



# Addressing Market Issues through the Competitiveness Improvement Program (CIP)

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# The Challenge

- Industry has required rapid innovation to compete with lower-cost distributed generation technologies
- Improved technology is progressing through the development cycle, enabling deployment and market impact.
- The U.S. distributed wind energy industry is made up of small companies with limited available resources and the CIP has been working closely with industry on these challenges since 2012.

# The Competitiveness Improvement Project

Through the Competitiveness Improvement Project (CIP), the U.S. Department of Energy (DOE) Wind Energy Technologies Office and National Renewable Energy Laboratory (NREL) offer a competitive, cost-shared solicitation for manufacturers of small and medium wind turbines to:

- Optimize their designs
- Invest in advanced component development
- Improve interoperability with other distributed energy resources
- Implement advanced manufacturing processes
- Help test and certify wind turbine technology, and
- Accelerate pathways for commercialization.

# The Next Step in CIP Evolution

CIP supports innovation at various stages of product development and has evolved to support commercialization and encourage market scaling to further reduce costs and meet growing demand for the technology. **The focus of CIP round 2024 is on the testing, certification/listing, and commercialization of distributed wind technology.**

## Competitiveness Improvement Project

Since 2012, NREL has awarded:



**64**  
subcontracts



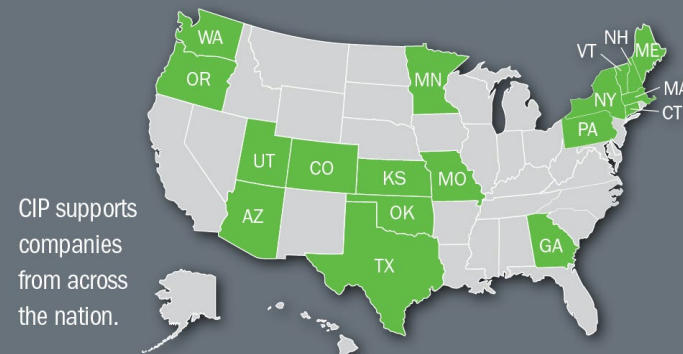
**\$15.4M**  
total DOE funding



**26**  
companies



**\$7.9M**  
additional private-sector investment



Infographic by NREL

# CIP Impact

The cost of distributed wind energy technology has trended steadily down

## Cost of Energy Comparison

(unsubsidized)

- Rooftop residential solar power: 11.7 – 28.2 cents/kilowatt-hour (kWh)

*Note: CIP awardees report LCOE of ~ 7 – 39 cents/kWh*

- Utility-scale solar power: 2.4 – 9.6 cents/kWh
- Land-based, utility-scale wind energy: 2.4 – 7.5 cents/kWh

Source: Lazard Levelized Cost of Energy Analysis version 16

Through CIP, companies are developing a wide range of advanced wind turbine technology from 300 watts to 300 kilowatts (kW) [note that CIP scope is up to 1000 kW]

### Example projects:

**Ryse Energy** working to achieve certification of the entire Air series of micro wind turbines (previously Primus Windpower).

**Intergrid LLC** and **Windurance** have developed inverters for a range of distributed wind turbines to meet updated grid integration requirements and fill a distributed wind energy industry gap.

**QED Wind Power** initiated field testing, certification, and electrical safety listing of their 20-kW wind turbine for rural communities.

**Windward Engineering** has developed a modern 60-kW design, ready for prototype testing.

**Pecos Wind Power** prototyped a new 85-kW wind turbine, resulting in an expected 55% lower cost of energy than comparable installations.

**Eocycle America** advanced their 100-kW M-series with a new, optimized rotor design and is working to achieve certification. They have also used the Commercialization topic area to develop partnerships with Ag companies.

**Carter Wind Turbines** modernizing their 300-kW wind turbine design to become a rapidly deployable, medium-size, hybrid wind energy system with integrated storage to provide critical resiliency for isolated communities.

Photo from Primus Windpower, NREL 44229



Photo from Carter Wind Turbines

[Visit NREL CIP website for project factsheets](#)

# CIP efforts have helped manufacturers achieve a competitive LCOE

COMPETITIVENESS IMPROVEMENT PROJECT: EXAMPLES OF CONTINUOUS INNOVATION *Infographic by NREL*

In collaboration with the U.S. Department of Energy/National Renewable Energy Lab, over the course of this effort...

 **2x**

Bergey Windpower Company (BWP) doubled annual energy production with the Excel 15 turbine...

which reduced the levelized cost of energy by

 **50%+**  
(~\$0.13/kWh)

**2012**

BWP produced this 10-kW work-horse wind turbine for 30 years.



**2013**

Under CIP, BWP conducted a complete redesign of the turbine.



**2014**

Under CIP, BWP partnered with Intergrid and greatly expanded the control and functionality of the turbine power electronics with a small additional cost.



**2015**

BWP started certification testing of a new 15-kW model to U.S. standards.



**2017**

BWP developed a new foundation design to reduce installed costs.



**2019**

BWP requested CIP funding to expand the applications for use of the 15-kW turbine focusing on microgrid markets.



**2021**

BWP focused on optimizing their permanent-magnet alternator, reducing its cost by 26%, leading to an 8% reduction in total system manufacturing costs.



**2022**

Taking advantage of the newest CIP topic area, BWP will develop a financing solution to accelerate the pace of rural residential market sales.



# 2024 CIP Topic Areas

focus on  
testing,  
certification,  
listing,  
commercializa  
tion.

## Prototype Design Development

This involves moving original concepts from the preliminary design phase to development of a production prototype.

## Prototype Manufacture and Installation

This involves construction and installation of a production prototype of the full wind turbine system for field or dynamometer testing.

## Prototype Installation and Testing

This involves validating a prototype wind turbine to determine the commercial readiness of the turbine system.

## Component Innovation

This involves innovation in existing wind generator designs to improve components, leading to a reduced levelized cost of energy.

## System Optimization

This involves improvements in existing wind generator designs to optimize the full system or a subsystem, leading to a reduced levelized cost of energy.

## Small Turbine Certification and/or Listing

For turbines with a peak power up to 150 kW, this involves focusing on certification to the American Clean Power Association's 101-1-2021 standard and can also include listing to electrical safety standards.

## Type Certification and Listing

This involves wind turbine type certification through the IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications (IECRE) and can also include listing to electrical safety standards.

## Manufacturing Process Innovation

This involves designing, building, and validating improved manufacturing processes for a defined production wind turbine or component, leading to a reduced levelized cost of energy.

## (New in 2024) Inverter Listing

These projects address the need for listed inverters built and tested specifically for small- and medium-scale wind turbines.

## Product Commercialization and Market Development

This involves development of markets for new products or existing products into new markets and helps address cost barriers to commercialization and rapid, large-scale deployment of improved, certified distributed wind energy technology. Projects should focus on key market opportunities identified in NREL's *Distributed Wind Futures Study* (2022) including rural and agricultural markets.



# Also new in CIP 2024



New CIP LinkedIn  
group for teaming



## Concept papers

31 received,  
Feedback sent



## Award limits

Prototype install &  
Test, \$250k > \$300k  
\$20k increase for Small  
Wind Certification for  
ACP 101-1 surveillance



## ICC-SWCC

NREL-funded  
preliminary reviews



## Proposal Support

via eFormative  
Options



## DEIA

DEIA assessment in  
merit criteria, CBPs a  
deliverable for  
commercialization  
projects

# References

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# Thank you.

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