Status of DOE-funded Smart/Informed/Activity-based/Sensor-based Curtailment Projects

Cris Hein

Minimizing Collision Impacts for Bats at Operational Wind Facilities, Part 1: Curtailment

4 October 2021

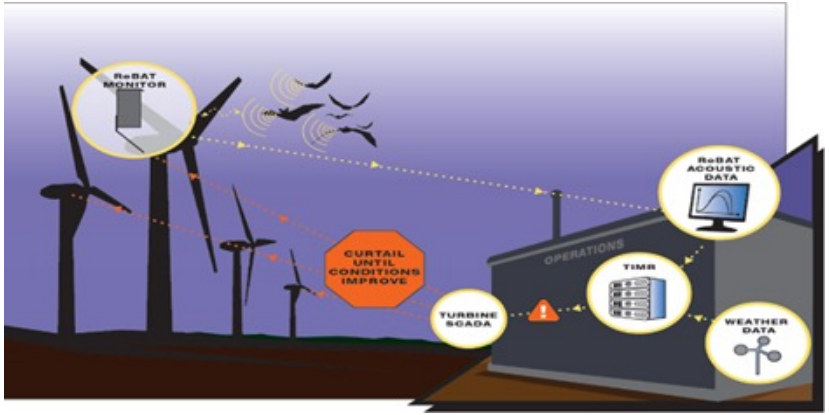
Overview of DOE-WETO Funding

- In March 2019, DOE-WETO selected 10 projects totaling $6.8M to reduce environmental impacts of land-based & offshore wind
- 4 of these received a total of $2.8M to advance smart curtailment strategies for bats
  - Electric Power Research Institute (EPRI)
  - Stantec Consulting Services (Stantec)
  - American Wind Wildlife Institute (AWWI)
  - Natural Power (NP)
- For more information on these studies, visit
  - https://awwi.org/news-events/webinars/ (26 March 2020 webinar)

Silver-hared bat. Photo by C. Hein

EPRI: Turbine Integrated Mortality Reduction (TIMR)

- TIMR Server/Software combines bat acoustic & wind speed data to make curtailment decisions
- Partners
  - AWWI
  - NREL
  - Bat Conservation International (BCI)
  - Normandeau Associates
  - U.S. Geological Survey (USGS)
  - MidAmerican Electric Company (MEC)



Graphic by Electric Power Research Institute

- Contact: Christian Newman (cnewman@epri.com)

EPRI: Turbine Integrated Mortality Reduction (TIMR)

- 2021: 1st field season
  - 4 ReBAT systems installed on nacelles
  - Monitoring between 15 Jun and 18 Oct (daily searches)
  - 3 treatments across 18 wind turbines (Randomized Block Design)
    - TIMR (6.9 m/s when bats present)
    - Blanket (5.0 m/s)
    - Control (feathered up 3.5 m/s)
  - 160 x 160 m plots
- 2022: 2nd field season

Photo by A. Janicki

Stantec: Activity-based Informed Curtailment

- Uses acoustic data measured at nacelle-height
- Design & evaluate a curtailment strategy based on exposure
- Partners
  - Western EcoSystems Technology, Inc.
  - MEC

Nacelle-mounted detectors.

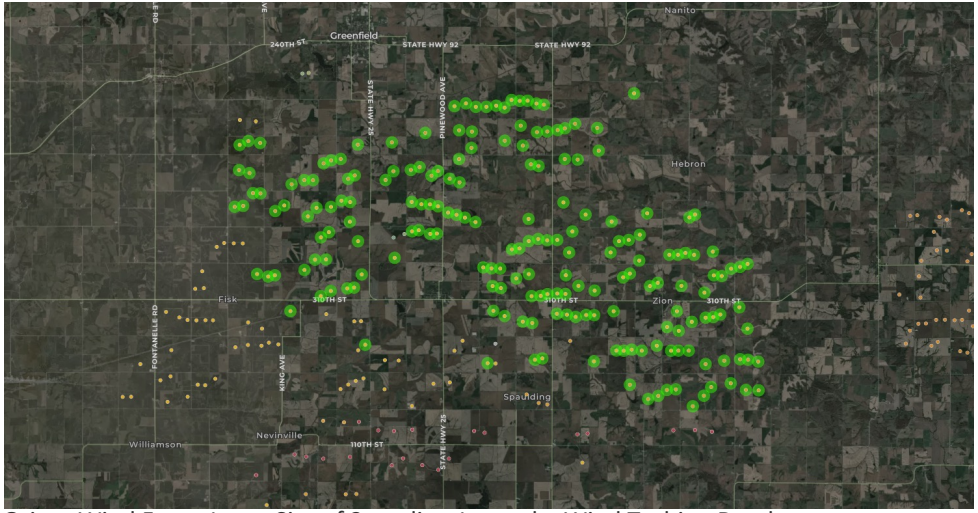
- Contact: Trevor Peterson (trevor.peterson@stantec.com)

Stantec: Activity-based Informed Curtailment

- 2021: Field season
  - Installed 15 nacelle-height acoustic detectors at each of 2 MEC sites + 15 ground-level acoustic detectors (7 at the 1st site & 8 at the 2nd site)
  - WEST, Inc. conducted mortality monitoring at each turbine
    - 100 m x 100 m plots & 140 m x 140 m plots
  - Will remove detectors in October
- 2022: Analysis
  - Use automated & manual ID for all recorded bats
  - Differentiate between exposed and unexposed activity
  - Analyze relationships between mortality data and exposed bat activity

AWWI: Vestas Bat Protection System

- Develop a model-based strategy using bat activity (acoustic & thermal video), bat mortality, & environmental variables using VBPS
- Partners
  - BCI
  - Vestas
  - Washington State University
  - MEC



Orient Wind Farm, Iowa. Site of 3 studies. Image by Wind Turbine Database.

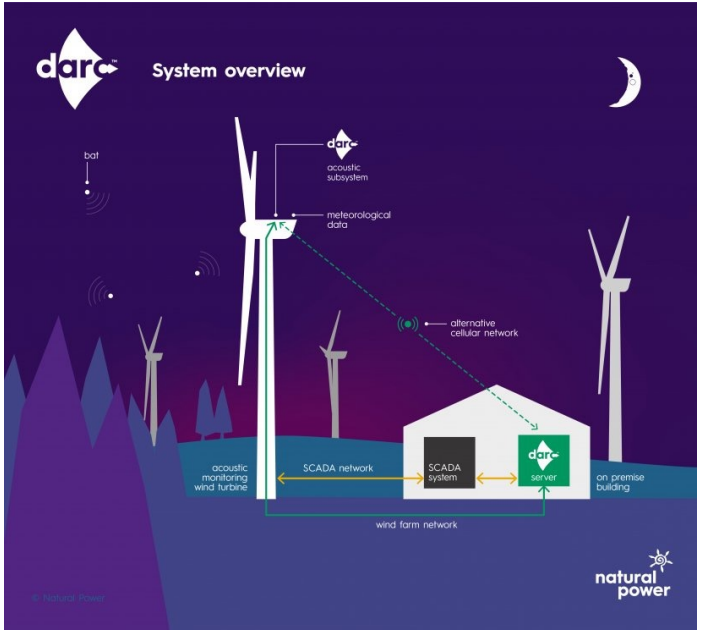
- Contact: Katy Battle (kbattle@awwi.org)

AWWI: Vestas Bat Protection System

- 2021: 1st field season
  - Collect weather, acoustic, thermal video, mortality data
  - Searches at 10 turbines (operating normally)
  - Summer/early autumn monitoring
- 2022: 2nd field season
  - Complete model development for curtailment based on risk according to weather data
  - Experimental Design TBD
    - VBPS-programmed curtailment
    - Blanket curtailment
    - Control

NP: Detection & Active Response Curtailment (DARC)

- DARC combines bat acoustic, wind speed, & temperature data to make curtailment decisions
- Partners
  - Rizea Engineering,
  - Skov
  - Scada Integration Solutions,
  - NREL
  - Wind Wildlife Research Fund
  - Alliant Energy



Graphic by Natural Power

- Contact: Crissy Sutter (christines@naturalpower.com)

NP: Detection & Active Response Curtailment (DARC)

- 2020: 1st field season
  - Acoustic detectors installed at 5 turbines
  - Monitoring between 1 Aug – 15 Oct (3-day searches)
  - 3 treatments across 69 wind turbines (23 turbines/treatment)
    - DARC (6.9 m/s when bats present)
    - Blanket (6.9 m/s)
    - Control (feathered up to 3.0 m/s)
  - Full plots (28 turbines) & R&P plots (41 turbines)
    - 160 x 160 m
- 2021: 2nd field season
  - 2 treatments across 69 wind turbines
    - DARC (5.0 m/s when pats present)
    - Blanket (5.0 m/s)

English Farms, Iowa. Image by Natural Power

NREL: Annual Energy Production Analysis Support for Awardees (AEPAS)

- NREL is working with these 4 projects to evaluate the Annual Energy Production (AEP) impacts of these strategies
  - Control (normal operations)
  - Blanket curtailment
  - Smart curtailment
- Objectives
  - Develop a defensible methodology for evaluating AEP impacts
  - Partner with FOA awardees to specify data requirements
  - Serve as a reviewer of the AEP analyses conducted by awardees
- Contact: Aubryn Cooperman (aubryn.cooperman@nrel.gov)

Hoary bat. Photo by C. Hein

Thank you

www.nrel.gov

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Stantec: Trevor Peterson (trevor.peterson@stantec.com)
AWWI: Katy Battle (kbattle@awwi.org)
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This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by U.S. Department of Energy Office of Energy Efficiency and Renewable Energy. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

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