REACTIVE POWER RESERVE MARGIN MANAGEMENT FOR VOLTAGE IMPROVEMENT USING EVOLUTIONARY PROGRAMMING OPTIMIZATION TECHNIQUE

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ABSTRACT

Reactive power reserve margin management in power system is important in order to obtain their maximum voltage improvement. This project presents Evolutionary Programming (EP) optimization technique as the application shows that after the optimal reactive power rescheduling, the reactive power of the system will be increased and at the same time voltage will be improved. Several fitness functions such as total power loss minimization and voltage profile improvement has been explored through the implemented Evolutionary Programming optimization technique. The proposed technique was tested with IEEE 30-Bus Test System and the programmed were developed using MATLAB software.

Keywords: Evolutionary Programming, voltage improvement, IEEE 30-Bus Test System, reactive power reserve, MATLAB software.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

In the restructured market background, utilities are required to have independent generation, transmission and distribution business units. The cost recovery of transmission assets is uncertain, and there are no clear incentives for improving the transmission system. As a result, investments in transmission have not kept pace with load growth and investments in generation [1], [2]. Thus, the network is being frequently used under stress and close to its maximum limits. Under these conditions, the decoupling of active and reactive power does not hold, and reactive power needs to be explicitly accounted for in system operations and planning.

In power systems planning and operations there are many sources of uncertainties. These are related to the load such allocation, quantity, direction of increase/decrease from the forecasted value, the generation in the available capacity and the transmission system (state of devices, thermal constraints, network topology). Thus, reactive power reserves have to be explicitly considered in system planning and operations.

Reactive power reserves can be viewed from the load's perspective and from the generation's perspective. From the load's perspective, the focus is on the extra amount of load (active and reactive) that can be supplied in a reliable manner. From generation's perspective, the focus is on the amount of reserve provided of each generator and its value. The quantification and valuation of reserve is important for system operations and planning, and electricity market.