = 2.5 * \frac{aFRR\ Capacity\ Underdelivery(W)}{aFRR\ Capacity\ Requested(W)} * remuneration\ aFRR\ awarded(W)$$

aFRR Capacity Requested

Similarly to the aFRR energy requested(QH) in the denominator of the energy penalty formula, there is a need to define capacity-wise what Elia requests to the BSP. Figure 12 illustrates what the aFRR Capacity Requested consists of.

The selection of a capacity bid following a capacity auction leads to a Capacity Obligation for the BSP to submit at least the same volume of balancing Energy Bids for all the QHs of the corresponding CCTU. The BSP is allowed to submit non-contracted Energy Bids in addition to the contracted Energy Bids (which must correspond to its Capacity Obligation). This means that it is possible that the BSP is requested to activate more power than its Obligation (in each direction), as illustrated in the far-left and far-right sides of Figure 12. However, to penalize capacity adequately, only the volume corresponding to the remunerated capacity should be considered, which is why the aFRR Capacity Requested is capped to the Capacity Obligation in both directions (defined as “Obligation Up” and “Obligation Down” for positive and negative directions respectively), if it applies.

For a given CCTU, in a given direction, for the Time Steps where aFRR Supplied is greater than the BSP’s Capacity Obligation, the BSP should not be exposed to a penalty linked to its capacity remuneration since it has respected its Obligation in the corresponding direction.

The aFRR Capacity Requested, for a given week, in MWh, is therefore as follows:

$$aFRR\ Capacity\ Requested(W) = \sum_{All\ Ts\ over\ week\ W} \frac{aFRR\ Capacity\ Requested(Ts)}{900}$$

Where $aFRR\ Capacity\ Requested(Ts) =$

$$\begin{cases} min(aFRR\ Requested(Ts-2); Obligation\ Up) & if\ aFRR\ Requested(Ts-2) > 0 \\ min(aFRR\ Requested(Ts-2); -Obligation\ Down) & if\ aFRR\ Requested(Ts-2) < 0 \\ 0 & if\ aFRR\ Requested(Ts-2) = 0 \end{cases}$$

aFRR Capacity Requested(Ts) is in MW.

Where Obligation Up and Obligation Down are the capacity obligations in the upward and downward directions of the BSP in the CCTU comprising the given Time Step, Ts, respectively. They are always positive values.

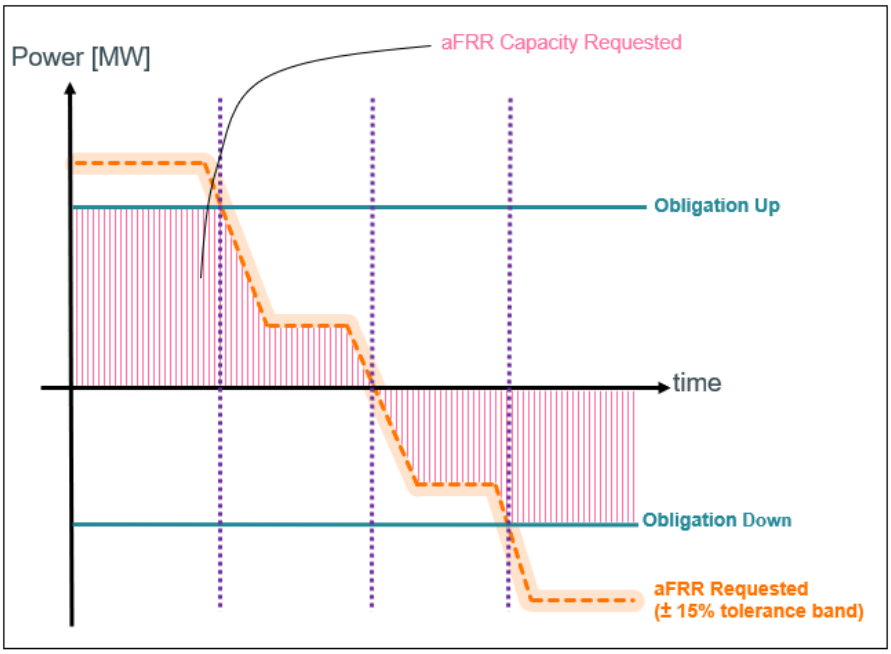

Figure 12 – Illustration of the aFRR Capacity Requested

aFRR Capacity Underdelivery

To define aFRR Capacity Underdelivery, Elia has investigated all possible relative positions between the 4 relevant variables (in the upward direction but the rationale is the same in the downward one): aFRR Made Available Up, Obligation Up, aFRR Requested, and aFRR Supplied. These are illustrated in Figure 13. Due to some constraints (for instance, the aFRR Requested can never be greater than the aFRR Made Available Up), there are in total 8 unique situations.

Elia investigated these situations and assessed whether it makes sense to penalize BSP capacity-wise in each of them. **There are only 2 situations for which it makes sense: the 1st and the 8th one, i.e., when 2 conditions are met:**

1) the aFRR Supplied is lower than the aFRR Requested, and

2) the aFRR Supplied is lower than the Obligation Up.

In the 1st case, the BSP doesn't deliver the full volume of aFRR Requested, which is lower than the Obligation Up, justifying a penalty linked to the capacity remuneration. In the 8th case, it is the same rationale except that the aFRR Requested is greater than the Obligation Up, meaning BSP submitted non-contracted bids in addition to its Obligation.

Note than in the 7th case, for instance, while the aFRR Supplied is lower than the aFRR Requested, BSP would not be penalized capacity-wise since the aFRR Supplied is greater than the Obligation Up, therefore respecting its Obligation in the upward direction (BSP would still be penalized energy-wise, though).

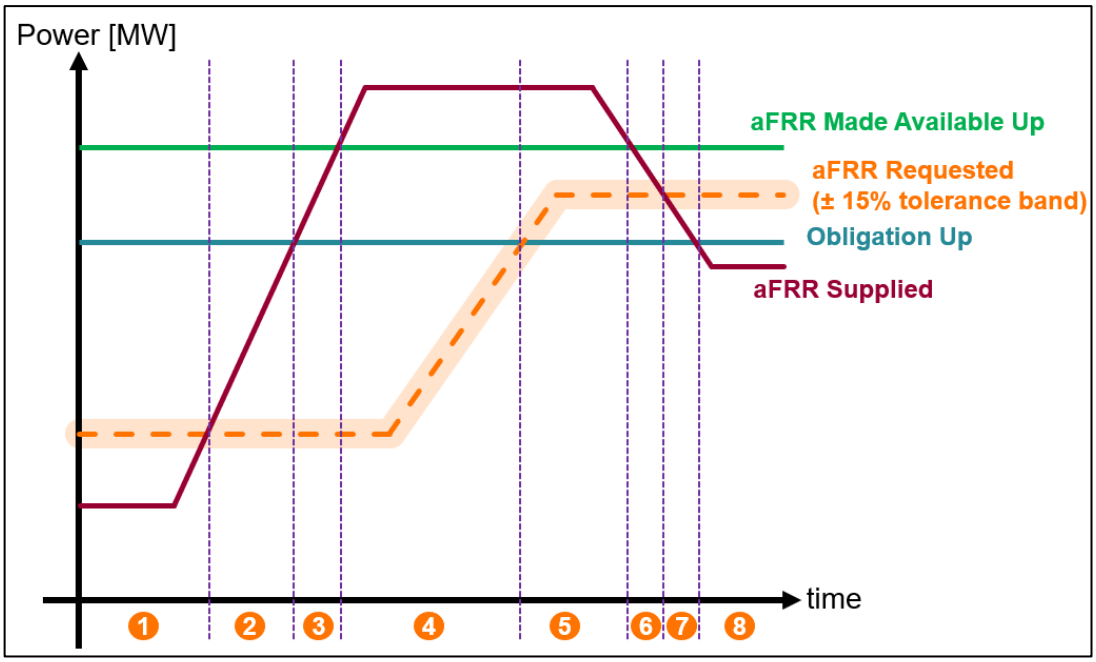

Figure 13 – The 8 unique situations that can happen when delivering aFRR

Zoom-in on situations when aFRR Supplied and aFRR Requested have opposite signs

Before defining the aFRR Capacity Underdelivery mathematically, one must consider situations where aFRR Supplied and aFRR Requested have opposite signs. This is illustrated in Figure 14.

- For the 1st and 5th areas, as discussed before, BSP should not be penalized capacity-wise since it has delivered more than what was requested, so there are no reasons for Elia to believe that the capacity is unavailable.
- For the 2nd area, BSP should not be penalized capacity-wise either since the aFRR Requested is equal to zero.

For the 3rd and 4th areas, BSP underdelivers. However, only the 4th area should be considered in the penalty calculation. Indeed, an activation in the opposite direction as that requested should not lead to additional capacity penalty, as this could lead to penalize more volumes than offered by the BSP in a given direction.

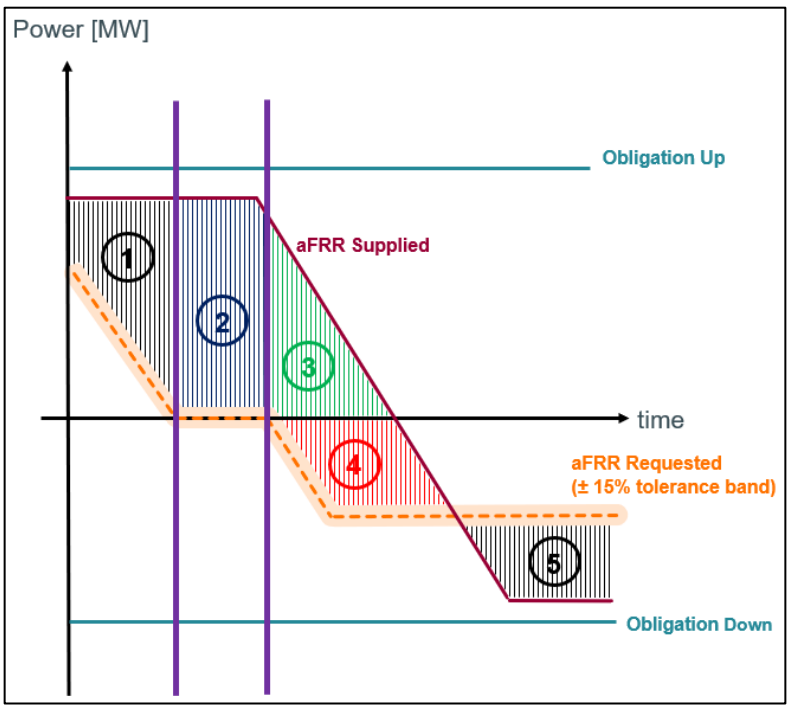

Figure 14 – Example where aFRR Supplied and aFRR Requested have opposite signs

Resulting definition of aFRR Capacity Underdelivery

Figure 15 illustrates the areas that are to be penalized capacity-wise based on the explanations given above. As explained, the first and last aFRR Capacity Underdelivery areas in Figure 15 are capped to Obligation Up and Obligation Down respectively since there are no capacity remunerations linked to the rest of the capacity requested during those Time Steps. As for the two other areas, the aFRR Capacity Underdelivery is capped to the aFRR Requested to adequately represent the underdelivery of the BSP: if, for instance, BSP has 10 MW Obligation Up, and Elia requests 5 MW but BSP only delivers 4 MW, it will be penalized only up to the aFRR Requested, that is, 5 MW, and not up to the Obligation Up. Indeed, considering the volume up to the capacity obligation could lead to discrepancies higher than 100% due to the capacity requested factor in the penalty formula. Also, it could give an incentive to the BSP to overdeliver, as a slight underdelivery would lead to a significant penalty when aFRR Requested is low (and hence during all ramping phases), which is undesired as well. Additionally, the underdelivery may result from a steering issue or from the failure of a small part of the BSP's portfolio (meaning that should the entire Obligation have been requested, other assets would have been activated, which may not have failed).

With the above rationale and Figure 14 in mind, **the aFRR Capacity Underdelivery, for a given week W, can be defined as follows:**

$$aFRR\ Capacity\ Underdelivery(W) = \sum_{Ts\ over\ week\ W} \frac{aFRR\ Capacity\ Underdelivery(Ts)}{900}$$

Where:

- If aFRR Requested(Ts – 2) > 0:

$$aFRR\ Capacity\ Underdelivery(Ts) = max\{\ [\min(aFRR\ Requested(Ts-2); Obligation\ Up) - max(aFRR\ Supplied(Ts); 0) - \delta_{perm}(Ts)]\ ; 0\}$$

- If aFRR Requested(Ts – 2) < 0:

$$aFRR\ Capacity\ Underdelivery(Ts) = |min\{\ [max(aFRR\ Requested(Ts-2);\ -Obligation\ Down) - min[aFRR\ Supplied(Ts); 0] + \delta_{perm}(Ts)]\ ; 0\}|$$

- If aFRR Requested(Ts – 2) = 0:

$$aFRR\ Capacity\ Underdelivery(Ts) = 0$$

- $\delta_{perm}(Ts)$ is defined the same way as in the AS IS design

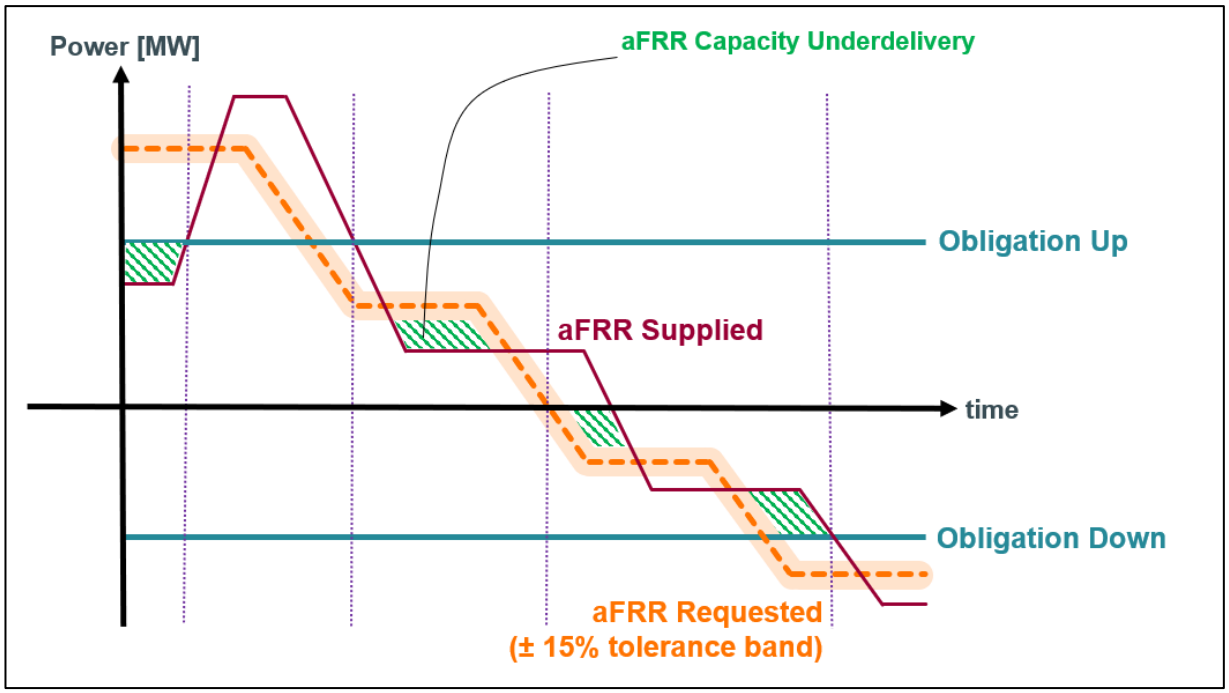

Figure 15 - aFRR Capacity Underdelivery illustration

Motivation for the weekly granularity of the aFRR capacity penalty formula

Unbundling capacity and energy controls for aFRR allows to determine a distinct granularity for the settlement of the capacity control. As much as it makes sense for the energy to go for a quarter-hour granularity, it would not be the case for capacity. Indeed, the Obligation in a given direction is constant throughout a CCTU. During that CCTU, depending on the amount of capacity made available by the BSP, its position in the merit-order list and the aFRR Elia requests, it may be that the BSP is not activated during that CCTU (or only for a part of its Obligation). Therefore, the granularity for the settlement of the capacity control must be large enough to cover situations where the activation of all contracted Energy Bids is requested and to assess the real availability of the capacity.
This is illustrated in Figure 16: if the granularity is too low (QH, e.g.), the BSP would not be adequately incentivized, as it would keep the main part of its capacity remuneration whereas it may not be delivering the service properly.
In Figure 16, out of the 16 QHs for which BSP has an Obligation in the upward direction ('Obligation Up'), the aFRR Requested is different from zero only over 4 QHs, and the BSP does not respect its capacity obligation. There are therefore good reasons to believe that the capacity was not available during the other QHs of the CCTU either. With a QH granularity, the BSP would keep the main part of its capacity remuneration linked to that CCTU, which would not give the BSP the right incentive to deliver the service properly when it is requested to do so.

On the other hand, as explained in Section 3.3.2 a too large granularity leads to a risk of arbitrage in case of large price spreads during the time-window.

An analysis of historical data showed that a **weekly granularity** for the capacity control is a good trade-off between the two extremes. With a weekly granularity, the time-window is large enough to correctly assess the full availability of the capacity of the BSP, and not too large to limit potential arbitrage in case of large price spreads. This parameter

will also be monitored by Elia, as the connection to the European aFRR-Platform might impact the activation frequency of the aFRR Energy Bids.

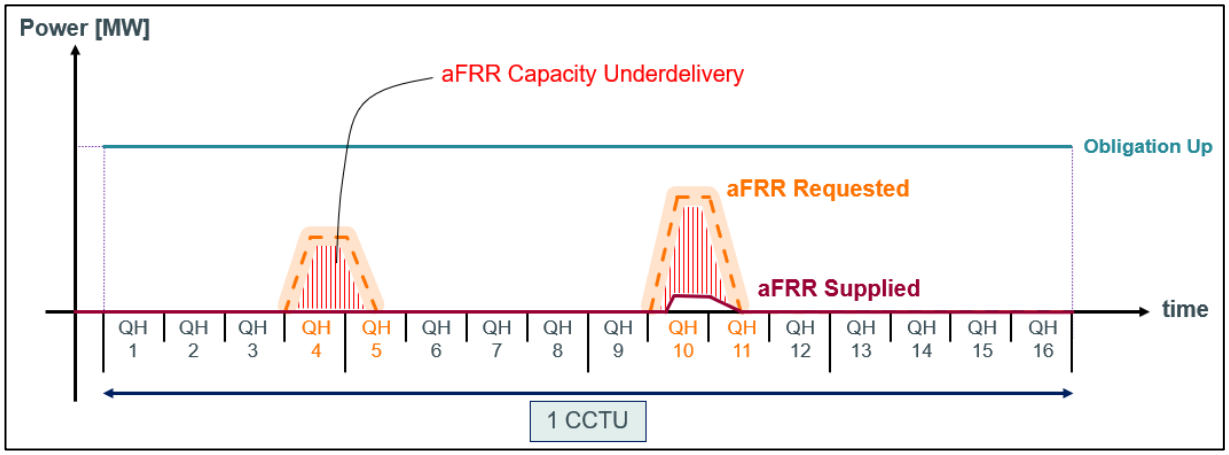

Figure 16 – Illustration of the granularity of the aFRR capacity control

3.3.3.3. Motivation of the penalty factors in the new design proposal

The motivation for choosing the penalty factors[5] holds in the following points:

1. The desired hierarchy between the different penalties has been considered and is improved compared to today's design, to limit arbitrage between the penalties and ensure that the BSPs are confident in the availability of their DPs.
2. The 1.25 factor in the energy penalty has been initially chosen to align with the (future) mFRR design. In the meantime, Elia proposed a different penalty factor for the mFRR activation control (from 1.25 to 1.1) and consequently, the penalty factor in the energy penalty of the activation control aFRR may need to be reviewed, also given the additional discussions with stakeholders that will take place after this incentive study.
3. The volume of discrepancy that will impact capacity remuneration is expected to be reduced by about 50% (depending on overdelivery vs underdelivery and on free bids). To not reduce the incentive to properly deliver the service, Elia proposes a penalty factor which is doubled for capacity compared to energy. Elia has computed the impact on the amount of penalties in 2022 and came to the conclusion that the order of magnitude is comparable with today's penalty design. However, the simulation did not consider a potential change in the BSP's behavior, which is why the quality level of the service will be closely monitored and penalty factors might be adapted based on the conclusions of the analysis.

[5] 1.25 and 2.5 in the energy and capacity penalties, respectively.

3.3.4. FEBEG's alternative proposal and analysis

FEBEG is concerned with Elia using the activation control aFRR to penalize the capacity remuneration (in both today's design and Elia's new penalty design proposal as presented in Section 3.3.3). FEBEG proposes to remove the capacity penalty from the activation control aFRR and to control capacity obligations via aFRR availability tests instead. It suggests that if needed, the possible resulting decrease in penalties for aFRR activation control could be addressed by an increase of the penalty factor in the energy penalty formula, so the BSPs remain incentivized to deliver the service with a sufficient quality level.

Elia has analyzed the alternative proposal and has initiated the discussions on the advantages and drawbacks with market parties. Those are listed below, as a basis for further discussions.

The advantage for the BSP of the alternative proposal is that its capacity remuneration is not impacted in case of underdelivery when following the activation signal due to inaccuracies in steering the asset, despite having all its capacity available.

The drawbacks of the alternative proposal are the following:

- In aFRR, the activation of the full merit-order is frequent, allowing to ensure that the capacity is available without doing availability tests, knowing that those are not remunerated, might lead to the unavailability of a significant part of the aFRR merit order during the test and create a system imbalance.
- Availability tests rely on a different process than activations: the tests can be failed while the capacity is available, leading to a significant penalty for the BSP while the capacity is actually available.
- Increase the penalty factor in the energy penalty formula would increase barriers for non-contracted energy bids. One of the motivation of Elia's new design proposal is precisely to remove such barriers.

3.3.5. Elia's recommendations

Although the new design proposal, as described in Section 3.3.3, is more complex than the current one, Elia still supports it as it addresses the areas of improvement identified in Section 3.3.2:

- the granularity of the penalty scheme is adapted in order to limit the potential situations of arbitrage in case of large price spreads in a given month;
- the energy penalty being proportional to energy remuneration only, a failed activation of non-contracted bids would no longer affect capacity remuneration.;
- the capacity penalty ensures that a BSP's capacity remuneration is not affected in case of overdelivery.

Nevertheless, as requested by market parties, further discussions on the penalty for activation control aFRR will take place in 2024 before a proposal for amending this penalty in the T&C BSP aFRR will be introduced by Elia.

4.aFRR Availability Control

In this section, **the design of the aFRR availability control is discussed. First, the AS IS design is reminded, then market feedback is given, and finally the new design proposal is presented.**

4.1. AS IS Design

The availability of the aFRR capacity is monitored by Elia on the basis of availability tests. Availability tests only apply for aFRR Obligation and focus on testing the aFRR Capacity Requested. The goal is to test the availability of the capacity, not the ramping behavior or the follow-up of a setpoint.

An availability test consists of the activation of one or more aFRR contracted Energy Bid(s) for a duration of three quarter-hours, as shown in Figure 17. First and Third QHs are dedicated to the ramp-up and ramp-down, respectively (if the test is in the upwards direction), and during the second QH the aFRR Capacity Requested must be supplied by the BSP.

The BSP must use the Delivery Point(s) listed in the concerned tested aFRR Energy Bid(s) when performing the aFRR availability test.

Elia considers an availability test as failed if the BSP has failed to execute the communications foreseen, and/or if the BSP does not respect the compliancy criteria described hereunder.

Compliancy Criteria

For the second QH of the availability test, Elia determines the aFRR Power Supplied per Time Step "Ts", as follows:

$$aFRR\ Power\ Supplied(Ts) = \sum_{DP}\left[DP_{baseline,Ts_0} - DP_{measured}(Ts)\right]$$

Where **$DP_{baseline,Ts0}$ is the last baseline received at the Time Step "Ts_0" at which the trigger of the availability test is sent by Elia, which means the baseline must be constant over the full period of the test.** The rationale behind is to avoid a manipulation of the baseline during the test.

The availability test is failed if the aFRR Power Supplied is inferior (respectively inferior) to the aFRR Capacity Requested for more than 15 Time Steps in case of availability test in the upward direction (respectively downward direction).

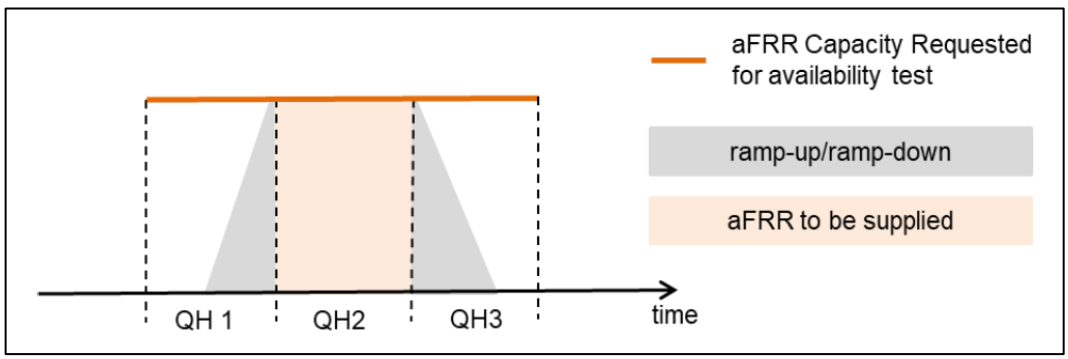

Figure 17 - aFRR availability test

4.2. Market Feedback

Several Market Parties have notified Elia of **the impossibility to maintain the baseline constant during the full period of the test, for various reasons**. Figure 18 illustrates an example of such impossibility to comply with the constant baseline requirement when an ID deal is fulfilled by the BSP during the test in the opposite direction of the tested capacity.

In Ts_0, the test is triggered, meaning the BSP must *freeze* its baseline. However, BSP settled an ID deal for QH2 before the triggering of the availability test. Therefore, during QH2 of the test, BSP must also respect its ID deal, but if it keeps its baseline constant, it results in a failed test. If the BSP was allowed to modify its baseline (as illustrated in Figure 19), then it could succeed the test while respecting its ID deal.

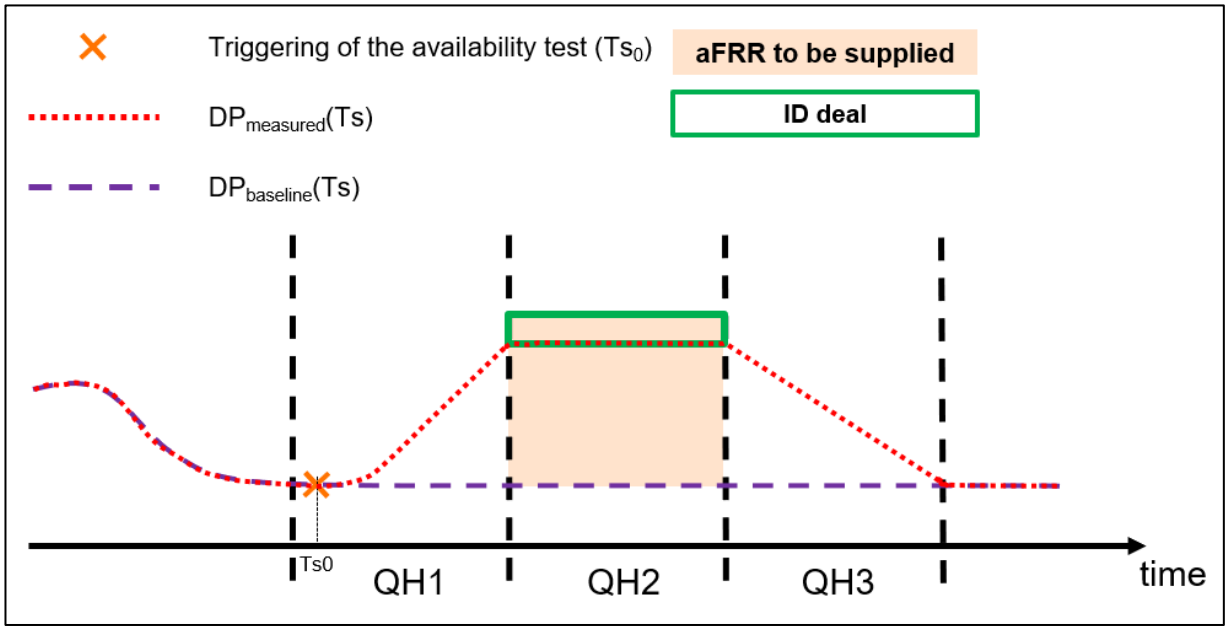

Figure 18 - ID deal occurring during aFRR availability test: constant baseline

4.3. New Design Proposal

The occurrence of a deal on the intraday market during the aFRR availability test is only one of the reasons why it may be justified for the BSP to modify its baseline (SoC management of a battery in line with its EMS, non or limited coordinable assets,…). **Elia proposes to authorize such baseline modification during the occurrence of an aFRR availability test, at the condition that the BSPs provides a sound ex-post justification to Elia within 7 working days following the test.**

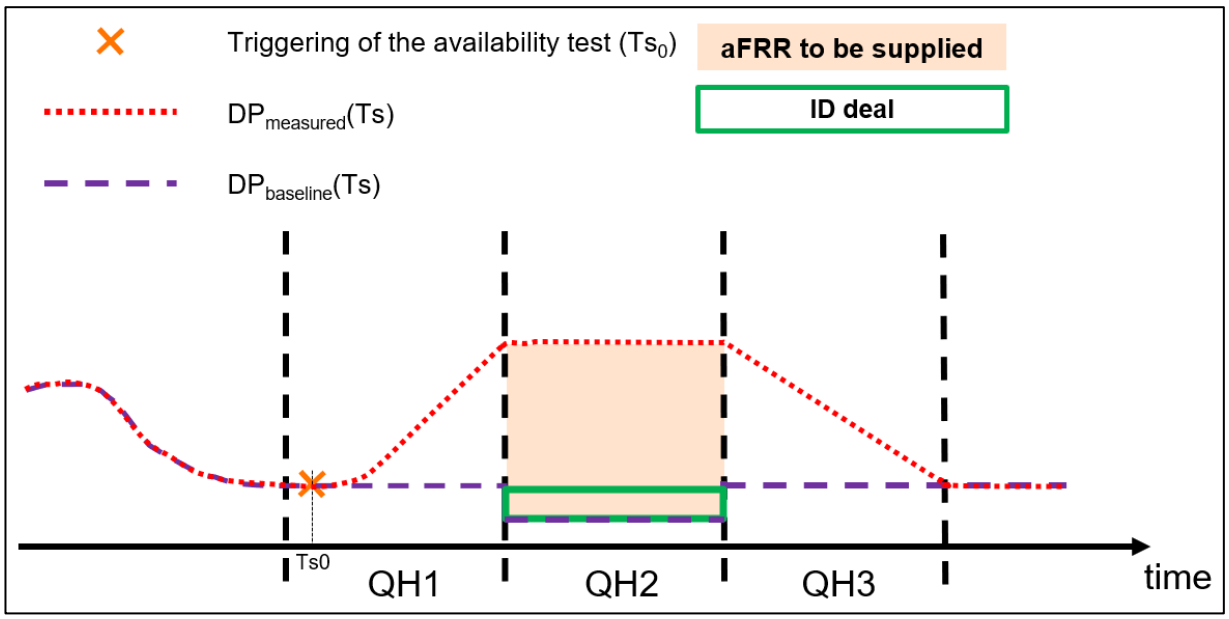

Figure 19 - ID deal occurring during aFRR availability test: baseline modification

5. Implementation Plan

From the conclusions of this incentive, and considering the general stakeholders' feedback from the public consultation, Elia proposes the following implementation plan:

- Prequalification process:
  Elia will include the proposed changes of the prequalification process in the next revision of the respective T&C BSP after the connection to the EU balancing platforms.
  An exception will be made for the reduction of the PQ test time-window in aFRR, which can be included as of the next public consultation on the T&C BSP aFRR, planned in March 2024, as it doesn't require an extensive redrafting of the T&C BSP nor significant implementation efforts.

- Penalty for MW Made Available and penalty for activation control aFRR:
  Elia has investigated possible design improvements of those penalties based on the stakeholders' feedbacks expressed both before and during this incentive study, leading to new design proposals. The insights provided have led to further discussions after the public consultation and the 3rd workshop. In order not to miss further feedback from stakeholders, Elia, the CREG, and stakeholders agreed during the 3rd workshop that further discussions will be useful. The analyses performed and the proposals made in the framework of the incentive will be the basis for those discussions.
  Considering the priority given to the developments needed on stakeholders' side on iCAROS/mFRR, Elia will define the timeline of the discussions together with stakeholders and the CREG based on this constraint. The objective will be to close discussions by the end of 2024, so that the new penalty designs may be included in the proposals for amendments of the T&C BSP aFRR and T&C BSP mFRR that will follow those related to the connection to the European balancing platforms.

6. Conclusion

In this final report, Elia has reviewed the current design of the prequalification process, control, and penalties related to the aFRR and mFRR services, and made proposals for a new PQ design as well as a change in the penalty for MW Made Available and in the penalty for activation control aFRR. To do so, Elia has, on the one hand, given the Market Parties the opportunity to address their feedback during 3 workshops and the public consultation and, on the other hand, has studied on its side potential design improvements linked to today's penalty schemes.

Elia is confident that the new prequalification design proposal will help reduce barriers to the participation to aFRR and mFRR services, facilitating the valorization of the flexibility of the stakeholders.

Elia is also confident that the new penalty design proposals would be improvements on several levels and should address most of Market Parties' comments.

Elia has also presented an implementation plan given time and resources constraints, as well as the request of market parties and of the CREG to keep the door open in 2024 for additional discussions on the designs of the penalty for MW Made Available and the penalty activation control aFRR.