

**APPROVAL PAPER OF THE REGULATORY  
AUTHORITIES OF THE CONTINENTAL EUROPE  
SYNCHRONOUS AREA**

**ON**

**THE ASSUMPTIONS AND METHODOLOGY FOR A  
PROBABILISTIC FCR DIMENSIONING IN THE  
CONTINENTAL EUROPE SYNCHRONOUS AREA IN  
ACCORDANCE WITH ARTICLE 153(2) OF THE  
COMMISSION REGULATION (EU) 2017/1485 OF 2  
AUGUST 2017 ESTABLISHING A GUIDELINE ON  
ELECTRICITY TRANSMISSION SYSTEM OPERATION**

**15 January 2025**

## I. Introduction and legal context

This document constitutes the agreement of the Regulatory Authorities of Continental Europe synchronous area (hereinafter referred to as: CE NRAs), as voted on 15 January 2025 on the Continental Europe TSOs' (hereinafter referred to as: CE TSOs) proposal for the assumptions and methodology for probabilistic dimensioning of FCR (hereinafter referred to as: FCR probabilistic dimensioning) in accordance with Article 153(2) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on Electricity Transmission System Operation as amended by Commission Implementing Regulation (EU) 2021/280 of 22 February 2021 (hereinafter referred to as: SO GL).

This agreement of the CE NRAs shall provide evidence that a decision on the FCR probabilistic dimensioning does not, at this stage, need to be adopted by ACER pursuant to Article 6(8) of SO GL. It is intended to constitute the basis on which the Regulatory Authorities will each subsequently approve the above-mentioned methodology pursuant to Article 6 of SO GL.

The legal provisions that lie at the basis of the FCR probabilistic dimensioning, and this CE NRAs agreement on the above-mentioned methodology, can be found in Articles 4, 6, 118, 153 and 156 of SO GL. They are set out here for reference.

### SO GL

#### Article 4

##### Objectives and regulatory aspects

1. *This Regulation aims at:*
  - (a) *determining common operational security requirements and principles;*
  - (b) *determining common interconnected system operational planning principles;*
  - (c) *determining common load-frequency control processes and control structures;*
  - (d) *ensuring the conditions for maintaining operational security throughout the Union;*
  - (e) *ensuring the conditions for maintaining a frequency quality level of all synchronous areas throughout the Union;*
  - (f) *promoting the coordination of system operation and operational planning;*
  - (g) *ensuring and enhancing the transparency and reliability of information on transmission system operation;*
  - (h) *contributing to the efficient operation and development of the electricity transmission system and electricity sector in the Union.*
2. *When applying this Regulation, Member States, competent authorities, and system operators shall:*
  - (a) *apply the principles of proportionality and non-discrimination;*
  - (b) *ensure transparency;*
  - (c) *[...]*
  - (d) *[...]*
  - (e) *respect the responsibility assigned to the relevant TSO in order to ensure system security, including as required by national legislation;*

[...]

#### Article 6

##### Approval of terms and conditions or methodologies of TSOs

1. *Each regulatory authority or where applicable the Agency, as the case may be, shall approve the terms and conditions or methodologies developed by TSOs under paragraphs 2 and 3. The entity designated by the Member State shall approve the terms and conditions or methodologies developed by TSOs under paragraph 4. The designated entity shall be the regulatory authority unless otherwise provided by the Member State. Before approving the terms and conditions or*

methodologies, the regulatory authority, the Agency or the designated entity shall revise the proposals where necessary, after consulting the respective TSOs, in order to ensure that they are in line with the purpose of this Regulation and contribute to market integration, non-discrimination, effective competition and the proper functioning of the market. (...)

2. (...)

3. The proposals for the following terms and conditions or methodologies and any amendments thereof shall be subject to approval by all regulatory authorities of the concerned region, on which a Member State may provide an opinion to the concerned regulatory authority:

(a) (...)

(b) (...)

(c) (...)

(d) methodologies, conditions and values included in the synchronous area operational agreements in Article 118 concerning:

i) (...)

ii) the dimensioning rules for FCR in accordance with Article 153;

[...]

6. The proposal for terms and conditions or methodologies shall include a proposed timescale for their implementation and a description of their expected impact on the objectives of this Regulation. Proposals for terms and conditions or methodologies subject to the approval by several regulatory authorities in accordance with paragraph 3 shall be submitted to the Agency within 1 week of their submission to regulatory authorities. Proposals for terms and conditions or methodologies subject to the approval by a designated entity in accordance with paragraph 4 may be submitted to the Agency within 1 month of their submission at the discretion of the designated entity while they shall be submitted upon the Agency's request for information purposes in accordance with Article 3(2) of Regulation (EU) 2019/942 if the Agency considers the proposal to have a cross-border impact. Upon request by the competent regulatory authorities, the Agency shall issue an opinion within 3 months on the proposals for terms and conditions or methodologies.

7. Where the approval of the terms and conditions or methodologies in accordance with paragraph 3 or the amendment in accordance with Article 7 requires a decision by more than one regulatory authority pursuant to paragraph 3, the competent regulatory authorities shall consult and closely cooperate and coordinate with each other in order to reach an agreement. Where the Agency issues an opinion, the competent regulatory authorities shall take that opinion into account. Regulatory authorities or, where competent, the Agency shall take decisions concerning the submitted terms and conditions or methodologies in accordance with paragraphs 2 and 3 within 6 months following the receipt of the terms and conditions or methodologies by the Agency or the regulatory authority or, where applicable, by the last regulatory authority concerned. The period shall begin on the day following that on which the proposal was submitted to the Agency in accordance with paragraph 2 or to the last regulatory authority concerned in accordance with paragraph 3.

8. Where the regulatory authorities have not been able to reach an agreement within the period referred to in paragraph 7 or upon their joint request, or upon the Agency's request according to the third subparagraph of Article 5(3) of Regulation (EU) 2019/942, the Agency shall adopt a decision concerning the submitted proposals for terms and conditions or methodologies within 6 months, in accordance with Article 5(3) and the second subparagraph of Article 6(10) of Regulation (EU) 2019/942.

[...]

## **Article 118**

### **Synchronous area operational agreements**

1. By 12 months after entry into force of this Regulation, all TSOs of each synchronous area shall jointly develop common proposals for:

(a) the dimensioning rules for FCR in accordance with Article 153;

[...]

2. All TSOs of each synchronous area shall submit the methodologies and conditions listed in Article 6(3)(d) for approval by all the regulatory authorities of the concerned synchronous area. Within 1 month after the approval of these methodologies and conditions, all TSOs of each synchronous area shall conclude a synchronous area operational agreement which shall enter into force within 3 months after the approval of the methodologies and conditions.

## **Article 153**

### **FCR dimensioning**

1. All TSOs of each synchronous area shall determine, at least annually, the reserve capacity for FCR required for the synchronous area and the initial FCR obligation of each TSO in accordance with paragraph 2.
2. All TSOs of each synchronous area shall specify dimensioning rules in the synchronous area operational agreement in accordance with the following criteria:
  - (a) the reserve capacity for FCR required for the synchronous area shall cover at least the reference incident and, for the CE and Nordic synchronous areas, the results of the probabilistic dimensioning approach for FCR carried out pursuant to point (c);
  - (b) the size of the reference incident shall be determined in accordance with the following conditions:
    - i) for the CE synchronous area, the reference incident shall be 3 000 MW in positive direction and 3 000 MW in negative direction;
    - ii) (...)
  - (c) for the CE and Nordic synchronous areas, all TSOs of the synchronous area shall have the right to define a probabilistic dimensioning approach for FCR taking into account the pattern of load, generation and inertia, including synthetic inertia as well as the available means to deploy minimum inertia in real-time in accordance with the methodology referred to in Article 39, with the aim of reducing the probability of insufficient FCR to below or equal to once in 20 years; and
  - (d) the shares of the reserve capacity on FCR required for each TSO as initial FCR obligation shall be based on the sum of the net generation and consumption of its control area divided by the sum of net generation and consumption of the synchronous area over a period of 1 year.

## **Article 156**

### **FCR provision**

[...]

4. An FCR provider shall guarantee the continuous availability of FCR, with the exception of a forced outage of a FCR providing unit, during the period of time in which it is obliged to provide FCR.

[...]

7. An FCR providing unit or FCR providing group with an energy reservoir that does not limit its capability to provide FCR shall activate its FCR for as long as the frequency deviation persists. (...)
8. A FCR providing unit or FCR providing group with an energy reservoir that limits its capability to provide FCR shall activate its FCR for as long as the frequency deviation persists, unless its energy reservoir is exhausted in either the positive or negative direction. (...)
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 normal state. For the CE and Nordic synchronous areas, as of triggering the alert state and during the alert state, each FCR provider shall ensure that its FCR providing units or groups with limited energy reservoirs are able to fully activate FCR continuously for a time period to be defined pursuant to paragraphs 10 and 11. [...]

[...]

## II. The Continental Europe TSOs' proposal

The FCR dimensioning methodology is one of the terms & conditions and methodologies to be included in the Continental Europe Synchronous Area Operational Agreement (hereinafter referred to as: CE SAOA), in line with Article 118 of SO GL and to be subject to NRAs approval according to Article 6(3)(d) of SO GL.

The current version of the CE SAOA (included in the wider Continental Europe Synchronous Area Framework Agreement, hereafter referred to as CE SAFA) adopts a deterministic approach, posing the FCR equal to the reference incident that SO GL sets at 3.000 MW for the Continental Europe Synchronous Area, without requiring any probabilistic assessment. Adopting a probabilistic dimensioning approach, in fact, is a right of the CE TSOs, but it is not compulsory.

Due to the significant changes occurring in the electrical system with more and more renewable production with its own volatility, the CE TSOs developed a probabilistic approach for FCR dimensioning to be included in the CE SAOA instead of the current deterministic approach.

The FCR probabilistic dimensioning was consulted between 15 May 2023 and 15 June 2023<sup>1</sup> and it started being submitted by the CE TSOs to the CE NRAs in December 2023. As confirmed by ACER Decision 10/2024, the last NRA received it on 17 January 2024, which determined the initial deadline for an CE NRA agreement as 17 July 2024.

On 22 May 2024 the CE NRAs asked ACER for a 6-month's prolongation of the legal deadline to reach an agreement on the FCR probabilistic dimensioning. The CE NRAs asked the CE TSOs for a study about Long Lasting Frequency Deviations (hereafter referred to as: LLFDs) within the scope of the 'appropriate steps' according to Article 5(9) of SO GL, defined by the CE NRAs towards the approval of the minimum delivery time period for limited energy reservoir FCR units (hereafter referred to as: T<sub>min</sub> LER). The LLFDs study was delivered in March 2024, but the CE NRAs needed a certain amount of time to review it, in particular to check whether the LLFDs dataset is reliable to be used for the FCR probabilistic dimensioning. Moreover, the proposal by the CE TSOs lacked a number of mathematical details that are needed to better understand the process. Checking the LLFDs and discussing the mathematical details required a certain level of interaction with the CE TSOs, impossible to achieve within the original deadline for reaching a decision on the FCR probabilistic dimensioning. ACER therefore granted an extension with its Decision 10/2024, setting the new deadline to 17 January 2025.

The FCR probabilistic dimensioning contains an iterative process to identify the symmetrical value of FCR. Starting from the reference incident (3.000 MW), several years are simulated applying a Monte Carlo approach, sampling some frequency deviations from three different datasets: deterministic frequency deviations, LLFDs and power imbalances due to outages (reported to a frequency deviation profile by simulating the Frequency Restoration Process with an equivalent single busbar model). By using deterministic formulas, for each frequency deviation the performances of the frequency transient in terms of Rate of Change of Frequency (hereafter referred to as: RoCoF), frequency nadir and frequency zenith are evaluated. These parameters are compared with the admissible thresholds identified by the CE TSOs: if the thresholds are violated no more than once in 20 years (as required by Article 153(2) of SOGL), the considered FCR value is the outcome of the dimensioning process and no further iterations are needed; otherwise FCR is increased and a new iteration is run.

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<sup>1</sup> The public consultation is available on the ENTSO-e website: <https://consultations.entsoe.eu/system-operations/methodology-for-performing-the-probabilistic-dimen/>

The FCR probabilistic dimensioning will be implemented within 12 months once approved by the CE NRAs.

In addition to the proposed timescale, the proposal includes also a description of its expected impact on the objectives of SO GL, in line with Article 6(6) of SO GL.

### **III. The Regulatory Authorities' position**

#### **On the content of the TSOs' proposal**

Article 153(2) of SO GL allows the TSOs to adopt a probabilistic dimensioning approach, taking into account the pattern of load, generation and inertia, including synthetic inertia as well as the available means to deploy minimum inertia in real-time with the aim of reducing the probability of insufficient FCR to below or equal to once in 20 years.

The FCR probabilistic dimensioning proposed by the CE TSOs is consistent with the above mentioned provisions. While conducting the FCR probabilistic dimensioning process insufficient FCR is detected by looking at the main parameters (RoCoF, zenith and nadir) of the frequency transients while the 'once in 20 years' – criterion of Article 153(2) of SOGL is embedded in the process. The pattern of load, generation and inertia are indirectly considered by looking at frequency deviations datasets: the frequency trend is an effective measure of the volatility of the load and of the production, pointing out whether the system lacks or doesn't lack inertia.

The CE NRAs had nonetheless the following concerns about specific aspects of the CE TSOs proposal:

#### **Mathematical details**

The FCR probabilistic dimensioning lacks all the mathematical details and thus its implementation cannot be properly monitored and, in case needed, enforced. Indeed, the CE TSOs provided all the details in the explanatory note, but this is not a legal document, hence it cannot be considered as a part of the methodology.

#### **Triggering of the alert state and LER depletion**

Article 156(9) of SO GL stipulates that the LER FCR providing units shall provide FCR indefinitely during the normal state, and for a limited amount of time (between 15 and 30 minutes to be set by the TSOs by the mean of a cost benefit analysis) as of the triggering of the alert state. The FCR probabilistic dimensioning proposed by the TSOs simulates the LER depletion as the frequency deviation exceeds 50 mHz, even if the alert state has not been triggered yet.

#### **LLFDs classification**

LLFDs datasets may include LLFDs that could be effectively mitigated by the CE TSOs and LLFDs that cannot be mitigated due to force majeure or political issues as in the Ukraine and Moldova LFC blocks or from imbalances in Kosovo. Having the roots cause of each LLFD included in the dataset is of utmost importance, in order to understand the positive effect of any mitigation measures to be implemented by the CE TSOs.

#### **Transparency on the parameters**

The FCR probabilistic dimensioning relies on different parameters adopted to identify the 'once in a 20 years insufficiency criterion' for FCR. These parameters are significant elements of the

methodology, but they are neither published nor at least sent to the CE NRAs before any instance of the process.

### LER splitting

Article 153(2) of SO GL states that the initial FCR obligation shall be split among the TSOs proportionally to the net generation and consumption. The initial obligations are then adjusted into the binding FCR obligations by taking into account a number of situations as sharing and exchanging of FCR across the different LFC blocks and the outcome of the FCR cooperation process. The latter involves some of the CE TSOs on a voluntary basis in order to procure FCR with a pure market based approach. These aspects are left by the SO GL to the willingness of the TSOs, without any contribution or approval by the NRAs. Having a better knowledge of the process may nonetheless help the CE NRAs in evaluating the proper implementation of the FCR probabilistic dimensioning.

### NRAs amendments

The CE NRAs deemed that the FCR probabilistic dimensioning needed to be significantly amended to accommodate the concerns mentioned above. To this extent the CE NRAs have exploited the provisions of Article 6(1) of SOGL, requiring the NRAs to revise the terms and conditions and methodologies, where necessary, after consulting the respective TSOs.

After a fruitful discussion with the CE TSOs, for the hearing phase the CE NRAs proposed the following main changes :

- a) including some definitions to improve the quality and the overall readability of the proposal;
- b) developing a technical annex to include the mathematical details adopting as a basis the explanatory note already provided by the CE TSOs;
- c) mandating the TSOs to send the CE NRAs a number of parameters before any instance of the process and a report once the process is over;
- d) adding the possibility for NRAs to request a reassessment of the FCR dimensioning
- e) specifying that the LER depletion shall be simulated as of the triggering of the alert state as stipulated by Article 156(9) of SO GL;
- f) including a classification of LLFDs into mitigable and non-mitigable ones;
- g) including the effect of the mitigation measures in the LLFDs dataset;
- h) asking the TSOs for a study to better understand how initial and binding FCR obligations are assigned;

### TSOs and stakeholders' consultation

The CE TSOs expressed a wide acceptance of the changes listed in the letters a), b), c and d), since fruitfully discussed during the interaction with the CE NRAs.

For the other changes suggested by the CE NRAs, the CE TSOs proposed, instead:

- i. keeping simulating the LER depletion when the frequency starts exceeding the 50 mHz deviations; the request cannot be accommodated since not consistent with the SO GL provisions; the reservoir amount shall be dimensioned accordingly by the LER providers;
- ii. not introducing the classification of LLFDs; the request is accommodated since the classification is not functional to the FCR dimensioning process; nonetheless the possibility of introducing this (o a similar) classification will be rediscussed in the coming months as a part of the CE NRAs duties on monitoring the quality of the frequency;
- iii. considering the LLFDs dataset as it is without any corrections to consider the effect of the mitigation measures; these measures are already indirectly taken into account since they are reflected in the most recent frequency samples that have the largest probabilities to be picked

up in the simulation process; the request cannot be accommodated, since the CE TSOs proposal would keep in the LLFDs dataset samples that are clearly outdated and unrealistic because of the new mitigation measures in place.

- iv. not foreseeing any study on the FCR obligations, but keeping discussing the topic in dedicated meetings with the CE NRAs; the request is accommodated; the CE TSOs are requested to arrange a series of meetings with the CE NRAs to keep discussing the FCR obligation topic.

Some further editorial comments were provided by the CE TSOs during the hearing phase and accommodated by the CE NRAs.

## **IV. Conclusions**

The CE NRAs have consulted and closely cooperated and coordinated with each other and with the relevant TSOs and ENTSO-E in order to amend and adopt the FCR probabilistic dimensioning submitted by the CE TSO as outlined above and annexed to this decision paper in both clean (Annex I) and track change (Annex II) versions.

The CE NRAs agree to issue their national approval decisions on the basis of this approval paper.