ABSTRACT

FACTS technologies can have major positive impacts on power system reliability performance and the actual benefits obtained can be assessed using suitable models and practice. Emerging techniques for composite power system reliability evaluation mainly focus on conventional generation and transmission facilities. In this thesis, the impact of FACTS controllers on Composite Power System Reliability on RBTS is examined by incorporating the controller devices.

FACTS controllers are used for natural sharing of power where as series compensator is used for reducing the effect of inductance. Addition of capacitance in series with the transmission line modifies the reactance of line. Number of TCSC’s & UPFC’s are connected in series (which is a multi module), to determine the individual reliability. This can be done by using state space representation or series-parallel system configuration using network reduction technique. Reliability analysis of the entire transmission system is being carried out by using load indices like loss of load expectation (LOLE) and loss of energy expectation (LOEE). A comparison has been carried out between the FACTS controllers (UPFC & TCSC); the results show a major improvement in the system reliability when using UPFC & series compensator. Software has been developed to determine the load indices and the limiting state probabilities using MATLAB / C.

A novel approach of composite power system has been presented by incorporating FACTS controllers in the RBTS system in all the transmission lines for determining the system reliability. Multi module FACTS controllers are also incorporated
in the system to determine the reliability of the system by using state space representation or series parallel representation using network reduction technique. Investigation results show a significant improvement in the Load point, system indices, probability of failure & EENS when utilizing UPFC rather than TCSC in all transmission lines & generation capacity while comparing the FACTS devices.

In order to improve system performance the impact of the combination of TCSC & UPFC will have to be considered. In this thesis an attempt is made to study the impact of TCSC & UPFC when combines on composite power system by using network reduction techniques.

In Chapter 1, Introduction of the thesis, literature survey and organization of the thesis is presented in detail.

In Chapter 2, Reliability analysis of transmission line with TCSC and Series Compensator has been discussed with all illustrations and algorithms. State space analysis and Series – Parallel representation of the combinations are also presented.

In Chapter 3, Reliability analysis of transmission line with UPFC and Series Compensator has been discussed with all illustrations and algorithms. State space analysis and Series – Parallel representation of the combinations are also presented. A comparison has been carried for the FACTS components of TCSC and UPFC for the given system.

In Chapter 4, Reliability analysis of 6 bus RBTS with different UPFC modules has been discussed with all illustrations and algorithms. Comparison between these
modules is presented. System Indices (BPSD, BPII, BPECI), probability of failure and EENS are also presented in both numerical and graphical form.

In Chapter 5, Reliability analysis of 6 bus RBTS with different TCSC modules has been discussed with all illustrations and algorithms. Comparison between these modules is presented. System Indices BPSD, BPII, BPECI, probability of failure and EENS are also presented in both numerical and graphical form.

In Chapter 6, a comparison of reliability analysis, system indices, probability of failure and EENS has been carried out between UPFC and TCSC of a 6 Bus RBTS in order to find out which component has the best performance values in all aspects.

In Chapter 7, Reliability analysis of IEEE 6 Bus RBTS & 24 Bus RTS with TCSC and UPFC has been discussed with all illustrations and algorithms. State space analysis and Series – Parallel representation of the combinations are presented. Comparison between these modules is presented. System Indices (BPSD, BPII, BPECI), probability of failure and EENS are also presented in both numerical and graphical method.

In Chapter 8, Conclusion has been made on the entire work and scope for future work is also presented in this chapter.