

Power Quality Improvement of Grid Connected Solar PV System

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Abstract: *In this dissertation, the design, modeling and analysis of a single phase grid connected photovoltaic (PV) system feeding nonlinear load is carried out. Normally, the phase-locked loop (PLL) circuits are used for synchronization purposes and generation of in-phase and quadrature templates. However, this paper presents an interesting application of FLLs for achieving load compensation for power quality improvement as well as estimation of phase and frequency components. Design and modeling of controllers using these FLLs for achieving power quality improvement is presented in the paper. A second order generalized integrator based frequency locked loop (SOGI-FLL) for control of a 5 kW PV interfaced single-phase compensator for power quality improvement is presented. The purposed control with voltage source converter (VSC) provides harmonic reduction, synchronization, fast dynamic response and enhance the overall power quality of the proposed system. The proposed system is designed in MATLAB/Simulink and results are analyzed under change in solar irradiance and nonlinear unbalanced load. The Total Harmonic Distortion of source voltage and source current is less than 5%, which follows the IEEE-519 standard.*

Keywords: VSC, second order generalized integrator, PV array

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