CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

34171

Project Title

Vortexes for Cheaper Solar Power

Abstract

Objectives/Goals

This project investigates whether a solar vortex can produce more energy than rising air without a vortex.

Methods/Materials

A vortex generator was built using a heating element at the bottom to simulate heat from concentrated sunlight and vertical slats to control airflow. A fan is at the top to convert air movement to electricity. The first step in the experiment is to heat up the air at the bottom of the vortex generator with an electric heater. Second, adjust slats so that incoming air swirls and measure the speed of the fan. Third, arrange the slats so the incoming air does not swirl, and measure the speed of the fan without the vortex. Fourth, chart the data and determine whether the swirling or non-swirling air produced the most energy. Investigate the effect of wind on the vortex by repeating steps one, two and four with wind simulated by an electric box fan. Finally, evaluate the cost of the system compared to a photovoltaic system with the same solar collection area.

Results

The vortex was able to spin the fan 48.5% faster than the no vortex case. The results were repeatable, since the fan speeds in all tests were within + / - 6.2% of the average for both the vortex and no vortex cases. The cost analysis shows that the solar vortex system costs 26.9% less compared to a photovoltaic system, for the same solar collection area.

Conclusions/Discussion

The hypothesis that a solar vortex will produce more energy than rising air without a vortex is true. The data was also repeatable. The cost analysis shows potential to be less expensive than a photovoltaic system. In the real world, this could be set up in deserts to create vortexes so solar power could be harnessed in a different way. Georgia Tech claims it can reduce the cost of energy by 65% over solar photovoltaic energy.

Summary Statement

This project investigates whether a solar vortex (or dust devil) can produce more energy than rising air without a vortex.

Help Received

My father mentored me and donated his garage space, and my family helped me assemble the rig by holding all the slats while I put the top on. My teacher, Ms. Ligeti, also provided guidance and encouragement.

Preliminary