



# CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

<b>Name(s)</b> <b>Biyonka Liang</b>	<b>Project Number</b> <b>J0219</b>
<b>Project Title</b> <b>The Effect of Filtering Sunlight through Water on the Power Output of a Solar Panel with Fresnel Concentrator</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this project was to find a way to keep the efficiency of silicon solar panels by keeping it cool and at the same time to use the unused part of the spectrum of the sunlight to warm up water. I chose to experiment with placing water between a Fresnel lens concentrator and a silicon solar panel to filter the sunlight before it reaches the solar panel. My hypothesis was that placing water between a Fresnel lens concentrator and a silicon solar panel will increase the efficiency of the silicon solar panel and at the same time warm up the water.</p> <p><b>Methods/Materials</b> Two identical solar panels (GP55x55-10B70 by Green Power Online), two multimeters, two 100 ohm resistors, two plastic fresnel lens on homemade wooden frame, an infrared thermometer, an oven thermometer, a clear glass container, water, and wires.</p> <p>The voltage on the resistor is measured using a multimeter. The power output in Watt is calculated using the formula <math>P = V^2/R</math>. This formula is nice because it lets me compute power with only voltage measurement so I do not need more multimeters to measure currents. In each experiment, the direction of the Fresnel lens and the solar panel was adjusted to get the largest voltage from the solar panel.</p> <p><b>Results</b> At the end of 22 minutes, the power produced by a solar panel with water-in-glass in front was 259.9mW. The solar panel without using a water-in-glass filter was producing only 194.4mW. The temperature of the solar panel with water-in-glass in front rose from 18.1A°C to 60.1A°C. The temperature of the solar panel without water-in-glass in front rose from 17.8A°C to 91.2A°C. The water temperature increased from 15.6A°C to 19.8A°C 22 minutes. It is 4.2A°C higher than without the Fresnel lens.</p> <p><b>Conclusions/Discussion</b> Because the water-in-glass filtered out the lights that were not efficient in generating electricity and would heat up the solar panel, the solar panel heated up much slower and was able to make more electrical power over a longer time. That part of the energy was not wasted, it was used to heat up the water. My experiments should be studied more and it may help improve the efficiency of real silicon solar power systems and produce hot water at the same time.</p>	
<b>Summary Statement</b> Use water to filter sunlight so the solar panel stay cool and produce more power and get warm water at the same time	
<b>Help Received</b> Father helped with buying parts from ebay and making the wood frames using power saw.	