Off-Grid Solar-Powered Electric Vehicle (EV) Charging Station – A Design-Build Project

Abstract

This submission discusses a collaborative effort between faculty members, undergraduate students, and licensed professional engineers to design an off-grid solar-powered electric vehicle (EV) charging station for a university campus. The objective of the project was to create a universally adaptable solution for off-grid solar-powered EV charging that was also more economical than other existing systems. The team value-engineered each iteration of the design to minimize the cost increases associated with fabricating custom elements for the station.

The design process involved weekly team meetings, with licensed professional engineers providing guidance to undergraduate students. The licensed structural engineer guided the structural engineering students in designing the primary above-ground framework for the station, while the electrical engineering students developed the station's solar collection array and battery storage systems. The construction management students worked with the architectural engineering students to develop and continuously update the project's cost estimate.

The project team evaluated the safety aspects of the system, including the structural integrity and designing to ensure the canopy does not topple over in high winds. The team worked closely to create a "best-for-project" thinking environment, where both design and construction listened to the challenges and issues of the other disciplines to mutually establish project solutions.

The project was green-lighted for installation by the University Facilities group as well as the leadership of the Campus Parking Authority, and the team is finalizing the design, securing funding, and making plans for the prototype to be fabricated and installed on campus. The project provided undergraduate students with a real-world collaborative scenario that allowed for true multi-disciplinary collaboration as a college experience. The resulting design could serve as a model for a universally adaptable solution that could be deployed on virtually any new or existing property at any parking lot configuration for either public or private owners.