

Mechanical Engineering Thesis Defense

Effects of Wildlife Deterrent Devices Affixed to Wind Turbines on Power Output

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abstract

Energy production is driven by economic needs, which sometimes results in the environment and wildlife being an afterthought. Unfortunately, many animals are killed as a result of flying too close to wind turbines, and the addition of animal deterrent devices are a promising alternative. This thesis seeks to provide a solution as a part of post-construction considerations regarding wildlife and wind turbine interactions through the introduction of a blade mounted ecological device. After testing the hypothesis, the data revealed the device is effective for increasing power output when placed at the root, middle, and tip of the blade. The middle position yielded the lowest increase at all speeds tested. The device was designed and attached to blades along the estimated line of separation. The blades were then mounted on a tower and tested with wind speed as an input and power as an output. The data was analyzed by fixing speed as a parameter and then looking at the distribution of the power output data. A comparison of blades with and without the device demonstrates a potential for increasing power output by 144% when the device is attached at the blade's root, 7.5% in the middle, and 21% near the tip. The analysis for this study was descoped due to the constraints of the system to be scaled up. As such, this analysis will hold for turbines with a blade length of no more than approximately eight feet. Blades of this type would be used in single building energy grid supplement turbines or turbines in areas with power requirements of equal or less than 1kW per turbine installed. Single building energy grid supplement turbines are most often mounted to the tops of buildings and take advantage of higher speeds of wind at those heights. As the ecological devices are designed to be similar to vortex generators, which have been tested on large blades, their addition to large blades could prove to have a similar effect.

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