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Phase Angle Based Control Strategy for Single-Stage Grid-Connected PV System

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Abstract

This paper proposes a new phase angle based control strategy for a single-stage grid-connected PV system. The maximum power from the PV array was extracted adjusting phase angle of the inverter switching patterns only keeping modulation index constant. Conventional H-bridge voltage source inverter (VSI) in series with a line frequency transformer was used as power conditioning unit (PCU). The single stage power interface eliminated the need for the feedback control loops essential in a two-stage converter system to keep the dc link voltage constant for maintaining the power balance and thus the overall system operation was made more stable. Because of the nature of the control process some reactive power was also injected into the grid simultaneously depending on the PV array output and grid voltage condition. The proposed scheme features stable operation and better utilization of the PV array, reduced harmonics and lesser computations. Apart from modeling and analysis, detail simulation results are presented that demonstrates the effectiveness of the proposed technique.

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