The Effect of Weather Conditions on the Efficiency of Solar Panels

Heilshorn, Lilly (School: Hempfield High School)

Solar energy is non-polluting, renewable, and consistently less expensive over time than other forms of energy. It was hypothesized that different panel designs, in combination with different weather conditions, will offer differing levels of efficiency when generating electricity. The purpose of this experiment was to determine which solar panel works the best with various weather conditions to create the most efficient solar panel system. The solar panels tested were: monocrystalline, polycrystalline, and thin-film. The weather conditions were: control, decreased angle of incidence, increased angle of incidence, increased temperature, fog, and increased humidity. Systems were constructed using solar panels soldered into circuits, which were placed on top of a model house inside of a plexiglass weather chamber. The weather conditions were simulated using various techniques, and recordings were taken for volts and milliamps for each trial. Each panel was tested five times with each weather condition. One set of five tests consisted of mounting the solar panel on the model house roof, running the wires outside the chamber, and simulating weather conditions inside the sealed chamber. All extraneous light sources were then turned off and the light source was turned on. Measurements were recorded for volts and milliamps. The recordings for volts and milliamps were multiplied together to determine the wattage output, which was then divided by the surface area (in square centimeters) for each panel to determine the wattage per square centimeter for each trial. Experimental results supported the research hypothesis. The most efficient system was Polycrystalline with Control and the least efficient was Monocrystalline with Fog.

Awards Won: