Secure power system operation of a highly wind power integrated power system is always at risk during critical weather conditions, e.g. in extreme high winds. The risk is even higher when 50% of the total electricity consumption has to be supplied by wind power, as the case for the future Danish power system in 2020. This paper analyses and compares the performance of the future Danish power system during extreme wind speeds, where wind power plants are either controlled through a traditional High Wind Shut Down storm controller or a new High Wind Extended Production storm controller. For this purpose, the power system model has been developed that represents the relevant dynamic features of power plants and compensates for power imbalances caused by the forecasting error during critical weather conditions.

The regulating power plan, as an input time series for the developed power system model, is provided by the hour-ahead power balancing model, i.e. Simulation power Balancing model (SimBa). The regulating power plan is prepared from day-ahead power production plan and hour-ahead wind power forecast. The wind power (forecasts and available) are provided by the Correlated Wind power fluctuations (CorWind) model, where the wind turbine storm controllers are also implemented.