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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”).

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 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.

SOGL, whereas (13)

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.

Furthermore, not covered by this Annex are bilateral or multilateral agreements between TSOs on sharing and exchange of reserves and agreements on the operation of FRR capacity markets etc.

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 4.

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:

'balance regulation' means activations by TSOs due to BRP imbalances;

'special regulations' means activations by TSOs due to network constraints;

'supportive energy' means energy exchange on interconnections between TSOs for handling of network constraints within a TSO's control area.

'balancing energy price' means marginal price for balance regulations, defined for both upward and downward balancing. When no balance regulations are performed in one or both directions, the balancing energy price will be equal to the price in the day-ahead energy market in the relevant direction(s).

'RPM price' (Regulating Power Market price) is equal to the balancing energy price in dominant direction;

'Predefined cross-border exchange of mFRR between synchronous areas' means exchange on interconnections for balance regulation 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.

'Mutually regulated areas (MRAs)' consisting of two or more bidding zones are defined when there in balance regulation are no congestions on borders between the relevant bidding zones in a specific hour or specified trading rules do not hinder the activation of balancing 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 - Regulation measures and 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 balancing energy bids in their control area. A common merit order list of 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 network reasons and to regulate the frequency in the Nordic synchronous area or the balance in DK1. Regulation carried out for network reasons 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 regulating the frequency 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.

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 area as long as this does not cause congestions between bidding zones or other unacceptable conditions for the adjacent areas. For this purpose, Mutually Regulated Areas (MRAs) 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 Regulation of frequency and balance

For the regulation of the frequency of the Nordic synchronous area and the balance in DK1, the available balancing energy bids for mFRR 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 balancing energy prices for mFRR are determined for all bidding zones. The balancing energy prices are set at the marginal price of

activated balancing energy bids in the common merit order list. When congestions do not arise during the hour of operation (i.e. if there is only one MRA), 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, MRAs will be defined which will obtain their own balancing energy prices. The balancing energy prices will be determined by the marginal price of the bids activated within each MRA.

In case of bidirectional regulation for an hour in a MRA, the hour shall for settlement reason be defined as an up-regulation hour or down-regulation hour depending on the net activated balancing energy. If no regulations have taken place or if the net volumes upwards and downwards are equal, the RPM 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 balance regulation and give rise to defining more MRAs. Congestions caused by a reduced transmission capacity to/from a bidding zone, after day-ahead market closure, are managed using special regulations.

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

3.1.2 Regulation for network reasons

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

Regulations carried out for network reasons within bidding zones shall not affect directly the calculation of the balancing energy price, and they are carried out as special regulations.

3.1.3 Exchange of balancing energy with TSOs outside the common Nordic regulating power market

Bids can be traded from a power system outside the common Nordic regulating power 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 regulating power market. These activations shall not influence the Nordic RPM-price, and the bids must be marked as special regulation.

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 energy

The price of balancing energy exchanged between bidding zones within the Nordic system is the average of the RPM 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 regulated in the same direction, the price of the predefined exchanged mFRR is set to that 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 regulation in any of the areas.

When the balance in the Nordic synchronous area and DK1 is regulated 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 energy*

This residual energy is priced as follows:

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

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

When there is a need to exchange supportive energy between two TSOs for handling of network constraints, the price will be set at the regulating TSO's cost, and conclusively set after the hour of operation. The price of supportive energy 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 regulation market in order to regulate the frequency in the synchronous system or the balance in some Nordic bidding zones must influence the pricing in the regulation market in the same way as bids ordered from the Nordic Common Merit Order List (CMOL).

ENDK uses such bids as special regulation only.

Bids that have been activated from the Nordic Common Merit Order List (CMOL) to support or balance a power system outside the Nordic regulation market must be marked as special regulation, and they constitute no grounds for pricing in the regulation 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 balance regulation has priority over predefined loop flows.

3.2.7 Pricing during operational disturbances on interconnectors

The price of supportive energy 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, SwePol Link: All Imbalances that occur are handled with balance regulations.
- NorNed: Imbalances caused by disturbance are handled with balance regulations.
- Kontek: Imbalances caused by disturbance are handled with balance regulations.
- AC connections to Germany: Imbalances and disturbances are handled with special regulations.
- Estlink: Imbalances caused by disturbances are handled with special regulations.
- Russian interconnector: Imbalances caused by disturbances in the Russian grid are handled with balance regulations, while disturbances on the actual cross-border connection are handled with special regulations.

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	NRA approval on
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	[to be filled in]
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	[to be filled in]
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	[to be filled in]

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/ | EBGL