U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

2021 PROJECT PEER REVIEW

U.S. DEPARTMENT OF ENERGY
WIND ENERGY TECHNOLOGIES OFFICE

E16 - Bat Smart Curtailment: Efficacy and Operational Testing

Program; Mitigate Market Barriers – Environmental Research

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Natural Power

August 2021

FY21 Peer Review - Project Overview

Project Summary:

- **High rates of bat fatalities are key barrier to wind farm siting and expansion of wind into low wind speed regions**
- **Evaluating the efficacy of bat smart curtailment to conserve bats while minimizing energy loss, across a range of wind speeds (Task 3).**
- **Addressing operational concerns that are barriers to BSC adoption by wind farm operators (Tasks 1 and 2)**
- **Partners: Interstate Power and Light (IPL)/Alliant Energy, NREL**

Project Objective(s) 2019-2020:

- **Task 1 – Identify and address any weakness and gaps in current cybersecurity practices and address**
- **Task 2 – Assess and address any turbine loading concerns**
- **Task 3 - Achieve at least a 50% reduction in fatalities compared to normal operations and achieve at least a 50% reduction in annual energy production (AEP) as compared to blanket curtailment under similar conditions.**

Overall Project Objectives (life of project):

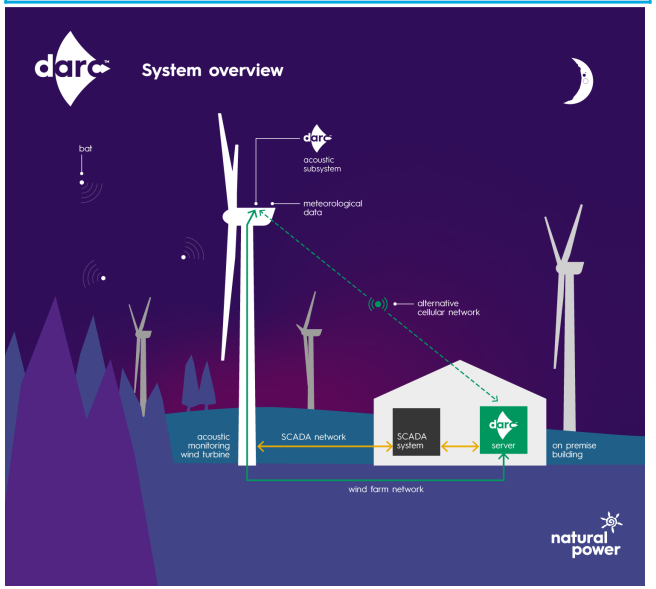
- Commercialize the Detection and Active Response Curtailment (DARC) system

Project Start: January 2020
Expected Completion: September 2021
Period of Performance: 1.5 years

DOE Share: $505,3000
Cost Share: $802,094
Total Project Budget: $1,307,394

Key Project Personnel: Christine Sutter, Steven Rizea, Kaj Nielsen, Jeff Maxted, Alan Arnold, Dana Scott, Jeroen van Dam, Samantha Rooney, Maurice Martin

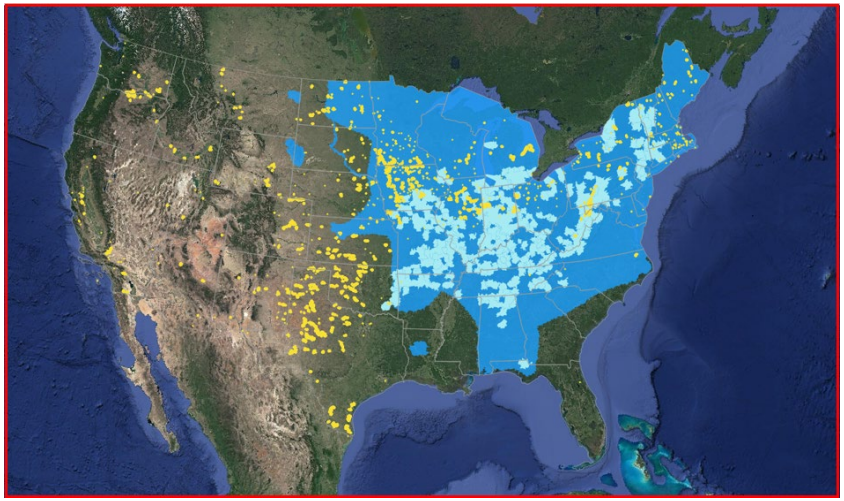
Key DOE Personnel: Michael Carella, Jocelyn Brown-Saracino, Raphael Tisch, Nicholas Massey

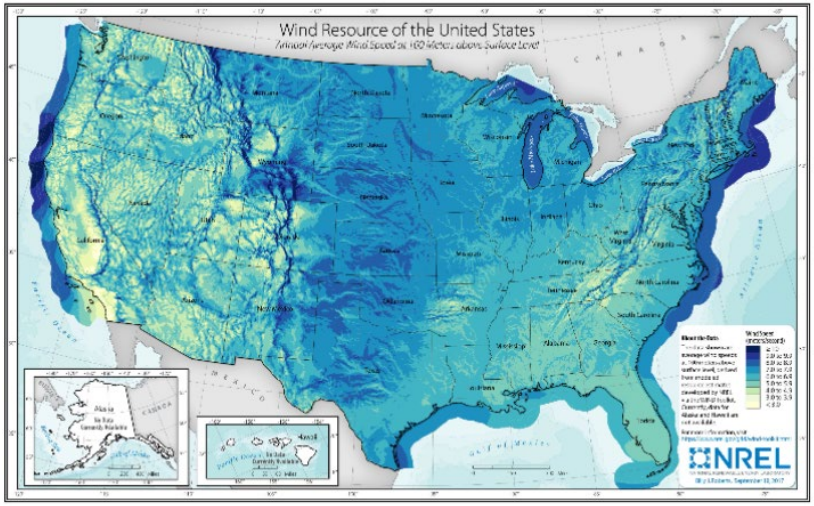


Project Impact

This research project is evaluating the effectiveness of smart curtailment as a strategy to reduce bat fatalities and minimize the economic impacts of curtailment. If successful, such a tool would facilitate expansion of wind energy.

- Hoary bat population level effects
- Endangered species effects
  - 600+ wind farms within Northern long-eared bat range
  - 250+ wind farms within Indiana bat range
  - New species potential listing in 2021-2023





Program Performance – Scope, Schedule, Execution

Schedule

- The COVID-19 pandemic struck just at the project was getting started. Delays in Task 1 and 2. No delays in Task 3
- Installation/cybersecurity issues delayed start of Task 3 by 4 days
- Reports for all tasks due by Sept 1, 2021

Research Approach and Method

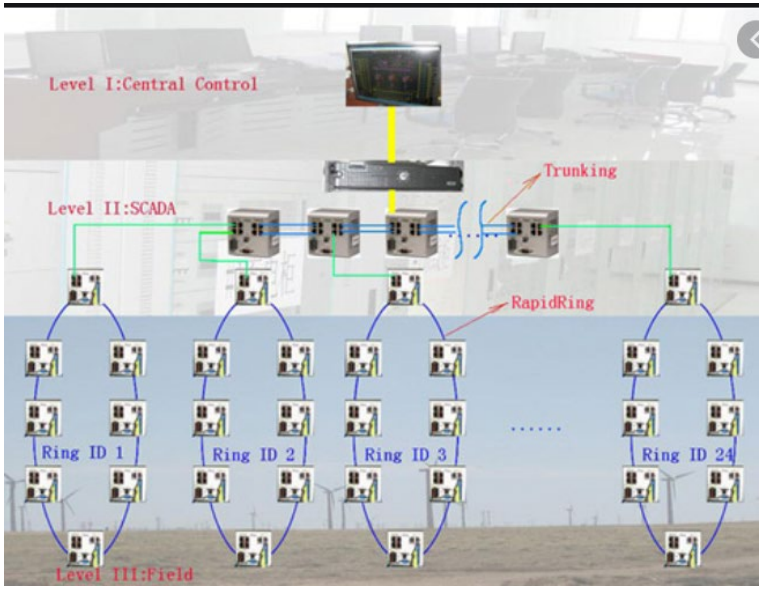
- Task 1 – expert third-party review of system architecture and cybersecurity practices
- Task 2 – Load testing of DARC curtailment at a NREL test facility
- Task 3 – Field test of DARC
  - 3 treatment groups
  - Mortality monitoring

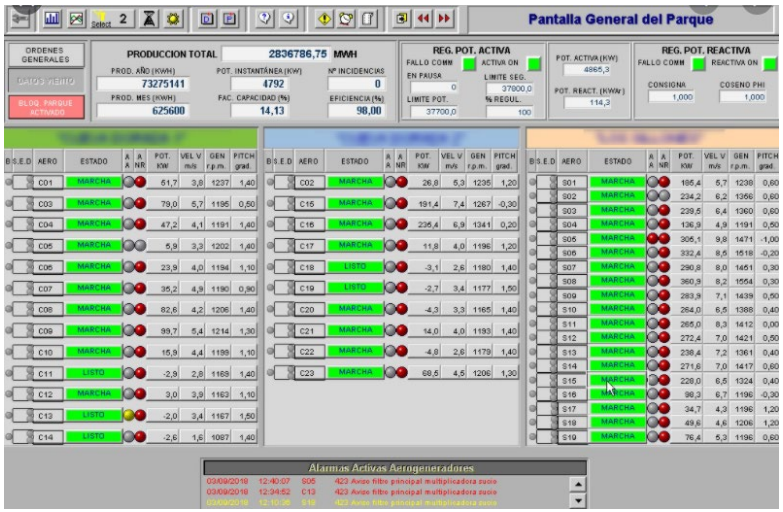
Treatment Number	Treatment Description
1	Minimally curtailed – turbine blades are pitched out below manufacturers cut-in speed of 3.0m/s but are not curtailed above that wind speed
2	6.9m/s blanket curtailment – turbines blades are pitched out below 6.9m/s, including below 3.0m/s
3	6.9 bat smart curtailment – turbines blades are pitched out below 6.9m/s when bats are present in the Rotor swept area. Blades also pitched out below 3.0m/s during all nighttime hours

Program Performance – Accomplishments & Progress

- Task 1 – NREL and Natural Power are still working on this task
- Task 2 – Load testing complete and draft report written and under review by Natural Power
- Task 3 – Field study is complete, data analysis and repot writing are underway
- Potential to conduct a second year of field study in 2021

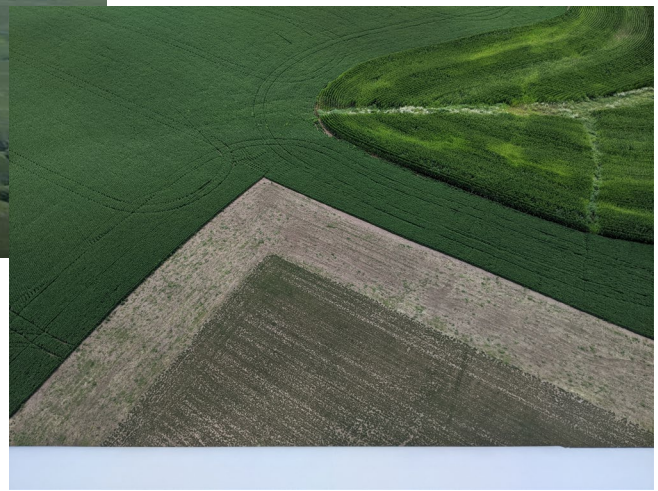
- Commercial sale and installation at a wind farm in Spring 2021





Project Performance - Upcoming Activities

- Completion of Task 1 and 2 reports by Sep 1, 2021
- Potential to conduct a second year of field study in 2021 (Aug to Oct)



Stakeholder Engagement & Information Sharing

- The preliminary results of this research were presented at the virtual Wind and Wildlife Research Meeting in December 2020 as well as the virtual CleanPower Conference in June 2021 with additional presentations planned.
- The technical reports for all three tasks will be made publicly available and the team intends to submit the results of the Task 3 Efficacy study to a peer-reviewed publication.

Key Takeaways and Closing Remarks

Project Impact: Reduce barriers to wind expansion by conserving both bats and renewable power generation

Project Performance: Study design and reviews are robust. All tasks are slightly behind schedule but will soon be completed

Stakeholder Engagement: Presentations and reports