



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Timothy R. Le</b>	<b>Project Number</b> <b>J0821</b>
<b>Project Title</b> <b>What Is the Voltage and Efficiency of Solar Panels at Different Angles Facing the Sun?</b>	
<b>Objectives/Goals</b> I wanted to have my project related to the current event of global warming and the high price of gasoline. I hoped to learn the efficiency of solar panels at different angles facing the sun.	
<b>Abstract</b>	
<b>Methods/Materials</b> Four solar panels were mounted into an adjustable frame. They were connected to a computer interface to record the voltage produced at different angles facing the sun. The efficiencies were then calculated for the different angles and the efficiency was set at 100% at 90° to the sun.	
<b>Results</b> The average voltages and efficiencies for my experiment are listed below: At 0°, the voltage was 1.61 V; at 30°, the voltage was 2.39V; at 60°, the voltage was 2.19V; at 90°, the voltage was 2.56V; at 120°, the voltage was 2.14V; at 150°, the voltage was 2.01V; and at 180°, the voltage was 1.36V. At 0°, the efficiency was 67.20%; at 30°, the efficiency was 96.25%; at 60°, the efficiency was 92.45%; at 90°, the efficiency was 100%; at 120°, the efficiency was 89.15%; at 150°, the efficiency was 80.19%; and at 180°, the efficiency was 67.71%. We did not measure the voltage and efficiency of the solar panels at 181° to 359° (facing away from the sun) because it would be impractical to mount solar panels at those angles on a roof. * Percent efficiency was calculated with 90° being 100%.	
<b>Conclusions/Discussion</b> The voltages produced by the solar panels would vary according to the movement of the sun and the maximum efficiency would be when the solar panel faces the sun at right angle. The solar panels should not produce any current at 180° and 0° to the sun. My independent variables were the angles of the solar panels. My dependent variables were the voltages produced and the efficiency(%). My results supported my hypothesis because at 90° angle, the highest volatage and efficiency was produced. My results all came over 50% efficient, even at 0° and 180°. My experiment relates to real life because the efficiency of the angles of the solar panels are important for people who want to make a lot of electricity thus reducing the use of environmentally damaging ways of producing electricity. This would reduce harm to the planet. I also came up with an idea to make solar panel arrays mounted on mini-blinds that always face the sun at 90 degrees to the sun for maximum efficiency. This way the solar panels do not have to be mounted on the roof and then can be accessed easily for repair.	
<b>Summary Statement</b> The purpose of this experiment was to find out the voltage and efficiency of solar panels at different angles to the sun.	
<b>Help Received</b> Dad helped in changing of the angles of the solar panels.	