

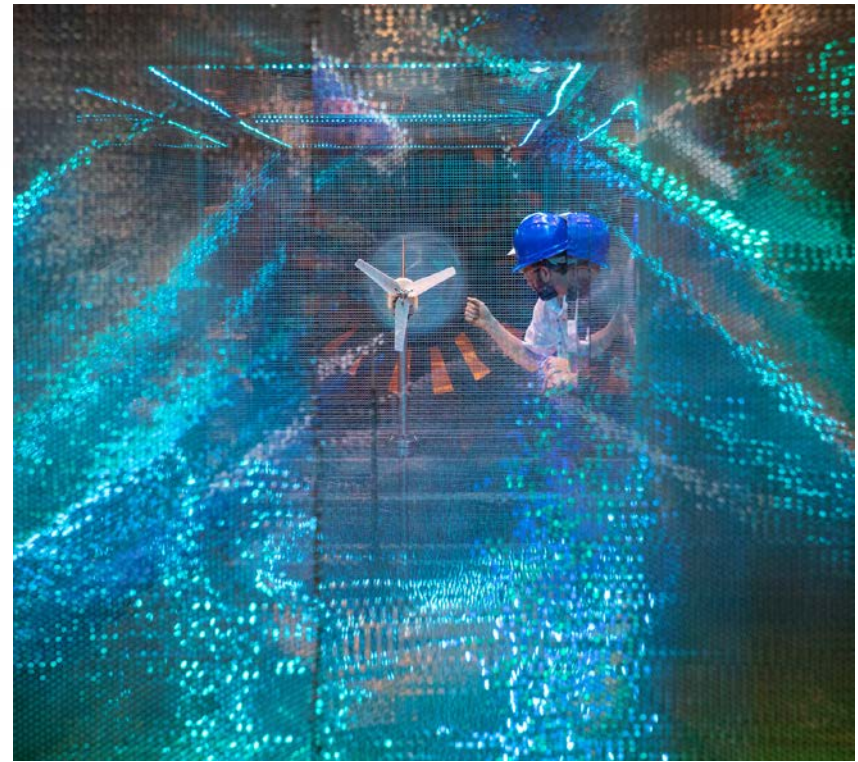
U.S. DEPARTMENT OF  
**ENERGY**

Office of  
ENERGY EFFICIENCY &  
RENEWABLE ENERGY

# Collegiate Wind Competition Project ID #M14

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National Renewable Energy Laboratory



*Photo by Werner Slocum, NREL*



# FY17-FY18 Wind Office Project Organization

“Enabling Wind Energy Options Nationwide”

Technology Development

Atmosphere to Electrons

Offshore Wind

Distributed Wind

Testing Infrastructure

Standards Support and International  
Engagement

Advanced Components, Reliability, and  
Manufacturing

Market Acceleration & Deployment

Stakeholder Engagement, Workforce  
Development, and Human Use Considerations

Environmental Research

Grid Integration

Regulatory and Siting

Analysis and Modeling (cross-cutting)

# Project Overview

## M14: Collegiate Wind Competition

### Project Summary

The U.S. Department of Energy (DOE) Collegiate Wind Competition (CWC) challenges interdisciplinary teams of undergraduate students from a variety of academic programs to offer unique solutions to complex wind-energy challenges.

### Project Objective & Impact

The objective of the DOE CWC is to inspire and prepare students from multiple disciplines to enter the wind-energy workforce by providing real-world technology and business plan development experience.

### Project Attributes

#### Project Principal Investigator(s)

Elise DeGeorge, National Renewable Energy Laboratory (NREL)

#### DOE Lead

Amber Passmore, DOE  
Jocelyn Brown-Saracino, DOE

#### Project Partners/Subs

KidWind  
American Wind Energy Association  
Wind Energy Foundation  
Industry Sponsors and Judges (multiple)  
University Partners

#### Project Duration

2012 to the Present

# Technical Merit and Relevance

- CWC supports the nation's efforts to accelerate the deployment of wind power technologies through improved performance, lower costs, and reduced market barriers.
- CWC was designed to be cross-disciplinary and hands-on introducing students to the many facets of wind energy development.



*Photo by Werner Slocum*

- A successful outcome includes:
  - Growing a wind industry workforce competitive in the global marketplace that closely mirrors the wind industry.
  - Incorporating multiple engineering disciplines, business, marketing, and communications into strong, diverse teams.

# Approach and Methodology

Inaugural 2014 CWC	2015 Engineering Contest	2016 CWC	2017 Technical Challenge	2018 CWC
<ul style="list-style-type: none"> <li>• 10 universities, over 150 students</li> </ul>	<ul style="list-style-type: none"> <li>• 2014 teams invited to re-compete</li> </ul>	<ul style="list-style-type: none"> <li>• 12 universities; 5 new, 7 returning</li> </ul>	<ul style="list-style-type: none"> <li>• 2016 teams invited to re-compete</li> </ul>	<ul style="list-style-type: none"> <li>• 12 universities; 4 new, 8 returning</li> </ul>
<b>Location:</b> <ul style="list-style-type: none"> <li>• AWEA WINDPOWER in Las Vegas</li> </ul>	<b>Location:</b> <ul style="list-style-type: none"> <li>• National Wind Technology Center in Colorado</li> </ul>	<b>Location:</b> <ul style="list-style-type: none"> <li>• AWEA WINDPOWER in New Orleans</li> </ul>	<b>Location:</b> <ul style="list-style-type: none"> <li>• National Wind Technology Center in Colorado</li> </ul>	<b>Location:</b> <ul style="list-style-type: none"> <li>• AWEA WINDPOWER in Chicago</li> </ul>
<b>Elements:</b> <ul style="list-style-type: none"> <li>• Turbine Testing</li> <li>• Technical Design</li> <li>• Business Plan</li> <li>• Market Issues</li> </ul>	<b>Elements:</b> <ul style="list-style-type: none"> <li>• Turbine Testing</li> <li>• Technical Design</li> <li>• Bonus: Siting Challenge</li> </ul>	<b>Elements:</b> <ul style="list-style-type: none"> <li>• Turbine Testing</li> <li>• Technical Design</li> <li>• Business Plan</li> <li>• Deployment Plan</li> <li>• People's Choice</li> <li>• Bonus: Visually Appealing Load</li> </ul>	<b>Elements:</b> <ul style="list-style-type: none"> <li>• Turbine Testing (added yaw)</li> <li>• Technical Design</li> <li>• Bonus: Siting Challenge</li> </ul>	<b>Elements:</b> <ul style="list-style-type: none"> <li>• Turbine Testing (with new tunnel – increased wind speed)</li> <li>• Technical Design</li> <li>• Business Plan</li> <li>• Siting Contest</li> </ul>

**In 2018 there were...**

- 12 teams
- 27+ faculty advisors
- 270+ students
- Approx. 30 major fields of study

Through its activities, the CWC remains true to its objective to attract the next generation of wind energy professionals by providing exposure to experts and educational opportunities and fully informing them of the issues and challenges facing the wind industry today.

# A Third Wind Tunnel Designed and Constructed

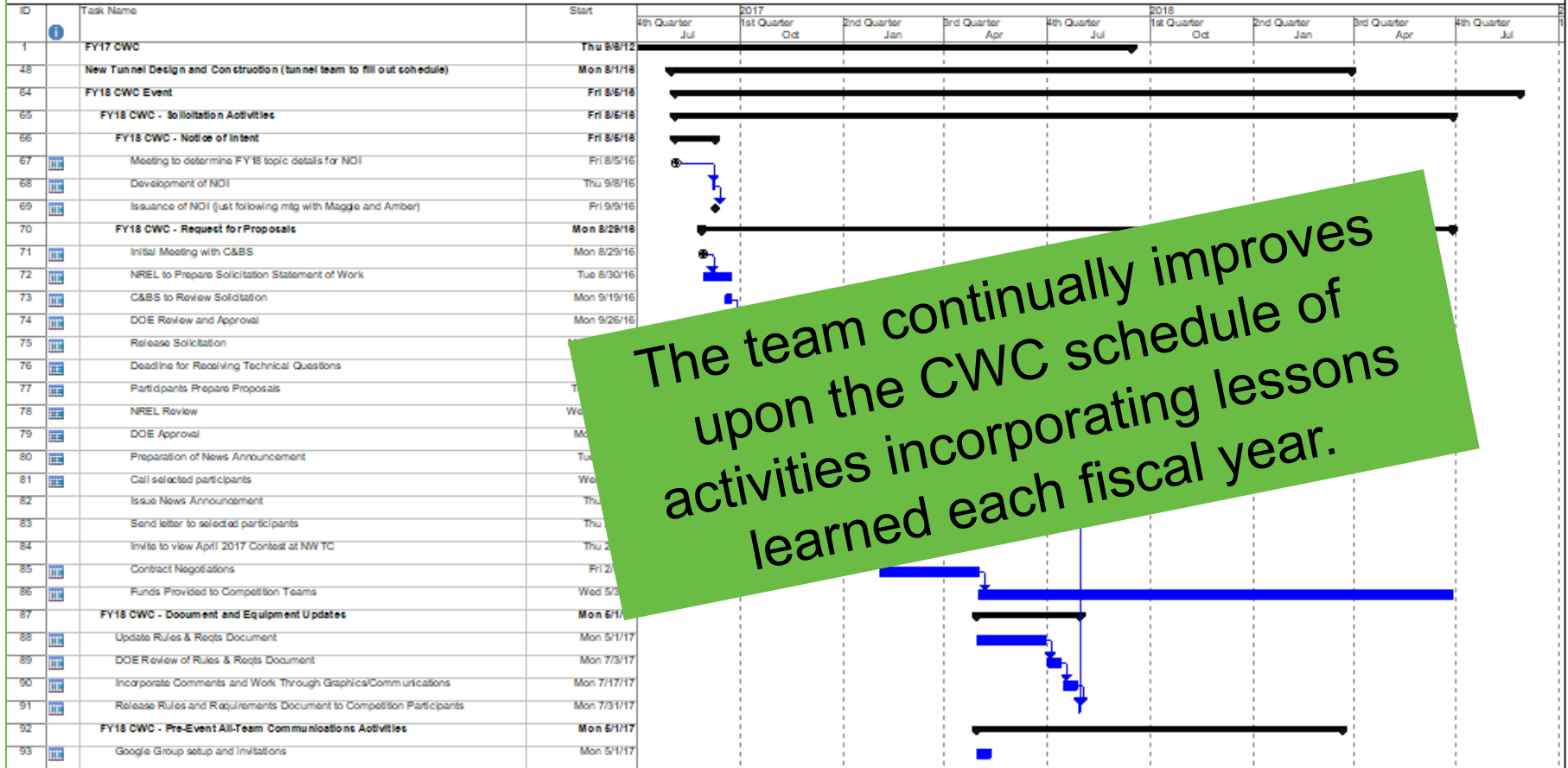
- A new wind tunnel was proposed in order to achieve real world max design wind speed (25 meters/second (m/s)), to be able to incorporate yaw and complex flow and to allow for modularity to accommodate different challenges.
- Three purpose-built tunnels designed and fabricated by National Wind Technology Center engineers and technicians with the newest built in FY17/FY18.
- Designed to test wind turbines with rotors less than 45 centimeters (cm) in diameter.
  - Two Generation 1 tunnels: 19-foot long with 4 x 4-foot test chamber.
  - One Generation 2 tunnel: *40-foot* long with *two* 4 x 4-foot test chambers, 85 horsepower (HP) motor, **up to 30 m/s**.
- Turbines are subjected to a range of wind speeds and tested for durability, safety, cut-in, power curve, and control.



The new Generation 2 tunnel (forefront) provides expanded capabilities over the Generation 1 tunnels (background) and will allow the competition to continue to evolve while reducing noise and other impacts. *Photo by Werner Slocum*

# Accomplishments and Progress

## U.S. Department of Energy FY17/18 Collegiate Wind Competition Revision Dated: 8/31/16



The team continually improves upon the CWC schedule of activities incorporating lessons learned each fiscal year.

Project: CWC FY17&18\_r5.mpp  
Date: Thu 2/28/19

Task	[Blue bar]	Project Summary	[Grey bar]	Inactive Summary	[Dotted bar]	Manual Summary	[Green diamond]	External Milestone	[Red bar]	Progress	[Green bar]
Split	[Dotted bar]	External Tasks	[Grey bar]	Manual Task	[Dotted bar]	Start-only	[Green diamond]	Deadline	[Red bar]	Deadline	[Green bar]
Milestone	[Green diamond]	External Milestone	[Green diamond]	Duration-only	[Dotted bar]	Finish-only	[Green diamond]	External Tasks	[Green diamond]		
Summary	[Blue bar]	Inactive Milestone	[Grey bar]	Manual Summary Rollup	[Green diamond]						



# Accomplishments and Progress

- Engaged institutions from Alaska to Puerto Rico (see map below)
- Catalyzed wind energy programs that use CWC information in their educational material
- Established a core alumni group of advocates including administration, faculty, staff, students, etc.
- Fostered academic-industry networks and connections with the K-12 educational community
- Created an inclusive environment

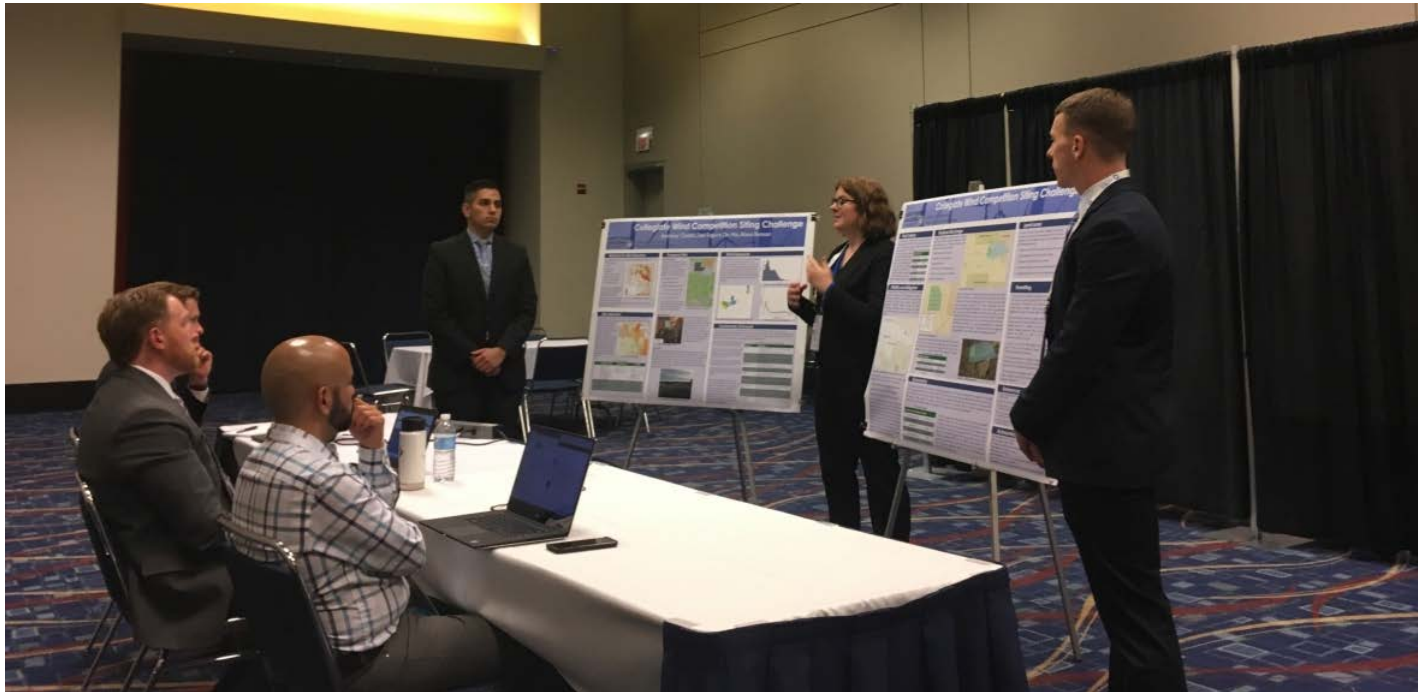




# Accomplishments and Progress

*“I feel extremely lucky. It was participation in the siting challenge that really got me my job. I learned about all the different considerations when putting a wind farm in the ground. Everything from resource assessment, which is what I work on now, to environmental factors, to working with the community—it was so fascinating and important to learn.”*

- Alana Benson



# Communication, Coordination, and Commercialization

The communications strategy aims to engage new schools to participate, bring in industry participants to help support the education opportunities for students, and create materials that will simplify and streamline the process for spreading the word for those that want to help. The team accomplishes this by:

- Establishing regular collaboration between DOE and NREL to make sure our strategies are aligned
- Developing social media content from DOE and NREL to engage directly with potential participants where they are most active
- Creating web content to tell more in-depth stories of student successes and elements of the competition
- Offering easily accessible tools to simplify the storytelling process for stakeholders
- Providing support during the competition through the design of an agenda, presentations, photography, and directional posters
- Producing conference materials to promote the competition at external events, including posters, fliers, and postcards.

## Example Communication Materials



# Upcoming Project Activities

- The Collegiate Wind Competition 2019 Technical Challenge:
  - May 6–9, 2019 at the National Wind Technology Center!
- DOE/NREL selected 12 teams (out of 21) to participate in CWC20 taking place in June 2020 in Denver, Colorado!



*Photo by Lee Jay Fingersh, NREL*