Protecting bats with better wind turbine control

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Nyctalus leisleri. Credit: De Gruyter

Bat fatalities caused by wind turbines could be significantly reduced by

as much as 86% thanks to a new site-specific mitigation scheme described by researchers in a study in the journal *Mammalia*.

The spread of wind turbines, driven by the steady move away from fossil fuel energy sources, poses a significant threat to bats as many are killed each year by collisions with turbine blades.

While several mitigation systems have been tried over recent years, their efficiency in protecting bats has not been fully investigated. One method, called blanket curtailment, slows blade rotation to less than one revolution per minute at the low wind speeds which have been found to cause the highest number of bat fatalities. This is still a relatively unsophisticated procedure since it usually involves applying a general wind speed threshold for all wind turbines for a longer period of time, and can cause considerable loss of energy generation.

To find a way to significantly reduce bat fatalities along with minimizing reduction in electricity production, lead author Dina Rnjak of Geonatura Ltd. and colleagues carried out a four-year monitoring program at Rudine wind farm, Croatia.

During the first two years, the high number of bat carcasses found from mid-July to the end of October indicated a clear need for some mitigation strategy at that time of year. In addition to the known importance of wind speed, the study also confirmed the significant role of temperature and rainfall on bat activity, which was reduced during periods of rain and at temperatures below 11°C.

Rudine wind farm, Croatia. Credit: De Gruyter

The direct monitoring of bat activity, fatalities and the effect of weather led to a site-specific wind turbine curtailment strategy dependent on the specific wind-speed range most dangerous for the bats, adapted to the most critical time periods and most significantly located wind turbines. In addition, the strategy included a process called blade feathering, which adjusts the angle of the turbine blade to prevent undesirable freewheeling. The overall effectiveness of this approach was confirmed in trials conducted over two years.

Using the same method at another wind farm in Croatia showed that different critical wind speed thresholds needed to be applied at that site

to achieve a significant reduction in fatalities.

"This indicates the importance of using site-specific data to determine the best mitigation scheme for each location," said Rnjak. "Our work shows that electricity production losses can be significantly reduced by replacing blanket curtailment with more adaptable and site-specific approaches."

The researchers now plan to continue to refine these methods and engage in publicity to encourage them to be more widely applied.

More information: Dina Rnjak et al, Reducing bat mortality at wind farms using site-specific mitigation measures: a case study in the Mediterranean region, Croatia, *Mammalia* (2023). DOI: 10.1515/mammalia-2022-0100

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