

Project Objective

- Able to power the entire house from one or more power sources
- Full backup, Solar, Grid-tie hybrid solution
- Sources list in priority of desirable consumption:
 - Solar Panels
 - Batteries
 - Grid
- Note that supply can be drawn from multiple sources. For example, we can draw from Solar and Batteries at the same time to meet load.
- The battery should be able to power all loads (inductive and non-inductive), including the air conditioner and electric ovens. I understand that this is based on a combination of battery types, and inverter technology.
- Automatic switch overall to Solar / Batteries during power outage (fast auto transfer switch)

Scenarios with Active Grid

- When solar panel is generating electricity
 - Load is satisfied by solar and/or battery
 - Excess source charges the battery or to the grid if battery is fully charged for net-metering
- When solar panel is NOT generating any electricity
 - During peak hours, load is satisfied by the battery up to a low-threshold capacity (e.g. 20% or 30%)
 - During non-peak hours, or battery low then load is satisfied by the grid, and the battery is charged from the grid

Scenarios with Grid Outage

- When solar panel is generating electricity
 - Load is satisfied by solar and/or battery
 - Excess source charges the battery (the grid should be **disconnected**)
- When solar panel is NOT generating any electricity
 - Load is satisfied by the battery until battery low alarm

Battery and Inverter Characteristics

- Batteries can be charged from either Solar or Grid depending on environmental condition
- Prefer LiFePO₄ (LFP) batteries but this is open to discussion (not firm)
- Prefer expandability; for example may start with 10kWh or 20kWh, but ultimately would like the option to expand to 30 to 40 kWh, which is approximately one full day of non-summer utilization based on historical data.
- Inverter needs to be powerful enough for peak and sustain supply especially for air conditioner and other inductive loads
- Full [TOU meter data](#) from Jan. 2020 to Aug. 15, 2021.

Reference information

- Solar Battery System Types
 - <https://www.cleanenergyreviews.info/blog/ac-coupling-vs-dc-coupling-solar-battery-storage>
- Residential Storage Buyer's Guide 2020
 - <https://solarbuildermag.com/energy-storage/residential-storage-buyers-guide-2020/>
- The Generac PWRcell home battery complete review
 - <https://news.energysage.com/generac-pwrcell-battery-review/>
- Tesla Powerwall Review
 - <https://www.cleanenergyreviews.info/blog/tesla-powerwall-2-solar-battery-review>
- What Is A Hybrid Inverter
 - <https://www.cleanenergyreviews.info/blog/what-is-a-hybrid-inverter>