APPROVAL BY REGULATORY AUTHORITIES

OF

ALL CONTINENTAL EUROPE AND NORDIC TSOs' PROPOSAL FOR A COST BENEFIT ANALYSIS METHODOLOGY IN ACCORDANCE WITH ARTICLE 156(11) OF THE COMMISSION REGULATION (EU) 2017/1485 OF 2 AUGUST 2017 ESTABLISHING A GUIDELINE ON ELECTRICITY TRANSMISSION SYSTEM OPERATION

1 March 2019

I. Introduction and legal context

This document elaborates an agreement of the Regulatory Authorities of Nordic and Continental Europe synchronous areas (hereinafter: Regulatory Authorities), agreed on 1 March 2019 on the Nordic and Continental Europe TSOs' (hereinafter: TSOs) proposal for a Cost Benefit Analysis Methodology (hereinafter: CBA) in accordance with Article 156(11) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on Electricity Transmission System Operation (hereinafter: SO GL).

This agreement of the Regulatory Authorities shall provide evidence that a decision on the CBA 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 CBA, and this Regulatory Authorities agreement on the above-mentioned methodology, can be found in Articles 4 and 156 of SO GL. They are set out here for reference.

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) (…)*
- *(b) (…);*
- *(c) apply the principle of optimisation between the highest overall efficiency and lowest total costs for all parties involved*

[…]

Article 156 – FCR provision

[…]

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. Where no period has been determined pursuant to paragraphs 10 and 11, each FCR provider shall ensure that its FCR providing units or groups with limited energy reservoirs are able to fully activate FCR continuously for at least 15 minutes or, in case of frequency deviations that are smaller than a frequency deviation requiring full FCR activation, for an equivalent length of time, or for a period defined by each TSO, which shall not be greater than 30 or smaller than 15 minutes.

10. *For the CE and Nordic synchronous areas, all TSOs shall develop a proposal concerning the minimum activation period to be ensured by FCR providers. The period determined shall not be greater than 30 or smaller than 15 minutes. The proposal shall take full account of the results of the cost-benefit analysis conducted pursuant to paragraph 11.*

11. *By 6 months after entry into force of this regulation, the TSOs of the CE and Nordic synchronous areas shall propose assumptions and methodology for a cost-benefit analysis to be conducted, in order to assess the time period required for FCR providing units or groups with limited energy reservoirs to remain available during alert state. By 12 months after approval of the assumptions and methodology by all regulatory authorities of the concerned region, the TSOs of the CE and Nordic synchronous areas shall submit the results of their cost-benefit analysis to the concerned regulatory authorities, suggesting a time period which shall not be greater than 30 or smaller than 15 minutes. The cost-benefit analysis shall take into account at least:*

    (a) *experiences gathered with different timeframes and shares of emerging technologies in different LFC blocks;*
    (b) *the impact of a defined time period on the total cost of FCR reserves in the synchronous area;*
    (c) *the impact of a defined time period on system stability risks, in particular through prolonged or repeated frequency events;*
    (d) *the impact on system stability risks and total cost of FCR in case of increasing total volume of FCR;*
    (e) *the impact of technological developments on costs of availability periods for FCR from its FCR providing units or groups with limited energy reservoirs.*

12. *The FCR provider shall specify the limitations of the energy reservoir of its FCR providing units or FCR providing groups in the prequalification process in accordance with Article 155.*

13. *A FCR provider using FCR providing units or FCR providing group with an energy reservoir that limits their capability to provide FCR shall ensure the recovery of the energy reservoirs in the positive or negative directions in accordance with the following criteria:*

    (a) *(…)*
    (b) *for the CE and Nordic synchronous areas, the FCR provider shall ensure the recovery of the energy reservoirs as soon as possible, within 2 hours after the end of the alert state.*

II. The Nordic and Continental Europe TSOs' proposal

The CBA was consulted by the Nordic and Continental Europe TSOs through ENTSO-E for one month from 10 January 2018 to 18 February 2018, in line with Article 11 of SO GL[1]. The methodology was received by the last Regulatory Authority of the Nordic and Continental Europe synchronous areas on 18 April 2018. The proposal includes proposed timescales for its implementation and a description of its expected impact on the objectives of SO GL, in line with Article 6(6) of SO GL.

[1] The public consultation is available on the ENTSO-e website: https://consultations.entsoe.eu/system-operations/cbam/

According to Article 7 of SO GL, on 30 July 2018, the Regulatory Authorities agreed on a request for amendments to the TSOs' proposal.

The amended CBA was received by the last Regulatory Authority on 20 February 2019, thus a decision is required by 20 April 2019, according to Article 7(2) of SO GL.

The CBA aims to set the minimum delivery period in the alert state for the FCR production units with low energy reservoirs (hereinafter: LER).

Different combinations of LER share (from 10% to 100% with a 10% step) and delivery period (15 min, 20 min, 25 min and 30 min) are explored and the best solution is selected by estimating the overall FCR cost and the acceptability of each combination against the most relevant real historical frequency events.

FCR cost is assessed by means of a probabilistic simulation model, based on a Monte Carlo approach, with three different input data:

a) deterministic frequency deviations
b) long lasting frequency deviations
c) outages.

All the available information related to the dependence amongst the three input data listed above are considered in order to avoid the double counting phenomena.

Moreover, for deterministic frequency deviations two different scenarios are investigated: one considering all those deviations, and one with those deviations partially filtered out to simulate the effect of the mitigation measures that will be introduced pursuant to Article 138 of SO GL.

FCR cost is computed based on the market experience for non LER FCR units, looking at energy price and marginal production cost; for existing LER OPEX and opportunity costs are considered, while for new LER (new investments) also the investment cost is taken into account where sustained explicitly to qualify for FCR provision.

The acceptability against the most relevant frequency events is evaluated with a dedicated process, by testing the system with LER with the same frequency trend occurred in the considered events: the goal is to evaluate whether the presence of LER would have been sustainable or whether it would have caused worse conditions. In particular, for Continental Europe Italian blackout on 28 September 2003 and European blackout on 4 November 2006 are considered.

The delivery period will be proposed by 12 months after the approval of the CBA: the selected period will aim to minimize the FCR cost, without jeopardizing system security.

III. The Regulatory Authorities' position

On the first CBA

The Regulatory Authorities asked the TSOs to fulfill the following tasks:

- Amend Article 9 to take into account that a new CBA shall be submitted following any change in the assumptions;
- Elaborate on the description of current experiences with LER;
- Evaluate the impact on European market integration in case different delivery periods are set in Nordic and Continental Europe synchronous areas pursuant to the CBA results;
- Include the list of the TSOs submitting the proposal
- Amend article 1, by adding a reference to Article 4(2)(c) of SO GL;
- Amend LER definition in Article 2 giving more details on different technologies; as an alternative the details may be given in the explanatory document;
- Define the length of the long system operation period in Article 4(5);
- Define the timeframe relevant for the energy marginal price in Article 5(2);
- Define what is intended with future installed LER in Article 5(2);

- Clarify the impact of the annual review of the K-factor on the CBA and why all cross border LFC processes are neglected;
- Correct the typos;
- Delete Article 11;
- Clarify the link between the CBA and the provisions about FCR requirements set in the synchronous area agreement;
- Simulate two different scenarios, one with deterministic frequency deviations fully on board and one with those deviations partially filtered out.

On the amended CBA

Regulatory Authorities welcome the amended CBA, since almost all the requests were successfully fulfilled by the TSOs.

Nonetheless there are some open points that should be solved.

LER Definition

According to Article 2(2), letter a), of the CBA, "*FCR providing units or groups are deemed to have limited energy reservoirs in case a FCR full activation for the time frame contracted by the TSO might, even in case of an active energy reservoir management, lead to a limitation of their capability to provide the full FCR activation due to the depletion of their energy reservoir(s) taking into account the effective energy reservoir(s) available at the beginning of that time frame*". A LER is, thus, identified not only on the basis of technical structural data (as the plate power and the dimension of the reservoir) but also on the basis of scheduled data (as the contractual obligations about FCR provisions and energy delivery and the starting level of the reservoir): in this way the amount of LER present in the system might change day by day, on the basis of the effective reservoir level.

The Regulatory Authorities are not per se against this definition, but they would like to share with the TSOs some concerns.

Above all, the LER definition included in the CBA cannot be considered as the ultimate one. The Regulatory Authorities requested to include such definition in the methodology only to improve the readability of the proposal: the Regulatory Authorities understand, in fact, that the LER definition has no influence per se on the CBA, since all the possible combination of LER share and delivery time period will be simulated independent on the LER definition. This definition, instead, will play a relevant role while assessing the CBA results: according to the specific LER definition, in fact, some scenarios might be excluded because they are not coherent with the real operation of the electrical system (for example with the LER definition proposed in the amended CBA, the LER share is expected to increase since also units with large reservoirs may be deemed as LER in case of a low starting reservoir level: scenarios with low LER share are thus likely to be not coherent). Moreover, the LER definition becomes relevant also in case additional properties for FCR provision are requested in the synchronous area agreement. The Regulatory Authorities thus recommend to TSOs to keep discussing the LER definition and to submit an ultimate proposal along with the CBA results and the proposal of the delivery time period in accordance with Article 156(11) of SO GL or along with the submission of additional properties for FCR provision pursuant to Article 118(1), letter b), of SO GL, whichever comes first.

The Regulatory Authorities also highlight the utmost importance of having a LER definition consistent across all the methodologies developed in accordance with SO GL provisions. LER should be defined in the same manner in the CBA (both methodology and results aimed to set the delivery time period) and in the additional properties for FCR provisions if foreseen in the synchronous area agreement in accordance with Article 118 of SO GL. In this context Regulatory Authorities welcome the provision included in Article 8(2) of the CBA, stating that "*The update of the cost-benefit analysis results shall be performed also as a consequence of changes in the assumptions due to additional requirements derived from SOGL art. 118*": this provision, in fact, creates a link between Article 118

proposals (with particular reference to the additional properties for FCR) and CBA assumptions, thus granting a priori a certain level of consistency. Nonetheless the Regulatory Authorities warn the TSOs that if the LER definition changes because of the discussion aimed to set the additional properties for FCR[2], the CBA methodology shall be resubmitted (to take into account the modified LER definition) and the CBA results shall be assessed accordingly.

LER cost curve

According to the definition of LER, also some units with large reservoirs may be considered as LER in case the level of the reservoir is not enough to fulfill the contractual obligations: nonetheless the cost of such units does not seem to be considered while building the LER cost curve (in the clarifications sent in January the TSOs listed only chemical devices). The Regulatory Authorities consider that these units are likely to be considered as LER only in remote situations and that including their contribution in the LER cost curve would not be relevant, nonetheless they would welcome more clarifications about this issue. The TSOs are thus invited to provide more details while submitting the CBA results.

In Article 5(2) of the CBA, the TSOs state that the capacity of future installed LER considered while building the LER cost curve is related to the LER share simulated in each run. The Regulatory Authorities deem this clarification not completely clear: the TSOs are invited to provide further clarifications while submitting the CBA results, highlighting the exact amount of future installed LER considered in each run and the associated cost curve.

Impact on European market integration

The TSOs haven't provided yet an analysis of the impact on European market integration in case different delivery time periods are set in Nordic and Continental Europe synchronous area, despite that this analysis was requested by the Regulatory Authorities both in the shadow opinion and in the request for amendments. The Regulatory Authorities understand that such impact analysis is not relevant per se for the CBA, but it will be necessary to assess the delivery time periods that will be proposed based on the CBA results. For this reason, the Regulatory Authorities recommend to TSOs to send the impact analysis at the latest along with the CBA results.

Acceptability against the most critical frequency events

The Regulatory Authorities understand that the combination of LER share and delivery time period is deemed not acceptable if it worsens the system security, i.e. if the system with such combination shows performances worse than the ones shown during the considered critical frequency events. Nonetheless the criteria to judge such performances are not given: the TSOs are requested to precise such criteria and to send them along with the CBA results.

Delivery time period

In Article 9(6) of the CBA the TSOs compute the energy content relevant for the LER depletion neglecting the alert state trigger time: "*if a continuous exceeding of the standard frequency range includes the triggering of an alert state, the activated energy and the residual energy in the reservoir is calculated from the first exceeding of the standard frequency range limits*". So, once the steady state deviation exceeds the normal state's limits, the LER energy content is consumed even if the alert state has not been triggered yet (because the alert state trigger time has not expired).

[2] For Continental Europe, for example, the Regulatory Authorities well know that such proposal hasn't been submitted yet and that discussions are still occurring at TSO level.

The NRAs highlight that Article 156 of SO GL requires that the LER shall provide FCR for the delivery time period as of triggering of the alert state and during the alert state. When submitting the CBA results, the TSOs are thus requested to elaborate the outcomes and to set a delivery time period fully in line with the SO GL provisions.

Typos and clarifications

The Regulatory Authorities spotted some typos and unclear messages in the CBA. The remarks are as follows:

- the document should be dated;
- in Articles 4(1), 4(4) and 5(1) "*mantain*" shall be corrected in "*maintain*";
- at the end of Article 6(3) the sentence "*with and without taking into account the implementation of mitigation actions*" shall be added to improve the readability of the text;

The TSOs are recommended to consider these remarks in case of submission of a new version of the CBA in the future.

IV. Conclusions

The Regulatory Authorities have consulted and closely cooperated and coordinated to reach an agreement that **they approve the amended CBA submitted by Nordic and Continental Europe TSOs pursuant to Article 156(11) of SO GL.** The Regulatory Authorities must take their national decisions, on the basis of this agreement, by 20 April 2019. The TSOs are nonetheless required to fulfill the following tasks:

- keep discussing LER definition in order to revert to the Regulatory Authorities with an ultimate proposal along with the CBA results or with the additional properties for FCR provisions, whichever comes first;
- provide along with the CBA results more clarifications about the data used to build the LER cost curve, clarifying why the cost of units with large reservoirs are not included and how future installed LER contributes to the curve itself;
- provide along with the CBA results the impact on European market integration of different delivery time periods set in Continental Europe and Nordic synchronous areas;
- provide along with the CBA results the detailed criteria used to judge the performances of each combination of LER share and delivery time period against the historical most critical frequency events;
- elaborate the outcomes of the CBA to set a delivery time period fully in line with SO GL provisions, in particular with article 156(9).

The NRAs are invited to clarify in their national decisions that the TSOs shall submit for approval, according to Article 6(3)d)v) of the SOGL, a delivery time period in full coherence with the SO GL provisions, as a result of the CBA to be carried out within 1 year after approval of the CBA methodology as provided by Article 156(11) of the SOGL.

The TSOs are required to address the above-mentioned improvements when a new CBA version is submitted.