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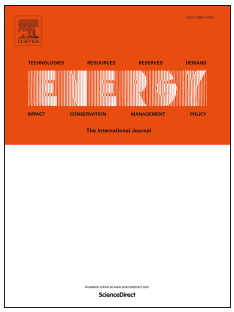

Stochastic electricity dispatch: A challenge for market design

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Stochastic Electricity Dispatch: A challenge for market design

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Abstract

We consider an energy-only electricity market where some generation and/or load is uncertain, and where there are flexibility costs, i.e. some conventional power plants have to be scheduled well before real time in order to participate in the dispatch, while for others, additional cost incurs if generation plans have to be adjusted close to real time.

In practice, electricity markets are often organized with sequential market clearing, and in this paper, we consider two sequential markets, for instance representing a day-ahead and a real-time market. We compare the outcomes of 1) a stochastic market clearing model, i.e. an integrated model that takes into account both markets and the uncertainty, to 2) a myopic market clearing model, where the first market is cleared based only on given bids, and not taking into account neither the uncertainty nor the bids to the second market.

Compared to previous literature, our main contribution is that we compare the two different market models with respect to both efficiency and allocation of surplus, and thus the incentives they imply for the market participants. We discuss what information is needed in market agent bids and how that information can be manipulated.

While the stochastic market clearing gives a solution with a higher expected social welfare, it poses several challenges for market design. The stochastic dispatch may lead to a dispatch where the day-ahead prices deviate from the bid curves to the first market. This can lead to incentives for self-scheduling, in that it may require market participants to accept prices that deviate from the marginal costs or benefits corresponding to the scheduled quantities. Our analysis shows that the intermittent producer has an