Abstract

Mahmoud O El Wadee

A Unified Control Strategy of Distributed Generation for Grid-Connected and Islanded Operation Conditions Using an Artificial Neural Network

This article presents a control strategy that enables both islanded and grid-tied operations of a three-phase inverter in distributed generation. This distributed generation (DG) is based on a dramatically evolved direct current (DC) source. A unified control strategy is introduced to operate the interface in either the isolated grid-connected modes. The proposed control system is based on the instantaneous tracking of the active power flow in order to achieve current control in the grid-connected mode and retain the stability of the frequency using phase-locked loop (PLL) circuits at the point of common coupling (PCC), in addition to managing the reactive power supplied to the grid. On the other side, the proposed control system is also based on the instantaneous tracking of the voltage to achieve the voltage control in the standalone mode and retain the stability of the frequency by using another circuit including a special equation \( wt = 2?ft, f = 50 \text{ Hz} \). This utilization provides the ability to obtain voltage stability across the critical load. One benefit of the proposed control strategy is that the design of the controller remains unconverted for other operating conditions. The simulation results are added to evaluate the performance of the proposed control technology using a different method the first method used basic proportional integration (PI) controllers, and the second method used adaptive proportional integration (PI) controllers, i.e., an Artificial Neural Network (ANN).