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**Amended Nordic synchronous area proposal for the FRR  
dimensioning rules in accordance with Article 157(1) of the  
Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing  
a guideline on electricity transmission system operation**

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13 May 2019

All TSOs of the Nordic synchronous area, taking into account the following:

### Whereas

- (1) This document is the common proposal developed by all Transmission System Operators within the Nordic synchronous area (hereafter referred to as “TSOs”) for the FRR dimensioning rules in accordance with Article 157(1) of Commission Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation (hereafter referred to as “SO Regulation”). This proposal is hereafter referred to as “Proposal”.
- (2) The Proposal takes into account the general principles and goals set in SO Regulation as well as Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross border exchanges in electricity (hereafter referred to as “Regulation (EC) No 714/2009”). The goal of the SO Regulation/Regulation (EC) No 714/2009 is the safeguarding of operational security, frequency quality and the efficient use of the interconnected system and resources. Article 119(1)(h) of the SO Regulation sets for this purpose requirements for the TSOs to “jointly develop common proposals for: [...] the FRR dimensioning rules defined in accordance with Article 157(1);”
- (3) Article 157(1) of the SO Regulation defines the scope of this Proposal: “1. All TSOs of a LFC Block shall set out FRR dimensioning rules in the LFC Block operational agreement.”. In Article 157(2) of the SO Regulation the minimum requirements for the FRR dimensioning rules are specified.
- (4) The TSOs apply two types of Frequency Restoration Reserves (FRR). This Proposal covers the dimensioning of both manual FRR (mFRR) and automatic FRR (aFRR).
- (5) In regard to regulatory approval, Article 6(3) 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: [...]  
(iv) the FRR dimensioning rules in accordance with Article 157(1);”*
- (6) According to Article 6(6) of the SO Regulation the expected impact of the Proposal on the objectives of the SO Regulation has to be described and is presented below.
- (7) 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 contributes to these objectives by specifying the dimensioning rules for mFRR and aFRR, which are key reserves that are used in the common Nordic load-frequency control processes. Sufficient mFRR and aFRR guarantee the right FRCE and frequency quality level and consequently maintain the operational security by reducing the risk for automatic Under Frequency Load Shedding (UFLS), automatic reduction of generation and for system blackouts due to under or over frequency.

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- (8) In conclusion, the Proposal contributes to the general objectives of the SO Regulation to the benefit of all market participants and electricity end consumers.

**SUBMIT THE FOLLOWING AMENDED PROPOSAL TO ALL REGULATORY AUTHORITIES OF THE NORDIC SYNCHRONOUS AREA:**

**Article 1 - Subject matter and scope**

1. The FRR dimensioning rules described in this Proposal are the common proposal of TSOs in accordance with article 157(1) of the SO Regulation. The Proposal applies solely to the Nordic LFC block.

The Nordic synchronous area covers transmission systems of East-Denmark (DK2), Finland, Sweden and Norway.

This Proposal has been developed by Energinet, Fingrid Oyj, Kraftnät Åland AB, Svenska kraftnät and Statnett SF.

2. This Proposal is subject to approval in accordance with Article 6(3) of the SO Regulation.

**Article 2 - Definitions and interpretation**

1. For the purposes of this Proposal, the terms used shall have the meaning of the definitions included in Article 3 of the SO Regulation.

2. In addition, this Proposal applies the following definitions and interpretations:
- a. Normal imbalances: Imbalances caused by the continuous mismatch between generation, demand, import and export. Normal imbalances include stochastic imbalances, deterministic imbalances and forecast errors;
  - b. Disturbances: Occasional imbalances caused by power deviation occurring instantaneously between generation and demand in a synchronous area. The largest disturbance in the LFC block equals the reference incident as defined in Article 3(2)(58) of the SO Regulation.

The dimensioning incident as defined in Article 3(2)(109) of the SO Regulation consists of the normal imbalances and disturbances. In a Nordic terminology this would be the maximum imbalance for LFC block, regardless of the cause of the imbalance.

3. In this Proposal, unless the context requires otherwise:
- a) the singular indicates the plural and vice versa;
  - b) the headings are inserted for convenience only and do not affect the interpretation of the Proposal; and
  - c) any reference to legislation, regulations, directives, orders, instruments, codes or any other enactment shall include any modification, extension or re-enactment of it when in force.

### **Article 3 – FRR dimensioning for the LFC block**

1. The articles below set out the FRR dimensioning rules for the LFC block. The total amount of reserve capacity on FRR for the LFC block shall be the sum of the automatic and manual FRR for normal imbalances and the automatic and manual FRR for disturbances in both positive and negative direction;
2. The sum of all reserve requirements on automatic FRR indicated in paragraph 1 and the sum of all reserve requirements of manual FRR indicated in paragraph 1 will set the ratio between automatic and manual FRR for the LFC block;
3. All TSOs shall use the input data as described in Article 4;
4. All TSOs shall dimension FRR with the objective to minimise within geographical limitations the total amount of required FRR for the LFC block taking into account:
  - a. The rules for dimensioning the total amount of reserve capacity on FRR for the LFC block as described in Article 5;
  - b. The rules for dimensioning FRR for normal imbalances as described in Article 6;
  - c. The rules for dimensioning FRR for disturbances as described in Article 7.
5. The TSOs geographically distribute the required FRR by dimensioning FRR per LFC area in accordance with the rules set out in Article 6 and 7.

### **Article 4 – Input to FRR dimensioning methodology**

1. The input to the FRR dimensioning methodology shall be:
  - a. *Historical LFC block imbalance*: aggregated historical LFC area imbalance of all LFC areas;
  - b. *Historical LFC area imbalance* for each LFC area, consisting of consecutive historical records of the LFC area imbalance in accordance with the requirements for historical records in article 157(2)(a) of the SO Regulation. The LFC area imbalance will be calculated as the power deficit or surplus, if the TSO would not have taken any regulation actions to restore FRCE of the LFC area to zero;
  - c. *Reference incident for the LFC Block* in both positive and negative direction: the largest of the reference incidents of all control areas, which shall be the largest imbalance that may result from an instantaneous change of active power of a single power generating module, single demand facility, or single HVDC interconnector or from a tripping of an AC line within the LFC block;
  - d. *Reference incident for each control area* in both positive and negative direction: the largest imbalance that may result from an instantaneous change of active power of a single power generating module, single demand facility, or single HVDC interconnector or from a tripping of an AC line within the control area;
  - e. *Reference incident for each LFC area* in both positive and negative direction: the largest imbalance that may result from an instantaneous change of active power of a single power generating module, single demand facility, or single HVDC interconnector or from a tripping of an AC line within the LFC area;
  - f. *Historical data on remaining, free transmission capacity* per LFC area border and direction. The *free transmission capacity* shall be the cross zonal capacity remaining after the day ahead- and intraday markets.

### **Article 5 – Rules for dimensioning the total amount of reserve capacity on FRR for the LFC block**

1. The total amount of reserve capacity on positive FRR for the LFC block shall be sufficient to cover the positive LFC block imbalances for at least 99 % of the time, based on the historical records referred to in Article 4(1)(a);
2. The total amount of reserve capacity on negative FRR for the LFC block shall be sufficient to cover the negative LFC block imbalances for at least 99 % of the time, based on the historical records referred to in Article 4(1)(a);
3. The reserve capacity on FRR of the LFC block shall be sufficient to respect the current FRCE target parameters for the LFC block as specified in the synchronous area operational agreement in accordance with article 118(1)(d)/128 of the SO Regulation. The TSOs shall ensure that the following probabilistic restrictions are fulfilled:
  - a. The probability that the FRCE of the LFC block shall be outside the Level 1 FRCE range shall be less than 30 %; and
  - b. The probability that the FRCE of the LFC block shall be outside the Level 2 FRCE range shall be less than 5 %.
4. In using that probabilistic methodology for calculating the probabilities mentioned in paragraph 3 of this article, the TSOs shall take into account:
  - a. The restrictions defined in the agreements for sharing or exchange of reserves due to possible violations of operational security and the FRR availability requirements as specified in the LFC block operational agreement in accordance with article 119(1)(l)/158(2) of the SO Regulation;
  - b. Any expected significant changes to the distribution of LFC block imbalances; or
  - c. Other relevant influencing factors relative to the time period considered.

### **Article 6 – Rules for dimensioning FRR for normal imbalances**

1. The reserve capacity on positive FRR for normal imbalances for the LFC block shall be the aggregated reserve capacities on positive FRR for normal imbalances for all LFC areas;
2. The reserve capacity on positive FRR for normal imbalances for the LFC block shall be minimised within the geographical limitations for the distribution of these reserves over the LFC block, based on the following rules:
  - a. For each LFC area, the probability that the imbalance can be completely covered by imbalance netting and reserve capacity on positive FRR for normal imbalances shall not be less than a specified target. This target is determined in order to meet the objective specified in Article 3(4) and the requirements for the LFC block as specified in Article 5. The target will be evaluated and updated at least once a year. The probability will be determined based on the historical LFC area imbalance referred to in Article 4(1)(b) and historical data on free transmission capacity referred to in Article 4(1)(f);
  - b. The result of a. shall be adjusted according to known long-term grid outages, possible transmission capacity withheld from the market for exchange of FRR and other constraints affecting the time period for which FRR is dimensioned.
3. The reserve capacity on negative FRR for normal imbalances for the LFC block shall be the aggregated reserve capacities on negative FRR for normal imbalances for all LFC areas;
4. The reserve capacity on negative FRR for normal imbalances for the LFC block shall be minimised within the geographical limitations for the distribution of these reserves over the LFC block, based on the following rules:

- a. For each LFC area, the probability that the imbalance can be completely covered by imbalance netting and reserve capacity on negative FRR for normal imbalances shall not be less than a specified target. This target is determined in order to meet the objective specified in article 3(4) and the requirements for the LFC block as specified in Article 5. The target will be evaluated and updated at least once a year. The probability will be determined based on the historical LFC area imbalance referred to in Article 4(1)(b) and historical data on free transmission capacity referred to in Article 4(1)(f);
  - b. The result of a. shall be adjusted according to known long-term grid outages, possible transmission capacity withheld from the market for exchange of FRR and other constraints affecting the time period for which FRR is dimensioned.
5. All TSOs shall determine the minimum reserve capacity on automatic FRR per LFC area using a probability-based approach. The required minimum volumes of automatic FRR will be determined by setting a confidence interval on the probability distribution of the short-term imbalances of each LFC area. This confidence interval shall consider the fulfilment of the requirements of Article 5(3) and shall take into account the automatic FRR full activation time and the manual FRR full activation time of standard products and – if applicable – to specific products, which shall not be more than the time to restore frequency;
6. Short-term imbalances represent imbalances that are intended to be handled with automatic FRR. The determination of short-term imbalances shall take into account the automatic FRR and the manual FRR full activation times. The short-term imbalances are extracted/calculated after the netting/aggregation process is performed.

#### **Article 7 – Rules for dimensioning FRR for disturbances**

1. The reserve capacity on positive FRR for disturbances for the LFC block shall be the aggregated reserve capacity on positive FRR for disturbances for all control areas;
2. For each control area, the required capacity on positive FRR for disturbances shall cover at least the positive reference incident for the control area. Each TSO shall make sure that each LFC area within its control area will have access to sufficient positive FRR for disturbances to cover the positive reference incident for the LFC area;
3. The required reserve capacity on positive FRR for disturbances for the LFC block shall be reduced by sharing of the required reserve capacity on positive FRR for disturbances of control areas subject to the following conditions:
  - a. Agreement on sharing by all TSOs of the LFC block;
  - b. The probability that the required cross zonal capacity will be available shall not be less than a specified threshold. This threshold is evaluated and updated at least once a year in order to meet the objective specified in article 3(4) and the requirements for the LFC block as specified in Article 5. The probability that the required cross zonal capacity will be available shall be based on the historical data on remaining, free transmission capacity as specified in Article 4(1)(f);
  - c. Paragraph a. and b. shall take into account known long-term grid outages, possible transmission capacity withheld from the market for exchange of FRR and other constraints affecting the output time period for which FRR is dimensioned.
4. The reserve capacity on negative FRR for disturbances for the LFC block shall be the aggregated reserve capacity on negative FRR for disturbances for all control areas;
5. For each control area, the required capacity on negative FRR for disturbances shall cover at least the negative reference incident for the control area. Each TSO shall make sure that each LFC area within

its control area will have access to sufficient negative FRR for disturbances to cover the negative reference incident for the LFC area;

6. The required reserve capacity on negative FRR for disturbances for the LFC block shall be reduced by sharing of the required reserve capacity on negative FRR for disturbances of control areas subject to the following conditions:
  - a. Agreement on sharing by all TSOs of the LFC block;
  - b. The probability that the required cross zonal capacity will be available shall not be less than a specified threshold. This threshold is evaluated and updated at least once a year in order to meet the objective specified in article 3(4) and the requirements for the LFC block as specified in Article 5. The probability that the required cross zonal capacity will be available shall be based on the historical data on remaining, free transmission capacity as specified in Article 4(1)(f);
  - c. Paragraph a. and b. shall take into account known long-term grid outages, possible transmission capacity withheld from the market for exchange of FRR and other constraints affecting the output time period for which FRR is dimensioned.
7. The minimum reserve capacity on automatic FRR for disturbances per control area / LFC areas is 0 MW.

### **Article 8 – Process for FRR dimensioning**

The FRR dimensioning process shall include the following steps:

1. Collection of input data including the input data specified in Article 4;
2. Dimensioning calculations in accordance with the rules in Article 3 to 7, including
  - a. baseline calculations, including
    - i. calculation of probability distributions;
    - ii. calculation of stand-alone requirements per LFC area;
    - iii. calculation of minimum LFC block requirement, without taking into account congestions between LFC areas (copper plate).
  - b. optimisations, including
    - i. statistical aggregation of imbalances between LFC areas using free transmission capacity;
    - ii. sharing of FRR for disturbances using free transmission capacity.
  - c. calculation of minimum amount of aFRR in accordance with the rules in Article 6(5).
3. Definition of output, including the FRR volume requirements and the minimum requirement for aFRR;
4. Evaluation, based on operational experience with the results from the dimensioning process;
5. Tuning of the FRR dimensioning methodology based on the results of the evaluation.

### **Article 9 – Publication and implementation**

1. The relevant TSOs shall publish (in accordance with Article 8 of the SO Regulation) the Proposal without undue delay after the competent NRAs have approved the Proposal or a decision has been taken by the Agency for the Cooperation of Energy Regulators in accordance with article 6 of the SO Regulation;
2. The TSOs shall implement the dimensioning rules for FRR by 2022.

### **Article 10 - Language**

The reference language for this Proposal shall be English. For the avoidance of doubt, where TSOs needs to translate this Proposal into national language(s), in the event of inconsistencies between the English version published by TSOs in Nordic Synchronous Area in accordance with Article 8(1) of the SO Regulation and any version in another language the relevant TSOs shall, in accordance with national legislation, provide the relevant national regulatory authority with an updated translation of the Proposal.