ABSTRACT

The present day power systems continue to witness an exponential growth in demand, owing allegiance to extensive automated needs of both domestic and industrial utilities. It is in tune with the growth of the nation that the extent of sophistication appears to evince a sense of reality in the present day world. Though technological revelation and the associated emergence of state of the art methodologies facilitate the ordeal, still precise requirements keep emerging and there is considerable scope for improvement.

The ever-growing load demand in the power system witnesses a gradual droop in the system voltage profile. It is precisely the inability of the system to generate the required reactive power that propounds the cause of voltage collapse. The system managers, thanks to a vibrant SCADA facility evolve schedules to extricate tirade situation and circumvent critical eventualities. However, the resurgence of well-defined mechanism is thus extremely significant in the context of voltage stability of power systems.

It is an accepted fact that a great deal of focus is in picture with regards to the use of reactive power compensation devices to alleviate this issue of voltage instability. However on account of the increasing cost of these VAR sources and owing allegiance to the truth that it is impractical to provide support at all the buses, there is a real need to device mechanisms to

predetermine the location and the exact requirements in order to ensure a smooth operation of the power system.

The recent developments in power electronics have introduced Flexible AC Transmission Systems (FACTS), which can facilitate the control of power flow, increase the power transfer capability, decrease the generation cost, improve the security and enhance the stability of the power systems. They allow the operation of the power systems more flexible, secure and economical through controlling various electrical parameters of transmission circuits. However, the decision on the size, the locations and their parameters is of great significance in obtaining the benefits of the FACTS devices.

It is in this prelude that an attempt is made to develop FACTS placement strategies that determine the size, type and location of FACTS devices with a view of enhancing voltage stability besides minimising the losses and improving voltage profile. The formulated algorithm in this dissertation is tested through three standard IEEE power systems to demonstrate its validity and illustrate its suitability for real time requirements.