

Engineering Team Goal – Environmental Impact

By March 22, 2021, connect a solar power system to run the lights solely from battery power for at least 4 hours on a full charge, while being fully off-grid and charging rapidly enough to avoid the user needing other light sources.

Plan of Action to Achieve This Goal

1. Research possible battery options that can hold the estimated power consumption of 4+ hours usage and choose the one that has the longest lifetime with reasonable price by March 1, 2021.
2. To achieve a full charge over 3 days in good weather conditions, select a solar panel with enough efficiency to generate that power in 24 hours of direct sunlight by March 1, 2021.
3. Acquire or construct a maximum power point controller to optimize battery charge time based on our battery and solar panel statistics by March 15, 2021.

Goal Metrics

Metric Measurand

The ratio of battery charge rate to ??? (also: what are the units?). The battery charge rate will be the metric since it will determine if the user will have the light system available for usage when needed.

Goal Achievement Threshold

Success will be based on the ratio of charge time to operational time. The system will need to charge in a reasonable time in order to have enough availability that the user does not resort to plug-in lighting outside of extended bad weather circumstances. Ideally, it will achieve

Commented [FJD1]: Revise. Limit each goal to one outcome. This goal specifies multiple outcomes: outcome1 AND outcome2 ...: run the lights AND charging rapidly enough

Also, this statement does not clearly indicate how the outcome is related to “environmental impact”.

The environmental impact might be something like, when installed, the prototype will only use renewable energy from photovoltaic panels to recharge the battery, thereby eliminating the need to recharge the battery using energy sources derived from fossil fuels or nuclear power.

Commented [FJD2]: Reminder: Put your name and the date on your assignments.

Commented [FJD3]: This is a good start. You also require steps such as “test the prototype” (does the prototype work as intended?) and “evaluate the prototype” (given the test data/results, is the design a success? How can the design be improved?).

Commented [JDF4]: Insert a non-breaking space (not an ordinary space) between a number and its units: 4+ hours (i.e., 4+<NBSP>hours). Always ensure a number and its units appear together on the same line, and on the same page—i.e., the number and its units should never be separated by a line break (as has happened here) or a page break. (NB: Preferentially use a thin no-break space (U+202F) rather than a regular non-breaking space. But I’ll accept a non-breaking space.) See also: <http://jkorpela.fi/chars/spaces.html>, <https://youtu.be/bUOuEakiWms>

Commented [JDF5]: Remove all extraneous prose.

Commented [FJD6]: FYI: There is substantial variance in the energy density of solar radiation at different times during the year, and at different latitudes. Consider that when specifying your metrics. For example, you might constrain the metrics to specific months during the year and specific latitudes. For example: good luck getting this system to meet the charging requirement when it is used in the northern Norway during the Winter! 😊

Commented [FJD7]: Vague.

a The goal is achieved if the battery's charge rate ~~of is~~ greater than one hour operating power per day when charging in partly cloudy to clear conditions.

Commented [JDF8]: What exactly is meant by "charge rate"? What are the units for this rate: X/Y?

Commented [FJD9]: Not specific. Remove extraneous prose. Define the value (or value range) with well-defined units that indicates goal achievement. No other written prose is needed (or wanted).

Commented [JDF10]: Confusing. Revise.

Measurand Measurement Method

From full discharge, measure how much charge per hour and per day the battery stores under various weather conditions. As a secondary test, measure the total time to fully charge the battery.

Commented [JDF11]: This will vary depending on the time of year and the latitude.