



# CALIFORNIA STATE SCIENCE FAIR 2002 PROJECT SUMMARY

<b>Name(s)</b> <b>Zach R. Schmidt</b>	<b>Project Number</b>  22300
<b>Project Title</b> <b>Gone with the Wind Turbine</b>	
<b>Objectives/Goals</b> The purpose of this project was to find out which wind turbine design generates the most electricity. The variables I chose were a Two-Bladed Horizontal Axis Wind Turbine (HAWT) and a Four-Bladed HAWT. <b>Abstract</b> <b>Methods/Materials</b> I built the wind turbine blades out of balsa wood and used a small 3 Volt hobby motor for the generator. I also soldered a network of 5 switches and 5 Ohm resistors so that as more resistors were switched on, the resistance decreased, which increased the electrical load on the generator. A gearbox was also added to increase the speed of the motor, since the motor was designed to spin at 11,000 RPM. The wind turbine was tested in a wind tunnel made of cardboard and powered with a 3 speed household fan. Measurements were made using a Digital Volt Meter (DVM). Determining electrical power from the measurements was done by using Ohm's Law, which states: to find power (Watts) you divide Volts squared by Ohms. The variables in this test were: 2 blade designs (2 and 4), 3 wind speeds, 3 gear ratios, and 6 resistor loads, for a total number of measurements of 108. <b>Results</b> The two bladed turbine produced more electricity than the four bladed one with a gear ratio of 1:1 and 4:1 because it was lighter. But it could not start up with a gear ratio of 16:1 at wind speeds of 12 and 18 mph because it did not have enough torque to rotate. The four bladed turbine produced more electricity than the two bladed one with a gear ratio of 16:1 because it had more torque than the two bladed turbine. <b>Conclusions/Discussion</b> According to my results, my hypothesis was both correct and incorrect. Different turbines work better than others in different conditions. This is probably why wind turbine manufacturers are always coming up with new wind turbine designs for different conditions. I also concluded that the power curves for wind power and electrical power have the same shape for the wind speeds that I tested.	
<b>Summary Statement</b> The purpose of this project was to find out whether a Two-Bladed Horizontal Axis Wind Turbine (HAWT) or a Four-Bladed HAWT wind turbine design generates the most electricity.	
<b>Help Received</b> Mother helped edit and type report. Father helped finance the project and supervised the research.	