CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
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Project Number
J0216

Project Title
The Effects of Reflective Designs on Solar Cell Power Output

Abstract

Objectives/Goals
The goal is to determine if reflective material placed around a solar panel will help to increase its electrical power output, and to also determine which reflector geometry produces the most power.

Methods/Materials
Two reflector designs were fabricated, one using flat panels and one with conical geometry. Their performance was evaluated by placing them around a solar panel that drives a motor to raise a weight 2.3meters. Data was obtained on electrical power by using electrical meters to measure voltage and current coming from the solar panel to the motor. Mechanical power was calculated by finding the work done by the motor in raising the weight and then dividing by the time elapsed. This test was performed using a range of weights for each reflector design.

Results
The conical solar reflector produced an average of 6.5 watts of electrical power and the flat panel mirror design produced 5.9 watts, whereas the solar panel without a reflector produced 5.1 watts. This is a 27% increase in power production for the cone and a 15% increase in power for the flat panel design. The reflectors increased the temperature of the panel, and this high temperature gradually lowered the voltage and power output. The heat caused slight melting in one spot of the panel.

Conclusions/Discussion
Reflective collectors can increase the energy output of a solar panel, and the conical design is the most effective. A challenge comes along with this greater power: to apply the reflector in the field, where the sensitive solar cells are exposed to sunlight for many hours, it may be necessary to find a way to keep the panel cool.

Summary Statement
This study researched the performance of reflector designs surrounding a solar panel to boost power output.

Help Received
Father helped with building the solar cone and setting up the experiment on a ladder.