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Control of Three-level Four Wire Shunt Active Power Filter in Grid-Connected PV-Fuel Cell System Employing Model Predictive Current Control Strategy

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Abstract – In this paper a Model Predictive Current Control (MPCC) of Four Wire Shunt Active Power Filter (4WSAPF) with Photo Voltaic (PV) system is proposed. The shunt active power filter requires an energy source to correct distortions in the current, and it utilizes a photovoltaic array with a DC-DC boost converter as a source of DC power. this study presents the application of a Particle Swarm Optimization (PSO) maximum power point tracking (MPPT) technique to the DC-DC boost converter, aiming to obtain the highest possible power from the photovoltaic array. The reference signal for the SAPF is obtained from the pqr theory. To fulfil the requirement of the active power filtering function under balanced, unbalanced, and distorted (including 3rd and 5th harmonics) power supply voltages, the inverter switching state control has been achieved based on MPCC. The effectiveness of the proposed configuration is verified through results obtained from simulation studies conducted in the MATLAB/Simulink environment.

Keywords – Photovoltaic System, Model Predictive Current Control (MPCC), Shunt Active Power Filter, MPPT, PSO Optimization.