Name(s)
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Project Number
J0205

Project Title
Determining Optimal Reflective Border Configuration for Maximizing Solar Energy Production on Shasta Dam

Abstract

Objectives/Goals
The objective of this study is to determine the optimal amount of white reflective border surrounding a photovoltaic solar cell for producing the most amount of electricity on a model Shasta Dam.

Methods/Materials
Using 9 volt rechargeable batteries, alligator clips, Sunnytech photovoltaic solar panels, 4 Shasta Dam sections from foam core boards, protractor, iPhone Compass App,and a digital multimeter, I measured voltage output every 10 minutes for 6 hours on 4 dams with varying widths of white painted borders surrounding solar cell panels.

Results
The voltage output was compared after solar generation periods using the 0cm, 3cm, 6cm, and 9cm white reflective borders surrounding the solar panel sections. The 3cm border proved most effective, producing 26.875% more voltage than the second highest 0cm side-by-side panel dam.

Conclusions/Discussion
Repeated trials demonstrate that the optimal white reflective border configuration surrounding the 8cm square photovoltaic solar cell panels is 3cm to maximize energy production in terms of voltage output. The 3cm border produced approximately 27% more voltage than the Control Dam with side-by-side panels. Based on the real Shasta Dam's dimensions and theorizing its usable space for actual size solar panels, this would provide 1,300 more kW per hour over the 0cm border configuration, therefore concluding that the converted 29 inch space around solar panels on Shasta Dam would maximize energy production.

Summary Statement
I found that a white reflective border around solar panels produces more voltage than side-by-side solar panels with an optimal ratio of border width to square solar panel width of 3 to 8.

Help Received
I designed, built, and performed the experiments by myself. However, I got help with ratio conversions from my dad.