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A Cross Border Congestion Management System integrating DC and AC Load Flow Models

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The rapid growth of cross border trading in Europe since the liberalization of the electricity markets has led to an increase of cross border power exchange. But due to the insufficiency of transmission capability of some European interconnections congestions occur in the UCTE system. Therefore the development of new efficient cross border congestion management systems is necessary for future competitive electricity markets. After the day-ahead market closure the Transmission System Operators (TSOs) receive the schedules of the generation units and demand. This data are the basis for the next day's operation planning including the congestion forecast. Reliable operation of the power system requires that the transmission system has to be operated within limits dictated by thermal and voltage constraints as well as (n-1)-contingencies analysis. In case of contingencies the TSOs have to relieve them using corrective measures. In this paper only the corrective measures that can be performed day ahead or during real time operation such as corrective switching, internal redispatch or coordinated redispatch are considered.

The aim of this paper is to present a cross border congestion management system based on evolution strategy which integrates DC and AC load flow models to assess possible congestions. The congestion management problem is formulated as an optimization problem with the objectives to minimize the total cost of all the corrective measures. The corrective measures proposed from the cross border congestion management system include both corrective switching and redispatch. Different load flow models are apply in order to find a compromise between computation time using DC load flow model and accuracy using AC load flow model. With the proposed algorithm the computation time to obtain the corrective measures is reduced without loss of accuracy. The corrective measures are compared with four criteria: number of generator units affected by the redispatch, number of topological changes, total costs of the corrective measures. First calculations with the cross border congestion management system show that coordinated redispatch leads to a more cost-effective use of the generator units as an internal redispatch. Furthermore it shows that combining corrective switching with coordinated redispatch gives economical advantages. Simulation results on a realistic test system demonstrate the efficiency and functionality of the proposed tool to solve cross border congestion management problems in a satisfactory computation time.