

Aerospace Engineering Thesis Defense

Analysis of Local Impact of Rooftop Photovoltaic Panels

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Abstract

Rooftop photovoltaic (PV) systems are becoming increasingly common as the efficiency of solar panels increases, the cost decreases, and worries about climate change increase and become increasingly prevalent. An under explored aspect of rooftop solar systems is the thermal effects that the systems have on the local area. These effects are investigated in this paper to determine the overall impact that solar systems have on the heating and cooling demands of a building as well as on the efficiency losses of the solar panels due to the increased temperature on the panels themselves. The specific building studied in this paper is the Goldwater Center for Science and Engineering located in the Tempe campus of Arizona State University. The ambient conditions were modeled from a typical July day in Tempe. A numerical model of a simple flat roof was also created to find the average rooftop temperature throughout the day. Through this study it was determined that solar panels cause a decrease in the maximum temperature of the rooftop during the day, while reducing the ability of the roof to be cooled during the night. The solar panels also saw a high temperature during the day during the most productive time of day for solar panels, which saw a decrease in total energy production for the panels.



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