CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
38293

Project Title
Improving Wind Turbine Efficiency

Abstract

Objectives/Goals
The purpose of this experiment is to determine which variable (the number of blades, length, or pitch of blades) has the greatest impact on wind turbines# electricity generation

Methods/Materials
3 wind speed window fan, Voltmeter, DC motor, wooden strips, 5 inch 4 blade, 3 blade and 2 blade propellers. 7 inch 4 degree and 6 degree pitch angle 2 blade propeller

I took 10 voltage readings for each blade at each wind speed, tabulated it, averaged readings for each blade at each wind speed and compared the results

Results
1) Number of Blades: The 4 blade 5 inch turbine was the most efficient across all wind speeds with an average of 0.22 V across all wind speeds and the 2 blade 5 inch turbine was the least efficient with a 0.16 V average. However, the 2 blade turbine was the most efficient at the highest wind speed with 0.27 V generated.
2) Length of blades: The 7 inch blade turbine was the most efficient across all wind speeds. However, the 5 inch blade turbine was the most efficient at the highest wind speed
3) Pitch Angle: The 4 degree pitch angle blade turbine was the most efficient across all wind speeds compared to the 6 degree pitch angle blade turbine

Conclusions/Discussion
Different blades may be required to get peak efficiencies from a wind turbine in different wind conditions. A 4 blade or longer blade turbine may be the most efficient where the wind speed varies a lot. However, in an area where the winds are consistently high, a 2 blade turbine or smaller blade turbine may be more efficient.

Lower pitch angles improve the efficiency of the turbine

Summary Statement
One type of blade may not be optimal for wind turbines under all wind conditions; the number and size of blades for a turbine should depend on the wind conditions where it will be installed

Help Received
I designed the project myself. However my dad bought all the materials needed and my advisor, Ms. Najwan, ensured that I stayed on task and completed my project on time