OPTIMUM REACTIVE POWER COMPENSATION & VOLTAGE CONTROL USING STATIC VAR COMPENSATOR FOR GRID SUBSTATIONS

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DECLARATION OF THE CANDIDATE AND SUPERVISORS

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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26th October, 2015

The above candidate has carried out research for the Masters dissertation under our supervision.

Signature of the Supervisor

(Dr. Asanka Rodrigo)

26th October, 2015

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ABSTRACT

As the volume of power transmitted in transmission lines increases, maintaining high quality and reliable power supply is required. Modern power systems sometimes operate with heavily loaded lines resulting in power system to work under condition of higher power loss and higher voltage deviation. Sometimes, it may lead to voltage instability or system collapse.

The emergence of power electronic based FACTS technology such as Static Var Compensator (SVC) has been of great help in improving the operation of power systems as it reduces the power system instability problem, power losses and voltage deviation. Placing FACTS devices at proper locations can serve the purpose of improving voltage levels and reducing losses in the system. Due to huge investments associated with SVC, a proper analysis and planning is required before the installation.

The objective of the study is to use optimization technique for minimization of power loss and voltage deviation along with installation cost calculation for the selection of SVCs for grid substations. Whole Sri Lankan power system has been modeled using the PSS/E (Power System Simulator for Engineers) software. The voltage deviation of all the buses in the network and the total active power loss in all the transmission lines are analyzed with SVCs and without SVCs using PSS®E software. Further, single line outages are considered as contingencies for optimal placement of SVC. Finally, optimum combinations of SVCs are selected to minimize the system voltage deviations and active power loss of transmission lines.

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LIST OF ABBREVIATIONS

FACTS	Flexible AC Transmission System
SVC	Static Var Compensator
TSC	Thyristor Switched Capacitor
TCR	Thyristor Controlled Reactor
FC	Fixed Capacitor
PS	Power Station
PSS/E	Power System Simulator for Engineers

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