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(57) Abstract :
In this idea, dynamic power management scheme is proposed for standalone hybrid AC/DC microgrid which constitutes photovoltaic (PV) based renewable energy source, proton exchange membrane (PEM) fuel cell (FC) as a secondary power source and battery-supercapacitor as hybrid energy storage. The power management algorithm accounts for seamless operation of microgrid under various modes and state of charge (SoC) limit conditions of hybrid energy storage, when all the sources, storages and loads are connected directly at the dc link. The power management scheme (PMS) generates current references for dc converter current controllers of fuel cell, battery, and supercapacitor. The average and fluctuating power components are separated using moving average filter. The dc link voltage regulation under dynamic changes in load and source power variation is proposed. Also, PV power curtailment through control is formulated. The proposed power management is modified and extended to multiple photovoltaic generation system and batteries with all the sources and storages geographically distributed operating under multi-time scale adaptive droop based control with supervisory control for mode transition. The proposed power management scheme is validated using simulation results. Also, FPGA/Lab view based laboratory scale experimental results are presented to validate the power management scheme under various critical conditions.

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