

Optimal sitting and sizing of DG for loss reduction and improve voltage profile based on Genetic Algorithm

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Abstract

Distributed Generation (DG) is a promising solution to many power system problems such as voltage regulation, power loss and etc. This paper presents a method for the optimal sitting and sizing of Distributed Generation in distribution systems. In this paper, our aim would be optimal Distributed Generation sitting and sizing for voltage profile improvement and loss reduction in distribution network. Genetic Algorithm (GA) was used as the solving tool, which referring two determined aim. The problem is defined and objective function is introduced. We used MATPOWER package for load flow algorithm and composed it with our Genetic Algorithm. The suggested method is programmed under MATLAB software.

Key words: Distributed Generation (DG), Genetic Algorithm (GA), Voltage profile, Optimal sitting

1. Introduction

Distributed power generation is a small-scale power generation technology that provides electric power at a site closer to customers than the central generating stations. Distributed generation (DG) provides a multitude of services to utilities and consumers, including standby generation, peaks chopping capability, base load generation. Investments in DG enhance on site efficiency and provide environmental benefits, particularly in combined heat and power applications. Before installing distributed generation, its effects on voltage profile, line losses, short circuit current, amounts of injected harmonic and reliability must be evaluated separately. Since the installation of DG units at non-optimal places can result in an increase in system losses, implying in an increase in costs and, therefore, having an effect opposite to the desired. For that reason, the use of an optimization method capable of indicating the best solution for a given distribution network can be very useful for the system planning engineer.

The selection of the best places for installation and the preferable size of the DG units in large distribution systems is a complex combinatorial optimization problem. The optimal placement and sizing of generation units on the distribution network has been continuously studied in order to achieve different aims. The objective can be the minimization of the active losses of the feeder [1,2], or the minimization of the total network supply costs, which includes generators operation and losses compensation [3-6], or even the best utilization of the available generation capacity [7]. In this paper is presented an algorithm for the allocation of generators in distribution networks, in order to voltage profile improvement and loss reduction in distribution network. The Genetic Algorithm is used as the optimization technique. In Section 2 it is presented a brief discussion about distributed generation issues and Section 3 is an