Bats vs Blades: Validating Wind Turbine Curtailment for Safer Skies

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Introduction

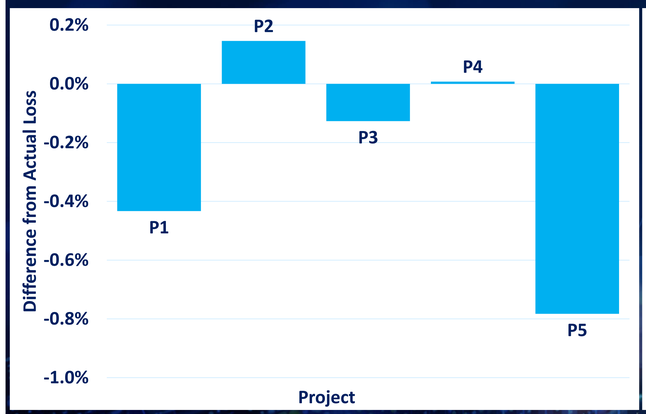
The integration of smart curtailment strategies to mitigate bat-turbine interaction is gaining traction within the wind energy sector. However, it is critical to validate existing methodologies that quantify the associated Annual Energy Production (AEP) losses to ensure accurate forecasting and operational decisions.

Methods

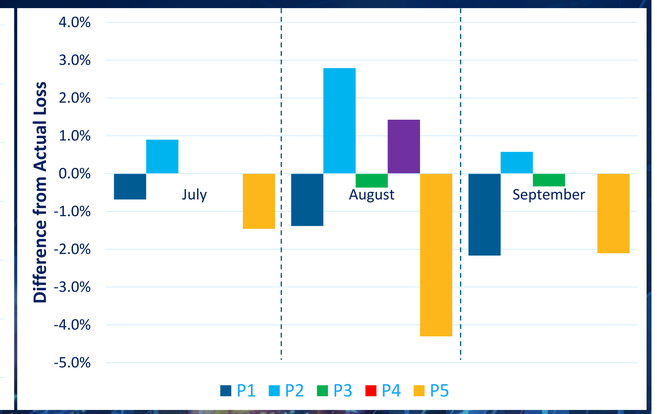
1. High-res SCADA data from **five operational projects across North America** were analyzed, including **event codes for avian curtailment** to calculate bat curtailment loss.
2. A wind flow and energy model was created and then a **time-series calculation** of bat curtailment impact was conducted across **two bat activity seasons**.
3. The results are compared in this study on an annual and monthly basis for each project.

DNV's calculation of **bat curtailment losses** show **strong agreement** with real-world operational data.

Further project data needed at diverse number of wind farms to draw robust conclusions.



Average difference in the annual bat curtailment loss for each project



Average difference in the monthly bat curtailment loss for each project

RESOURCE &TECH

AMERICAN CLEAN POWER

Results

- Modeled versus observed AEP losses ranged from **-0.8% to 0.2%**, indicating a broad alignment of the current curtailment models with operational data.
- **August** exhibited the **largest deviation in AEP losses**, potentially corresponding with peak bat activity and higher curtailment events.
- **AEP losses** were **highly sensitive to wind speed** thresholds, emphasizing the need for precise wind speed modeling in curtailment strategies.

Discussion

Future validation efforts should focus on collecting data from a broader array of wind farm environments and turbine configurations to strengthen these conclusions and enhance the precision of curtailment impact modeling. We invite collaboration from industry partners interested in advancing bat conservation strategies while optimizing energy production.

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DNV