Data-Denial Experiments for the Improvement of Wind Energy Forecasts with the NCEP North American Mesoscale Modeling and Assimilation System: The WFIP and POWER Projects

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In a partnership with the Department of Energy (DOE) and the Earth Systems Research Lab's Global Systems and Physical Sciences Divisions (ESRL/GSD and ESRL/PSD), the National Centers for Environmental Prediction/Environmental Modeling Center (NCEP/EMC) has participated in two separate projects which focused on improving short-term wind forecasts, O(6 hrs), for the wind energy community. The first, the Wind Forecast Improvement Project (WFIP), involved a year-long field experiment which covered two separate study regions over the Northern and Southern Great Plains of the United States. In both regions special wind profiler, SODAR, and RASS observations were taken throughout the duration of the project. Using these special observations, along with industry-provided tall tower and nacelle wind speed observations, data-denial experiments were conducted with the North American Mesoscale model forecast system (NAM) to assess the impact of these special observations on the wind energy forecast over two, week-long periods. In addition to performing analysis/forecast cycles with the standard 12 km NAM domain the system was also extended to include an analysis/forecast cycle for its 4 km CONUS-nest.

The second project, POWER (Position of Offshore Wind Energy Resources), is a collaborative effort with DOE, ESRL/GSD, and ESRL/PSD to provide information about observation networks needed to support offshore wind energy development. Currently, maximizing the potential of offshore wind energy resources is made difficult by our inability to measure the shallow layer above the sea-surface, where offshore wind turbine rotors reside. During the summer 2004 New England Air Quality Study ~13 coastal wind profilers and one shipborne Doppler lidar were deployed in the New England area. The POWER project takes advantage of these pre-existing data and uses them in a set of data-denial experiments with an hourly-updated version of the NAM system. These data-denial experiments evaluate the potential benefits of assimilating coastal profiler observations upon short-term, offshore wind energy forecasts.

Preliminary results from both WFIP and POWER projects will be presented along with future work and plans for the hourly-updated NAM forecast system.