

**REACTIVE POWER DISPATCH BY DISTRIBUTED
GENERATORS THROUGH STEP LOAD FLOW
SIMULATION AND GENETIC ALGORITHM**

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Degree of Master of Science

Department of Electrical Engineering

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree
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ACKNOWLEDGEMENTS

It is with deepest sense of gratitude, I acknowledge the tremendous encouragement, guidance and support extended to me by my supervisors Prof. J.R. Lucas and Dr. H.M. Wijekoon.

I extended my sincere gratitude and thanks to all lectures of the Department of Electrical Engineering, University of Moratuwa for providing all the necessary facilities and guidance for all our academic activities.

I would specially like to appreciate the support provided by Ceylon Electricity Board for allowing me to following this MSC and to collect data and information from relevant branches.

I would further like to thank the senior engineers Mr. Eranaga Kudahewa and Mr. Amila Wijethunga and my friends Mr. Jagath Samarawickrama, Mr. Dinesh Disanayaka and Mrs. Erandhi Hemachandra for the support provided by them in numerous ways throughout this period.

I thank all personnel who gave their ideas, support and encouragement.

Finally, I owe my gratitude to my father, mother and my two brothers for their endless support and encouragement, and without them I would not have come this far.

A.M.G.G.S.H.B.Abeysinghe

ABSTRACT

Demand for reactive power in a transmission and distribution network is met by various ways such as through power generating plants, compensation by means of capacitors at the utility grid and compensation at the load point through capacitors etc. In CEB utility grid, most of the reactive power requirement is supplied by the grid via transmission and distribution network from major generating stations. This leads to increase of transmission and distribution network current, thereby increasing real power loss in the system

This can be avoided by producing required amount of reactive power closer to the load centers. Possibly, economical reactive power generation can be done at medium voltage systems. Medium voltage system consist of many distributed generators such as diesel generators, wind power generators, bio mass plants and mini hydro plants etc. Due to inconsistency of water inflow in Mini Hydro plants, they do not run at full load throughout the day. Thereby, Mini Hydro plants can be utilized to compensate reactive power requirement in the medium voltage level while meeting their primary objective of generating real power.

Generating reactive power from several mini hydro plants, while reducing losses at the power system is a complex optimization task. In this research Genetic Algorithm was used to solve above optimization problem and simulated in SynerGEE and Matlab software.

Results of this research is focused on developing a scheme to dispatch reactive power to the grid through Mini Hydro plants while reducing losses at the distribution system and meeting its primary objective of providing real power from the same Mini Hydro plants.

Key words Genetic Algorithm, Mini Hydro plants, Medium voltage

TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
1 INTRODUCTION	1
1.1 Background	1
1.2 Literature Review	4
1.3 Problem Statement/ Justification.....	7
1.4 Objective of the Study.....	7
1.5 Research Methodology.....	8
2 PRESENT REACTIVE POWER GENERATION AND CAPABILITY STUDY	9
2.1 Reactive Power Generation from Main Power Plants.....	9
2.2 Medium Voltage Grid Capacitor Banks.....	10
2.3 Capacitor Banks at Medium Voltage Lines	11
2.4 Distributed Generators at distribution network.....	11
2.4.1 Diesel Generators.....	12
2.4.2 Wind Power Plants.....	12
2.4.3 Bio Mass Plants.....	12
2.4.4 Mini Hydro Plants.....	12
2.5 Capability of Mini Hydro Plants for reactive power generation.....	13
3 OPTIMIZATION OF LOSSES THROUGH DISTRIBUTED REACTIVE POWER GENERATION	15
3.1 Simulation of MV feeder with SynerGee Software	15
3.1.1 Actual Feeder simulation with SynerGee (Ukuwela Grid Feeder-10, CEB).....	17
3.1.2 Use of Genetic Algorithm.....	20

3.2	Simulation with Matlab Software	22
4	CASE STUDY WITH UKUWELA FEEDER-10	28
4.1	Introduction	28
4.2	Demand Curves for Ukuwela Feeder-10.....	30
5	FINANCIAL ANALYSIS.....	34
5.1	Cost of an energy unit for Ukuwela Feeder-10	34
5.2	Calculation of saving in a day at Ukuwela Feeder-10	35
5.3	Calculation of annual energy and financial saving in Ukuwela Feeder-10...35	
6	CONCLUSION	37
6.1	Recommendations	38
6.2	Suggestions for future work	38
	Reference List.....	39

LIST OF TABLES

Table 2.1: Major Reactive Power Generation Plants in Sri Lankan Network.....	9
Table 2.2: Grid Capacitor banks in Sri Lankan network	10
Table 3.1: Loss and Voltage Variation with Power Factor Variation of MHPs	19
Table 3.2: System Loss with Variation of Power Factor in MHPs by 0.01 Intervals..	25
Table 4.1: Hourly Power Factor Schedule for MHPs in Ukuwela Feeder 10.....	32
Table 5.1: Average Transfer Price from Transmission to Distribution Licensees Tariffs for Jan-June 2014.....	34
Table 5.2: Hourly Energy Saving in a Day at Ukuwela Feeder 10.....	35
Table 5.3: Annual Energy Saving.....	36
Table 5.4: Annual Financial Saving.....	36

LIST OF FIGURES

Figure 1.1: Daily Generation profile of a MHP	4
Figure 2.1 : Line Capacitor Banks at Horana New Gantry (450 kvar) and Malambe Gantry (300 kvar) in Sri Lankan Distribution Network	11
Figure 2.2: A Synchronous Generator Capacity Curve	14
Figure 3.1: Model Feeder with single MHP	16
Figure 3.2: Loss Variation of Model Feeder with Power Factor Variation of MHP in Peak and off Peak.....	16
Figure 3.3: Ukuwela Feeder 10 with Three MHPs	18
Figure 3.4: Loss and Maximum Voltage Variation along Feeder at Off Peak	19
Figure 3.5: Loss and Minimum Voltage Variation along Feeder at Peak	20
Figure 3.6: Flow Chart of Simulation Method with SynerGee Software	21
Figure 3.7: Model Feeder with Two MHPs.....	22
Figure 3.8: Model Feeder with Single MHP in MATLAB Simulink	23
Figure 3.9: Results of Model Feeder with Single MHP	24
Figure 3.10: Model Feeder with Two MHP in Matlab	24
Figure 3.11: Graphical Representation of 400 Nos Simulations	25
Figure 3.12: Flow Chart of Simulation Method with Matlab	26
Figure 3.13: Results of Model Feeder with Two MHPs with Genetic Algorithm for Peak Load	26
Figure 3.14: Results of Model Feeder with Two MHPs with Genetic Algorithm for Off Peak Load.....	27
Figure 4.1: Reactive Power Flow with 33kV Capacitor Bank at Grid Substation	28
Figure 4.2: Ukuwela F10 and Two Transmission Line model in Matlab.....	29
Figure 4.3: Peak Simulation Result for Minimum Losses	30
Figure 4.4: Off Peak Simulation Result for Minimum Losses	30
Figure 4.5: Active Power Demand Curves for Ukuwela Feeder-10.....	31
Figure 4.6: Reactive Power Demand Curves for Ukuwela Feeder-10.....	31
Figure 4.7: Hourly Loss Variation in Current System and Propose System in Ukuwela Grid Feeder 10	33

LIST OF ABBREVIATIONS

ACSR	Aluminum Conductor Steel Reinforced
AR	Auto Recloser
BSC	Breaker Switched Capacitor
CEB	Ceylon Electricity Board
CRO	Control Room Operator
DNO	Distribution Network Operator
DCC	Distribution Control Centers
DG	Distributed Generators
GSS	Grid Substation
GA	Genetic Algorithm
HV	High Voltage
kVA	kilovolt Ampere
kW	kilo Watt
kWh	kilo Watt hour
MV	Medium Voltage
MVA	Megavolt Ampere
MW	Mega Watt
MWh	Mega Watt hour
MHP	Mini Hydro Plant
OPF	Optimum Power Flow
OLTC	On Load Tap Changer
PUCSL	Public Utilities Company Sri Lanka
PSS	Primary Substation
SPP	Small Power Producer
SVC	Static Var Controller
SCADA	Supervisory Control and Data Acquisition