CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Laura E. Ratliff

Project Number
J0216

Project Title
The Effects of Dust Buildup on Solar Panels

Abstract

Objectives/Goals
The objective of this experiment was to measure the decrease in efficiency of solar panels over several weeks or months due to dust buildup, in order to determine how often solar panels need to be washed.

Methods/Materials
My house has two arrays of solar panels, installed in 2009. There is an array of 12 panels on the shade structure in back of the house, and 16 on the garage. The panels naturally collect dust over time and my experiment was to clean the panels in a controlled way to measure the effect of dust buildup on the energy produced by each array. My father climbed on the roof to clean the solar panels while I took pictures from the ground. The output of the solar panels was recorded by the solar company, Sunpower, by a monitor that sends the data from the solar panel inverters to the Sunpower website through our wireless network. We cleaned the arrays three times between November 2011 and January 2012. I downloaded the hourly data from the website and supplemented it with additional data from the past two years. To calculate the efficiency lost, I used the ratio of the energy of the garage array to the shade structure array in order to remove other variables such as season and weather conditions.

Results
The first finding in this experiment was that the effects of dust buildup were not measurable in the winter months due to rapid and frequent changes in shading. Looking at older data from the summer showed that the average efficiency of the panels lost to dust each day was 0.000332606.

Conclusions/Discussion
This data is important because it provides us with proof that it is important to wash your solar panels. This data also gives us another reason to develop self-cleaning panels.

Summary Statement
I measured the effects of dust buildup on solar panels and found that the efficiency loss over a month is about 1%.

Help Received
My dad climbed on the roof to clean the panels and also helped me figure out the equation and how to use Excel. The Sunpower technical support people supplied me with necessary data that was not readily available on their website. Benjamin Root and #Home Power# magazine was very encouraging and