

Optimal Dispatch of Grid Battery in Distribution System

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Project Summary

- Do the dispatch study of the grid battery in a 9-bus distribution system with PV penetration;
- Investigate the impact of the battery on voltage deviation and economic consideration.

Background

- A 9-bus radial system is simulated;
- A 60kW/120kWh battery is simulated;
- Power flow analysis is performed to observe the impact;
- 9 PV sources are simulated on each bus.



Case1

- Investigate the reduction to the voltage deviation;
- Results (Figs. 1-3) show a small effect on the voltage, namely 0.32V on the LV network.

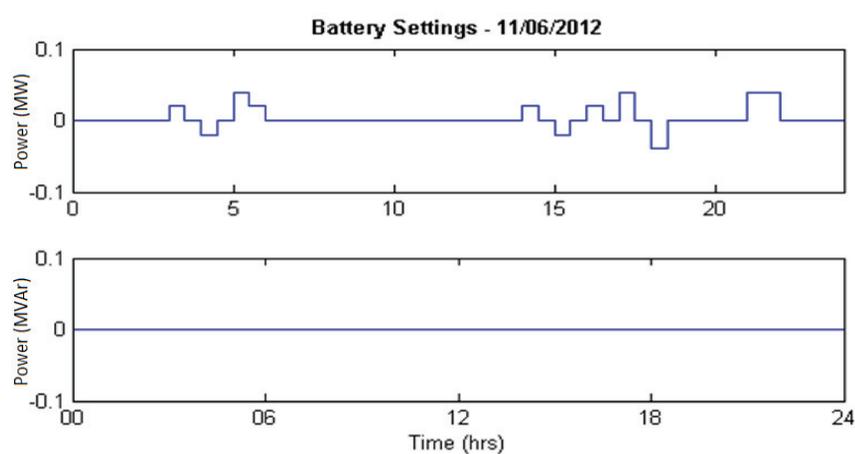


Fig. 2 Battery charging/discharging scheme

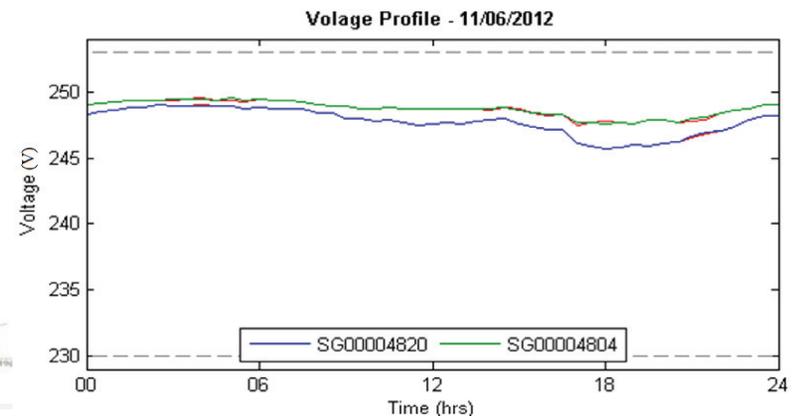


Fig. 1 Optimization of voltage profile (battery effect in red)

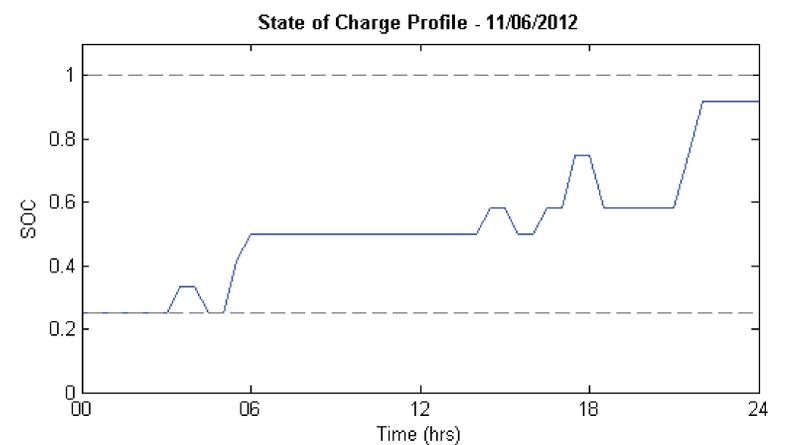


Fig. 3 Optimization of the SOC profile of the battery

Case2

- Investigate the effect of dispatch battery to make profit;
- Results (Fig. 4-5) show that when the peak prices are high, the battery dispatch provides encouraging profit; otherwise, the profit is small.

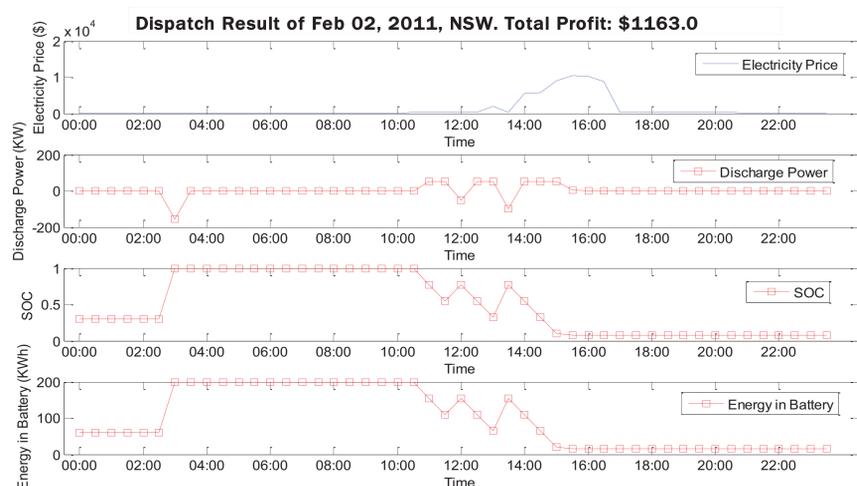


Fig. 4 Dispatch result when the peak market prices are high



Fig. 5 Dispatch result when the peak market prices are low

Conclusions

- The battery dispatch has small effect on voltage deviation;
- Battery can make large profit when there is high peak market prices; however, the cost of the battery's lifetime depression should be taken into account.

