



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

<b>Name(s)</b> <b>Josh C. Benson</b>	<b>Project Number</b>  36018
<b>Project Title</b> <b>Increasing the Useful Lifetime of Solar Panels</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Over time, solar panels lose efficiency in electrical voltage and current. The objective of my project was to learn if I could find an affordable way to expand the useful lifetime of solar panels. If we can keep solar panels efficient for a longer period of time, then they will last longer and be used more frequently. That is good because solar power is renewable and less polluting than fossil fuels, which our planet is quickly running out of.</p> <p><b>Methods/Materials</b> My materials included 5 old poly-crystalline solar cells, 3 furnaces, a multi-meter, floodlight, and a stopwatch. I also had safety equipment including safety goggles, a heavy lab coat, and gloves. I heated (annealed) the solar cells in the three furnaces at various temperatures and for different lengths of time. The floodlight was securely mounted to a wall in a dark room. I used the multi-meter to measure the cells' voltage and current. For each test, three trials were done.</p> <p><b>Results</b> The data demonstrated that at 550 Celsius there is a significant drop off in current even after just 30 minutes in the furnace. We saw the same drop off in current at 400 C after 24 hours. The data also indicated that there is a significant drop off in voltage after 24 hours at 550 C. 200 C was not hot enough to make any statistically significant changes in voltage or current. At 400 C after 30 minutes in series one there was an 8 - 10 percent increase in current. That result was not replicated in series two (when I repeated the experiment to validate the initial results).</p> <p><b>Conclusions/Discussion</b> Measured drop offs in current were likely due to cracking aluminum grid lines that deliver the electricity to the multi-meter. The apparent reason for such an immediate drop off in current at 550 C, and a similar drop off at 400 C after 24 hours, is that that the effect of temperature is exponential. This means that temperature has a greater effect than time. The drop off in voltage at 550 C after 24 hours was the only major change in voltage, and that was likely due to the main aluminum strip cracking. With regard to the potential increase in voltage, more testing needs to be done to get conclusive results regarding whether heating the panel at 400 C for 30 minutes is truly beneficial to the cell or if the some of the tests performed were outliers.</p>	
<b>Summary Statement</b> This project tested an affordable, efficient method of using intense heat to increase the electricity output (voltage and current) of older solar panels.	
<b>Help Received</b> My mentor, Ryan Need, who is a doctoral graduate student at UCSB, granted me access to his shared lab which provided me with equipment critical to accomplishing this project (furnaces, microscope, and safety equipment).	