CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
S0910

Project Title
Increasing the Efficiency and Cost Effectiveness of Solar Panels Through the Use of Reflectors

Abstract

Objectives/Goals
This project was designed to discover the best design and position for a reflector to help boost the efficiency and cost effectiveness of solar panels. This objective was developed in response to both scholarly research and product research that determined that few companies have tried to make use of reflectors to enhance solar panels. Standard solar panels are so inefficient that they take 20 or more years to pay for themselves. In contrast, reflectors show significant promise for reducing this break even point in cost recovery.

Methods/Materials
This project involved two major phases of testing. For phase 1, four solar panels were used, each producing 6 volts, at 36.47 mW, used with 1000 ohm resistors at ½ watt. Of the four solar panels measuring 9.5 X 6.4 cm, one was used as a control, one was placed in a bowl reflector, one was placed in a two sided reflector, and one was placed in a mirror box reflector. These four panels were tested at positions facing east, then south, then sunward throughout the day on three different days. For phase 2, a channel reflector was designed to take advantage of the best results from phase 1 testing. A control panel and the channel reflector were faced south and tested at angles of 0, 15, 30, and 45 degrees. Efficiency factors were then calculated using the formula Power = Volts^2/Resistance.

Results
All of the reflector designs performed better than the control in terms of power output, especially in cloudy weather or shade. The channel reflector outperformed the control panel in power output and efficiency at all times of the day. The glass reflectors for phase 2 added less than 1% to the cost of the panel, but boosted efficiency per square meter by an average of 11.97%, but sometimes by as much as 122.86% during the early morning or during cloudy weather.

Conclusions/Discussion
After two phases of testing, I discovered that the best design was the channel reflector set due south at a 30 to 45 degree angle. This reflector design is simple, inexpensive, easy to build, and easy to maintain. This design could revolutionize the use of solar energy in America by improving efficiency and greatly reducing production costs, allowing solar power installations to pay for themselves in about 10 years instead of the typical 20 years they now take.

Summary Statement
This project explores various reflector designs at different angles to see which combination best boosts the efficiency and cost effectiveness of solar cells.

Help Received
Mr. Tim Tasabia of See Bright Solar provided entrance to The National Solar Science Fair and Expo in Anaheim, 2009. Dr. Barth at the Universityof California at Riverside gave advice about solar cells at the early stages of the project. Dr. Daven Kari, my father, helped me gain access to university libraries.