PredictiveControl of a Grid Connected PVSystemsIncorporating Active Power FilterFunctionalities

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Abstract : This paper presents a multifunction operation of adouble stage grid connected photovoltaic system, with insertionthe active power filter (APF) functionalities. This system is usedto compensate the reactive power, suppression harmonicscurrents supply the nonlinear loads and inject the active powerinto grid. Our work is focused on the grid side, a perturbationand observation control is used to reach the maximum powerpoint tracking (MPPT) regardless of solar radiation. On the gridside, a modified instantaneous active and reactive poweralgorithm (P-Q) based on a multi-variable filter (MVF) is usedin order to identify the harmonics currents reference underdistorted source voltage condition, also a modified predictivecurrent control (PCC) algorithm is used to control the sourcevoltage inverter in order to ensure compensate reactive powerand harmonic currents, feed the non linear load and inject thesurplus generated power into the grid. In Matlab/Simulinksoftware, the proposed control scheme is investigated under loadchange and radiation change conditions. Simulation resultsshows that the proposed PCC of the APF guarantees a flexiblesettlement of real power amounts exchanges with the grid with ahigh power factor operation. Furthermore, the grid currentrecovers 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)