



GAMS

OPTIMIZING POWER TRADING AUCTIONS

A GAMS Application in the Energy Sector

The German “Energiewende” (transition of the energy system) aims for a power system on the basis of renewable energy sources (RES). In 2015, about 30% of the power generation was provided by RES. The RES target for 2025 is a 40–45% share and 55–60% are expected in 2035. Large parts of these shares are based on fluctuating wind and solar power. For a successful “Energiewende”, a highly efficient matching of generation and demand will be required.

The Auctioning Markets

One important element to achieve that is the organization of ancillary services. Those are fast reacting generators used by the transmission system operators (TSOs) to smooth short-term imbalances. These balancing reserves are procured by the TSOs via auctioning markets. Potential suppliers place related offers and the TSOs select the most cost-efficient combination of bids to cover the requirements. Supported by several TSOs, the 50Hertz Transmission GmbH, TSO of Eastern Germany and part of the Elia group, manages an internet platform to collect bids and execute described auctions of balancing reserves.



The Optimization Solution

As a technical solution for a timely and robust calculation of the auction results, the optimization software GAMS was chosen. The auctions translate to a mixed-integer optimization problem in which each country has a certain reserve demand. Exchanges of reserves are possible with respect to export limits and core shares (maximal total import for a country). A combination of bids is selected so that the demand in all countries is covered with minimal costs. CPLEX is the selected solver applying an extended solution pool so that no possible combination is neglected.

The reserve market is currently characterized by many ongoing changes of market design and regional scope. Thanks to the implemented solution, the incorporation of these changes was easy and straightforward. In total, the organization of the reserve market becomes more and more efficient reducing the electricity costs for all consumers despite the challenges of the “Energiewende”.



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