All-in-One PV Sensor – Phase II

Sponsor: OUC (Orlando Utility Commission)

It is no secret that the earth's climate is changing due to greenhouse gas emissions. Each community must make commitments and changes to aid in the fight against rising global temperatures – some communities have options such as wind, hydroelectric, or geothermal. In Florida, and especially Central Florida, solar is our primarily available asset. As part of our commitment to sustainability OUC aims to reach 50% carbon neutrality by 2030 with a goal of 100% carbon neutrality by 2050 all through the use of solar, storage, and energy conservation.

There are always exciting, new technologies being commercialized in the solar industry and OUC operates a number of research solar arrays to investigate these new developments. In order to better model these solar arrays OUC wishes to install simple, low-cost data sensing equipment.

The design of this data sensing equipment also aims to tackle another solar industry problem: PV monitoring. When large arrays are built they may be comprised of hundreds of thousands of individual solar modules. When one of these panels becomes defective it can prevent large portions of the array from outputting power. Technicians are dispatched to troubleshoot which of the hundreds of panels it could be and then replace it resulting in lost energy, money, and time. Such a monitoring device would quickly point to a problematic module and reduce downtime – increasing the solar power on the grid and decreasing the operating costs of such plants.

OUC pursued such a project in collaboration with a group of UCF ECE students in 2021, who successfully developed circuits for reading DC voltage and irradiance, while wirelessly transmitting data to a central node for storage. The plans for the next phase of the project in 2022 are to develop and make improvements in the following areas:

1. Design new current and temperature sensing circuitry
2. Design new filtering circuitry to improve data quality
3. Redesign terminal connections to accommodate 10 AWG wire
4. Design custom packaging to withstand environment
5. Implement three sensors and node at the OUC research array to record data
6. Stretch Goal: Design circuit upgrades to increase available input from 500 to 1200 Watt level