FORECASTED CROSS-BORDER CAPACITIES IN THE BALTIC ELECTRICITY MARKET IN 2025

Baltic States transmission system operators shall implement multiple essential changes in the Baltic power system, which will affect the cross-border capacity available for electricity trade, are as follows:

- **Planned disconnection from the BRELL power system followed by synchronisation with the Continental Europe synchronous area in February 2025;**
- **Planned reconstructions of interconnection power lines;**
- **Introduction of the Baltic balancing capacity market in February 2025.**

Baltic States transmission system operators (TSOs) have jointly estimated the initial indicative cross-border capacities for 2025 to prepare the electricity market for changes listed above. Estimated capacities and the process has been jointly described in this document.

These capacities are estimates based on initial outage plans and static stability limits. Calculated capacities will be re-calculated for the market periods to take into account the final agreed outage plans and the state of system operation to assess static and dynamic stability limits.

Process of outage coordination of generation units and transmission lines

The regional outage planning process for the following year starts on 1 November. It ends on 1 December, in accordance with the European Union Regulation establishing guidelines for the operation of the electricity transmission system ((EU) 2017/1485) (from now on, SOGL), where transmission system operators (from now on TSOs) submit and coordinate planned outages within the framework of the Baltic Outage Planning Region.

Currently, TSOs have no information on the planned outages of generation and cross-border transmission lines under the following year's outage plan 2025 in the transmission grid, as the following year's outage planning process will take place in the 4th quarter of 2024.

Cross-border capacity calculation methodology to be applied after synchronisation with continental Europe

The Commission Regulation (EU) 2015/1222 establishing a guideline on Capacity Calculation and Congestion Management (CACM Regulation) foresees the development and implementation of a common Day Ahead and Intraday Capacity Calculation Methodology (DA ID CCM) per Capacity Calculation Region. Baltic CCR TSOs have submitted the methodology (DA ID CCM[1]) to NRAs and will implement it based on the NRA decision.

The Commission Regulation (EU) 2016/1719 of 26 September 2016 Establishing a Guideline on Forward Capacity Allocation (FCA) foresees the development and implementation of a common Long Term Capacity

[1] consultations.entsoe.eu/markets/baltic-ccr-tsos-propsal-da-and-id-ccm

Calculation Methodology (LT CCM) per Capacity Calculation Region. This methodology covers capacity calculation for year-ahead and month-ahead planning periods. Long-term capacity calculation methodology[2] was published for public consultations on 5th March 2024.

After synchronisation cross-border Net Transfer Capacity (NTC) for day-ahead and intraday market may vary considerably more than currently because after Baltic capacity market go-live, the NTC will be shared between both markets - the electricity market and the balancing capacity market.

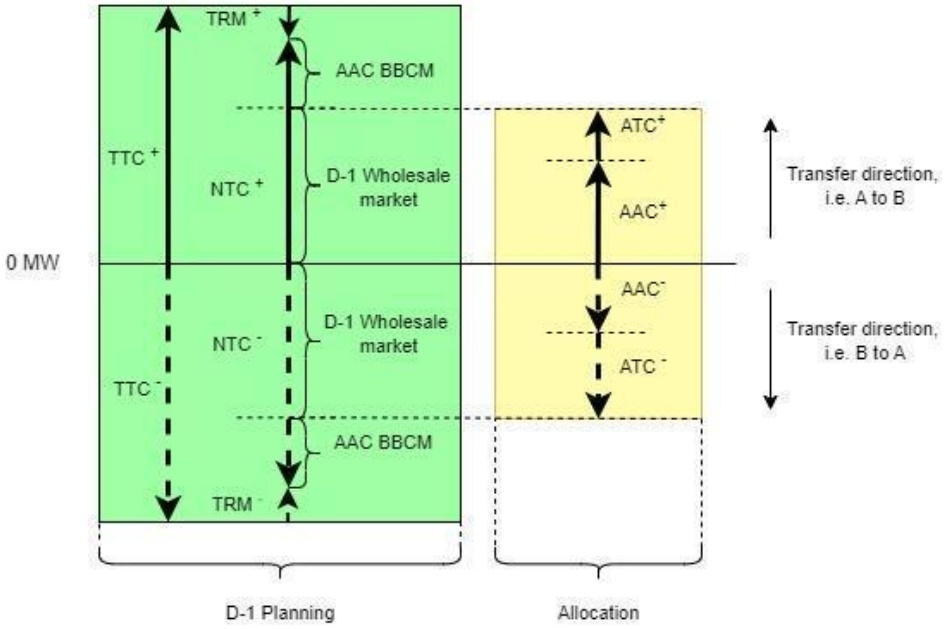


Figure. 1. Principle of cross-border capacity calculation and allocation.

Total Transfer Capacity (TTC) is a technical limit which shall not be exceeded to ensure safe power system operation. Because commercial power flows differ from physical flows during real-time operation, providing a margin for error is necessary. For that reason, NTC = TTC – TRM, where TRM (transmission reliability margin) is a value which is calculated based on historical data of deviations between planned and actual power flows and is necessary to ensure that the interconnected transmission network is secure under a reasonable range of uncertainties in system conditions. In more detail, TRM calculation principles are described in the capacity calculation methodology. The resulting NTC value is to be interpreted as the expected maximum volume of generation that can be transferred between the two power systems, which does not lead to network constraints in either system. Once the NTC value is determined, part of the cross-border capacity shall be allocated in Baltic capacity market to share and exchange the balancing reserves. After capacity is allocated for the balancing capacity market, remaining NTC is given to the D-1 wholesale electricity market. Available transmission capacity (ATC) for the intraday market is calculated as NTC (value for D-1 wholesale market) – AAC = ATC, where AAC is already allocated capacity from the D-1 electricity market. If D-1 capacity for the electricity market is allocated in one direction, then the ATC value for the same market time unit in the other direction will be larger than the NTC value for the respective direction.

[2] consultations.entsoe.eu/markets/baltic-ltcc-methodology

Forecasted indicative cross-zonal capacity values for the year 2025

Baltic TSOs, in coordination with Baltic RCC, have conducted preliminary calculations of NTC forecasted values for 2025 according to the currently applicable Baltic CCR Capacity Calculation Methodology. NTC values are calculated by considering the best available forecast of generation, consumption and possible outages of generation units and transmission lines, starting with February and continuing until December 2025. It is important to note that the forecasted NTC values (table 1) are only indicative and may differ notably from the values that will be published this December after the completed coordination process by the SOGL. Moreover, the forecasted values do not consider possible limitations for ensuring the dynamic stability of the transmission grid. Baltic TSOs plan to make dynamic stability limit calculations by the end 2025.

Lithuania-Poland NTC values were evaluated based on forecast data for 2025 from perspective of Baltic power systems. Actual Lithuania-Poland NTC values will be determined based on actual parameters of Baltic power systems and coordinated with Polish TSO in accordance with Capacity Calculation Methodology.

As regards the forecasted cross-border NTC values in NordBalt, Estlink-1 and Estlink-2 cables, apart from regular maintenance outages and temporary limitations in February after synchronization with the Continental European Synchronous Area, no changes are expected in capacity availability compared with previous years. The exact outage plan for 2025 is yet to be coordinated with the Finish and Swedish TSO during the course of 2024.

Month	EE-LV [MW]	LV-EE [MW]	LV-LT [MW]	LT-LV [MW]	PL-LT [MW]	LT-PL [MW]
February	1178	1534	1308	1114	150	150
March	807	786	1526	1196	150	150
April	1301	1499	1130	1028	150	150
May	1226	1322	1184	1062	150	150
June	1270	1483	1422	972	150	150
July	1237	1236	820	866	150	150
August	825	759	982	1055	150	150
September	1294	1372	1230	1176	150	150
October	1232	1402	1252	1331	150	150
November	1223	1409	1416	1307	150	150
December	1277	1394	997	1005	150	150

Table 1. Forecasted NTC values

Cross-zonal capacity allocation for sharing and exchange of balancing capacity

On January 21, 2021, Baltic TSOs published the Baltic Load-Frequency control block (LFC block) concept, which foresees the implementation of the Baltic LFC block with 3 LFC areas which would represent each of the three TSOs control areas and would ensure cooperation in terms of maintaining the necessary balancing capacity reserve. To ensure harmonised and common rules for balancing service providers in balancing capacity market, Baltic TSOs have commonly prepared, and Baltic NRAs have approved the proposal for Balancing capacity market[3] pursuant with Article 33(1) and Article 38(1) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (hereinafter – EBGL) that

[3] https://www.ast.lv/sites/default/files/editor/Baltic proposal for the Baltic balancing capacity market rules in accordance with EBGL Articles 33(1) and 38(1).pdf

describes common and harmonised rules and processes for the exchange, sharing, and procurement of aFRR, mFRR and FCR capacity (hereinafter – BBCM proposal).

To facilitate a well-functioning balancing capacity market in the Baltics, the Baltic CCR TSOs have developed a market-based methodology of cross-zonal capacity allocation for the exchange of balancing capacity or sharing of reserves[4], in accordance with Article 41 of EBGL (hereinafter – CZCA methodology).

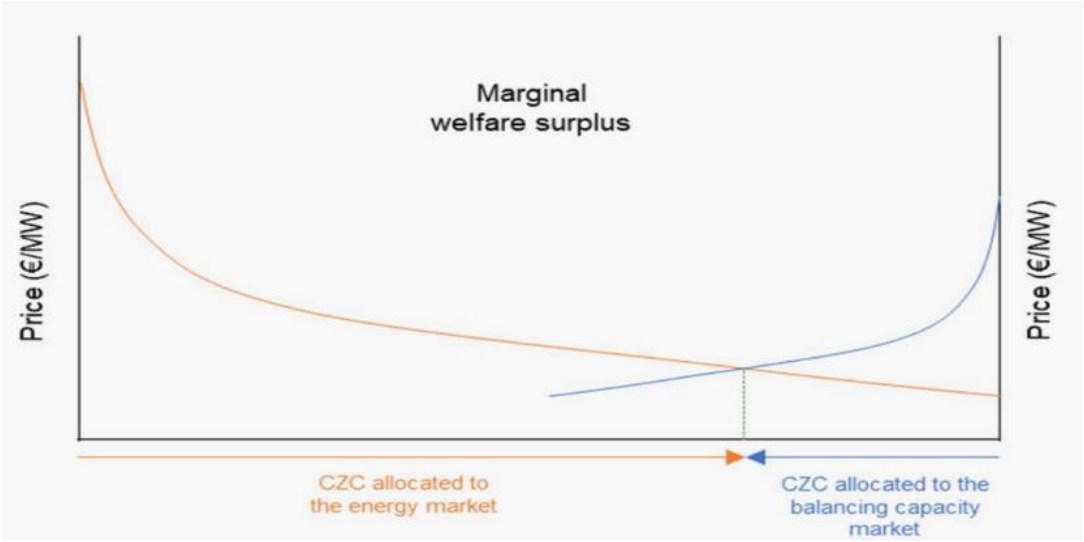


Figure 2. Cross-border capacity allocation optimization concept.

Both these documents (BBCM proposal and CZCA methodology) determine how Baltic TSOs share and exchange balancing capacity and allocate the cross-zonal capacity for balancing capacity before the single day-ahead coupling. The establishment of the Baltic LFC block enables Baltic TSOs, instead of maintaining balancing capacity in the amount of each area dimensioned FRR amount (for example, Latvia – 440 MW, Lithuania 700 MW, Estonia – 650 MW), to maintain the balancing capacity in the amount that's dimensioned for Baltic LFC overall (for the aforementioned example, 700 MW). The precise volumes of FRR necessary are calculated in accordance with Baltic TSO's methodology for FRR dimensioning.[5] Necessary balancing capacity for the Baltic LFC block will be procured in the common Baltic balancing capacity market, but to ensure that reserve is available for each TSO, cross-zonal capacity will be allocated on the borders of LT-LV and LV-EE in both directions for both borders. Cross-zonal capacity allocation will allow supplying the LFC areas of the Baltic LFC block with the necessary amount of balancing reserves in case of an incident from another area of the LFC block.

According to the BBCM, the procurement of balancing capacity is performed to procure necessary balancing capacity while ensuring the maximum overall welfare. It means that not only the actual cost of procurement must be taken into account but, due to the impact of resulting cross-zonal capacity allocation on the cross-border electricity trading in later markets, the optimization function of BBCM shall also evaluate the cost associated with the necessary CZC allocation that could result in increased prices in the day-ahead market. This uses reference day prices to determine the day-ahead market's forecasted values.

The cross-zonal capacity allocated for exchange and sharing of the balancing reserves on each cross-border depends on the results reached in the optimization function, where the cost of balancing capacity offered by

[4] https://www.ast.lv/sites/default/files/editor/Baltic%20proposal%20to%20EBGL%20Article%2041%2020230716%20CLN.cleaned.pdf
[5] https://www.ast.lv/sites/default/files/editor/Baltic%20LFC%20block_FRR%20dimensioning%20methodology.pdf

market participants and the forecasted cross-border capacity value in the day-ahead market will be compared at the same time in procurement process respecting the limits for maximal cross zonal allocation amount**. In accordance with BBCM proposal, normally up to 50% of CZC can be allocated for balancing capacity sharing. However, when TSOs cannot procure sufficient balancing reserve capacity, the CZC limit for balancing reserve sharing will be increased up to 70% of the total NTC**.

The results of the balancing capacity market are highly dependent on the activity of market participants, the prices they offer for reserve capacity, and the amount of the cross-zonal capacity in the day-ahead market (as per forecast value). In the following section, two conceptual examples with different distribution of reserves are provided. In these examples, the CZC value is disregarded, primarily emphasizing the impact of procured capacity distribution between the LFC block areas and allocated cross-zonal capacity on the Baltic internal borders.

Example for cross-zonal capacity allocation for balancing capacity sharing and exchange

The following steps demonstrate a simplified balancing capacity procurement and capacity allocation for sharing and exchanging the balancing reserve.

- If the example, the dimensioned amount of FRR for Baltics is 803 MW upwards and 519 MW downwards. The sum of the bid quantity of different balancing service providers selected for procurement to cover Baltic demand could be distributed as indicated in Figure 3 and Figure 4. For example, in Estonia, 250 MW of FRR upwards.
- At the same time, based on the dimensioned demand for each area separately (indicated in figure 3 and 4, for example, Estonia 656 MW upwards), cross-zonal capacity allocation is done, shown with multicolour arrows. The maximum of the necessary FRR transmission on the border will determine the amount of capacity allocated in the specific direction for specific cross-border.

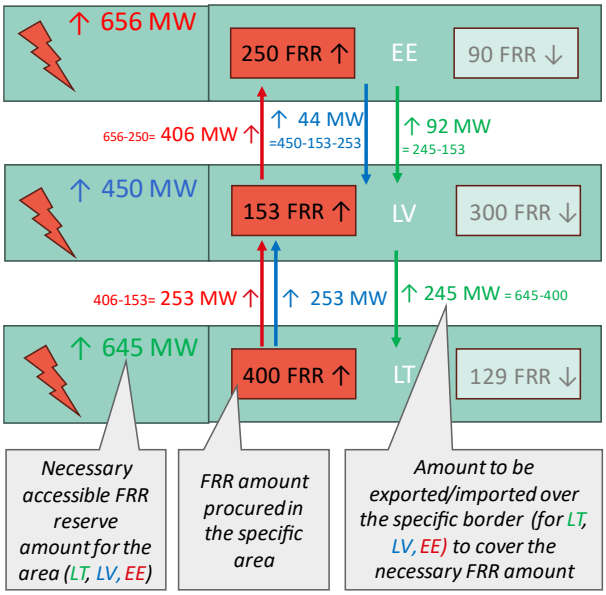
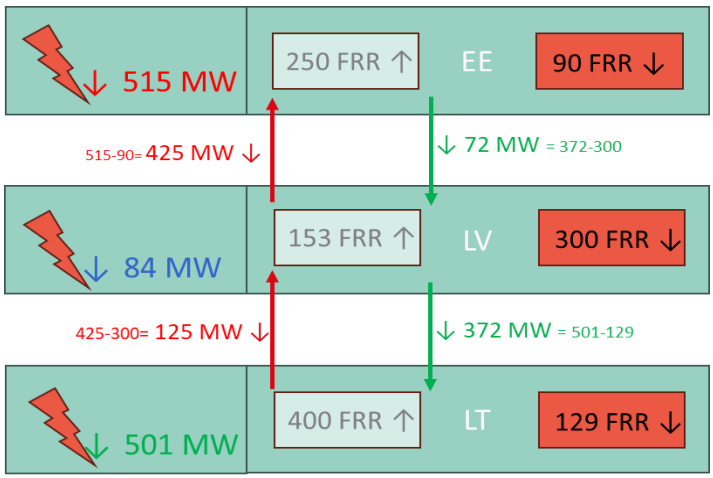


Figure 3



*CZCA allocation for **down FRR import** means CZCA allocation in **export direction***

Figure 4

- For the allocation of the downward FRR sharing and exchange over the border, the allocation direction is the opposite. When the downward reserve is imported, the area's export increases, leading to such an allocation approach.
- In the result, the maximum necessary cross-zonal capacity for FRR upwards and downwards sets the capacity to be allocated for FRR sharing and exchange (see Figure 5) to ensure that each TSO has enough accessible volume of commonly procured FRR reserves to cover the possible incidents in their area.

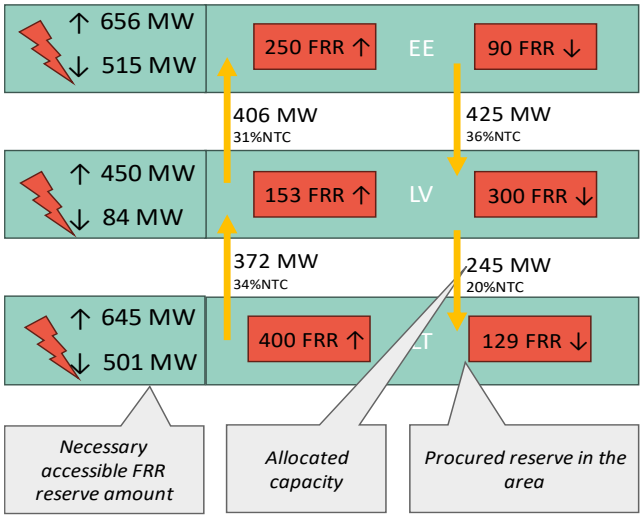


Figure 5

Procurement costs together with forecasted impact on welfare in the day-ahead market (due to capacity allocation) shall be evaluated through all possible combinations of bids to be selected in procurement together with the cross-zonal capacity to be allocated in such cases. The algorithm aims to find the minimum value of procurement costs and the difference in welfare for the day-ahead market.