Power flow study of a power system with distributed generators

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Abstract

Distributed Generators (DGs) play an important role to balance load requirements, power loss and voltage drop in power systems. Researchers normally perform load flow analysis to conclude the system under study to place DG. The inappropriate placement of DG would put the system operations at risk. This paper intends to create an interest among Engineering students about load flow studies to incorporate DG. Also it highlights about the characteristics of DG, challenges faced to size and sit DGs in distribution networks.

Key words—Distributed Generators(DG), loss minimization, Newton-Raphson method, load flow study, optimal placement.

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1.Introduction

The increased energy demand leads a search of alternative solutions through pollution free natural energy sources that are not depleted. Luckily based on the geographical locations, earth part can catch wind, solar, geothermal and tidal powers that can be converted as electrical power for useful purposes. The conversions of energy in a pollution free environment shift the generation plants nearer to the consumers. Thus by availing on spot renewable sources, DGs may serve a certain percentage of its nearby demand. The main reason of DG placement nearer to load centre is to minimize transmission losses. In power systems, power loss minimization is important for economic operation to reduce energy cost [1].The common loss reduction techniques in distribution systems are network reconfiguration, optimal placing of DG and sizing, reactive power compensation, usage of high-efficient transformer and automatic voltage booster. There are different terminologies used for DGs in different countries, such as isolated generation, embedded generation, decentralized generation [2].The range of generated power is 3 kW to 10 MW from renewable sources like solar, wind, fuel cells,bio-mass, bagasse etc., which are environment friendly and connected closer to the customers [3-5].It has benefits like increased efficiency, improved reliability, reduction of peak power requirements, reducing SO_2, CO_2 gas emissions. The optimal allocation of DGs in the radial distribution systems will resolve environmental and economic challenges [6]. Also, DGs are used as a

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