

Predictive Control of a Grid Connected PV System Incorporating Active power Filter functionalities

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Abstract: This article proposes a multifunction of a double stage grid connected photovoltaic (PV) system, with insertion the active power filter (APF) functionalities. This system is used to compensate the harmonics currents, compensate reactive power, supply the nonlinear loads and inject the PV system's active power into grid. This study is based on grid side, a perturb and observe algorithm is used to extract the maximum power point tracking (MPPT) from the PV array regardless of solar irradiance. On the grid side, a modified instantaneous active and reactive power theory (P-Q) based on a multi-variable filter (MVF) is applied to correctly identify the harmonics currents reference under distorted source voltage condition, also a modified predictive current control (PCC) algorithm is used to generate the switching signals for the source voltage inverter in order to ensure compensate reactive power and harmonic currents, feed the non linear load and inject the surplus of active power into the grid. In Matlab/Simulink™ software environment, the performance of the proposed control scheme is investigated under load change and irradiance change conditions. Simulations results demonstrate that the proposed PCC of the APF ensure a manage of active power exchanges with the grid with power factor correction. Furthermore, the grid current recovers its sinusoidal waveform with a total harmonic distortion (THD) meet to IEEE-519 standard.

Keywords : Photovoltaic system (PV), activ power filter (APF), Predictive current control (PCC), active and reactive power theory (P-Q), multivariable filter (MVF), total harmonic distortion (THD)