CUCKOO SEARCH ALGORITHM BASED MULTIPLE DG PLACEMENT AND VOLTAGE PROFILE IMPROVEMENT IN A RADIAL DISTRIBUTION SYSTEM

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Abstract: Distributed generation (DG), is being increasingly adapted in distribution network. . The advantages of placing DG in the distribution network are ***loss reduction, backup power supply, and real, reactive power management increase reliability of the network. In this paper Cuckoo Search Algorithm (CSA) has been adapted for optimal sizing and placement of DG for loss minimization Comparisons are made between the single, multiple DGs and DG combination with capacitor. . Results are validated on IEEE-33 bus test system and 29 bus real time system.***

Keywords: DG placement, capacitor placement, loss minimization, Cuckoo search algorithm, optimization.

I. INTRODUCTION

The distribution system is the crucial and critical link in the power system network; it connects utilities to its consumers. It is critical as the power quality, reliability, losses, voltage profile etc effect the consumer who pays for the power supplied. One of the major issues in the distribution system is distribution losses and peak load management. One of the most appropriate solutions to these issues is adoption of DG. DGs are classified as the generators that are directly connected to distribution system. DGs are most likely to be nonconventional resources, whose cost benefits shall be considered. DGs could be placed to supply both real and reactive power to the network.

Numerous works are already published in literature for optimal placement and sizing of DG using various optimization techniques. The review work will focus on different optimization techniques/algorithms for sizing, evaluation of sensitivity/performance index for optimal placement, cost benefits, and reliability constraints of DG. Numerical approaches for optimal location and sizing are considered in [1-3]. Test systems are evaluated and it shall be noted that these approaches are easy to implement with high computational efficiency, fast response, robust and effective to achieve the objective but, limited application to linear systems, fail to achieve global optima, and not efficient for large number of load flow computation. [4-6] Analytical approach is considered for optimization, kalman filter algorithm, and exhaustive load flow solutions, and improved analytical method. The benefits include power and voltage support, less computation time, iterations not required. But losses are not evaluated, and complexity in voltage and load flow calculations.

Recently optimizations are carried out using Meta-heuristic algorithms which are robust, susceptible to global optima, and efficient to solve multi objective functions. Genetic Algorithm (GA) is the oldest algorithm, which is used for optimal placement and sizing of DGs, though they are efficient it is found from [7, 8] that are not accurate when required for high quality solution, premature and excess convergence time. [9-11] considered three different algorithms namely Ant Colony Search (ACS), Artificial Bee Colony (ABC) and Harmony Search Algorithm (HSA) are used for multiple DG placements and for constant and variable power load models. It is observed that there is lack of accuracy, results were not guaranteed, some computations are do not satisfy the conditions in terms of speed.

The above literature discuss the optimization techniques for DG and it shall be noted that in all the literature, the common objective is to minimise the loss of the given network and also to adopt a optimization technique, which is compatible with the complexity of the system, which shall be applicable for test system as well as, real time system.

In this paper, Cuckoo Search Algorithm (CSA) [12, 13] has been proposed for optimal sizing and placement of DG. Cuckoo Search is a new nature inspired algorithm CSA inspired by species of bird named Cuckoo. The simplicity about the algorithm is that it has lesser number of parameters. The convergence rate of algorithms is better. It has similarities with the other algorithms, it is a population bas

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