ECONOMIC ANALYSIS OF ADDING CAPACITOR BANKS TO THE SRI LANKAN NETWORK

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Declaration

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(Dr. K.T.M. Udayanga Hemapala)

Abstract

At present, there are significant reactive power flows in the Sri Lankan power system, giving rise to excessive network losses, creating under voltage conditions and limiting the utilization of transmission line and transformer capacities. This undesirable flow of reactive power through the network can be reduced by generating reactive power as close as possible to the loads; at least at grid substation level. Capacitor banks can be used for reactive power compensation and voltage support in grid substations as it is a comparatively inexpensive source of reactive power.

Ceylon Electricity Board (CEB) has some amount of breaker switched capacitor banks installed at several grid substations. In most of the cases the capacitors have been selected only with the aim of mitigating under voltage situation and very little attention is given for loss reduction in the power system by installing capacitor banks. But still there are grid substations which experience under voltages during some periods of the day. Therefore, the objective of this research is to propose new additions of capacitors to the CEB network for network loss reduction and mitigating under voltage levels.

Whole CEB power system is modeled in Power System Simulator for Engineering (PSS®E) software. Load flow network simulations were run for different scenarios and identified the grid substations showing the under voltages and key locations for reactive power demand. First the required sizes of capacitor banks were selected for grid substations considering only under voltage mitigation. Then the capacitor banks were selected for grid substations considering both voltage support and loss reduction. The new selection of capacitors was justified by examining its economic feasibility.

Proposed new additions of capacitors to the CEB network can contribute for reducing the network losses, delaying the investment on generators and improving the voltage level in the power system.

Key words: Reactive Power, Breaker Switched Capacitor, Network Loss Reduction

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List of Abbreviations

Abbreviation	Description
AVR	Automatic Voltage Regulator
BSC	Breaker Switched Capacitor
CEB	Ceylon Electricity Board
GT	Gas Turbine
NPV	Net Present Value
PCB	Poly Chlorinated Biphenyl
PSS/E	Power System Simulator for Engineering

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