

**NETWORK OPTIMIZATION BASED LOAD  
BALANCING TECHNIQUE FOR LV ELECTRICITY  
DISTRIBUTION NETWORK**

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**May 2017**

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DISTRIBUTION NETWORK**

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Dissertation submitted in partial fulfillment of the requirements for the degree Master  
of Science in Electrical Engineering

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May 2017

## Declaration

“I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Date:

(Dr. K.T.M. Udayanga Hemapala)

## **Dedication**

I dedicate this work to my loving parents and to teachers

## **Acknowledgement**

First, I pay my sincere gratitude to Dr. K.T.M. Udayanga Hemapala and Dr. P.S.N. de Silva who encouraged and guided me to conduct this investigation and on perpetration of final dissertation. Without their encouragement and help, this research will not be a success.

I extend my sincere gratitude to Prof. N. Wickramarachchi, Head of the Department of Electrical Engineering and all the lectures and visiting lectures of the Department of Electrical Engineering for the support extended during the study period.

I would like to take this opportunity to extend my sincere thanks to Eng. S.D.C Gunawardena, System Development Manager–Lanka Electricity Company, Eng. U. Wijesinghe, Test Engineer- Lanka Electricity Company, Branch staff- Lanka Electricity Company -Kelaniya who gave their co-operation to conduct my research successfully.

It is a great pleasure to remember the kind co-operation extended by the colleagues in the post graduate program.

I should remember my wife, mother and brother who encouraged and helped me to continue the studies from start to end while facing so many problems.

## **Abstract**

### **Network Optimization Based Load Balancing Technique for LV Electricity Distribution Network**

Network optimization is vital requirement for all the electricity distribution companies. Energy loss reduction, fulfill the statutory requirements, lifetime improvements of the network accessories and healthy operation of network are some of benefits of network optimization. Load arrangement within the network is one of key factor influence for network condition. Proper load balancing mechanism among phases is based on the appropriate positioning of consumers within the electricity distribution network which empowers network optimization. So load balancing can be referred as way of consumer arrangement within the context of electricity distribution.

Ceylon Electricity Board (CEB) and Lanka Electricity Company (LECO) are the utilities responsible for electricity distribution within Sri Lanka. Presently there is not proper methodology used for load balancing by Sri Lankan electricity utilities. According to the electricity demand growth and increasing sensitivity to network by consumers, better network planning methodology will be required to cater their requirements.

In order to address this issue, this dissertation focuses on development of network optimization based load balancing technique for LV electricity distribution network. Actual features enriched distribution network model and appropriate power flow analysis method are essential infrastructure for accurate determination network condition. Such kind of platform can be used to evaluate different consumer arrangement patterns along low voltage feeders using their load profiles to find network optimized arrangement. Consumer load profiles can be represented by characteristic curves which illustrate their electrical behavior. Evaluation of network status generated due to combined effect throughout each and every point of consumer load profiles for all consumer arrangement patterns provide better result rather than just consideration of particular set of values.

Three phase four wire neutral grounded systems are using for electricity distribution in Sri Lanka. Incorporation of ground return path in to network model is considered within this research work. Applicability of forward backward load flow techniques is validated for proposed distribution network model. Proposed an algorithm for network optimization based load balancing which provide consumer arrangement plan at nodes for a certain low voltage feeder of distribution network.

Generally, this study provides the platform for network planners to find best arrangement of consumers at the network to achieve optimum network condition. This can be used for existing network evaluation as well as future planning of the distribution networks.

**Key words:** Network optimization, load balancing, Consumer assignment

# Table of Content

Declaration.....	i
Dedication.....	ii
Acknowledgement.....	iii
Abstract.....	iv
Table of Content.....	v
List of Figures.....	vii
List of Tables.....	viii
List of Abbreviations.....	ix
List of Appendices.....	x
1 INTRODUCTION.....	1
1.1 Background.....	1
1.2 Motivation.....	3
1.3 Objective of the Study.....	4
1.4 Methodology.....	4
1.5 Thesis Organization.....	5
2 LITERATURE SURVEY.....	6
2.1 Modeling Methods for Low Voltage Overhead Distribution System with Ground Return.....	6
2.2 Power Flow Analysis Methods for Steady State Analysis.....	15
2.3 Methods for Electricity Distribution Network Optimization.....	16
3 IMPEDANCE MODEL FOR RADIAL DISTRIBUTION FEEDER WITH GROUND RETURN.....	18
3.1 Development of Power Flow Algorithm for Considered Network Model.....	19
4 VALIDATION OF PROPOSED POWER FLOW ALGORITHM.....	27
4.1 Introduction.....	27
4.2 Primitive Impedance Matrix for Considered Feeder.....	27
4.3 Field Measurements Taken for Validation Process.....	29
4.4 Method of Validation.....	33
5 DEVELOPMENT OF ALGORITHM FOR NETWORK OPTIMIZATION BASED LOAD BALANCING TECHNIQUE.....	41
5.1 Introduction.....	41
5.2 Generation of Consumer Connections Arrangements among Phases at a Node.....	42
5.3 Generation of Consumer Connection Patterns along the Low Voltage Feeder.....	45
5.4 Generation of Network Status for Each Consumer Connection Pattern Using Load Profiles of Connected Consumer.....	46

5.5	Selection of Network Optimized Consumer Connection Pattern.....	47
6	APPLICATION OF PROPOSED LOAD BALANCING TECHNIQUE FOR LOW VOLTAGE FEEDER.....	50
6.1	Existing Status Analysis of Sample Feeder .....	50
6.2	Application of Proposed Algorithm.....	56
6.3	Generation of Network Status for Each Consumer Connection Pattern Using Load Profiles of Connected Consumers.....	59
6.4	Generation of Network Status for Each Consumer Connection Pattern Using Representative Load Profiles .....	64
6.5	Evaluation of Patterns .....	64
6.6	Sample of Results of Pattern Analysis.....	65
7	CONCLUSIONS & RECOMMENDATIONS .....	68
7.1	Conclusions on the Proposed Methodology.....	68
7.2	Recommendations for Future Work.....	70
	References.....	71
	Appendix A - Arial Bundle Conductor Data and Impedance Calculations .....	74
	Appendix B - Load Flow Calculation.....	78
	Appendix C - Consumer Connection Pattern Generation.....	92
	Appendix D - Characteristic Curve Generation.....	96



## List of Figures

Figure 1.1: Thesis Organization.....	5
Figure 2.1: Two conductors with ground return .....	7
Figure 2.2: Conductors with earth return .....	9
Figure 2.3: Neutral grounded line segment.....	13
Figure 3.1: Physical arrangement of considered feeder. ....	18
Figure 3.2: Power flow analysis algorithm .....	19
Figure 3.3: Model of the three-phase four-wire distribution line.....	20
Figure 3.4: Unbalance current division.....	21
Figure 4.1: Meter arrangement in the field .....	30
Figure 4.2: Transformer AZ-0043 .....	31
Figure 4.3: Energy meters installed at transformer for source detail collection .....	31
Figure 4.4: Energy meter installed for domestic consumer .....	32
Figure 4.5: Energy meter installed at feeder end .....	32
Figure 4.6: Node-02 current profiles taken on 2016-12-18 .....	33
Figure 4.7: Node-02 voltage profiles taken on 2016-12-18.....	34
Figure 4.8: Phase "R" voltage error variation .....	36
Figure 4.9: Phase "Y" voltage error variation.....	37
Figure 4.10: Phase "B" voltage error variation.....	38
Figure 4.11: Current error variation.....	39
Figure 5.1: Algorithm for Network Optimization Based Load Balancing Technique.....	41
Figure 5.2: Algorithm for Generation of possible consumer arrangements among phases at a node.....	42
Figure 5.3: Algorithm for consumer connection pattern generation.....	45
Figure 5.4: Algorithm for network status generation.....	46
Figure 5.5: Summary of network optimization based load balancing algorithm .....	49
Figure 6.1: Phase Current Variation of Feeder start taken on 2016.12.18.....	50
Figure 6.2: Neutral Current Variation of Feeder start taken on 2016.12.18.....	51
Figure 6.3: Voltage variation at feeder start and end of phase R taken on 2016.12.18 .....	52
Figure 6.4: Voltage variation at feeder start and end of phase Y taken on 2016.12.18 .....	52
Figure 6.5: Voltage variation at feeder start and end of phase B taken on 2016.12.18 .....	53
Figure 6.6: Consumer current profiles taken on 2016.12.18.....	55
Figure 6.7: Characteristic Curve Generation for Consumers.....	59
Figure 6.8: Measured and characteristic kW profile – consumer C1.....	61
Figure 6.9: Measured and characteristic kW profile – consumer C2.....	62
Figure 6.10: Current profile at feeder start for existing connection pattern.....	63
Figure 6.11: Feeder loss variation relevant to pattern for considered sample patterns.....	66
Figure 6.12: Current profile at feeder start for selected connection pattern .....	67

## List of Tables

Table 2.1: Power flow methods and applicability.....	16
Table 4.1: Consumer connection arrangement.....	28
Table 4.2: Details of installed data recordable meters and their application .....	29
Table 4.3: Summery of number of Voltage error distribution. ....	40
Table 4.4: Summery of number of Current error distribution.....	40
Table 5.1: Symbolic representations of four consumer connection at Node-i .....	43
Table 5.2: Redefined set of consumer connections.....	44
Table 5.3: Sample of generated connection arrangements.....	44
Table 5.4: Accumulated connection arrangements .....	44
Table 5.5: Sample of patterns generated from algorithm.....	46
Table 6.1: Summarized output of pattern generation algorithm .....	56
Table 6.2: Sample of consumer arrangments at node-5 .....	57
Table 6.3: Sample of consumer arrangments at node-7 .....	57
Table 6.4: Sample of consumer connection pattern .....	58
Table 6.5: Evaluation results for existing arrangement. ....	63
Table 6.6: Sample results of pattern analysis.....	65
Table 6.7: Selected pattern among evaluated cases .....	66

## **List of Abbreviations**

LECO	Lanka Electricity Company
CEB	Ceylon Electricity Board
PUCSL	Public utilities commission of Sri Lanka
CT	Current Transformer
ABC	Arial Bundle Conductor

## List of Appendices

<b>Appendix</b>	<b>Description</b>	<b>Page</b>
Appendix A	Arial Bundle Conductor data and Calculations	74
Appendix B	Load flow calculation	78
Appendix C	Consumer connection pattern generation	92
Appendix D	Nominal voltages	96