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Central- versus Self-Dispatch in Electricity Markets

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In US, electricity markets have converged to a standard market design, which is advocated by the Federal Energy Regulatory Commission (FERC). This design has some crucial differences to European electricity markets. In this paper, we discuss some advantages and disadvantages with the American wholesale market design compared to the European wholesale market design.

The US has centralized wholesale electricity markets, while most of Europe has decentralized wholesale electricity markets. In centralized markets, producers submit detailed cost data to the day-ahead market, and the market operator decides how much to produce in each plant. This differs from decentralized markets that instead rely on self-commitment and where producers send less detailed cost information to the operator of the day-ahead market.

Ideally centralized electricity markets would be more effective, as the clearing process considers more detailed information, such as start-up costs and no-load costs. On the other hand, the bidding format is rather simplified and does not allow producers to express all details in their costs. This is a particular problem for plants with complex cost structures, such as Combined Cycle Gas Turbines (CCGT) and cascaded hydroelectric systems.

The main problem with centralized markets in the US is that they do not provide intra-day prices which can be used to continuously up-date the dispatch as the forecast for renewable output changes. It should be possible to reduce this problem by introducing centralized intra-day auctions. Moreover, due to uplift payments, producers have incentives to exaggerate their costs. Centralized markets with uplifts payments are not budget balanced. In this report we argue that there is a trade-off between rents and efficiency when designing tariffs that are used to cover the uplift payments.

Another issue with centralized markets is that they are very computer intensive and NP-hard to scale up. This is a potential problem as the global trend is to increase the geographical size of electricity markets and to shorten the length of delivery periods. On the other hand, the computational performance and the performance of clearing algorithms are also improving over time. The iterative and computer-intensive clearing process means that centralized electricity markets are opaque and somewhat of a black box. The dispatch changes for each iteration, which makes the dispatch somewhat arbitrary.

Intra-day markets are more flexible and better adapted to deal with renewable power in decentralized markets. Iterative intra-day trading in a decentralized market can also be used to sort out coordination problems related to non-convexities in the production. On the other hand, the downside of iterative trading is that increased possibilities to coordinate also increase the risk of collusive outcomes. Continuous intra-day trading has problems to deal with inter-zonal congestion in an efficient way. It is our belief that discrete, auction-based, intra-day trading is necessary to manage this issue.

Self-dispatch means that more of the data processing and dispatch optimization has been delegated to producers, which should increase their costs. Transaction costs are probably higher in a decentralized market. Block orders reduce this problem, but on the other hand they also introduce some of the drawbacks of a centralized market. Financial markets and hedging work better for decentralized markets with zonal pricing.

We believe that European decentralized day-ahead markets can be improved by considering network constraints in more detail, as in US. Many European countries would benefit from reducing the size of their zones, especially on the supply side. For political reasons and to encourage producers to sell more in the forward market, there are advantages with having large zones for consumers, and smaller zones for producers. The flow-based approach that is advocated by EU should also improve market efficiency.

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