

European day-ahead electricity markets simulation

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European Power Exchanges (PXs) constitute marketplaces where two-sided supply (portfolio- or unit-based) and demand orders are effectively cleared in the presence of critical line congestion constraints, and settled in a uniform, marginal price per bidding area. During the last decade, the European Commission has prioritized the creation of a single internal electricity market, aiming at the effective trading of electricity products in different bidding areas and time periods.

In this direction, important steps have been achieved lately with the creation of a pan-European day-ahead electricity market. In June 2012 and following the publication of the Network Codes on capacity allocation and congestion management by ENTSO-E, seven PXs of the European region launched the Price Coupling of Regions (PCR) initiative, which aimed at the integration of the aforementioned day-ahead electricity markets, along with the electricity markets of the CEE region, Great Britain and those of the Italian and Iberian peninsulas. The clearing of the envisioned pan-European day-ahead electricity market has been performed through a price coupling algorithm, called EUPHEMIA. This algorithm is practically an extension of the COSMOS software (previously developed for the clearing of the day-ahead markets of CWE) and incorporates all market and network constraints appearing in the coupled electricity markets.

The successful launching of the PCR algorithm took place in February 4th 2014, effectively coupling in this way the CWE region and the Nord Pool Spot market. Further important steps in the creation of the pan-European day-ahead electricity market were achieved with the implicit auctioning of the Spain-France border (13th May 2014), whereas the Italian market has been successfully coupled to the other European markets at the 24th February 2015.

The Power Systems Lab of Aristotle University of Thessaloniki has created an optimization tool, named “EUTERPE”, as an acronym of “EUropean-Type Electricity maRket sPlitting modEl”, which fully simulates the functionalities of EUPHEMIA, in terms of market products’ clearing conditions and transmission constraints (ATC-based and flow-based model). The optimization tool employs an iterative algorithm for the handling the non-intuitive bilateral exchanges and the paradoxically accepted block and minimum income orders. The basic functionality of EUTERPE shall be the basic subject of the current lecture.

Additionally, the research conducted in the Power Systems Lab of Aristotle University of Thessaloniki concerning the optimal allocation of flexibility resources in the day-ahead scheduling phase and in the real-time balancing market shall be discussed.