Optimal Design of a Reflector to Increase Photovoltaic Cell Output

Madsen, Ella (School: Madsen Homeschool)

One of the major needs in our world today is developing clean energy sources which can help limit the use of fossil fuels and prevent global warming, as well as bring electricity to developing areas where no electrical grid exists. One of the best methods for producing clean electricity is solar panels. Unfortunately, solar panels are very expensive. If we could find a cost effective way to increase solar panel output, more of our electricity could be generated cleanly from solar panels. For my project, I tested two methods that could increase the electrical output of residential solar panels in a cost effective way. The first method is to add a reflector to the solar panel design to increase the amount of sunlight that hits the panel, increasing the electrical output. The second method is to change the angle of the solar panel and reflector depending on the season and the time of day, to better track the sun. Commercial solar plants adjust the angle of the panel but residential solar panels are not adjusted. Adding a reflector to the design of a solar panel increases the electrical output (24%, 56%, and 9% in summer at 10 AM, noon, and 4 PM and 26%, 35%, and 10% at 10 AM, noon and 4 PM in winter) by much more than it increased the cost (4% cost increase). For residential solar panels that are not adjusted, a panel angle of 60° and a reflector angle of 120° is optimal.

Awards Won: