

Effect of Wind Turbine Blade Length on Noise, Electricity Production, and Temperature Change

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Wind turbines are clean alternative energy sources that are increasing in popularity. However, landowners and environmentalists have expressed concerns in regard to noise pollution and negative effects on surrounding ecosystems. The purpose of this project was to investigate how wind turbine blade length affects electricity production, proximal temperature changes, and resulting sound levels. It was hypothesized that longer blade lengths would produce more electricity, greater temperature changes, and higher levels of sound. To conduct this investigation, three sets of turbine blades were cut from PVC pipe. The blades were cut into three different lengths: 0.3, 0.6, and 0.9 meters. The blades were bolted onto the flywheel before testing. A volt meter was connected to the wind turbine generator, and voltage was recorded during eight different wind speeds. A thermometer was held in front of the blades to measure the surrounding temperature while a thermometer was held under the blades to determine the temperature change. A sound meter was held at the back of the blades to collect decibel values. The hypothesis was not completely supported. The longest blades did not create the greatest voltage, and instead created the lowest average voltage (7.6 V) with the highest wind speed (32.2 km/h). However, the longer blade produced the greatest temperature differential as well as the highest decibels of sound. The shortest blades created the highest voltage (12.93 V) at the highest wind speed while producing the least amount of sound and temperature change. As wind turbine use continues to grow more research must be conducted to maximize the energy harnessed from the wind.