Contribution à l'Etude du Choix Optimal de l'Emplacement du Dispositif UPFC dans les Réseaux Electriques en Utilisant une des Méthodes Artificielles

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Soutenue en: 2016

Abstract: With the increasing electric power demand, the operation of power system becomes more complex to operate within the indices power quality, and therefore will become less secure. The advent of Flexible Alternating Current Transmission Systems (FACTS) technology has coincided with the major restructuring of the electrical power industry; it can provide significant benefits in increasing system transmission capacity and power flow control flexibility and rapidity. Several types of FACTS exist and choosing the appropriate device depends on the objectives to reach. Unified Power Flow Controller (UPFC) is one of the most effective FACTS devices for enhancing power system security; however, to what extent the performance of UPFC can be brought out, it highly depends upon the location and parameter setting of this device in the system. A lot of research has been done on determining the optimal locations of FACTS devices in power systems. There are several methods permitting to find the optimal locations of FACTS devices according to specified criteria and constraints. Among these methods are found the Genetic Algorithm (GA) method. The latter is a global search and optimization technique which is based on the mechanisms of natural selection and genetics; it can search several possible solutions simultaneously and do not require any prior knowledge of the objective function. In this thesis, genetic algorithms technique is used to solve the problem of choosing the location and rating of FACTS to install. Five types of FACTS devices have been used in this study namely: SVC, TCSC, TCVR, TCPST and UPFC. These FACTS devices are used to maximize the system loadability in the network. Their position and size are determined using coefficients calculated when the load increases. To validate the efficacy of the technique used, has been applied on many IEEE standard electrical network test (14, 30 and 57 bus) using the MATLAB program.

Keywords : Indices power quality, FACTS, UPFC, GA, global optimization, objective function, SVC, TCSC, TCVR, TCPST, loadability, MATLAB program