

**REDUCTION OF REACTIVE POWER LOSSES IN RADIAL
DISTRIBUTION SYSTEM USING EVOLUTIONARY
PROGRAMMING TECHNIQUE**

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

UNIVERSITI TEKNOLOGI MARA



اَوْبَهُرْ سِيَّيْ تِي كَمُو اَوْبِي مَارَا

**MOHAMAD AMIRUL NIZAM BIN MOHAMED THARI
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR**

ACKNOWLEDGEMENT

Bismillahirrahmannirrahhim, I would like to take this opportunity to express my deepest gratitude to my project supervisor, Dr. Ismail Musirin, for his support and encouragement during the whole period of project study. He provided me with initiative, direction, and timely guidance along this study.

Gratitude and appreciation to my parents, Mohd Tahir Hj. Musa and
for their encouragement and continuing support, without which, I would never have been able to make it this far.

Also a lot of thanks to my wife, Nordiah Abdul Hamid and my daughter, Amirah Humaira for their sacrifice and attentions along this journey.

Finally, I would like to thank all my friends for their friendship and their support, which made this long journey a joyful one. Thanks.

Mohamad Amirul Nizam bin Mohamed Thari
Faculty of Electrical Engineering
Universiti Teknologi MARA (UiTM)
Shah Alam, Selangor Darul Ehsan

ABSTRACT

This thesis presents the study for reduction of reactive power losses in radial distribution system using Evolutionary Programming (EP) technique. The study involves the development of Evolutionary Programming engine to be written in MATLAB taking the reactive power minimization as the objective function. This study has been realized on the 30-bus distribution system. Results obtained from the experiments indicated that the proposed technique is able to reduce reactive power losses in the system.

TABLE OF CONTENT

CHAPTER		PAGE
	DECLARATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	TABLE OF CONTENT	vi
	LIST OF TABLES	viii
	LIST OF FIGURES	ix
1	INTRODUCTION	
	1.1 Introduction	1
	1.2 Objective of the Study	1
	1.3 Scope of Project	2
	1.4 Organization of the Thesis	3
2	POWER SYSTEM	
	2.1 Power System	4
	2.2 Reactive Power Losses	6
3	CAPACITOR PLACEMENT	
	3.1 Introduction	9
	3.2 Methodology	9
4	LOAD FLOW ANALYSIS	
	4.1 Introduction	11
	4.2 Load Flow Analysis	11

CHAPTER 1

INTRODUCTION

1.1 Introduction

In real life, power system must be safe, reliable and economical. The voltages will drop as the power losses increase. Excessive voltage drops can cause overheating and failure to the electrical equipment. That is why the reactive power losses are very important in power system. The losses will affect the operational, economical and quality service of electric deliver. In this case, the reduction technique of these losses must be implemented to reduce those effects.

As Malaysia is a developing country, which has relatively high in power losses, therefore the problem must be alleviated. The active power must be fully utilized, which required the reactive power to be compensated [1]. There are many solutions in references in reducing the reactive power losses, which subsequently require the capacitor placement to be addressed in this study.

Evolutionary Programming (EP) technique as a part of Artificial Intelligence (AI) hierarchy [2] is the method used to determine the suitable capacitor value in this study. The compensation technique is placement of shunt capacitor in the distribution system.

1.2 Objective of the Study

The objective of this study is to study the mathematical formulation of reactive power losses and to develop evolutionary programming (EP) engine for loss reduction in radial distribution system. In addressing, the loss reduction capacitor placement has been chosen as the compensation technique.