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FACTS Based Stabilization for Smart Grid Applications

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Abstract : Nowadays, Photovoltaic-PV Farms/ Parks and large PV-Smart Grid Interface Schemes are emerging and commonly utilized in Renewable Energy distributed generation. However, PV-hybrid-Dc-Ac Schemes using interface power electronic converters usually has negative impact on power quality and stabilization of modern electrical network under load excursions and network fault conditions in smart grid. Consequently, robust FACTS based interface schemes are required to ensure efficient energy utilization and stabilization of bus voltages as well as limiting switching/fault onrush current condition. FACTS devices are also used in smart grid-Battery Interface and Storage Schemes with PV-Battery Storage hybrid systems as an elegant alternative to renewable energy utilization with backup battery storage for electric utility energy and demand side management to provide needed energy and power capacity under heavy load conditions. The paper presents a robust interface PV-Li-Ion Battery Storage Interface Scheme for Distribution/Utilization Low Voltage Interface using FACTS stabilization enhancement and dynamic maximum PV power tracking controllers. Digital simulation and validation of the proposed scheme is done using MATLAB/Simulink software environment for Low Voltage- Distribution/Utilization system feeding a hybrid Linear-Motorized inrush and nonlinear type loads from a DC-AC Interface VSC-6-pulse Inverter Fed from the PV Park/Farm with a back-up Li-Ion Storage Battery.

Keywords : AC FACTS, smart grid, stabilization, PV-battery storage, Switched Filter-Compensation (SFC)
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