Geophysical Research Abstracts
Vol. 16, EGU2014-10254, 2014
EGU General Assembly 2014

Evaluation of Dynamical Downscaling Resolution Effect on Wind Energy Forecast Value for a Wind Farm in Central Sweden

Martin Rosgaard (1), Andrea Hahmann (2), Torben Skov Nielsen (1), Gregor Giebel (2), Poul Ejnar Sørensen (2), and Henrik Madsen (3)

(1) ENFOR A/S, Hørsholm, Denmark, (2) DTU Wind Energy, Risø, Denmark (grgi@dtu.dk), (3) DTU Compute, Lyngby, Denmark

For any energy system relying on wind power, accurate forecasts of wind fluctuations are essential for efficient integration into the power grid. Increased forecast precision allows end-users to plan day-ahead operation with reduced risk of penalties which in turn supports the feasibility of wind energy. This study aims to quantify value added to wind energy forecasts in the 12-48 hour leadtime by downscaling global numerical weather prediction (NWP) data using a limited-area NWP model.

The accuracy of statistical wind power forecasting tools depends strongly on this NWP input. Typical performance metrics are mean absolute error or root mean square error for predicted- against observed wind power production, and these metrics are closely related to wind speed forecast bias and correlation with observations. Wind speed bias can be handled in the statistical wind power forecasting model, though it is entirely up to it's NWP input to describe the wind speed correlation correctly. The basis of comparison for forecasts is data from the Stor-Rotliden wind farm in central Sweden. The surrounding forest adds to the forecasting challenge, thus motivating the downscaling experiment as the potential for wind power forecast improvement is higher in complex terrain.

The 40 Vestas V90 turbines were erected in 2009 and correspond to 78MWe installed electrical capacity. Forecasts from global and limited-area NWP models, together covering five different horizontal computational grid spacings of $\sim$50km down to $\sim$1km, are studied for a yearlong, continuous time period. The preliminary results shown quantify forecast strengths and weaknesses for each NWP model resolution.