

DEVELOPMENT OF A COST BASED OPTIMIZATION TECHNIQUE FOR TOWER LINE DESIGN

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Dissertation submitted in partial fulfillment of the requirements for the degree Master
of Science
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March 2014

DECLARATION OF THE CANDIDATE AND SUPERVISORS

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The above candidate has carried out research for the Masters dissertation under our supervision.

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ACKNOWLEDGEMENTS

Foremost, I would like to express my sincere gratitude to my supervisors Dr. Asanka Rodrigo and Eng. Mr. A. C. S. Wijayatilake for the continuous support given for the research, for their patience, motivation, enthusiasm, and immense knowledge. Their guidance helped me in all the time of research and writing of this dissertation.

My sincere thanks go to Mr. Lakdasa de Silva; former Electrical Engineer in Ceylon Electricity Board, for enlightening me the first glance of research.

Further, I must thank all the lecturers engaged in the MSc course sessions for making our vision broader, providing us with the opportunity to improve our knowledge in various fields.

It is a great pleasure to remember the kind cooperation of all my colleagues who have helped me in this Post Graduate programme by extending their support during the research period.

My special thanks go to my husband, Janaka, my parents Mr. and Mrs. J.Rathnayaka, and my brother and sister-in-law Mr. and Mrs. G.Rathnayaka, for supporting me spiritually throughout my life and tolerating my engagement on this work.

R. K. A. N. Rathnayaka

ABSTRACT

Overhead high voltage and medium voltage transmission using tower lines is a common practice all over the world. Tower line construction projects integrate high costs while about 25 % of the cost is for tower metallic parts and 30 % of that is for foundation and erection [1].


Developed economies trying to achieve the cost optimization of tower lines by optimum spotting of towers at designing stage and several techniques have been developed in that purpose. In Sri Lanka, the process of planning, design and construction of transmission and medium voltage power lines is solely authoritative by Transmission Licensee and Five Distribution Licensees of the country. Until now, these six licensees and contractual parties, who are involved in power line construction process, do not use any systematic method for cost optimization in line design and construction.

As the first step of this study, a research survey was done about available line design techniques, design criteria and constraints and available cost optimization techniques. Data were collected on available structure types, most recent structure costs, foundation costs and erection costs.

This report will discuss the Dynamic Programming algorithm which gives the choice of available towers (structure) and sites of the towers for given survey data of a transmission line route, in such a way that the overall cost of running the line from one end of the route to the other, subject to all the design constraints, is a minimum.

A software tool was developed which runs based on the developed dynamic programming algorithm. The software tool chooses and sites the towers, given the survey data of a transmission line route, available tower types and conductor parameters. By developed software tool, several experiments and re-designing were done using profile survey data of some constructed and existing 33 kV tower lines under Projects and Heavy Maintenance Branch-Region 01 of Ceylon Electricity Board (CEB) from year 2010. The results were compared with the initial designs and it has shown that a reasonable cost reduction can be achieved, and that cost reduction is varying with total line length, and characteristics of the line route.

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LIST OF ABBREVIATIONS

CEB	Ceylon Electricity Board
PLS-CADD	Power Line Systems Design and Drafting ()
ACSR	Aluminum Conductor Steel Re-inforced
UTS	Ultimate Tensile Strength
MWT	Maximum working tension
EDT	Every day temperature
MOT	Maximum operating temperature
MV	Medium Voltage



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