

Abstract

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Multifunctional Single-Phase Single-Stage Grid-Connected PV System

This paper presents the analysis of a multifunctional single-phase single-stage grid connected photovoltaic (PV) system. The primary function of the grid connected inverter in a single stage (PV) system is to supply active power to both load and grid in a way that complies with the applied grid connection standards. The added functions to the grid connected inverter are compensation for reactive power requirements and mitigation of the harmonics produced by the nonlinear loads connected to the point of grid connection. The single stage topology utilized in the grid connected PV system has the advantages of high efficiency and low cost compared with the two stage topology. Maximum power point tracking (MPPT) is achieved using perturb and observe algorithm. A test system composed of the PV array, single phase inverter, single phase supply, and three different types of single phase loads is modeled to evaluate the performance of the multifunctional operation of the PV grid connected system. The results of the test system simulation, using MATLAB/Simulink environment, validate the effectiveness of the system to perform the multifunctional operation of the grid connected inverter.