# Introduction to the Incentive related to Additional Properties

# Objectives of the incentive

- Analyze and propose designs deviating from the proposed standard solution in order to **remove entry barriers for BSP** as long as the **minimum needs of Elia are satisfied**, given the specific context of Elia's LFC Block. The proposal of design shall **not necessarily be limited by choices** made by other TSOs of the FCR Cooperation

Incentive:

La CREG fait remarquer qu'il est justifié de **déroger aux solutions standard si cela permet de réduire ou d'éliminer les obstacles à la participation au marché et tant que les besoins minimaux de chaque GRT sont satisfaits, compte tenu du contexte spécifique du bloc RFP concerné.** La proposition faite dans le cadre de l'article 154(2) du SOGL prévoit une dérogation aux solutions standard proposées par les GRT en Europe continentale et énumère les besoins minimums qui doivent être satisfaits. Par conséquent, la CREG estime **qu'Elia ne doit pas nécessairement être freinée dans le développement de solutions** innovantes en raison des **choix faits par d'autres GRT dans la région concernée**. La proposition faite conformément à l'article 154(2) du SOGL cadre en effet avec la liberté nationale d'appliquer de meilleures solutions que la solution standard. La CREG adapte donc la proposition en ce sens.

# Scope of the incentive

- The proposal of design shall be **limited to design evolutions** related to article 154(2) of SOGL.
- The proposal of design shall **analyze the impact** of those evolutions on the development of a **competitive national FCR market**, on the **participation of end-consumers on low voltage, Demand Side Response (DSM) and storage.**

Incentive:

Etude consistant **à analyser et proposer des évolutions de design FCR adéquates**, dans le cadre de l'implémentation des règles européennes établies **conformément à l'article 154(2) du SOGL**. Plus particulièrement, Elia étudiera les possibilités de déviation au niveau national par rapport aux règles européennes établies par défaut et proposera plusieurs solutions alternatives après concertation avec la CREG et les stakeholders. L'analyse tiendra compte **des besoins d'Elia et des possibilités des BSPs**, ainsi **que de l'impact des exigences établies** au niveau national sur le développement d'un marché de la FCR compétitif, **y inclus sur la participation à ce marché d'unités ou clients finaux raccordés en basse tension, de la gestion de la demande et du stockage.** Les propositions d'Elia seront effectuées en concertation avec les acteurs de marché.

# Content of the incentive

Concrètement, dans le cadre de cet incitant :

- les raisons techniques qui pourraient justifier une dérogation aux exigences de l'article 3(2) des propriétés complémentaires FCR sont examinées ;
- une solution de rechange est élaborée, le cas échéant, en ce qui concerne l'exigence énoncée au troisième point de l'article 3(5) ;
- l'application du « mode réserve » tel qu'il est défini à l'article 4(4) et à l'annexe I des propriétés complémentaires FCR est examinée et, si nécessaire, d'autres critères pertinents seront élaborés ;
- la solution de rechange visée au point c) de l'article 3(7) et à l'article 3(9) est examinée et développée ;
- l'application des exigences de l'article 3(8) est étudiée et développée ;

Prequalification of non-compliant units

Derogation of to the rated to pre-qualified power ratio

Obligation and conditions on the provision of Reserve Mode

Obligation and conditions on the use of Centralized Controller

# Timeline of the incentive

| | Incentive | Year | 2022 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Month | 1 | | | | | 2 | | | | 3 | | | | 4 | | | | 5 | | | | | 6 | | | | 7 | | | | |
| | | Week | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
| | WG BAL | Day | 03 | 10 | 17 | 24 | 31 | 07 | 14 | 21 | 28 | 07 | 14 | 21 | 28 | 04 | 11 | 18 | 25 | 02 | 09 | 16 | 23 | 30 | 06 | 13 | 20 | 27 | 04 | 11 | 18 | 25 | 01 |
| Stakehold | WG Balancing | | | | | Intro Incentives | | | | | | | | | | | | | | Reporting WS | | | | | | | Reporting WS | | | | | |
| | Stakeholder workshop | | | | | | | | | | | | | | | | | WS 1 | | | | | | | | | WS 3 | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Public Consultation | | | | | | | | | | | | | | | | | 2 | | Consultation | | | | | | | | | | | | | |

- **March 31st 2022:** Concertation with CREG on the incentive and considered alternative solutions.
- 2 **April 30th 2022:** Deadline for the launch of public consultation
- 3 **June 30th 2022:** Deadline for the organization of a workshop to discuss and motivate the inclusion or not of the feedback of the stakeholders.
- October 31st 2022: Deadline for the submission of the consultation report with recommendations and an implementation plan for the amendment of the T&C BSP FCR.

# Prequalification of non-compliant units

# FCR technical minimum requirement SOGL Article 154.7

Each TSO of the CE synchronous area shall ensure that the combined reaction of FCR of a LFC area comply with the following requirements:

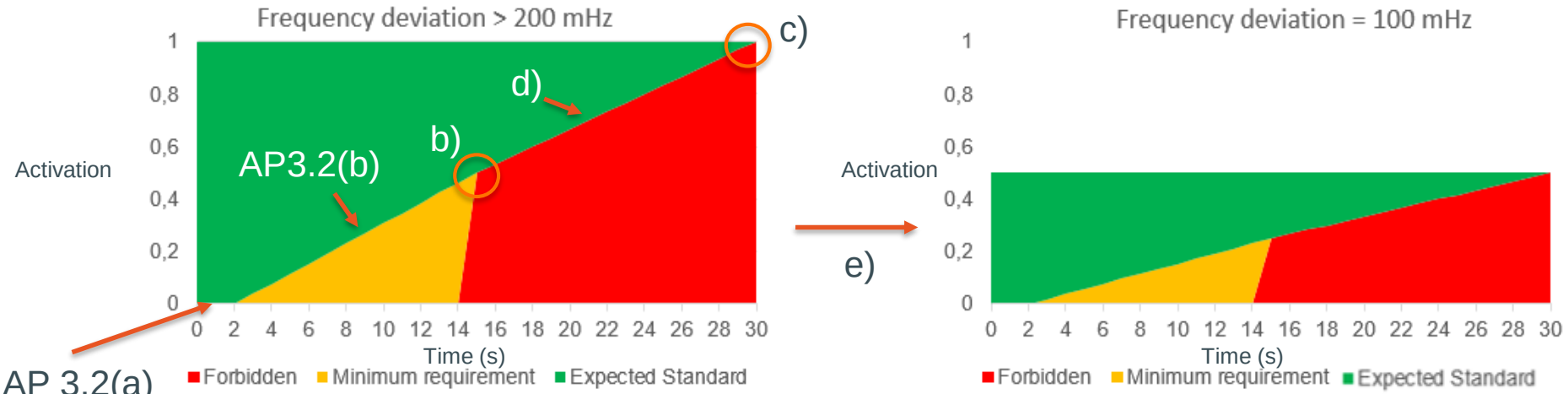
a) the activation of FCR shall not be artificially delayed and begin as soon as possible after a frequency deviation;

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

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

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

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



# Prequalification of non-compliant units

**Precision to the SOGL re. FCR activation**:

Each TSO shall ensure that the activation of FCR providing units and FCR providing groups:

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

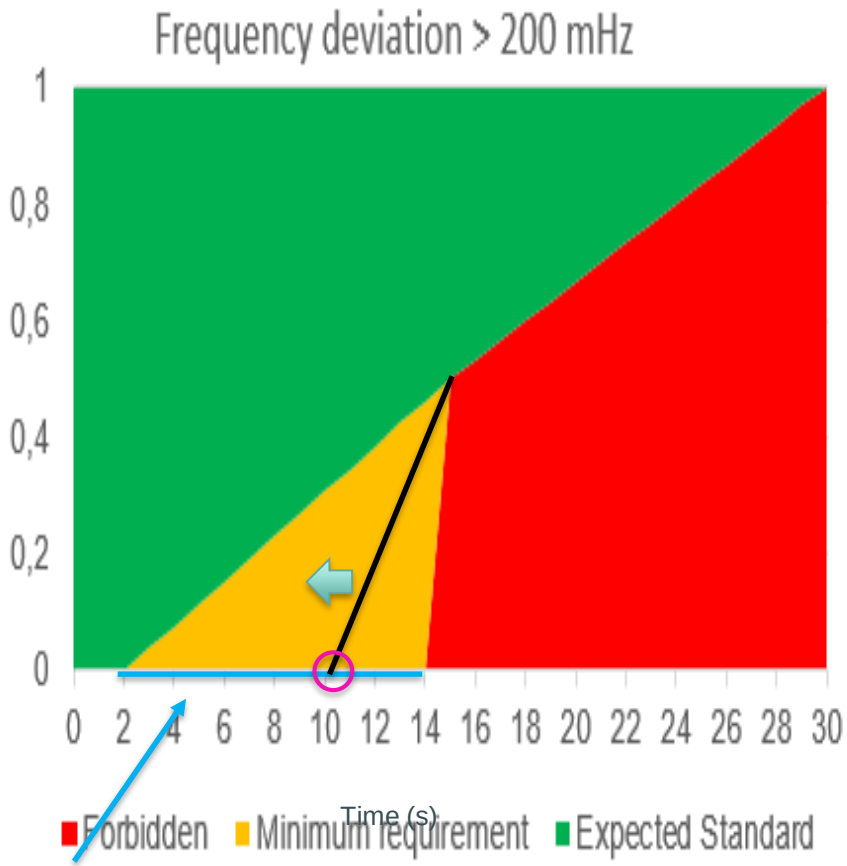
b) rises **at least linearly**.

**Already foreseen** in T&C FCR BSP (II.10.2/II.10.3)

When one of the requirements a) or b) cannot be met, the FCR providing group or FCR providing unit **shall provide technical evidence to the reserve connecting TSO**. The reserve connecting TSO assesses these justifications and **decides whether or not the unit or group can be qualified to provide FCR**. A refusal to be qualified shall be duly motivated by the reserve connecting TSO. The motivated decision **shall be communicated to the FCR provider and relevant regulatory authority**.

Possibility of derogation if one of the condition is met

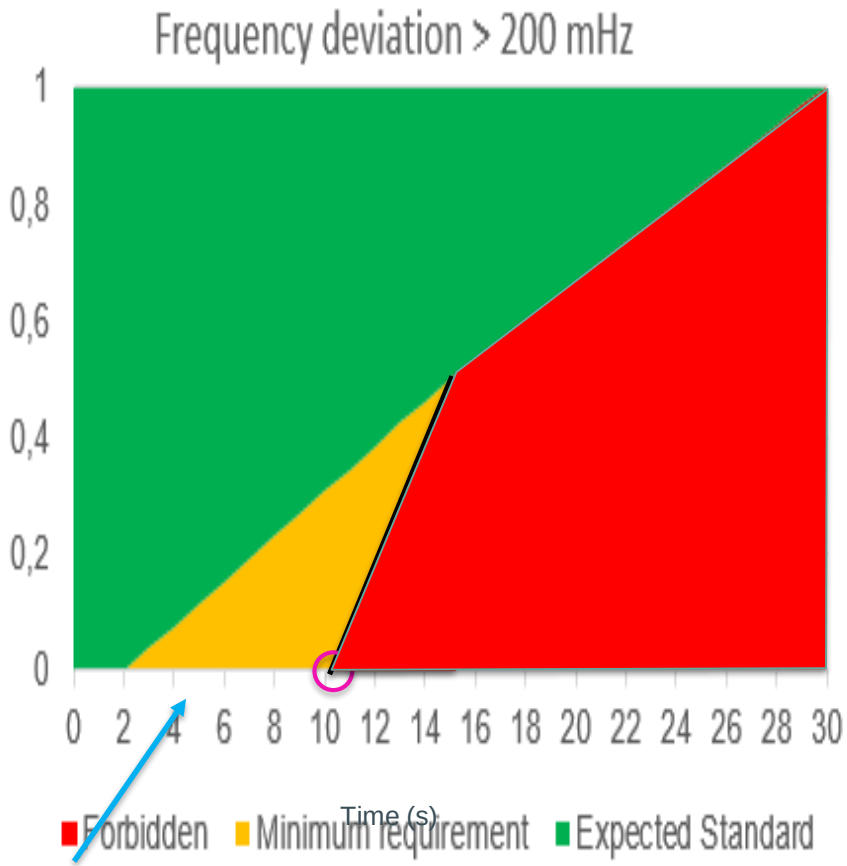
# Derogation to Additional Properties art 3.2(a)




Derogation to AP 3.2(a)

- The **derogation** to AP art. 3.2(a) allows the BSP to have **a reaction time** to a frequency deviation of **above the 2s stipulated**, as shown in yellow and which is bound by SOGL 154.7(a-e), where 50% of the FCR capacity for a given frequency deviation shall be delivered within 15 seconds.
- The **blue line** represents all the **possibilities of derogation** to art. 3.2(a). For a given point on the blue line ○ , an black line can be drawn to the 50% activation after 15 second. The reaction of FCR shall be left ⇦ to the corresponding black line if the requirement of at least a linear provision of FCR (pursuant AP art. 3.2(b)) remains applicable.
- The **black line** represents the **minimum requirement** for FCR Provision
- **The derogation shall be based on a technical demonstration**

# Derogation to Additional Properties art 3.2(a)

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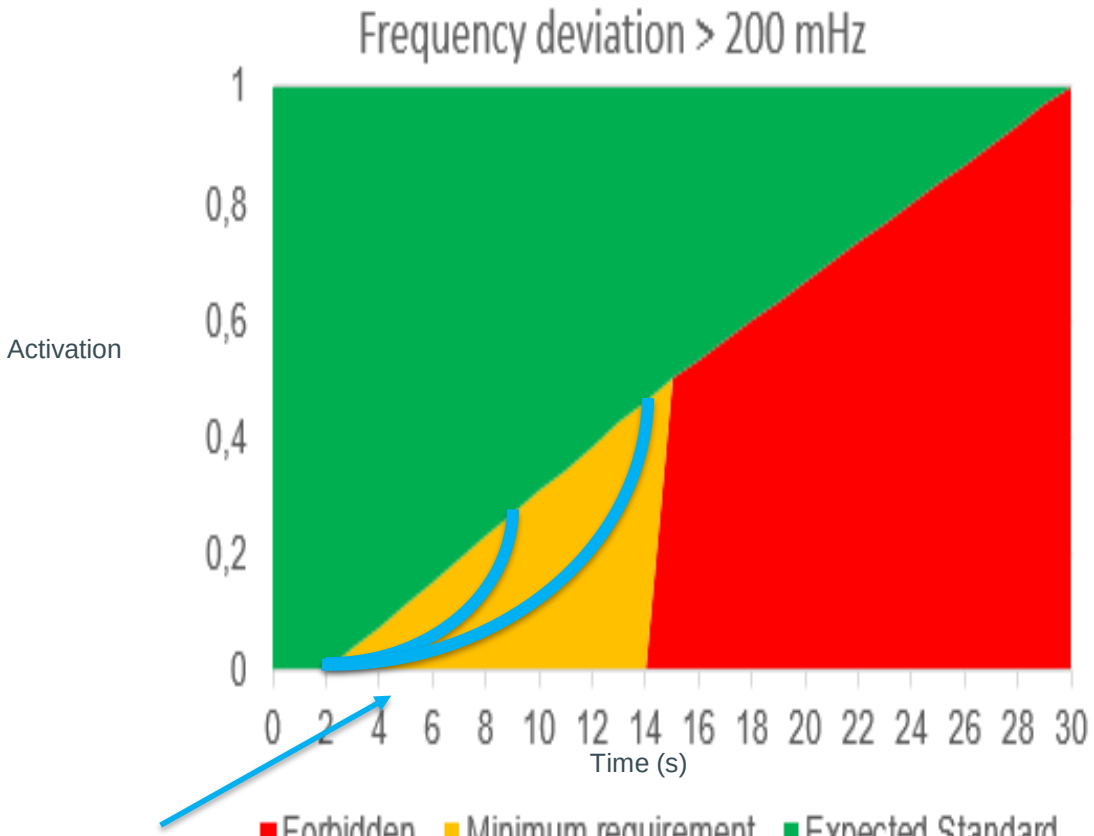
- The **black line** represents the **minimum requirement** for FCR Provision
- **The derogation shall be based on a technical demonstration**

# Derogation to Additional Properties art 3.2(b)



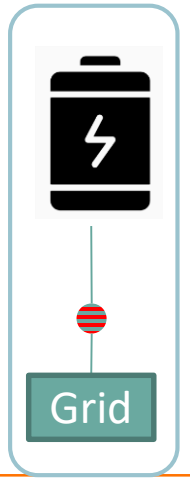

- The derogation to AP art. 3.2(b) allows the BSP to have sublinear reaction.
- The blue lines are examples of derogation to art 3.2(b). The reactions are **in function of frequency, while taking into account** the maximum combined effect of inherent frequency response insensitivity and possible intentional frequency response dead band of the governor of the FCR providing units or FCR providing groups **of 10 mHz** (SOGL Annex V).
- The FCR activation shall be **monotonic** according to SOGL art 142.2
- **The derogation shall be based on a technical demonstration**

# Derogation of to the rated to pre-qualified power ratio

# Derogation of to the rated to pre-qualified power ratio

For prequalification, the TSOs shall require that:

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



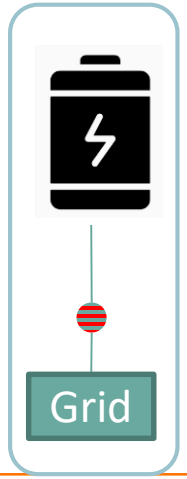

E.g.: A standalone battery with a rated power of 1.25 MW can at maximum pre-qualify 1 MW for the provision of FCR.

# Rationale behind the 1.25 ratio of rated power/pre-qualified power,

**SOGL art. 156.9:** For the CE and Nordic synchronous areas, each FCR provider shall ensure that the FCR from its FCR providing units or groups with limited energy reservoirs **are continuously available during <u>normal state</u>**. […]

The system remains in Normal State as long as the frequency:

- remains below 50mHZ; or → **Indefinite period of time (structural power balance)**
- does not meet the condition to switch to Alert State (|df| ≥ 50 mHz for 15' or |df| ≥ 100 mHz for 5') or Emergency State (|df| ≥ 200 mHz instantaneously) → **Transitory period of time (reserve energy)**




The 1.25 ratio allows a standalone battery ("worst case scenario") to be able to fulfill such obligations. E.g.:

- A battery with a rated power of 1.25 MW can at maximum pre-qualify 1 MW for the provision of FCR.
- Thus 0.25 MW of the battery may be used in the Energy Management Strategy to charge the battery when necessary.
- If the frequency deviation remains at 50 mHz indefinitely, the battery shall produce 25% of the contracted FCR service. With 0.25 MW of charging capacity, the battery is capable at all time to fulfill its obligation.

# Alternative solution to the ratio rated power/pre-qualified power of 1.25

Any unit or group with a ratio of rated power/pre-qualified power between [1;1.25] may be pre-qualified as long as in the EMS, an indefinite FCR activation in Normal State can be demonstrated.

The EMS shall be designed so that the **FCR service is actually provided** i.e. variation of output in function of frequency and **not be artificial** as a result of the charging/discharging component.

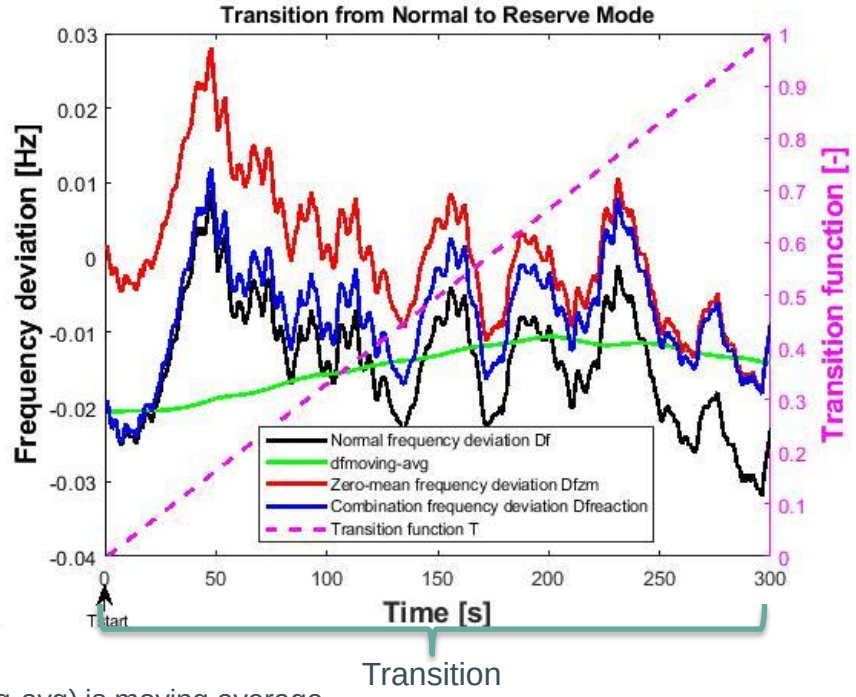
- The EMS can use a **combination of strategies**
- The demonstration can be based on **a deterministic analysis**
- Alternatively, the demonstration can be based on **a statistical analysis**
  - Analysis to be performed on a period of 2 historical years
  - When the historical data used for the demonstration appear not be representative anymore, Elia has the right to request an update of the statistical analysis

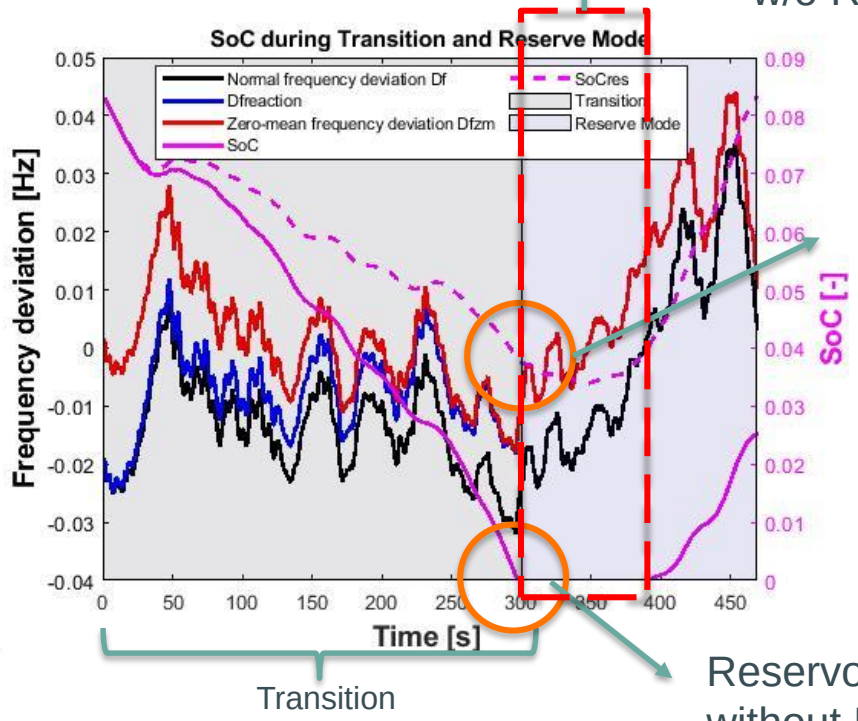
# Reserve Mode: Introduction

# What is Reserve Mode ?

The rationale behind the Reserve Mode is **avoid the depletion of the energy reservoirs** of the LER RPU in **long lasting frequency deviations** events and the loss of all FCR supports. The Reserve Mode aims therefore to have the LER RPU still providing a (limited) FCR **support for short frequency deviation** instead of none during such events.

The reduction of FCR support [f(Hz)] is compensated by aFRR [f(SI)] (cf. next slide)




- Green (dfmoving-avg) is moving average.
- Black (normal frequency deviation, df) to which Green is removed to get Red (short term frequency deviation).
- Blue (modified frequency in reserve mode) is transitioning linearly from Black to Red.

# Threshold to enter Reserve Mode:
# When is Reserve Mode activated and under what conditions ?

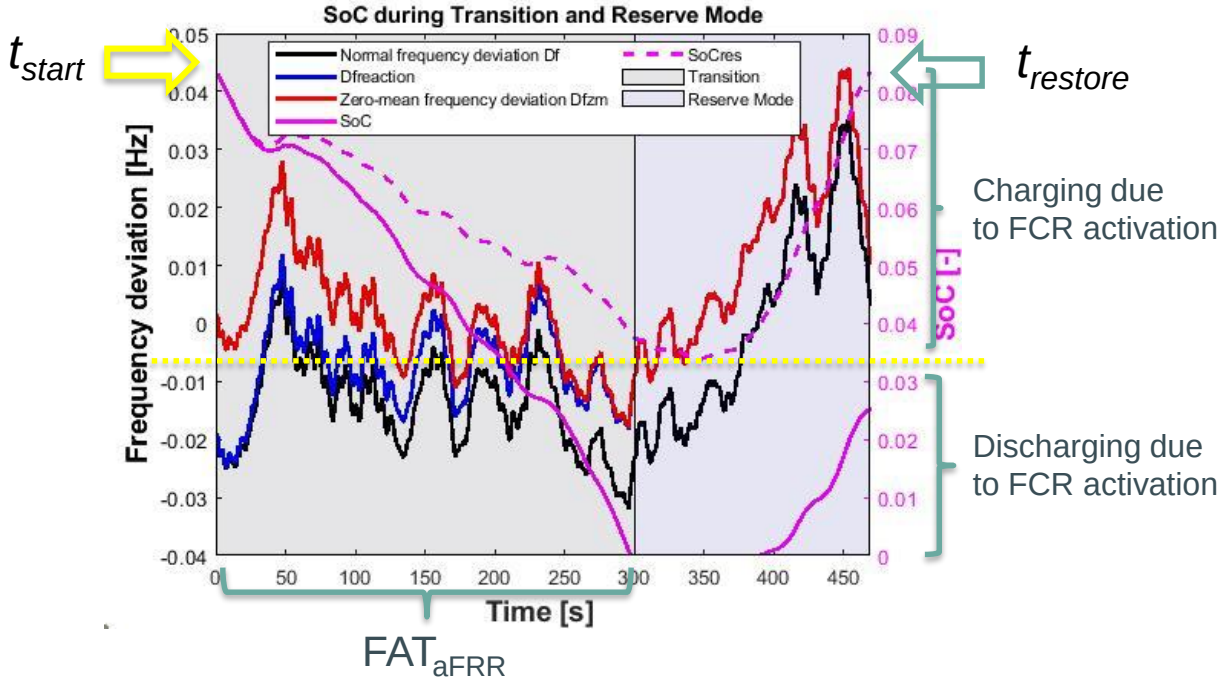
The Additional Properties art. 3 introduces a new operating mode, the Reserve Mode for which: " ***Besides*** *ensuring that the energy reservoir is sufficient to continuously activate FCR in normal state and fully activate FCR in alert state* […]*, LER FCR providing units (either single or belonging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

The Reserve Mode shall be activated only when:

- in Alert State and,
- after the T-min LER and,
- when exceeding the SoC threshold.

# Reaction function and weighting function: How long should the Reserve Mode stay for and exit conditions?

**TRANSITION FROM NORMAL MODE**




**TRANSITION FROM RESERVE MODE**

The Annex I of AP states that "**When charge is restored**, the unit shall revert to Normal Mode". While the condition is necessary, it is **insufficient** to ensure that **the assets switch back and forth to Reserve Mode**.

- If the asset is charging due to the restoration of the frequency and reached the threshold, there is no guarantee that the transition back to Normal Mode will not put the SoC back to a level to trigger the transition to Reserve Mode.

- **Therefore, Elia proposes the following conditions to transition back to Normal Mode:**
  - the SoC is restored ($\mathrm{SoC}_{\min} < \mathrm{SoC} < \mathrm{SoC}_{\max}$)
  - **the system enters Normal State**

# Threshold to enter Reserve Mode: SoC threshold & FAT value

$$soc_{min} = \frac{P * \Delta t_{FAT}}{C}$$
$$soc_{max} = 1 - soc_{min}$$

The rationale behind the definition of the threshold in function of the FAT is to **compensate the decrease of the FCR activation** by entering into the Reserve Mode by an aFRR activation. The aFRR activation would substitute the FCR activation for the long standing frequency deviation part.

## Entry Barrier

- SoC of Reserve Mode is additional dimensioning element for LER
- The **lower the FAT**, the **more flexibility** the BSP has for other purposes

## EU Benchmark

- All TSO shall have an aFRR FAT of **5 min by Dec' 24**
- TSOs of FCR Cooperation **agreed to a FAT of 5 min** for the Reserve Mode

## System needs

Power substitution between FCR and aFRR **activation is imperfect even FAT corresponds**:

- due to Local LFC controller
- aFRR activation approach
- PICASSO platform

- Elia proposes 5 min bearing in mind the inherent design shortcoming for the system but the increased flexibility for the BSP.
- Elia also proposes to keep the definition of $SoC_{min}$ and $SoC_{max}$ symmetrical as no system security advantage has been identified for the time being.

Cf. next slide for the color code

# Reaction function, weighting function, zero-mean frequency deviation

$$f_{reaction}(t) = \overline{\Delta f_{zero-mean}(t)} \cdot T + (1 - T) \cdot \Delta f(t)$$

provides the frequency deviation to which a BSP needs to react to

$$T = \begin{cases} 0 & t < t_{start} \\ \frac{t - t_{start}}{\Delta t_{FAT}} & for\ t_{start} \le t < t_{start} + \Delta t_{FAT} \\ 1 & t \ge t_{start} + \Delta t_{FAT} \end{cases}$$

$$T = \begin{cases} 1 & t < t_{restore} \\ \frac{t_{restore} - t}{\Delta t_{FAT}} + 1 & for\ t_{restore} \le t < t_{restore} + \Delta t_{FAT} \\ 0 & t \ge t_{restore} + \Delta t_{FAT} \end{cases}$$

*are the weighting function:*
$t_{start}$ is the time when upper or lower state of **charge limits are exceeded.**
$t_{restore}$ is the time when upper or lower state of **charge limits are restored.**

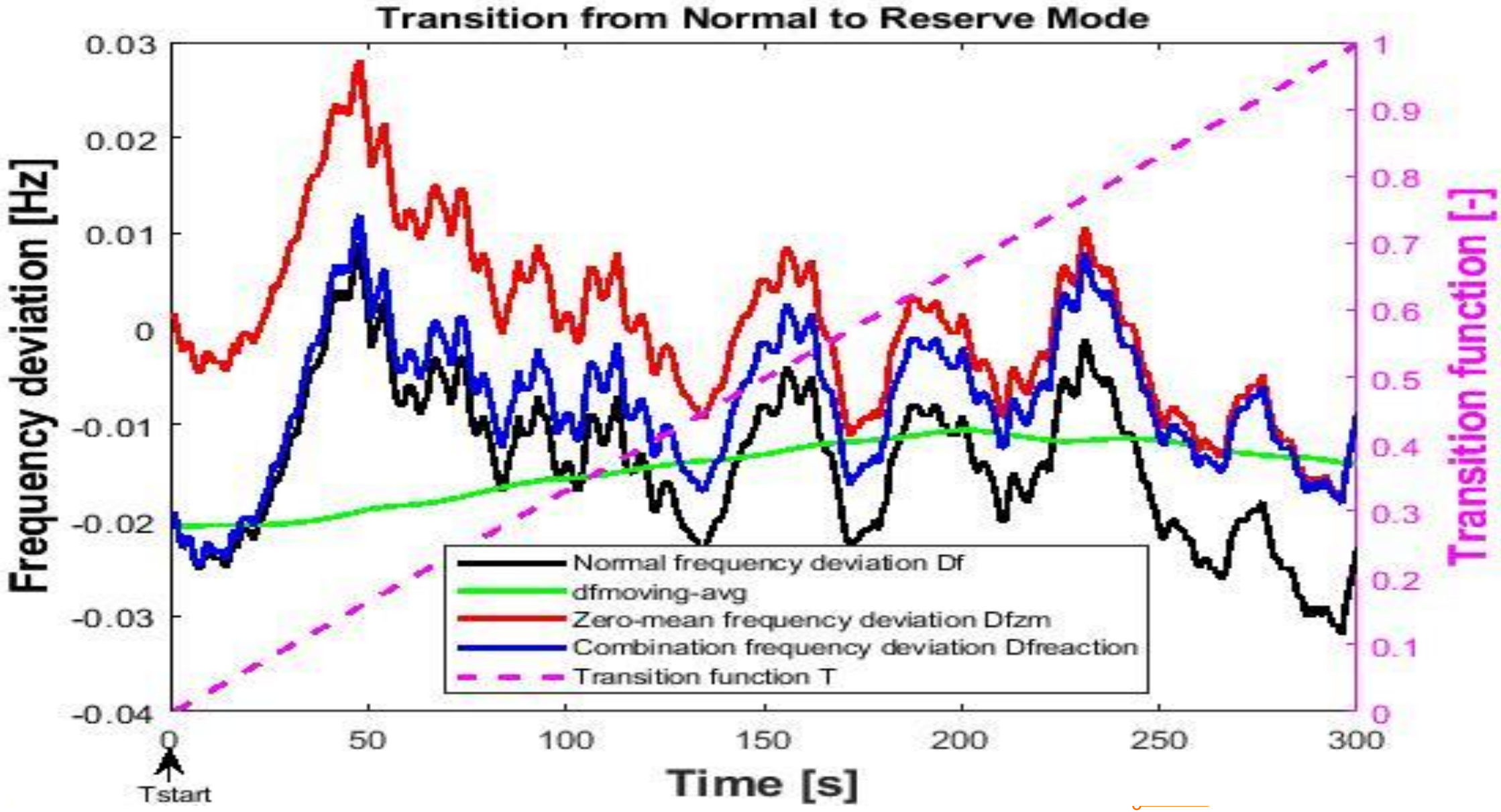
$$\Delta f_{zero-mean}(t) = \Delta f(t) - \frac{1}{t_{FAT}} \sum_{i=0}^{t_{FAT}-1} \Delta f(t - i)$$

is the steady-state frequency deviation

By using the **standard values**,

- it does not further increase system security.
- the reaction of the LER FCR is **simple and understandable**. This in turns **avoid complex implementation** (and hence **decreases entry barriers)** for a situation which **is expected to be seldom**.
- Additionally, **a level playing field** would be ensured with the other TSOs of the FCR Cooperation.

For all possible modifications, **Elia suggests to keep the standard values**


Transition from Normal to Reserve Mode
Frequency deviation [Hz]
Transition function [-]
Time [s]
Tstart
Normal frequency deviation Df
dfmoving-avg
Zero-mean frequency deviation Dfzm
Combination frequency deviation Dfreaction
Transition function T
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
50
100
150
200
250
300

# Application of Reserve Mode on existing assets

# Application of Reserve Mode on existing RPU (and RPG)

4. Each TSO **may recommend to extend** the provisions of the Reserve Mode to **existing LER FCR providing units** which are connected to **the grid by means of inverters**: in this case the rules for the application of requirements to existing units reported **in Article 4(1)(b) of RfG** apply and the deadline for the implementation is set accordingly.

Elia proposes **to not recommend** the application of Reserve Mode on existing assets for the following reasons:

- While there is **"significant factual changes in circumstances"** with the integration of batteries in the FCR market, a **sound** quantitative cost-benefit **analysis** (especially on the socioeconomic benefit) would **be inconclusive** due to lacking of relevant data (Alert State situations).

# Application of Reserve Mode: example

For a BSP which has a portfolio of 29 MW and based on current proposal:

- 5 MW with Reserve Mode obligation (newly pre-qualified LER)
- 20 MW without Reserve Mode obligation (existing LER)
- 4 MW non-LER

The BSP shall always be able to provide 4 MW of FCR service

In case of Alert State and after the T-min LER, the BSP shall provide the Reserve Mode with at least 5 MW.

In line with AP art 3(5) :

- FCR providing units or groups **not deemed as LER FCR providing units or groups** that contain technical entities with limited energy reservoirs shall thus **ensure to be able to fully activate their FCR provision** in accordance with Article 156(7) of the SO Regulation.
- **Technical entities with unlimited energy** reservoir of FCR providing units or FCR providing groups **shall not limit their FCR provision** in case technical entities with **limited energy reservoir** (of that FCR providing group/unit) **are already exhausted** in either the positive or negative direction according to Article 156(8) of the SO Regulation.

# Obligation and conditions on the use of Centralized Controller with Decentralized Frequency Measurement

# Some useful definitions

*As defined in Additional Properties Art. 2.2 (b):* ***Decentralised Frequency Measurement****: principle of* ***using independent on-site frequency measurements at the connection points*** *or below at site of generating units of the technical entities forming FCR providing units or FCR providing groups and* ***activation of FCR based on this on-site measurement****;*

*As defined in Additional Properties Art. 2.2 (c):* ***Centralised Frequency Measurement or Centralised FCR Controller:*** *principle of* ***using a single frequency measurement*** *for* ***activation of a number of decentrally located technical entities*** *forming a FCR providing unit or providing group. The application of this principle requires the respective transmission of the frequency signal to the individual FCR providing unit or FCR providing group;*

| | |
|---|---|
| Local control of the asset based on-site measurement | Central control of the assets with on-site measurement for each asset |
| Local control based on a centralized (remote) measurement | Central control with a single measurement |

→ Decentralised Frequency Measurement

→ Centralised Frequency Measurement or Centralised FCR Controller

The key concept relates the origin of the frequency measurement (local/central or remote) used for FCR activation rather than the level of control (local or central control)

# Centralized FCR Controller with Decentralized Frequency Measurements - Scenarios to be tackled

7. FCR **providing groups** shall implement alternatively one of the following approaches:

> b) a Centralised FCR Controller with Decentralised Frequency Measurements **per connection point** (based on local frequency measurement) **to be used as a fallback solution** to ensure **an autonomous function** and a **proper activation** in case of errors in the Centralised FCR Controller itself (e.g. **outage of SCADA, faults of communication lines**) or **in case of a system split** affecting the perimeter of the group; if the group includes FCR providing units, local frequency measurements available for these units pursuant to paragraph 6 shall be part of the fallback solution;

The Additional Properties considers 2 scenarios to be considered in case of a Centralized FCR Controller with Decentralized Frequency Measurements:

1. **IT issues on the BSP side**: Outage of SCADA and/or failure of communication.
    - Elia considers that it is the **BSP's responsibility** to ensure sufficient **redundancies in their IT** system in order to deliver the FCR service at all time. Elia also considers that **sufficient incentives** are already in place
        - Should the FCR service not be provided due to IT issues, **penalties shall apply** as prescribed in the T&C.
        - Additionally, IT issues also represents **opportunity costs** for the BSP.
2. **System split**
    - The case of system split is further developed in the next slides.

# Centralized FCR Controller with Decentralized Frequency Measurements Definition system split and issue.

- A **system split** in a synchronous area is a **separation** of the synchronous area **in two or more areas** of different frequencies due to the generation and load repartition.
- This usually happens due to **outage of multiples** transmission network elements (in cascade), **linking the areas.**
- In case of system split, the **main risk** linked to **a Centralized FCR Controller** with **a unique frequency** measurement is that **the assets are not reacting correctly the frequency.**
  - If the frequency measurement is in an under-frequency area, all assets located in a over-frequency area will further deteriorate the frequency of the area.
  - If there are several under-frequency areas, the FCR provision may not be proportionate to the right frequency.

# Obligation and conditions on the use of Centralized Controller with Decentralized Frequency Measurement

8. In case the Decentralised Frequency Measurements are used as a fallback solution pursuant to paragraph 7(b):

a) an **observation function** shall detect any kind of errors of the central control or frequency discrepancies among the technical entities within the perimeter of the group;

b) the **FCR provider shall** immediately initiate **appropriate counter-measures** to ensure that the FCR provision is not significantly negatively impacted by switching to the Decentralised Frequency Measurements; and

c) the **minimum accuracy of the local frequency measurement** used as a fallback solution can be reduced according to the national terms and conditions applicable to the reserve connecting TSO.

# Centralized FCR Controller with Decentralized Frequency Measurements
# Observation function: examples

8. In case the Decentralised Frequency Measurements are used as a fallback solution pursuant to paragraph 7(b):

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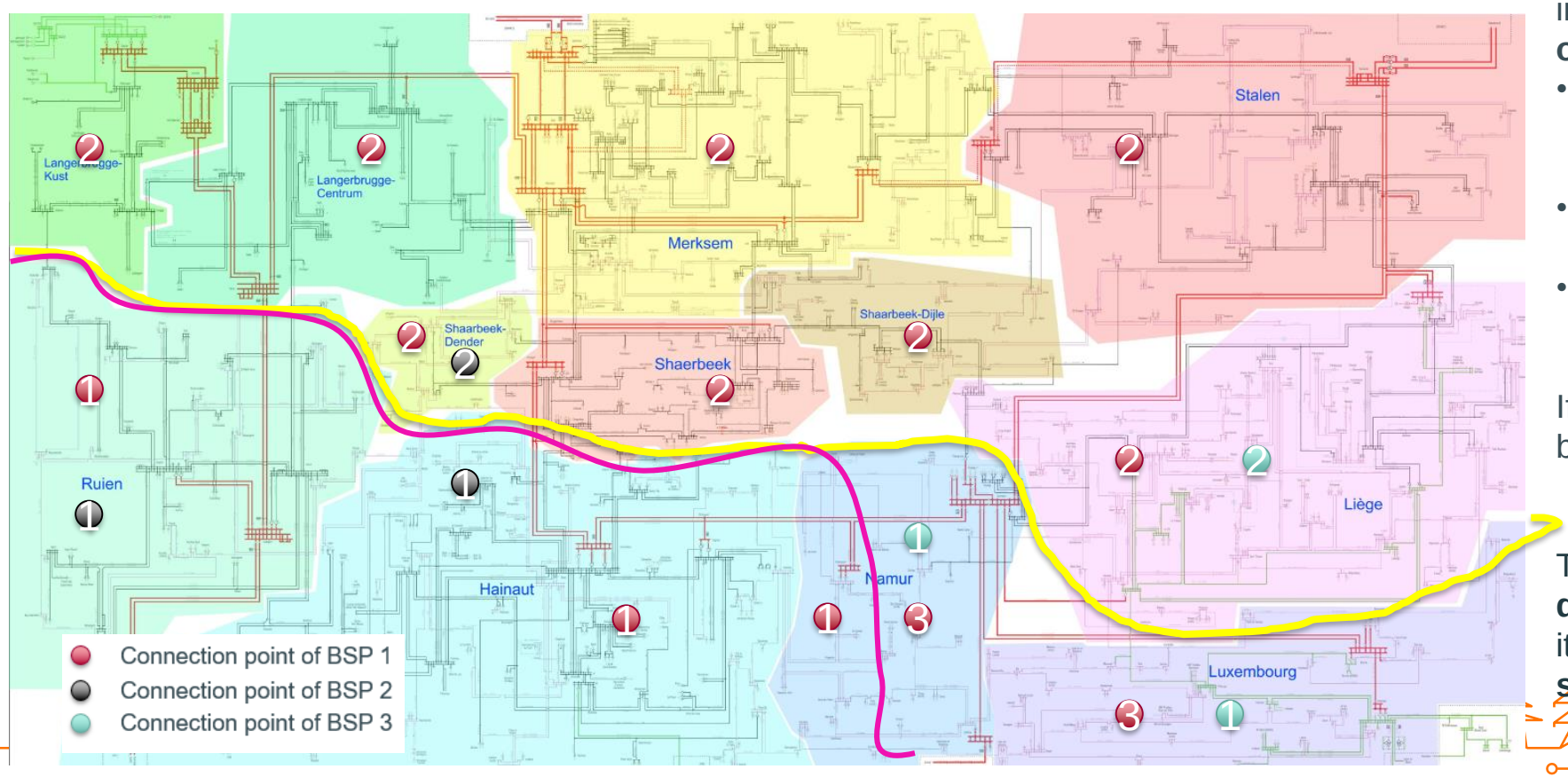



**Example:** Given that **each connection point has a Decentralized Frequency Measurement**, the observation function shall compare the frequency **between each of the connection point** and identify the "fault line" in case of system split **(between zones only)**.

- BSP 1 - bubble 1&3: Ruien, Hainaut, Namur, Luxembourg;
  bubble 2: the rest
- BSP 2 - bubble 1: Ruien, Hainaut;
  bubble 2: Schaerbeek-Dender
- BSP 3 - bubble 1: Namur, Luxembourg;
  bubble 2: Liège

If the fault line is within a zone, BSP 1 shall be able to detect it and form bubbles 1 & 3

The design of the observation function highly **depends on the BSP** and the distribution of its assets. A BSP is expected **to explain its strategy to detect a system split.**

Map is used for illustration purposes only

# Centralized FCR Controller with Decentralized Frequency Measurements
# Appropriate counter-measures & minimum accuracy of local frequency measurement

8. In case the Decentralised Frequency Measurements are used as a fallback solution pursuant to paragraph 7(b):

> b) the **FCR provider shall** immediately initiate **appropriate counter-measures** to ensure that the FCR provision is not significantly negatively impacted by switching to the Decentralised Frequency Measurements; and
>
> c) the **minimum accuracy of the local frequency measurement** used as a fallback solution can be reduced according to the national terms and conditions applicable to the reserve connecting TSO.

Regarding the appropriate counter-measures, Elia proposes that counter-measures are in place within a reasonable time and **no longer than 2s considering the initial event trigger**, except if the BSP provides technical evidence pursuant to the requirement of AP art 3(a). In essence, the countermeasures should be a new control strategy considering the volumes and natures of assets in resulting areas.

Regarding the minimum accuracy of the local frequency measurement**, Elia proposes to relax the accuracy of frequency measurement to 10 mHz**, thus removing the constraints to have a more accurate frequency measurement if the industrial standard is better, as described in SOGL Annex V

# Alternative to the use of Centralized Controller with Decentralized Frequency Measurement

# Alternative to the use of Centralized Controller with Decentralized Frequency Measurement

Concrètement, dans le cadre de cet incitant :

la solution de rechange visée au point c) de l'article 3(7) et à l'article 3(9) est examinée et développée ;

7. FCR providing groups shall implement alternatively one of the following approaches:

> c) an alternative solution with equivalent effect to the fallback solution pursuant to b), as in guaranteeing a proper activation in case of errors in the Centralised FCR Controller or in case of a system split.

9. In case the alternative solution with equivalent effect pursuant to paragraph 7(c) is implemented:

> a) if the FCR providing group includes FCR providing units, the local frequency measurements available for these units pursuant to paragraph 6 may be integrated in the alternative solution;
>
> b) the FCR provider shall demonstrate the effectiveness of the alternative solution with respect to the decentralised frequency measurements; and
>
> c) the solution may be implemented only if allowed by the national terms and conditions, applicable to the reserve connecting TSO.

# Alternative to the use of Centralized Controller with Decentralized Frequency Measurement: Rationale and proposal.

The aim of the alternative solution of Elia is to provide **a standard "off-the-shelf" solution** that BSP can readily use **without** having the need to perform **additional design** and therefore further **lower entry barriers** stemming from the obligation. Nevertheless, the **BSP shall demonstrate** its capability to apply this solution during prequalification. This **alternative solution** shall be used **for decentralized asset which is not equipped with a local frequency meter** which is used to FCR activation (Decentralized Frequency Measurement), in other words assets pooled in a Virtual Delivery Points.

The proposed solution follows the rationale that it exists **zones** within which system **split cannot or is unlikely to occur.** In this case, **a unique frequency meter per zone is sufficient to control all the assets in the zone**. The determination of the zones is the critical aspect.

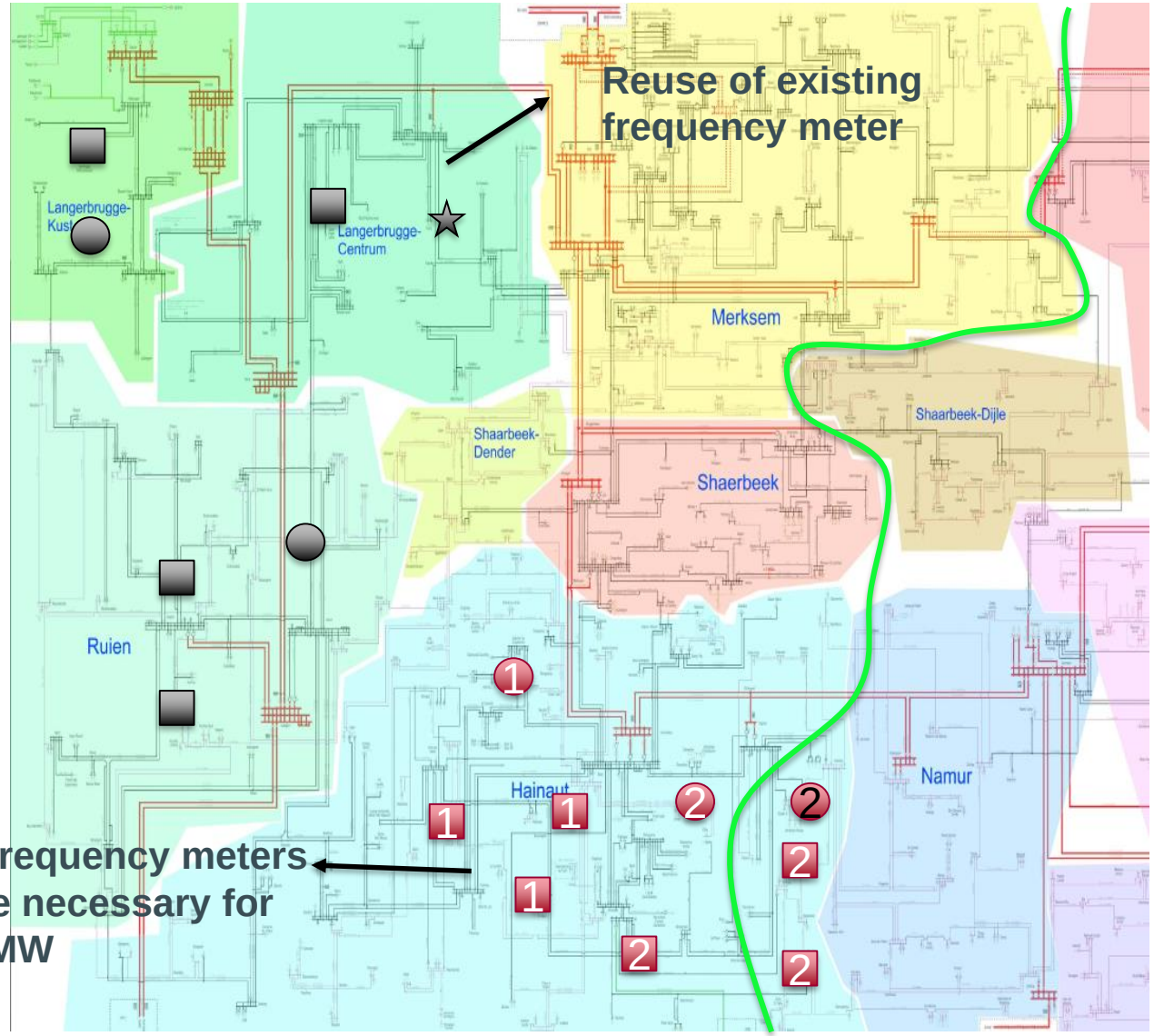
- If the zone is Belgium, one frequency meter would be sufficient.
- In the other extreme, if one zone needs to be defined for each single connection point, the default obligation as stated in Additional Properties Art. 3.7(b) would apply.

After system analysis, Elia proposes one alternative solution which balances its needs for operational security and the entry barriers that the solution creates.
All BSPs are welcomed to provide during pre-qualification their own alternative solution based on their assets, technologies and capabilities

# Alternative solution: defined zones for system split

- **Belgium is divided into electrical zones**, for which we **assume** in this context that **a split will be between the zones** (although a split can still occur within a zone). The proposed zones are the Congestion zones **defined in iCAROS.**
    - Elia accepts a **risk of faulty FCR activation up to a power of 1.5 MW**, which corresponds to the maximum aggregation amount for a Virtual Delivery Point.
    - The BSP may decide on where to install the frequency meter of the Virtual Delivery Point(s).
    - For the sake of clarity, a BSP can rely on the same frequency measurement for several Virtual Delivery Points provided the total contribution of the assets reacting to this measurement in the corresponding CRI zone does not exceed 1.5 MW.
- Given the assumption, **having a unique frequency measurement at CRI zone level** which is used to pilot all assets (**for which a local frequency measurement is not available**) located in the zone is acceptable for Elia as a solution.
    - In case of large disturbance, the BSP shall detect subsequent split within the delivering group and adjust the control strategy.

# Example of minimum requirement




In case of system split, partially within a zone, there is an intrinsic risk in case frequency meter is 2 that the 2 assets 2 right to the system split are not reacting properly. In this example, the improper FCR activation is 1 MW.

In case frequency meter is 2, the asset 2 left to the system split (0,5 MW) is not reacting properly.

**The capping of the MW limits the amount of FCR improperly activated.**

If only the frequency meter 2 was used as a reference to control assets 1 & 2 , the improper activation of FCR would be 2 MW out of 3 MW.

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Freq. meter  Decentralized asset (0,5 MW)  Freq. meter+ asset