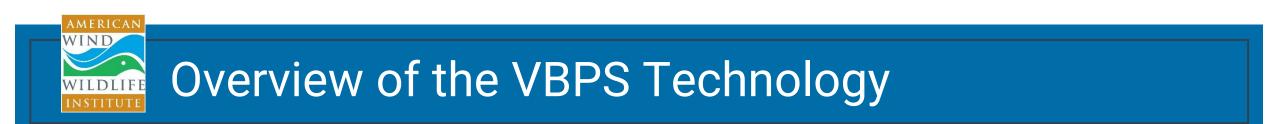


American Wind Wildlife Institute Developing and Evaluating a Smart Curtailment Strategy Integrated with a Wind Turbine Manufacturer Platform

Katy Battle; Manager, Technology Innovation Program – March 26, 2020

<u>www.awwi.org</u>



Problem

Blanket curtailment is a coarse and bio/ecologically uninformed strategy

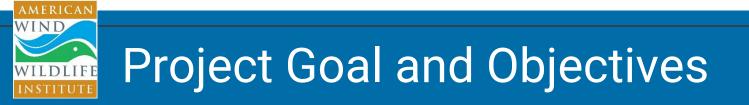
Vestas Bat Protection System (VBPS) Technology

 Newly developed software module in Vestas turbines' Supervisory Control And Data Acquisition (SCADA) systems

 $_{\odot}$ Environmental data → Algorithm → Bat fatality risk estimate → SCADA → Smart curtailment orders

Solution

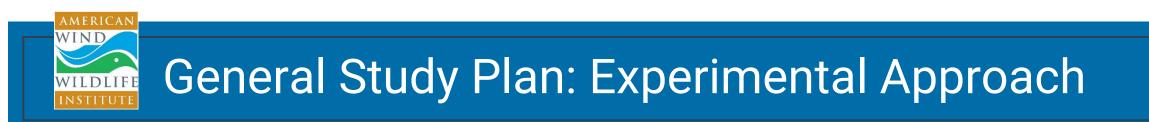
 Improved efficiency (less power production loss) and improved efficacy (reduced bat fatalities) better than Blanket curtailment



- Project Goals:
 - Develop a VBPS smart curtailment strategy that minimizes bat fatalities more efficiently than does than blanket curtailment by minimizing power production loss
- Project Objectives:
 - Develop and evaluate a model-based smart curtailment strategy using VBPS based on bat activity, bat fatalities, and environmental variables
 - Evaluate the economic, power production, and other Annual Energy Production (AEP) implications of this VBPS smart curtailment strategy



- American Wind Wildlife Institute (AWWI)
 - Prime Award Recipient
 - Project Managers (Stu Webster and Katy Battle)
 - Principle Investigator (Taber Allison)
- Bat Conservation International (BCI)
 - Award Subrecipient
 - Field Study Principle Investigators (Winfred Frick, Michael Schirmacher, and Mike Whitby)
- MidAmerican Energy Company (MEC)
 - Host Site, Operations, and SCADA support (Jesse Leckband)
- Vestas Americas (VA)
 - Technology Vendor (Tom Allain)
- Washington State University (WSU)
 - Project Statistician and model developer (Leslie New)



Study Site:

 $\odot\,\text{MEC's}$ Orient windfarm in Adair County, Iowa

• 3 Phases:

Phase 1: Environmental and biological data collection
Phase 2: Algorithm development for smart curtailment strategy
Phase 3: Experimental testing of selected curtailment strategies

- Phase 1: Environmental and Biological Data Collection
 - \circ 10 turbines operating under normal operator parameters
 - **o Biweekly SCADA data requests**
 - Weather data (3 spatial and 3 temporal scales)
 - o Bat Data
 - Acoustic Surveys
 - Thermal Videography
 - Carcass Searches

- Phase 2: Algorithm Development for Smart Curtailment Strategy
 - Determine correlates between carcass/acoustic and between carcass/thermal data
 - Model bat fatality risk according to weather data and develop curtailment strategies. Inform algorithm with best-performing model
 - Estimate theoretical risk reduction and power loss resulting from curtailment strategies and compare against blanket curtailment

- Phase 3: Experimental Testing of Various Curtailment Strategies
 - 18 turbines operating assigned strategy via Randomized Block Design (RBD)
 - 6 control, 6 blanket curtailment, 6 VBPS-programed smart curtailment strategies
 - **o Biweekly SCADA data requests**
 - Fatality, acoustic, and thermal camera monitoring
 - Comparative analysis of blanket and smart curtailment strategies
 - AEP and strategy cost-to-implement comparative analysis



- Project Start: 09/01/2019 (awarded)
 - BP1: 09/01/2019 4/30/2021
 - Year 1 field study: June October 2020
 - Bat fatality risk model development: Spring 2021

○ BP2: 05/01/2021 - 8/31/2022

- Power production stats: Spring 2021
- Year 2 field study: June October 2021
- Final report to DOE: Summer 2022
- Manuscript to journal: Summer 2022

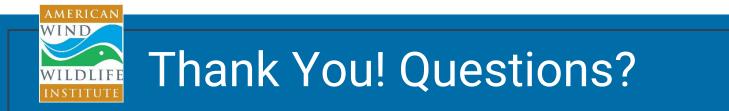
• Project End: 8/31/2022



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For further information, DOE-EERE's program, please visit their webpage at: <u>https://www.energy.gov/eere/wind/environmental-impacts-and-siting-wind-projects</u>



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- AEP: Annual Energy Production
- AWWI: American Wind Wildlife Institute
- BCI: Bat Conservation International
- BP: Budget Period
- DOE: Department of Energy
- MEC: MidAmerican Energy Company
- SCADA: Supervisory Control and Data Acquisition
- VA: Vestas Americas
- VBPS: Vestas Bat Protection System
- WSU: Washington State University