A HEURISTIC APPROACH UNIT COMMITMENT SOLUTION IN ELECTRICAL POWER GENERATION

Thesis is presented in partial fulfillment for the award of the Bachelor of Electrical Engineering (Hons)

UNIVERSITI TEKNOLOGI MARA



MOHD SHAHRIL BIN MUSA
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM
SELANGOR DARUL EHSAN

ACKNOWLEDGEMENTS

Alhamdulillah....

In the name of ALLAH SWT the most gracious and most merciful, and to our prophet Muhammad SAW and his family. Thanks to ALLAH SWT for giving us an opportunity to complete this project and thesis.

I would like to express my deep sense of gratitude and appreciation to my supervisor for this Industrial Project, **Professor Madya Tuan Haji Muhammad Yahya** for his support, consistent help and guidance as well as prevision of his valuable time, encourage and patience during the period of completing this project.

I would like also special thanks **Mr Ir Hisham Mustaffa**, **Mr Kennedy** staff of Tenaga National Berhad for giving me data, explanation, comment about **unit commitment.** Only ALLAH SWT could pay back their kindness and I will appreciate it until the rest of life.

Lastly, thanks to my beloved parents for giving me financial and moral support to do my project. Without them I can never complete this project. Finally, this expression of gratitude also goes to all my friend and individual for willing to help us on doing my industrial project.

MOHD SHAHRIL MUSA
Faculty of Electrical Engineering,
Universiti Teknologi Mara,
40450 Shah Alam,
Selangor Darul Ehsan.

ABSTARCT

This project deals with a computer programming to solve the unit commitment solution in electrical power generation. The concept of unit commitment is to minimize cost of generation operation over period of time. The transmission losses are neglected. Unit commitment is the best set of the unit to be available to supply the forecasted load demand. The project involves the processing of a historical utility data of Tenaga National Berhad (TNB). This project tests the system with 69 generator unit over 24 hour period using priority list method. The data can be applied using *C programming* to solve unit commitment. The result can be obtained from the program output where solution of unit commitment with constraint, based on the heuristic method that is priority list method.

TABLE OF CONTENTS

DECLARATION		i
APPROVAL		ii
AKNOWLEDGEMENT		iii
ABSTRACT		iv
TABLE OF CONTENTS		v
LIST OF FIGURE		viii
LIST OF TABLE		ix
LIST OF ABBREVIATION		x
CHAPTER		**PAGE**
1	**INTRODUCTION**	
	1.1 Background	1
	1.2 Definition of Unit Commitment	2
	1.3 Objective of Unit Commitment	3
	1.4 Problem formulation	3
	1.5 Economic Load Dispatch	4
	1.6 Scope of the Project	7
2	**EVALUATION OF AN EXISTING METHOD**	
	2.1 Introduction	8
	2.2 Priority List Method	9
	2.3 Average Full Load Cost(AFLC)	10
	2.4 Heuristic Approach	10
	2.5 Integer and mixed- Integer programming	11
	2.6 Branch and Bound	11
	2.7 Artificial Neural Network(ANN)	12

CHAPTER 1

INTRODUCTION

1.1 Background

Human activity follows cycles and most systems supplying services to large population will experience cycles. Load demand also follows this cycle. The load taken by human activities do not generally occur at the same instant. Generation units must be ran to serve the requirements but electrical energy cannot be stored. It has to be generated whenever there is a demand for it. It is, therefore, imperative for the electrical power utilities that the on their system (network) should be estimated in advance. Because the total load of power varies throughout the day and reaches a different peak value from one day to another, the electric utility has to decide which generators to start up and when to connect them to the network - and the sequence in which the operating units should best shut down and for how long. The computational procedure for making such decision is called **UNIT COMMITMENT** and a unit when scheduled for connection to the system is said to be committed. **[1]**

1.2 Definition of Unit Commitment

Unit commitment is the process of deciding when and which generating unit at each power station to start-up and shut down. Types of generating unit are thermal and hydro electric generating unit. For example in thermal unit power system. Unit commitment is necessary for short-term operation planning as it provide the generation of every thermal plant throughout a scheduling period at minimum cost. The problem of unit commitment consist of minimizing the operation cost of thermal unit such as start-up costs, shut down cost and operating cost satisfying a set of constraints related to these units such as minimum and maximum output power, minimum up and down times. The production costs include fuel; start up, shutdown, and no-load costs. Constraints include capacity reserve, minimum up/down time, maximum power flow in the transmission lines and operating limits.**[7]** The UCP is a mixed combination and continuous optimization problem, which is very