

The Comparison of the efficiency of a static PV system vs a solar tracker system

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Abstract

Solar tracking systems can be used to enhance the performance of photovoltaic (PV) systems by following the path of the sun to capture the maximum possible power. The efficiency of a system powered by solar energy may be improved if static PV panels are replaced by a solar tracking system. As the cost of solar systems decreases, the viability of implementing these type of renewable energy systems increases. The purpose of this project was to evaluate the differences in efficiency between a stationary solar panel and a dual axis solar panel that had the capability to track the sun.

This project was a part of a larger collaboration through the NSF Research Experience for Teachers program. The multidisciplinary team consisted of two electrical engineering students, five teachers (middle and high school), and an Electrical and Computer Engineering (ECE) college professor that supervised the activities.

The system designed consisted of two servo motors which controlled horizontal and vertical movement of the solar panel. A group of four light dependent resistors (LDR) were situated on top of the solar panel with a cross piece separating the LDRs. Both horizontal and vertical motors were programmed to adjust positioning to wherever the light intensity was the greatest according to LDRs. The system also has a temperature and humidity sensor. To enhance the performance of the solar tracker system during cloudy days, an equation that calculates the position of the sun, based on geographical location, date, and time was added to the system. An Arduino microcontroller was used to perform the calculations of the position of the sun during cloudy days, and to read from the sensors, and to send the control signals to the servomotors. The power output of both stationary and solar tracking systems were compared to evaluate which system was most efficient. The paper provides the results of the efficiencies obtained from the solar tracker system and the static PV system.