APPLICATION OF MULTISTAGE EVOLUTIONARY PROGRAMMING FOR REACTIVE POWER CONTROL IN POWER SYSTEM

This thesis is presented in partial fulfillment for the award of the
Bachelor of Electrical Engineering (Hons)
UNIVERSITI TEKNOLOGI MARA

NOOR AZMI BIN MOHD RADZI
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR

ACKNOWLEDGMENT

All praise to Allah S.W.T, The Most Gracious and Most Merciful who has given me the strength, ability and patience to complete this project and the thesis.

First I would like to express my sincere appreciation to my project supervisor Prof Madya Dr Titik Abd Rahman whose patience, inspiration, contribution of precious ideas, proposals, causal, support, encouragement and constant guidance has helped me to successfully complete the project and this thesis.

I would like also to thank my friends Nurhayati, Laili, Nazrul, Yamin, Wan, Aizat, Jaz, Niz, Liza and Master student En. Syazwan bin Ishak who has giving me a lot of guidance and help to completed this project. Throughout the development of the MEP stage, their advice and assistance in various ways have been extremely helpful.

Finally, I would like to express my gratitude to my parent En. Mohd Radzi Mohamad and my brother and my sisters who were a constant support me in completing this thesis, as well as in completing this course. They have been the ones who gave me strength working on this project until its completion. I am very grateful having them in my life.

ABSTRACT

This final year project discussed the application of multistage evolutionary programming for reactive power dispatch in power system. Several techniques have been developed to make the EP suitable to the practical optimal problems of large scale systems. Simulation results are presented to show the potential for applications of the proposed method to power system economical and secure operations. Distribution system through network reconfiguration is realized to be operated under minimized loss condition due to a large consumption in power energy nowadays. This final year project presents a technique for networks reconfiguration that aims to improve voltage stability and hence minimized the loss. By presenting the relationship between voltage stability and loss minimization it can be shown that voltage stability is maximized when power losses are minimized in the network. Simulation studies on IEEE 30-bus Reliability Test System (RTS) are presented to illustrate the methodology and to demonstrate the benefits of the proposed method using MATLAB programming language.

TABLE OF CONTENTS

CHAPTER			PAGE
	DECLARATION		ii
	ACKNOWLEDGEMENT		iii
	ABSTRACT		iv
	TABLE OF CONTENTS		v
	LIST OF FIGURE		ix
	LIST OF TABLE		x
	LIST OF ABBREVIATIONS		xi
1.0	**INTRODUCTION**		
	1.1	Introduction	1
	1.2	Report Objectives	2
	1.3	Scope of Work	2
	1.4	Organization of Thesis	3
2.0	**REACTIVE POWER DISPATCH**		
	2.1	Introduction	4
	2.2	Voltage Control and Managing Reactive Power	4
		2.2.1 What is Reactive Power?	5
		2.2.2 The Need for Reactive Power	8
	2.3	Reactive power Dispatch Problem	8
3.0	**POWER FLOW ANALYSIS**		
	3.1	Introduction	10
	3.2	Power Flow Solution	10
		3.2.1 Slack bus	10
		3.2.2 Load buses	11
		3.2.3 Generator Buses	11
	3.3	Power Flow Program	11

CHAPTER 1

INTRODUCTION

1.1 Introduction

Power system economical operation consists of two aspects: active power regulation and reactive power control. This forms a multi-objective global optimization problem of large-scale industrial system. This problem is considered conventionally as two separate problems: P- and Q-problems. The P-problem is to compute the optimal real power outputs of the generators for minimizing the power production cost and Q-problem is to compute the optimal voltage profile of PV-buses for minimizing the network real power loss and keeping the voltages of all the buses in their secure limits [1].

Solving these problems is subject to a number of constraints, such as limits on bus voltages, tap settings of transformers, reactive and active power of power resources and transmission lines, and number of controllable variables [2].

One of the major problems faced by power system operators is the reactive power dispatch imposed on electric power utilities for continues and reliable supply of energy. Major power loads require a significant amount of reactive power that has to be supplied while maintaining load bus voltages within their permissible operating limits. Any changes in the system configuration or system demand may result in higher or lower voltage profiles where, the high voltage at light load condition and low voltage at heavy load condition.

The reactive power dispatch problem is important for the modern power system to operate in a reliable and economic way because it is the voltage control in the power system. The purpose of the reactive power dispatch is to improve the voltage profile and minimize the real power loss in the system.