



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Brandon M. Moore	Project Number J0221
Project Title Which Type of Light Bulb Efficiently Generates the Most Electricity on a Solar Panel?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment is to determine which kind of light bulb (11W Incandescent, CFL, or LED) generates the most electricity on a solar panel in the most efficient fashion. I hypothesize that the CFL (compact fluorescent) bulb will do so.</p> <p>Methods/Materials To test the energy levels being produced by the panel, each bulb was tested in a specially-designed cardboard box, which was used to surround a 5W solar panel, the light bulb, and a Type A light bulb socket. This was done so that no exterior light or other factors could skew data. Energy levels (volts - V and Milliampere - mA) were read off of a multi-meter, and the volts and the Milliampere were multiplied together to find the Milliwatts (mW) produced by the panel. To test the efficiency component, a Celsius thermometer was put in the box, and the difference in temperature (before and after the trial) determined if extra energy was given off (see Discussion). Each light bulb was tested in 6 different trials for a total of 18 tests.</p> <p>Results The incandescent light bulb generated an average of 83.94 mW and had an average temperature gain of +0.35 degrees Celsius. The CFL bulb generated 69.67 mW with a temperature gain of +0.05 degrees Celsius. The LED bulb generated 67.20 mW with a temperature gain of +0.02 degrees Celsius.</p> <p>Conclusions/Discussion Solar panels respond to a frequency of light that carries a certain amount of energy, measured in electron volts (eV). A single-crystalline solar cell needs approximately 1.1 eV to create current for the cell in the form of an electron-hole pair, which corresponds to the infrared frequency of light (1,127 nm wavelength). A solar cell will give off any extra energy over the threshold of 1.1 eV off as heat. In essence, this project determines which type of light bulb gives off the most infrared light. The incandescent bulb generated the most electricity, but also had the highest temperature gain, which means it was not efficient. The LED bulb generated the least electricity, but had the least temperature gain. Therefore, the CFL bulb generated the most electricity on a solar panel in the most efficient fashion.</p>	
Summary Statement This project tests which type of light bulb efficiently generates the most electricity on a photovoltaic (solar) cell.	
Help Received My father suggested ideas for the project and helped purchase supplies; my mother assisted with display board.	