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*Mitigation of Environmental Impacts Caused by Wind Turbines*

With a worldwide installed capacity of over 200000 MW, wind energy programs are positioned for a rapid growth over the next few years. It is already well established that they are environmentally friendly in terms of energy production. The question that I explored was whether these projects are truly environmentally conscious. It has been reported that various potential impacts arise from having wind turbines in the neighborhood. The major ones are termed as shadow flicker, wind turbine noise, and avian mortality. My research, both theoretical and experimental, focused on understanding the impacts of wind turbines on the environment and on identifying practical mitigation options where needed. In the process of this research, it was apparent that the study has to be truly multidisciplinary, covering aspects of biology, geometry, economics, engineering, medicine and electronics. I started with the problem of Shadow Flicker, a moving shadow resulting from the blades that sometimes causes epilepsy. To mitigate this, I applied foliage to cover the shadow and used trigonometry and geometry to work out details of the solution. To reduce deaths of avian life, I changed the turbine's orientation, reducing surface area. The energy output of the vertical model turbine, measured by a multimeter, wasn't comparable to the output of the horizontal turbine. Therefore, the practical solution is to use ultrasonic devices to repel birds and bats away from turbines. Finally, I attempted to mitigate the noise created by wind turbines. I concluded that a combination of foam insulation being applied to the gears of the turbine and noise canceling methods would mitigate this.