TECHNO-ECONOMIC FEASIBILITY OF 400kV FOR THE 2032 TRANSMISSION SYSTEM OF SRI LANKA

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Degree of Master of Science

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DECLARATION OF THE CANDIDATE & SUPERVISORS

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(Dr. L.N.W. Arachchige)

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(Dr. H.M.Wijekoon)

ABSTRACT

Electricity is a basic need for the economic growth of any country. Therefore, the electricity demand grows at a higher rate with the rapid development of the economy. To meet the increasing demand of electricity, addition of new generation capacity into the system is required.However, with new generation additions , there should be a way to transmit bulk power to load centers. This transfer of power is done through the transmission network.

Transmission system of Sri Lanka mainly operatesat 220 kV and 132 kV voltage levels and it interconnects the grid substations (GS) and power stations (PS). Together with the increase of electricity demand and bulk power generation, there is a point at which introduction of new higher voltage level is required for reliable, efficient and better quality of supply. However, it has to be technically feasible and economically justifiable.

This study focuses on the major bulk power transmission from Sampur, Ambalangoda and Hambanthota generation stations of Sri Lanka to load centers. Two power system models for each 220kV and 400kV voltage level options were developed for the years 2025 and 2032. These models were analyzed for voltage stability using PV and QV curves in order to find the technical feasibility between the two options.

Then the economic analysis between the two options was performed in order to assess the economic feasibility of the two options.Technical feasibility and economic justification of introducing a higher voltage than that of existing voltage to transmit bulk power to load centers from bulk power generating stations in Sri Lanka is discussed in detail in this research.

Keywords: *economical, electricity, transmission, voltage stability*

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LIST OF ABBREVIATIONS

Abbreviation	Description
AC	Alternating Current
ACSR	Aluminium Conductor Steel Reinforced
B/C	Benefit to Cost ratio
CEB	Ceylon Electricity Board
DC	Direct Current
EHV	Extra-High Voltage
EIRR	Economic Internal Rate of Return
FC	Foreign Cost
GE	General Electric
GS	Grid Substation
GS/PS	Grid Substation and Power Station
HV	High Voltage
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
LC	Local Cost
LTGEP	Long Term Generation Expansion Plan
LV	Low Voltage
MF	Multiplying Factor
MLKR	Rupees Million
MV	Medium Voltage
NPV	Net Present Value
PS	Power Station
PSS®E	Power System Simulator for Engineering
ROW	Right of Way
SCC	Short Circuit Capacity
SIL	Surge Impedance Loading
SS	Switching Station
TL	Transmission Line
UG	Under-Ground
UHV	Ultra-High Voltage

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