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Solving The Active Distribution Network Reconfiguration (ADNR) Problem Taking Into Consideration A Stochastic Wind Scenario and Load Uncertainty By Using HBFDE Method

Mr.Peter Musau Moses[1], Dr. Nicodemus Abungu Odero[2]

[1] Post Graduate Student, [2] Senior Lecturer, Department of Electrical and Information Engineering, The University of Nairobi-Kenya, P.O Box 30197-00100 GPO

***Abstract*--Past literature has attempted to solve the problem of network reconfiguration with Distributed Generators (DGs) without taking into consideration the intermittent renewable at a close` proximity. Distribution Network Reconfiguration (ADNR) must account uncertain behavior of loads and wind when the commercial wind based DG, Doubly Fed Induction Generators (DFIG) supports a significant part of network. In this paper, a new Hybrid Bacterial Foraging and Differential Evolution (HBFDE) algorithm is considered for the ADNR problem with minimum loss and an improved voltage profile. In the HBFDE algorithm the Differential Evolution (DE) algorithm is combined with the Bacterial Foraging (BF) algorithm to overcome slow and premature convergence of BF. Indeed, the proposed algorithm is based on the evolutionary natures of BF and DE, to take their advantage of the compensatory property, and avoid their corresponding drawbacks. In addition, to cope with the uncertainty behavior of loads and wind, a stochastic model is presented to solve the ADNR problem when the uncertainty related to wind and load forecast is modeled in a stochastic framework on scenario approach basis. The proposed algorithm is tested on the IEEE 33-Bus Radial Distribution Test Systems. The results of the simulation show the effectiveness of proposed algorithm real time and real world optimization problems facing the smart grid.**

***Keywords*-- Active Distribution Network Reconfiguration (ADNR), Bacterial Foraging (BF), Differential Evolution (DE), Doubly Fed Induction Generators (DFIG), Hybrid Bacterial Foraging and Differential Evolution (HBFDE).**

I. INTRODUCTION

The configuration of electric distribution networks is mostly as radial for proper protection coordination. Due to some objectives such as: supply all of the loads, reduce power loss, increase system security and enhance power quality; the configuration of these networks may be changed with automatic or manual switching operations. Distribution network reconfiguration also relieves the overloading of network components.

This change is performed by opening sectionalizing (normally closed) and closing tie (normally open) switches of the network. These switching operations are performed in such a way that all of the loads are energized and the radiality of the network is preserved. From the impact of DG on power distribution networks, the distribution system reconfiguration is found to have more line losses and reduction of terminal voltage as compared to transmission network. For optimizing power loss, the new reconfiguration can be used as the feeder reconfiguration as a systematic method to operate the distribution system at minimum cost and with improved system reliability and security. By opening or closing the feeder switches, load currents can be transferred from feeder to feeder thus helping to study the effect of DG on the distribution networks with reference to network reconfiguration problems.

The algorithms dealing with feeder reconfigurations like heuristic based and modern optimization methods have been proposed to solve the problem. The GA based method and Ant Colony Optimization (ACO) were proposed for optimal reconfiguration in presence of DG for distribution system power loss reduction respectively. The other conventional methods like Honey Bee Colony Optimization (HBCO) and Dig Silent software were also suggested. The feeder reconfiguration and DG placement process not only reduce the power loss but also improve the voltage profile. DGs are not only employed to provide real and /or reactive power compensation in distribution systems but also to reduce the power losses and to maintain the voltage profile within acceptable limits. This paper will focus on the wind specialized DFIG.

The numerous advantages of the DFIG in terms of their low or zero emission and their much smaller size than conventional central power plants have created more incentives than before to use these kinds of generators with free energy source.