

BACKGROUND

- Energy storage systems (ESS) store energy produced at one time and discharge to supply electricity at a time when it is needed most.
- ESSs can provide services to support the grid, such as peak shaving, load shifting, frequency regulation, and reactive power compensation.
- The most common use of an ESS is to reduce demand charge from the utilities by peak shaving.
- The demand charge is much larger than the usage charge from the utilities, so decreasing the peak will greatly reduce electricity costs.

SIMULATION OF GRID CONNECTED MICROGRID

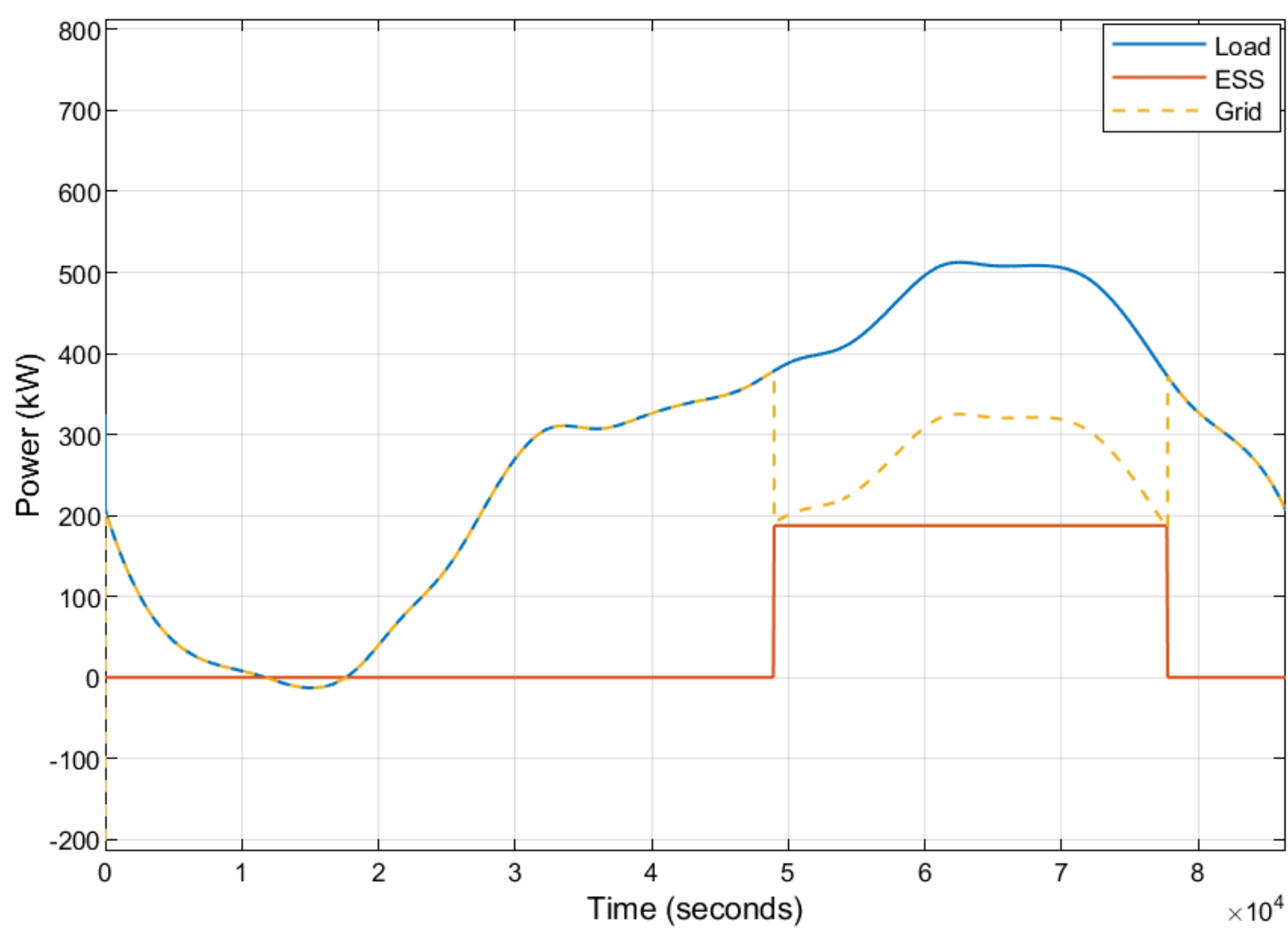


Fig. 1. Power of grid, load, and BESS in grid connected microgrid

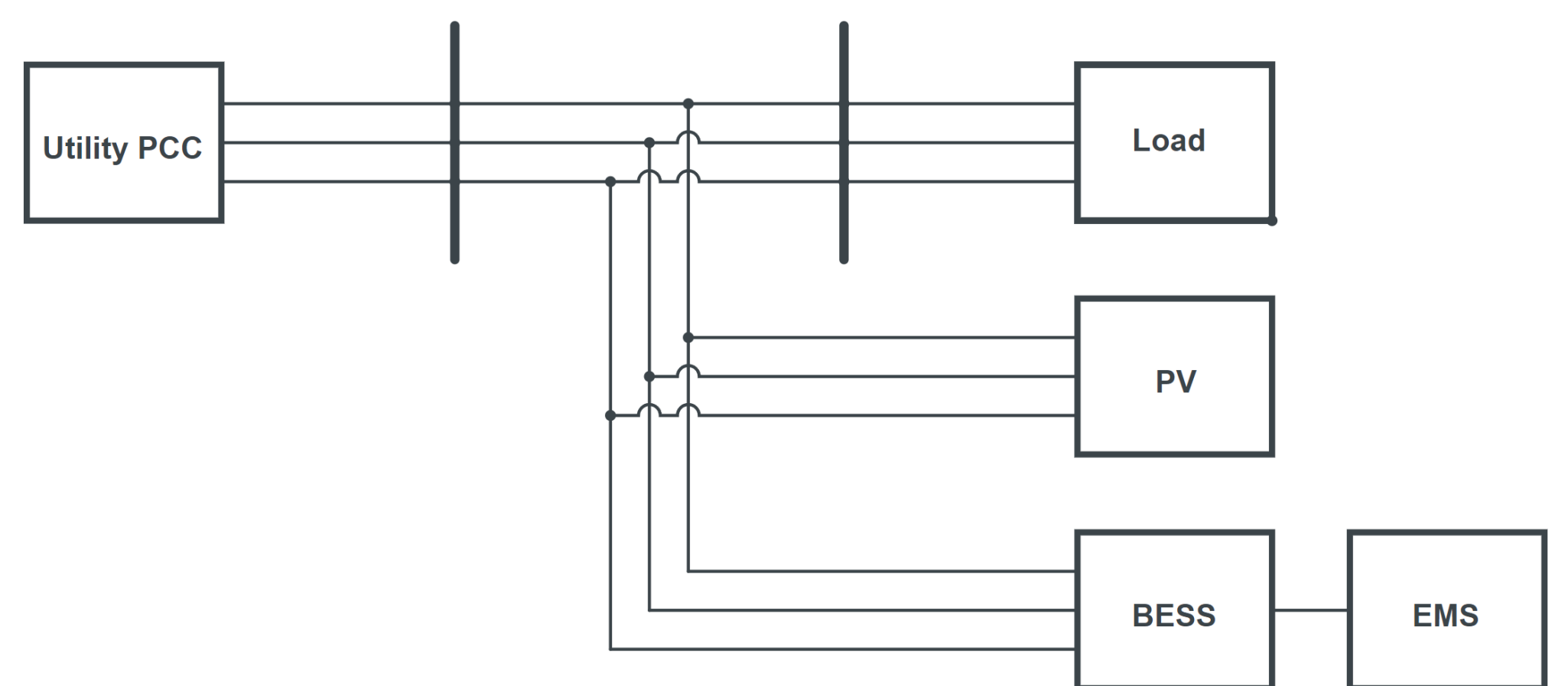


Fig. 2. Microgrid simulation topology

- 24-hour simulation of a grid connected battery energy storage system (BESS) in Simulink
- Set power, duration, and start time for ESS to discharge
- Using Electric Power Board Chattanooga pricing, the cost of electricity is calculated for a 24-hour period.

NUMBER OF HOURS OF PEAK SHAVING

- For each of the 5 capacities listed, a cost analysis was done to find the optimal number of hours to peak shave to reduce cost.
- Peak value is reduced more by changing number of hours of peak shaving than increasing the capacity of the system.
- A flatter peak requires more hours of peak shaving than a sharp peak to see a significant decrease in cost.

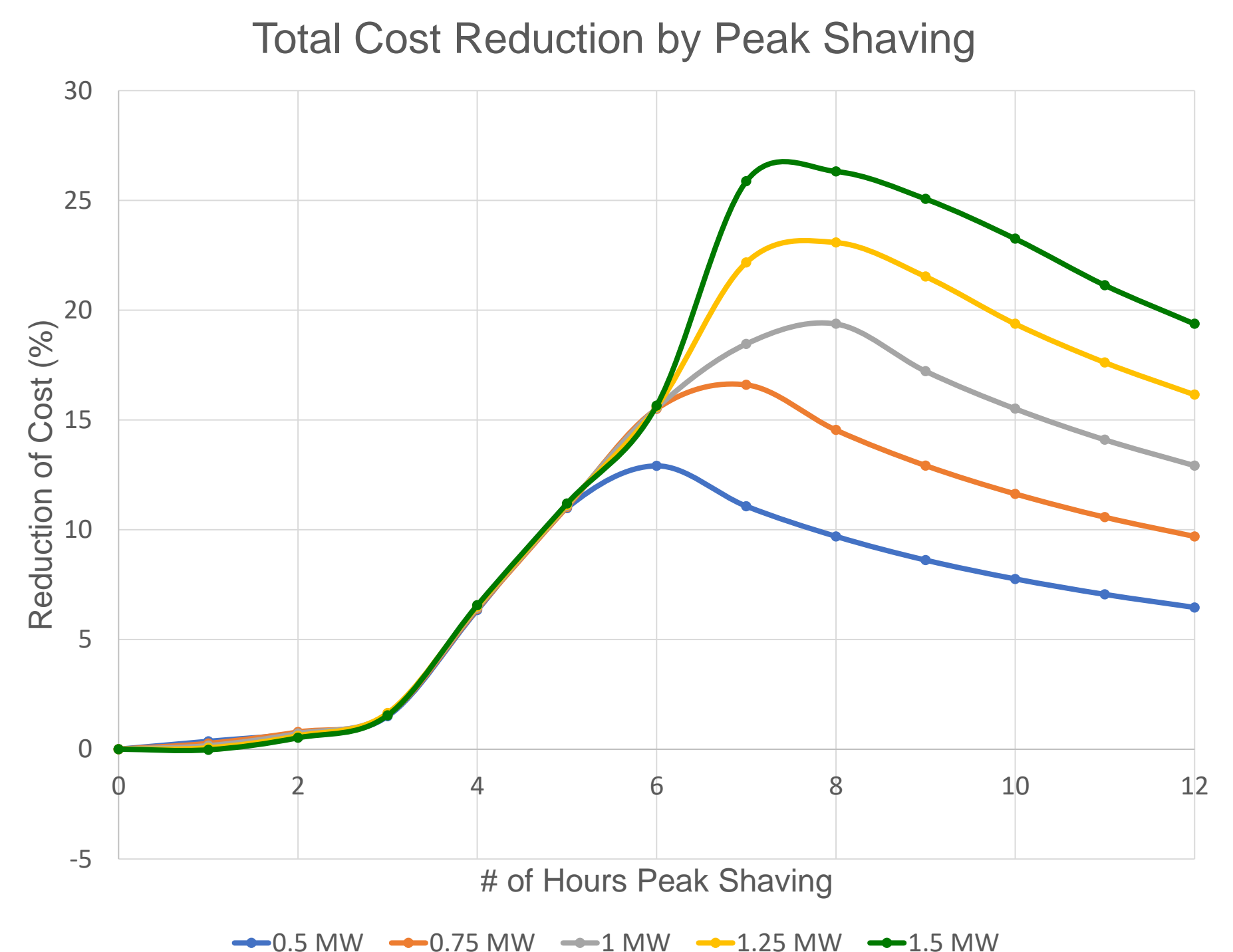


Fig. 3. Reduction of cost by peak shaving for different number of hours

CONCLUSION

- The best number of hours to peak shave for this load profile is between 6 and 8 hours depending on the capacity of the BESS.
- The capacity of BESSs used for less than 5 hours of peak shaving does not impact cost reduction.
- Cost reduction by peak shaving is heavily dependent on the shape of the load profile.

