

A 3kW Grid Connected Residential Energy Storage System with PV and Li-Ion Battery

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Abstract : In the near future, energy storage will play a vital role to enhance the present changing technology. Energy storage with power generation becomes necessary when renewable energy sources are connected to the grid which consequently adjoins to the total energy in the system since utilities require more power when peak demand occurs. This paper describes the operational function of a 3 kW grid-connected residential Energy Storage System (ESS) which is connected with Photovoltaic (PV) at its input side. The system can perform bidirectional functions of charging from the grid and discharging to the grid when power demand becomes high and low respectively. It consists of PV module, Power Conditioning System (PCS) containing a bidirectional DC/DC Converter and bidirectional DC/AC inverter and a Lithium-ion battery pack. ESS Configuration, specifications, and control are described. The bidirectional DC/DC converter tracks the maximum power point (MPPT) and maintains the stability of PV array in case of power deficiency to fulfill the load requirements. The bidirectional DC/AC inverter has good voltage regulation properties like low total harmonic distortion (THD), low electromagnetic interference (EMI), faster response and anti-islanding characteristics. Experimental results satisfy the effectiveness of the proposed system.

Keywords : energy storage system, photovoltaic, DC/DC converter, DC/AC inverter

Conference Title : ICEPES 2015 : International Conference on Electrical Power and Energy Systems

Conference Location : London, United Kingdom

Conference Dates : March 14-15, 2015