RE-CONDUCTORING OF TRANSMISSION LINES TO INCREASE CAPACITY

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DECLARATION

The work submitted in this thesis is the result of my own investigation, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

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April 4, 2016

I endorse the declaration by the candidate.

Prof. H. Y. Ranjith Perera

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Abstract

Electric power consumption, is increasing rapidly, showing growth faster growth in the last few decades. To meet the increase in demand of electricity the expansion of transmission networks is needed all over the country. In Sri Lanka most of the electric lines are saturated, they are reaching critical values of capacity and sag. Therefore, building new lines is necessary to provide the ever increasing consumption. The difficulty to find line route and environmental issues limited the construction of new overhead lines. Therefore, there is an urgent need to find out some alternatives that increases the power transfer capacity of the existing lines. This circumstance is forcing the use of the existing lines, which represents a cheaper solution compared underground transmission for countries like Sri Lanka.

This research study is focused on finding facts to replace the conductor by a high current capacity one. In this study, a suitable alternative method is proposed for existing transmission lines comprising zebra conductors. In order to evaluate the potential benefits of re conducting of a transmission network a holistic computational methodology is used. This allows sag, capacity and tension calculations to be carried out for each section of selected transmission line.

Further, PLS -Tower and PLS – CADD software is used to analyze usage of various high current rating conductors in the market with the new technologies. Tower loads due to wind, weight of the conductor etc.. are calculated and loaded to the existing towers to check the strength.

The proposed technique can be used to analyze the tower strength to replace high current capacity conductors. The same can also be used as a powerful method at planning stage at the new transmission line projects.

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List of Abbreviations

BS – British Standards for Design and Construction

CEB - Ceylon Electricity Board

ISO – International Organization for Standardization

OPGW – Optical Fibre Ground wire

PLS – Power Line System software

TDL - Tower Double circuit Line

TD1 - (Tower Double circuit –Deviation angle 0°- 10°)

TD3 - (Tower Double circuit –Deviation angle 10°- 30°)

TD6 - (Tower Double circuit –Deviation angle 30°- 60°)

TDT - (Tower Double circuit Terminal)

WS– Wind span

For Earth wire (OPGW)

- Ne –Numbers
- De (mm) - Diameter
- We (kN/m) - Weight
- Te (kN) – Tension
- Pe (kN/m^2) – Wind pressure

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