Reliable Electric Power Supply to Jaffna
Study on the Jaffna Medium Voltage Network

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Abstract — **Energy plays a major role in development of a nation. Therefore, proper studies of energy usage are important for a sustainable development. Especially in Jaffna, the electrical energy consumption increases rapidly during the recent past years. It has been reported that the electricity produced in Jaffna region have (i) low reliability, (ii) large network losses, (iii) high generation cost and (iv) high environmental pollution.**

Recent research and development has resulted advance technology up to smart grid concept to make the electrical network smarter, which operates the grids effectively and efficiently. As a post war development, it is important to have proper study and implement the latest stable technology as the best solution for the betterment to the community thus the country.

This paper presents the modelling of the existing Jaffna Medium Voltage (MV) network. This study has resulted few over loaded transformers in the MV network. Therefore, if the network remains same and with the rapid increase in demand, this will leads many places with under voltage or over loading problems. Further properly modelled study will help to implement automated network concept, which can efficiently operate the network with high reliability, good power quality and low losses.

Keywords — **Energy, Medium Voltage, Voltage violation and Jaffna Electric Power Network.**

I. INTRODUCTION

Modeling of power system network is the foundation of a power system analysis and it is an area, which has the most priority in a power system analysis. Existing arrangement of the system and its performance can be checked by this power system modeling. These days the world runs towards the globalization. There are many new techniques, thoughts and inventions. Finding the appropriate tasks on network operation, maintenance, expansion can be done through power system modeling. Because of the different kind of load addition in the irregular manner, the planning of the power system has become a challenging issue. Power system modeling and analysis on the model using the available data enables planners to make correct decision. Many power system modeling simulation packages are available in the market to model and simulate power systems with advanced characteristics of different equipment. Selection of the simulation package for this kind of application is highly subjective on the purpose of modeling, cost and accuracy [1 - 4].

In Sri Lanka, Jaffna Peninsula is one of the well-known places with many admirable things itself including university,

public library and other important places. Jaffna peninsula is having an isolated electric power system grid. According to the recent release of the long term transmission of the Ceylon Electricity Board (CEB), the Jaffna MV network is going to be connected to the National Grid before 2016 [5]. Therefore to study about aforesaid interconnection and internal operations of the grids, it is mandatory to have both models (interconnected and islanded) in simulation software.

This paper explains the modeling of the Jaffna MV network using IPSA computer simulation package. Accuracy of the power system model is very important as it is the backbone for all further studies. Further this paper explains the validation of the model using measured data of the existing system.

II. DESCRIPTION OF THE EXISTING POWER SYSTEM

In early 1970's Jaffna MV network was connected to the national grid. It was disconnected during the conflict period and it is going to be re-connected to the national grid by near future. In the existing Jaffna MV network, the power generation is mainly by thermal, which are diesel power plants. The power station is located at Chunnakam. There are three power providers, they are two Independent Power Providers (IPPs) and CEB. IPPs are namely Aggreko and Northern Power. Table-1 shows the details about the all three power distributers. According to the contract, total power is 46 MW. Normally Jaffna peninsula Day and Night peaks is respectively 43 MW and 36 MW.

TABLE I
DETAILS OF POWER PROVIDERS

Power distributors	Contract power/MW	No of generator	No of transformers
IPP1	18	7	2 x (11/33 kV)
IPP2	15	18	6 x (0.4/11 kV) & 2 x (11/33 kV)
CEB	13	14	14 x (0.4/33 kV)

There are 7 feeders in Jaffna power system namely CHAVA, PPD, JAFFNA, KOMPAYAN, KKS1, KKS3 and VADDU. There are 3 primary sub stations and they are located at JAFFNA, KOMPAYAN and VADDU. Fig. 1 shows the single line diagram of all feeders' arrangements and Fig. 2 clearly shows the path of physically placed feeders in Jaffna Peninsula.