Storage Application in Smart Grid with High PV and EV Penetration

Rapid deployment of renewable energy sources (RES) and concerns regarding their impacts on power systems provide new opportunities for utilizing more electrical energy storage system (EESS) in power systems. Peak-shaving in high Photovoltaic (PV) penetration conditions and providing ancillary service in high load conditions are among the applications of EESS in distribution systems. In this paper, a new method is developed based on the voltage sensitivity analysis of the network in order to calculate the EESS capacity required for prevention of voltage rise and voltage drop in distribution grids with residential PVs and Electric Vehicles (EVs). The effect of EV home charging on EESS capacity in high PV penetration is also addressed. The results indicate that increasing the EV penetration in the network can decrease the EESS capacity need. This decrease is highest in situations with low PV penetration.

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