Engineering & Applied Science
UNIVERSITY OF COLORADO **BOULDER**

SOLAR FLEX

Acknowledgements:
CU Electrical Engineering Department
Professor Femrite, Supervisor Jake Perez

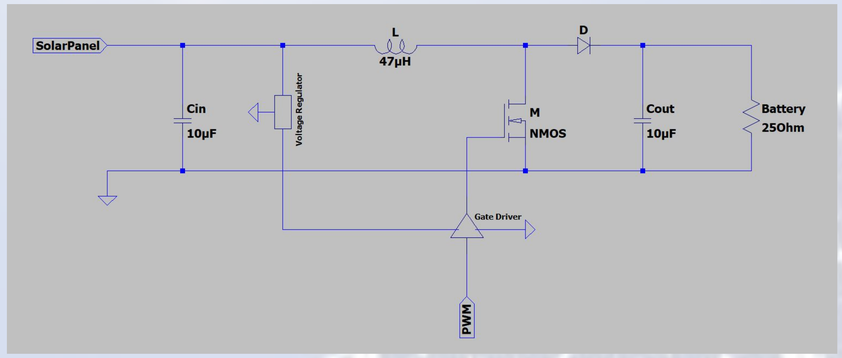
Background

The threat of climate change requires cleaner methods of travel such as electric cars and bikes, but they need to be charged using clean electricity for them to truly make a difference. Our product makes this possible. We originally wanted to create an electric car charging system, however the voltages & power involved is too high for us to do it safely & within budget. Instead, we created a charging system for high voltage electric bikes to charge using clean, solar power!

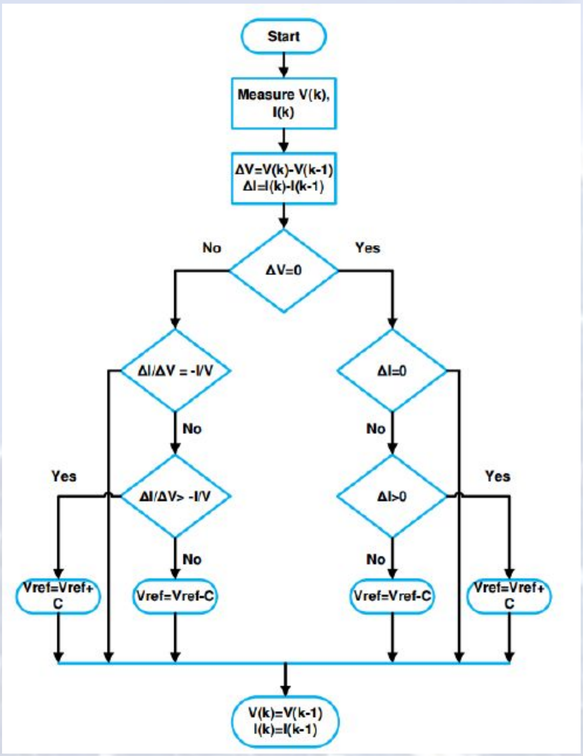
Objectives

- Charge 52V bike battery using solar power
- Efficiency > 80%
- User interface that displays system's characteristics
- One cohesive product with 4 major subsystems
  1) Solar Panel
  2) MPPT
  3) Power Converter
  4) UI Display

Converter Topology



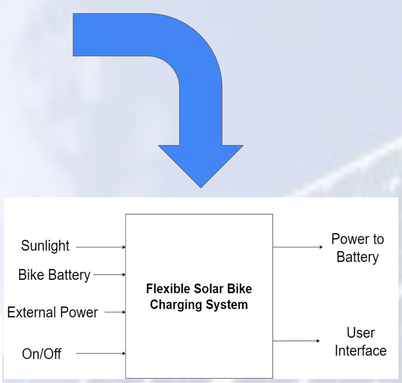
MPPT Algorithm

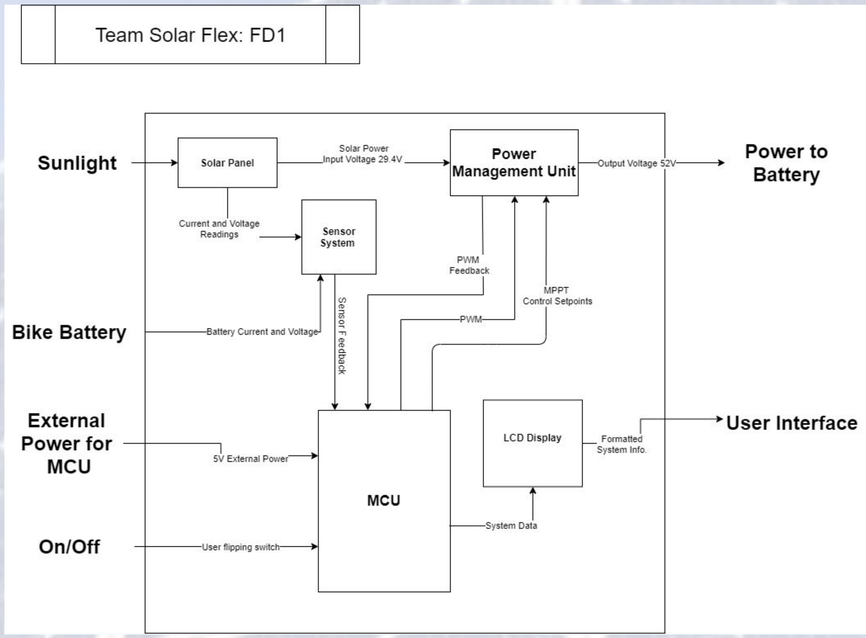


System Design & Flowchart

SunPower 170W Flexible Solar Panel

52V Bike Battery





Lessons Learned

- Good heat dissipation and heat management is important to consider when designing anything high power. We installed fans, large traces, and heat sinks for this purpose, but only after we burned up some components.
- Do as much testing as possible before designing the next spin. This can save lots of time later as you know what to expect with regards to system performance
- Due to expensive components, we were forced to make some compromises because we could not afford to get the best, most effective pieces
  - Isolated system costs too much to build isolated IC's that could transmit voltage/current information to the MCU from our PMU
  - High resolution current sensors that can also withstand high power