Electric Power Components and Systems, 40:1149–1159, 2012

ISSN: 1532-5008 print/1532-5016 online
DOI: 10.1080/15325008.2012.682249

A Novel Hybrid Islanding Detection Technique Using Rate of Voltage Change and Capacitor Tap Switching

M. GARMRUDI,[1] H. NAFISI,[1] A. FEREIDOUNI,[1] and H. HASHEMI[1]

[1]Department of Electrical and Electronics Engineering, Islamic Azad University, Karaj Branch, Karaj, Iran

Abstract *Distributed generators are acquiring more attention in power systems because they can avoid distribution and transmission upgrade requirements and improve power quality issues. Islanding is one of the problems that arise with integrating these resources into the distribution system. In this article, a novel hybrid islanding detection technique is proposed which uses average rate of voltage change and capacitor bank tap switching. The proposed method is tested on a real system and different load characteristics with different dependence coefficients to voltage and frequency are studied. The power system is perturbed only when the method suspects that islanding has occurred. The proposed method could detect islanding conditions with very small power mismatches in them.*

Keywords distributed generation, islanding detection, load characteristic

1. Introduction

Islanding detection capability is an essential requirement for distributed generators (DGs) in distribution systems. The islanding situation of a DG refers to a condition in which the DG is isolated from the main utilities voltage source but independently continues to energize the local loads around it [1]. This condition is not desirable from the both customer and DG owner point of view because it may create safety hazards to utility personnel and create unaccepted frequency and voltages in the isolated section. The voltage and frequency provided to the customers in the islanded system can vary significantly if the distributed resources do not provide regulation of voltage and frequency [2]. Thus, IEEE standards requires disconnection of the DG within a maximum of two seconds after islanding [3, 4].

Many different methods have been proposed for islanding detection. These methods are divided into three different categories: active methods, passive methods, and the recently proposed hybrid methods. In active methods, perturbations are continuously imposed to the system by a DG, and a number of local parameters are measured. In an islanding condition, the injected perturbations lead to serious changes in locally

Received 8 September 2011; accepted 31 March 2012.
Address correspondence to Mr. Hamed Nafisi, Department of Electrical and Electronics Engineering, Islamic Azad University, Karaj Branch, on the corner of Eteghal and Shahid Moazen Blvd, end of Rajaee Shahr, Karaj, Iran, 313-31485. E-mail: nafisi@aut.ac.ir or hamednafisi@gmail.com