DEVELOP AN EFFECTIVE METHODOLOGY TO EVALUATE THE ENERGY LOSS IN LOW VOLTAGE NETWORK

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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 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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Dr. W.D.A.S. Rodrigo

ABSTRACT

Power system losses have turned out to be a major challenge for electricity utilities worldwide and losses in electricity distribution represent dominant part in the overall power system losses. In the Sri Lankan context, losses in the distribution system are around 8.5% of gross electricity generation when the total losses in transmission and distribution amount to 10.5% in 2014. Though this can be viewed as a reasonably good level, when compared with the power system losses in rest of the developing countries in the region, country need long strides to reach the levels achieved by the developed countries. Before formulating strategies for loss reduction, it is essential to determine the losses at each level. Once losses are segregated, utility can clearly identify their priorities and launch effective programs to arrest losses.

At present the CEB doesn't have the data required to calculate the energy loss of the LV network and has only few basic information. Further collecting LV network data and calculating the LV loss by modeling the LV network is difficult to be done practically.

So, the objective of this study was to build a suitable methodology to calculate the transformer wise energy loss using the available LV network data in CEB to identify the transformers with high technical energy loss and the areas with higher non-technical loss.

In this study, total transformers were divided into 3 groups according to the consumer mix and 6 sample transformers were selected. Then calculated the technical power loss of feeders after doing the synergy modeling for the each feeder that has been selected and a formula was built to calculate the feeder power loss based on the results obtained. The technical energy loss of each transformer is calculated after calculating the feeder wise technical power loss of the 20 transformers using the built formula. Based on the results of the 20 transformers a formula was built to calculate the technical energy loss.

According to the results of this study, the technical energy loss of LV network in Ratmalana area is 2.6%. and it increases to 3.12%, when lines are consisted with 70 mm^2 ABC lines. Further, there are 10% of transformers in this area with technical energy loss greater than 4% and 50% of the transformers has a value less than 1.5%.

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LIST OF ABBREVIATIONS

Abbreviation	Description
CEB	Ceylon Electricity Board
LECO	Lanka Electricity Company (Pvt.) Ltd
PUCSL	Public Utility Commission of Sri Lanka
NTL	Non-Technical Losses
TL	Technical Losses
GDP	Gross Domestic Production
DL	Distribution License
HT	High Tension
DD	Distribution Division
WPS1	Western Province South 1
MV	Medium Voltage
LV	Low Voltage
EG	Embedded Generators
GSS	Grid Substations
CSC	Consumer Service Centers
PPM	Programmable Poly phase Meter
TOU	Time of Use
SIN	Substation Identification Number
EE	Electrical Engineer
CE	Chief Engineer
AEE	Area Electrical Engineer
ABC	70 mm^2 Aerial Bundle Conductors
T/F	Transformer

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