

Photovoltaic-Based Interconnected-Modified DC-Nanogrids within an Open Energy Distribution System

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Abstract

A DC nano-grid is typically intended as a reliable scheme capable of delivering power to the local loads from distributed renewable energy resources. The conventional nano-grid uses two-separate conversion stages for feeding both ac and dc loads. But, the modified design for the dc nano-grid uses only a single-stage converter. It is based on a single-input power-electronic multi-output converter that interfaces the source with the average load requirements. It deals with a switched boost inverter (SBI) that can fed from a solar photovoltaic (PV) renewable energy source. SBI is a single-stage power converter capable of simultaneously supplying both dc and a higher or lower ac loads from a single dc input voltage source. The converter operation is also contributed by a simple model reference adaptive closed loop control technique, to fed the high output ratings steadily, especially in the critical range for its duty ratio. In addition, this paper presents a full model design for multiple interconnected nanogrids through a dc-link within a multilevel direct current (dc) scheme called an open energy distributed system (OEDS). Each nanogrid involves a switched boost inverter (SBI) providing its closed-loop control method for its dc-link voltage. Moreover, this paper involves a controller method to attain the optimum power flow with high reliability for the suggested interconnected nanogrids. The proposed systems are modelled and simulated with the help of MATLAB/Simulink software package to assess the robustness of the proposed OEDS with multiple 5-Kw interconnected nanogrids fed from photovoltaic (PV) renewable energy resources.

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