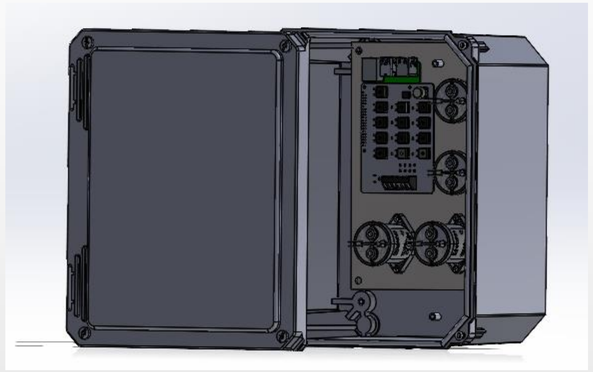
HiTech EdVentures

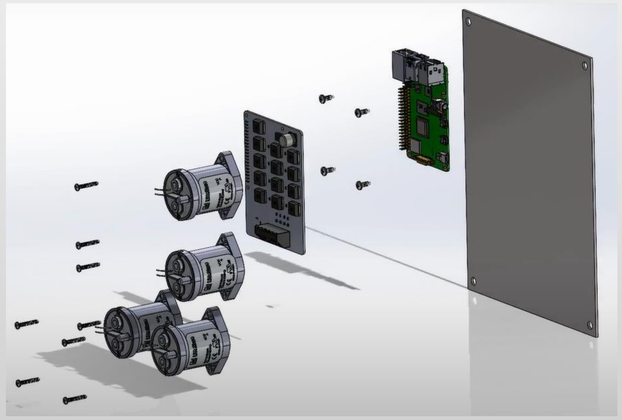
HELIOS

Energy Management System

San Diego State University

CAD View



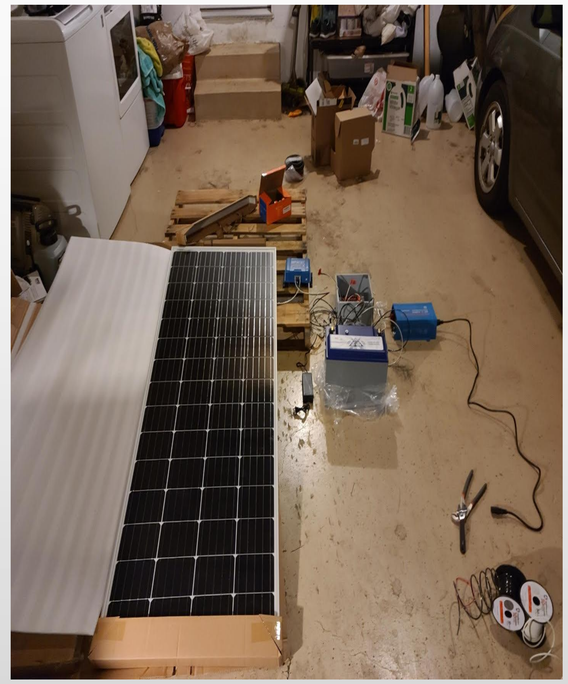


Problem Statement

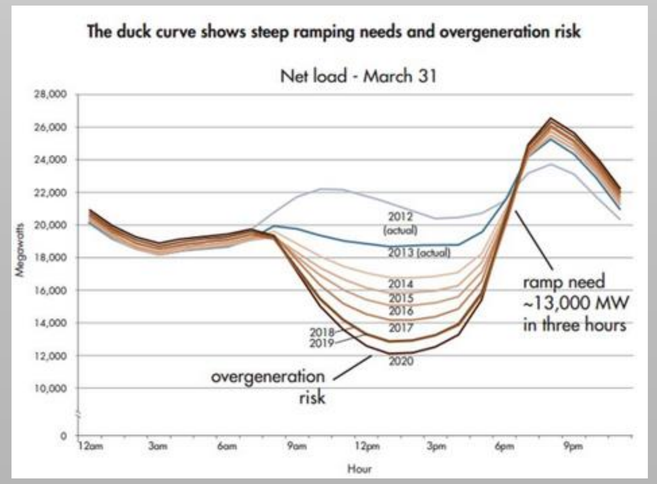
With the rise of renewable energy in the last decade, power providers face a new problem. Shown on the bottom left, the duck curve represents the energy production throughout a 24-hour period. The large dip in the middle (the belly of the duck) happens midday when the sun is at its highest and solar production is at its peak. The dip means power providers do not need to supply as much energy to consumers, but as the sun sets and people begin coming home, those same power providers need to rapidly ramp up production to account for the new load, creating the neck and head of the duck. In order to help supply the large demand, fossil fuel plants are used causing copious amounts of greenhouse gasses to be released into our atmosphere.

To help mitigate the steep ramp, HELIOS employs a process called 'peak shaving'. HELIOS pulls the Day-Ahead Locational Marginal Prices data from CAISO and will intelligently plan when to use solar energy stored in batteries by observing energy prices and sorting the data.

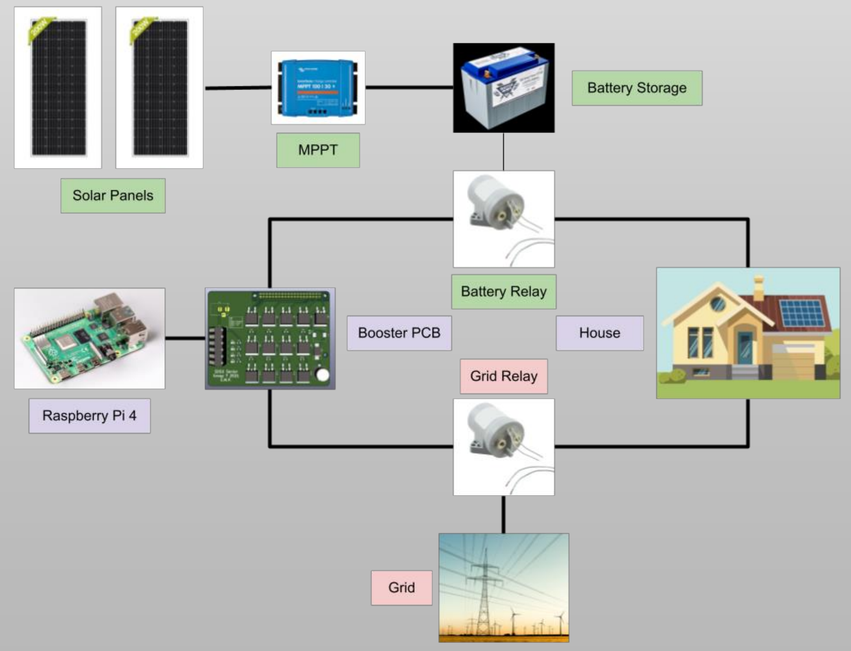
Final Product



Duck Curve



System Line Diagram



The enclosure which consists of a PCB/ Raspberry Pi will pull day-ahead data from CAISO and sort them to help the user save money.

Team Members

Electrical Team:

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HELIOS

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ADVISORS: Professor B. Dorr, Professor K. Arnold, SDSU
SPONSOR: San Diego State University

Energy Management System

HELIOS is an energy management system designed to limit carbon emissions by peak shaving. To do this energy prices for the next day are taken from California ISO. The peak prices as well as valley prices are identified to determine when power from the grid should be used or when power should be stored. During the valleys when energy prices are scheduled to be the lowest, energy will be stored in batteries either from solar panels or from the grid [SM1] when solar power is not available. Then when energy prices are the highest usually when the sun is setting or down, use the stored energy to power the house. If a fraction of homes with solar panels but no battery storage had a similar style energy management system, the need for simple cycle power plants could be reduced, limiting carbon emissions.