Needs for Flexibility Caused by the Variability and Uncertainty in Wind and Solar Generation in 2020, 2030 and 2050 Scenarios

The growing share of variable renewable energy sources (VRE) in Nordic and Baltic countries is expected to increase the need for flexibility in the energy systems. VRE generation is highly variable because it is determined by weather conditions, and it is uncertain due to forecasting errors. Both of these aspects will be considered for the analysed 2020, 2030 and 2050 scenarios. In addition to the variability in VRE generation, the variability in net load (electricity consumption subtracted by the VRE generation) is analysed. The results show that, compared to hourly ramp rates in consumption, the hourly ramp rates of the net load are not expected to increase significantly; however, there is a modest increase in 2050. The relative variability of the net load is expected to increase significantly when going from 2014 to 2050. Wind generation forecasting uncertainties are assessed for 5 minute, 15 minute and hour ahead forecasts. It is shown that the forecasting error probability distributions are fat-tailed, which means that the risk of experiencing a large forecasting error is higher than what one would expect assuming normality.

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