Abstract

Microgrid(s) integration into distribution networks and the growing use of Distributed Generation Systems necessitate the switch from traditional fossil fuel-based power generation methods to renewable resource-based ones. To achieve optimal power delivery, an adaptive method for solving power quality delivery problems posed by this transition is required. Unexpected islanding is an important power security concern that can lead to equipment damage, electrical risks, and decrease in power quality delivery. To address this problem, ANFIS-Based power management and islanding detection utilizing permeation rate(γ) and relaxation parameter(ζ) is proposed in this paper based on a rate of change of output voltage(ROCOV) of power sources at the point of common coupling in a 34-bus distribution network. Modeling of the distribution network, distributed generators, ANFIS training, and simulations was done using MATLAB/Simulink software. Results show that a **0.3** and 1.01 value indicates permeation rate of Microgrid(s) in a grid-tied mode whereas a 0 value indicates relaxation parameter of Microgrid(s) disconnected from the main distribution network. Islanding detection time of 0.02 sec was recorded when all Microgrids were disconnected during disturbances, and a 0.04 sec islanding detection time for disconnecting individual power sources at a time was recorded respectively. In general, islanding causes a system nominal voltage(400 V) deviation of 7 %. However, this was quickly restored without causing network voltage fluctuations due to the adaptive nature of ANFIS. Comprehensive simulations were used to validate the suggested method. The outcomes demonstrated that the proposed approach effectively distinguishes between islanding and non-islanding events and can quickly and accurately identify islanding as compared to other related works.