

Review of Local and Remote Techniques for Islanding Detection in Distributed Generators

D. Velasco¹, C. L. Trujillo^{1,2}, E. Figueres¹, G. Garcerá¹, O. Carranza³

¹ Department of Electronic Engineering, Universidad Politécnica de Valencia
Camino de Vera S/N, 7F, Valencia, 46022, Spain
Phone number: +0034 963876001, e-mail: davede@posgrado.upv.es, efiguere@eln.upv.es,
ggarcera@eln.upv.es

² Department of Electronic Engineering, Universidad Distrital Francisco José de Caldas
Carrera 7 N° 40-53 Piso 5, Bogotá, Colombia
Phone number: +005713239300/2506, e-mail: cltrujillo@udistrital.edu.co

³ Escuela Superior de Cómputo, Instituto Politécnica Nacional
Av. Juan de Dios Bátiz S/N, 07738, D. F. (Mexico)
Phone number: +52 5557296000 ext 52022, e-mail: ocarranzac@ipn.mx

The condition of “Islanding” in Distributed Generators (DGs) is an electrical phenomenon that occurs when the energy supplied by the power grid is interrupted due to various factors and the DGs continue energizing some or the entire load. Thus, the power grid stops controlling this isolated part of the distribution system, which contains both loads and generation. Therefore, islanding operation of grid connected inverters may compromise security, restoration of service and the reliability of the equipment.

In the case of several Distributed Generation Systems connected to a low-voltage power grid, it is possible that the amount of energy generated by the distributed system agrees with the amount of energy consumed by the loads on the grid. Under this situation, there is no energy flow towards the grid and the distributed systems may fail to detect a possible power grid disconnection, so that the DGs may continue feeding the loads leading to an “Islanding” condition. In addition, when the islanding condition happens, there is a primary security condition which forces the generator system to disconnect from the de-energized grid without taking into account the connected loads.

The “islanding” effect in inverters may result from a failure detected by the grid and the consequent switch opening, accidental opening of the electrical supply because of equipment failure, sudden changes in the electric distribution systems and loads, intentional disconnection for maintenance services either on the network or in the service, human error, vandalism or acts of nature.

There are many reasons why islanding should be anticipated in the distributed generation systems connected to the grid. The main reasons are safety, liability and maintenance of the quality of the supplied energy.

In this paper a revision about different techniques for islanding detection in distributed generators is presented. On one hand, remote techniques, not integrated in the distributed generators, are discussed. On the other hand, local techniques, integrated in the distributed generator, are described. Furthermore, it is discussed how the local techniques are divided into passive techniques, based on exclusively monitoring some electrical parameters, and active techniques, which intentionally introduce disturbances at the output of the inverter, in order to determine if some parameters are affected.