DISTRIBUTION SYSTEM RELIABILITY MODELING AND ANALYSIS

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

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Professor Sisil Kumarawadu Dr. P.S.N.De Silva

DEDICATION

My loving father, mother and teachers,

Who encouraged me,

For my education.

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ABSTRACT

With the background of imposing new electricity act and the regulatory regime for electricity industry, utilities have to be concerned not only the cost of the electricity but also the quality of the supply. As the cost of electricity is embedded to the electricity tariff, cost of reliability will also be added to the tariff in near future. Hence, utilities need to have a reliability study model to enhance the reliability of power supply at optimum level.

Aim of this research is to formulate methodology to calculate supply reliability to end user by component reliability. Past three years outage data of Lanka Electricity Company (LECO) had been analysed to calculate reliability of critical path components of the distribution network. Two reliability models named direct restoration method and step restoration method had been applied to calculate sustained end user reliability indices such as SAIDI and SAIFI. End user reliability indices had been calculated using the derived component reliability for the selected distribution network portion of LECO for this purpose. Finally, the results had been compared with the absolute data for the same network as a measure of model validation.

The result from the direct restoration model is deviated from the recorded results. It is noted that the results calculated by step restoration model comply with the recorded data. There were instances of deviation caused due to the non conformity of step restoration Markovian model of the network portion.

Considering the validation of results, it was identified that LECO distribution network reliability shall be modeled using step restoration model. It is also noted that due to the statistical nature of component reliability, the results are also statistically distributed.

The requirement of utilities to incorporate reliability criteria into their planning objectives is a requirement today in view of the regulatory governance of the electricity sector. The tariff when comes cost reflective essentially needs to incorporate cost of reliability as well.

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Abbreviation	Description
BTAG	Bentota Aluthgama
CSC	Customer Service Center
DCC	Distribution Control Center
KMAG	Kaluwamodara Aluthgama
KMBE	Kaluwamodara Beruwela
KMDT	Kaluwamodara Dhargatown
KMMOR	Kaluwamodara Moragalla
LECO	Lanka Electricity Company
MTTF	Mean Time To Failure
MTTR	Mean Time To Repair
MTTS	Mean Time To Switch
PCC	Point of Common Coupling
PUCSL	Public Utilities Commission of Sri Lanka
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index

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