



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Lindsay S. Brown	Project Number J1004
Project Title Watts Your Angle?	
Abstract Objectives/Goals The goal of this project was to determine the best tilt angle for a solar panel to generate electrical power. Methods/Materials I aligned the solar panel at true south or the azimuth angle at 180 degrees. Testing was conducted between 11:30 AM to 12:30 PM when the sun was at its peak altitude. I increased the tilt angle by 5 degrees between 0 and 90 degrees. I recorded the voltage across the resistors using a multi-meter for each tilt angle. Then I converted the voltage into power for each tilt angle and plotted output power versus tilt angle. Results My results showed that the output power at 0 degrees tilt was on average 39% less than the maximum power observed. Once the power leveled off, little change occurred until 65 to 70 degrees tilt angle when output power declined at a much slower rate than the initial rise. The output power at 32 degrees was usually only 3 to 5% less than the maximum output power. The absolute best tilt angle was 55 degrees for the period of time I did these experiments. These times just happened to coincide with the time of the winter solstice. Conclusions/Discussion If I pick the right tilt angle for my solar panel I can get more power up to a certain point. Since the difference in output power between 47 and 55 degrees was only 0.2%, 47 degrees turns out to be a good compromise between 32 and 55 degrees during the winter months. I noticed that there was only a 3% difference between 32 and 55 degrees. Just laying a solar panel flat on the ground or at 0 degrees tilt angle has 37% less output power than the maximum at 55 degrees. I believe that investing in a mechanical tracking system for tilt angle would not be worth it. You can manually adjust the tilt angle of your solar panels but you would have to decide for yourself how often you really need to. It may even be acceptable to just leave your solar panels at 32 degrees all year long.	
Summary Statement The objective of this project was to determine the best tilt angle for a solar panel to generate electricity.	
Help Received Grandfather helped build tilt angle measuring device; Professor Rick Moyer answered questions about project; Mom bought materials; Dad helped with motivation.	