Explanatory document for the Nordic synchronous area proposal for coordination actions aiming to reduce FRCE as defined in Article 152(14) and measures to reduce FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation

1. Introduction

The Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereinafter **"SO Regulation"**) sets out rules on relevant subjects that should be coordinated between Transmission System Operators, as well as between TSOs and Distribution System Operators and with significant grid users, where applicable. The goal of the SO Regulation is to ensure provision of an efficient functioning of the interconnected transmission systems to support all market activities. In order to deliver these objectives, a number of steps are required.

One of these steps is to define coordination actions aiming to reduce the FRCE. Pursuant to Article 119(1)(q) of the SO Regulation, all Transmission System Operators in the Nordic LFC block shall jointly develop common proposals for the coordination actions aiming to reduce the FRCE as defined in Article 152(14). In addition, pursuant to Article 119(1)(r) of the SO Regulation, all Transmission System Operators in the Nordic LFC block shall jointly develop common proposals for measures to reduce the FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16).

According to Article 6(3)(e) (ii) and (iii) of the SO Regulation the proposal for coordination actions aiming to reduce FRCE as defined in Article 152(14) and measures to reduce FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16) (hereafter referred to as "**Proposal**") shall be submitted for approval by the relevant national regulatory authorities (hereinafter "NRAs") no later than 14 September, 2018. The Proposal is submitted for regulatory approval to all NRAs in the Nordic LFC block. According to Article 6(6) of the SO Regulation the Proposal needs to be submitted to ACER as well, who may issue an opinion on the Proposal if requested by the NRAs.

This document contains an explanation of the Proposal from all TSOs of the Nordic synchronous area (hereinafter **"TSOs"**). It is structured as follows. The legal requirements for the Proposal are presented in Chapter 2. Chapter 3 describes the objective of measures aiming to reduce FRCE. Chapter 4 provides an overview of the existing situation and Chapter 5 an outlook to future developments. The proposed measures are described in Chapter 6. Chapter 0 describes the expected impact on the relevant objectives of the SO Regulation. Finally, Chapter 8 provides the timeline for implementation and Chapter 9 describes the public consultation.

2. Legal requirements and interpretation

2.1 Legal references and requirements

Several articles in the SO Regulation set out requirements which the Proposal must take into account. These are cited below.

(1) Article 119(1)(q) and (r) and 119(2) of the SO Regulation constitutes the legal basis that the Proposal should take into account. Article 119 has the following content:

> *"1. By 12 months after entry into force of this Regulation, all TSOs of each LFC block shall jointly develop common proposals for: […]*
>
> *(q) coordination actions aiming to reduce the FRCE as defined in Article 152(14); and*
>
> *(r) measures to reduce the FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16).*
>
> *2. All TSOs of each LFC block shall submit the methodologies and conditions listed in Article 6(3)(e) for approval by all the regulatory authorities of the concerned LFC block. Within 1 month after the approval of these methodologies and conditions, all TSOs of each LFC block shall conclude an LFC block operational agreement which shall enter into force within 3 months after the approval of the methodologies and conditions"*

(2) Article 152 of the SO Regulation has the following content:

*"***System states related to system frequency**

1. Each TSO shall operate its control area with sufficient upward and downward active power reserve, which may include shared or exchanged reserves, to face imbalances between demand and supply within its control area. Each TSO shall control the FRCE as defined in the Article 143 in order to reach the required frequency quality within the synchronous area in cooperation with all TSOs in the same synchronous area.

2. Each TSO shall monitor close to real-time generation and exchange schedules, power flows, node injections and withdrawals and other parameters within its control area relevant for anticipating a risk of a frequency deviation and shall take, in coordination with other TSOs of its synchronous area, measures to limit their negative effects on the balance between generation and demand.

3. All TSOs of each synchronous area shall specify a real-time data exchange in accordance with Article 42 which shall include:

(a) the system state of the transmission system in accordance with Article 18; and

(b) the real-time measurement data of the FRCE of the LFC blocks and LFC areas of the synchronous area.

4. The synchronous area monitor shall determine the system state with regard to the system frequency in accordance with Article 18(1) and (2).

5. The synchronous area monitor shall ensure that all TSOs of all synchronous areas are informed in case the system frequency deviation fulfils one of the criteria for the alert state referred to in Article 18.

6. All TSOs of a synchronous area shall define in the synchronous area operational agreement common rules for the operation of load-frequency control in the normal state and alert state.

7. All TSOs of the GB and IE/NI synchronous areas shall specify in the synchronous area operational agreement operational procedures for case of exhausted FCR. In those operational procedures the TSOs of a synchronous area shall have the right to require changes in the active power production or consumption of power generating modules and demand units.

8. All TSOs of a LFC block shall specify operational procedures for cases of exhausted FRR or RR in the LFC block operational agreement. In those operational procedures the TSOs of a LFC block shall have the right to require changes in the active power production or consumption of power generating modules and demand units.

9. The TSOs of a LFC block shall endeavour to avoid FRCEs which last longer than the time to restore frequency.

10. All TSOs of a synchronous area shall specify in the synchronous area operational agreement the operational procedures for the alert state due to a violation of system frequency limits. The operational procedures shall aim at reducing the system frequency deviation in order to restore the system state to the normal state and to limit the risk of entering the emergency state. The operational procedures shall include the right of TSOs to deviate from the obligation set in Article 143(1).

11. If the system state is in the alert state due to insufficient active power reserves in accordance with Article 18, the TSOs of the concerned LFC blocks shall, in close cooperation with the other TSOs of the synchronous area and the TSOs of other synchronous areas, act to restore and replace the necessary levels of active power reserves. For that purpose, the TSOs of a LFC block shall

have the right to require changes in the active power production or consumption of power generating modules or demand units within its control area to reduce or to remove the violation of the requirements concerning active power reserve.

12. If the 1-minute average of the FRCE of a LFC block is above the Level 2 FRCE range at least during the time necessary to restore frequency and where the TSOs of a LFC block do not expect that FRCE will be sufficiently reduced by undertaking the actions in paragraph 15, TSOs shall have the right to require changes in the active power production or consumption of power generating modules and demand units within their respective areas to reduce the FRCE as specified in paragraph 16.

13. For the CE and Nordic synchronous areas, where the FRCE of a LFC block exceeds 25 % of the reference incident of the synchronous area for more than 30 consecutive minutes and if the TSOs of that LFC block do not expect to reduce sufficiently the FRCE with the actions taken pursuant to paragraph 15, the TSOs shall require changes in the active power production or consumption of power generating modules and demand units within their respective areas to reduce the FRCE as specified in paragraph 16.

14. The LFC block monitor shall be responsible for identifying any violation of the limits in paragraphs 12 and 13 and:

(a) shall inform the other TSOs of the LFC block; and

(b) together with the TSOs of the LFC block shall implement coordinated actions to reduce the FRCE which shall be specified in the LFC block operational agreement.

15. For the cases referred to in paragraphs 11 to 13 all the TSOs of each synchronous area shall specify in the synchronous area operational agreement actions to enable the TSOs of a LFC block to actively reduce the frequency deviation with the cross-border activation of reserves. In cases referred to in paragraphs 11 to 13 the TSOs of the synchronous area shall endeavour to enable the TSOs of the concerned LFC block to reduce their FRCE.

16. The TSOs of a LFC block shall specify, in the LFC block operational agreement, measures to reduce the FRCE by means of changes in the active power production or consumption of power generating modules and demand units within their area."

(3) Article 6(3)(e)(ii) and (iii) of the SO Regulation states:

"The proposals for the following terms and conditions or methodologies 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: […]
(e) methodologies and conditions included in the LFC block operational agreements in Article 119, concerning:
(ii) coordination actions aiming to reduce FRCE as defined in Article 152(14);
(iii) measures to reduce FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16);"

2.2 Interpretation and scope of the Proposal

This Proposal only covers the 'normal' and the 'alert state' (as defined in Article 18 of the SO Regulation). The 'emergency state', 'blackout state' and 'restoration state' are referred to in the commission regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration. The measures included in this proposal are aimed to prevent for to limiting the risk of entering into the emergency state. However, some measures may apply to several states.

Paragraph 14 of Article 152 of the SO Regulation refers to paragraph 12 and 13: *"The LFC block monitor shall be responsible for identifying any violation of the limits in paragraphs 12 and 13*". The limit in paragraph 12 is specified as *"the 1-minute average of the FRCE of a LFC block is above the Level 2 FRCE range at least during the time necessary to restore frequency".*

The limit in paragraph 13 is specified as *"FRCE of a LFC block exceeds 25 % of the reference incident of the synchronous area for more than 30 consecutive minutes".* The largest reference incident of the Nordic synchronous area is approximately 1400MW. Consequently, 25% of the reference incident is approximately 350MW, which needs to be converted to a frequency deviation. Assuming 7000MW/Hz, this will result in approximately 50mHz. Consequently, the limit means for the Nordic synchronous area that *'where the frequency deviation exceeds 50mHz for more than 30 consecutive minutes*'. Since 50mHz is within the standard frequency range of ± 100mHz, the Nordic TSOs consider this limit a bit too strict. This may be quite normal operation and not be a situation that requires changes in active power production or consumption.

The scope of this proposal only includes those measures that may be applied during the operational hour. Preparation measures to prevent for this situation are not included.

3. Objective of coordination actions and measures aiming to reduce FRCE

To maintain the frequency quality and the FRCE quality the TSOs shall have sufficient measures, not only to keep the frequency within its standard frequency range, but also to be able to let the frequency return to the standard frequency range in case of excursions. The objective of the coordination actions and measures in this Proposal is therefore to provide the TSOs with sufficient tools to maintain frequency quality and the FRCE quality in both the 'normal state' and 'alert state' and prevent for entering into the 'emergency state'.

4. The existing situation

During the operational hour the TSOs' operators follow the trend of the operational situation and continuously estimate upcoming need of readjusting the balancing. In normal and alert state conditions TSOs use market based FRR activation as long as possible.

However, in some cases, where the market does not provide sufficient possibilities to mitigate the problem, the TSOs will have to use other options to maintain system security. The operators make a judgement based on the available real-time data and planning information in order to make a decision on appropriate action(s). In such cases, the operators have the following tools:

- Activate fast mFRR bids with a high volume out of price order;
- Activate TSO owned or controlled reserve power plants;
- Activate available generation and demand response[1] that did not submit mFRR-bids;
- Agree with other TSOs on supportive power over HVDC links;
- Perform manually activated Load shedding.

5. Outlook

The new Nordic balancing model is expected to reduce the need for using the measures in Chapter 4 especially by more automation in balancing and more electronic ordering of mFRR activation.

[1] This refers to prequalified mFRR capacity for which BSPs have not sent in mFRR bids.

6. Proposal measures to reduce FRCE

As discussed in section 2.2 of this Proposal, the scope of this Proposal only includes coordinated actions and measures that are required during the operational hour.

Article 3 of the Proposal specifies the coordination actions aiming to reduce FRCE pursuant to Article 152(14) of the SO Regulation:

Article 3 – Coordinated actions to reduce the FRCE

1. The TSOs shall implement the following coordinated actions to reduce the FRCE in accordance with article 152(14) of the SO Regulation:
    a. Activate fast mFRR bids with a high volume out of price order;
    b. Activate TSO owned or controlled reserve power plants;
    c. Activate available generation and demand response that did not submit mFRR-bids;
    d. Agree with other TSOs on supportive power over HVDC links.

Article 4 of the Proposal specifies the measures to reduce FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16) of the SO regulation:

Article 4 – Measures to reduce the FRCE by means of changes in the active power production or consumption of power generating modules and demand units within their area

1. If the measures expressed in Article 3 will not be sufficient to limit the risk of entering into the emergency state, the TSOs are allowed to:
    a. Request immediate changes in the active power production or consumption of power generating modules and demand units within their control area;
    b. Perform manually activated load-shedding.

7. Expected impact of the Proposal on the relevant objectives of the SO Regulation

The Proposal generally contributes to and does not in any way hamper the achievement of the objectives of Article 4 of the SO Regulation. In particular, the Proposal serves the objectives to:

- Article 4(1)(c) determining common load-frequency control processes and control structures;
- Article 4(1)(d) ensuring the conditions for maintaining operational security throughout the Union; Article 4(1)(e) ensuring the conditions for maintaining a frequency quality level of all synchronous areas throughout the Union;

The Proposal contributes to these objectives by specifying measures to reduce FRCE on top of the measures that are applied continuously to maintain the frequency quality in the Nordic synchronous area. The measures contribute to maintaining operational security and ensure the conditions for maintaining a frequency quality level in the Nordic synchronous area.

8. Timescale for the implementation

The TSOs shall implement the Proposal not later than when Nordic LFC block operational agreement enters into force in accordance with Article 119 of the SO Regulation.

9. Public consultation

Article 11 of the SO Regulation states that: *"TSOs responsible for submitting proposals for terms and conditions or methodologies or their amendments in accordance with this Regulation shall consult stakeholders, including the relevant authorities of each Member State, on the draft proposals for terms and conditions or methodologies listed in Article 6(2) and (3). The consultation shall last for a period of not less than one month."*

This Proposal will be consulted in the period 1 July to 15 August 2018.