CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
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Project Number
J0225
34987

Project Title
Temperature's Effect on Solar Panel Energy Output

Abstract

Objectives/Goals
The objective of this experiment was to find out if the energy output of a photovoltaic solar panel is affected by its temperature. The hypothesis was that they are and that colder temperatures would increase a solar panel's voltage output.

Methods/Materials
Two small solar panels were used to compare a heated panel with a cooled one. Heat lamps were used to heat the panels and a cooling system was built for one. This was done by taking apart the panel and weaving aluminum tubing inside that cold water could be pumped through. The surface temperature was measured with a digital thermometer and the voltage with a volt meter.

The temperature and voltage output of the panels were first measured at room temperature for each of the three trials making sure they were the same. The heat lamps were turned on and the temperature and output measured at 5, 10, and 15 minutes. Next, the small pump was turned on to begin pumping cold water through one panel and the temperature and outputs on that panel were measured again every five minutes for 15 minutes.

Results
The results of this experiment showed that as the surface temperature of the solar panels increased, the voltage output steadily declined and as the temperature decreased, the voltage output steadily climbed. The surface temperature started at 71°F with an output of 13.5V and after 15 minutes was up to 80° with a decreased output of 11.6V. Then when the panel was cooled, dropping to 45° after 15 minutes, it was generating 17.6V, an incredible 152% jump in output. Once the heat lamp was turned off, it was observed that the first panel cooled and increased its output back to the baseline very slowly comparatively.

Conclusions/Discussion
The surface temperature of a solar panel does affect its energy output and actually quite significantly as shown, confirming the hypothesis that cooler surface temperature of the panels would produce higher voltage output than hotter ones.
We expect solar panels to perform better as their exposure to sunlight increases, but many may not realize that their performance starts to decline rapidly if they start getting hot as well. So especially in very hot regions, it would be highly beneficial to have a cooling mechanism in place to keep from losing efficiency.

Summary Statement
The purpose of this project is to determine the effect of solar panel surface temperature on its energy output.

Help Received
Dad helped build the experiment apparatus and mom helped by proofreading my written work for errors.