REDEFINING RIGHT-OF-WAY WIDTH OF 33kV TOWER LINE BY MINIMIZING DISTURBANCES TO THE VEGETATION

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Degree of Master of Science

Department of Electrical Engineering

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DECLARATION OF THE CANDIDATE AND SUPERVISORS

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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J.C.G. Dissanayakege

06th November, 2015

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

Dr. Asanka Rodrigo

06th November, 2015

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ABSTRACT

With the economic development in the country the demand for electricity is becoming important so that the government needs to achieve 100% electrification in the country in near future. Here, providing a safe & reliable power supply to all sectors in the country has become a great challenge to the utility company.

To cater this requirement, planning branches of Ceylon Electricity Board (CEB) do preliminary studies of new power lines, reliability evaluations, load flow studies, etc. Thereafter, medium voltage line is designed including the line length, current rating, circuit type (Four circuit/Double Circuit/Single Circuit), conductor parameters, staring & end points, etc.

As the first step of this research study, a survey was done regarding the available line design techniques, design criteriae, details of the selected tower line, valuation methods of vegetation, conductor types used in tower line applications, right-of-way width of a transmission line, etc. The prime concern was drawn in collecting as much as possible data on vegetation distribution along the line, payment made on vegetation clearing, classification of trees, tree related information, locations of removed trees of the selected line, available structure types, most recent structure costs, foundation costs and erection costs, etc.

With the rapid urbanization, finding a route for a new transmission line across a populated area is a major difficulty to be faced by the utility. In this study, width of a 33kV transmission line Right-Of-Way (ROW) is proposed. Internationally used vegetation management techniques for transmission line was studied, since a well-defined, eco-friendly methodology for vegetation compensation process has not been adhered to the conventional practice.

Most of the countries in the world pay much attention in the construction of eco-friendly overhead power lines. Hence, application on Covered Conductors on 33kV transmission line construction in CEB was studied while ensuring the adoptability of newly developed CC in Sri Lanka. The existing line was re-designed using the LYNX equivalent covered conductor. The ROW widths and the per km cost of a 33kV tower

line were calculated for three different cases considering the different equivalent spans. Considerable amount of cost could be saved by the utility while concerning the designed equivalent span and the conductor type for properly maintaining the ROW width.

CONTENTS

List of Figures

List of Tables

LIST OF ABBREVIATIONS

Term	**Definition or Clarification**
4CCT	Four Circuit
ABC	Aerial Bundled Conductors
ACSR	Aluminum Conductor Steel Reinforced
ANSI	American National Standards Institute
BZ	Border Zone
° C	Celsius
CC	Covered Conductor
CEB	Ceylon Electricity Board
CENELEC	European Committee for Electro-technical Standardization (French Standard)
CO_2	Carbon Dioxide
DBB	Double Bus Bar
DBH	Diameter at Breast Height
DC	Double Circuit
DS	Divisional Secretariat
EDT	Every Day Temperature
EMF	Electro Magnetic Force
ENATS	Energy Networks Association Technical Specifications
f.o.s	factor of safety

GPS	Global positioning System
GN	Grama Niladhari
GSS	Grid Sub Station
HV	High Voltage
IUCN	International Union for Conservation of Nature
kN	Kilo Newton
kV	Kilo Volts
LiDAR	Light Detection And Ranging
LSHP	Lighting Sri Lanka Hambantota Project
MV	Medium Voltage
NESC	Network Embedded Systems C
PLSCADD	Power Line Systems Computer Aided Design and Drafting
PPC	Project Procurement Committee
ROW	Right Of Way
SC	Single Circuit
UK	United Kingdom
UTS	Ultimate Tensile Strength
WZ	Wire Zone