Design of a Low-Cost Weather Station for Photovoltaic Modeling

Bo, Chad (School: Eleanor Roosevelt High School)

As the use of solar energy expands, there is a rising demand for Photovoltaic modeling programs which can track, monitor, and predict the energy output of solar arrays. However, the high cost of acquiring the meteorological data necessary for modeling can be a detriment to the use of this technology. The goal of this project was to design a weather station that measures and logs both Global Horizontal Irradiance and Temperature for less than $250, including additional autonomous capabilities to allow the device accessible for real-time solar monitoring of small scale installations. The construction of the weather station utilized an Arduino microcontroller to collect data from several low cost sensors, and attempted to integrate it with a Raspberry Pi for data logging. The resulting system was then calibrated and tested for its reliability and accuracy on the field. By using the coefficient of variance, the light and temperature sensors were shown to have a high degree of consistency, showing that the weather station can be used autonomously for significant periods of time. Testing for utilizing the degree of accuracy of the weather station is currently ongoing.

Awards Won:
American Meteorological Society: Honorable Mention of $125