EV Charging Facilities and Their Application in LV Feeders with Photovoltaics

Low-voltage (LV) grid feeders with high penetration of photovoltaics (PVs) are often affected by voltage magnitude problems. To solve such issues, previous research has shown that reactive power methods, active power curtailment and grid reinforcement can be used for voltage support, yet showing several limits. We introduce the use of electric vehicle (EV) public charging stations with energy storage system (ESS) as a solution for voltage regulation in LV feeders with PV. A novel method is proposed to determine the ESS charging load required for voltage regulation and compare the results for the different locations in the feeder. With time-series simulations, we quantify the energy size required for a station ESS. A Belgian LV residential grid, modeled using real PV generation and load profiles, is used as case study. The method and simulation results show the effectiveness of using public EV charging facilities with the additional function of voltage regulation in feeders with PV.

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