EASE reply to ENTSO-E stakeholder consultation on the "All CE and Nordic TSOs' results of CBA in accordance with Art.156(11) of the Commission Regulation (EU) 2017/1485 of 2 August 2017" report

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EASE Key Messages

Energy storage can provide much-needed flexibility, in a carbon neutral way, which is essential to transition to a system dominated by variable renewables.

Energy storage technologies can provide an important contribution to system security while enabling the transition to a decarbonised energy system. The fast-dynamic response of energy storage devices is expected to help cope with the system inertia decrease and the RES variability, thereby contributing to grid stability. However, energy storage can only provide such services if there are no undue barriers in the network code provisions.

EASE welcomes the efforts of ENTSO-E and the TSOs of the CE and Nordic synchronous areas to propose assumptions and methodology for the CBA 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. With this reply EASE would like to give our feedback to the solutions proposed and draw attention to aspects where we find that the proposed methodology might in our view lead to strong distortions of the results or to an incomplete CBA.

EASE would like to emphasise that this discussion must be seen, on one side, as the need to have a stable electricity system and, on the other side, as the need to get energy storage into the market to avoid undue system costs and CO2 emissions.

It is important to note that even though ENTSO-E asks, with this consultation, stakeholders to comment on the 3 options proposed, one must, at the same time look if the basis, on which the 3 options were defined, is objectively neutral towards FCR providers with limited energy reservoirs.

In this context it must be highlighted that ENTSO-E, when proposing the text that later became the Commission Regulation (EU) 2017/1485, establishing a guideline on electricity transmission system operation (SO GL), proposed to have 30 minutes as a uniform FCR activation period, also for FCR providers with limited energy reservoirs. Only in subsequence exchanges was the principle of a CBA, in order to define the optimal activation time, agreed upon.

EASE supports setting Tmin for FCR providers with LER to 15 minutes, however, EASE notes that the methodology itself should be re-assessed before it is possible to carry out the CBA and based on that, to discuss the results.

Therefore, EASE would like to draw the attention to number of assumptions and design choices in the methodology leading to biased results in disadvantage of FCR units with limited energy reservoir, both coming from the methodology and

the CBA:

- Simulation of energy depletion of LER is not in line with SO GL. The explanation for CBA methodology shows very clearly that the current CBA is trying to determine an appropriate reservoir size, rather than - as it is the goal of SO GL art 156 - an appropriate time for full activation during alert state. The CBA treats effectively the point where frequency exceeds the standard frequency range as the point of alert state trigger, so also depletion before the alert state (only if the event includes an alert state trigger to be precise). The same is done for a post-alert time period, even within the standard frequency range. This is not consistent with SO GL, which requires LER to be continuously available during normal state. This leads to overestimating the time period required for full activation during alert state on the basis of system stability, since it is treating the pre-alert state, as well as the post-alert state, as alert state effectively, and counting the energy activation there as energy activation during alert state.

- Simulation of synchronous frequency restoration controller brings flawed results as modelling the Frequency Restoration Process of the synchronous area with a single controller leads to an overestimation of the required time period of the FCR providing units in alert state.

- Management of energy reservoir has not been taken into account. Not modelling active energy reservoir management would not be problematic if the CBA would really be determining a required time period during alert state, as required by SO GL art. 156.

- Management of energy reservoir considering deterministic phenomena is leading to less cost-effective results. Deterministic phenomena, in particular market induced effects which normally create imbalances on the hour are by definition predictable since this is the result of the day-ahead and intra-day market results. Increasing the required size of the energy reservoir would be definitely less cost-effective than ensuring a forward-looking energy reservoir management accounting for deterministic phenomena. For that reason new CBA simulations need to be run with and without the effect of determinist phenomena to assess the contribution of these phenomena to energy reservoir depletion and alert state time period requirements.

- Behaviour of FCR providing units with limited energy reservoir in the unlikely event of reservoir depletion is not fully assessed. Failure to do so leads again to underestimating the availability of FCR providing units with limited energy reservoir to stabilise the system and overestimating the need to increase the dimensioning of FCR as the share of FCR providing units with limited energy reservoir increases.

- Benefits of fast responding FCR providing units with limited energy reservoir have not been considered, thus neglecting the positive effect on system stability of an increased share of FCR providing units in the form of battery energy storage systems.

- Effect of long-lasting frequency deviations and deterministic frequency deviations cannot be appropriately assessed. The calculation assumptions that have been used in the methodology and the real data of the current situation (last 12 years) is providing diametrically different results.

- Energy to power ratio of FCR providing units with limited energy reservoir cannot give accurate results. A time requirement cannot be translated into an energy to power ratio requirement without consideration of the active energy reservoir management strategy. Therefore, it would make sense to conduct a sensitivity analysis on this assumption.
- Over dimensioning of FCR due to problems in the delivery of FRR should not be solution. FCR providing units should not be made responsible of correcting the problems of FRR providing units.
- Benefits of fast responding FCR providing units with limited energy reservoir should be considered.
- Costs for existing FCR providing units with limited energy reservoir needs to be quantified. These costs (in the form of lost returns on investment) need to be quantified in the CBA in the corresponding scenarios.
- The cost assessment of some FCR devices is questionable because some externalities are not taken into account. Taking into account 100% of the costs for new LER entrants considers implicitly that they are designed to provide this service only. This assumption is questionable and leads to incorrect results as most of the LER based on Energy Storage Systems (ESS) are used to stack several services on the same device, to be profitable.

1. Introduction

On 19 February 2020 ENTSO-E submitted for consultation a draft report on *"All CE and Nordic TSOs' results of CBA in accordance with Art.156(11) of the Commission Regulation (EU) 2017/1485 of 2 August 2017"*.

EASE welcomes the efforts of ENTSO-E and the TSOs of the CE and Nordic synchronous areas to propose assumptions and methodology for the CBA 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. With this reply EASE would like to give our feedback to the solutions proposed and draw attention to aspects where we find the proposed methodology might in our view lead to strong distortions of the results or to an incomplete CBA.

2. LER Depletion and FCR dimensioning

Before giving feedback about the CBA, EASE would like to draw the attention to number of assumptions and design choices in the methodology leading to biased results in disadvantage of FCR units with limited energy reservoir. EASE would like to note that the methodology itself should be re-assessed before it is possible to carry out the CBA and based on that, to discuss the results. EASE finds the methodology strongly biased against a 15 minutes solution based on the following:

a. Simulation of energy depletion of LER is not in line with SO GL

The assumption explanatory document[1] on the CBA methodology is in strong contradiction with the actual goal of the CBA, which is to define an appropriate time period for full activation during the alert state.

According to SO GL 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 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 /…/.*

The reason given in the CBA methodology for considering energy depletion during normal state is the following "*Considering the Nordic system thresholds as an example, even if the period between the overcoming of ±100mHz and the trigger of alert state can be considered as normal state, it is very unlikely that the LER can keep their energy reservoir fully available in this situation.*[2] It is important to highlight that the explanation for CBA methodology shows very clearly that the current CBA is trying to determine an appropriate reservoir size, rather than – as it is the goal of SO GL art 156 – an appropriate time for full activation during alert state. This is again confirmed by the sentence the "*energy content is equal to the full activation of FCR for the time period*"[3].

This approach in the CBA is very problematic for the following reasons:

i. **The result of the CBA needs to be a time period, not a reservoir size.** It is not possible to determine an appropriate reservoir size without taking into account active energy reservoir management.

ii. Considering what happens during normal state, also as relevant to the time period requirement for the alert state is not consistent with SO GL art 156 (9), according to which "*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*". It is crucial to

[1] Explanatory document of the proposal for assumptions and methodology for a Cost Benefit Analysis (CBA) compliant with the requirements contained in Article 156(11) of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (System Operation Guideline Regulation – SOGR)" 10.01.2018. Available online: https://consultations.entsoe.eu/system-operations/cbam/supporting_documents/180109_CBA%20Methodology%20%20Article%2015611%20of%20SO%20GL_%20Annex_V1_public.pdf.

[2] *Ibid.*

[3] *Ibid.*

note that if the time period defined by the CBA is affected by frequency deviations during normal state, this will later lead to double counting when prequalification requirements are defined based on CBA results. **Therefore, the CBA is not in line with SO GL art. 156 nor with the additional properties[4], since it is effectively considering the frequency deviations before entering the alert state as part of the alert state.**

iii. The CBA treats effectively the point where frequency exceeds the standard frequency range as the point of alert state trigger, so also depletion before the alert state (only if the event includes an alert state trigger to be precise). The same is done for a post-alert time period, even within the standard frequency range. This is not consistent with SO GL, which requires LER to be continuously available during normal state. **This leads to overestimating the time period required for full activation during alert state on the basis of system stability**, since it is treating the pre-alert state, as well as the post-alert state, as alert state effectively, and counting the energy activation there as energy activation during alert state.

b. Simulation of synchronous frequency restoration controller brings flawed results

By averaging between FRR with lower Full Activation Time (FAT) and FRR with higher FAT the action of faster FRR (so lower FAT) is effectively delayed in the simulation. This leads to an overestimation of the energy that needs to be provided by FCR units while FRR is ramping up, or equivalently an overestimation of the duration of the alert state. **That means – and it is relevant to emphasise – that modelling the Frequency Restoration Process of the synchronous area with a single controller leads to an overestimation of the required time period of the FCR providing units in alert state.**

c. Management of energy reservoir has not been taken into account

The current CBA has not taken into account the possibility for FCR providing units with limited energy reservoirs to manage their energy reservoir. Actually, this is done as a normal way of managing a limited energy reservoir device. Not modelling active energy reservoir management would be not problematic if the CBA would be really determining a required time period during alert state, as required by SO GL art. 156. **It should be underlined that while the assessment of a time period does not need to model active reservoir management to translate the time period requirement into an energy reservoir requirement, the characteristics of the active energy reservoir management need to be considered.**

[4] All CE TSOs' proposal for additional properties of FCR in accordance with Article 154(2) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation. 28.01.2019. Available online: https://forsyningstilsynet.dk/media/7021/metode-for-yderligere-egenskaber-for-fcr.pdf

d. Management of energy reservoir considering deterministic phenomena is leading to less cost-effective results

Deterministic phenomena, in particular market induced effects, which normally create imbalances on the hour, are by definition predictable since this is the result of the day-ahead and intra-day market results. A normal, forward looking energy reservoir management would be able to take these into account and schedule its energy reservoir management actions to compensate them in advance (for example by purchasing the corresponding energy in the day-ahead or intra-day energy market and thus shifting their baseline correspondingly).

Given this possibility, it is questionable why deterministic phenomena should be taken into account at all to assess reservoir depletion. **It is apparent that increasing the required size of the energy reservoir would be definitely less cost effective than ensuring a forward-looking energy reservoir management accounting for deterministic phenomena.**

For that reason, new CBA simulations need to be run with and without the effect of determinist phenomena to assess the contribution of these phenomena to energy reservoir depletion and alert state time period requirements. **As a result to these simulations, FCR providing units that are able to demonstrate their ability to compensate for these phenomena should therefore be allowed a correspondingly lower dimensioning of the energy reservoir.**

e. Behaviour of FCR providing units with limited energy reservoir in the unlikely event of reservoir depletion is not fully assessed

Even in the unlikely event of reservoir depletion, there are technical means to make sure that FCR providing units with limited energy reservoir are still contributing to system stability by responding to short-term frequency deviations. According to the all CE TSOs proposal[5] as specified in the additional properties of FCR:

> *The idea of the Reserve Mode is to relieve FCR providing units with limited energy reservoir from the "mean deviation" of system frequency. By applying this approach, the availability of FCR providing units with limited energy reservoir can be prolonged /…/ depending on the mean value of system frequency.*

Given that there are specific plans to introduce this Reserve Mode, it would only be logical to include this possibility in the assessment (at least as an additional scenario). **Failure to do so leads again to underestimating the availability of FCR providing units with limited energy reservoir to stabilise the system and overestimating the need to increase the dimensioning of FCR as the share of FCR providing units with limited energy reservoir increases.**

[5] *Ibid.*

f. [Benefits of fast responding FCR providing units with limited energy reservoir have not been considered]

Battery energy storage systems can ramp their power much faster than conventional FCR providing units. Therefore, they can minimise the maximum frequency deviation before the steady state frequency is reached. **The methodology does not consider the FCR dynamic response, thus neglecting the positive effect on system stability of an increased share of FCR providing units in the form of battery energy storage systems.** Why this has been excluded is not clear to us.

g. [Effect of long-lasting frequency deviations and deterministic frequency deviations cannot be appropriately assessed]

Long lasting frequency deviations are due to FRR saturation, while deterministic frequency deviations are due to market induced effects (power plants ramping up/down at various rates). Measures to mitigate these effects have been taken in the past and are also currently being planned.

Regarding the statistics for long lasting frequency deviations and deterministic frequency deviations, only the most recent years should be used in the model, with the historic data dating back to 2003 not being relevant anymore, given the evolution since then of key parameters, such as the generation mix. When taking into account, the data from years 2008-2018 and assessing the LER share, the results are strikingly different, as seen in the table below:

Reality check

Table 5: Yearly average depletion number in CE (with FCR = 3000 MW)

	LER share											Yearly average Alert State events exceeding equivalent of TminLER 2008-2018
TminLER	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	
15'	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	0.27
20'	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0
25'	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0
30'	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0
Mean	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	

It is important to note that:

- alert state exceeded 3 times the equivalent of 15 minutes full activation in the period 2008-2018 and
- last occurrence was in 2012.

As it is very clearly seen on the table – the calculation assumptions that have been used in the methodology and the real data of the current situation (last 12 years) is providing diametrically different results.

3. Feedback on cost-benefit assessment

a. Energy to power ratio of FCR providing units with limited energy reservoir cannot give accurate results

The CBA assumes that the energy to power ratio of FCR providing units with limited energy reservoir is equivalent to two times the time of activation during alert state. As explained above, **a time requirement cannot be translated into an energy to power ratio requirement without consideration of the active energy reservoir management strategy**. Therefore, it would make sense to conduct a sensitivity analysis on this assumption.

b. Over dimensioning of FCR due to problems in the delivery of FRR should not be a solution

Long lasting frequency deviations are typically due to exhaustion of FRR in a single LFC area. Therefore, the costs of mitigating the problems in the delivery of FRR should be weighed against the costs, economic and environmental, of increasing the requirements for FCR providing units (by extending the delivery period from 15 to 30 minutes). It should be noted that at least one of the NRAs, the Bundesnetzagentur in Germany, has set this expectation, claiming that **FCR providing units should not be made responsible of correcting the problems of FRR providing units**.

c. Benefits of fast responding FCR providing units with limited energy reservoir should be considered

Battery energy storage systems have a significantly faster response compared to conventional FCR proving units, thus limiting the maximum frequency deviation before steady state. By doing so, they limit the probability of underfrequency load shedding/distributed generator disconnection, which also represent costs to society. **Thus, an increased share of battery energy storage systems leads to quantifiable benefits to society, in the form of avoided costs for underfrequency load shedding/distributed generator disconnection.**

Any measure taken to limit the participation of battery storage systems in FCR procurement, either directly by limiting the share of FCR units with limited energy reservoir or indirectly by increasing the requirements for this units, will lead to a missed opportunity to reduce underfrequency load/generator shedding events and their related costs to society.

d. Costs for existing FCR providing units with limited energy reservoir needs to be quantified

There are FCR providing units with limited energy reservoir currently prequalified according to a 15-minute time period. An increase of the time period beyond 15 minutes will lead to a reduction of their FCR prequalification (a retrofit being hardly an option in practice). The investments in these systems will not be recovered due to this fact. **These costs (in the form of lost returns on investment) need to be quantified in the CBA in the corresponding scenarios.**

e. The cost assessment of some FCR devices is questionable because some externalities are not taken into account

Taking into account 100% of the costs for new LER entrants considers implicitly that they are designed to provide this service only. **This assumption is questionable and leads to incorrect results as most of the LER based on Energy Storage Systems (ESS) are used to stack several services on the same device, to be profitable.**

This means that the whole cost of LER devices cannot be attributed to the FCR service only, but must be proportionally attributed also to the other services provided. By participating in FCR, non-LER may renounce to higher benefits than LER on others markets (typically capacity mechanisms), therefore leading for them to higher prices. These higher cost for non-LER devices have also not been taken into consideration.

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About EASE

The European Association for Storage of Energy (EASE) is the voice of the energy storage community, actively promoting the use of energy storage in Europe and worldwide. It supports the deployment of energy storage as an indispensable instrument within the framework of the European energy and climate policy to deliver services to, and improve the flexibility of, the European energy system. EASE seeks to build a European platform for sharing and disseminating energy storage-related information and supports the transition towards a sustainable, flexible and stable energy system in Europe. For more information please visit www.ease-storage.eu

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Disclaimer

This response was elaborated by EASE and reflects a consolidated view of its members from an energy storage point of view. Individual EASE members may adopt different positions on certain topics from their corporate standpoint.

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