UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF PROFIT-BASED UNIT COMMITMENT SOLUTION USING PARTICLE SWARM OPTIMIZATION

IDA SYAHIRAH BT BADEROL ISKANDAR

Thesis submitted in fulfilment of the requirements
for the degree of
Bachelor of Engineering (Hons) Electrical Engineering

Faculty of Electrical Engineering

January 2017

ACKNOWLEDGEMENTS

First of all, Alhamdulillah and all praises to Allah for His blessing and lend me strength to finish the research. I would like to credit my thanks to my supervisor, PM Bibi Norasiqin Sheikh Rahimullah for her continuous support and advices in completing thus research. I am really grateful for her guidance and encouragement with patience in motivating me while conducting the research. I also take this opportunity to express my sincere thanks to my family members, lecturer of Faculty Electrical Engineering, fellow friends and those who has help me, directly and indirectly.

ABSTRACT

This thesis presents the solution of profit-based unit commitment (PBUC) by using particle swarm optimization (PSO) technique. In this study, the on/off scheduling of generator units will be determined based on maximizing the profit while fulfilling the constraints. The proposed solution also helps to make decision on how much power and reserve is put up in the market sale while giving maximum profit based on the price behavior in the spot market. This optimization technique is performed on a test system consisting of three and ten generating units to study the effectiveness of this method to the PBUC problems. The results are compared to conventional unit commitment problem (UCP).

Keywords - problem-based unit commitment (PBUC), particle swarm optimization (PSO), unit commitment problem (UCP)

TABLE OF CONTENTENTS

		Page
APPROVAL		i
DECLARATION		ii
ACKNOWLEDGEMENT		iii
ABSTRACT		iv
TABLE OF CONTENTS		v
LIST OF FIGURES		
LIST OF TABLES		
LIST OF SYMBOLS AND ABBREVIATIONS		
CHAPTER		
1	**INTRODUCTION**	
	1.1 Background of Study	1
	1.2 Problem Statement	2
	1.3 Objectives	2
	1.4 Scope of Work	3
	1.5 Thesis Organization	4
2	**LITERATURE REVIEW**	
	2.1 Economic Dispatch	5
	2.2 Unit Commitment	6
	2.3 Profit-Based Unit Commitment	6
	2.4 Elements in PBUC	7
	2.4.1 Type of Power Plant	7
	2.4.2 Inaccuracy and Uncertainties	8
	2.4.3 Security Function	9
	2.5 Optimization Techniques	10

3	**METHODOLOGY**	
	3.1 Introduction	14
	3.2 MATLAB Software	14
	3.3 Particle Swarm Optimization	15
	3.3.1 PSO Algorithm	16
	3.3.2 Representation of Swarm	16
	3.3.3 Initialization of Swarm	17
	3.3.4 Initialization of Best Position	17
	3.3.5 Movement of Particles	18
	3.4 PBUC Problem Formulation	20
	3.4.1 Objective Function	20
	3.4.2 Constraints Function	20
	3.4.3 Others Function	21
	3.5 Solving PBUC Problem Using PSO	23
4	**RESULTS AND DISCUSSION**	
	4.1 Introduction	26
	4.2 PSO Parameters Setting	26
	4.3 Three-Unit Test System	27
	4.3.1 Data of Three-Unit Test System	27
	4.3.2 Results For Three-Unit Test System	28
	4.4 Ten-Unit Test System	32
	4.4.1 Data of Ten-Unit Test System	32
	4.4.2 Results for Ten –Unit Test System	34
5	**CONCLUSIONS AND RECOMMENDATION FOR FUTURE WORK**	
	5.1 Conclusion	36
	5.2 Future Recommendation	37
REFERENCES		38