Baltic LFC block FRR dimensioning forecast 2026-2035

2025-07-29
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Contents

1 Purpose of the document

This document is developed by Baltic TSOs (Litgrid, AST, Elering) to provide information about long term forecast of frequency restoration reserves (FRR) capacity volumes for the Baltic Load Frequency Control (LFC) block for period 2026-2035.

2 FRR dimensioning forecast remarks

Previously, Baltic TSOs have performed FRR dimensioning for the period 2025-2032. This FRR dimensioning forecast considers the period 2026 to 2035, as compared to previous forecast following principles have been changed:

- Updated RES installed capacity values as per latest information.
- Method of estimation.

All assumptions used in the forecast calculations have been defined in Chapter 4.

Baltic TSOs consider that long-term FRR dimensioning is influenced by multiple parameters where later years of the forecast might provide estimations with high error margin. Baltic TSOs consider in order to accurately estimate the forecast the following measures are necessary:

- More accurate data, in terms of power imbalance, more historical FSKAR process costs and aFRR balancing costs are implemented to the market and,
- Sophisticated RES imbalance scaling method is necessary.

3 Method

FRR capacity estimations provided in this document are based on publicly consulted Baltic LFC FRR dimensioning methodology principles. The method takes into account the historic imbalances, where the historical FRR amount increase tendencies are identified and applied to the upcoming years.

After Baltic power system synchronization with Continental Europe Synchronous area FRR capacities are procured in the Baltic balancing capacity market, where the FRR capacities can be located in any Baltic LFC area taking into account the available allocated capacities of cross-borders and the LFC area FRR reserve requirement.

4 Assumptions

Throughout the calculations several assumptions have been considered to investigate the FRR capacity dimensioning forecast between 2026 and 2035:

- 2025 has been considered as the base year for the analysis,
- It has been considered that aFRR shall be dimensioned in 4 hours cycles, i.e. 6 cycles per day,
- The capacity procurement shall follow common Baltic capacity market requirements considering available cross-zonal capacity between Baltic LFC block LFC areas.

5 Input data

As an input data for the analysis, the data from each Baltic TSO has been gathered regarding the foreseen development of RES from 2026 to 2035, Elering and AST has used RES capacity increase data provided in ten-year network development plan, Litgrid has used latest RES capacity increase forecast data (June 2025). The summarized data is provided Table 1.

Table 1 RES installed capacity increase based on Baltic power system estimations in MW.

Lithuania										
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Wind	*2809*	*3614*	*4015*	*4315*	*4515*	*4715*	*4950*	*5800*	*6020*	*6920*
Sun	*3591*	*3761*	*3919*	*4031*	*4100*	*4200*	*4400*	*4600*	*4800*	*5000*
Latvia										
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Wind	*331*	*451*	*571*	*604*	*695*	*803*	*1011*	*1571*	*1732*	*1855*
Sun	*1049*	*1292*	*1508*	*1719*	*1905*	*2116*	*2327*	*2538*	*2749*	*2935*
Estonia										
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Wind	*942*	*1152*	*1362*	*2022*	*2682*	*2749*	*2815*	*2882*	*2941*	*4000*
Sun	*1370*	*1420*	*1470*	*1520*	*1570*	*1577*	*1583*	*1590*	*1595*	*1600*
Baltics										
Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Wind	*4082*	*5217*	*5948*	*6941*	*7892*	*8267*	*8776*	*10253*	*10693*	*12775*
Sun	*6010*	*6473*	*6897*	*7270*	*7575*	*7893*	*8310*	*8728*	*9144*	*9535*

6 aFRR results

The aFRR capacity is dimensioned to balance the variations in the power system due to load variation, inadvertent non-observance of schedules by producers, and prediction errors of RES production. The aFRR is activated via automatic controllers that monitor the system ACE. The aFRR capacity will be calculated based on the recommendation of Continental Europe Synchronous Area Framework Agreement (CE SAFA) Policy 1[1] statistical approach. The activated aFRR is replaced by mFRR activations for longer system imbalances. Considering the FRR dimensioning methodology, aFRR forecast has been split into 4 hour cycles. Each cycle has an individual forecast.

When comparing mFRR and aFRR demand for procurement of capacity in 2025 with forecasted data, it should be taken into account that in 2025 aFRR demand has been reduced by 50 % and substituted with mFRR demand due to an intermediate period following the Baltic balancing capacity market start.

6.1 aFRR forecast

The amount of aFRR upward and downward reserve is not expected to change significantly over the period 2026–2035. Baltic TSOs foreseen that the largest need of aFRR capacity upward will be visible at a cycle which starts from 16:00 to 20:00 EEST, reaching a maximum value of 120 MW. Largest need of aFRR capacity downward will be visible at a cycle which starts from 12:00 to 16:00 EEST, reaching a maximum value of 115 MW.

[1] SAFA Policy on Load-Frequency Control and Reserves

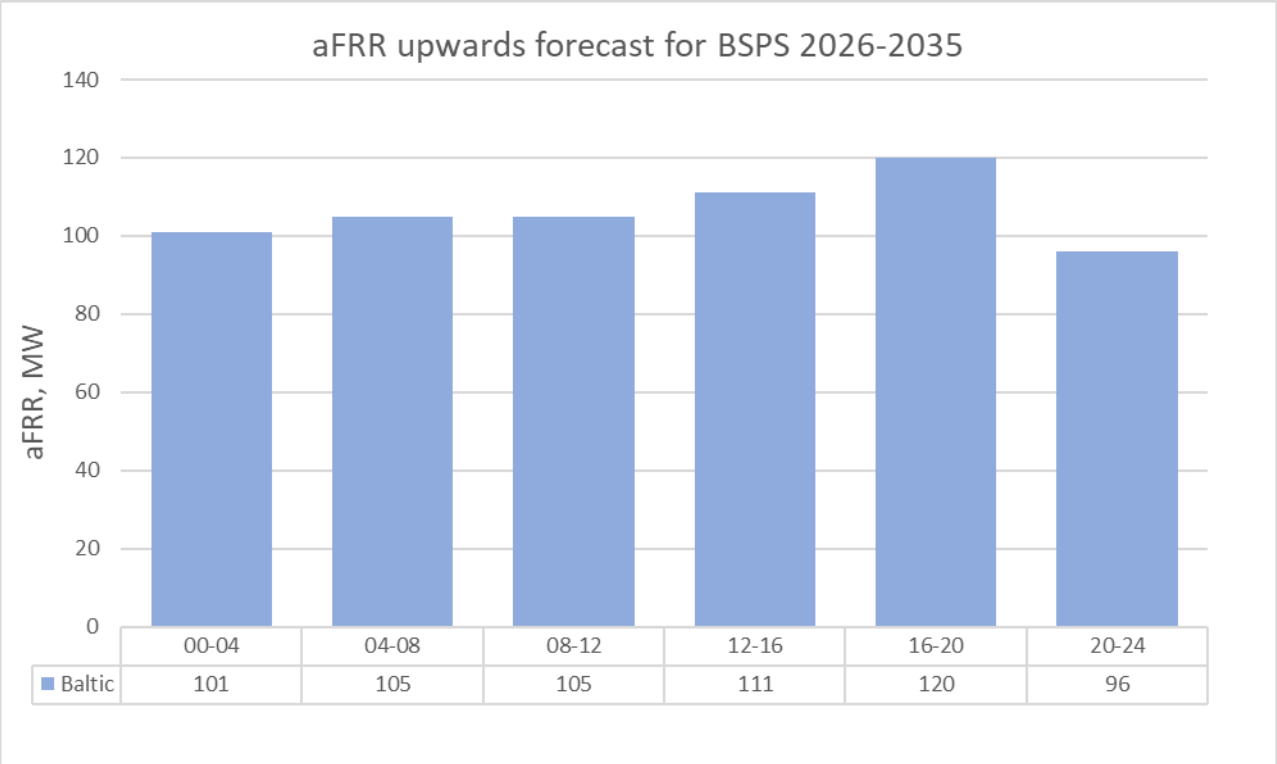

Figure 1 upward aFRR amount for BSPS

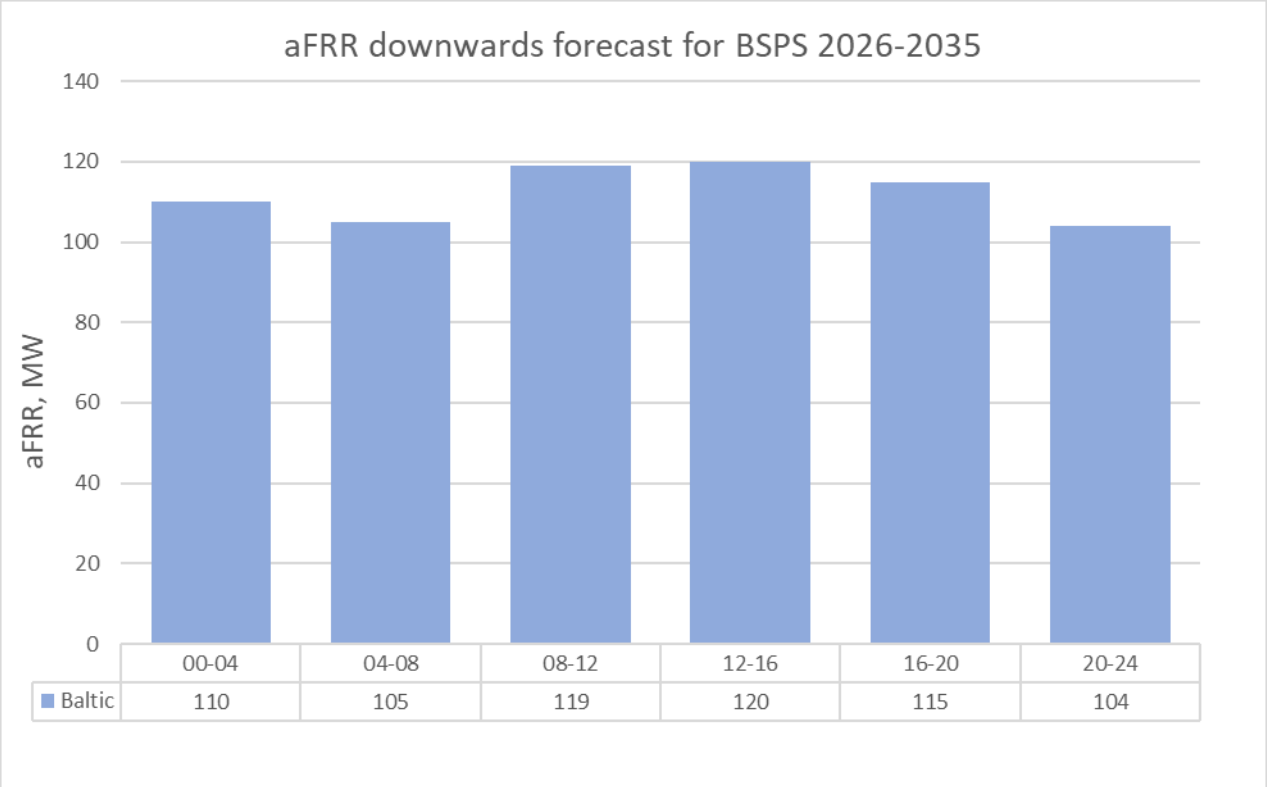

Figure 2 downward aFRR amount for BSPS

It should be noted that frequency control quality has a major influence on the amount of the aFRR necessary within the LFC block. Minding that the control quality is becoming more strict, the Baltic

TSOs may increase the aFRR capacity amount. Increasing the aFRR capacity amount will reduce the mFRR capacity, although the total amount of FRR capacity will not change.

7 mFRR results

The mFRR capacity is managed by the TSOs to cover reference incidents and long-term imbalances in the power system to free up aFRR capacities for short-term imbalances. mFRR downward is needed to cover excessive generation or missing load in the power system. mFRR is considered as the remaining part of the FRR not covered by aFRR.

7.1 mFRR upward forecast

It is foreseen that Baltic LFC block needs of mFRR upward in 2026 will be 604 MW, where in 2035 the mFRR upward needs will increase up to 754 MW.

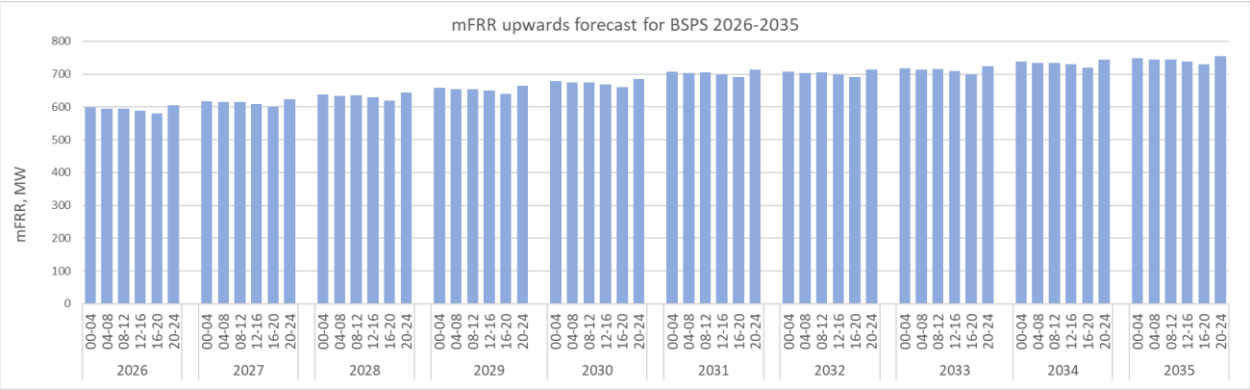

Figure 3 upward mFRR amount for BSPS

Table 2 upward mFRR values for BSPS

Hours	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
00-04	598	618	638	658	678	708	708	718	738	748
04-08	594	614	634	654	674	704	704	714	734	744
08-12	595	615	635	655	675	705	705	715	735	745
12-16	589	609	629	649	669	699	699	709	729	739
16-20	580	600	620	640	660	690	690	700	720	730
20-24	604	624	644	664	684	714	714	724	744	754

7.2 mFRR downward forecast

It is foreseen that Baltic LFC block needs of mFRR downward in 2026 will be 691 MW, where in 2035 the mFRR downward needs will increase up to 991 MW.

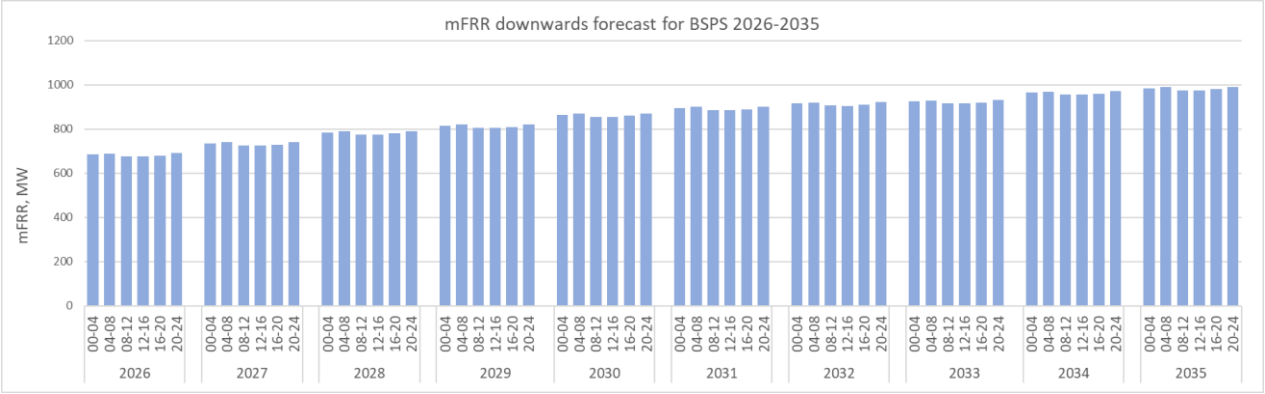

Figure 4 downward mFRR amount for BSPS

Table 3 downward mFRR values for BSPS

Hours	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
00-04	685	735	785	815	865	895	915	925	965	985
04-08	690	740	790	820	870	900	920	930	970	990
08-12	676	726	776	806	856	886	906	916	956	976
12-16	675	725	775	805	855	885	905	915	955	975
16-20	680	730	780	810	860	890	910	920	960	980
20-24	691	741	791	821	871	901	921	931	971	991

8 Conclusions

1 Baltic TSOs foresee a rapid increase in FRR needs in Baltic LFC block due RES capacity increase from 2026 to 2035.
   a. Largest aFRR upward need is foreseen at 16:00 to 20:00 cycle, reaching a maximum value of 120 MW.
   b. Largest aFRR downward need in Baltic LFC block is foreseen at 12:00 to 16:00 cycle, reaching a maximum value of 115 MW.
   c. mFRR upwards need are foreseen to increase from 604 at 2026 to 754 MW at 2035.
   d. mFRR downward need are foreseen to increase from 691 at 2026 to 991 MW at 2035.
2 All results are heavily influenced by foreseen RES increase, therefore additional increase or decrease in RES development would have an impact to FRR capacity needs in Baltic LFC block.
3 The provided values shall be considered estimated values, while the actual mFRR and aFRR needs for the procurement in common Baltic Balancing capacity market will be calculated based on the actual RES capacities, outage rates and imbalance data following the Baltic LFC block FRR dimensioning methodology.
4 Baltic TSOs consider that long-term FRR dimensioning is influence by multiple parameters where later years of the forecast might provide estimations with high error margin.
5 In case of Baltic LFC block FRR dimensioning methodology change, the forecast must be considered as obsolete.