Design and Simulation of DC/DC Boost Converter with Maximum Power Point Tracking for Grid Connected PV Inverter Considering the Nonlinearity of the PV Generator

Moien A. Omar[1], Marwan M. Mahmoud[2]*

[1] An-Najah National University, Electrical Eng. Department, Palestine, State of
[2] An-Najah National University, Electrical Eng. Department, Palestine, State of
[*] *Corresponding author*

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Abstract

The design of the DC/DC boost converter used for maximum power point tracking in grid connected PV systems is complex due to the non-linearity of the PV source. This paper presents a unique design approach of the boost converter for grid-connected photovoltaic inverters. The design considerations and requirements to derive the converter equations, appropriate for determining the main variables and elements of its circuit have been respected. Moreover, the functional requirements of the inverter and the continuous current mode have been fully respected. The discussed design parameters are the DC inverter input voltage, maximum/minimum duty cycle, the ripple values in the boost input/output voltage and the inductor current ripple. This approach requires the val of the inverter threshold power and the maximum allowed ripple values of inductor current, input voltage and output voltage. The simulation results show that the presented design approach enables selecting the appropriate converter elements that facilitate its function. Moreover, the impacts of important parameters as solar radiation intensity and PV cell temperature are considered. The simulation of the converter has been carried out by Matlab-Simulink software in order to verify the effectiveness of the proposed design approach.
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Keywords

DC/DC Boost Converter Design; Modeling and Simulation; PV-Grid Connected Systems

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