IMPLEMENTATION OF A FLOW-BASED MARKET COUPLING ALGORITHM FOR CROSS-BORDER CONGESTION MANAGEMENT

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In an actual context of liberalization, the European interconnected power system is under reorganization: the electrical energy becomes a commercial product whose trades are not only managed in the national market, but even in the international one. One of the challenges of this reorganization concerns the congestion management to ensure the safety of the electrical network and to avoid blackouts like that in Italy in September 2003.

According to the common propose of ETSO and EuroPEX, the aim of this paper is to study a Flow-based Market Coupling (FMC) approach. Especially, the objective is to develop an application which allows studying and comparing many market coupling approaches in different day-ahead markets. This application developed in GAMS® compute the economical optimum, based on the technical constrains like transmission lines capacity, generation maximum output and based on the DC load flow equations. The economical optimum is based on the minimization of the total generation costs.

According to the European power system data, a model of the 1st synchronous UCTE allows comparing several market coordination processes. Moreover, the separation of the UCTE network into many areas named as mini-fora in the 11th Florence Forum meeting of 2004 is adopted. Then, based on the FMC approach, many market coordination processes are evaluated. This coordination process gives encouraging results with a decrease of total costs of over 2% referred to the isolated national market case and with very good correlation factor of the generation amount in each country (exceeding 99%) and good correlation with the power flows on the interconnections, too.

Finally, the validation of the power system model is proposed by a sensitivity factors analysis. Referenced to a more complex model, the Power Transfer Distribution Factors values (PTDF) are compared with real ones. Comparing the results for different transactions, the correlation factor is only some percent worse than the more complex model which reaches over than 95%.