



Bergey Windpower's 2021 Competitiveness Improvement Project award will be used to design, fabricate, and test a new, advanced permanent-magnet alternator for the Excel 15 wind turbine (shown here). The goal of the project is to lower the alternator's fabrication cost by at least 25% and levelized cost of energy by 8%, which will lead to more sales, manufacturing and installation jobs, and greenhouse gas savings. *Photo from Jordan Nelson, Nelson Aerial Productions*

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

2021 Component Innovation Project Awardee: Bergey Windpower

Project Dates: Oct. 13, 2021–July 11, 2023

Project Overview

Component Redesign Could Reduce Distributed Wind Energy Costs and Increase Adoption Rates

In recent years, the cost of small wind turbines for homes, farms, and small businesses has decreased dramatically thanks to advances in American technology made possible by research and development support from the U.S. Department of Energy. But further reductions are needed to realize the gigawatt-scale potential of distributed wind energy to help electrify rural America, reduce carbon emissions, and create jobs.

Currently, for residential- and farm-scale wind turbines with direct-drive, permanent-magnet alternators, the alternator is the highest-cost component of the wind turbine (excluding the tower). The [Bergey Windpower](#) Excel 15 wind turbine incorporates advanced technology in its rotor and controls and will soon incorporate advanced power electronics—but its alternator is based on technology that is more than a decade old. To help reduce capital expenditures of the Excel 15 wind turbine, Bergey Windpower is developing an advanced, lower-cost, permanent-magnet alternator.

“Reducing the cost of the alternator on Bergey Windpower's best-selling Excel 15 wind turbine will have a significant benefit because that alternator is the most expensive component of the wind turbine.”

Mike Bergey, Bergey Windpower president and CEO

Project Outcomes and Deliverable

The goal of the project is to lower the alternator fabrication cost by at least 25%, which will provide a levelized cost of energy reduction of at least 8%.

The deliverable is a newly designed, fabricated, and tested advanced permanent-magnet alternator for the Excel 15 wind turbine.



Project Approach

To achieve its goal, Bergey Windpower will evaluate possible improvements to its alternator, such as new magnetic circuit designs, stronger magnets, segmented laminations, and structure optimization, and develop a design for manufacturing. Successful tests will lead to updated certifications and integration into manufacturing of the Excel 15 wind turbine at Bergey Windpower's factory in Norman, Oklahoma.

Project Collaborators

Bergey Windpower will collaborate on this project with:

- **National Renewable Energy Laboratory**—Technical assistance
- **Auburn University**—Technical reviews

Project Financial Information

Award Amount: \$186,858

Awardee Share: \$83,000

Total: \$269,858

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 the National Renewable Energy Laboratory (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.

"Bergey Windpower has received previous CIP awards to accelerate R&D on new, distributed wind technology. Their past awards resulted in a 60% reduction in the cost of energy and helped enable this 40-year-old, family-owned, American company to stay in business and remain competitive. This kind of track record indicates further cost reductions are coming soon."

Brent Summerville, NREL technical monitor



A permanent-magnet alternator converts the rotational energy in the wind turbine rotor to electrical energy by passing powerful rare earth magnets through coils of copper wire or windings, inducing an electrical current. With the Bergey Windpower permanent-magnet alternator, the turbine blades are directly connected to the alternator rotor, or magnet can (shown in the foreground of this photo). This alternator rotor is then assembled with the stator, the stationary part of the permanent-magnet alternator that contains the copper coils. Fully assembled permanent-magnet alternators for Bergey Windpower's Excel 15 wind turbine are shown in the background. *Photo from Mike Bergey, Bergey Windpower*

More Information

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

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