



## **FACULTY MENTOR**

Chris Mi

## **PROJECT TITLE**

Research On Second Life EV Battery for Energy Storage Applications in Business Buildings

## **PROJECT DESCRIPTION**

Description: The goal of this project is to investigate the feasibility of second-life EV batteries integrated with a PV system in small to medium sized businesses. To accomplish this, we will design the energy storage system using second-life EV batteries, obtain permits, and construct two demonstration sites in San Diego, one with 220kWh of battery and the other with 100kWh of battery. The design, permit, and construction will be completed by the middle of 2022. Students working on this project will initially participate in the design and help with the construction of the two demonstration projects. Then you will focus on the optimization of the system operation. The goal of the optimization will achieve: (1) reduce the building demand charge to be limited no more than 10% of its average power; (2) reduce the peak-time usage by at least 75%, i.e., shifting the electricity usage to the super-off-peak times during the day; (3) build forecasting models considering the historical usage and weather forecast, and model predictive control algorithms to achieve the above goals. The savings goal of site 1, for example, is estimated to be 30% of its current charge, or at \$3000 per month, or \$300,000 over the life time of the system with a payback period no more than 3 years.

In addition, the students may also learn: (1) how to design and operate DC-DC converters and inverters that are connected to the power grids; (2) how to optimize the sizing of the energy storage system; (3) how to design the thermal management of the energy storage system; (4) energy management system design; and (5) battery management systems. It is possible to design and build a module and turnkey solution that can be commercialized by a startup company.

This project will be in person.

## **INTERNS NEEDED**

5 Students (3 graduate students, 2 undergraduate students)

## **PREREQUISITES**

1. Prefer to have taken ECE 121A&B and/or 125A & B.