

# Nordic System Operation Agreement (SOA) – Annex Electricity Balancing (EB)

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## Table of contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	Interaction with other Agreements	3
1.2	Background	3
1.3	This Annex	4
1.4	Geographic area	4
1.5	Structure of this Annex	4
1.6	Definitions	5
<b>2</b>	<b>Roles and responsibilities</b>	<b>5</b>
<b>3</b>	<b>Nordic TSOs methodologies</b>	<b>6</b>
<b>3.1</b>	<b><i>Nordic Balancing and pricing principles of pricing</i></b>	<b>6</b>
3.1.1	<i>Frequency and balance control</i>	6
3.1.2	<i>Activation for system constraints</i>	7
3.1.3	<i>Exchange of mFRR balancing energy with TSOs outside the common mFRR activation market</i>	8
<b>3.2</b>	<b><i>Pricing of energy exchanged between TSOs</i></b>	<b>8</b>
3.2.1	<i>Balancing energy exchanged between TSOs within the Nordic synchronous area</i>	8
3.2.2	<i>Predefined mFRR exchange between the Nordic synchronous area and DK1</i>	8
3.2.3	<i>Residual balancing energy between the Nordic synchronous area and DK1</i>	8
3.2.4	<i>Pricing of Supportive power within the Nordic synchronous area and between the Nordic synchronous area and DK1</i>	9
3.2.5	<i>Pricing of Balancing energy between the Nordic synchronous area and other synchronous areas</i>	9
3.2.6	<i>Predefined loop flows</i>	9
3.2.7	<i>Pricing during operational disturbances on interconnectors</i>	10
3.2.8	<i>Pricing of activations due to reduced capacity on interconnectors in the operational phase</i>	10
<b>3.3</b>	<b>Methodologies related to the Nordic Synchronous Area and the Nordic Capacity Calculation Region (CCR)</b>	<b>10</b>
<b>4</b>	<b>All European TSOs methodologies</b>	<b>11</b>

# 1 Introduction

## 1.1 Interaction with other Agreements

This Annex is part of the Nordic System Operation Agreement (SOA). This Annex makes references to the requirements set up in:

- Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (hereinafter referred to as "EBGL");
- Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereinafter referred to as "SOGL").

The Parties have signed the Cooperation Agreement – Nordic balancing cooperation of 8 March 2018 establishing a basis for the LFC structure (as required by SOGL art 141(2)) and for the future cooperation on design, development and operation of balancing in the Nordic region.

## 1.2 Background

EBGL establishes an EU-wide set of technical, operational and market rules to govern the functioning of electricity balancing markets. It sets out rules for the procurement of balancing capacity, the activation of balancing energy and the financial settlement of balance responsible parties. It also requires the development of harmonised methodologies for the allocation of cross-zonal transmission capacity for balancing purposes. Such rules will increase the liquidity of short-term markets by allowing for more cross-border trade and for a more efficient use of the existing grid for the purposes of balancing energy. As balancing energy bids will compete on EU-wide balancing platforms, it will also have positive effects on competition.

EBGL, whereas (5)

EBGL pursues the objective of ensuring the optimal management and coordinated operation of the European electricity transmission system, while supporting the achievement of the Union's targets for penetration of renewable generation, as well as providing benefits for customers. TSOs, working with DSOs where relevant, should be responsible for organising European balancing markets and should strive for their integration, keeping the system in balance in the most efficient manner. To do so, TSOs should work in close cooperation with one another and with DSOs, coordinating their activities as much as possible to deliver an efficient electricity system, across all regions and voltage levels, without prejudice to competition law.

EBGL, whereas (6)

EBGL has a close relationship with SOGL part IV on Load-Frequency Control and Reserves (hereinafter referred to as "LFCR") which aims at setting out clear, objective and harmonised requirements for TSOs, reserve connecting DSOs, providers' power generating modules and providers' demand facilities in order to ensure system security and to contribute to non-discrimination, effective

SOGL, whereas (13)

competition and the efficient functioning of the internal electricity market. The provisions on LFC and reserves provide the technical framework necessary for the development of cross-border balancing markets.

Since EBGL strives for European integration of balancing markets, many methodologies need to be agreed between all European TSOs.

### 1.3 This Annex

In this Annex the Nordic TSOs agree upon the main principles and requirements on electricity balancing. This Annex includes the Nordic methodologies related to electricity balancing with the focus on balancing market related issues, or references to NRA approved methodologies. There is a link between this Annex and the LFCR Annex to the SOA.

In addition, this Annex refers to the methodologies required by the EBGL on a European level. The purpose of the included references is purely for information.

The principles and requirements on electricity balancing, as set out in this Annex, shall be detailed in Nordic Operational instructions. These Operational instructions shall align with this Annex while providing practical guidance for day-to-day use by the TSOs. Consequently, by this Annex the Nordic TSOs will agree on the high-level principles and requirements only.

Terms and Conditions and Methodologies required by the EBGL on a national level are not included in this Annex since they are part of national legislation.

Bilateral or multilateral agreements between TSOs on sharing and exchange of reserves and descriptions of FRR capacity markets are covered by the SOA annex Load Frequency and Control.

### 1.4 Geographic area

The geographical area to which the SOA/EB annex applies is the Nordic Synchronous area for aFRR

and the interconnected Nordic power system for mFRR. It is noted that Western Denmark (hereafter: DK1) is not part of the Nordic Synchronous area while DK1 is included in the interconnected Nordic power system.

### 1.5 Structure of this Annex

This Annex includes the Nordic methodologies that relate to electricity balancing in chapter 3 and an overview of the European methodologies in chapter 0.

## 1.6 Definitions

For the purpose of this Annex, the terms used shall have the meaning of the definitions included in Article 2 of EBGL, Article 3 of SOGL and the other items of legislation referenced therein. In addition, the following definitions are applied in this Annex:

*'activation for balancing purpose' means activations by TSOs due to BRP imbalances;*

*'activation for system constraints' means activations by TSOs due to network constraints;*

*'supportive power' means agreed energy exchange on interconnections between TSOs.*

*'mFRR balancing energy price' means marginal price for activation for balancing purposes, defined for both upward and downward balancing.*

*'imbalance price' is equal to the mFRR balancing energy price in dominant direction;*

*'predefined cross-border exchange of mFRR between synchronous areas' means exchange on interconnections for balancing or netting. Predefined means that the mFRR exchange is included in the schedule for flow control on the HVDC interconnectors between synchronous systems in addition to day-ahead and intraday exchange. This schedule is fixed some minutes before real-time;*

*'scheduled commercial exchange' means a resulting electricity transfer from the day-ahead and intraday energy markets between bidding zones for each market time unit.*

*'uncongested areas' consisting of two or more bidding zones are defined when there in balancing are no congestions on borders between the relevant bidding zones in a specific hour or specified trading rules do not hinder the activation of mFRR bids in price order in the Nordic Common Merit Order List (CMOL) for mFRR.*

## 2 Roles and responsibilities

The roles and responsibilities with respect to electricity balancing in the Nordic system are detailed in the SOA/LFCR Annex and the Cooperation Agreement 'Nordic balancing cooperation' of March 2018.

## 3 Nordic TSOs methodologies

### 3.1 Nordic Balancing and pricing principles of pricing

*The TSOs balance their LFC block with both manual Frequency Restoration Reserves (mFRR) and automatic Frequency Restoration Reserves (aFRR).*

*For mFRR, each TSO collects mFRR balancing energy bids in their control area. A common merit order list of mFRR balancing energy bids is compiled, in the order of price, containing bids from both the Nordic synchronous area and DK1.*

*During the hour of operation, activation of mFRR is carried out for system constraints and to control the frequency in the Nordic synchronous area or the balance in DK1. Activation carried out for system constraints can take place on one or both sides of a congestion.*

*The aFRR product shall be seen as an automatic complement to mFRR in the frequency restoration process and will consequently only be used for frequency control in the Nordic synchronous area. Currently, only procured aFRR reserve capacity can be activated. Each TSO procures aFRR reserve capacity in accordance with the amount of aFRR resulting from the aFRR dimensioning process in accordance with the rules in chapter 7 of the LFCR annex. In December 2022 a Nordic aFRR capacity market was implemented and all the TSOs procure their share of the agreed Nordic aFRR capacity in the market in accordance with the harmonised rules described in the methodology on aFRR capacity market referred to in section 3.3.*

*Balancing energy, as a net result of BRP imbalances, the Frequency Containment Process and the Frequency Restoration Process, will be exchanged between the control areas within the Nordic synchronous areas as long as this does not cause congestions between bidding zones or other unacceptable conditions for the adjacent areas. For this purpose, uncongested areas) may be defined. Exchange of balancing energy between the Nordic synchronous area and DK1 primarily takes place in the form of predefined cross-border exchange of mFRR.*

#### 3.1.1 Frequency and balance control

*For the frequency control of the Nordic synchronous area and the balance in DK1, the available mFRR balancing energy bids on the common merit order list are used in the order of price.*

*The Nordic LFC block centrally activates aFRR from a single Load Frequency Controller (LFC). Based on the measured frequency, this LFC calculates the required activation of aFRR and distributes the activation requests to the Nordic TSOs pro-rata to the TSOs' shares. Consequently, each Nordic TSO distributes the requests to the contracted aFRR providers in its control area.*

*For each hour, the mFRR balancing energy prices are determined for all bidding zones. The mFRR balancing energy prices are set at the marginal price of activated mFRR balancing energy bids in the common merit order list. When no activation for balancing purposes are performed in one or both directions, the mFRR balancing energy price for the relevant direction(s) will be equal to the price in the day-ahead energy market. When congestions do not arise during the hour of operation (i.e. if there is only one uncongested area), the prices in all bidding zones will be equal. The methods to define balancing energy prices for aFRR are defined nationally.*

*There may be available cross zonal capacity during the hour of operation even if there is a congestion in the energy market. This available cross zonal capacity can be utilised for exchange between the TSOs. When a congestion arises during the hour of operation between bidding zones, uncongested areas will be defined which will obtain their own mFRR balancing energy prices. The mFRR balancing energy prices will be determined by the marginal price of the bids activated within each uncongested area.*

*In case of bidirectional activation for an hour in an uncongested area, the hour shall for settlement reason be defined as an hour with net upward balancing or an hour with net downward balancing depending on the net activated mFRR balancing energy. If no activations have taken place or if the net volumes upwards and downwards are equal, the imbalance price will be set at the day-ahead market price.*

*Congestions to/from a bidding zone which are caused by imbalances within a bidding zone are dealt with as activation for balancing purpose and give rise to defining more uncongested areas. Congestions caused by a reduced transmission capacity to/from a bidding zone, after day-ahead market closure, are managed using activations for system constraints.*

*A prerequisite for a TSO in the Nordic synchronous area to be able to set its own mFRR balancing energy price is that the scheduled commercial exchange is exceeded.*

### **3.1.2 Activation for system constraints**

*For activations for system constraint reasons due to internal constraints within a bidding zone, bids are used in the control areas which rectify the network problem.*

*Activations carried out for system constraints within bidding zones shall not directly affect the calculation of the mFRR balancing energy price, and they are carried out as activations for system constraints.*

### **3.1.3 Exchange of mFRR balancing energy with TSOs outside the common mFRR activation market**

*Bids can be traded from a power system outside the common Nordic mFRR activation market to support or balance any Nordic bidding zone.*

*Bids can be activated from the Nordic Common Merit Order List (CMOL) for mFRR to support or balance a power system outside the common Nordic mFRR activation market. These activations shall not influence the Nordic imbalance price, and the bids must be marked as activations for system constraints.*

## **3.2 Pricing of energy exchanged between TSOs**

### **3.2.1 Balancing energy exchanged between TSOs within the Nordic synchronous area**

*The volume of balancing energy exchanged between bidding zones (belonging to different control areas) within the Nordic synchronous area is equal to:*

*metered flow – scheduled commercial exchange – supportive power*

*The price of balancing energy exchanged between bidding zones within the Nordic system is the average of the imbalance prices in these bidding zones.*

### **3.2.2 Predefined mFRR exchange between the Nordic synchronous area and DK1**

*Balancing energy between the Nordic synchronous area and DK1 is mainly predefined cross-border exchange of mFRR.*

*The following applies to predefined cross-border exchange of mFRR between the Nordic synchronous area and DK1: When the balance in the Nordic synchronous area and DK1 is balanced in the same direction, the price of the predefined exchanged mFRR is set to that mFRR balancing energy price – if they are different – which is closest to the system price in the day-ahead market. The same rule applies when there is no activation for balancing in any of the areas.*

*When the balance in the Nordic synchronous area and DK1 is balanced in different directions, the price of predefined exchanged mFRR is set to the system price in the day-ahead market.*

### **3.2.3 Residual balancing energy between the Nordic synchronous area and DK1**

*'Residual balancing energy exchange' is the energy exchange on an HVDC interconnector that is caused by not being able to follow the interconnector schedule exactly.*



The volume of residual balancing energy exchange between the Nordic synchronous area and DK1 is equal to:

*metered flow – scheduled commercial exchange –  
–predefined mFRR exchange – aFRR exchange – supportive power*

This residual energy is priced as follows:

- **For exchange between DK1 and Sweden:** Swedish imbalance price applies between DK1 and Sweden;
- **For exchange between DK1 and Norway:** Norwegian imbalance price applies between DK1 and Norway.

### 3.2.4 Pricing of Supportive power within the Nordic synchronous area and between the Nordic synchronous area and DK1

When there is a need to exchange supportive power between two TSOs for handling of system constraints, the price will be set at the activating TSO's cost, and conclusively set after the hour of operation. The price of supportive power shall not affect the pricing of balancing energy exchanged between bidding zones.

### 3.2.5 Pricing of Balancing energy between the Nordic synchronous area and other synchronous areas

mFRR activated from an adjacent power system outside the inter-Nordic mFRR activation market in order to control the frequency in the synchronous system or the balance in some Nordic bidding zones must influence the pricing in the mFRR activation market in the same way as bids ordered from the Nordic Common Merit Order List (CMOL).

Energinet uses such bids as activations for system constraint purposes only.

Bids that have been activated from the Nordic Common Merit Order List (CMOL) to support or balance a power system outside the Nordic mFRR activation market must be marked as activations for system constrain purposes, and they constitute no grounds for pricing in the mFRR activation market.

### 3.2.6 Predefined loop flows

In the event of congestion situations, it may be appropriate to schedule predefined loop flows between TSOs to relieve the congestion. This will not affect the individual control area's balance and the price of the exchange will be set at 0 EUR. Predefined cross-border exchange of mFRR for activation for balancing purpose has priority over predefined loop flows.

### 3.2.7 Pricing during operational disturbances on interconnectors

The price of supportive power which is due to an operational disturbance on the interconnector itself, will be the average of the area prices in the day-ahead market in the adjacent systems.

### 3.2.8 Pricing of activations due to reduced capacity on interconnectors in the operational phase

For imbalances which require bid activations within the Nordic system due to reduced capacity on interconnectors from the Nordic countries in the operational phase, the following rules apply:

- *Baltic Cable and SwePol Link: All Imbalances that occur are handled with activations for balancing purposes.*
- *NorNed: Imbalances caused by disturbance are handled with activations for balancing purposes.*
- *NordLink: Imbalances caused by disturbance are handled with activations for balancing purposes.*
- *NSL: Imbalances caused by disturbance are handled with activations for balancing purposes.*
- *Kontek and Kriegers Flak: The combined imbalances of Kontek and Kriegers Flak caused by disturbance are handled with activations for balancing purposes.*
- *AC connections to Germany: Imbalances and disturbances are handled with activations for system constraint purposes.*
- *Estlink: Imbalances caused by disturbances are handled with activations for system constraint purposes.*

## 3.3 Methodologies related to the Nordic Synchronous Area and the Nordic Capacity Calculation Region (CCR)

Table 1 includes references to the methodologies, related to the Nordic Synchronous Area and the Nordic Capacity Calculation Region (CCR).

EBGL

**Table 1: Methodologies required by EBGL, related to the Nordic Synchronous Area.**

article in EBGL	Methodology	section in this Annex
33(1) and 38(1)	Nordic TSOs' proposals for establishment of common and harmonized rules and processes for the exchange and procurement of aFRR balancing capacity	3.1
34	Energinet, Fingrid, Statnett and Svenska kraftnät proposal for exemption for not allowing balance service providers to transfer	

	their obligations to provide aFRR capacity in accordance with Article 34(1) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing	
41	All TSOs' of CCR Nordic proposal for a methodology for a market-based allocation process of cross-zonal capacity for the exchange of balancing capacity in accordance with Article 41(1) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing	

## 4 All European TSOs methodologies

The all-European TSO methodologies, including the NRA approval dates and explanatory documents are published on the ENTSO-E website: [https://www.entsoe.eu/network\\_codes/eb/](https://www.entsoe.eu/network_codes/eb/)

EBGL