

Task 1

The Python code for this assignment is uploaded as `afrr_imbalance_analysis.py`.

To assess the amount of activation of aFRR reserves in relation to the imbalance, two metrics are used in this solution. Firstly, the linear relation between the values can be analysed with statistical correlation. In this work, the correlation was calculated between total activation in the region and total absolute imbalance. Secondly, some info can be gained by analysing how much of imbalance was corrected by aFRR using the following formula:

$$\frac{\text{Dispatched aFRR (MW)}}{\text{Absolute Imbalance (MWh)}}$$

The data, code and compiled graph for 22 September suggest some correlation between activated aFRR volumes and total imbalance volumes, with the strongest correlation in Lithuania. According to the metrics calculated, linear correlation in the Baltic region between activation and imbalance cannot be shown during this day, with the correlation value at 0,2, which indicates a lack of linear correlation.

The activation/imbalance ratios are as follows:

Estonia 0,18

Latvia 0,25

Lithuania 0,398

Baltic (overall) 0,358

This seems to show that on 22 September, aFRR was most used in regulating Lithuanian imbalance. Estonia and Latvia show a smaller proportion of regulation through aFRR. This might mean that regulation of imbalance was done by other mechanisms like cross-border exchange, mFRR etc. Also, the imbalances might have been too great for existing aFRR service providers.

The compiled graph seems to support the analysis by metrics. The greatest spikes in imbalances and activation occurred in Lithuania. aFRR seems to have been used more actively to regulate imbalances during the period between 22:00-03:00, when the spikes of imbalances and activation are synchronized. Later during the day however, there exist more irregularities between imbalance regulation and aFRR activation. This would confirm the absence of a linear correlation, at least in the Baltic scale.