
**Nordic synchronous area 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**

10 September 2018

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 additional properties of FCR in accordance with Article 154(2) 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 the 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 118(1)(b) of the SO Regulation sets for this purpose requirements for the TSOs to “*jointly develop common proposals for: [...] additional properties of FCR in accordance with Article 154(2);*”
- (3) Article 154(1) of the SO Regulation refers to Annex V of the SO Regulation for the properties/minimum technical requirements for FCR that shall be ensured by each reserve connecting TSO. Annex V of the SO Regulation defines the minimum technical requirements for FCR for the Nordic synchronous area:

<i>Minimum accuracy of frequency measurement</i>	<i>10 mHz or the better industrial standard if better</i>
<i>Maximum combined effect of inherent frequency response insensitivity and possible intentional frequency response dead band of the governor of the FCR providing units or FCR providing groups</i>	<i>10 mHz</i>
<i>FCR full activation time</i>	<i>30 s if system frequency is outside standard frequency range</i>
<i>FCR full activation frequency deviation</i>	<i>± 500 mHz</i>

- (4) On top of the minimum technical requirements specified in Annex V of the SO Regulation, Article 154(2) of the SO Regulation gives the TSOs “*the right to specify, in the synchronous area operational agreement, common additional properties of the FCR required to ensure operational security in the synchronous area*”. Article 154(2) of the SO Regulation further describes that this shall be done “*by means of a set of technical parameters and within the ranges in Article 15(2)(d) of Regulation (EU) 2016/631 and Articles 27 and 28 of Regulation (EU) 2016/1388. Those common additional properties of FCR shall take into account the installed capacity, structure and pattern of consumption and generation of the synchronous area. The TSOs shall apply a transitional period for the introduction of additional properties, defined in consultation with the affected FCR providers.*”. This Proposal covers additional properties of FCR for the Nordic synchronous area (only) and shall be applied by the Nordic TSOs (only).
- (5) Article 15(2)(d) of Regulation (EU) 2016/631 (“*network code on requirements for grid connection of generators*”) provides a number of requirements (ranges) that shall be met by Type C and Type D power-generating modules “*when frequency sensitive mode (‘FSM’) is operating*”.

These include ranges of the “*Active power range related to maximum capacity*”, “*Frequency response insensitivity*”, “*Frequency response deadband*”, “*Droop*”, “*Active power frequency response capability*”, “*initial activation of active power frequency response*” and the requirement that “(v) *the power-generating module shall be capable of providing full active power frequency response for a period of between 15 and 30 minutes as specified by the relevant TSO.*”. Furthermore, “(vi) *within the time limits laid down in point (v) of paragraph 2(d), active power control must not have any adverse impact on the active power frequency response of power-generating modules;*”.

- (6) Articles 27 and 28 of Regulation (EU) 2016/1388 (“*network code on demand connection*”) describes requirements for demand units to provide demand response services to system operators, including “*autonomously controlled demand response system frequency control*”. More specifically, Article 28 of Regulation (EU) 2016/1388 stipulates the “*specific provisions for demand units with demand response active power control, reactive power control and transmission constraint management*”. These provisions relate to operating capability across frequency ranges and voltage ranges, requirements related to receiving and executing instructions, controlling and adjusting power consumption, and requirements for maintaining the modification to power consumption.
- (7) The Nordic Frequency Containment Process (FCP) currently applies two types of Frequency Containment Reserves (FCR). FCR for normal operation (FCR-N) is used for continuous imbalances to keep the frequency within the $\pm 100\text{mHz}$ range. In conjunction with a rapid frequency change to 49.9/50.1 Hz, FCR-N shall be up regulated/down regulated within 2-3 minutes. FCR for disturbance situations (FCR-D) is only used in upward direction (upward FCR-D). The purpose of upward FCR-D is to mitigate the impact of incidental disturbances once the frequency is below 49.90Hz. Upward FCR-D shall be fully activated if the frequency stabilises at 49.50Hz. In the event of a frequency drop to 49.5 Hz caused by a momentary loss, FCR-D shall be fully activated within 30 seconds. It has to be noted that the *FCR full activation frequency deviation* of $\pm 500\text{mHz}$ and *FCR full activation time* of 30s that are specified in Annex V of the SO Regulation only apply to FCR-D. Consequently, the TSOs specify the required FCR-N response as additional properties in this Proposal. The other two requirements in Annex V of the SO Regulation apply to both FCR-N and FCR-D.
- (8) 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: [...]*
(d) *methodologies, conditions and values included in the synchronous area operational agreements in Article 118 concerning:*
(iii) *additional properties of FCR in accordance with Article 154(2);*
- (9) 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.
- (10) 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 (1)(c) determining common load-frequency control processes and control structures, (1)(d) ensuring the conditions for maintaining operational security throughout the Union, (1)(e) ensuring the conditions for maintaining a frequency quality level of all synchronous areas throughout the Union and (1)(h) contributing to the efficient operation and development of the electricity

transmission system and electricity sector in the Union. The Proposal contributes to these objectives by specifying the additional rules for FCR-N and upward FCR-D, which are key reserves that are used in the common Nordic load-frequency control processes. The additional properties are required to maintain the operational security by reducing the risk for automatic Under Frequency Load Shedding (UFLS) and for system blackouts due to under or over frequency. The additional properties balance the impact of both cost for FCR and outage risk and therefore ensure efficient operation of the electricity transmission system.

- (11) The TSOs together operate the Nordic synchronous system. Consequently, the TSOs and all the power consumers, generators, balance service providers and networks directly or indirectly connected to the TSOs' networks, influence the frequency quality level and experience the same frequency level. FCR-N and FCR-D will only be effective if all providers will provide the contracted amounts in accordance with their specifications.
- (12) 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 PROPOSAL TO ALL REGULATORY AUTHORITIES OF THE NORDIC SYNCHRONOUS AREA:

Article 1 - Subject matter and scope

1. The additional properties for FCR described in this Proposal are the common proposal of TSOs in accordance with article 154(2) of the SO Regulation. The Proposal applies solely to the Nordic synchronous area.

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 the Proposal, the terms used shall have the meaning of the definitions included in Article 3 of the SO Regulation.
2. 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 – FCR-N additional properties

1. FCR-N shall be fully activated at $f = 49.9/50.1\text{Hz}$ ($\Delta f = \pm 0.1\text{Hz}$). FCR full activation frequency deviation for FCR-N is $\pm 100\text{mHz}$.
2. In conjunction with a rapid system frequency change to 49.9/50.1 Hz, FCR-N shall be up regulated/ down regulated within 3 minutes.

Article 4 – Upward FCR-D additional properties

1. Upward FCR-D shall be activated at 49.9 Hz and shall be fully activated at 49.5 Hz. It shall increase virtually linearly within a system frequency range of 49.9-49.5 Hz.
2. In the event of a system frequency drop to 49.5 Hz:
 - 50 % of the upward FCR-D shall be regulated upwards within 5 seconds;
 - 100 % of the upward FCR-D shall be regulated upwards within 30 seconds.
3. Agreed automatic load reduction in the event of frequency drops to 49.5 Hz can be counted as part of the upward FCR-D reserve. However: Load reduction can only be used as upward FCR-D in the

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frequency range of 49.9 Hz to 49.5 Hz, when load reduction meets the same technical requirements set under item 1 of this article.

Article 5 – 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 Proposal not later than when Nordic synchronous area operational agreement enters into force in accordance with Article 118 of the SO Regulation.

Article 6 - 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.

**Nordic synchronous area proposal for the dimensioning rules for
FCR in accordance with Article 153 of the Commission Regulation
(EU) 2017/1485 of 2 August 2017 establishing a guideline on
electricity transmission system operation**

10 September 2018

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 dimensioning rules for FCR in accordance with Article 153 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 118(1)(a) of the SO Regulation sets for this purpose requirements for the TSOs to “*jointly develop common proposals for: [...] the dimensioning rules for FCR in accordance with Article 153;*”
- (3) Article 153(2) of the SO Regulation describes the scope of this Proposal:
“2. All TSOs of each synchronous area shall specify dimensioning rules in the synchronous area operational agreement [...]”. Article 153(1) of the SO Regulation stipulates how these dimensioning rules shall be applied: “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”. The Proposal covers the dimensioning of FCR for the Nordic synchronous area (only) and shall be applied by the Nordic TSOs (only).
- (4) Article 153(2) of the SO Regulation further states that the “*dimensioning rules*” shall be specified “*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 [...] 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:*
[...]
 - (ii) [...] the reference incident shall be the largest imbalance that may result from an instantaneous change of active power such as that of a single power generating module, single demand facility, or single HVDC interconnector or from a tripping of an AC line, or it shall be the maximum instantaneous loss of active power consumption due to the tripping of one or two connection points. The reference incident shall be determined separately for positive and negative direction;*
 - (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.*

- (5) The TSOs concluded that *"the maximum instantaneous loss of active power consumption due to the tripping of [...] two connection points"* that is suggested in Article 153(2)(b)(ii) of the SO Regulation shall not set the 'reference incident' for the Nordic synchronous area. The reason for this is that the TSOs do not consider the probability for two simultaneous outages of demand facilities significant.
- (6) In addition to the types of *'instantaneous change of active power'* that may set the reference incident as suggested by Article 153(2)(b)(ii) of the SO Regulation, the TSOs consider that tripping of one busbar may be evaluated as a reasonable N-1 disturbance. This may be relevant during especially longer outages on a busbar.
- (7) The Nordic Frequency Containment Process (FCP) applies two types of Frequency Containment Reserves (FCR). FCR for normal operation (FCR-N) is used for continuous imbalances to keep the frequency within the $\pm 100\text{mHz}$ range. For this reason, the purpose of FCR-N is not to mitigate the consequences of a disturbance such as a reference incident. The purpose of FCR-D is to mitigate the impact of incidental disturbances, including the reference incident. The criteria that are specified in Article 153(2)(a)-(c) of the SO Regulation refer to (reference) incidents and can therefore only be applied to FCR-D. With respect to the dimensioning rules for FCR, the scope of this Proposal shall therefore be limited to the dimensioning rules for FCR-D.
- (8) Article 153(2)(d) of the SO Regulation about the initial distribution of FCR does not make an explicit differentiation between FCR-N and FCR-D. However, in contradiction to Article 153(2)(a)-(c)- Article 153(2)(d) can be applied to both FCR-N and FCR-D. The TSOs therefore consider Article 153(2)(d) of the SO Regulation applicable to both FCR-N and FCR-D.
- (9) Article 153(2) of the SO Regulation requires the dimensioning of both upward and downward FCR. The Nordic FCR-D is currently only applied in upward direction. I.e. it is activated in cases of power deficit that result in a system frequency below 49.90Hz. However, mainly caused by the increasing number of HVDC interconnectors to other synchronous areas, the Nordic synchronous area faces more and more large disturbances in downward direction (e.g. caused by a trip of an exporting HVDC interconnector to another synchronous area). Since these incidents also affect the operational security, this proposal includes the dimensioning of both upward FCR-D and downward FCR-D.
- (10) The TSOs have discussed a probabilistic methodology that can be used for a probabilistic dimensioning approach for FCR-D as mentioned in Article 153(2) of the SO Regulation. The TSOs decided not using this methodology at the moment because the process for how to translate a certain risk level, inertia level and actual probability for incidents and other inputs to a suitable measures, including FCR-D dimensioning needs to be further defined. For this reason, the TSOs do not use *"the right to define a probabilistic dimensioning approach for FCR"* in accordance with Article 153(2)(c) of the SO Regulation.
- (11) 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: [...]
(d) methodologies, conditions and values included in the synchronous area operational agreements in Article 118 concerning:
(ii) the dimensioning rules for FCR in accordance with Article 153;

- (12) 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.
- (13) 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 (1)(c) determining common load-frequency control processes and control structures, (1)(d) ensuring the conditions for maintaining operational security throughout the Union, (1)(e) ensuring the conditions for maintaining a frequency quality level of all synchronous areas throughout the Union and (1)(h) contributing to the efficient operation and development of the electricity transmission system and electricity sector in the Union. The Proposal contributes to these objectives by specifying the dimensioning rules for FCR-D, which is one of the key reserves that is used in the common Nordic load-frequency control processes. Sufficient FCR-D guarantees 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. The dimensioning rules balance the impact of both cost for FCR-D and outage risk and therefore ensure efficient operation of the electricity transmission system.
- (14) The TSOs together operate the Nordic synchronous system. Consequently, the TSOs and all the power consumers, generators, balance service providers and networks directly or indirectly connected to the TSOs' networks, influence the frequency quality level and experience the same frequency level. The dimensioning of FCR-D in this Proposal have been analysed, discussed and agreed by the TSOs and will only be effective if all providers of FCR-D will provide the contracted amounts in accordance with their specifications.
- (15) 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 PROPOSAL FOR THE DIMENSIONING RULES FOR FCR TO RELEVANT REGULATORY AUTHORITIES WITHIN NORDIC SYNCHRONOUS AREA:

Article 1 - Subject matter and scope

1. The dimensioning rules for FCR described in this Proposal are the common proposal of TSOs in accordance with article 153 of the SO Regulation. The Proposal applies solely to the Nordic synchronous area.

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

3. For the purposes of the Proposal, the terms used shall have the meaning of the definitions included in Article 3 of the SO Regulation.
4. 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 – Dimensioning rules for FCR-D

1. Following the dimensioning rules in this article, the Nordic TSOs will dimension FCR-D daily, separately for upward FCR-D and downward FCR-D.
2. The input to the dimensioning process of FCR-D shall be:
 - a. Planned network topology, considering maintenance of relevant network components;
 - b. Estimated (gross) generation of large generation modules;
 - c. Estimated demand of large connected consumers;
 - d. Estimated flows on HVDC interconnectors;
3. The total reserve capacity for upward FCR-D required for the Nordic synchronous area shall be dimensioned at least equally to the imbalance caused by the reference incident in negative direction.
4. The total reserve capacity for downward FCR-D required for the Nordic synchronous area shall be dimensioned at least equally to the imbalance caused by the reference incident in positive direction.
5. The reference incident shall be defined as the largest imbalance that may result from an instantaneous change of active power of:
 - a. *A single power generating module;*
 - b. *A single demand facility;*
 - c. *A single HVDC interconnector;*

- d. *Tripping of an AC-line:* This may result in i) system protection scheme (SPS) activation which may trip one or more power generating units or ii) loss of a regional part of the system.
 - e. *Single failure on a busbar tripping more than one generation module or demand facility.*
6. The imbalance volume of the ‘instantaneous change of active power’ mentioned in item 5 of this article shall be determined by the net loss of active power as seen from the grid. I.e. it should be taken into account that auxiliaries load of the generation module may still consume power in the case that the unit generator breaker is tripped. Furthermore, the imbalance volume of the reference incident is determined by the maximum production, import, consumption or export that has been scheduled for the period for which the reference incident is determined.

Article 4 – Calculation the initial distribution per TSO

1. In accordance with article 153(2)(d) of the SO Regulation, FCR-D and FCR-N shall be distributed to the TSOs pro-rata to the shares defined below.
2. The input to the calculation of the initial distribution are:
 - a. net generation per control area for calendar year $y-2$ in which net generation of a unit is defined as the generation level less than the total gross power generation of a unit, due to internal auxiliary power consumption of the unit;
 - b. net consumption per control area for calendar year $y-2$ in which ‘net’ means that the consumption of power plants’ auxiliaries is excluded, but network losses are included.
3. 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 one year.
4. The shares shall be revised each year before 1 October of year $y-1$ and the new shares will enter into force on 1 January of year y .

Article 5 – 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 upward FCR-D (article 3(3) of this Proposal) and the rules for the initial distribution of FCR (article 4 of this Proposal) not later than when Nordic synchronous area operational agreement enters into force in accordance with Article 118 of the SO Regulation. The TSOs agreed that downward FCR-D in the Nordic synchronous area shall be implemented by 2021. The dimensioning rules for downward FCR-D (article 3(4) of this Proposal) will therefore be implemented by 2021.

Article 6 - 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.

**Nordic synchronous area proposal for the frequency quality defining
parameters and the frequency quality target parameter in
accordance with Article 127 of the Commission Regulation (EU)
2017/1485 of 2 August 2017 establishing a guideline on electricity
transmission system operation**

10 September 2018

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 frequency quality defining parameters and the frequency quality target parameter in accordance with Article 127 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 118(1)(c) of the SO Regulation sets for this purpose requirements for the TSOs to “*jointly develop common proposals for: [...] the frequency quality defining parameters and the frequency quality target parameters in accordance with Article 127;*”
- (3) Article 127(1) and (4) of the SO Regulation describe the scope of this Proposal, by listing the relevant frequency quality defining parameters and the frequency quality target parameter for the Nordic synchronous area:
“1. *The frequency quality defining parameters shall be:*
 - a. *the nominal frequency;*
 - b. *the standard frequency range;*
 - c. *the maximum instantaneous frequency deviation;*
 - d. *the maximum steady-state frequency deviation;*
 - e. *the time to restore frequency;*
 - f. *[..]*
 - g. *the frequency restoration range;*
 - h. *[..]*
 - i. *the alert state trigger time for all synchronous areas.**[..]*
4. *The frequency quality target parameter shall be the maximum number of minutes outside the standard frequency range per year per synchronous area and its default value per synchronous area are set out in Table 2 of Annex III.*”
- (4) Article 127(2) of the SO Regulation states that the nominal frequency shall be 50 Hz for all synchronous areas. Article 127 (3) and (4) and Table 1 and 2 of Annex III of the SO Regulation provide default values for all synchronous areas:
“3. *The default values of the frequency quality defining parameters listed in paragraph 1 are set out in Table 1 of Annex III.*

Nordic synchronous area proposal for frequency quality defining parameters and the frequency quality target parameter in accordance with Article 127 of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation

Frequency quality defining parameters referred to in Article 127:

Table 1

Frequency quality defining parameters of the synchronous areas

	CE	GB	IE/NL	Nordic
standard frequency range	± 50 mHz	± 200 mHz	± 200 mHz	± 100 mHz
maximum instantaneous frequency deviation	800 mHz	800 mHz	1 000 mHz	1 000 mHz
maximum steady-state frequency deviation	200 mHz	500 mHz	500 mHz	500 mHz
time to recover frequency	not used	1 minute	1 minute	not used
frequency recovery range	not used	± 500 mHz	± 500 mHz	not used
time to restore frequency	15 minutes	15 minutes	15 minutes	15 minutes
frequency restoration range	not used	± 200 mHz	± 200 mHz	± 100 mHz
alert state trigger time	5 minutes	10 minutes	10 minutes	5 minutes

4. The frequency quality target parameter shall be the maximum number of minutes outside the standard frequency range per year per synchronous area and its default value per synchronous area are set out in Table 2 of Annex III.

Frequency quality target parameters referred to in Article 127:

Table 2

Frequency quality target parameters of the synchronous areas

	CE	GB	IE/NL	Nordic
maximum number of minutes outside the standard frequency range	15 000	15 000	15 000	15 000

”

- (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: [...]

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

(i) the frequency quality defining parameters and the frequency quality target parameter in accordance with Article 127; [...]

- (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 serves the

objectives to (1)(c) determining common load-frequency control processes and control structures, (1)(d) ensuring the conditions for maintaining operational security throughout the Union, (1)(e) ensuring the conditions for maintaining a frequency quality level of all synchronous areas throughout the Union and (1)(h) contributing to the efficient operation and development of the electricity transmission system and electricity sector in the Union. The Proposal contributes to these objectives by specifying the values for the frequency quality defining parameters and for the value of the frequency quality target parameter that the TSOs shall endeavour to comply with. The proposed values for the frequency quality defining parameters and for the value of the frequency quality target parameter intend to set efficient limits to the system frequency in different circumstances with the main objective to balance the operational security (risk for supply interruptions) and efficient operation of the electricity system (cost of load-frequency control measures to comply with the values).

- (8) The TSOs together operate the Nordic synchronous system. Consequently, the TSOs and all the power consumers, generators and networks directly or indirectly connected to the TSOs' networks, influence the frequency quality level and experience the same frequency level. The values proposed in this Proposal have been analysed, discussed and agreed by the Nordic TSOs and are based on many years of experience with the same or at least similar parameters.
- (9) In conclusion, the Proposal contributes to the general objectives of the SO Regulation to the benefit of all market participants and electricity end consumers.

Nordic synchronous area proposal for frequency quality defining parameters and the frequency quality target parameter in accordance with Article 127 of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation

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

Article 1 - Subject matter and scope

1. The frequency quality defining parameters and the frequency quality target parameter described in this Proposal are the common proposal of TSOs in accordance with article 127 of the SO Regulation. The Proposal applies solely to the Nordic synchronous area.

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 the Proposal, the terms used shall have the meaning of the definitions included in Article 3 of the SO Regulation.
2. 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 – Frequency quality defining parameters

1. The following values from Table 1 of Annex III of the SO Regulation apply for the Nordic synchronous area:

Table 1: Frequency quality defining parameters for the Nordic synchronous area.

Frequency quality defining parameters	
nominal frequency	50 Hz
standard frequency range	±100 mHz
maximum instantaneous frequency deviation	1000 mHz
maximum steady-state frequency deviation	500 mHz
time to restore frequency	15 minutes
frequency restoration range	±100 mHz
alert state trigger time	5 minutes

Nordic synchronous area proposal for frequency quality defining parameters and the frequency quality target parameter in accordance with Article 127 of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation

Article 4 – Frequency quality target parameter

1. The following value from Table 2 of Annex III of the SO Regulation applies for Nordic synchronous area: The *maximum number of minutes outside the standard frequency range* for the Nordic synchronous area is 15,000 minutes per year.
2. The aim for frequency deviations outside the *standard frequency range* is not more than 10,000 minutes per year.
3. The minutes outside the standard frequency range shall be determined by observing all frequency samples which should have a measurement period equal to or shorter than one second. If the value is outside the standard frequency range, $\frac{\text{measurement period in s}}{60s}$ shall be added to the number of minutes outside the standard frequency range.

Article 5 – 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 Proposal not later than when Nordic synchronous area operational agreement enters into force in accordance with Article 118 of the SO Regulation.

Article 6 - Language

The reference language for this Proposal shall be English. For the avoidance of doubt, where TSOs need 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.

**Nordic synchronous area Proposal for limits for the exchange of FCR
between the TSOs in accordance with Article 163(2) of the
Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing
a guideline on electricity transmission system operation**

10 September 2018

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 limits for the exchange of FCR between the TSOs in accordance with Article 163(2) 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 118(1)(t) of the SO Regulation sets for this purpose requirements for the TSOs to “*jointly develop common proposals for: [...] if applicable, [...], limits for the exchange of FCR between the TSOs in accordance with Article 163(2);*”
- (3) The dimensioning rules for FCR in accordance with Article 153 of the SO Regulation result in the total required amount of FCR for a synchronous area. Article 153(2)(d) of the SO Regulation defines this amount shall be initially distributed over the TSOs of the synchronous area. Article 163 sets out the rules for deviating from this initial distribution by exchanging FCR between the TSOs within a synchronous area.
- (4) Article 163(2) of the SO Regulation defines the limits for the FCR exchange which is the scope of this Proposal: “2. *All TSOs involved in the exchange of FCR within a synchronous area shall respect the limits and requirements for the exchange of FCR within the synchronous area specified in the Table of Annex VI. Table of Annex VI of the SO Regulation specifies for the Nordic synchronous area that “The TSOs of the synchronous area shall have the right to specify in the synchronous area operational agreement limits for the exchange of FCR in order to:*
 - *avoid internal congestions in case of the activation of FCR;*
 - *ensure an even distribution of FCR in case of network splitting; and*
 - *avoid that the stability of the FCP or the operational security is affected.*
- (5) The TSOs make use of the right to specify in the synchronous area operational agreement limits for the exchange of FCR.
- (6) Article 39(4) of Regulation (EU) 2017/2195 (hereafter: “**EB Regulation**”) includes a relevant restriction to the exchanged of FCR: “*Cross-zonal capacity allocated for the exchange of balancing capacity or sharing of reserves shall be used exclusively for frequency restoration reserves with manual activation, for frequency restoration reserves with automatic activation and for replacement reserves. The reliability margin calculated pursuant to Regulation (EU) 2015/1222 shall be used for operating and exchanging frequency containment reserves, except on Direct Current (‘DC’) interconnectors for which cross-zonal capacity for operating and exchanging frequency containment reserves may also be allocated in accordance with paragraph 1.*”.

- (7) The Nordic TSOs apply two types of Frequency Containment Reserves (FCR). FCR for normal operation (FCR-N) is used to mitigate continuous stochastic imbalances in the synchronous area with the objective to keep the frequency within the $\pm 100\text{mHz}$ range. Since activation of FCR-N follows the system frequency, FCR-N activation *energy* is continuously exchanged. The activation of FCR-D is considered as a response to an (n-1) contingency that shall be considered in the calculation of the cross zonal capacities even before the reliability margin is deducted.
- (8) 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: [...]
(d) methodologies, conditions and values included in the synchronous area operational agreements in Article 118 concerning:
(vii) for synchronous areas other than CE and if applicable, the limits for the exchange of FCR between TSOs in accordance with Article 163(2);
- (9) 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.
- (10) 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 (1)(d) ensuring the conditions for maintaining operational security throughout the Union, and (1)(h) contributing to the efficient operation and development of the electricity transmission system and electricity sector in the Union. The Proposal contributes to these objectives by specifying the limits for exchange of FCR between TSOs. The proposed limits for the exchange of FCR intend to set efficient limits that balance the objective of ensuring the conditions for maintaining operational security and efficient operation of the electricity system.
- (11) 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 PROPOSAL TO ALL REGULATORY AUTHORITIES OF THE NORDIC SYNCHRONOUS AREA:

Article 1 - Subject matter and scope

1. The limits for the exchange of FCR between the TSOs described in this Proposal are the common proposal of TSOs in accordance with article 163(2) of the SO Regulation. The Proposal applies solely to the Nordic synchronous area.

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

3. For the purposes of the Frequency quality proposal, the terms used shall have the meaning of the definitions included in Article 3 of the SO Regulation.
4. 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 – Limits for the exchange of FCR-N

1. Each TSO shall have at least 2/3 of their initial FCR-N obligation (determined in accordance with Article 153(2)(d) of the SO Regulation) in its own control area;
2. The 2/3 obligation in paragraph 1 can be partly fulfilled by guaranteed FCR-N provision from another synchronous area;
3. In case of FCR-N capacity shortage in certain areas, affected TSOs may agree on a temporary exception to paragraph 1 and 2;
4. Because of the small initial FCR-N obligation for East Denmark (DK2), paragraph 1 shall not apply to East Denmark (DK2).

Article 4 – Limits for the exchange of FCR-D

1. Each TSO shall have at least 2/3 of their initial FCR-D obligation (determined in accordance with Article 153 of the SO Regulation) in its own control area;
2. The 2/3 obligation in paragraph 1 can be partly fulfilled by guaranteed FCR-D provision from another synchronous area;
3. In case of FCR-D capacity shortage in certain areas, affected TSOs may agree on a temporary exception to paragraph 1 and 2;

Nordic synchronous area Proposal for limits for the exchange of FCR between the TSOs in accordance with Article 163(2) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation

4. Because of the small initial FCR-D obligation for East Denmark (DK2), paragraph 1 shall not apply to East Denmark (DK2).

Article 5 – 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 Proposal not later than when Nordic synchronous area operational agreement enters into force in accordance with Article 118 of the SO Regulation.

Article 6 - 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.