Refining a Selectively Perceptible Wind Turbine System for Preventing Bat Fatalities

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Webinar presentation:
New Research on Wind Operational Impact Minimization Technologies: DOE-Funded Technology Development & Innovation Projects
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Bat Fatalities at Wind Turbines Mostly Involve Species that Avoid People

n = 8,889

Hoary bat
Eastern red bat
Silver-haired bat
Little brown bat
Tri-colored bat*

photos: J. S. Altenbach
*Al Hicks

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Consistent Characteristics of Bats Dying Most Often at Turbines: Rely on Trees & Avoid Developed Areas

Most Wind Turbines in Dark Places
Bats Have Sensitive, Blurry Vision

Do Bats Visually Confuse Turbines for Trees?
Goal: Change How Bats See Turbines at Night from Far Away

Visually confused by silhouettes of structures similar to trees, where they can consistently find...

Shelter (roosts)?
Food (insects)?
Others (young, mates)?
Rather than Near Deterrence, We are Aiming for Distant Dissuasion

Selectively Perceptible Wind Turbine System

Change the way wind turbines appear to distant bats by flickering extremely dim, ultraviolet (UV) light onto surfaces of the monopole, nacelle, and blades. Passive cue sent to perception's edge.
**Why Very Dim Ultraviolet (UV) Light?**

- Easy to transmit through air
- Outside spectral range of humans
- Outside sensitivity range of birds
- Unlikely to attract insects from afar

A potential bat-specific communication channel

Gorresen et al. 2015
Ultraviolet vision may be widespread in bats. Acta Chiropterologica 17:193-198.

Gorresen et al. 2015
Dim ultraviolet light as a means of deterring activity by the Hawaiian hoary bat (Lasiurus cinereus semotus). Endangered Species Research 28:249-257

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**Distant Signaling Method**

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Dim Ultraviolet light
Bat-specific communication channel
“This is Scary”
The Plan

- Experimentally UV-illuminate 2 turbines at NWTC every other night for 15 months with UV
- Monitor nighttime bat, bird, and insect activity with thermal surveillance cameras
- Compare video activity measures, behaviors, and strikes between lit and unlit conditions
- Report findings in autumn and winter of 2019

Plenty of Bat Activity at NWTC

Goldenberg et al. (In prep) Seasonal behaviors of bats at a wind turbine may explain continental fatality trends.
Plenty of Behaviors at NWTC

Goldenberg et al. (In prep) Seasonal behaviors of bats at a wind turbine may explain continental fatality trends.

Is it Difficult, Safe, Effective?

bat activity & fatality monitored by tower-mounted thermal cameras

UV illuminating tower, nacelle, and blade surfaces

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Video Monitoring

Simple, Reliable Video Setup
Two time-linked cameras
Alternate views
Target height above cameras
Facilitate target identification
Signals will correspond to time-linked acoustic detectors
Camera, Lights, Action…
Designed and Built Prototypes

- BRC engineering team designed & built
- Averaged $540 per light (12 per turbine)
- $6,480 per turbine

June 2018 Test
August 2018 Installation

Installed 20 meters (65 feet) up on Two 80-m-tall Towers by Mid August 2018

Preliminary Information – Subject to Revision.
Do They Work?

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Dark UV Imaging

Preliminary Information—Subject to Revision.
June 2018 Test

Modified Canon Rebel DSLR camera

Photometrics prototype UV camera

September 2018 Tests

Preliminary Information-Subject to Revision.
September 2018 Tests

Both turbines from ~2.5 km (1.6 mi) away, 2-minute exposure UV-mod Canon Rebel

Preliminary Information-Subject to Revision.

September 2018 Tests

Northern turbine from 1 km (0.6 mi) away, Photometrics camera 300 millisecond exposure

Preliminary Information-Subject to Revision.
September 2018 Tests

Southern turbine from ~1 km (0.6 mi) away, Photometrics camera 300 millisecond exposure

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Next Steps

• Continue running cameras and lights to confirm proper operation and correct implementation of UV treatments
• Continue nightly video monitoring and process video within days of recording
• Finish new video processing code by early spring of 2019 in time for next activity season

Preliminary Information-Subject to Revision.
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