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# A New Scheme for Islanding Event Identification by Strategic Installation of Different DG Units

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*Abstract*: With the increasing load demand and emergence of various types of Distributed Generators (DG) the complexities and challenges for reliable operation of Distribution Network (DN) power system have increased. The major operational challenge in the DN is non-detection of Islanding event, which may cause the system to collapse. In this paper, two Modified Islanding Detection Techniques (MIDT-I \& MIDT-II) are proposed for accurate and early islanding detection in the presence of different types of DGs. These approaches utilizes robust parameters for accurate identification of the islanded bus. The proposed MIDT schemes combines the advantages offered by different existing passive Islanding Detection Techniques (IDTs) for early identification of the islanding event. In the proposed schemes the DGs are installed in the existing DN by Genetic Algorithm (GA) based Multi-Level Optimization (MLO) approach. The installation of DGs is performed to improve the voltage stability margin of the system and for power loss reduction. In the second stage during operation of the network two methods are proposed to detect unintentional islanding. The proposed scheme is demonstrated on IEEE 33 and IEEE 69 standard radial bus system for the effectiveness of the scheme.

*Keywords*: Distributed Generation, Islanding detection, Voltage-Active Power Sensitivity, Frequency-Reactive Power Sensitivity, Active Power loss, Voltage Stability Margin, Genetic Algorithm, Penetration Level.

## 1. Introduction

Electric power source connected directly to the DN is known as DG. The different definitions and technologies of DGs are explained in [1]-[2]. With more emphasis on green energy technology due to environmental concerns, the importance of the DG units in the network has increased. DG plays an important role in enhancing the security, reliability and efficiency of the modern power systems [3]. The different types of DGs are: (i) type-1: supplying only active power, (i) type-2: supplying only reactive power, (i) type-3: supplying both active and reactive power and (i) type-4: supplying active power while consuming reactive power [4]. An exhaustive analysis of different methods and models for optimal installation of DG units is given in [5]. Various techniques have been proposed for optimal placement of the DG units in the DNs using different AI techniques [6]-[9]. The advantages of various DGs for improvement of voltage profile, minimization of power, increased power transfer capability, overcoming uncertainties of load and fuel prices, planning of dispatchable and non-dispatchable DG units, better network security and reliability etc. are discussed in [10]-[13].

The electrical isolation of distribution system from the power system due to abnormal conditions while being connected to the DG is known as Islanding [14]. The islanding detection is critical during the operation of the system. A comprehensive survey of islanding protection with renewable DG is reported in [15]. The islanding detection techniques are broadly classified

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