



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Marcus Luebke</b>	<b>Project Number</b> <b>J1811</b>
<b>Project Title</b> <b>Laser Transmission of Energy: To Power the Future</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this project was to figure out whether lasers might be used to transfer energy efficiently. Specifically, to measure the efficiency when power is converted into light and then back into power.</p> <p><b>Methods/Materials</b> In order to model &amp; measure the energy transmission efficiency, electricity was converted into laser light and then back into electricity using a laser pointed at a photo detector. An oscilloscope was used to measure the input voltage into the laser and the output voltage from the photo detector.</p> <p><b>Results</b> The response of the system had several different characteristics. From 0-1.7 volts there was no output voltage. Greater than 2.1 volts the output voltage stayed at 0.5 volts. The only significant changes from the system came in the medium input voltage region of 1.7 to 2.1 volts, the band-gap region for the laser where electron flow is proportional to an increase in voltage. The maximum transmission efficiency, measured as the ratio of the output voltage to the input voltage, was ~23%.</p> <p><b>Conclusions/Discussion</b> This experiment showed that with desktop equipment a ~23% transmission efficiency was achieved when simulating Space Based Solar Power via conversion of input power to laser light and then back to output power. Conclusion: Space Based Solar Power using lasers is feasible, with a superior 23% transmission efficiency compared to an equivalent 18% Earth based solar power system.</p>	
<b>Summary Statement</b> To determine if lasers might be used to transfer energy efficiently as part of a Space Based Solar Power system, power was converted into light and back into power, resulting in a transmission efficiency of ~23%, greater than the 18% goal.	
<b>Help Received</b> My Dad taught me about soldering, cutting wires & time management. My Grandma helped me cut welding glass filters. My Mom helped me research and put together my report & display board. SLAC Researcher Mike K. & NIF Engineer Fred W. inspired ideas on high energy physics & lasers.	