A Novel Approach of a Single Input Multi Output Switched Boost Inverter

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Abstract

A DC nano-grid is typically designed as a reliable system that can supply power from the distributed renewable energy sources to the local loads. Traditional nano-grid employs two-stage ac-dc power converter/inverter sets to feed both ac and dc loads respectively. But, modified nano-grid utilizes only one single-stage converter. This system is based on a power-electronic single-input multi-output converter which interfaces the source with the average load demands. This paper deals with a switched boost inverter (SBI) applicable for solar photovoltaic system (PV) as its renewable energy source. SBI is a single-stage power converter that can supply both dc and ac loads simultaneously from a single dc input voltage source. The SBI can also produce an ac output voltage either greater or lower than its dc input voltage. This converter exhibits better Electro Magnetic Interference (EMI) noise immunity as compared to the two stage-power converter. Also, this converter operation allows shoot-through of the inverter legs without damage to its IGBT-switches. So, this paper discusses the advantages, structure, steady-state analysis, and PWM control technique for the SBI especially, when produces a high-rating dc-output voltage from a very-low input-voltage of a PV-solar array to establish its verification. Matlab/Simulink-based simulation is performed for several cases of operations-with PV-mathematical model-to test the robustness of this converter against the supply fluctuations. Also, the harmonic spectrum analysis for the load current is also computed and plotted for a 5-Kw proposed nanogrid.

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