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

Naser Mohammed Bayoumy AbdelRahim ,E. A. Ebrahim, N. A. Maged, F. Bendary

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.

6th International Conference on Advanced Control Circuits and Systems (ACCS) & 2019 5th International Conference on New Paradigms in Electronics & information Technology (PEIT), Hurgada, Egypt, 2019, November