Economic Inefficiencies of Cost-based Electricity Market Designs

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Overview

Some restructured power systems rely on audited cost information instead of competitive bids for the dispatch and pricing of electricity in real time, particularly in hydro systems in Latin America. Audited costs are also substituted for bids in US markets when local market power is demonstrated to be present. Regulators that favor a cost-based design argue that this is more appropriate for systems with a small number of generation firms because it eliminates the possibilities for generators to behave strategically in the spot market, which is a main concern in bid-based markets. We discuss existing results on market power issues in cost- and bid-based designs and present a counterintuitive example, in which forcing spot prices to be equal to marginal costs in a concentrated market can actually yield lower social welfare than under a bid-based market design due to perverse investment incentives. Additionally, we discuss the difficulty of auditing the true opportunity costs of generators in cost-based markets and how this can lead to distorted dispatch schedules and prices, ultimately affecting the long-term economic efficiency of a system. An important example is opportunity costs that diverge from direct fuel costs due to energy or start limits, or other generator constraints. Most of these arise because of physical and financial inflexibilities that become more relevant with increasing shares of variable and unpredictable generation from renewables.

Methods

Critical analysis of existing literature on market power issues in bid- and cost-based electricity markets.

Bi-level equilibrium modelling.

Results

We find that most of the markets that operate under a cost-based design do it so to prevent the exercise of market power in the short term. However, using a simple example we show that there is no evidence that operating a simulated spot market based on audited costs is more efficient than a bid-based one. We also list a series of difficulties of auditing opportunity costs in the prescense of inflexible contract designs, renewable policies, and generators with intertemporal constraints.

Conclusions

In this paper, we discussed some of potential inefficiencies of cost-based electricity market designs, in which investments are deregulated but the dispatch and pricing of power is conducted based on audited cost information from private generation firms. Many countries in Latin America opted for these hybrid designs at the time of deregulation with the goal of preventing the exercise of market power in the spot market (Hammons et al., 2002)—the type of strategic behavior that regulators and consumers seem most sensitive to. Elsewhere, Ireland until recently had a similar system, and several US markets also require cost-based bidding when local market power is shown to exist. However, up until now, little has been said with regards to the economic efficiency of such markets and how effective they are at reducing the incentives for generators to behave strategically compared to bid-based markets, especially concerning long-term investment.

Our main arguments are that cost-based spot market designs have two main features that make them inefficient. First, the exercise of market power is still possible in concentrated markets where there are barriers to entry, since firms have incentives to underinvest or to increase the share of the peaking technology, deviating from the socially-optimal generation portfolio. We use a simple numerical example to show that the welfare loss due to the exercise of market power can be larger in a cost-based market than under a bid-based one. Thus, a bid-based design can be more

efficient than a cost-based one even if firms can behave strategically in the spot market. Second, we argue that auditing the true marginal costs of generation is difficult in a market environment when firms face important opportunity costs that are not directly attributable to expenses on fuel and other out-of-pocket operations and maintenance costs. Opportunity costs can be large in situations where, for example, generators face inflexible fuel contracts, firms are subject to environmental regulations or renewable generators can obtain additional revenues from tax credits or from the sales of RECs, and where there exist intertemporal generator constraints such as a bound upon the number of starts over a limited period. These become more relevant in systems with increasing shares of variable and unpredictable generation from renewable energy resources.