OPTIMAL LOCATION AND SIZING OF DISTRIBUTED GENERATION FOR ECONOMIC OPERATION IN POWER SYSTEM USING EVOLUTIONARY PROGRAMMING OPTIMIZATION TECHNIQUE

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ABSTRACT

This project report presents a new technique to find the optimum location and size of distributed generation (DG) in a power system using an Evolutionary Programming optimization technique. This study will utilize concept of Evolutionary Programming (EP) by using MATLAB software. The study indicates several fitness function include total loss minimization, total cost minimization and maximisation of voltage level in power system. Comparison was made in order to determine the best fitness function to be used for solving this technique. The proposed technique is tested on IEEE 26 bus reliability test system.

Keywords:

Distributed Generation (DG), Evolutionary Programming (EP), total loss minimization, total cost minimization, voltage control.

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CHAPTER 1

INTRODUCTION

1.1 Background

In recent years, the interest of researchers and utilities in distributed generation has grown due to the improvements of some well established technologies. The low rated power of such generation plants allows their installation potentially at any bus in MV and LV distribution networks. Therefore, the choice of the optimal location and sizing of distribution is a challenge for planning engineers. For company with de-regulation and its creation of competition in the production and sale of electric power, distributed generation will help create technological, as well as commercial, competition at the retail level. As mentioned before, this technology becomes more and more important in the future electricity distribution system. The tendency is increased by the commercial availability of small-scale production units (e.g. fuel cells, micro-CHPs, photovoltaic panels) and the liberalization of the energy market, putting more pressure on the system [1]. Also the support for sustainable development using renewable energy sources plays a key role.

In this project report, the search for the optimal placement and power level of the different types of generation units (in such a way that the power losses are minimized, the generated cost are minimized and the voltage are controlled) is a non-convex optimization problem that requires exhaustive search.

Most optimization algorithms are designed for solving problems represented by continuous functions and use methods such as gradient descent which are sensitive to the topology of the surface on which the solution lie.

There are several optimization techniques that have been applied in different ways like exhaustive searches [2], Lagrangian based approaches [3], Hereford Ranch Algorithm (HRA) [4], tabu searches [5], or Analytical approach [6].