



**CALIFORNIA STATE SCIENCE FAIR  
2010 PROJECT SUMMARY**

<b>Name(s)</b> <b>Ruiqi Zhu</b>	<b>Project Number</b> <b>S0223</b>
<b>Project Title</b> <b>The Relationship Between the Number of Blades on Wind Turbines and Power Output</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Objective: The most of wind turbine generator in California have two blades. So I made an experiment to build a wind turbine with an optimal number of blades that is best suited for generating power. I test the power output in relation with the number of blades, which can be measure by a multimeter.</p> <p><b>Methods/Materials</b> Materials: cardboards, notecards, glue, water bottles, ac generator, multimeter, a piece of wood, a 20x20 inch box fan, glue gun, duct tape Methods: Make a wind tunnel, make four wind turbines out of note cards, make a removable ac generator. Put a 20 inch by 20 inch fan at the end of windtunnel while the wind turbine is on the other side of the wind tunnel. Measure the Power output from the generator by using a multimeter. Test our all four of the wind turbines.</p> <p><b>Results</b> RESULTS: Unlike what I thought, the wind turbines with fewer blades had a larger output than turbines with more blades. This was very surprising and contradiction with my hypothesis. But power output from wind turbines can be calculated from the equation: <math>P=0.5dAv^3</math>. The reason why fewer blades corresponds with higher output can be reasoned from the equation of continuity: <math>d1A1v1=d2A2v2</math>. Since density is lower, velocity is higher. A higher velocity would result in higher power output from <math>P=0.5dAv^3</math>.</p> <p><b>Conclusions/Discussion</b> CONCLUSIONS: I was not able to support my thesis from the contradicting data. But I was able to find out reasons why fewer bladed turbines can produce more power than turbines with more blades. As my results pointed out, the turbine with only one blade produced the most output(mW) and output decreased as number of blades increased. I wish to further my research by testing on larger model as well as on different angles of the wind turbines. Larger scales of these wind turbines can be built without an excessive amount of effort. We should commercially build these wind turbines and this will reduce our dependence for extensive wind farms and promote the construction of urbanized wind turbines.</p>	
<b>Summary Statement</b> The Relationship Between the Number of Blades on Wind Turbines and Power Output	
<b>Help Received</b> Mom and dad helped to get materials. Dad helped to cut card board. Friend, Jonathan, helped out.	