Algorithm Improvements on a Load-Management Photovoltaic Electric Vehicle Charging System

Dustin Nguyen

Mentors: Dr. Meng Tao, Kelvin Tan

School of Electrical, Computer, and Energy Engineering

Abstract

Electric vehicles (EVs) chargers rely on power conversion infrastructure to transform grid supply to usable power for a vehicle battery. However, these existing power converters lose power at each required conversion step. Professor Tao's research team has previously worked on a load-management photovoltaic (LMPV) algorithm to cut out these power conversion steps and link power supplies directly to vehicles' batteries. Last semester, a project focused on a capacitive load was conducted. This project looked to project the switching algorithm of the controller.

System Overview
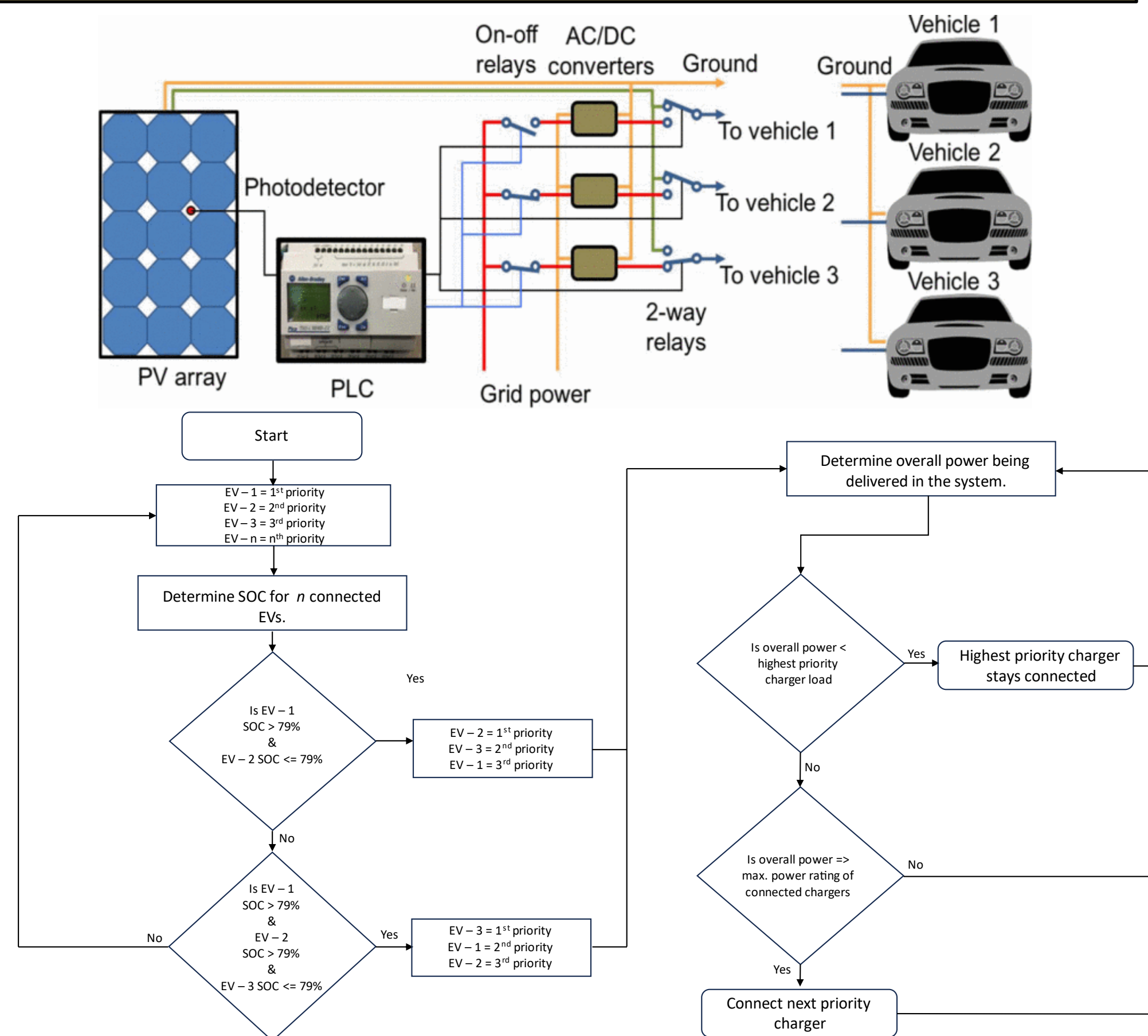
Figures 1 and 2: Framework for LMPV EV Charger System and the block diagram of the control algorithm that connects additional EV over time.

Improvement Strategies

Previously, the model connected and disconnected loads immediately depending on power levels. This results in sharp changes in the overall power output. To solve this, we implemented a delay and switch system.
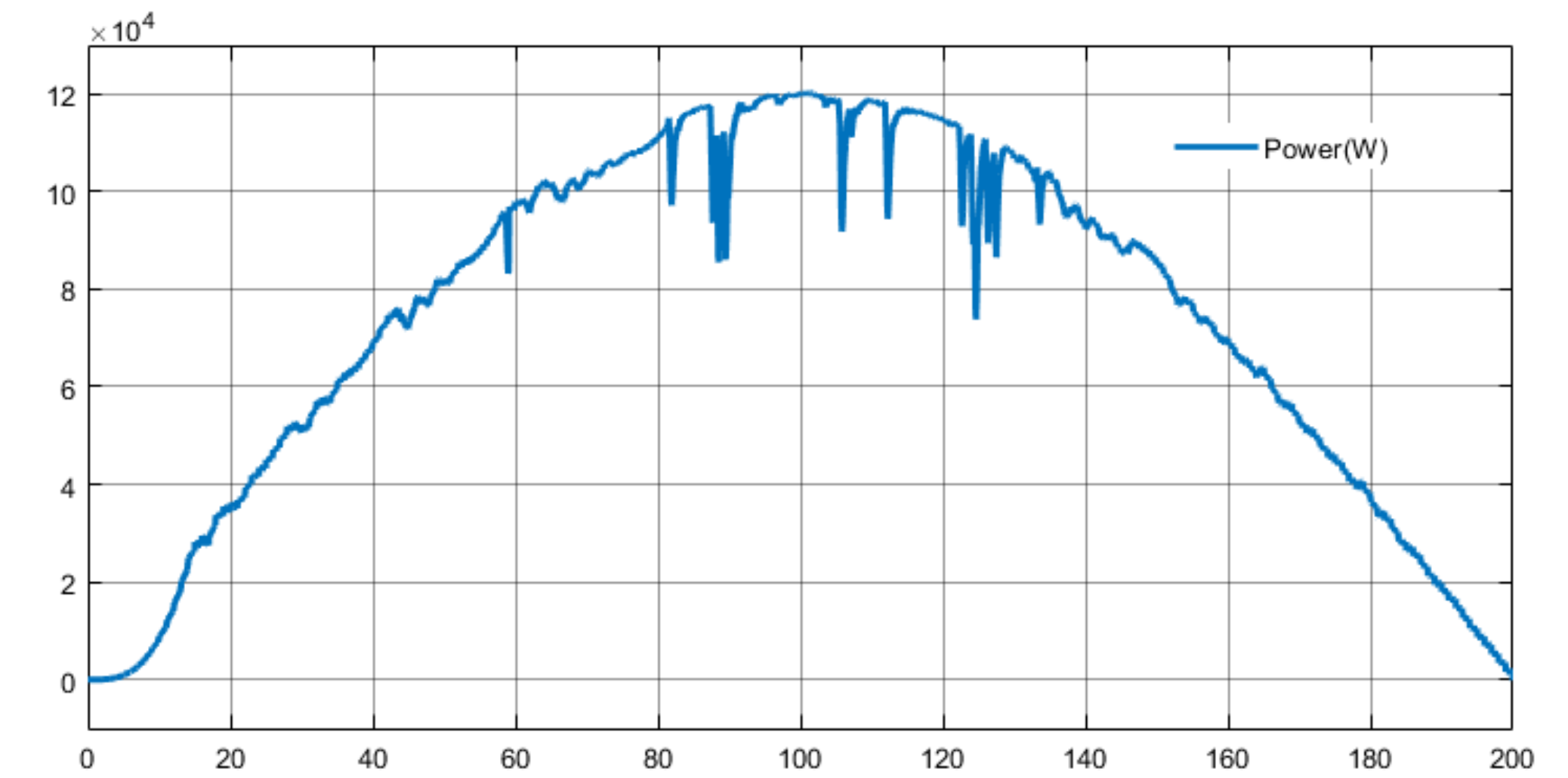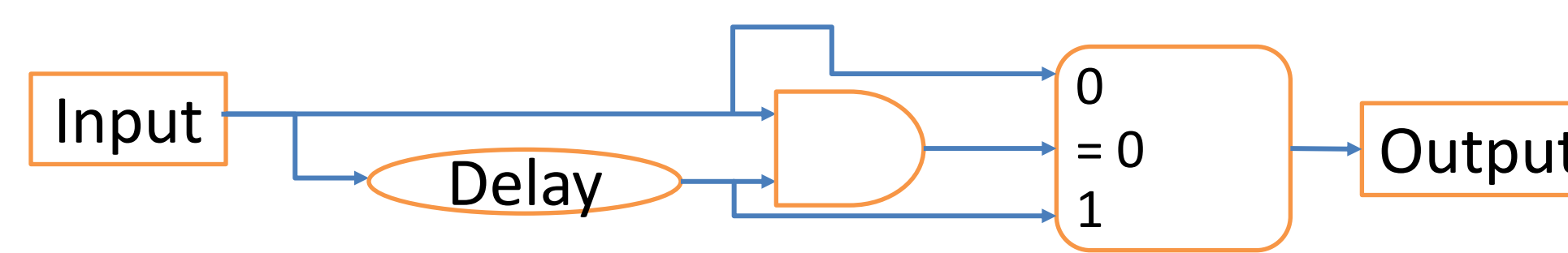

Results

Figure 3: Previous Power Curve

Figure 4: Power Curve with new algorithm

Figure 4: Power Curve with new algorithm
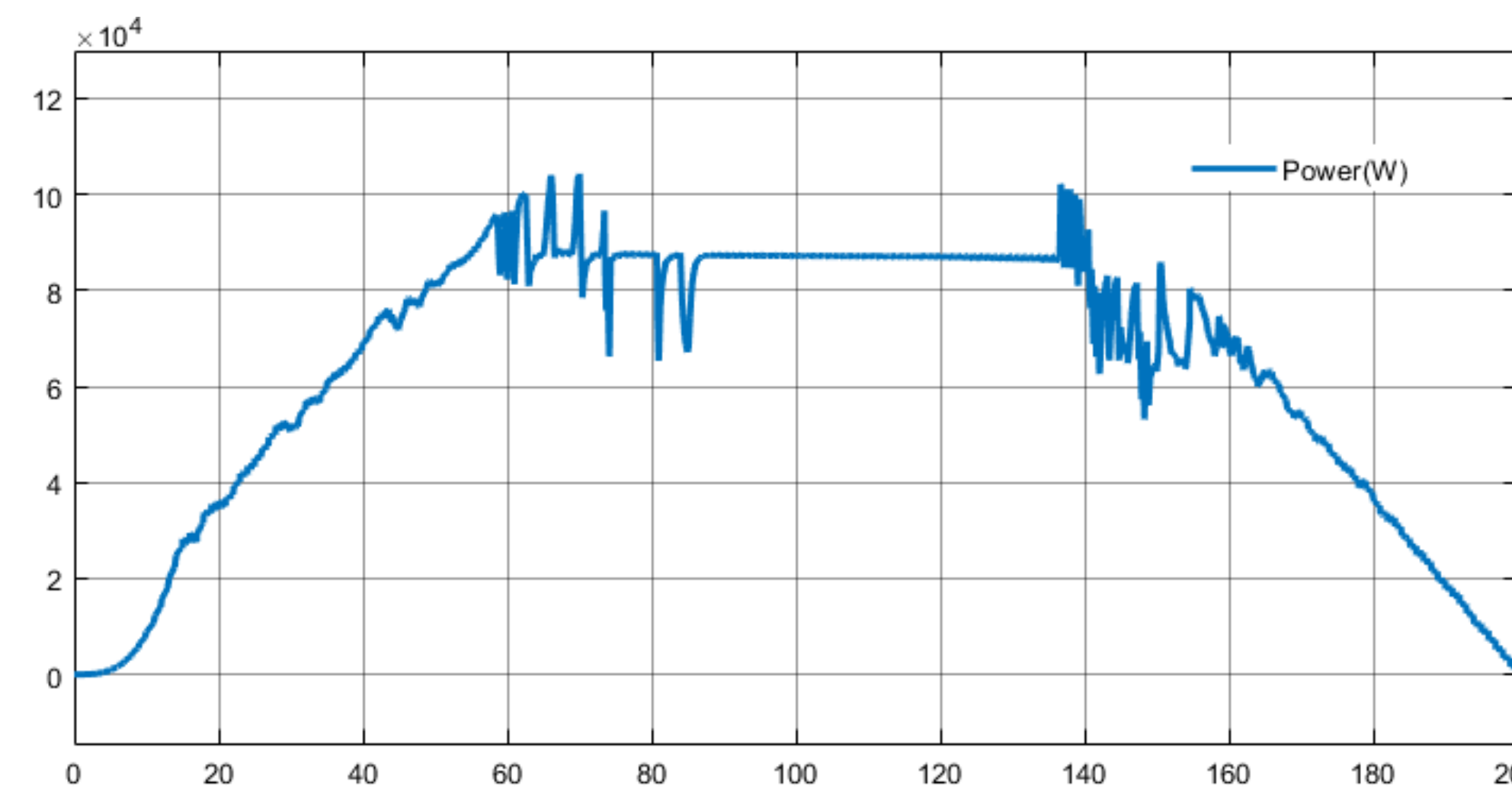
Conclusion

The addition of delays in the algorithm allows for more precise switching that is less reactive and reduces sudden disconnections and connections of loads. This improves accuracy of switches to maximize power by ensuring switching a load on or off would boost overall power output

Future Work and Acknowledgement

Future work on this project includes the following:
- Investigating voltage and current oscillations in individual load batteries
- Improving charging steadiness

FURI

Ira A. Fulton Schools of Engineering

Arizona State University