

Incorporating Switched Modulated Power Filter Compensator to Enhance Microgrid Stability Under Fault Provoked Islanding Conditions

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Abstract

Microgrid (MG) gains higher potential and plays a key role in grid infrastructure upgrade. Although MG have many benefits, its performance during fault caused islanding conditions still needs more attentive investigations. In this context, the MG load types and the behavior of the distributed generations (DGs) control system have the significant impact on the stability of MG. This article analyzes the influence of various control techniques of the inverter DG unit on the dynamic performance MG after fault-provoked islanding conditions. To enhance the MG stability and the quality of voltage waveform, an adapted MG configuration equipped with a low-cost switched modulated power filter compensator (MPFC) is proposed. Using MPFC alongside the inverter DG unit gives adequate solution to overcome the shortcomings of the inverter and the flexibility of the interfacing control scheme. The MG structure equipped with MPFC is simulated using Matlab/Simulink software package. A wide perspective on the simulation results indicates that the MG stability is highly vulnerable to the inverter DG control techniques. Further, the MG may lose its stable operation due to some load type characteristics. The proposed MG structure with the MPFC can withstand longer fault durations and give better stability performance especially with induction motor (IM) loads. Moreover, the MG equipped with the MPFC has the ability to keep the voltage total harmonic distortion (THD) within the acceptable limits.

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