



Windurance will produce an 80-kilowatt, three-phase version of this 25-kilowatt single-phase inverter developed by Intergrid. *Image by Robert Wills, Intergrid*

U.S. Department of Energy Competitiveness Improvement Project (CIP)

2020 Component Innovation Awardee: Windurance LLC

Project dates: December 23, 2020—July 25, 2022

Project Overview

A certified wind turbine power conversion component from a U.S. manufacturer—and shared across multiple wind turbine original equipment manufacturers (OEMs)—will leverage volume and cost benefits, leading to a reduced levelized cost of energy for domestic distributed wind.

Currently, there is no wind system power-conversion component available to wind turbine OEMs that is certified to applicable standards for use in the U.S. distributed wind energy market. Off-the-shelf industrial drives have features that are not needed by distributed wind OEMs and lack other features that would be valuable for the operation and control of wind turbine generating systems. In addition to adding costs for OEMs, these industrial drives increase uncertainty and risk for project developers and prospective owners. All of this presents barriers and increases costs for the development of distributed wind in the United States.

With funding from CIP, **Windurance** plans to develop an industry-specific power-conversion component that will offer application-specific features at lower cost for distributed wind OEMs.

Project Outcomes and Deliverable

Windurance proposes to advance the development of an existing 25-kilowatt (kW), single-phase inverter design developed by Intergrid through a separate CIP award.

“Through this Competitiveness Improvement Project, Windurance will develop a certified power-conversion component for the distributed wind industry. We seek to gain a consensus among distributed wind turbine OEMs that the modular Intergrid family of Windurance power-conversion electronics is the highest performing and most cost-effective solution available for their products.”

Dan Clunies, Windurance Business Development Manager

This single-phase design accommodates adding a three-phase capability. Additional engineering development and design verification work are needed to complete the three-phase implementation for a 480-volt, three-phase converter (generator to direct current [DC]) and inverter (DC to alternating current [AC] consumer). These form the basic power conversion elements for a wind system power-conversion platform.

Windurance will leverage existing designs from its self-powered DC bus shunt regulators. These will be configured to serve target OEM wind turbines rated from 50 kW to at least 120 kW. These diversion load controllers can be scaled by adding multiple units, as required, for the individual wind turbine designs.



This project includes the basic software and hardware integration of the Windurance core processor to serve as a power-conversion supervisor. The focus is on power electronics performance verification and certification testing, including:

- Generator torque command
- Monitoring generator speed
- Monitoring fault and appropriate fault response(s)
- Monitoring AC and DC voltage levels
- Monitoring AC and DC current levels
- Computation of power
- Functionality to receive, store, and transfer to the inverter processor the wind-turbine-specific configuration, such as speed/torque (power curve) data
- Diversion load controller configuration
- Condition data monitoring capability.

At the end of the project, Windurance intends to have a certified power-conversion component available to the distributed wind industry.

Project Approach

Windurance will begin with an existing and partially tested Intergrid design for an 80-kW, three-phase, 480-volt inverter. From there, Windurance will:

- Review, verify, and update the design
- Manufacture the inverter
- Obtain third-party certification.

Project Collaborators

Current and future project partners include:

- **Intergrid**—Foundational inverter technology
- **Pecos Wind Power**—85-kW wind turbine OEM
- **Windward Engineering**—50-kW wind turbine OEM
- **Northern Power Systems**—100-kW wind turbine OEM
- **XFlow Energy**—Vertical-axis wind turbine OEM

Project Financial Information

Award Amount: \$399,998

Awardee Share: \$195,161

Total: \$595,159

“Windurance is an authority on the component design requirements of modern wind turbines serving in harsh environments. This 2020 CIP award will enable the company to develop and obtain third-party certification for wind system power-conversion equipment configurable to serve wind turbines from 50 kW to 120 kW.”

Lee Jay Fingersh, NREL Technical Monitor

Component Innovation Award

One of eight types of Competitiveness Improvement Project awards, Component Innovation Awards are designed to support innovation in existing components—such as controllers, inverters, alternators, rotor blades, or towers—to lower costs and/or improve production. Projects can also include development of turbine components that will allow the wind turbine to enter new market areas.

About the Competitiveness Improvement Project

The U.S. Department of Energy’s (DOE’s) Competitiveness Improvement Project supports U.S. leadership in distributed wind technologies. Managed by NREL on behalf of DOE’s Wind Energy Technologies Office, the Competitiveness Improvement Project supports innovation to advance wind energy as a low-cost, distributed generation technology option.

More Information

Visit NREL’s website at www.nrel.gov/wind/competitiveness-improvement-project.html

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