

## **Educational Photovoltaics and Battery Energy Storage Systems at CalPoly**

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Renewable energies are an emerging part of power systems that provide clean energy at a lower cost; however, due to their alternative nature, new challenges have been brought to the power system. To address these challenges in the current curriculum, CalPoly is dedicated to build a renewable energy laboratory for the students. This laboratory can be used as an asset for the students to work around the theories that they learn in the lectures. It can also be used as an opportunity for the graduate/undergraduate students and the faculties who are interested to do some research in this area.

In this poster, our focus is on a set of laboratory equipment that can be used to utilize the solar energy to consume it in on its local load or transfer it to the grid or store it in batteries in case of excess of energy. In this regard, a commercial system from the Tabucci Company has been bought which consists of two major components. The first component is Lithium-ion Storage Battery Unit with the home scale size of 9.89KWh. This unit by can be connected to the solar panels and to the grids through its hybrid inverter. At the current step, locating and mounting the solar panels on the roof are under the investigations by the power faculties and students who are taking senior design projects on this subject. The short goal for now is defined to run the system by connecting the inverter system with its two battery units to the grid. In this way, charging and discharging the batteries from/to the grid can be analyzed by our students. The next step would be to mount the solar panels on the roof to charge the batteries or transfer the power back to the grid through the inverters. Upon completion of this phase, a solid demonstration for the students to learn and investigate how a home-scale microgrid will work will be completed. Multiple interesting projects such as analyzing the output power of solar panels with respect to the weather condition and insolation of the sun can be investigated. Also, in the bigger plan, this real system can be added to a much larger grid in the real time simulator for further analysis.