

The State of the Science on Operational Minimization to Reduce Bat Fatality at Wind Energy Facilities

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Abstract

Projected wind energy production increases and evolving turbine technology have heightened concerns about cumulative impacts on bat populations in North America. We assess the cumulative evidence of operational minimization (i.e., curtailment) studies by quantifying the efficacy of these techniques using quantitative meta-analysis of publicly available studies from 8 wind energy facilities that tested treatments 19 times. These studies indicate that operational minimization is an effective strategy for reducing bat mortality at wind turbines and that the efficacy is measurable. We estimate that total bat fatalities are reduced by 33 % with every 1.0 m/s increase in cut-in speed. Estimates of the species specific efficacy for every 1.0 m/s increase in cut-in speed are similar (28 % for hoary bats [*Lasiurus cinereus*], 32 % for eastern red bats [*L. borealis*], and 32 % for silver-haired bats [*Lasionycteris noctivagans*]). Across multiple facilities and years, a 5.0 m/s cut-in speed is estimated to reduce total bat fatalities by an average of 62 % (95 % CI: 54–69 %). Total bat fatality reductions at individual facilities in any given year are estimated to fall between 33 %–79 % (95 % prediction interval). Most variation in efficacy is attributed to inter-annual differences. The interannual differences in efficacy observed at the studies in our analysis outweighed any spatial difference in efficacy.