IMPACT: International Journal of Research in Engineering & Technology (IMPACT: IJRET)
ISSN(E): 2321-8843; ISSN(P): 2347-4599
Vol. 2, Issue 3, Mar 2014, 173-184

PV/BATTERY TO THE GRID INTEGRATION OF HYBRID ENERGY CONVERSION SYSTEM WITH POWER QUALITY IMPROVEMENT ISSUES

P. MOHAN[1], G. S. SUGANYA[2] & T. SIVANANDHAN[3]

[1,2]PG Student, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Anna University, Chennai, Tamil Nadu, India

[3]UG Student, Department of Electrical and Electronics Engineering, Sapthagiri College of Engineering, Anna University, Chennai, Tamil Nadu, India

ABSTRACT

Grid integration of photo voltaic (PV)/Battery hybrid energy conversion system with (i) multi-functional features of micro grid-side bidirectional voltage source converter (μGVSC) (ii) tight voltage regulation capability of battery converter (iii) MPPT tracking performance of high gain integrated cascaded boost (HGICB) dc-dc Converter with quadratic gain and less current ripple are presented in this paper. The PV side HGICB Converter is controlled by P&O MPPT algorithm to extract the maximum power from the variable solar irradiation. This paper proposes a modified Instantaneous symmetrical components theory to the μG-VSC in micro-grid applications with following intelligent functionalities (a) to feed the generated active power in proportional to irradiation levels into the grid (b) compensation of the reactive power, (c) load balancing and (d) mitigation of current harmonics generated by non-linear loads, if any, at the point of common coupling (PCC), thus enabling the grid to supply only sinusoidal current at unity power factor.

The battery energy storage system (BESS) is regulated to balance the power between PV generation and utility grid. A new control algorithm is also proposed in this paper for the battery converter with tight DC link voltage regulation capability. The dynamic performance of battery converter is investigated and compared with conventional average current mode control (ACMC). A model of a hybrid PV Energy Conversion System is developed and simulated in MATLAB/SIMULINK environment. The effectiveness of the proposed control strategies for HGICB converter and μG-VSC with battery energy conversion system are validated through extensive simulation studies.

KEYWORDS: PV Energy Conversion System, High Gain Integrated Cascaded Boost DC-DC Converter, Instantaneous Symmetrical Components Theory, Battery Energy Storage System