Nordic System Operation Agreement (SOA) – Annex Load-Frequency Control & Reserves (LFCR)

Appendix 2:

Exchange and sharing agreements

FINGRID ENERGINET SVENSKA KRAFTNÄT Statnett kraftnät åland

Version	Approval date	Entry into force	Revision
V1	26/06/2021	26/06/2021	Initial version

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Appendix 2A: Exchange and sharing of FRR capacity, Finland - Estonia

1 Introduction

This document is an appendix to the LFCR Annex to the Nordic System Operation Agreement (hereafter referred to as "Nordic SOA"). This appendix includes the assessment of arrangements for *exchange and sharing of FRR capacity between Finland and Estonia on HVDC interconnectors EstLink 1 and EstLink 2*. The assessment in chapter 2 of this appendix has been approved by RGN on *12 May 2020*.

Regional Group Nordic

Assessment of arrangements for exchange and sharing of FRR capacity between synchronous systems.

Arrangement for exchange/sharing between Finland and Estonia on Estlink 1 and 2 interconnections

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Date: 22nd April 2020

Responsible for assessment: Reima Päivinen

Content

General

- Basic information and a short description of the exchange/sharing arrangement

Exchange	Sharing	Volume MW
X	X	mFRR exchange – no limits mFRR sharing 140 MW aFRR exchange 35 MW

Nominal size of interconnector	Specific conditions regarding flow control
Estlink 1, 350 MW EstLink 2, 650 MW	Estlink 1, TTC 0-350 MW EstLink 2, TTC 30-650 MW

Describe the conditions agreed for capacity exchange/sharing

Following sharing/exchange arrangements apply on interconnections between Fingrid and Elering:

- sharing and exchange of mFRR
- exchange of aFRR

Exchange/sharing of mFRR capacity can be done on a request from both parties. Minimum sharing period is 1 hour and the maximum period one month.

Sharing is only applied in case Fingrid is procuring mFRR capacity from Estonia as the shared capacity will be reserved for both Elering and Fingrid. In case of fault on Estlink 1 and 2, voluntary bids in the Nordic balancing market will be used. Svk is informed when the sharing arrangement is applied.

Exchange of aFRR is possible only on a request from Fingrid. Exchange is possible on Estlink 1 when there is more than 100 MW free capacity after day-ahead market results. Counter trading might be needed in case intra-day uses all free capacity on Estlink 1. aFRR bids from Estonian providers will be delivered to aFRR market platform for daily auction. Exchange of aFRR capacity is based on market results of aFRR capacity procurement.

Describe the operational procedures for energy activation including information exchange

Activation of shared and exchanged mFRR capacity is only possible within available capacity of the interconnections after confirmed day-ahead and intra-day trades and provided that the operational situation in Finland and Estonia enables it. The maximum duration for activation is normally expected to last up to 4 hours, but during exceptional disturbance cases in the power system, it may be longer.

In case of need in Estonia, the bids are activated from the Finnish balancing/capacity market and can deviate from price order if needed. Bids are only activated if Fingrid's requirement for mFRR in real time to cover the reference incident, is fulfilled.

In case of need in Finland, the capacity purchased in Estonia will be activated on a request from Fingrid.

The activation requests for mFRR are done by phone. The TSO in duty of the operation of the interconnections shall adjust the power flow. Activation shall be effected within 15 minutes by changing the power flow of the interconnections accordingly. Svk is informed about the activation.

Activation of aFRR in Estonia is based on control request sent to Elering by Fingrid. aFRR control request is calculated by Fingrid. The TSO that has control of Estlink 1 at the moment of aFRR exchange, shall change the confirmed power flow on Estlink 1 according to the control request. Activation shall be carried out in its entirety within 5 minutes of the activation signal being sent by changing the power flow of the interconnections automatically.

Exchange

- Evaluation of how the arrangement complies with article 176 in SOGL for exchange

Nordic synchronous area approved methodology to determine limits on the amount of exchange of FRR/RR between synchronous areas defined in accordance with Article 176(1)/178(1) and the methodology to determine limits on the amount of sharing of FRR/RR between synchronous areas defined in accordance with Article 177(1)/179(1)

Article 3 – Limits for exchange of aFRR and mFRR

Article 3.1 The Nordic TSO involved in exchange of FRR is responsible for complying with article 176 of the SO Regulation;

Article 3.2, The TSO who intends to exercise the right to implement an exchange of FRR with a TSO in another synchronous area shall make an assessment against article 176 and the criteria below. The TSO shall:

a. secure that dimensioning requirements in the Nordic LFC block are satisfied

i. In case of export of FRR capacity from a TSO to another TSO outside of the LFC block, equivalent FRR capacity equal to the export contract must be secured by the Nordic TSO in addition to the Nordic LFC block dimensioning volume requirement;

ii. In case of import of FRR capacity to a Nordic TSO from another TSO outside of the LFC block; procured volume may be counted for in the Nordic LFC block compliance monitoring for reserve availability as long as b) and c) below is fulfilled.

b. secure that the needed availability of grid capacity between source and sink has a probability of at least 99%;

c. secure that the needed availability of FRR from the reserve instructing TSO in the other synchronous area has a probability of at least 99%.

Article 3.3 The assessment of FRR exchange arrangements with other synchronous areas shall be approved by all Nordic TSOs based on a proposal of the exchanging TSO, which shall not be unreasonably withheld or delayed.

An assessment according to SOGL article 176 (1) of the operational impact between the synchronous systems, impact on the stability of the FRP of the synchronous area, impact on the ability of TSOs of the synchronous area to comply with the frequency quality target parameters defined in accordance with Article 127 and the FRCE target parameters defined in accordance with Article 128 and impact on the operational security.

The HVDC interconnections can be operated according to the product specification in the Nordic synchronous system, and hence, it is not supposed to have any impact on overall stability, operational security and frequency quality in the Nordic LFC block.

An assessment according to article 3.2 (a) above against dimensioning requirements in the Nordic LFC block.

Activation of mFRR capacity is only carried out if Fingrid's requirement for mFRR to cover the reference incident, is fulfilled. Hence, it has no impact on the dimensioning requirements for mFRR in the Nordic LFC block.

Activation of aFRR requires available aFRR capacity from Estonia and hence, it has no impact on the dimensioning requirements for aFRR in the Nordic LFC block.

An assessment according to article 3.2 (b) above against requirements for availability of grid capacity.

As the exchange agreement of aFRR/mFRR only is possible within available capacity of the interconnections after confirmed day-ahead and/or intra-day trades, it is not supposed to have any impact on availability of grid capacity. Counter trade shall be used if needed.

An assessment according to article 3.2 (c) above against requirements for availability of FRR from the reserve instructing TSO

The exchange of the reserve takes place within the EU territory, which is obliged under the SO GL to ensure that the FRR obligation is fulfilled 99% of the time. Based on this it can also be assumed that the reserve is available with a probability of at least 99%.

Sharing

- Evaluation of how the arrangement complies with article 177 in SOGL for sharing

Nordic synchronous area approved methodology to determine limits on the amount of exchange of FRR/RR between synchronous areas defined in accordance with Article 176(1)/178(1) and the methodology to determine limits on the amount of sharing of FRR/RR between synchronous areas defined in accordance with Article 177(1)/179(1)

Article 4 – Limits for sharing of aFRR and mFRR

1. The Nordic TSO involved in sharing of FRR is responsible for complying with Article 177 of the SO Regulation;
2. The TSO who intends to exercise the right to implement sharing of FRR with a TSO in another synchronous area shall make an assessment against article 177 and the criteria below. The TSO shall:

    a. secure that dimensioning requirements in the Nordic LFC block are satisfied
        i. Disturbances leading to activations of the shared reserves, shall be reported for common Nordic evaluations of Nordic consequences
        ii. The shared volume may be counted for in the LFC block compliance monitoring for reserve availability as long as b), c), d) and e) below is fulfilled
    b. secure that the needed availability of grid capacity between source and sink has a probability of at least 99%;
    c. secure that the needed availability of FRR from the reserve instructing TSO in the other synchronous area has a probability of at least 99%;
    d. secure that the reduction in positive FRR capacity for disturbances within the Nordic LFC block does not exceed 50% of the size of the positive reference incident in the relevant control area;
    e. secure that the reduction in negative FRR capacity for disturbances within the Nordic LFC block does not exceed 50% of the size of the negative reference incident in the relevant control area.

An assessment against SOGL article 177(1)of the operational impact between the synchronous areas, the stability of the FRP of the synchronous area, the maximum reduction of FRR that can be taken into account in the FRR dimensioning in accordance with Article 157 as a result of the FRR sharing, the ability of the synchronous area to comply with the frequency quality target parameters defined in accordance with Article 127 and the FRCE target parameters defined in accordance with Article 128 and the operational security.

As the sharing agreement only is applied in rare situations e.g. in case of lack of mFRR capacity in Finland and when the operational situation enables it, it is not supposed to have any impact on overall stability, operational security and frequency quality in the Nordic LFC block.

An assessement according to article 4.2(a) above against dimensioning requirements in the Nordic LFC block.

Sharing of capacity is only carried out in case Fingrid is procuring mFRR capacity from Estonia as the shared capacity then will be reserved for both Elering and Fingrid. Hence, it has limited impact on the dimensioning requirements in the Nordic LFC block as shared volume is small and probability for simultaneous faults in Estonia and Finland is limited.

An assessment according to article 4.2(b) above against requirements for availability of grid capacity.

As the activation of shared mFRR capacity or exchanged aFRR/mFRR is only possible within available capacity of the interconnections after confirmed day-ahead and intra-day trades, it is not supposed to have any impact on availability of grid capacity. Counter trade shall be used if needed.

An assessment according to article 4.2(c) above for availability of FRR from the reserve instructing TSO

The sharing of the reserve takes place within the EU territory, which is obliged under the SO GL to ensure that the FRR obligation is fulfilled 99% of the time. Based on this it can also be assumed that the reserve is available with a probability of at least 99%.

An assessment according to 4.2(d) above for max reduction in positive FRR capacity for disturbances secured for the relevant control area

The sharing agreement does not allow that more than 50% of the Finnish mFRR requirement is shared. The maximum mFRR sharing volume is 140 MW and the reference incident 900 – 1100 MW.

An assessment according to 4.2(e) above for max reduction in negative FRR capacity for disturbances secured for the relevant control area

NA

Comments from NOD on assessment:

NOD has no specific remarks to this assessment. NOD considers that availability of mFRR and aFRR resources from Estonia and specifications for provision over Estlink 1 and Estlink 2 are similar to service provision from inside of the Nordic LFC block.

SOGL has a restriction for reduction of the positive and negative reserve capacity in the LFC block of less than 30%, but this is currently not a realistic concern in the Nordic LFC block. If this should change, the TSOs will have to agree about some arrangement for distribution of reserve reduction in case of sharing with other synchronous systems.

Any changes to the arrangements, described in this assessment, shall be presented to NOD in due time before implementation for common Nordic evaluation.

Copy of decisions in RGN meeting (from MoM):

RGN approved NOD proposal on the assessment of arrangements for exchange/sharing between Finland and Estonia on EstLink 1 and 2 interconnections.

Date of approval of assessments in RGN:

12th May 2020

Appendix 2B: Exchange and sharing of FRR capacity DK1-DK2

1 Introduction

This document is an appendix to the Annex Load-Frequency Control & Reserves (hereafter referred to as LFCR Annex) to the Nordic System Operation Agreement (hereafter referred to as "Nordic SOA"). This appendix includes the assessment of arrangements for *sharing of mFRR capacity between bidding zones DK1 (Western Denmark) and DK2 (Eastern Denmark) on the Great Belt HVDC interconnector*. The assessment in chapter 2 of this appendix has been approved by RGN on *12 May 2020*.

Regional Group Nordic

Assessment of arrangements for exchange and sharing of FRR capacity between synchronous systems.

Arrangement for sharing of mFRR between DK1 and DK2 on Great Belt interconnection.

Date: 22nd April 2020

Responsible for assessment: Klaus Winther

Content

General

1. Basic information and a short description of the exchange/sharing arrangement of capacity

Exchange

2. Evaluation of how the arrangement comply with the approved Nordic methodology for exchange.

Sharing

3. Evaluation of how the arrangement comply with the approved Nordic methodology for sharing.

General

1. Basic information and a short description of the exchange/sharing arrangement

Exchange	Sharing	Volume MW
	X	+ 300 MW

Nominal size of interconnector	Specific conditions regarding flow control
Great Belt, ± 600 MW	Cannot be regulated continuously in the interval - 30 MW < P < 30 MW

Describe the conditions agreed for capacity exchange/sharing

Energinet is sharing + 300 MW of mFRR between DK1 and DK2.

The amount of mFRR purchased in DK1 is reduced with 300 MW.

In case of a fault in DK1 (Reference Incident is 700 MW), resources are in normal situations covered by 300 MW mFRR capacity purchased in DK1 and utilisation of voluntary bids in the regulating power market in addition to 90 MW aFRR in a capacity market.

In very rare situations, the need for mFRR can be complemented by additional mFRR purchased in DK2 over the Great Belt interconnector or, as a last option, remedial actions will take place in DK1.

The flow direction on the interconnector is normally from west to east (DK1 to DK2). The free capacity is defined on a day to day basis. If reduced capacity or flow in opposite direction, additional mFRR reserves are purchased in DK1.

In case of fault in DK2 (Reference incident is 600 MW), resources are covered by 428 MW mFRR capacity purchased in DK2 and 200 MW capacity purchased in DK2 with a longer activation time than 15 minutes, a sharing agreement with SVK of 300 MW mFRR and additional voluntary bids in the regulating power market. The bid margin in the regulating power market in DK2 (contracted capacity and voluntary bids) are normally (1% fractal) more than 600 MW after activation of bids for balancing, which implies that reserves with longer activation times than 15 minutes (200 MW) together with the sharing agreement with SVK of 300 MW mFRR not will be required.

In case of simultaneously incidents in both synchronous areas, DK1 and DK2 at the same time and in case of that fully 300 MW mFRR already has been activated in DK2 and “transferred” to DK1, the reference incidents in DK2 (600 MW) is still covered by mFFR in DK2, however some of the reserves have longer activation time than standard mFRR (15 minutes), therefore it is possibly that part of the sharing agreement of 300 MW mFRR between DK2 and SVK will become effective for a shorter period, this in form of a telephone call between Energinet and Svk in cooperation with Statnett.

Describe the operational procedures for energy activation including information exchange

Control centre staff of Statnett, in the role of LFC Block monitor, in cooperation with control centre staff of Svenska Kraftnät, to be informed by telephone calls

Standard procedure for activation of mFRR is used (Regulating power market). Reserves are accessible in NOIS.

Sharing

2. Evaluation of how the arrangement complies with article 177 in SOGL for sharing

Nordic synchronous area approved methodology to determine limits on the amount of exchange of FRR/RR between synchronous areas defined in accordance with Article 176(1)/178(1) and the methodology to determine limits on the amount of sharing of FRR/RR between synchronous areas defined in accordance with Article 177(1)/179(1)

Article 4 – Limits for sharing of aFRR and mFRR

1. The Nordic TSO involved in sharing of FRR is responsible for complying with Article 177 of the SO Regulation;
2. The TSO who intends to exercise the right to implement sharing of FRR with a TSO in another synchronous area shall make an assessment against article 177 and the criteria below. The TSO shall:

    a. secure that dimensioning requirements in the Nordic LFC block are satisfied
        i. Disturbances leading to activations of the shared reserves, shall be reported for common Nordic evaluations of Nordic consequences
        ii. The shared volume may be counted for in the LFC block compliance monitoring for reserve availability as long as b), c), d) and e) below is fulfilled
    b. secure that the needed availability of grid capacity between source and sink has a probability of at least 99%;
    c. secure that the needed availability of FRR from the reserve instructing TSO in the other synchronous area has a probability of at least 99%;
    d. secure that the reduction in positive FRR capacity for disturbances within the Nordic LFC block does not exceed 50% of the size of the positive reference incident in the relevant control area;
    e. secure that the reduction in negative FRR capacity for disturbances within the Nordic LFC block does not exceed 50% of the size of the negative reference incident in the relevant control area.

An assessment against SOGL article 177(1)of the operational impact between the synchronous areas, the stability of the FRP of the synchronous area, the maximum reduction of FRR that can be taken into account in the FRR dimensioning in accordance with Article 157 as a result of the FRR sharing, the ability of the synchronous area to comply with the frequency quality target parameters defined in accordance with Article 127 and the FRCE target parameters defined in accordance with Article 128 and the operational security.

As the sharing agreement only come into force in very rare situations it is not supposed to have any impact on overall stability and frequency quality in the Nordic LFC block.

As for all incidents in the Nordic area, Svk as synchronous area monitor will report the incident and initiate an analyse if required.

An assessment according to article 4.2(a) above against dimensioning requirements in the Nordic LFC block.

As the sharing agreement only comes into force in very rare situations and because we do not dimension for N-2 faults and normally have free capacity on the Øresund connection the sharing agreement has no impact on the dimensioning requirements in the Nordic LFC block.

An assessment according to article 4.2(b) above against requirements for availability of grid capacity.

The grid capacity is evaluated on a day by day basis, if not 100 % capacity is available on the interconnector, additional procurement of mFRR will take place in DK1. DK2 will be secured by contracted mFRR reserves in DK2.

An assessment according to article 4.2(c) above for availability of FRR from the reserve instructing TSO

The availability of FRR from the reserve instructing TSO is secured by using the Nordic regulating power market for activation (NOIS).

An assessment according to 4.2(d) above for max reduction in positive FRR capacity for disturbances secured for the relevant control area

The Sharing agreement secure that not more than 50 % of mFRR requirement is shared, defined in article 4 – Limits for sharing of aFRR and mFRR

An assessment according to 4.2(e) above for max reduction in negative FRR capacity for disturbances secured for the relevant control area

The Sharing agreement secure that not more than 50 % of mFRR requirement is shared, defined in article 4 – Limits for sharing of aFRR and mFRR

Comments from NOD on assessment:

NOD has no specific remarks to this assessment. NOD considers that availability of mFRR and aFRR resources from DK1 and specifications for provision over Great Belt are similar to service provision from inside of the Nordic LFC block.

SOGL has a restriction for reduction of the positive and negative reserve capacity in the LFC block of less than 30%, but this is currently not a realistic concern in the Nordic LFC block. If this should change, the TSOs will have to agree about some arrangement for distribution of reserve reduction in case of sharing with other synchronous systems.

Any changes to the arrangements, described in this assessment, shall be presented to NOD in due time before implementation for common Nordic evaluation.

Copy of decisions in RGN meeting (from MoM):

RGN approved NOD proposal on the assessment of arrangement for sharing of mFRR between DK1 and DK2 on Great Belt interconnection.

Date of approval of assessments in RGN:

12th May 2020