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GE ENVISIONS THE NEXT GENERATION OF WIND FARMS

Built on big data, the Digital Wind Farm could boost AEP by 20 percent

Illustrations Courtesy of GE

GE recently announced the launch of its Digital Wind Farm, a dynamic, connected, and adaptable wind energy ecosystem that pairs world-class turbines with the digital infrastructure for the wind industry. The technology boosts a wind farm's energy production by up to 20 percent and could help generate up to an estimated $50 billion of value for the wind industry.

The Digital Wind Farm uses interconnected digital technology — often referred to as the Industrial Internet — to address a long-standing need for greater flexibility in renewable power. The technology will help integrate renewable power into the existing power grid more effectively.

"Every business — including our own at GE — and every industry is being transformed by smarter digital technologies, and the greatest opportunity lies in energy," said Steve Bolze, president and CEO of GE Power & Water. "The question is not whether to start down this path. It's about knowing how to get the most out of your digital transformation. That's what will separate industry leaders from those left behind."

GE is leading the transformation of the wind power industry with today's launch of the world's first Digital Wind Farm. This new wind ecosystem pairs world-class turbines with a digital infrastructure to enhance production, reduce costs and boost operating efficiency over the life of the wind farm.

The Digital Wind Farm ecosystem begins with the production of the turbines themselves. With the next generation of "Brilliant" wind turbines, GE's new 2MW platform utilizes a digital twin modeling system to build up to 20 different turbine configurations at every unique pad location across a wind farm in order to generate power at peak efficiency based on the surrounding environment. Additionally, each turbine will be connected

to advanced networks that can analyze turbine operations in real time and make adjustments to boost operating efficiencies.

Once the turbines are built, their embedded sensors are connected and the data gathered from them is analyzed in real time with GE's Predix software, which allows operators to monitor performance from data across turbines, farms, or even entire industry fleets. The data provides information on temperature, turbine misalignments, or vibrations that can affect performance.

As more data is collected, the system actually learns over time, becoming more predictive and "future-proofing" wind farms by maintaining top performance and avoiding the maintenance issues that typically occur as turbines age. It also reduces costs by customizing maintenance schedules to ensure preventive maintenance is done only when needed.

"GE's focus on life-cycle operations is consistent with the way we operate our wind farms," said Michael Polsky, president and CEO of the leading energy company Invenergy. "We look forward to working together with GE's Digital Wind Farm to unlock even more long-term value across our fleet."

The Digital Wind Farm builds on GE's Wind PowerUp technology, which was unveiled 18 months ago. Now, installed in 4,000 units, the technology has improved turbine efficiency up to 5 percent, which translates to up to a 20 percent improvement in profitability for each turbine.

"Big data is worthless without the insight to take action, and our vision for the industry is to use today's data to predict tomorrow's outcomes," Bolze said. "By harnessing the full power of the Industrial Internet, we can create a world where wind farms learn, adapt and perform better tomorrow than they do today."

— Source: GE

Clemson and NREL will collaborate on turbine R&D

Cooperative effort focuses on drivetrain optimization and grid integration

Two advanced U.S. wind energy research and testing facilities have joined forces to help the wind energy industry improve the performance of wind turbine drivetrains and better understand how the turbines can integrate more effectively with the electrical grid.

Through a Cooperative Research and Development Agreement (CRADA), the Energy Department's National Renewable Energy Laboratory (NREL) and Clemson University will partner to share resources and capabilities in the operation and development of testing facilities. The CRADA also includes the exchange of staff for training and research and development purposes, including collaborative participation in facility commissioning and testing activities.

"Our partnership with Clemson is an excellent example of how a university and a national laboratory can work together," said Brian Smith, acting center director for NREL's National Wind Technology Center (NWTC). "The collaborative efforts of these two research entities will complement one another for the technical advancement and large-scale deployment of wind and water power."

NREL, with support from the Wind Program in the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy, leads the way in developing custom facilities and capabilities to enable testing of full-scale integrated wind turbine drivetrain systems in accordance with the needs of the wind industry. NREL currently operates 2.5 MW and 5 MW dynamometers and a controllable grid interface grid simulator that can help engineers better understand how wind turbines will react to grid disturbances.

Supported by a $45.6 million DOE investment that is cost matched with over $70 million in funds, Clemson Univ currently operates a drivetrain testing facility with 7.5 MW and 15 MW dynamometers at its SCE&G Energy Innovation Center, as well as a 20 megavolt ampere (MVA) grid emulator the Duke Energy eGrid, which enables mechanical and electrical testing of wind turbines and other multi-megawatt devices bound for the electrical grid. These projects

Clemson University Photo

spurred the development of the $21 million Zucker Family Graduate Education Center, which will house Clemson's graduate programs in the Charleston, Soth Carolina, area and is located adjacent to the test facilities. NREL and Clemson are installing hardware-in-the-loop modeling and control capabilities to enhance their testing facilities.

"Clemson University's mission of promoting public-private partnerships to develop new technologies for the energy industry and educate the workforce of the future at the SCE&G Energy Innovation Center and NREL's activities at the NWTC share a lot of common ground," said Dr. Nikolaos Rigas, executive director of the Clemson University Restoration Institute. "This agreement will provide the framework for further collaboration and technical exchanges that benefit both organizations and brings a stronger team together to tackle broader challenges related to energy."

— Source: NREL

Siemens installs 7MW offshore prototype

Generator and electrical system testing currently underway at Denmark site


Siemens Press Picture

Only a few months after its sales launch at the EWEA Offshore trade show in Copenhagen, the new Siemens offshore flagship wind turbine of the type SWT-7.0-154 has now been installed as a prototype. The planned field-testing of the 7MW offshore turbine, installed onshore in Osterild, Denmark, mainly focuses on the upgraded generator and the enhanced electrical system. The majority of other components are equal to the proven technology of the Siemens SWT-6.0-154 - including the 154-meter rotor diameter. This latest edition of the D7 product platform can produce 32 million kWh of clean electricity

under offshore wind conditions — enough energy to supply up to 7,000 households.

In May 2011, Siemens installed the first prototype of its direct drive offshore wind turbine, while in the meantime the direct drive wind turbine has become the benchmark in the offshore wind industry.

"The installation of the 7-MW version is an exciting step in its further development," said Morten Rasmussen, head of technology at Siemens Wind Power and Renewables division. "Based on the reliable technology and supply chain of our 6MW machine, we have improved our flagship wind turbine with stronger permanent magnets, optimized generator segments and upgraded converter and transformer units. With only these minor changes, we expect to get it ready for serial production within only two years."

The gearless drive technology allows for a compact design. Using Siemens' direct drive technology, the SWT-7.0-154 is the lightest turbine of its class. The combination of robust design and low weight reduces offshore infrastructure, installation, and maintenance costs. Today's cranes and installation vessels will be sufficient for its installation.

— Source: Siemens

DNV GL awards prototype certificate for 7MW Siemens turbine

DNV GL, the world's largest resource of independent energy experts, has awarded Siemens Wind Power with offshore prototype certification for its new 7MW offshore wind turbine SWT-7.0-154, which will now undergo field testing in Østerild, Denmark.

The prototype certificate confirms the compliance of the wind turbine design with the mandatory prototype requirements of the IEC 61400-22 standard and the Danish Executive Order (DEO). Being granted Prototype Certification confirms all relevant safety features on the turbine and allows installation of the prototype, to demonstrate how it performs. The prototype certification is a major step towards reaching the final Type Certification.

DNV GL has also been contracted to carry out the Type Certification of the SWT-7.0-154 offshore turbine and is currently involved in the design evaluation process.

"Such a demanding project requires not only the best in wind energy expertise, but also state-of-the-art project management in order to deliver this project in a timely manner," said Steffen Haupt, global head of business development and sales for renewables certification at DNV GL. "Having supported Siemens with type certification of the SWP-6.0-154 last year, and to now see it grow to become the even bigger D7 turbine, DNV GL has been able to guarantee continuity for the certification process not only to Siemens as our customer, but also to their customers and partners."

— Source: DNV GL