SVC SIZING OPTIMIZATION USING ANT COLONY OPTIMIZATION (ACO) TECHNIQUE

Thesis is presented in partial fulfillment for the award of the

Bachelor of Electrical Engineering (Hons.)

UNIVERSITI TEKNOLOGI MARA

MOHD NUR IZUAN BIN HAMDAN

2007410142

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

40450 SHAH ALAM

SELANGOR, MALAYSIA

MAY 2010

ACKNOWLEDGMENT

All praises be to mighty Allah S.W.T., the Most Gracious, Most Merciful and Most Beneficent for giving me strength and blessing me throughout the entire research and completion of this project. Peace upon our Prophet Muhammad S.A.W. who has given light to mankind.

In this opportunity, I would like to express my heartfelt gratitude and thank to my supervisor, Mr. Nik Fasdi Bin Nik Ismail for his tremendous support, encouragement, patience and profusion of ideas throughout the implementation of the project. I wish to express my appreciation to my family and friends who through their patience and support, this project has been eventually completed successfully.

Lastly, I would like to thanks all the persons who have involved directly or indirectly towards this journey in terms of sharing perspective, views and guidance on the right direction until this project is completed.

ABSTRACT

Abstract — This project presents the application of Ant Colony Optimization (ACO) technique for the determination of optimal sizing of Static Var Compensator (SVC) installed on a transmission line for loss minimization and voltage profile stability in power system IEEE reliability test system was used for validation purposes. SVC is the one of the Flexible AC Transmission System (FACTS) devices. In recent practice, the use of FACTS devices has been proposed for enhancement of power grid protection and control in power system by improving the stability, reduction of losses and generation cost and improves the loadability of the system. However, prohibitive cost is major stumbling block for utility company to install more than a few FACTS devices on any power grid. Therefore, with this project, the optimal sizing of SVC for solving the loss and voltage stability problems will be determined.

Keywords- Static Var Compensator (SVC), Ant Colony Optimization (ACO), Flexible AC Transmission System (FACTS).

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

A power system at a given operating state and subject to a given disturbance undergoes voltage instability or voltage collapse if post-disturbance equilibrium voltages are below acceptable limits, voltage instability or voltage collapse may be partial or total. For safe and reliable operation of power systems, the voltage at the terminal of all equipment in the system should be within acceptable limits, and there is enough reactive power support to ensure transient stability when the power system subjected to large disturbances. The control of voltage levels is accomplished by controlling the production, absorption, and flow of reactive power at all levels in the system. Since reactive power cannot be transmitted over long distance, therefore, voltage has to effective controlled by using specific devices dispersed throughout the system [1].

Power systems components mainly consist of generators, transmission lines, transformers, switches, active or passive compensators and loads [2]. In power system, transmission losses become a major factor to be considered when it is needed to transmit electric energy over long distances or in the case of relatively low load density over a vast area [3]. Reinforcement of a power system can be accomplished by improving the voltage profile, increasing the transmission capacity and others.

A recent concern about power quality has forced engineers to incorporate system voltage profile, transmission loss minimization in addition to economic criterion when designing transmission line. Power loss in transmission line causes loss of