



# CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

<b>Name(s)</b> <b>Erika Y. Hathaway</b>	<b>Project Number</b> <b>J0207</b>
<b>Project Title</b> <b>A Brighter World: Evaluation and Enhancement of Solar Conversion Devices</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> As traditional energy resources such as petroleum oil diminish, we need to explore alternative energy sources, including nuclear energy, hydro power, wind energy, and solar energy. Due to safety and environmental concerns, all must be eliminated, except for solar energy, which is a new, safe, and environmental friendly source of power. Unfortunately, solar energy is too expensive. In the experiment, the scientist tests different solar cells in combination with normal household materials to evaluate efficiency enhancement techniques. The goal is a knowledge base that the public can exploit to improve solar cell energy output.</p> <p><b>Methods/Materials</b> The hypothesis was: A decrease in temperature, an increase in light intensity, or changing the color of light input to a solar cell should improve the efficiency. Materials used included common household items. This experiment consisted of 36 individual experiments; variables included Red, Blue, and Yellow color filters; Hot and Cold temperatures, and High &amp; Low light intensities. Two companies (Hanwa Solar and Yingli Green Energy) supplied samples of silicon solar cells of various types. A solar light from Hampton Bay &amp; another from Malibu Company were procured from Home Depot. Experiments were repeatedly conducted from 10 AM to 2 PM.</p> <p><b>Results</b> Initially, data showed that the output of the solar cells under color filters, different intensities, and different temperatures were less efficient than the energy output at ambient. Yellow light filters worked the best, then red and finally blue. The temperature results showed no clear affect. Hi and Low light intensities both degraded the output level. As a result, the hypothesis was rejected.</p> <p><b>Conclusions/Discussion</b> After reviewing solar cell efficiency research, supplemental experiments were added to determine if the original data was somehow flawed. Results showed that with a larger, better quality magnifying sheet, and an angle facing more directly towards the sun, the output of the solar cells increased 315% from the baseline. Cooling the cells increased their output 4.2%. In conclusion, solar cells that receive intensified light, while pointed at the sun, and cooled will produce optimized output power. In the future, another research idea would be to use water to magnify the light input, while cooling the solar cells.</p>	
<b>Summary Statement</b> "A Brighter World: Evaluation and Enhancement of Solar Conversion Devices" is a project about adjusting the color of light, intensity of light, and temperature of solar cells to increase their efficiency.	
<b>Help Received</b> Father helped understand how to work the Digital Volt Meter and use a cutter knife to strip wire.	