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DISTRIBUTION SYSTEM RELIABILITY ASSESMENT AND TECHNIQUES FOR IMPROVEMENT.

A dissertation submitted to the
Department of Electrical Engineering, University of Moratuwa
in partial fulfillment of the requirements for the
Degree of Master of Science

by

A.D. JANAKI RUPASINGHA



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University of Moratuwa , Sri Lanka



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DECLARATION

The work submitted in this dissertation in 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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A.D.J. Rupasingha
Date:08/04/2008

I endorse the declaration by the candidate.

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Prof. Ranjit Perera

ABSTRACT

Although reliability indices were introduced in the past as Key Performance Indicators to gauge the activities of electricity utilities, reliability studies on electricity network are rarely carried out to determine what improvements can be made in the future. The data collected in the past has been only used for manual calculation of reliability indices in the various operating divisions with no attempts made to study & effect improvements based on them.

This study focused on the following,

- A study of the sustained failure indices such as SAIDI & SAIFI making use of the SynerGEE software package for medium voltage distribution network, as an initial computation of indices.
- Comparison of the results with values for reliability indices obtained in practice using past data from operating divisions & their system control centres in the CEB.
- Identification and selection of mitigation techniques in Kalpitiya that is a heavily salt polluted area of the North Western province of Sri Lanka.
- Analysis of the effectiveness of the selected mitigation techniques to improve the reliability level in the Kalpitiya area and a financial analysis to justify the viability of the project.
- Proposing methods for reliability improvement, such as better maintenance practices, policies, augmentation of lines and improvement of switching arrangements.

The tool available in the SynerGEE software package for reliability calculation in the distribution network has not been used effectively in the past for calculations and mitigation planning purposes due to unavailability of proper data base.

In this study the SynerGEE software package has been used to calculate the sustained failure indices such as SAIDI and SAIFI for the medium voltage distribution network of the North Western Province initially with mitigation techniques applied. Further it is recommended that similar studies are conducted in other areas of the CEB as well and techniques applied to critical regions with much benefit to be derived in the future.



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LIST OF ABBREVIATIONS

AAC- All Aluminum Alloy Conductors
ABS- Air Break Switch
ACSR-Aluminum Conductor with steel reinforcement
AR- Auto Reclosure
CAIDI-Customer Average Interruption Duration Index
CAIFI-Customer Average Interruption Frequency Index
CSC- Consumer Service Centre
DDLO- Drop Down Lift Off
DGM- Deputy General Manager
GDP- Gross Domestic Product
GSS- Grid Sub Station
HT - High Tension
LBS- Load Break Switch
LT - Low Tension GSS- Grid Power Station
NWP- North Western Province
PSS- Primary Substation
SAIDI-System Average Interruption Duration Index
SAIFI-System Average Interruption Frequency Index
SIN-Substation Identification Number
SIR -Silicon Rubber

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