EVOLUTIONARY PROGRAMMING (EP) FOR OPTIMAL STATIC VAR COMPENSATOR SIZING IN DISTRIBUTION SYSTEM

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ABSTRACT

This report presents a Evolutionary Programming for optimization and automatic control of reactive power in distribution feeders and substations. An optimal Static Var Compensator placement, sizing, and controlling problem is formulated objecting to minimize power loss in a distribution system. These optimal solutions provide decisions support to reactive power compensation planning in large scale energy companies. The study involved the Evolutionary Programming (EP) Based Technique for Static Var Compensator Placement in Distribution System for loss minimization. Tests were performed on the 12-bus radial distribution system.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Electrical power losses in distribution systems correspond to about 30% of total losses in electric power systems [1]. These electrical losses can be considerably reduced through the installation and control of reactive compensation equipments, such as capacitor banks, reducing reactive currents in distribution feeders. Furthermore, voltage profiles, power-factor and feeder capability of distribution substations are also significantly improved.

Computational technique for capacitor placement in distribution systems, have been extensively researched since the 60's, with several available technical publications in this research area [2]. Published literature describes several approaches and techniques to the problem, standing out the analytic methods, heuristic methods, numerical programming, fuzzy logic, ant colony optimization, Tabu search [3], neural networks, genetic algorithms [1] and hybrid methods [4].

Compelled to identify the locations, number, size, type and control scheme for each capacitor to be installed in a distribution. systems, the problem is usually formulated in terms of a combinatorial optimization problem, where conflicting objectives are considered as purchase and installation cost minimization of Static Var Compensator and electrical losses reduction.

Despite quality and quantity of works on issue, established a final outcome and, due lack of human and financial resources, electric utilities usually implement gradually intermediate non-optimal solutions to the problem. In addition, it's a common practice, especially in companies with large concession areas and long feeders, to apply these algorithms in planning scenarios studies, regarding different financial constrains represents by number (or size) limits to capacitors banks at busses, feeders and/or distributions substations.