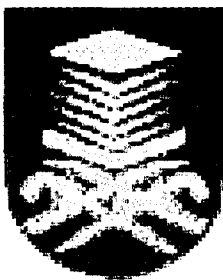


**SIMULATED ANNEALING FOR SOLVING
ECONOMIC DISPATCH PROBLEM**

Thesis is presented in partial fulfillment for the award of the

Bachelor of Electrical Engineering (Hons)

UNIVERSITI TEKNOLOGI MARA



**WAN KHAIRULIZUAN BIN WAN ISMAIL
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR**

ACKNOWLEDGEMENTS

All praise to Allah S.W.T., The Most Gracious and The Most merciful that has given me the strength and ability to complete this Final Year Project.

I would like to express my gratitude and appreciation to my supervisor, Assoc. Prof. Bibi Norasiqin Bt. Sheikh Rahimullah for providing me with valuable guidance, support, commitment, ideas and constructive comment during the course of this project.

My appreciation also goes to all who have been involved directly or in directly for their numerous ideas, comment and guidance until the success of this project.

My deepest appreciation also goes to my beloved parent, En. Wan Ismail Bin Wan Mamat and Pn. Nazimah Bt. Ismail, and my family members for their moral and spiritual support.

Lastly, I would like to take this opportunity to express my gratitude to my highly valued best friends especially my lovely friends and classmate who were involved in this progression of this final project. Also thanks to everyone who has contributed either directly or indirectly throughout the preparation of this thesis and this project.

Thank You.

ABSTRACT

This project presents the Simulated Annealing (SA) solutions to the Economic Dispatch (ED) problem in power system. ED is very critical and essential part in electrical power system since it gives impact to the total generation cost of the system. The ED problem is to minimize the total cost of generation under various systems and operational constrains while satisfying the power demand. An optimization technique will be required to find the optimal combinational power generator output of the system, in order to achieve ED objectives. SA does not have many mathematical requirements for optimization problems. They can handle any kind of objective function and any kind of constraint (linear or nonlinear) defined on discrete, continuous or mixed search spaces. In the SA algorithm, the load balance constraint and the operating limit constraints of the generators are fully accounted for. In the development of the algorithm, transmission losses are first discounted and they are subsequently incorporated in the algorithm through the use of the B-matrix loss formula. The algorithm is demonstrated by its application to a test system. To evaluate the proposed method, a six unit generating power system was tested in order to obtain the minimum cost of generator. SA algorithm used in this study was implemented by using MATLAB 7.8.0 (R2009a). The experimental results show that the SA method has the capability for obtaining higher-quality solutions in solving the ED problem while at the same time have good performance in terms of to minimize total generation cost and have shorter time taken in optimization process.

Keywords: Economic Dispatch (ED), Simulated Annealing (SA)

TABLE OF CONTENTS

CHAPTER 1	1
INTRODUCTION	1
1.1 OVERVIEW.....	1
1.2 PROBLEM STATEMENT	2
1.3 OBJECTIVES	3
1.4 SCOPE OF WORK	3
1.5 THESIS ORGANIZATION.....	4
CHAPTER 2	5
LITERATURE REVIEW	5
2.1 INTRODUCTION.....	5
2.2 ECONOMIC DISPATCH BASIC THEORY	5
2.3 ECONOMIC DISPATCH CONSTRAINTS.....	7
2.3.1 Inequality or Generation Limits Constraint	8
2.3.2 Power Balance Constraint.....	8
2.3.3 Total Power Losses, PL	9
2.4 SOLVING TECHNIQUES IN ED PROBLEM.....	10
2.5 THE SIMULATED ANNEALING SOLVER.....	11
CHAPTER 3	13
METHODOLOGY	13
3.1 INTRODUCTION.....	13
3.2 SIMULATED ANNEALING ALGORITHM	13
3.2.1 Simulated Annealing With Bound Constraint	14
3.2.2 Simulated Annealing Pseudo Code.....	16
3.2.3 SA Initialization Process.....	19
3.2.4 SA Optimization Process	19
3.3 DESIGNING THE SIMULATION.....	22
3.4 APPLICATION OF MATLAB.....	24
3.4.1 MATLAB Overview	25
3.4.2 Overview of the MATLAB Environment.....	25
3.4.3 The MATLAB System	26
3.1.1 Overview of the Toolbox Simulated Annealing	27
CHAPTER 4	30
RESULTS AND DISCUSSION	30
4.1 INTRODUCTION.....	30
4.2 SA PARAMETER SETTINGS.....	30
4.3 UNIT GENERATION PARAMETER	32
4.4 STOPPING CRITERION.....	34

4.5	FUNCTION GENERATION COST (\$/h).....	35
4.6	BEST FITNESS VALUE.....	37
4.7	THE BEST SOLUTION FOR ECONOMIC DISPATCH PROBLEM.....	40
CHAPTER 5		41
CONCLUSION.....		41
CHAPTER 6		42
FUTURE DEVELOPMENT AND RECOMMENDATION		42
CHAPTER 7		43
REFERENCES		43
APPENDICES		46
APPENDIX A.....		46
APPENDIX B.....		48
APPENDIX C.....		52