CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36674

Project Title

Effect of Shapes of Solar Panels on the Generation of Electricity

Abstract

Objectives/Goals

One way to use the abundant energy from Sun is to convert it into electricity using solar panels. Improving the efficiency of solar panels, currently under 20%, means more energy for us with minimal environmental impact. The efficiency depends on the angle of incidence of sunlight. However, the angle of incidence varies during a day and during seasons. So, in a system without tracking or tilt adjustments, the shapes may affect its power output. My experiment explores the effect of different shapes of solar panels on the generation of electricity. Based on my research, I form the hypothesis that a dome shaped panel would produce more electricity overall.

Methods/Materials

I used the same number of flexible solar modules to form cuboid, dome, cylinder, and flat shaped panels to keep the same solar cell area. In each panel, ten solar modules were connected in parallel. Next, I planned five different positions of the light source corresponding to different times during a day from morning to evening modeling the path of sun during summer. Placing a 75W light bulb in each of these five positions, I measured voltage and current of all four solar panels using a digital multimeter. Next, measurements were done for five different positions modeling the path of sun during equinox and winter. The experiment was repeated for a total of three trials.

Results

When I calculated the power multiplying the voltage and the current, the cuboid shaped panel produced the least amount of power. The peak power were similar between the flat and dome shaped panels. To find the overall effect of the shapes, I calculated the total power for five different positions (in a day) of the light source. For all three trials, the overall power of the dome shaped panel was better than the next best shape (cylinder) by about 16% during summer, 5% during equinox, and 29% during winter.

Conclusions/Discussion

The results show that for a given position of the light source, the power output varied depending on the shapes of solar panels. Based on the overall power across different positions, the dome shaped panel produced the maximum power. Hence my hypothesis is supported. In real world application, solar modules covering a helmet or a car could be optimized in shape for generating more electricity to charge up electronic devices.

Summary Statement

This project explores the effect of different shapes of solar panels on the generation of electricity.

Help Received

My science teacher suggested OEM solar modules, and my parents helped me to purchase them along with other materials.