Influence of Operational Risk Assessment on Bidding Strategies in Power Markets

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Abstract
Advanced analytical tools are enabling the estimation of new measures of operational reliability in power systems. In bid-based power markets, these estimates could be included in the information set that is provided to bidders. Such information could lead to improved market efficiency due to more informed decision-making, or to opportunistic bidding strategies that adversely affect economic efficiency. This paper explores the relationship between risk assessment and bidding strategies. Implications of that relationship for market information policies are assessed. Of particular focus is information on operational reliability effects of incremental changes in generation levels.

1. Introduction
Bid-based generation market systems are being used to establish competitive generation markets. Key to designing an efficient bidding system is specifying the information set that is provided to bidders. The public policy objectives in establishing the information set could include:
- Achieving economically efficient bidding schedules,
- Maintaining operational reliability,
- Enabling market-enforcement of bidding rules (where rule violations such as collusive bidding could be identified by market participants), and
- Creating fair market rules (so that the rules do not unduly favor one market participant over another).

Information provided to a centralized market is typically specified in a system code that applies to the power exchange and independent system operator (ISO) functions.

Operational risk assessment is important in bid schedule development. A particular concern to generation bidders is whether their bidding strategy results in generation choices by a power exchange or ISO that adversely affects the risk that the bidder will not be supplying energy to the market. Opportunistic bidding inconsistent with efficient use of resources could also arise from market power arising from the bidder’s geographic location and from the system reliability effects of private decision-making.

There is a parallel concern from the power system perspective on whether bidding schedules degrade operational reliability. Reliable operations are important in allowing the market to work and in avoiding uncompensated losses in value to generators and consumers. Economic incentives and physical controls can be used to assure reliability.

Advanced computational techniques now exist for estimating new measures of operational reliability, such as the effects of incremental changes in a generation level on operational reliability. From a system perspective, that knowledge is useful for determining directions for generation (or market transaction) reallocation to avoid infeasible system operating conditions and for determining ex ante nodal prices. From a bidder perspective, this information can affect bidding strategy development because of its effects on profitability risk. Without this information, generators may undertake independent evaluations that could lead to bidding strategies based on misinformation. A related question is whether such information is needed if prices incorporate reliability effects.

The objective of this paper is to explore the relationship between risk assessment and bidding strategies, and the implications of that relationship for information policies in markets with centralized bidding. Of particular focus will be information on the operational reliability effects of generation changes around a base system condition.

[The complete paper can be downloaded in PDF format from the Power System Engineering Research Center (PSerc) web site at http://www.pserc.wisc.edu. Follow the Publications link.]