

**2020 12th International Conference on
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Optimal Placement and Sizing of Distributed Generation Using Multi-Verse Optimization

Kingshuk Roy

Department of Electrical Engineering
Madhav Institute of Technology and
Science

Gwalior, India

kingshukroy52@gmail.com

Laxmi Srivastava

Department of Electrical Engineering
Madhav Institute of Technology and
Science

Gwalior, India

srivastaval@hotmail.com

Shishir Dixit

Department of Electrical Engineering
Madhav Institute of Technology and
Science

Gwalior, India

shishir.dixit1@gmail.com

Abstract—In this present situation, power loss minimization in distribution network is one of the challenging area of research. In distribution system losses are more compared to transmission system. High power loss occurs when the connected loads in the distribution network are moved away from distribution substation. Adequate allocation and sizing of distributed generation (DGs) and capacitors are the modern way to minimize the distribution power loss. Improper placement leads to increase in power loss and may affect system performance adversely. Computation intelligence based methods has been used to allocate the DGs in proper location. In this present work a recently developed nature inspired algorithm known as Multi Verse Optimization (MVO) has been implemented for DGs placement problem. The implementation of MVO has been tested on 33 bus radial distribution system. The obtained results have also been compared with the reported results in literature to establish effectiveness of the algorithm.

Keywords—Multi Verse Optimization, Distributed Generation, DTR, WP etc.

I. INTRODUCTION

The main goal of power system is to deliver the power at each location of the power system network economically and reliably. Previously for generating electrical energy only conventional energy resources were used. These conventional resources are coal, hydro, nuclear. These generators deliver power widely distributed to different types of users are connected through long transmission and distribution networks. In nowadays, the central power plant is becoming weakening. The weakening of the central power plant is due to environmental issues and also due to reduction in conventional resources. As a result transmission and distribution costs are also gradually increasing. Then the distributed generation comes into the existence and it accomplishes a solution the most of these upcoming challenges. DG in simple terms can be defined as small range generation or decentralized generation that is neither centrally planned nor centrally dispatched. DGs are used near to the load side and they use energy sources such as solar PV system, wind generation system, fuel cells, gas micro turbines etc. and its capacity is also less than 100 MW. The reactive power is supplies to the load by the capacitors. By connecting capacitors to the system improvement in the system voltage profile is observed. The capacitor is also comes under 2nd type of DGs. When DGs and Capacitors are connected to the system, encouraging effect on the system power losses, system voltage profile is evident. For achieving the encouraging effect on the system after connecting DGs, the optimal size and location of DGs are to be selected in distribution networks. A number of researchers have done the work on this relevant topic for many years for

optimal allocation and sizing of DG and capacitors. Several types of research have been done in the past years on optimal allocation problem of DGs and capacitor. For optimally locate the proper size of DGs different methods have been used by the researchers for decades. Some of these are analytical methods, meta-heuristic methods, population based method, computational optimization methods and AI based algorithms etc. In ref. [1] uniformly increasing and distributed type load has been considered. DGs allocation for this type of load has done using combination of sensitivity and analytical method. The authors of this paper had worked on real time system that is Eastern Washington region a small part of large WCSS system. In ref. [2] voltage improving sensitivity and loss minimization sensitivity method are used to calculate best location for DG implementation. In ref. [3] author has done the amalgamation of GA and PSO algorithm for finding optimal location and size of dispersed generation in distribution network. In ref. [4] for determining the optimal location of DG and Capacitor voltage stability index approach has been used by considering both active and reactive power loss minimization as objective function. Voltage Stability Index has been implemented for finding adequate location and size of dispersed generation units [6]. A brief description about DG is also presented in [7]. Modified GA has been implemented for finding adequate location and size of dispersed generation units [9]. In ref. [11] for placing the dispersed generation units at optimal location with optimal size a multi-objective decomposition based evolutionary algorithm (MOEA/D) in distribution network has been applied while considering objectives for the problem as abbreviation system real and reactive power losses. The authors here used multi-objective objective function to optimize total cost per year by reducing real power loss. The Salp Swarm Optimization, Modified GA have been implemented for finding favorable location and size of dispersed generation units [12-13].

II. PROBLEM FORMULATION

Placement of DGs at favorable location with optimal size is done by minimizing the objective function while satisfying the operational constraints.

A. Objective function

Objective of the problem is minimizing the real power loss. The exact real power loss formula is taken from ref [6]. For N bus system the loss formula can be is given as