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OPTIMAL CONTROL OF REACTIVE POWER FLOW FOR IMPROVEMENT IN VOLTAGE PROFILE AND REAL POWER LOSS MINIMIZATION

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Abstract

Reactive power consumption increases losses in the system, which reduces the total system real power. Total system real power loss can be minimized by optimizing reactive power in the system. This can be obtained by optimally setting the terminal voltage of generating plant, transformer tap settings, output of compensating devices such as capacitor bank and synchronous condensers.

Conventional Optimal Reactive Power Flow (ORPF) formulations utilize minimization of total system real power loss or voltage deviation as an objective to compute optimal settings of reactive power output or terminal voltage of generating plants, transformer tap settings and output of compensating devices. The present work has considered the setting of Flexible AC transmission system (FACTS) devices as additional control parameters in the ORPF formulation and study its impact on system loss minimization. FACTS device consisting of Thyristor Controlled Series Compensator (TCSC), has been included in the present ORPF formulation.

FACTS is a concept promoting the use of thyristor-controlled devices in the power system with the objective of optimally utilizing the existing transmission system facilities. Evolution of FACTS has given rise to fast acting controllers which control the parameters affecting power transfer namely the end voltage magnitude, angle between end voltages and transmission line impedance. The development of these devices is based on the use of reliable high-speed power electronics, advanced control technology, advanced micro-computers and powerful analytical tools

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