

Transmission Line Congestion Management Using Hybrid Fish-Bee Algorithm with Unified Power Flow Controller

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Abstract : There is a widespread changeover in the electrical power industry universally from old-style monopolistic outline towards a horizontally distributed competitive structure to come across the demand of rising consumption. When the transmission lines of derestricted system are incapable to oblige the entire service needs, the lines are overloaded or congested. The governor between customer and power producer is nominated as Independent System Operator (ISO) to lessen the congestion without obstructing transmission line restrictions. Among the existing approaches for congestion management, the frequently used approaches are reorganizing the generation and load curbing. There is a boundary for reorganizing the generators, and further loads may not be supplemented with the prevailing resources unless more private power producers are added in the system by considerably raising the cost. Hence, congestion is relaxed by appropriate Flexible AC Transmission Systems (FACTS) devices which boost the existing transfer capacity of transmission lines. The FACTs device, namely, Unified Power Flow Controller (UPFC) is preferred, and the correct placement of UPFC is more vital and should be positioned in the highly congested line. Hence, the weak line is identified by using power flow performance index with the new objective function with proposed hybrid Fish & Bee algorithm. Further, the location of UPFC at appropriate line reduces the branch loading and minimizes the voltage deviation. The power transfer capacity of lines is determined with and without UPFC in the identified congested line of IEEE 30 bus structure and the simulated results are compared with prevailing algorithms. It is observed that the transfer capacity of existing line is increased with the presented algorithm and thus alleviating the congestion.

Keywords : available line transfer capability, congestion management, FACTS device, Hybrid Fish-Bee Algorithm, ISO, UPFC

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