Baltic Load-Frequency Control block concept document

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1 Abbreviations and Definition

ACE - Area control error
ACEol – Open loop area control error
aFRP - Automatic frequency restoration process
aFRR - Automatically activated Frequency Restoration Reserve
BC - Balancing Capacity
BE - Balancing Energy
BRP - Balancing Responsible Party
BSP - Balancing Service Provider
CCR - Capacity Calculation Region
CEP_IE - Commission Regulation 2019/943 of 5 June 2019 on the internal market for electricity.
CESA - Continental Europe Synchronous Area
CMM - Capacity Management Module
CZC - Cross-zonal Capacity
EBGL - Electricity Balancing Guidelines
FAT - Full activation time
FCP - Frequency Containment Process
FCR - Frequency Containment Reserve
FRCE - Frequency restoration control error
FRP - Frequency Restoration Process
FRR - Frequency Restoration Reserve
GCT - Gate Close Time
GOT - Gate Opening Time
LER - Limited Energy Resource
LFC - Load Frequency Control
LFC BOA - Load-frequency control block operational agreement
MARI - Manually Activated Reserve Initiative
mFRR - Manually activated Frequency Restoration Reserve
PICASSO - Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation
RR - Restoration reserve
RRP - Restoration reserve process

SAFA - Synchronous Area Framework Agreements
SCADA - Supervisory Control and Data Acquisition is a system of remote control and telemetry used to monitor and control the energy system.
SOGL - System Operation Guidelines
TSO - Transmission System Operator

2 Introduction and background on Load-Frequency control

Taking into consideration the Baltic desynchronization of IPS/UPS synchronous area and synchronization to CESA the TSOs of Baltic States shall have to follow and start operating LFC processes required by the Continental Europe SAFA.
Taking into consideration this common understanding and acknowledging of intentions for Baltic system operations and balance management Baltic TSOs have commonly developed this LFC Concept Document in order to highlight the key concepts, principles and actions as well as to describe the technical requirements and procedures for the future of Baltic load frequency control and market setup to support it.

2.1 The scope and aim of the document

One of the most critical processes in ensuring operational security with a high level of reliability and quality is the LFC. Effective LFC is possible only if the TSOs cooperate to balance generation and demand in real time to achieve stable system frequency of 50 Hz.
This document includes the concept of LFC in synchronized operation with CESA while isolated mode of Baltic power is not be a part of this document.
The provisions in SOGL, Part IV Load-Frequency Control and Reserves aim 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.
To that end, SOGL addresses the LFC structure and operational rules, the quality criteria and targets, the reserve dimensioning, the reserve exchange, sharing and distribution and the monitoring related to the LFC.
In this document, the Baltic TSOs describes the main principles and requirements as foreseen to be developed including:

1) LFC block structure

2) LFC reserve technical requirements and prequalification
3) LFC reserve capacity dimensioning and distribution methodology
4) LFC reserves capacity sharing/exchange principles
5) LFC reserve capacity standard products
6) LFC reserve energy standard products
7) LFC reserve capacity procurement process
8) LFC reserve activation process

All definitions and abbreviations used in this document must be applied and used as defined in Chapter 0.

2.2 Principles of load-frequency control

The SOGL sets an obligation for responsibility for LFC processes, frequency containment and frequency restoration processes, and the respective process quality to TSOs. At the same time, the SOGL recognizes the fact, that due to the physical properties of synchronously operated transmission systems, frequency is a common parameter for the synchronous area. For this reason, all TSOs operating in a synchronous area are obliged to cooperate, and they are dependent on this cooperation to keep the system frequency within acceptable ranges. The cooperation among TSOs requires a clear definition of responsibilities for LFC processes, organization of reserve availability and assignment of individual quality targets.

The definitions of these responsibilities are harmonized across synchronous areas by formulation of requirements for the LFC structure in the SOGL. The LFC structure includes control processes within process activation structure set in Article 140 of the SOGL and geographical responsibilities as process responsibility structure set in Article 141 of the SOGL. Each TSOs has obligations to operate and apply control processes for the respective geographical areas (monitoring area, LFC area, LFC block and synchronous area) in accordance with Article 141 of SOGL.

SOGL defines responsibilities for each TSO in relations to other TSOs within a synchronous area to apply LFC processes as a member of LFC block, LFC area and monitoring area to maintain system frequency and its quality.

The operation of LFC processes is based on operational areas, where every area has their individual responsibilities with respect to the LFC structure. The superior structure is the synchronous area in which frequency is the same for the whole area. The synchronous area

Continental Europe consists of several LFC Blocks, each LFC Block consists of one or more LFC Areas. An LFC Area itself consists of one or more Monitoring areas. The above described hierarchy is illustrated in Figure 1.

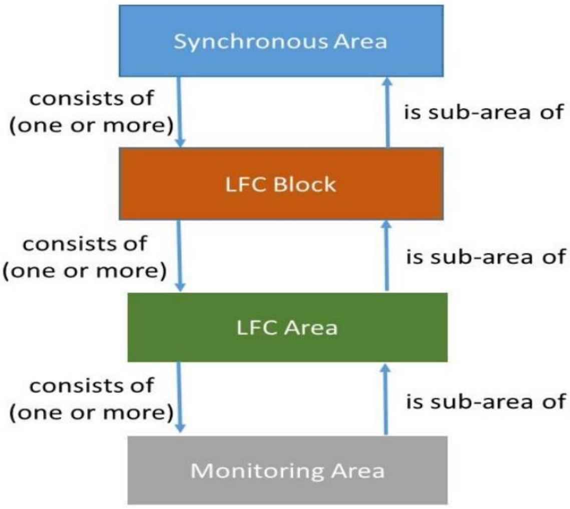

Figure 1. Types and hierarchy of areas operated by TSO

Each of these operational areas has their own obligations. A Monitoring Area has the obligation to calculate and measure the active power interchange in real-time in that area. An LFC Area has the additional obligation to fulfil the frequency restoration quality target parameters by using the frequency restoration process. An LFC Block is in addition responsible for the dimensioning of FRR and RR. The Synchronous Area has the obligation to fulfil the frequency quality target parameters by using the frequency containment process.

The framework of the load-frequency control processes in general:

Obligation	Monitoring Area	LFC Area	LFC Block	Synchronous Area
Online calculation and monitoring of actual power exchange	MANDATORY	MANDATORY	MANDATORY	MANDATORY
Calculation and monitoring of the Frequency Restoration Control Error	NA	MANDATORY	MANDATORY	MANDATORY
Frequency Restoration Process	NA	MANDATORY	MANDATORY	MANDATORY
Frequency Restoration Quality Target Parameters	NA	MANDATORY)	MANDATORY	MANDATORY
FRR Dimensioning	NA	NA	MANDATORY	MANDATORY
RR Dimensioning	NA	NA	MANDATORY	MANDATORY
Frequency Containment Process	NA	NA	NA	MANDATORY
FCR Dimensioning	NA	NA	NA	MANDATORY
Frequency Quality Target	NA	NA	NA	MANDATORY

Figure 2. Obligations for LFC related to different areas

The overall body is the Synchronous Area in which frequency and phase angle are close to being the same for the whole area.

1) LFC block defines the size of the network area for which the balancing capacities are being procured and is physically demarcated by points of measurement at interconnectors to other LFC blocks, consisting of one or more TSOs fulfilling the obligations of a load-frequency control[1]. The LFC block is important as this is the geographical area over which reserves (other than the fastest type) ought to be dimensioned, such as FRR and RR dimensioning;
2) LFC area: physically demarcated by points of measurement of interconnectors to other LFC Areas, operated by one or more TSOs fulfilling the obligations of load-frequency control. An LFC Area has the additional obligation to fulfil the Frequency Restoration Control Error Target Parameters by using the FRP;
3) Monitoring area: part of the synchronous area or the entire synchronous area, physically demarcated by points of measurement at interconnectors to other monitoring areas, operated by one or more TSOs fulfilling the obligations of a monitoring area to calculate and measure the active power interchange in real-time in that area;
4) Scheduling area: TSOs' obligations regarding scheduling apply due to operational or organisational needs BSPs and BRPs shall be compliant with the terms and conditions to balancing.

[1] Article 3(18) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation

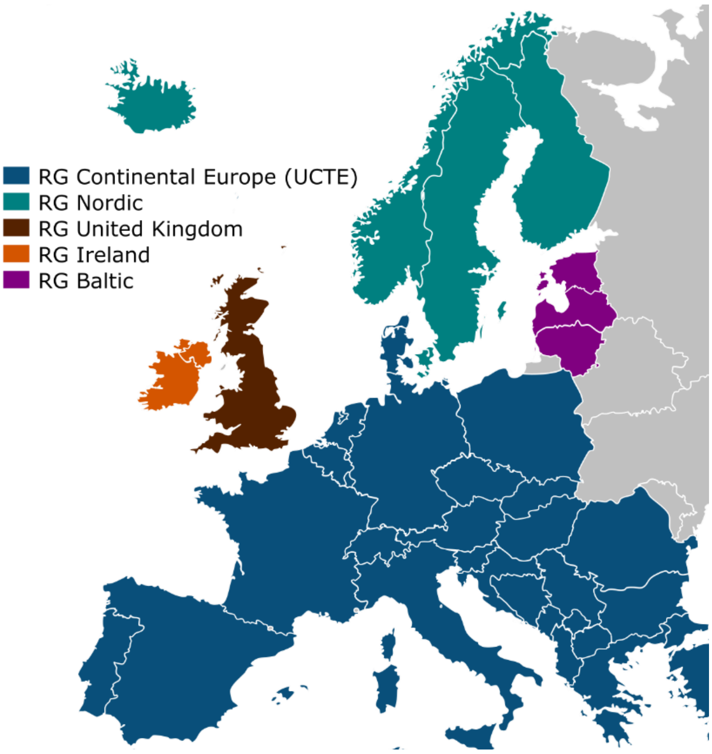

Figure 3. Synchronous areas in Europe

Synchronous Area of Continental Europe consists of several LFC Blocks, each LFC Block consists of one or more LFC Areas, each consists of one or more Monitoring Areas, list of current Monitoring Areas, LFC Areas and LFC Blocks provided in the Annex 1.

Each TSO of CESA shall operate the FCP, which stabilizes the frequency after the disturbance at a steady-state value within the permissible maximum steady-state frequency deviation by a joint action of FCR within the synchronous area. The FCR activation happens immediately after a difference in the balance between generation and demand causes system frequency deviation in the synchronous area. The dimensioning rules for FCR are defined in the SOGL Article 153 and managed on the Synchronous Area level.

All TSOs of an LFC area shall operate the FRP, which controls the frequency towards its set point value by activation of frequency restoration reserves and replaces the activated FCR. The activation of FRP is triggered by the disturbed LFC area either by activating automatically or manually the FRR. The dimensioning rules for FRR capacity are defined on the LFC block level taking into account SOGL Article 157.

The RRP replaces the activated FRR and/or supports the FRR activation by activation of RR. The activation of RRP is triggered by the disturbed LFC area. The dimensioning rules for RR are defined on LFC block level taking into account SOGL Article 160.

The sequence of LFC reserve activation and the activation periods is shown on Figure 4.

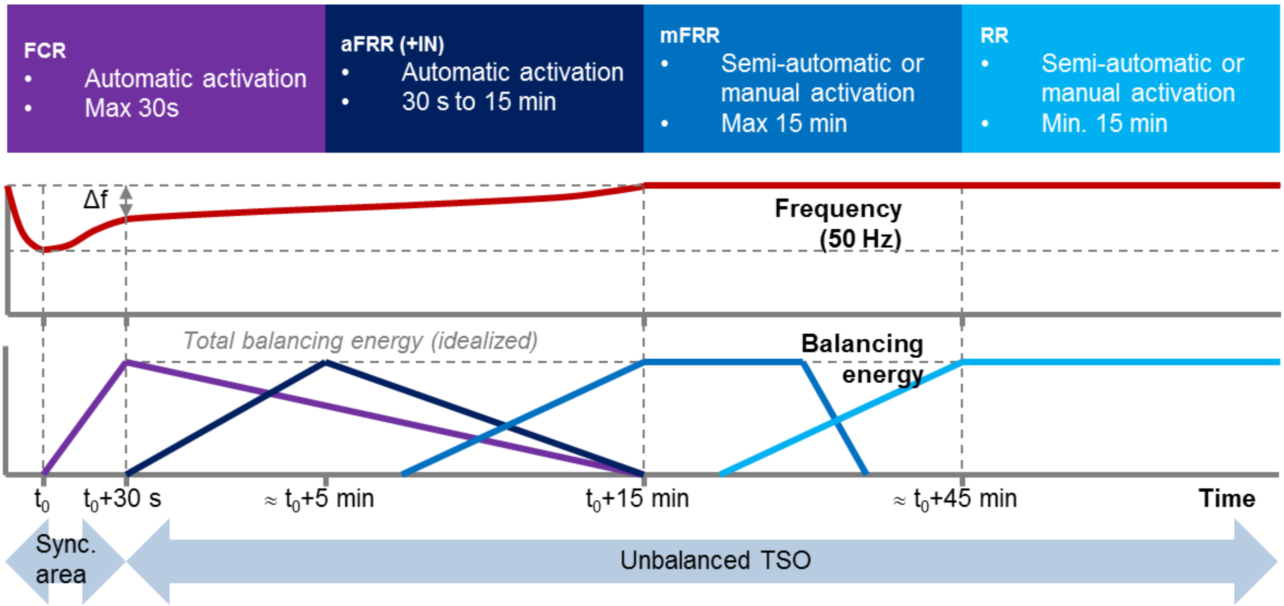

Figure 4. Balancing market processes for frequency restoration

2.3 Balancing requirements and markets

Balancing means all actions and processes through which TSOs continuously ensure the maintenance of system frequency within a predefined stability range, as well as compliance with the amount of reserves needed with respect to the required quality. The EBGL lays down detailed rules for the integration of balancing energy markets in Europe, with the objectives of fostering effective competition, non-discrimination, transparency and integration in electricity balancing markets, and by doing so, enhancing the efficiency of the European balancing system as well as security of supply.

The balancing process consists of three main steps:

1) TSOs dimension their need for balancing reserves,
2) TSOs procure the required balancing capacity and
3) TSOs procure balancing energy.

The ultimate goal of the EBGL is to 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 the competition. Rules set out in EBGL also help to ensure adequate competition based on a level-playing field between market participants, including demand-response aggregators and assets located at the distribution level.

The EBGL establishes an EU-wide set of technical, operational and market rules to govern the functioning of electricity balancing markets. According to the EBGL all TSOs operating the relevant processes related to the exchange of balancing energy need to implement following common European platforms:

1) **PICASSO** is the project leading the design and implementation of the aFRR platform as defined in article 21 of EBGL.
   a) The primary objective of this platform is the exchange, among TSOs, of the automatic activation of the power reserves available to restore system frequency to the nominal frequency. In terms of scope, this should be done by TSOs performing the aFRP. This means all TSOs of the Continental Europe and Nordic synchronous areas shall implement it jointly.
2) **IGCC** is the project leading the design and implementation of the imbalance netting platform as defined in article 22 of EBGL.
   a) The main goal of this platform is to reduce the overall volume of activated balancing reserves in Europe and the national balancing markets, avoiding the simultaneous activation of the frequency restoration reserve (FRR) in opposite directions, taking into account the respective FRCEs as well as the activated FRR and by correcting the input of the involved FRPs accordingly. In other words, to reduce the inefficient counter-activation of balancing reserves.
3) **MARI** is the project in which the design and implementation of the mFRR platform is coordinated as defined in article 20 of EBGL.
   a) The primary objective of this platform is the exchange, among TSOs, of the manual activation of the power reserves available to restore system frequency to the nominal frequency. In terms of scope, this should be implemented by all TSOs.
4) **TERRE** is the leading project working on the design and implementation of the RR platform as defined in article 19 of EBGL.
   a) The primary objective of the RR platform is the exchange among TSOs of the activation of reserves from generators, storage and demand response. These are used by TSOs to restore the required level of FCR and FRR due to their earlier usage if additional system imbalances appear following activation. Contrary to FCR and FRR, not all TSOs in the EU use RR products.

The requirements for balancing markets shall be established following provisions of SOGL, EBGL and CEP IE.

3 General concept for Baltic Load-frequency control

3.1 Objective and high-level concept

Baltic TSOs make a common proposal to establish a Baltic LFC block in accordance with Article 141(11) of SOGL and create a Baltic LFC block operational agreement according to Article 119 of SOGL by the end of 2024. Baltic LFC block proposal shall be agreed by Synchronous Area Continental Europe TSO's and after that „All TSOs' proposal for the determination of LFC blocks for the Synchronous Area Continental Europe" shall be updated accordingly and provided for Synchronous Area Continental Europe TSO's national regulators for approval.

The Baltic LFC block will consist of three LFC areas (Lithuanian LFC area, Latvian LFC area and Estonian LFC area). Each Baltic LFC areas will be operated by individual TSO. Detailed structure is provided in Table 1.

Country	TSO	Synchronous area	LFC block	LFC area	Monitoring area	Scheduling area	Bidding zone
Estonia	Elering AS	Continental Europe (CESA)	Baltic	Estonia	Estonia	Estonia	Estonia
Latvia	AS "Augstsprieguma tīkls"			Latvia	Latvia	Latvia	Latvia
Lithuania	LITGRID AB			Lithuania	Lithuania	Lithuania	Lithuania

Table 1. Baltic LFC block structure

Baltic LFC block is proposed to ensure high cooperation within the Baltic TSOs to the load-frequency balancing in the Baltics and to implement well-functioning Baltic balancing capacity and balancing energy markets.

The Baltic LFC block TSO's will implement following load frequency control structure processes:

1) Frequency containment process (FCP) as further described in Chapter 5;
2) Frequency restoration process (FRP) as further described in Chapter 0;
3) Imbalance netting process according to IGCC or PICASSO requirements;
4) Time control process according to SOGL Article 181 and Continental Europe SAFA requirements.

3.2 Roles & Responsibilities

Baltic TSOs have roles and responsibilities for the LFC defined on the SA, LFC block and LFC area level, for which TSOs have to processes in operation.

All TSOs of the CESA shall:

1) implement and operate a FCP for the synchronous area according to Article 142 of SOGL;
2) comply with the FCR dimensioning rules in accordance with Article 153 of SOGL;
3) endeavour to fulfil the frequency quality target parameters of CESA defined in the Annex III of SOGL

All TSOs of Baltic LFC block shall:

1) fulfil the FRCE target parameters set for the LFC block that are calculated annually over the CESA;
2) agree on the distribution methodology of FRCE target parameters for each Baltic LFC area and coordination actions aiming to reduce FRCE;
3) define ramping restriction for active power output;
4) follow FRR dimensioning rules that comply with Article 157 of SOGL;
5) agree on the distribution methodologies of FRR for each Baltic LFC area;
6) assign LFC block monitor role defined in Article 134 of SOGL in rotational basis between TSOs;
7) specify FRR availability requirements and requirements on the control quality of FRR providing units and FRR providing groups for their LFC block;
8) specify operational procedures for cases of exhausted FRR in the LFC block;
9) define limits for exchange of FRR between the LFC areas of the Baltic LFC block;
10) define limits for exchange of FRR between the LFC areas of neighbouring LFC block

Each TSO operating the LFC area of the Baltic LFC block shall:

1) monitor the FRCE of the LFC area;
2) implement and operate the FRP of the LFC area;
3) endeavour to fulfil the FRCE target parameters of the LFC area agreed in the LFC BOA;
4) implement imbalance netting process to minimize the need of FRR activation;
5) implement the cross-border FRR activation process;
6) receive and implement time correction signals from the Synchronous Area time monitor in the FRP;
7) set up prequalification processes for FCR, aFRR and mFRR Reserve Unit prequalification.

4 FRCE quality target values

4.1 Objective and high-level concept

One of the obligations of the TSOs of an LFC block is to endeavour to fulfil the FRCE target values, which are defined in accordance with Article 118(1)(d) of SOGL, the FRCE target values for each LFC block are part of the synchronous area operational agreement
These target parameters shall allow a regular check of the control performance of the individual areas, by themselves. The calculation of level 1 and level 2 will provide concrete values, which are the limit values for the ACE for LFC block and LFC areas. The ACE shall not exceed these values for more than:

- level 1: 30 % of the time intervals of the year respectively
- level 2: 5 % of the time intervals of the year.

4.2 FRCE target values for Baltic LFC block and Baltic LFC areas

FRCE target values for Baltic LFC block will be determined in accordance All CE TSOs' agreement on frequency restoration control error target parameters in accordance with Article 128 of SOGL and. the calculation principles are described in the Explanatory document of the agreement (download link for the document). Determination of FRCE target values for Baltic LFC areas shall be calculated based on the same principles that are defined in CESA agreement for FRCE target values for LFC blocks.

FRCE level 1 target value, MW	FRCE level 2 target value, MW
35*	65*

**- are estimated values*
Table 2. FRCE target level estimation for Baltic LFC block

4.2.1 Coordination actions aiming to reduce the FRCE

SOGL requires the TSOs to define measures for FRCE reduction in accordance with Article 152(14) and Article 152(16). Article 152(14) states, that LFC block monitor shall be responsible for identifying any violation of the limits in paragraphs 12 and 13 and shall inform the other TSOs of the LFC block and together with the TSOs of the LFC block shall implement coordinated actions to reduce the FRCE which shall be specified in the LFC block operational agreement.

Baltic TSOs shall establish coordination action within the frequency restoration process in order to ensure FRCE target values as further described in Chapter 0, while each Baltic TSOs shall have the responsibility to ensure FRCE target values for relevant LFC area.
Additionally, to frequency restoration process Baltic TSOs may apply additional measures, such as procurement of energy in the intraday market for countertrade purposes.

5 Frequency containment reserves (FCR) – technical part

5.1 Objective and high-level concept

FCR has the purpose to contain the system frequency in the synchronous area during any fluctuations of active power balance in the system. As the effect of the frequency deviation can affect the whole synchronous area, CESA has distributed the FCR requirement between all TSOs of the synchronous area and defined the rules for FCP. Each TSO of LFC area in the CESA has to have a FCP in operation and ensure that the dimensioned FCR for the LFC area is available. The main requirements and legal references regarding FCP and FCR are in Title 5 of SOGL and in the SAFA Annex 1.
FCR can be provided by any reserve providing unit that fulfils the technical requirements described in this Chapter and has completed the prequalification process accordingly. In a general view FCR shall be fully activated within 30 seconds on the reserve providing unit after a frequency deviation has occurred in the power system.

5.2 FCR technical requirements

Reserve Units that provide FCR deliver their FCR by means of a proportional governor reacting to frequency deviations or alternatively based on a monotonic piecewise linear power-frequency characteristic in case of relay activated FCR.
The proportional activation has a negative feedback on the Reserve Unit active power output, this means as the frequency deviation increases in positive direction, the active power output of the FCR provider shall decrease and vice versa. FCR response shall be provided as the frequency deviation exceeds ±10 mHz, which is the maximum allowed intentional and unintentional deadband. The requirement refers to both the accuracy of the measurement device and the presence of intentional (deadband) or unintentional (e.g. mechanical clearances) insensitivities. It corresponds to the minimum accuracy of frequency measurement equipment that shall be required for FCR providers.

Parameter	FCR technical requirement
Deadband	±10 mHz
Full activation frequency deviation	±200 mHz
Full activation time	30s

Table 3. General technical requirements for FCR

FCR provided by a Reserve Unit shall fulfil the following FCR activation rules:

1) the activation of FCR shall not be artificially delayed and begin as soon as possible after a frequency deviation;
2) in case of a frequency deviation equal to or larger than 200 mHz, at least 50 % of the full FCR capacity shall be delivered at the latest after 15 seconds;
3) in case of a frequency deviation equal to or larger than 200 mHz, 100 % of the full FCR capacity shall be delivered at the latest after 30 seconds;
4) in case of a frequency deviation equal to or larger than 200 mHz, the activation of the full FCR capacity shall rise at least linearly from 15 to 30 seconds; and
5) in case of a frequency deviation smaller than 200 mHz the related activated FCR capacity shall be at least proportional with the same time behaviour referred to in points 1 to 4.

The ideal activation curve of a FCR providing Reserve Unit is shown in Figure 5.

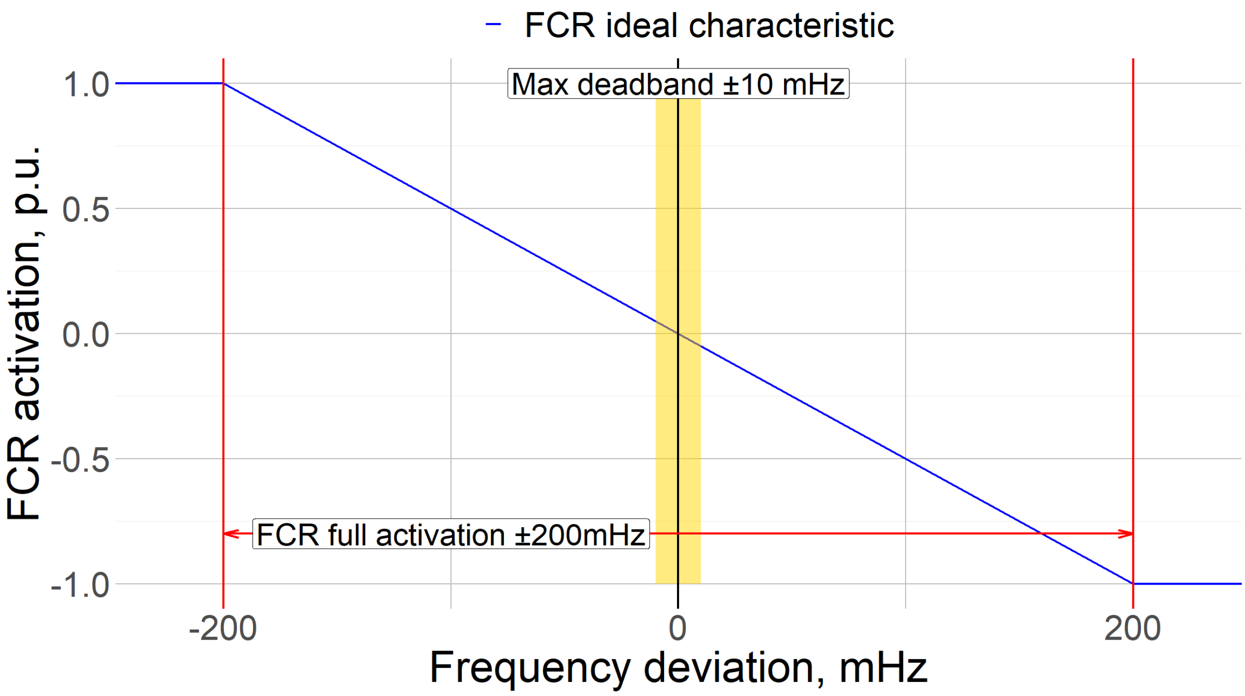

Figure 5. FCR activation ideal characteristic based on the frequency deviation

The graph represents on the y-axis the FCR activation (in p.u. of the dimensioned value) and on the x-axis the frequency deviation (mHz) that causes this activation. The curve is intended to be static, it refers to the condition reached once the transient of FCR deployment is completed.

The FCR provider shall be capable to provide FCR within the frequency range defined in Table 4 in accordance with network code on requirements for grid connection of generators article 13(1). These requirements state that each Reserve Unit shall provide the expected FCR as long as it remains connected to the system. FCR providing Reserve Units shall be able to continue their FCR provision (FCR full activation) also if the frequency deviation exceeds the full activation frequency (±200 mHz).

Frequency range [Hz]	Minimum time period for operation
47.5 – 48.5	30 minutes
48.5 – 49.0	30 minutes
49.0 – 51.0	Unlimited
51.0 – 51.5	30 minutes

Table 4. Minimum time periods for which power-generating module has to be capable of operating in different frequencies without disconnecting form the network in CESA

There is no maximum time for the provision of FCR. A potential long-lasting unidirectional frequency deviation shall be covered by FCR providers without limitation.

The only exception to this rule is allowed for FCR providers which rely on an energy reservoir that limits their FCR availability. These providers shall activate their FCR as long as the frequency deviation persists, unless their energy reservoir is exhausted in either the positive or negative direction. For such resources providing FCR, the FCR provider shall ensure that during normal state the service is continuously available. During the alert state TSOs shall define a period for which the FCR providers should be able to fully activate FCR continuously – the time defined shall not be greater than 30 or smaller than 15 minutes.

Each BSP shall provide for each Reserve Unit the following real-time information to the connecting TSO:

1) time stamped FCR status (on/off);
2) time stamped active power and information on the set point on which the FCR is provided (needed for calculating the actual provided FCR);
3) the FCR droop or an equivalent parameter that indicates the ratio between frequency deviation and the activated FCR.

Above mentioned data shall be provided in real time with a time resolution of at least 10 s. FCR provider has the right to aggregate the respective data for more than one FCR providing unit if the maximum power of the aggregated units is below 1.5 MW and a clear verification of activation of FCR is possible.

If the connecting TSO needs more detailed information to verify the FCR activation, the FCR provider shall be able to make available the requested information regarding each unit belonging to the aggregate.

In order to participate in FCR service provision, all the FCR providing units need to have successfully completed the prequalification process. After being prequalified, the FCR providers are authorized to offer the prequalified units with their volumes to the FCR capacity procurement process. When the capacity bid is successful in the procurement process and the bid is selected, then the service provider needs to ensure that the service fulfils all the requirements and the service is available for the whole time period for which it was procured.

Each TSO shall develop processes to verify that the LFC area has adequate volumes of FCR and quality of FCR response is ensured. The verification processes to check compliancy need real-time data exchange between the TSO and Reserve Units. The real time data transfer shall be provided as information submitted to TSO regarding the FCR location and for allowing the real time control over the provision of adequate reserve. The connection established with the TSO shall have the following characteristics:

1) Minimum reliability 99.5%;
2) Data refreshing cycle: ≤ 10 seconds.

To enable the real time control of the FCR provision the communication interface is equipped in such a manner so that from the electricity generating facility to the TSO at least the following signals, for each separate generation unit, can be transferred:

1) the signal of the FCP state of operation (on/off) – per change;
2) the power unit's reference power, - per cycle;
3) the volume of the FCR on the power unit – per cycle;
4) actual (measured) value of the active power output, per a 10-second cycle;
5) the droop and frequency response deadband - per cycle;
6) frequency on the power unit's terminals - per cycle.

All data shall have a time stamp.

5.3 Concept of FCR prequalification process

As the FCP and FCR obligation is distributed between all CESA TSOs, then each TSO shall develop an FCR prequalification process and shall make publicly available the details of the FCR prequalification process. Baltic TSOs plan to harmonize the prequalification requirements inside Baltic LFC block.

The FCR qualification is the process by which a potential FCR provider demonstrates its Reserve Unit compliance to all the FCR requirements. The successful completion of the qualification process is required for the potential FCR provider to participate in the FCR market and provide FCR service.

The FCR prequalification process shall test:

1) Static parameters of frequency control;
2) Dynamic parameters of frequency control;
3) Characterisation of the actual energy capacity in case of LER type of Reserve Unit.

The prequalification of FCR providers shall be re-assessed:

1) at least once every 5 years;
2) in case the technical or availability requirements or the equipment have changed;
3) in case of modernization of the equipment related to FCR activation;
4) in case during provision of FCR service the quality parameters were breached and FCR provision service was suspended.

Baltic TSOs will develop the final FCR prequalification processes and testing principles according to the roadmap described in Chapter 8.3

5.4 FCR Dimensioning rules

FCR dimensioning is made on the SA level as all LFC areas participate in the process of containing the frequency level in CESA. Article 153(1) of SOGL requires that the FCR requirement for a SA is defined at least on an annual basis by all TSOs. Article 153(2) of SOGL provides also the criteria that are requested to be considered for the dimensioning by TSOs in the Synchronous Area Operational Agreement. These criteria can be sum up as follows:

1. The FCR dimensioning shall at least cover the so-called reference incident. For CESA the reference incident is equal to 3000 MW on both upward and downward direction.
2. The FCR dimensioning can be based also on a probabilistic approach. The TSOs have the right to use the probabilistic approach, but they are not required to.

The proposal from all CESA TSOs is to use the reference incident criterion and Baltic TSOs do not see any reason to oppose this proposal as the use of the reference incidents criterion has proven to be enough to ensure the conditions for maintaining the frequency quality level and respecting the operational security requirements. The proposal includes the formula to calculate the FCR obligation for each TSO for certain year by using the consumption and production data of the second last calendar year with respect to the considered year:

$$P_{TSO,t} = 3000 \cdot \frac{G_{TSO,t-2} + L_{TSO,t-2}}{G_{CE,t-2} + L_{CE,t-2}} \ [MW]$$

where:

$G_{TSO,\ t-2}$-being the energy generated in the control are for which the single TSO is responsible in the second last calendar year;

$L_{TSO,t-2}$-being the energy consumption in the control are for which the single TSO is responsible in the second last calendar year;

$G_{CE,t-2}$- being the energy generated in the CE SA in the second last calendar year;

$L_{CE,t-2}$- being the energy consumption in CE SA in the second last calendar year.

5.4.1 Distribution of FCR per LFC area

Taking into account the FCR dimensioning rules and the forecasted data for 2025 the estimated FCR volumes for Baltic TSOs are presented in Table 5. The calculated FCR capacity volumes reflect the need of FCR when Baltic TSOs are synchronized with the CESA. Final FCR capacities for Baltic TSOs shall be calculated based on the historic data.

	Estonia	**Latvia**	**Lithuania**	**Total Baltic LFC block**
FCR volume MW (upward and downward)	8	8	9	25

Table 5. Estimated FCR capacities for Baltic countries

6 Frequency restoration reserves (FRR) – technical part

6.1 Objective and high-level concept

The main purpose of FRR and frequency restoration process is to regulate the FRCE towards zero within the time to restore frequency in the Baltic LFC block and consequently replace activated FCR. FRR shall be sufficiently available to maintain the FRCE quality, and to be within operational security limits.

FRR is provided by BSPs, who shall activate FRR as instructed by their TSO. Two types of FRR products are to be recognized by Baltic TSOs: mFRR and aFRR.

mFRR activations are done with human operator involvement and sent as activation instruction messages. The goal of these activations is to restore the faster reserves (FCR and aFRR), to pro-actively prevent expected FRCE deviations and to keep the grid within operational security limits.

aFRR activations are automatically generated as SCADA signals in the frequency restoration controller and forwarded to the BSP control system that manages the reserve providing units. The goal of the activations is to free previously activated FCR and to restore the FRCE towards zero.

6.2 FRR products and characteristics of FRR

6.2.1 Characteristics of mFRR

Standard mFRR balancing energy product bid shall respect the following characteristics:

Parameter	**mFRR standard product**
Mode of activation	Manual. Electronic messages are used for communication of activation orders. Phone communication can be used for backup.
Activation type	Direct or scheduled. Whereas direct could also be activated for scheduled, but not vice versa
Direction	Upward or downward
Full activation time (“FAT”)	12,5 minutes
Minimum quantity	1 MW
Bid granularity	1 MW
Maximum quantity	9,999 MW
Minimum duration of delivery period	5 minutes
Price resolution	0.01 €/MWh
Price	in €/MWh no maximum price cap

Validity Period	A scheduled activation can take place at the point of scheduled activation only. A direct activation can take place at any time during the 15 minutes after the point of scheduled activation.
Location	Baltic bidding zone with identification of exact power plant or aggregation of power plants
Divisibility	BSPs are allowed to submit divisible bids with an activation granularity of 1 MW. BSPs are allowed to submit indivisible or partly indivisible bids based on BSP prequalification. Maximum size of indivisible bids shall not be higher than the largest technical minimum production or consumption of the pre-qualified generation or load unit of the BSP.
Technical linking between bids	BSPs may submit information on technical linking between bids submitted in consecutive quarter hours and within the same quarter hour
Economic link	BSPs may submit information on child with parent and exclusive group orders
Preparation Period	Not higher than 7 minutes
Ramping Period	Not higher than 12 minutes
Deactivation Period	Not higher than 10 minutes
Maximum duration of delivery period	Not higher than 20 minutes for scheduled activation and 35 minutes for direct activation.
Minimum duration between the end of deactivation and the following activation	Not defined/not applicable for BSPs

Table 6. mFRR characteristics

More detailed bid characteristic and linking information can be found on “Baltic balancing market rules” that will be published separately by the Baltic TSOs.

6.2.2 Characteristics of aFRR

Standard aFRR balancing energy product bid shall respect the following characteristics:

Parameter	aFRR standard product
Mode of activation	Automatic SCADA signals are used for communication of activation orders.
Direction	Upward or downward
Full activation time ("FAT")	5 minutes
Minimum quantity	1 MW
Bid granularity	1 MW
Maximum quantity	9,999 MW
Minimum duration of delivery period	None - No minimum delivery period
Price resolution	0.01 €/MWh
Price	in €/MWh no maximum price cap
Validity Period	15 minutes
Location	Baltic bidding zone with identification of exact power plant or aggregation of power plants
Divisibility	All bids shall be fully divisible with activation step of 0.01 MW
Linking	No linking of bids is allowed
Preparation Period	0 minutes
Ramping Period	Not higher than 5 minutes
Deactivation Period	Not higher than 5 minutes
Maximum duration of delivery period	15 minutes
Minimum duration between the end of deactivation and the following activation	None

Table 7. aFRR characteristics

6.3 FRR prequalification process

Balancing Service Providers wishing to participate in the FRR markets need to prequalify the reserve providing Reserve Units according to the prequalification process. Prequalification process is defined by each TSO in accordance with SOGL Article 159. All TSOs of the LFC block shall design and follow common prequalification process. Common prequalification process allows mFRR and aFRR Reserve Units to be valid for the entire LFC block according to SOGL Article 159(5). Reserve Unit operated by BSP can consist of a single FRR providing unit or a group of FRR providing units.

Prequalification process includes the technical prequalification tests that shall test the technical capabilities of the Reserve Unit:

1) Exchange of information between TSO and BSP;
2) FAT of the Reserve Unit for given product;
3) Ramping period;
4) Deactivation period;
5) Ramp rate of the Reserve Unit for given product.

During prequalification test of mFRR the technical minimum shall be determined and this technical minimum is considered as a maximum indivisible part of the bid that can be provided. During prequalification tests of aFRR or mFRR the maximum bid size shall be determined. TSOs support the testing procedure by sending activation signals to the Reserve Unit according to the test plan.

The prequalification of FRR providers shall be re-assessed:

1) at least once every 5 years;
2) in case the technical or availability requirements or the equipment have changed;
3) in case during provision of FRR service the quality parameters were breached and FRR provision service was suspended.

Baltic TSOs will develop the final aFRR and mFRR prequalification processes and testing principles according to the roadmap described in Chapter 8.3.

6.4 FRR provision requirements

6.4.1 Data exchange requirements for aFRR and mFRR provision

Data exchange requirements will be defined by each TSO in terms and conditions for BSPs. mFRR data exchange requirements will be based on "ENTSO-E manual Frequency Restoration Reserve process implementation guide" as a basis. aFRR data exchange requirements will be based "ENTSO-E automatic Frequency Restoration Reserve process implementation guide" as a basis. Latest versions of both aforementioned documents are to be made available on ENTSO-E Electronic Data Interchange (EDI) Library[2].

6.4.2 FRR availability

All FRR capacity procured by the TSO shall be guaranteed by the BSP to be made available 100%. Once the capacity has been procured by the TSO, the BSP is responsible for providing

[2] https://www.entsoe.eu/publications/electronic-data-interchange-edi-library/

energy bids responding to the capacity for the time periods that balancing capacity service is being provided to connecting TSO.

6.5 FRR dimensioning concept

6.5.1 Concept of FRR dimensioning for LFC block

The purpose of FRR capacity dimensioning is to ensure that there is enough reserve capacity to respect the FRCE target parameters set for the LFC block and to ensure that there is enough FRR to cover the positive and negative LFC block imbalance for at least 99% of the time.

The positive and negative system imbalances for Baltic LFC block are the result of the mismatches of generation or consumption plans, unplanned outages of power plants or large consumers and unplanned outages of importing or exporting HVDC connections.

To estimate the total FRR capacity needed for Baltic LFC block in 2025 the total effect of all of these imbalance sources was taken into account with a Monte-Carlo method to simulate the possible imbalances of Baltic LFC block (hereinafter – probabilistic method). The results of the simulations allow to estimate the FRR capacity values that cover the imbalances 99% of the time.

Due to the fact that the RES capacity is expected to increase in 2025 RES historic imbalances were scaled up to RES installed capacity as provided in Table 8.

RES type	2020 scenario	2025 scenario
Solar EE	128	350
Solar LV	1	6,3
Solar LT	103	600
Wind EE	329	400
Wind LV	70	194
Wind LT	533	1500

Table 8. RES scenarios taken into account for the FRR dimensioning

Probabilistic method simulation used following data as input:

1) Outage rate of power plants with a nominal power over 100 MW;
2) Outage rate and power flow direction of Baltic HVDC connections in 2025;
3) Historical LFC area imbalance data for 2019;
4) Historical LFC area RES imbalance data of 2019 as base and scaling imbalances for different RES scenarios for 2025.

The result of the Probabilistic method analysis is shown in Table 9. It can be seen that there is small difference between scenarios for 2020 and 2025 - the positive FRR need (upward balancing capacity) is a bit higher than 700 MW ranging between 707 to 708 MW and negative FRR need (downward balancing capacity) is ranging between 521 to 548 MW.

Scenario	**Positive FRR need, MW**	**Negative FRR need, MW**
2020	707	548
2025	708	521

Table 9. Probabilistic method simulation results for FRR

Additional parameter that needs to be assessed for the FRR dimensioning is the reference incidents of the LFC block and LFC areas as FRR volume shall not be less than dimensioning incident of the LFC block in accordance with SOGL Article 157. Reference incidents are the outage of large generation or consumption unit. In the Baltics the largest incidents are caused from HVDC import or export disconnection and largest generation units. For Latvia LFC area largest incident in positive direction is determined by Riga CHP-2 unit size (442MW), largest incident in negative direction – maximum possible amount of simultaneously disconnected load (50MW). In the Baltics by 2025 there will be 4 HVDC connections – Estlink 1 (350 MW), Estlink 2 (650 MW), Nordbalt (700 MW) and Harmony link (700 MW). To be able to cover the incident of disconnection of these HVDC connections there must be enough FRR capacity available to cover the reference incident of largest of these HVDC connections. That would mean that for both, positive and negative incident, the Baltic LFC block would need to have ±700 MW of FRR capacity available to provide the HVDC capacities to the market.

Area	**Reference incident in positive direction**, MW	**Reference incident in negative direction,** MW
EE LFC Area	650	650
LV LFC Area	442	50
LT LFC Area	700	700
Baltic LFC block	700	700

Table 10. Reference incidents in each LFC area in Baltic LFC block

Based on above described dimensioning principles Baltic TSOs estimate following Baltic LFC block FRR volumes:

1) **710 MW of upward FRR** to cover the possible imbalances of the system based on Probabilistic method;
2) **700 MW of downward FRR** to cover the negative Baltic LFC block incident.

FRR amount consists of aFRR and mFRR volumes: $FRR_{block} = aFRR_{block} + mFRR_{block}$. Therefore, it is important to calculate the distribution between aFRR and mFRR for the Baltic LFC block.

It is important to understand that analyses presented are based on historic data and can change if newer data is used for the analysis. Final volumes of FRR shall be calculated based on Baltic LFC block methodology that shall be approved by NRAs using the actual historical data.

6.5.2 Baltic LFC block aFRR dimensioning methodology concept

The aFRR capacity is dimensioned to balance the variations in the power system due to load variation, schedule changes and prediction errors of RES. The aFRR capacity will be calculated based on the recommendation of SAFA Policy 1 statistical approach. The activated aFRR is replaced with mFRR for longer system imbalances. The variation of the power system is checked by calculating the difference[3] of 1-minute ACEol[4] value and the 15-minute average ACEol on historical imbalance data.

The positive aFRR capacity is estimated to be larger than the 1st percentile and negative aFRR capacity is larger than the 99th percentile of the calculated ACEol differences.

For Baltic LFC block aFRR estimation is done based on the data for scenario 2020. The results of aFRR dimensioning is presented in Table 11. It can be seen from the aFRR estimations that the capacity does not change critically with different RES scenarios. This is due to the fact that the RES imbalance data from 2019 has a stable variation in the 15-minute timeframe and the scaling of RES for different scenarios does not impact the variation.

Scenario	Upward aFRR, MW (1st percentile)	Downward aFRR, MW (99th percentile)
2020	123	125
2025	123	126

Table 11. aFRR dimensioning for Baltic LFC block

Based on above described dimensioning principles Baltic TSOs estimate following Baltic LFC block aFRR volumes:

1) **130 MW of upward aFRR;**
2) **130 MW of downward aFRR.**

[3] Difference is calculated on 1-minute resolution

[4] ACEol (open loop ACE) equals to area control error (ACE) value as it would be if power balancing of aFRR, mFRR or RR was not performed

6.5.3 LFC block aFRR capacity distribution between LFC areas concept

To determine amount of positive and negative aFRR reserves for each LFC area, distribution of Baltic LFC block aFRR amount shall be based proportionally to the aFRR need for each LFC. The estimated aFRR distribution for LFC area is presented in Table 12.

Area	**Upward aFRR need**, MW	**Downward aFRR need**, MW	**Upward share of aFRR**	**Downward share of aFRR**	**Estimated Upward aFRR**, MW	**Estimated downward aFRR**, MW
EE LFC Area	70	69	0,30	0,30	40	40
LV LFC Area	53	52	0,23	0,23	30	30
LT LFC Area	109	108	0,47	0,47	60	60
Baltic LFC block					**130**	**130**

Table 12. Estimated aFRR capacity per LFC area

6.5.4 Baltic LFC block mFRR dimensioning methodology concept

The mFRR capacity shall be dimensioned to cover the rest of the FRR that is not covered by aFRR. The estimated mFRR for Baltic LFC block for 2020 and 2025 scenarios are presented in Table 13.

Scenario	**Positive FRR need, MW**	**Negative FRR need, MW**	**Positive aFRR need, MW**	**Negative aFRR need, MW**	**Positive mFRR need, MW**	**Negative mFRR need, MW**
2020	707	700	130	130	577	570
2025	708	700	130	130	578	570

Table 13. mFRR capacity estimation based on different RES scenarios

Based on above described dimensioning principles Baltic TSOs estimate following Baltic LFC block mFRR volumes:

1) **580 MW of upward mFRR**;
2) **570 MW of downward mFRR**.

6.5.5 LFC block mFRR capacity distribution between LFC areas

The mFRR volume for LFC area shall be at least the amount of FRR that is not covered by the aFRR, and shall not be less than aFRR volume. To determine amount of positive and negative mFRR reserves for each LFC area, distribution of Baltic LFC block mFRR amount shall be determined as shown on Figure 6.

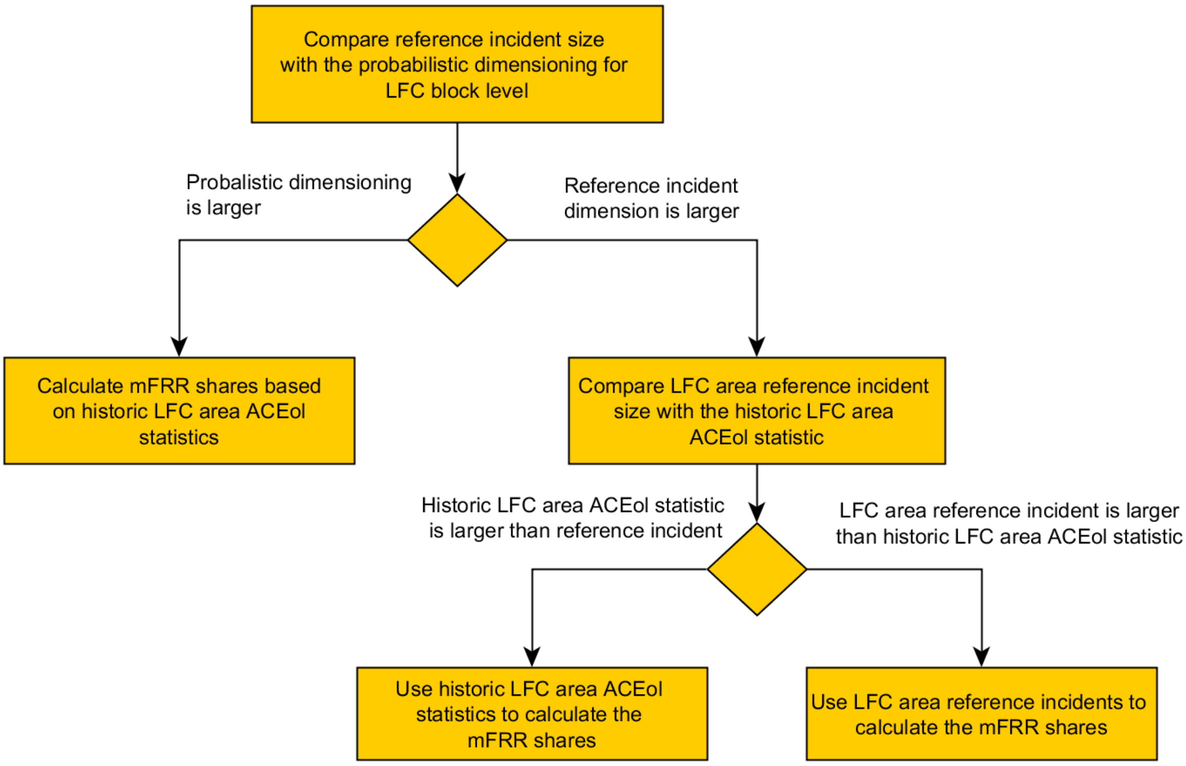

Figure 6. mFRR distribution principles between LFC areas

In the calculations that are presented in Table 14 and Table 15, the 2020 scenario was used as the mFRR estimation.

Area	**ACEol 1st percentile**, MW	**Positive reference incident**, MW	**Positive share,** MW	**Positive share of mFRR**	**Upward mFRR,** MW
EE LFC Area	196,60	650	196,6	0,36	209
LV LFC Area	124,50	442	124,5	0,25	145
LT LFC Area	255,30	700	255,3	0,39	226
Baltic LFC block					**580**

Table 14. Calculation of estimated positive mFRR capacity per LFC area

Area	**ACEol 99th percentile**, MW	**Negative reference incident**, MW	**Negative share,** MW	**Negative share of mFRR**	**Downward mFRR**, MW
EE LFC Area	148,00	650	650	0,45	257
LV LFC Area	94,20	50	94,2	0,065	37
LT LFC Area	220,50	700	700	0,485	276
Baltic LFC block					570

Table 15. Calculation of estimated negative mFRR capacity per LFC area

Based on above described principles Baltic TSOs estimate following mFRR volumes for LFC area for 2025 that are presented in Table 16.

Area	**Upward mFRR**, MW	**Downward mFRR**, MW
EE LFC Area	209	257
LV LFC Area	145	37
LT LFC Area	226	276
Baltic LFC block	580	570

Table 16. Estimated mFRR capacities per LFC area

6.5.6 Determining accessible volume of FRR reserve for each LFC area

To implement the reserve procurement processes and allocating the necessary capacity on cross-borders, Baltic TSOs need to determine FRR volume that shall be accessible for each LFC area to fulfil the SOGL requirements for FRR dimensioning as accessible volume of FRR. Accessible volume of FRR reflects the full FRR capacity that the LFC area needs to operate securely to ensure frequency quality. Input data used for the determination are the reference incidents and values of LFC area probabilistic method imbalances. The total demand of FRR for each LFC area shall be determined by comparing the largest reference incident with the statistical FRR imbalance values and choosing the maximum to reflect the LFC area demand. Based on the data available for 2019 the LFC area accessible volumes are following:

LFC area	Accessible volume of upward FRR, MW	Accessible volume of downward FRR, MW
EE	650	650
LV	442	75
LT	700	700

Table 17. LFC area accessible volume of FRR

6.5.7 LFC block FRR dimensioning implementation

Baltic TSOs foresee FRR dimensioning and area demand processes estimation to be a dynamic process, where the necessary reserve capacities are dimensioned periodically (more often than annually) to reflect the actual system needs. Further analysis shall be carried out by Baltic TSOs to find the most effective time period for dynamic estimation of Baltic LFC block needs. Furthermore, once Baltic TSOs procure FRR capacities, there will be a daily evaluation process to see if adequate capacity of FRR reserves were procured. Dynamic estimation process and FRR capacity procurement evaluation are necessary processes to ensure that Baltic TSOs procure enough reserves for system stability and minimise the economic costs.

Baltic TSOs propose the following timeline in Table 18 to develop the final proposal and implement the FRR dimensioning process in Baltic LFC block.

MILESTONES	Deadline
Baltic TSOs develop the methodology for dimensioning of FRR for the Baltic LFC block	2021-2022
Baltic TSOs develop and publish the FRR dimensioning methodology for public consultation	2023 Q1
Baltic TSOs shall submit FRR dimensioning rules for approval of each Baltic NRA	2023 Q3
Baltic NRAs have approved the FRR dimensioning rules	2024 Q1

Table 18. Roadmap for implementing LFC block FRR dimensioning process

7 Balancing energy markets in Baltic LFC block

7.1 Objective and high-level concept

The Baltic TSOs foresees that before the synchronous operation with CESA Baltic systems Baltic balancing market shall be integral part of European balancing energy markets participating in MARI and PICASSO balancing energy platforms, including the 15-minute imbalance settlement period in accordance with EBGL regulation.

European integration target model for the EU-wide balancing market is based on TSO-TSO model[5]; this is that all cross-border processes (i.e. exchange of balancing energy or capacity) are only a TSOs' obligation[6]. In this model, BSPs provide balancing services to its connecting TSO[7] then the TSO can either use them locally (i.e. non-standard products) or submit (i.e. all standard and converted to standard products) to the corresponding European platform which they will lead to the common merit order list. BSPs have an obligation to submit the balancing energy bids which were successful in the capacity procurement and all BSPs have the right to submit additional balancing energy bids.

7.2 Balancing energy markets framework

EBGL European balancing market framework is described in EBGL regulation and implementation frameworks for each balancing platform:

1) Implementation framework for the exchange of balancing energy from replacement reserves in accordance with Article 19 of EBGL;
2) Implementation framework for the European platform for the exchange of balancing energy from frequency restoration reserves with manual activation in accordance with Article 20 of EBGL;
3) Implementation framework for the European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation in accordance with Article 21 of EBGL;
4) Implementation Framework for a European platform for the imbalance netting process in accordance with Article 22 of EBGL.

Common processes for the balancing markets that are defined in ACER approved methodologies:

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[5] the exchange of balancing services where the balancing service provider provides balancing services to its connecting TSO, which then provides these balancing services to the requesting TSO

[6] EB regulation leaves open the possibility to TSO-BSP model may be applied only where the TSO-BSP model is also applied for the exchange of balancing capacity or where one of the involved TSOs does not operate the reserve replacement process as part of the load-frequency-control structure

[7] TSO which operates the scheduling area in which BSPs and BRPs shall be compliant with the terms and conditions related to balancing Article 2(22) of EB regulation

1) Methodology for pricing balancing energy and cross-zonal capacity used for the exchange of balancing energy or operating the imbalance netting process Pricing proposal in accordance with Article 30(1) of EBGL;
2) Methodology for classifying the activation purposes of balancing energy bids in accordance with Article 29(3) of EBGL;
3) Common settlement rules applicable to all intended exchanges of energy as a result of the reserve replacement process, the frequency restoration process with manual and automatic activation and the imbalance netting process in accordance with Article 50(1) of EBGL.

For each balancing product (aFRR, mFRR and RR) will be EU common harmonised standard products as below in Table 19 which shall be applied in Baltic states. The details about the products is described in this document in Chapter 6.2.

	aFRR	**mFRR**	**RR**
Mode of activation	Automatic	Manual	Manual
Activation type	Automatic	Direct or scheduled	Scheduled
Full activation time ("FAT")	5 minutes	12,5 minutes	30 minutes
Minimum quantity	1 MW	1 MW	1 MW
Bid granularity	1 MW	1 MW	1 MW
Maximum quantity	9,999 MW	9,999 MW	9,999 MW
Minimum duration of delivery period	no minimum delivery period	5 minutes	30 minutes
Price resolution	0.01 €/MWh	0.01 €/MWh	0.01 €/MWh
Validity Period	The validity period shall be 15 minutes. The first validity period of each day shall begin right after 00:00 CET. The validity periods shall be consecutive and not overlapping.	A scheduled activation can take place at the point of scheduled activation only. A direct activation can take place at any time during the 15 minutes after the point of scheduled activation	60 minutes

Table 19. Standard balancing energy product bids characteristics

The general functional structure of balancing platforms is provided in Figure 7. Hereinafter are explained the main steps in which the BSPs and TSOs interact at pan European balancing energy market level:

1) The BSPs send to the connecting TSOs the balancing energy bids for standard or specific products or integrated scheduling process bids8 or update the balancing energy bids, , until the balancing energy gate closure time (BE GCT);
2) TSOs forward bids to the relevant balancing energy exchange platform until the TSOs gate closure time (converted from integrated scheduling process bids in case of TSO using central dispatch model);
3) TSOs submit available cross-zonal capacity (CZC) and CMM calculate the overall CZC available for each balancing process and the relevant network constraints in each of them;
4) TSOs submit balancing energy elastic and inelastic demands to the balancing platform;
5) Activation optimisation function (AOF) receives local merit order lists, merge them in common merit order list and calculates the output data taking into account the available CZC;
6) AOF provides as output data - the selected bids to be activated, the netted demands, cross-border exchange (if any) and used cross-zonal capacities (8), based on which TSOs request their BSPs to activate balancing energy bids according to the algorithm outcomes
7) The platform provides data for settlement.

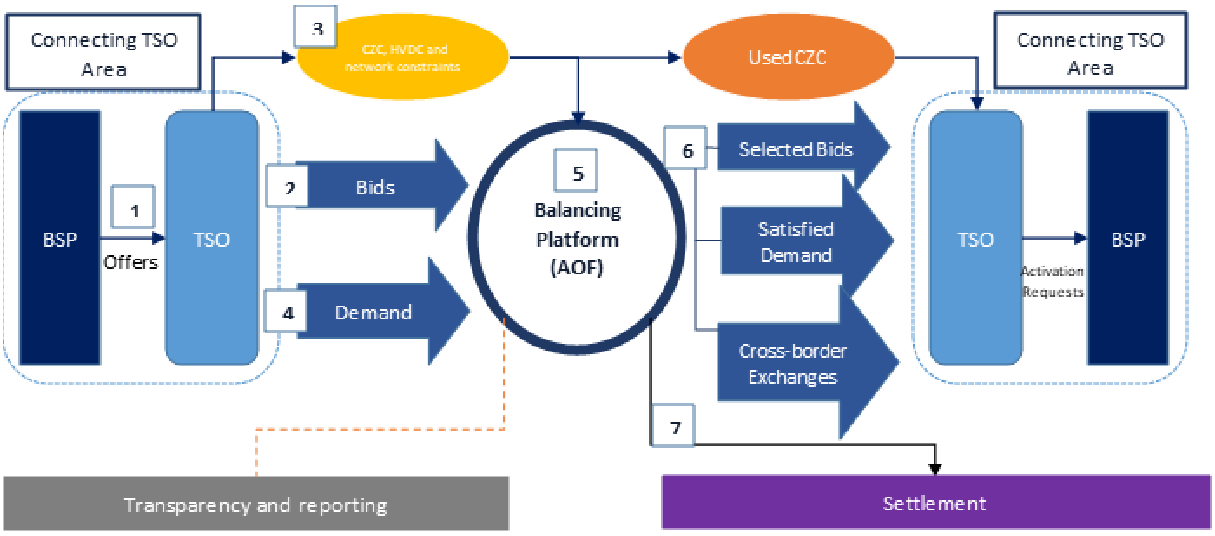

Figure 7.General functional structure of balancing platforms

Figure 8 illustrates the relevant process occurring in the interface for balancing timeframe:

[8] for TSO applying central dispatching model

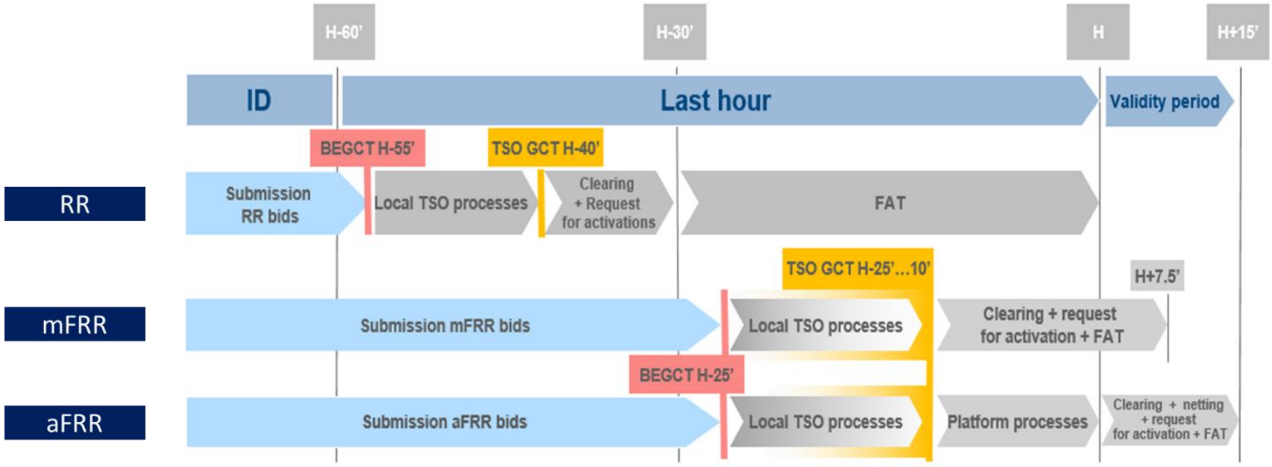

Figure 8. Balancing energy processes: relevant timings

EBGL does not foresee EU platform for FCR energy products nor any specific requirement for the settlement of the energy that is provided or consumed during Frequency containment process (FCP) due to activation of FCR balancing capacity. Taking into account the already applicable solution in EU countries the energy that is provided or consumed during provision of the FCR balancing capacity service shall be considered as imbalance and settlement is performed in accordance with BRP terms and conditions.

Baltic TSOs do not foresee to implement frequency replacement process (RP) process therefore joining with the TERRE platform could be considered if there would be interest from market participants to provide the standard product of RR defined in the Replacement Reserves Implementation Framework, pursuant to Article 19(1) of the EBGL (FAT is 30 minutes) and implementation of RP process should be based cost-benefit analysis.

7.3 aFRR balancing energy market in Baltic LFC block

Baltic TSOs will be joined to the European aFRR balancing energy platform (PICASSO) in accordance with article 21(6) when the automatic frequency restoration process (aFRP) will be established in Baltic power systems. aFRR balancing energy bid activations in Baltic bidding zones will be executed in accordance with the results from AOF of the PICASSO and in accordance with the provisions as defined in the aFRR Implementation Framework. Each TSO will submit aFRR demand of relevant LFC area to PICASSO platform together with CBCLs as provided in Figure 9. In case of activation of aFRR energy bids in other LFC areas or imbalance netting the corrections signal (Pcorr) will be sent to Connecting TSO of respective LFC area to adjust the aFRR demand which afterwards will be processed with local merit order list of aFRR bids. Structure of activation process is provided bellow:

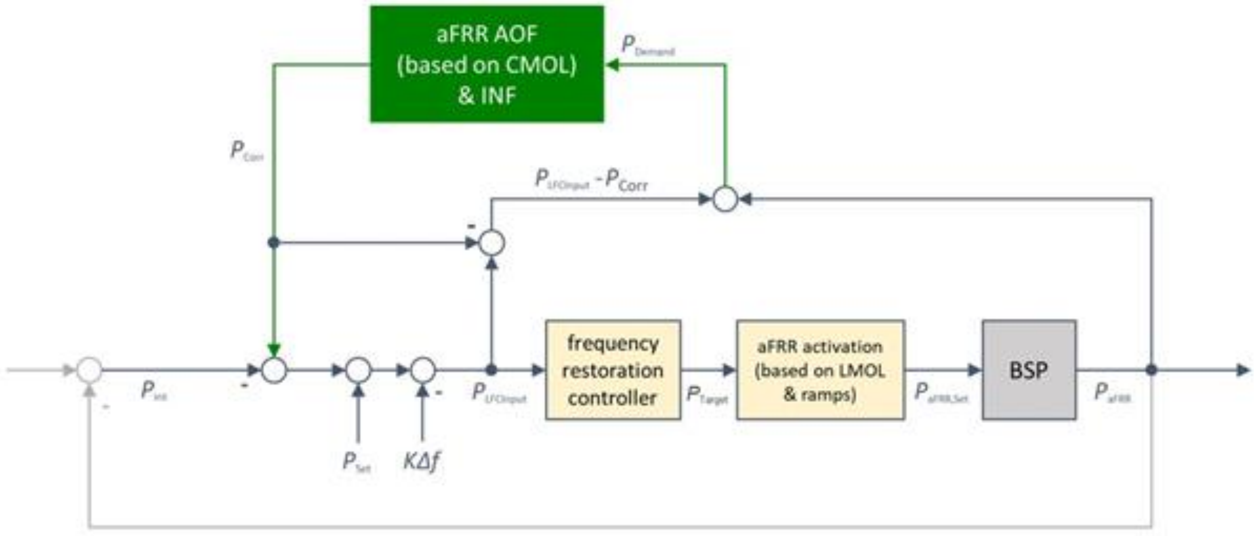

Figure 9. Activation process and aFRR demand estimation within one LFC Area

aFRR activation process is constant loop of data exchange and calculations. The frequency of this loop is yet not decided but will be within 4 to 10 seconds. BSPs will continuously receive set-points for the aFRR energy bids that have been provided for the TSOs and PICASSO platform. The set-point is received according to the granularity of the aforementioned loop via SCADA communications standard.

Integration with PICASSO platform will ensure the cross-border aFRR exchange between Baltic LFC areas and other areas that will be integrated with PICASSO. Currently imbalance netting process is handled in separate European platform IGCC, it is planned that PICASSO AOF will include the imbalance netting process, therefore Baltic TSOs have started the implementation of aFRR balancing energy market and participate in the PICASSO implementation project as observers. Roadmap for the implementation of Baltic aFRR balancing energy market is provided in Table 20.

MILESTONES	Deadline
Baltic aFRR balancing energy market rules and technical requirements (concept)	2021 Q4
IT implementations	2022-2024
Update standard terms and conditions for BSPs	2023
Testing of aFRR balancing market processes	2023-2024
Baltic TSOs join the PICASSO platform	2024
Baltic TSOs join the IGCC platform[9]	2024

[9] In case PICASSO will not include imbalance netting

Table 20. Roadmap for implementation of aFRR balancing energy market within one LFC Area.

It is planned that PICASSO AOF will include the imbalance netting process, therefore Baltic TSOs expect that by the time of Baltic TSOs will join the PICASSO platform at 2024, the PICASSO platform will be considered as imbalance netting platform pursuant to article 22 of EBGL regulation. In case imbalance netting is still handled by separate IGCC platform by the time when Baltic TSOs will join PICASSO platform, Baltic TSO will consider joining IGCC platform at the same time to ensure imbalance netting process implementation.

7.4 mFRR balancing energy market in Baltic LFC block

Baltic TSOs will be joined to the European mFRR balancing energy platform (MARI) in accordance with article 20(6) of EBGL and mFRR balancing energy bid activations in Baltic bidding zones will be executed in accordance with the results from AOF of the MARI and in accordance with the provisions as defined in the mFRR Implementation Framework. Each TSO will submit mFRR demand of relevant LFC area to MARI platform together with CBCLs as provided in Figure 7. In case of activation of mFRR energy bid in Baltic LFC areas, activation order from MARI will be sent to Connecting TSO of respective LFC area, which will submit activation order to respective BSP.

Integration with MARI platform will ensure the cross-border mFRR exchange between Baltic LFC areas and other areas that will be integrated with MARI: Sweden, Finland and Poland.

There will be process for activation of mFRR energy bids locally not via MARI platform in case mFRR energy demand submitted for LFC area cannot be satisfied or it cannot be processed in MARI platform due to technical issues.

Roadmap for the Baltic mFRR balancing market development will be further provided together with public consultation of Baltic Balancing Market rules that is planned to be published on 2020 October by Baltic TSOs. Baltic TSOs foresees that changes to the Baltic mFRR balancing energy market due to synchronization with CESA will be limited to changes on TSO-TSO procedures and how the mFRR balancing energy demand shall be evaluated based on LFC structure. Following table gives the milestones for mFRR balancing energy market development.

MILESTONES	Timeline
Concept document for MARI implementation	2021 Q3
IT implementations (TSOs and BSPs)	2022
Amendment of terms and conditions for BSPs	2023 Q1

MARI platform implementation (TSOs)	2023 Q3

Table 21. MARI implementation roadmap

8 Balancing capacity markets in Baltic LFC block

8.1 Objective and high-level concept

To ensure the reliable operation of the Baltic electricity systems and to comply with all frequency and balance control requirements applicable to the CESA and regulations (SOGL and EBGL), Baltic TSOs have identified the relevant changes for further power system operation and markets setup. Baltic TSOs set the following objectives for the Baltic capacity markets:

1) Establish market mechanism to ensure procurement of required FCR and FRR reserves for operation with CESA;
2) Market mechanism shall promote exchange of balancing capacity through cross borders;
3) Market mechanisms shall provide right incentives for BSP and new market participants.

Baltic TSOs have agreed that each TSO shall be responsible to procure and provide its LFC area distributed share of dimensioned LFC Block reserves. Procured FRR of the Baltic LFC block will be shared and exchanged among TSOs to ensure availability of reserves to cover the need of each LFC area defined in the Chapter 6.5.6. The TSOs shall promote the establishment of an exchange of FCR and FRR reserves inside the LFC block in order to maximize the economic welfare.

Baltic TSOs have agreed also to strive to implement the common LFC reserves capacity market among two or all LFC areas within the agreed timeline with following principles:

1) Balancing markets and exchanging balancing capacity shall ensure operational security whilst allowing for maximum use and efficient allocation of cross-zonal capacity across timeframes;
2) The procurement of balancing capacity shall be market-based and organised in such a way as to be non-discriminatory between market participants in the prequalification process whether market participants participate individually or through aggregation;
3) Allocation of cross-border capacity shall be arranged in accordance with Article 38 of EBGL.

LITGRID AB highlights that establishment of common Baltic balancing capacity market requires to ensure non-discriminatory conditions for all Baltic market participants participating in common Baltic balancing capacity market. Harmonised tariff and tax regulatory framework for market participants that use gas as primary energy source shall be established. Non-discriminatory conditions shall ensure that market participants that use gas as primary energy source can participate in Baltic balancing capacity market on an equal terms and conditions with market participants from other areas and market participants using primary energy sources other than gas.

Above mentioned non-discriminatory condition should be evaluated and confirmed by Baltic NRAs for the establishment common Baltic balancing capacity market as described in this Concept document.

Final approval of the Baltic balancing capacity market design by Baltic NRAs shall be executed in accordance with Article 5(3b) of EBGL by approving the common and harmonized rules and process for the exchange and procurement of balancing capacity and with Article 5(4c) of EBGL by approving the national terms and conditions for BSPs and.

In this Chapter, Baltic TSOs introduces the vision about the balancing capacity products, requirements, market activities foreseen for Baltics. For background information the Baltic TSOs recommend to look into summary of common practises in the EU for Balancing Capacities that are described in the ENTSO-E report “2020 ENTSO-E Balancing Report”. The report can be found on ENTSO-E website: link to the report.

8.2 Capacity market requirements and common practices in EU

8.2.1 General description about EU FCR markets cooperation

The FCR Cooperation is not required by EBGL regulation; however, a voluntary initiative was set up by 10 TSOs[10] comprising seven countries[11]. This cooperation has been introduced in coordination with their respective NRAs. The main achievement of this platform is to procure this capacity through a common auction based on a common merit order list (CMOL) where the participant TSOs of the FCR Cooperation pool includes all the offers received from the BSPs connected to their respective grids.

FCR procurement features are as below:

Features	**FCR Procurement**
Procurement model	TSO-TSO-model
Pricing	CBMP + compensations for TSO-TSO settlement Marginal pricing (CBMP, LMPi, LMPe) for TSO – BSP settlement
Product type	Symmetric product (meaning that upward and downward FCR are procured together)
Auctions timing	Daily auctions[12] Publication time at 16:00 CET at the date of GCT. As of 1 July 2020 (delivery day), the target common and harmonised rules and processes will apply: 1) GOT in D-14 2) GCT at 08:00 CET in D-1 3) Publication time at 08:30 CET in D-1
Auctions information	The auction calendar is notified by TSOs to their BSPs in November of the previous year at the latest.
Product duration	Duration is one day (within 24h). As of 1 July 2020 (delivery day), the product duration will be 4h, with 6 independent products in a day (0-4h, 4-8h, 8-12h, 12-16h, 16-20h, 20-24h).

[10] APG, Elia, Swissgrid, 50Hertz, Amprion, TenneT DE, TransnetBW Energinet (DK1), RTE and TenneT NL

[11] Austria, Belgium, Switzerland, Germany Denmark (Dk1), France and the Netherlands

[12] GOT in D-14

Bids divisibility	The Auction Allocation Algorithm allows divisible bids together with indivisible bids in all participating TSOs. Indivisible bids have a maximum bid size of 25 MW.
Bid size	The minimum bid size is 1 MW and the bid resolution is 1 MW
TSO – BSP Settlement	The TSO-BSP settlement will be based on pay-as-clear (marginal pricing - CBMP, LMPi, LMPe)[13]
TSO – TSO Settlement	Marginal pricing (CBMP) and compensations[14]

Table 22. FCR procurement features

8.2.2 General description about EU FRR capacity market requirements and standard products

Each connecting TSO is responsible for the prequalification for the provision of the standard product for balancing capacity of the reserve-providing units and/or reserve-providing group in its LFC Area. Each standard balancing capacity product bid submitted by each BSP shall fulfil the general product requirements described in Chapter 8.5.1.

8.2.2.1 *EU harmonised FRR and RR standard capacity products*

For each contracted standard aFRR balancing capacity product, each BSP shall provide corresponding capacity in the form of integrated scheduling process bids or standard aFRR balancing energy product bid(s) the aFRR standard bids as follows:

[13] Core shares, also called import limits (which are mandatory according to ANNEX VI SOGL) and Maximum transfer of capacities, also called export limits (which are mandatory according to ANNEX VI SOGL).

[14] If the import limit of a country is hit, the country has to pay a higher or equal price (LMPi) to BSPs than it has to pay for compensation to the other (exporting) TSOs (CBMP). Whereas, If the export limit of a country is hit, the country has to pay a lower or equal price (LMPe) to BSPs than it will get for compensation from the other (importing) TSOs (CBMP). In both cases the difference between the payment to the BSPs and the compensation from TSOs is summed up.

aFRR Product	#1	#2	#3	#4	#5
Validity period	15 minutes	1 hour	4 hours	1 day	1 week
The minimum duration between the end of deactivation period and the following activation	0 minutes				
Direction	Positive or negative				

Table 23. List of EU harmonised aFRR standard capacity products

For each contracted standard mFRR balancing capacity product, each BSP shall provide corresponding capacity in the form of integrated scheduling process bids or standard mFRR balancing energy product bid(s). Such bids shall be direct activation bids, provided that the delivery period does not exceed the end of the last validity period for which the BSP is contracted.

mFRR Product	#1	#2	#3	#4	#5	#6	#7
Validity period	15 minutes		1 hour		4 hours	1 day	1 week
The minimum duration between the end of deactivation period and the following activation	0	0-8 hours	0	0-8 hours	0	0	0
Direction	Positive or negative						

Table 24. List of EU harmonised mFRR energy products

For each contracted standard RR balancing capacity product, each BSP shall provide corresponding capacity in the form of integrated scheduling process bids or standard RR balancing energy product bid(s).

RR Product	#1	#2	#3	#4	#5
Validity period	15 minutes	1 hour	4 hours	1 day	1 week
The minimum duration between the end of deactivation period and the following activation	0 minutes				
Direction	Positive or negative				

Table 25. List of EU harmonised standard RR products

8.2.2.2 *aFRR capacity market in the Nordic synchronous area*

The Nordic TSOs submitted methodological proposals for a common aFRR capacity market between the 11 Nordic bidding zones in April 2019 to their respective NRAs. The common Nordic market for aFRR Balancing Services will consist of two separate mechanisms:

1) Nordic aFRR capacity market where aFRR balancing capacity is procured before the day-ahead market, considering geographical distribution and network constraints. Reservation of Cross-zonal Capacity will be based on economic optimisation. The corresponding market-based allocation of CZC shall be determined together with the procurement of aFRR capacity one day (D-1) prior to the delivery day;
2) Nordic aFRR energy activation market where aFRR balancing energy is activated based on a Common Merit Order List. Balancing energy bids will be activated, considering network constraints in real time. Balancing energy in real time shall be provided by Balancing Service Providers (BSPs) whose Balancing Services are procured in advance in the aFRR capacity market, or by other Balancing Service Providers who can voluntarily offer Balancing Energy based on their availability.

The volume of aFRR capacity procured by TSOs consists of separate volumes for upward aFRR capacity and downward aFRR capacity. There will be a daily auction of aFRR capacity for each MTU. Prequalified BSPs will submit their aFRR capacity bids to the common aFRR capacity market.

The gate closure time for prequalified BSPs to submit aFRR capacity bids will be at most one day prior to the delivery day and fall between 00:00 and 12:00 CET. A single gate closure time will apply to the whole market, such that all prequalified BSPs must submit bids by the same point in time.

The TSOs will announce the gate closure time to submit aFRR capacity bids, or of any changes to this gate closure time. Such announcements will be made at least four weeks before they take effect, excepting instances when the gate closure time is exceptionally delayed or else the bidding window is reopened. In these instances, the TSOs will announce these changes as soon as they are able to.

In choosing the gate closure time, TSOs will endeavour to set the gate closure time as close to real time as possible subject to the need to both ensure the resilience of the balancing capacity market, for example in the event of insufficient bids or a technical failure, and fulfil the TSOs' obligations, notably in relation to maintaining the operational security of the power system and providing information on the CZC capacity available to the electricity market.

The procurement optimisation function selects aFRR capacity bids and allocates CZC for the purpose of exchanging aFRR capacity. Accepted bids shall be notified to the relevant BSPs no later than 30 minutes after completion of the procurement. Accepted aFRR capacity bids shall be fully available for aFRR energy activation during the delivery period. In the event that a BSP transfers its aFRR capacity obligation in accordance with Article 34 of the EBGL, this obligation to be fully available for aFRR energy activation during the delivery period will also be transferred as part of the capacity obligation.

The aFRR capacity bid shall comply with the following requirements:

1) minimum bid volume equals 1 MW;
2) the volume of the bid shall be divisible by 1 MW;
3) only a bid with a bid volume of less than 50 MW can be indivisible; and
4) the full activation time of the bids shall be set by each TSO in accordance with the methodologies pursuant to article 157 and 159 of the SO GL Regulation.

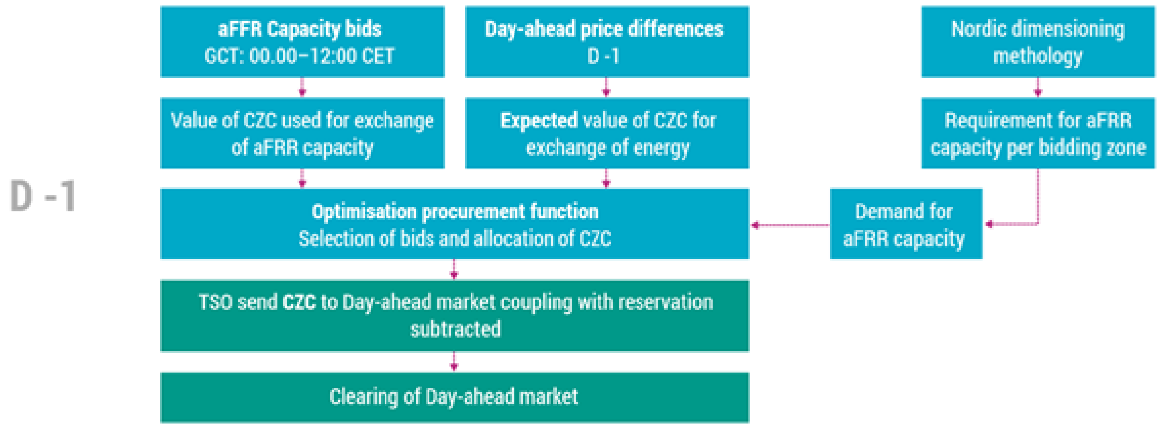

Figure 10. Nordic aFRR capacity market principle scheme

8.3 Prequalification processes for balancing capacity markets

Only a BSP with prequalified FCR and FRR resources can submit bids in the balancing capacity market in accordance with EBGL article 16 and SOGL article 155 and 159. The concept for FCR, aFRR and mFRR prequalification processes and qualification tests are described in Chapters 5.3 and 6.3.

Each TSO shall develop the terms and conditions for BSP which shall contain the rules for the qualification process to become a balancing service provider. Each Baltic TSO is responsible for the pre-qualification process and monitoring of the delivery from the BSPs in their control area. The Baltic TSOs have the intention to make the requirements and process of the pre-qualification as similar as possible in order to facilitate a well-functioning Baltic balancing capacity market.

As the Baltic TSOs shall need to start operating the fully operational load-frequency control once Baltic power system is synchronized with CESA, the Baltic TSOs wish to ensure and verify that Baltic region has enough reserves available that are capable of providing FCR, aFRR and mFRR services according to the SOGL and SAFA regulations. To verify the availability of the assets in the Baltic region, the Baltic TSOs propose the following actions:

1) Each Baltic TSO shall develop and publish the pre-qualification process and requirements for FCR and FRR balancing capacity provision by latest of Q4 2021;
2) Each Baltic TSO shall start with the pre-qualification process for capacity units in its systems for FCR and FRR balancing capacity provision by latest of Q4 2022. The TSOs shall share the data of prequalified reserve units and capacities with all other Baltic TSOs;
3) Baltic TSOs assess the volumes of prequalified reserve providing units if the available capacities fulfil the dimensioned capacities for LFC block and LFC areas by the end of 2023. If the prequalified reserve providing units do not fulfil the dimensioned volumes Baltic TSOs need to take actions to ensure the dimensioned reserve capacities are available to synchronize with CESA.

Baltic TSOs foresee that until synchronization with CESA there will raise a need to ensure the FCR, aFRR or mFRR reserves capacities that are compliant with CESA requirements for non-standard time period during the testing of Baltic LFC block load-frequency control capabilities. Only Reserve Units that have pre-qualified can participate in the procurement process.

8.4 Cross-zonal capacity allocation

According to the EBGL reliability margin calculated pursuant to the CACM shall be used for operating and exchanging FCR, additional cross zonal capacity shall not be allocated. To ensure the availability of FRR balancing capacities that are exchanged or shared the EBGL request TSOs to define the allocation process of CZC for the exchange of balancing capacity or sharing of reserves. Unlike to the balancing energy market, the balancing capacity seeks to ensure the system to be pre-prepared for the exchange of cross-zonal capacity and guarantees to the participant's parties involved that the cross-zonal capacity will be allocated when submitting a balancing energy bid.

According to EBGL, standard products of balancing capacity only need to be used if TSOs voluntarily implement balancing capacity cooperation where CZC is allocated. Besides, according to the recast electricity regulation[15], TSOs need to procure at least a part of their reserves from standard products of balancing capacity.

[15] Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019

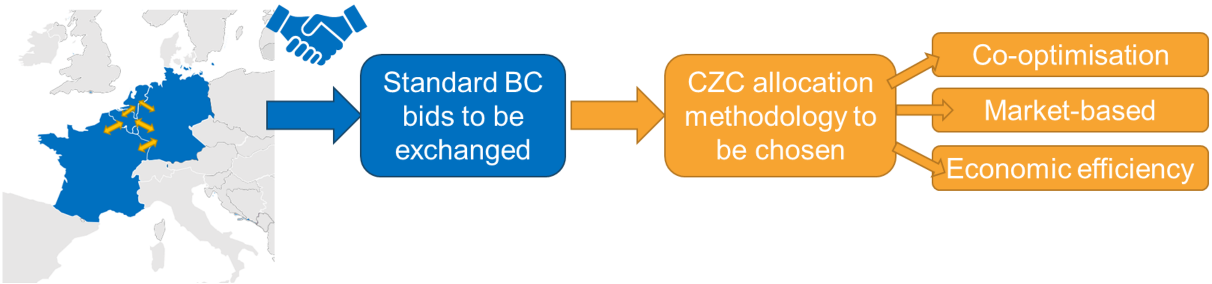

Figure 11. Balancing capacity products and cross-zonal capacity methodologies

For each contracted standard product for balancing capacity (be it aFRR, mFRR or RR), the qualified BSP for which the bid(s) was/were selected shall provide corresponding capacity in the form of integrated scheduling process bids or standard balancing energy product bid(s). Regardless of the methodology implemented, when allocating CZC for exchange of balancing capacity or sharing of reserves, the objective is always to maximise the economic surplus[16] from the (forecasted or actual) day-ahead bids and the (forecasted or actual) balancing capacity bids.

8.4.1 Cross-zonal capacity allocation for the exchange of balancing capacity or sharing of reserves

TSOs have to define methodologies for the allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves based on three processes -i.e. co-optimised allocation, market-based allocation and allocation based on economic efficiency analysis. Table 26 summarises the key aspects of these approaches.

	The co-optimised approach (EBGL, art 40)	The market-based approach (EBGL, art 41)	The economic efficiency approach (EBGL, art 42)
Value of CZC for energy exchange day-ahead and intraday	Value based on actual bids	Value forecasted	Value forecasted
Value of CZC for balancing capacity exchange	Value based on actual bids	Value based on actual bids	Value forecasted
Decision time for allocation of CZC/contracting	At D-1 12:00. Part of the market coupling in day-ahead time-frame	At D-1 12:00 or At ≦ W-1 and > D-1. D-1 before sending the	At > W-1. More than one week in advance of the provision of the balancing capacity

[16] The sum of producer surplus (supply bids), consumer surplus (demand bids), and the congestion income

period for balancing capacity		CZC to the day-ahead market coupling	

Table 26. Cross-zonal capacity allocation methodologies with their main characteristics

Following Chapters 8.4.1.1 to 8.4.1.4 provide a more detailed description of the three approaches and introduces also probabilistic approach.

8.4.1.1 ***Co-optimised approach***

The co-optimised allocation process refers to a single, unified process for the allocation of cross-zonal capacity between the energy and balancing markets based on actual bids (see Figure 12). The contracting for the exchange of balancing capacity must be done "not more than one day in advance of the provision of the balancing capacity". This implies a change in the market coupling algorithm and functioning in order to allow TSOs to participate and place asks for reserves products while (pre-qualified) market participants may place offers to provide reserves products. The market coupling algorithm would then minimise the cost to procure energy and balancing capacity at the same time and allocate transmission capacity optimally to energy trade and balancing capacity exchange.
It is Baltic TSOs expectation that co-optimised approach is not available for utilisation in 2025 and this methodology is, therefore, not considered to be feasible for the purpose of cross-zonal capacity allocation from the start of synchronous operation with CESA. At the same time, the approach would probably be most economically efficient and Baltic TSOs will certainly consider utilisation of the methodology when available.

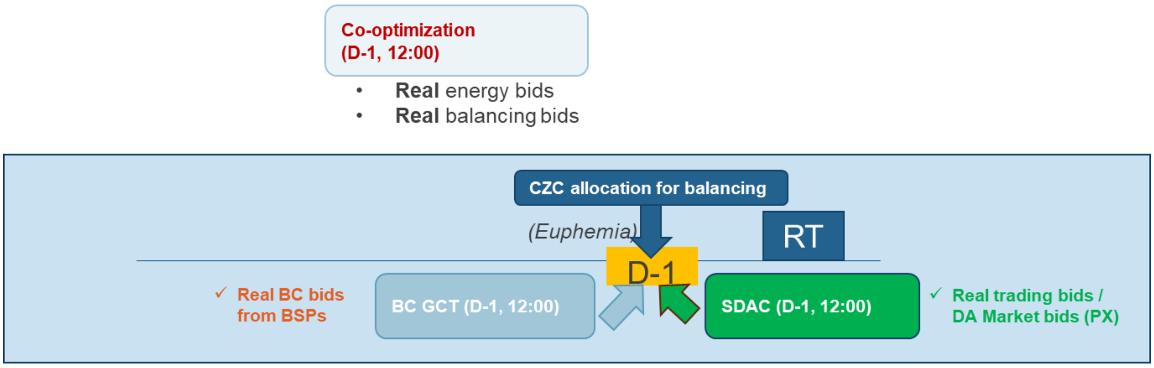

Figure 12. Process for co-optimised approach

8.4.1.2 ***The market-based approach***

The market-based allocation process refers to the allocation of cross-zonal capacity for the exchange of balancing capacity based on the actual value of reserves and the forecast value of day-ahead energy (see Figure 13). If the forecast value of energy is higher at a pre-agreed point in time (e.g. at D-2), transmission capacity is allocated for the exchange of energy. The contracting for the exchange of balancing capacity must be done “not more than one week in advance of the provision of the balancing capacity”. If the reservation of transmission capacity is contracted more than two days in advance of the provision of balancing capacity, the maximum transmission capacity allocation that is permitted is 10% of the available capacity of the exchange of energy between bidding zones.

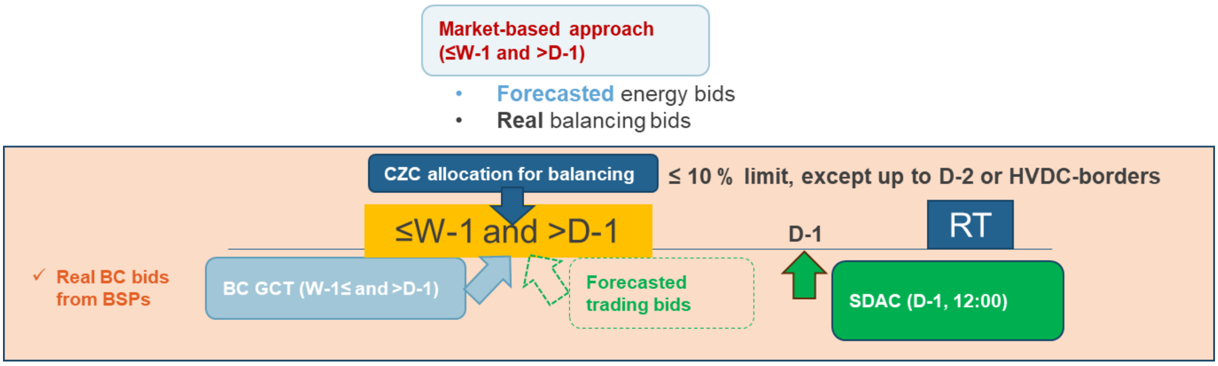

Figure 13. Process for market-based approach

8.4.1.3 ***The economic efficiency approach***

An allocation process based on economic efficiency analysis is based on the ex-ante forecasts of the benefits of reserving transmission capacity for reserves relative to the benefits of reserving transmission capacity for energy. Similar to the market-based allocation process, the reservation of transmission capacity for the exchange of reserves is made if the benefits expected based on forecasts are higher than for the exchange of energy. The contracting for the exchange of balancing capacity must be done “more than one week in advance of the provision of the balancing capacity”.

8.4.1.4 ***The probabilistic approach***

An allocation process based on a probabilistic approach refers to a balancing capacity exchange based on an ex-ante forecast of available cross-zonal capacity after the day-ahead and intraday markets. The forecast will then be used as available transmission capacity by the capacity procurement optimisation function and exchange will be possible in cases where the forecast predict that the wholesale markets will not utilize all available cross-zonal capacity. In cases where the forecast predicts a lower wholesale market utilization than the actual outcome and the exchanged balancing capacity is activated, the system operator use remedial actions, primarily countertrade, to alleviate the system and secure operation within the security limitations.

At least one of these methodologies (co-optimised allocation) has been defined by all TSOs. The other was left for each CCR to develop and implement with the scope of the CCR voluntarily. Apart from the process, the main difference between these three is the timeframe in which the contracting period and allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves is done.

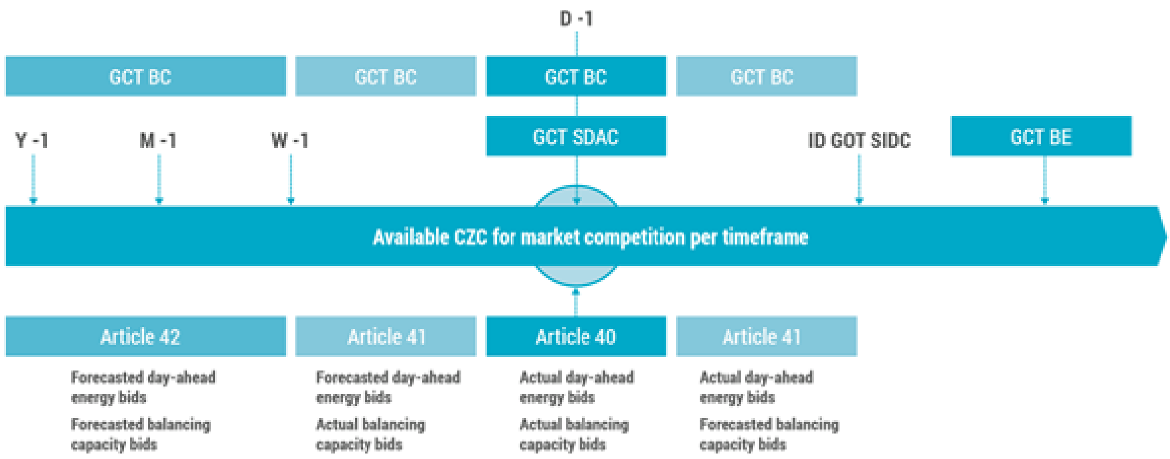

Figure 14. Possible approaches for allocation of CZC for the exchange of balancing capacity or sharing of reserves within a timeline

8.4.2 **Proposal for Baltic LFC block for CZC allocation**

No additional CZC will be allocated for FCR exchange in Baltics, necessary amount of FCR capacity will be included in calculation of the reliability margins pursuant to the CACM.

Baltic TSOs foresee that market-based CZC allocation approach would be possible mechanism to ensure CZC allocation for sharing and exchange of FRR balancing capacity. The reasons for proposing market-based approach are as follows:

1) While co-optimised approach would probably be most economically efficient, Baltic TSOs do not expect the approach to be available in the timescale of synchronisation. The timeline of European Single Day-ahead Coupling development processes is agreed on European level between TSOs and NEMOs, and therefore, Baltic TSOs have limited influence on the development of co-optimised approach. Therefore, it is not feasible to count on applying the co-optimised approach at the planned start of Baltic balancing capacity market. Co-optimised approach is considered as the target solution, however it shall not hinder the implementation of Baltic balancing capacity market;
2) Economic efficiency approach is a simplified allocation process based on an ex-ante economic analysis. Both balancing and day-ahead value of CZC is forecasted. This approach is limited to markets applying longer contracting periods and procurement is done more than a week before provision (EBGL, Article 42). The forecasted values and longer procurement time would introduce economic inefficiencies. Further, the capacity allocation

would be limited to 10% on CZC, which may be insufficient for economically efficient solution;
3) The probabilistic approach does not guarantee sufficient balancing capacity availability and requires additional reserves to do counter-trade, when needed. It also does not compare the value of CZC for day-ahead energy and balancing capacity, leading to potential loss of economic value. Therefore, Baltic TSOs do not propose using this approach;
4) Nordic TSOs are in process of applying the market-based approach for the aFRR capacity market. Having the same approach with Nordic TSOs increases the potential for integrating the balancing capacity markets, which would increase economic efficiency of procurement of balancing capacity.

Baltic TSOs foresees following principles for MB CZCA method:
1) The Baltic TSOs shall dimension the LFC block FRR capacities commonly and distribute the reserve capacities according to the method described in Chapter 6.5;
2) CZC between LFC areas should be allocated to ensure for each TSO the access to needed reserves for an LFC area;
3) All TSO shall procure required LFC reserves (demand of each LFC area) in single optimisation algorithm, thus ensuring coordinated CZC allocation in Baltic region;
4) The settlement for the winning bids would be priced based on the marginal pricing methodology;
5) The objective function for the allocation of cross-zonal capacity between Single day ahead coupling and the exchange of balancing capacity or sharing of reserves shall be the maximisation of the sum of expected economic surplus for SDAC and the economic surplus from the exchange of balancing capacity or sharing of reserves per trading day;
6) The CZC that is allocated for sharing or exchange shall be subtracted from the available CZC and remaining CZC shall be provided to the day-ahead market;
7) The LFC block reserve procurement costs are shared between TSOs based on the LFC block dimensioning rules.

Figure 15 presents a possible overview for the market-based allocation process. The capacity procurement function uses the bids, LFC block and area demands, the cost and availability of the CZC as input information to maximise the economic surplus of reserve procurement. The output of the optimization function are the winning bids, the CZC that is allocated for reserve sharing or exchange and the total cost of reserves.

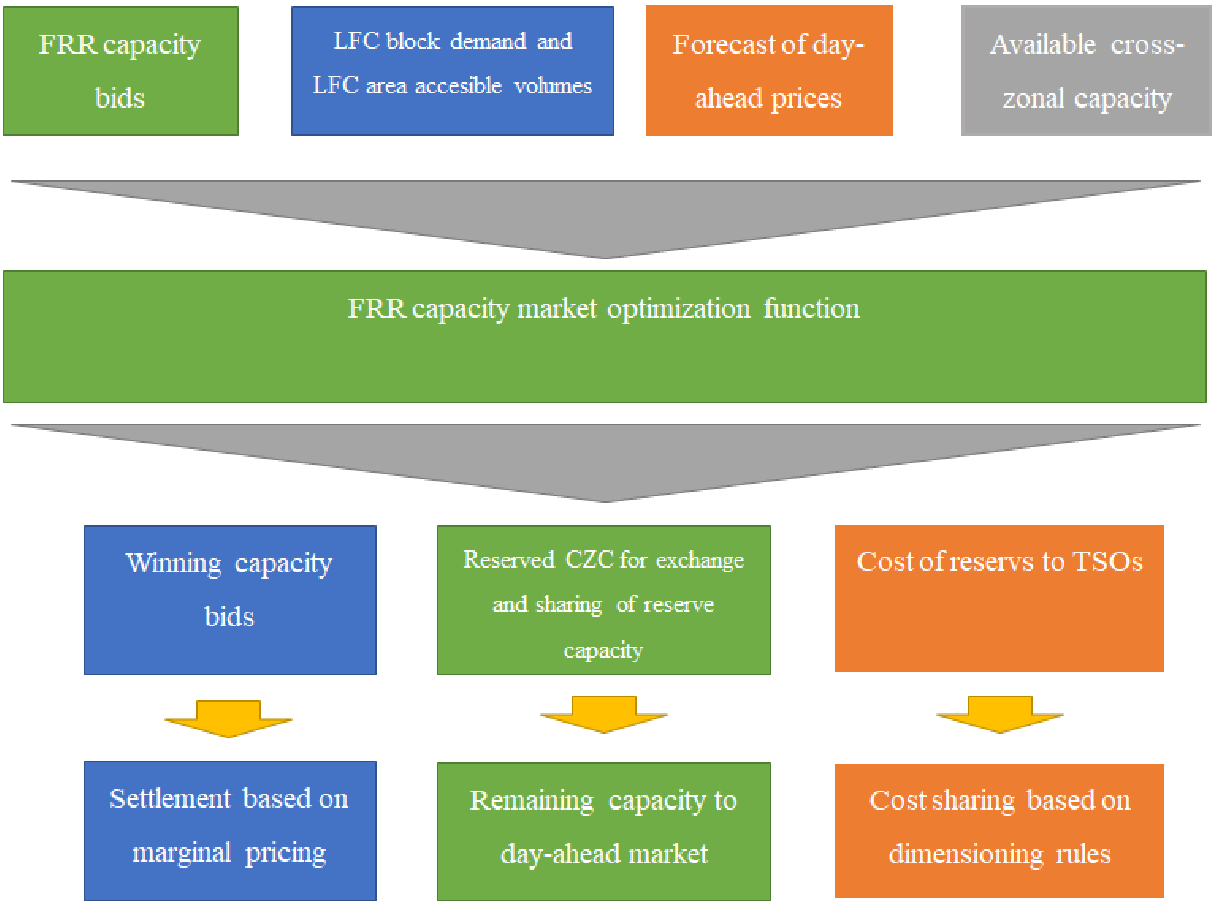

Figure 15. General procurement process for FRR capacity reserves

Baltic TSOs plans to develop the proposal for Implementation of MB CZC allocation method with harmonized rules and process for the exchange and procurement of balancing capacity pursuant to Article 33(1) of EB GL and submit for public consultation. Further steps for establishment of common Baltic balancing capacity market are shown in Table 27.

Task	Deadline
Harmonized rules and process for the exchange and procurement of balancing capacity pursuant to Article 33(1) of EB GL (Proposal)	2022 Q1
Public consultation of Proposal	2022 Q2
Baltic TSOs submit Proposal for Baltic NRA approval	2022 Q3
Baltic NRAs approves the Proposal	2023 Q1
IT Implementation of procurement optimisation function	2022-2024
Amendment of standard terms and conditions for BSPs	2023
Go-live of Baltic balancing capacity market	2025 Q1

Table 27. Baltic TSOs roadmap to develop CZC allocation method

8.5 Balancing capacity market framework concept for Baltic

Baltic TSOs wish to adapt best practices from the CESA and see that similar processes for capacity procurement can be used. Following Chapters describe the common requirements for capacity reserves and then introduce the Baltic vision for FCR, aFRR and mFRR capacity procurement and products.

Figure 16 illustrates the differences between the harmonisation level of balancing energy and balancing capacity markets:

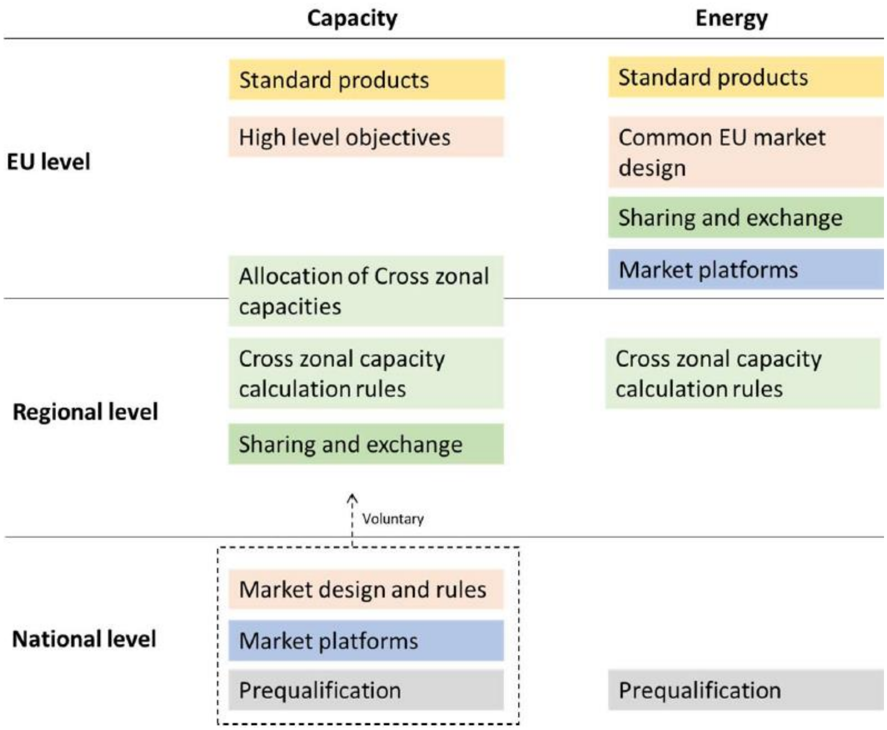

Figure 16. Differences in regulation of the balancing capacity market and the balancing energy market

8.5.1 Product description for capacity markets

As a general requirement each standard balancing capacity product bid submitted by each BSP shall fulfil the following characteristics:

1) The standard balancing capacity product bid price shall be submitted in (EUR/MW)/h and has a resolution of 0.01 (EUR/MW)/h;
2) the price of each bid shall be positive or zero and the payment shall be from TSO to BSP;
3) the minimum bid quantity and granularity shall be 1 MW;
4) for indivisible bids, the bid quantity shall not exceed the value defined by the TSOs exchanging balancing capacity or sharing of reserves;
5) the location of the bid shall be at least the smallest of LFC Area or bidding zone in which the providing units and/or providing groups are connected to. More detailed locational information may be required in terms and conditions for BSPs pursuant to Article 18(5) of the EBGL.

8.5.2 **Balancing Service Provider roles and responsibilities**

BSP is responsible for providing bids for balancing energy or balancing capacity including:

1) Each BSP shall submit to the connecting TSO its balancing capacity bids;
2) Each BSP participating in the procurement process for balancing capacity shall submit and have the right to update its balancing capacity bids before the gate closure time of the procurement process;
3) Each BSP with a contract for balancing capacity shall submit to its connecting TSO the balancing energy bids or integrated scheduling process bids corresponding to the volume, products, and other requirements set out in the balancing capacity contract;
4) Any BSP shall have the right to submit to its connecting TSO the balancing energy bids from standard products or specific products or integrated scheduling process bids for which it has passed the prequalification process;
5) For each product for balancing energy or balancing capacity, the reserve providing unit, the reserve providing group, the demand facility or the third party and the associated balance responsible belong to the same scheduling area.

8.5.3 **Procurement and auctions**

Baltic TSOs foresee that all capacity of balancing reserves shall be procured in a daily auction as it is defined in Article 6 point 9 of Electricity Regulation. Daily auctions allows to maximize the usage of CZC allocation for FRR without any addition constrains that are foreseen for allocation for longer periods than D-2 in Article 41(2) of EBGL. Table 28 provides a general overview for different balancing capacity auctions. The balancing reserve procurement shall take place before the day-ahead market. For each reserve type a common merit order list is created based on the balancing capacity bids received from the BSPs. These bids are compared to the balancing reserve capacity demands.

Reserve	**FCR symmetrical product**	**aFRR upward product**	**aFRR downward product**	**mFRR upward product**	**mFRR downward product**
Type	Daily	Daily			
Period	24 h (00-24)	24 h (00-24)			
Validity periods	96	96			
GOT* (EET)	D-14 00:00	D-14 00:00			
GCT* range (EET)	D-1 08:00 – 08:30	D-1 09:30 – 10:00			
Publication range (EET)*	D-1 08:30 – 09:00	D-1 10:00 – 10:20			

**- the times in the table are indicative and are not final/binding*
Table 28. Concept for Baltic LFC procurement auctions

To optimize the auction processes the capacity reserve bids can be linked to different auctions. In case a reserve provider makes bids for FCR and are not procured the reserve provider can transfer the bid to the aFRR or mFRR auction. This is valid in case the reserve provider has prequalified for all service types.

8.5.4 Procurement optimisation

Procurement uses allocation algorithm that minimises the overall procurement costs for the Baltic LFC market. The optimisation algorithm for FRR procurement has the following constraints:

1) Take into account the net transfer capacities as well as exchange and sharing limits between bidding zones;
2) Maximize the economic welfare for procurement and CZC allocation processes to ensure LFC block demand;
3) Ensure that each LFC area has access to the accessible volumes of FRR determined in Chapter 6.5.6;
4) Respect the characteristics and product requirements;
5) If there is a set of equally optimal solutions to cover the LFC block demand, the volumes of CZC allocated of exchange and sharing of balancing capacities shall be minimized.

The optimisation algorithm for FCR procurement has the following constraints:

1) Take into account the exchange and sharing limits between bidding zones;
2) Maximize the economic welfare for procurement to ensure LFC area demands;
3) Respect the characteristics and product requirements;

After considering all these conditions and preferences, if there are still more than one optimal solution (e.g., two bids with the same volume, cost, and timestamp), what first comes out as a result of the algorithm will be accepted.

8.5.5 Settlement rules for balancing capacities

The exchange of balancing capacity between TSOs, according to Article 33 (2) of EBGL, shall always be performed based on a TSO-TSO model:

1) The settlement of the BSPs for the selected offers shall be done by connecting TSO according to marginal price of product (FCR, aFRR, mFRR);

2) TSOs shall implement TSO-TSO settlement agreement to deliver the payment from demand TSO to BSP whose offer were selected;
3) TSOs shall implement cost-sharing principles to cover the cost of procuring the reserves from market. The cost-sharing shall follow the results of LFC block capacity distribution between LFC areas described in Chapter 6.5.

8.6 Baltic FCR capacity market concept and product

8.6.1 High-level design of the Baltic FCR capacity market

According to requirements the total FCR amount for CESA shall be at least 3000 MW which is distributed for each connected system in proportion with annual electricity consumption and generation. The exact quantity of the balancing capacity of the FCR is determined for each calendar year in advance.

Therefore, the estimated volumes for each Baltic LFC area to provide FCR amounts for CESA cooperation are as follows: EE 8 MW, LV 8 MW, LT 9 MW. The volumes shall be procured for both directions symmetrically – upwards and downwards.

Baltic TSOs foresees to develop the FCR capacity market based on re-use of best practises for FCR cooperation in Europe to ensure future integration of regional markets. Exchange of FCR balancing capacity among Baltic LFC areas shall be based on TSO-TSO model pursuant EBGL Articles 33(1) and 32(2) and taking into account the SOGL limitations. BSPs wanting to participate in the FCR balancing capacity market have to request from Connecting TSO qualification of their technical capability to provide bids. Connecting TSO shall qualify BSPs pursuant EBGL Articles 16 and 18(5).

BSP shall guarantee the availability of 100% of the procured FCR capacity that is procured by the TSO. The following table provides roadmap for FCR capacity market development.

MILESTONES	Timeline
FCR prequalification process documents published by each TSO	2021 Q4
Terms and conditions for FCR BSPs	2022 Q4
FCR prequalification process implementation	2022 Q4
Milestone when dimensioned FCR quantities shall be technically present in each LFC area	2024 Q4
FCR market and settlement rules	2024 Q4
FCR procurement process implementation (all Baltic TSOs)	2025 Q1

Table 29. FCR capacity market roadmap

8.6.2 FCR Balancing capacity products

The following table describes the Baltic FCR capacity product.

Parameter	Product description
Auction periods	Daily auction
Direction:	symmetrical (upward and downward together)
Validity period	15 minutes
Minimum size	1 MW
Maximum size	as defined in prequalification of BSP units.
Divisibility	divisible in 1MW
Price of the bid	In €/MW
Volume	In MW
Availability	FCR capacity bids shall be fully available for FCR energy activation during the delivery period. In the event that a BSP transfers its FCR capacity obligation in accordance with Article 34 of the EBGL, this obligation to be fully available for FCR energy activation during the delivery period will also be transferred as part of the capacity obligation.
Price method	Marginal pricing
Settlement	TSO-TSO and connecting TSO-BSP

Table 30. FCR concept product

8.7 Baltic FRR capacity markets and products

8.7.1 Proposal for Baltic aFRR capacity market

Determination of the scope of the FRR balancing capacity in accordance with the requirements of the SOGL is carried out on the scale of the LFC block. In this document Baltic TSOs foresees to create common Baltic LFC block.

The detailed aFRR balancing capacity dimensioning principles and methods are described in Chapter 6.5 in this document. Due to target to restore the balance deviations within 15 minutes the aFRR balancing capacity quantity is determined according to the balance deviations meaning that the exact quantity of the aFRR will depend on the actual deviations of the systems and their distribution.

8.7.1.1 *High-level design of the Baltic aFRR capacity market*

Baltic TSOs foresees to develop the aFRR capacity market based on the CESA requirements and align with best practices from Nordic aFRR capacity market summarised in Chapter 8.2.2.2. Each BSP participating in the Baltic aFRR capacity market shall be prequalified in accordance with Articles 16 and 18(5) of the EBGL. Prequalified BSPs shall be eligible to submit aFRR capacity bids to the Baltic aFRR capacity market. The volume of aFRR capacity procured by TSOs consists of separate volumes for upward aFRR capacity and downward aFRR capacity.

The bid format and communication protocol shall be in accordance with ENTSO-E data exchange recommendations. The latest versions of the recommendations shall be made available on the TSOs' websites. The TSOs shall be able to view all bids submitted for the Baltic aFRR capacity market. The procurement optimisation function selects aFRR capacity bids and allocates CZC for the purpose of exchanging aFRR capacity. The TSOs shall not increase the reliability margin calculated in accordance with Article 22 of the CACM Regulation due to the exchange of aFRR capacity.

BSP shall guarantee the availability of 100% of the procured aFRR capacity that is procured by the TSO. The following table provides roadmap for aFRR capacity market development.

MILESTONES	Timeline
aFRR prequalification process documents published by each TSO	2021 Q4
Terms and conditions for aFRR BSPs	2022 Q4
aFRR prequalification process implementation	2022 Q4
Milestone when dimensioned aFRR quantities shall be technically present in each LFC area	2024 Q4
aFRR market and settlement rules	2024 Q4
aFRR procurement process implementation (all Baltic TSOs)	2025 Q1

Table 31. aFRR capacity market roadmap

8.7.2 Proposal for Baltic mFRR capacity market

Baltic TSOs foresees to develop the mFRR capacity market based on requirements for European balancing capacity product and re-use best practices to ensure future integration of regional markets. mFRR capacity is used to balance larger system imbalances and free up already activated aFRR. The detailed mFRR balancing capacity dimensioning principles and methods are described in Chapters 6.5 in this document

8.7.2.1 *High-level design of the Baltic mFRR capacity market*

Each BSP participating in the Baltic mFRR capacity market shall be prequalified in accordance with Articles 16 and 18(5) of the EBGL. Prequalified BSPs shall be eligible to submit mFRR capacity bids to the Baltic mFRR capacity market. The volume of mFRR capacity procured by TSOs consists of separate volumes for upward mFRR capacity and downward mFRR capacity. The bid format and communication protocol shall be in accordance with ENTSO-E data exchange recommendations. The latest versions of the recommendations shall be made available on the TSOs' websites. The TSOs shall be able to view all bids submitted for the Baltic mFRR capacity market. The procurement optimisation function selects mFRR capacity bids and allocates CZC for the purpose of exchanging mFRR capacity. The TSOs shall not increase the reliability margin calculated in accordance with Article 22 of the CACM Regulation due to the exchange of mFRR capacity.

BSP shall guarantee the availability of 100% of the procured mFRR capacity that is procured by the TSO. The following table provides roadmap for mFRR capacity market development.

MILESTONES	Timeline
mFRR prequalification process documents published by each TSO	2021 Q4
Terms and conditions for mFRR BSPs	2022 Q4
mFRR prequalification process implementation	2022 Q4
mFRR market and settlement rules	2024 Q4
mFRR procurement process implementation (all Baltic TSOs)	2025 Q1

Table 32. mFRR capacity market roadmap

8.7.2.2 *Baltic aFRR capacity product*

Standard product for Baltic aFRR capacity foresees to be with validity period 15 minutes and follow the requirements described in Chapter 8.5.1. Indivisible bids are not allowed and the bid quantity shall not exceed the value defined during prequalification of BSP units. The following table provides additional information for Baltic aFRR capacity product.

Parameter	Product description
Auction periods	Daily auction
Direction:	upward or downward
Validity period	15 minutes
Minimum size	1 MW
Maximum size	as defined in prequalification of BSP units.

Divisibility	divisible in 1MW
Price of the bid	In €/MW
Volume	In MW
Availability	Accepted aFRR capacity bids shall be fully available for aFRR energy activation during the delivery period. In the event that a BSP transfers its aFRR capacity obligation in accordance with Article 34 of the EBGL, this obligation to be fully available for aFRR energy activation during the delivery period will also be transferred as part of the capacity obligation
Price method	Marginal pricing
Settlement	TSO-TSO and connecting TSO-BSP

Table 33. Baltic aFRR capacity product concept

8.7.2.3 ***mFRR Balancing capacity Product***

The standard product for Baltic mFRR capacity bid shall follow the requirements described in Chapter 8.5.1. The following table provides additional information for Baltic mFRR capacity product.

Parameter	**Product description**
Auction periods	Daily auction
Direction:	upward or downward
Validity period	15 minutes
Minimum size	1 MW
Maximum size	Defined in prequalification of BSP units.
Divisibility	Divisible in 1MW or indivisible bids as defined in prequalification of BSP units.
Price of the bid	In €/MW
Volume	In MW
Validity period	MTU
Availability	Accepted aFRR capacity bids shall be fully available for aFRR energy activation during

	the delivery period. In the event that a BSP transfers its aFRR capacity obligation in accordance with Article 34 of the EBGL, this obligation to be fully available for aFRR energy activation during the delivery period will also be transferred as part of the capacity obligation
Price method	Marginal pricing
Settlement	TSO-TSO and connecting TSO-BSP

Table 34. Baltic mFRR capacity product concept

8.8 Baltic LFC block proposal for exchange and sharing of balancing reserve capacity

The limits for the maximum reserve capacity exchange that is allowed for different type of reserves between LFC blocks and synchronous areas are defined in Annex VI and VII of SOGL.

8.8.1 **FCR capacity sharing rules**

As the FCR obligations of the synchronous area are distributed between all TSOs of the synchronous area and all TSOs have to support the synchronous area FCP, then FCR sharing within synchronous area is not allowed to reduce the required FCR.

Sharing FCR with other synchronous areas is allowed based on Article 174 of SOGL. The FCR sharing agreements are made on the synchronous area level and Baltic LFC block shall follow CESA agreement requirements for possible FCR sharing with Nordic TSOs:

1) Sharing of FCR where CESA is reserve connecting SA – the total maximum shared FCR amount shall not exceed the security limits for CESA that is calculated on a yearly basis.
2) Sharing of FCR where CESA is reserve receiving SA is not allowed

8.8.2 **FCR capacity exchange rules**

Exchange of FCR capacity is allowed within and outside the synchronous area. The limits for FCR exchange inside the common synchronous area are defined in Annex VI of SOGL, which state that 30% of the TSOs obligation or maximum of 100 MW can be exchanged within the synchronous area.

Exchanging FCR with other synchronous areas is allowed based on Article 173 of SOGL. The FCR exchange principles are made on the synchronous area level and Baltic LFC block shall follow CESA agreement requirements for possible FCR exchange with Nordic TSOs.

8.8.3 **FRR capacity sharing rules**

Sharing of FRR, including both aFRR and mFRR, is allowed within and outside the synchronous area. LFC blocks have the right to make FRR sharing agreements with other LFC blocks of the same synchronous area within the limits set by the Article 157 of SOGL, which state that the maximum sharing capacity of upward regulation capacity is limited to 30% of the positive dimensioning incident of that LFC block and maximum sharing capacity of downward regulation capacity is limited to the difference of the negative dimensioning incident and the reserve capacity on FRR required to cover the negative LFC block.
Sharing of FRR with other synchronous areas is allowed based on Article 177 of SOGL. The FRR sharing principles are made on the synchronous area level and Baltic LFC block shall follow CESA agreement requirements.

8.8.4 **FRR capacity exchange rules**

Exchange of FRR, including both mFRR and aFRR, is allowed within and outside the synchronous area. The limits for FRR exchange inside common synchronous area are defined in the Annex VII of SOGL, which state that not more than 50% of the LFC block dimensioned capacity can be exchanged with other LFC blocks.
Exchange of FRR with other synchronous areas is allowed based on Article 176 of SOGL. The FRR exchange principles are made on the synchronous area level and Baltic LFC block shall follow CESA agreement requirements.

8.8.5 **Baltic LFC block proposal for exchange and sharing**

As the Baltic LFC block shall be created for the synchronization with CESA, the Baltic TSOs have no sharing nor exchange agreements agreed upon with neighbouring LFC blocks, therefore exchange and sharing of reserves shall be established only between Baltic LFC areas. Nonetheless, after establishing Baltic LFC capacity market, the Baltic TSOs encourage and promote cooperation with neighbouring LFC blocks to achieve more efficient balancing capacity markets and to allow access for Baltic market participants to neighbouring LFC block capacity markets and vice versa.

8.9 Additional requirements for Baltic balancing capacity market

8.9.1 Baltic security of supply study for balancing capacities

As the Baltic balancing capacity reserve market will be relatively small in size, the liquidity and reliability problems may arise in the Baltic reserve market. To assess the potential risks on system security and liquidity of the market, the Baltic TSOs will conduct a common study to analyse following requirements for Baltic balancing capacity market:

1) Minimum reserve volume physically maintained inside LFC area to ensure the security of supply of Baltic power systems in case of network splitting or isolated operation. Minimum required level of FRR that is calculated from the LFC area dimensioned FRR capacity may be expected to be in range from 0% till 50% that is equal to the minimum volume of FRR that has to be present in LFC blocks according to SOGL Annex VII. Minimum required level of FCR that is calculated from the LFC area dimensioned FCR capacity may be expected to be in range from 0% till 70% that is equal to the minimum volume of FCR that has to present in LFC blocks according to SOGL Annex VI.
2) Reserve capacity bid sizes, - to ensure availability of reserves during emergency situations, maintenance periods of reserve providing- units and increase of frequency control quality. Considering existing practises in EU countries the maximum bid size might be expected to be in range from 20% till 40% of total Baltic LFC block reserve volumes.

The aim of the TSOs is to make sure that reserve costs to the end consumers are minimised while guaranteeing security of supply. Baltic TSOs aim to finish the study by the end of 2021 Q4 after which the results of the study shall be published.

8.9.2 Usage of TSO resources for balancing services

Baltic TSOs foresee that resources owned by TSOs should be taken into account to fulfil the dimensioned reserve need of TSO. Procured demand from BSP by each TSO shall be as needed amount of reserves on top of the available capacity of TSOs own reserves for particular period to fulfil the dimensioned volume requirement. TSO resources shall be shared according to same principles within Baltic LFC block.

The sharing of reserves between TSOs should take into account the CEP IE provisions that balancing capacity contracts shall not set the price for balancing energy and the price of balancing energy shall not be pre-determined in contracts for balancing capacity.

Nevertheless, Baltic TSOs have identified concerns regarding proposed approach and asks Baltic NRAs to provide guidance on the usage of TSO resources to reduce the procured capacity and for the TSO resource activation pricing. Above mentioned principles shall be further included in the proposal in accordance Article 33(1) of EBGL and submitted for Baltic NRAs approval.

9 Roadmap and milestones for Baltic LFC block and balancing markets

Baltic TSOs have identified projects important for the establishment of Baltic LFC block and balancing markets. A summary view of the roadmap for these projects is provided below. More detailed information is provided in sub-chapters of this document.

PROJECTS	PLAN START	PLAN END	2020	2021	2022	2023	2024	2025	2026
MARI platform implementation	2020	2023	■	■	■	■			
PICASSO platform implementation	2020	2024	■	■	■	■	■		
Baltic LFC block operational agreement establishment	2020	2024	■	■	■	■	■		
Balitc LFC block common prequalification requirements for Reserve Units	2021	2022		■					
LFC Reserve Unit prequalification*	2022	-			■	■	■	■	■
15 minutes ISP implementation**	2020	2024	■	■	■	■	■		
Baltic common balancing capacity markets implementation (FCR, aFRR, mFRR)	2021	2025		■	■	■	■	■	

* - By the end of 2023 Baltic TSOs will verify the capacities that have been prequlified to see if the dimensioned capacities can be covered. If not enough reserves are available Baltic TSOs need to take measures to ensure that enough reserve will be availaible to synchronize with CESA.

** - 15 minutes ISP implementation is not described in LFC concept document.

Figure 17. Roadmap summary for Baltic LFC block and balancing markets

10 Annex 1 - Continental Europe LFC Blocks

Country	TSO (full company name)	TSO (short name)	Monitoring Area	LFC AREA	LFC Block
Albania	Operatori sistemit transmetimit	OST	OST	OST	OST
Austria	Austrian Power Grid AG	APG	APG	APG	APG
	Vorarlberger Übertragungsnetz GmbH	VUEN			
Bosnia and Herzegovina	Nezavisni operator sustava u Bosni i Hercegovini	NOS BiH	NOS	NOS	SHB
Belgium	Elia System Operator SA	Elia	ELIA	ELIA+	ELIA+
Bulgaria	Electroenergien Sistemen Operator EAD	ESO	ESO	ESO	ESO
Switzerland	Swissgrid AG	Swissgrid	SG	SG	SG
Czech Republic	ČEPS a.s.	ČEPS	CEPS	CEPS	CEPS
Germany	TransnetBW GmbH	TransnetBW	TNG	TNG	TNG+TTG+AMP+50 HZT+DKW+LU
	TenneT TSO GmbH	TenneT GER	TTG	TTG+DKW	TNG+TTG+AMP+50 HZT+DKW+LU
	Amprion GmbH	Amprion	AMP	AMP+LU	TNG+TTG+AMP+50 HZT+DKW+LU
	50Hertz Transmission GmbH	50Hertz	50HZT	50HZT	TNG+TTG+AMP+50 HZT+DKW+LU
Denmark	Energinet.dk	Energinet.dk	DK	TTG+DKW	TNG+TTG+AMP+50 HZT+DKW+LU
Spain	Red Eléctrica de España: S.A.	REE	REE	REE	REE
France	Réseau de Transport d'Electricité	RTE	RTE	RTE	RTE
Greece	Independent Power Transmission Operator S.A.	IPTO	IPTO	IPTO	IPTO
Croatia	HOPS d.o.o.	HOPS	HOPS	HOPS	SHB
Hungary	MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság	MAVIR ZRt.	MAVIR	MAVIR	MAVIR
Italy	Terna - Rete Elettrica Nazionale SpA	Terna	TERNA	TERNA	TERNA
Luxembourg	CREOS	CREOS	LU	AMP+LU	TNG+TTG+AMP+50 HZT+DK+LU
Montenegro	Crnogorski elektroprenosni sistem AD	Crnogorski elektroprenosni sistem	CGES	CGES	SMM
FYR of Macedonia	Macedonian Transmission System Operator AD	MEPSO	MEPSO	MEPSO	SMM
Netherlands	TenneT TSO B.V.	TenneT NL	TTB	TTB	TTB
Poland	PSE S.A.	PSE S.A.	PSE	PSE	PSE(+Western WPS)1

Portugal	Rede Eléctrica Nacional, S.A.	REN	REN	REN	REN
Romania	C.N. Transelectrica S.A.	Transelectrica	TEL	TEL	TEL
Serbia	Joint Stock Company Elektromreža Srbije	EMS	EMS	EMS	SMM
Slovenia	ELES, d.o.o.	ELES	ELES	ELES	SHB
Slovak Republic	Slovenska elektrizacna prenosova sustava, a.s.	SEPS	SEPS	SEPS	SEPS
Turkey	TEIAS	TEIAS	TEIAS	TEIAS	TEIAS