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3	Ph.D Thesis Title	Robust Optimization Techniques for Location of Facts Controllers to Improve Power System Stability	
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7	Brief synopsis		

The research work carried out has two strategies – Conventional method called sensitivity method & computational intelligence technique (Genetic Algorithm and Particle Swarm Optimization) for optimal location of series FACTS controller. The research work presents an effective comparison of conventional method and evolutionary method for locating TCSC - a series FACTS device. The work also emphasizes the line flows and line losses in both the cases. It can be observed from the result that TCSC can be optimally located for any IEEE standard bus system using GA and PSO methods. The effect of placing TCSC in particular branch, results in loss variation in the lines. The total loss effectively reduces and it increases the power transfer capability of the line. The comparison of proposed GA and PSO methods for standard test systems clearly indicated that the GA method validates the superior performance than other PSO or Conventional methods.

A practical 220kV, 14 bus system a part of Karnataka Power System Network, in India for optimal location of FACTS device, has been considered to test the credibility of the two strategies. The results obtained are quite encouraging & will be useful in electrical restructuring.

Simulation studies have been carried out on a 220kv Basthipura real system. The most sensitive lines have been identified using conventional reactive power loss index method. TCSC has been effectively placed among the identified sensitive line using GA and PSO methods. It has been observed from results that the reactive power loss reduces by placing TCSC in the most sensitive line and the power flows in the line has been enhanced by 32%. In this case also GA performed more superior than PSO.

Shunt controllers like Static Var compensator (SVC) and Static Synchronous Compensator (STATCOM) are capable of effectively controlling the voltage profile by dynamically adjusting the reactive power output at the point of connection. However, these controllers are very expensive and, hence, their optimal locations in the network must be ascertained. Among these two FACTS controllers, SVC is more popular due to its lesser cost/size as compared to the STATCOM. Shunt Flexible AC Transmission System (FACTS) devices, when placed at the mid-point of a long transmission line, plays an important role in controlling the reactive power flow to the power network and hence controls system voltage fluctuations and improves transient stability. This thesis also deals with Impact of Shunt Facts Controllers on Transient System Stability of Power System using Matlab blockset simulink models. With different shunt FACTS devices, namely SVC and STATCOM in a long transmission line for a 3 bus system has been tested using the simulink model. It has been observed from the simulation results that by locating the STATCOM at the midpoint of the transmission line, transient stability has been enhanced compared to SVC. Self tuning regulator has also been adopted in the present research work by locating TCSC optimally at a specific bus for a 5 bus system and verified the parameters like voltage, current and power using simulink blockset models and results found to be satisfactory during normal and contingency conditions, which shows that stability has been improved.

Finally using conventional and heuristics methods for location of FACTS devices, the stability of the system has been improved and congestion in the overloaded lines has also been reduced, which in turn improved stability of the power system.