

NREL Establishes a 1.5-MW Wind Turbine Test Platform for Research Partnerships

Research turbine supports sustained technology development.

For more than three decades, engineers at the National Renewable Energy Laboratory's (NREL) National Wind Technology Center (NWTC) have worked with the U.S. Department of Energy (DOE) Wind Program and industry partners to advance wind energy technology, improve wind turbine performance, and reduce the cost of energy. Although there have been dramatic increases in performance and drops in the cost of wind energy—from \$0.80 per kilowatt-hour to between \$0.06 and \$0.08 per kilowatt-hour—the goal of the DOE Wind Program is to further increase performance and reduce the cost of energy for land-based systems so that wind energy can compete with natural gas by 2020.

In support of the program's research and development (R&D) efforts, NREL has constructed state-of-the-art facilities at the NWTC where industry partners, universities, and other DOE laboratories can conduct tests and experiments to further advance wind technology. The latest facility to come online is the DOE-GE 1.5-MW wind turbine test platform. Working with DOE, NREL purchased and installed a GE 1.5-MW wind turbine at the NWTC in 2009. Since then, NREL engineers have extensively instrumented the machine, conducted power performance and full-system modal tests, and collected structural loads measurements to obtain baseline characterization of the turbine's power curve, vibration characteristics, and fatigue loads in the uniquely challenging NWTC inflow environment.

By successfully completing a baseline for the turbine's performance and structural response, NREL engineers have established a test platform that can be used by industry, university, and DOE laboratory researchers to test wind turbine control systems and components. The new test platform will also enable researchers to acquire the measurements needed to develop and validate wind turbine models and improve design codes.

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The DOE-GE 1.5-MW wind turbine is 80 meters tall and has a 77-meter rotor diameter. Photo by Dennis Schroeder, NREL/PIX 19083

Key Research Results

Achievement

NREL purchased and constructed a GE 1.5-MW wind turbine, installed specialized instrumentation, conducted power performance and full-system modal tests, and collected structural loads measurements to obtain a baseline characterization.

Key Result

The turbine provides industry, university, and DOE laboratory researchers with a test platform for conducting experiments, testing components, developing models, and improving design codes.

Potential Impact

The turbine will support sustained technology development, continued wind energy cost reductions, and long-term wind energy competitiveness to enable aggressive wind energy deployment to meet strategic U.S. energy needs.