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STATCOM Control Reconfiguration Technique for Steady State and Dynamic Performance Optimization during Network Fault Conditions

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Abstract: The introduction of flexible AC transmission/distribution system (FACTS) in a power system is to improve the stability, reduce the losses, and also improve the loadability of the network system. Herein, the proposed work is a non-traditional optimization technique which has been adopted to optimize the various process control parameters that contribute notably to control STATCOM device operations in a power system network during any undesired condition. The simulation was performed by taking into consideration STATCOM process control parameters; hereby the controller was also configured in strategic ways to optimize the control model under both steady state and dynamic performances. The optimization process results have clearly indicated that the introduction of STATCOM device in the right location of the system increases the loadability and sustainability of the power system through optimization process. The new control can thus be effectively used for this type of optimization process.

Keywords*: UPFC, TPSC, PSCAD, PLL, PI*

Introduction

The generating and absorbing of controllable reactive power with various power electronic switching converters are extensively used in power system to maintain steady state and dynamic performance of the controllers. The use of power electronics has been largely recognized [1-7]. The STATCOM based on voltage source converter is used for voltage regulation in transmission and distribution systems [1-15]. The STATCOM objective is to rapidly supply dynamically defined VARs to meet system operational requirements for voltage support during any system fault condition.

To improve the power electronics based control system performance PWM (plus-width-modulation) strategic operations technique has been developed and adopted through PI controller to reduce the STATCOM and total system losses. The voltage source converters will function precisely and within control limit when the PWM operations technique is in place. In this paper, the PI controller has been used to optimize the "PWM" strategic operations to control the STATCOM process parameters to prevent any possible deviation which may lead to STATCOM tripping. In this connection, suitable DC capacitor selection has been carefully selected so as to enhance its effectiveness to mitigate any possible affects during any abnormal event.

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