A Scenario-Based Approach for Energy Storage Capacity Determination in LV Grids with High PV Penetration

In this paper a new method is proposed to determine the minimum energy storage required to be installed at different locations of a low voltage (LV) grid in order to prevent the overvoltage due to high residential photovoltaic (PV) penetration. The method is based on the voltage sensitivity analysis of feasible scenarios associated with the net injected power into the grid by customers. A new concept is defined based on the remaining power curve (RPC) associated with the local generation and consumption, and the uncertainties related to PV output and load consumption are modeled in some RPCs with different occurrence probabilities without involving the time-series studies problems. The proposed method is capable of modeling output power of PV panels with different orientations as well as different electric vehicle (EV) charging patterns.