Greater San Diego Science and Engineering Fair
2015 PROJECT SUMMARY

Name: Kedar Sitapati Grade: 8 School: Marshall Middle School **Teacher:** E. Gillum

Project Title: How the Modern Day Wind Turbine Can Improve

Abstract

Objectives/Goals
The purpose of this experiment was to determine the optimal design of a wind turbine to produce power.

Hypothesis
The three bladed white set of blades should be the most efficient because they are the longest. A four bladed turbine is most efficient according to John H., mentioned in research paper. A three bladed turbine is hypothesized second. The six bladed blue turbine nether has small blade number nor long blades. It is hypothesized to be the worst for this reason. Nether torque nor speed decreased for the 1:1 gear ratio so it was hypothesized to be the best. A 1:3 gear ratio is thought to be the second best because it produces more speed, turning the dynamo faster. A 3:1 gear ratio is thought to be the worst because it removes speed.
The experimenter believes that **the three bladed white set of blades will be 50% more efficient than the three bladed blue set. The three bladed white set will be 200% of the six bladed blue set.** It is believed that **a 1:1 gear ratio will be 125% of the 1:3. A 1:1 gear ratio will be 100% better than the 3:1. The best blade angle for the three bladed white set will be 0 degrees because the angle is pre-set. The best blade angle for the blue bladed three and six bladed set is predicted to be 20 degrees on high and medium and 25 degrees on low.**

Methods/Materials
Thames & Kosmos Wind Power 2.0 was acquired and built. This project tested blade angle, gear ratio for each shape of the three blades sets of blades tested and configuration. The turbine was set up with a fan. The turbine was reconfigured for the different tests.

Results
A 6 bladed 22 cm airfoil set of blades proved to be the most efficient. Its best configuration was with a 3:1 gear ratio at a 20 degree angle. Its best power output was 252 mW. A 3 bladed 22 cm airfoil set of blades followed in second. Its best configuration was with a 3:1 gear ratio at a 20 degree angle. Its best power output was 32 mW. The modern type of blade, the most common, a 3 bladed 42 cm blade set proved to be the least efficient. Its best configuration was with a 1:1 gear ratio, and best angle was 10 degrees though it already had an angle pre-set in it.

Conclusions/Discussion
The result disproved the hypothesis. The results across the experiments are so radically different that they are easier to explain exponentially than through percentages. The best preforming 6 bladed 22 cm blade under its best configuration and with a high air speed, produced a whapping 252.00 mW. The second best preforming 3 bladed 22 cm blade under its best configuration and with a high air speed, produced only 32.20 mW. The worst preforming 3 bladed 41 cm blade under its best configuration and with a high air speed, produced an unbelievable 5.40 mW. This shows that companies that make wind turbines should reconsider their design.

Summary Statement
Wind turbine companies worldwide need to ensure they have the most optimal blade design.

Help Received
Greg Glosser, a masters in engineering mentor, helped with experimentation, my family and Mrs. Gillum helped edit the research paper.