Development of innovative weather and power forecast models for the grid integration of weather-dependent energy sources

Malte Siefert and Jan Dobschinski

Fraunhofer IWES, Kassel, Germany (malte.siefert@iwes.fraunhofer.de)

The absolute error of wind power and photovoltaic forecasts for Germany continues to rise due to the rapid expansion of these weather-dependent renewable energies. The error for the day-ahead forecast alone can reach the amount of the available operating reserve. For a reliable energy supply in the face of the rising development of renewable energies, a significant improvement in power forecasts is absolutely required. In the project EWeLiNE, Fraunhofer IWES, the German Weather Service, and the three largest transmission system operators Amprion GmbH, TenneT TSO GmbH and 50Hertz Transmission GmbH are working together to improve forecasts at every stage of the process, from the weather models used to the application of forecasts in control rooms. For this reason, the project aims to exploit improvements by combining meteorology, power forecasts and requirements of the energy industry. In particular, extreme forecast errors that threaten the security of the electrical grid security are observed. The identification of the underlying causes and the improvement of forecasts for these extreme errors are a central goal. For the forecast user, it is of great interest to get additional information on the underlying weather situation and the resulting forecast uncertainties. The developed forecast and weather information are provided to the transmission system operators via a live "demonstrator". This is a four-year projecting ending late 2016 that employs 20 scientists.

In this talk, the present progress of the project EWeLiNE is summarized. At the beginning of the project, forecast errors and requirements of the forecast end users were systematically analyzed. The result is an overview of the used forecast and the specific weaknesses of the current forecasts. We investigated areas with potential for improvement identified throughout the entire forecast chain, from data assimilation up to the use of the power forecast. Fraunhofer IWES has developed and improved wind power and PV forecasts for different regions and grid nodes for both shortest-term and day-ahead forecasts. Another focus is the generation of probabilistic forecasts and their transfer to specific applications for the marketing of renewable energies and load flow calculation for the electrical grid security.