



**CALIFORNIA STATE SCIENCE FAIR  
2010 PROJECT SUMMARY**

<b>Name(s)</b> <b>Peter A. Mellinger</b>	<b>Project Number</b> <b>J0115</b>
<b>Project Title</b> <b>Comparing Power Output of Wind Turbine Blades with Different Angles of Attack</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> In the real world, it is important to get a significant amount of power from a wind turbine. One of the main things that determines how much power you can get from a wind turbine is the type of turbine blades you are using. In my experiment, I decided to find out which Angle of Attack for a wind turbine blade would produce the most electricity at varying wind speeds.</p> <p><b>Methods/Materials</b> I had three turbine blades with different Angles of Attack (8x4, 8x6, 8x8), and I hooked each of them up to an AC motor and a 20 Ohm resistor to generate electricity. Then, using a homemade wind tunnel, I found out how many volts each propeller made in a 1m/s airstream, a 2m/s airstream, a 4m/s airstream, a 8m/s airstream, a 12m/s airstream, and a 16m/s airstream. Then, I plugged the number of volts into an equation (<math>P = e^2/R</math>) so that I could find the total amount of power generated, which I measured in Watts.</p> <p><b>Results</b> My results clearly showed that the propeller with the highest angle of attack (the 8x4 propeller) was able to generate the most power. This is because the propellers with the lower angles of attack cannot generate as much lift as the others.</p> <p><b>Conclusions/Discussion</b> My data both proves and disproves my hypothesis. My Hypothesis stated that if wind speed and angle of attack were related to the amount of power a wind turbine could generate, then turbines with lower angles of attack would generate more power at lower wind speeds and turbines with high angles of attack would generate more electricity at higher wind speeds. My data clearly shows that the 8x4 prop made the most electricity in all wind conditions, not just at higher wind speeds. I think that my hypothesis would have been completely correct if I had found a prop with a higher angle of attack that would stall at the lower wind speeds or if I had used a resistance higher than 20 ohms. I think that my experimental procedure worked well because its results were very repeatable, suggesting a high level of precision. If I did this experiment again I would find a propeller with a very high angle of attack that would stall at lower speeds, and I would also use a larger wind tunnel. My findings could help people who are building wind farms to use blades with the right angle of attack.</p>	
<b>Summary Statement</b> Which Angle of Attack for a wind turbine blade produces the most electricity in varying wind conditions?	
<b>Help Received</b> Dad helped with understanding the electrical concepts in my project. MBARI loaned me some test equipment.	