The impact of coordination on wholesale market participation: The case of the U.S. electricity industry

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Abstract

Coordination costs in a wholesale electricity market are a relevant public policy consideration. The mitigation of coordination costs, all else equal, should increase participation in the marketplace. Since Federal Energy Regulatory Commission (FERC) Order 888 was issued in 1996, the level of trading activity in bulk electricity markets has increased significantly. In 1999, FERC issued Order 2000 to advance the role of regional transmission organizations (RTOs) in the restructured marketplace for wholesale electricity. RTOs have the potential to reduce the coordination costs, while also having the countervailing effect of causing market participants to incur compliance costs. This paper utilizes the diversity of the United States electricity market and a panel data set representing electric utilities for the period 1990-2009 to study the effects that RTOs have had on wholesale electricity exchange. The paper finds that the presence of a transparent wholesale marketplace for electricity has the effect of increasing participation, but this participation is uneven across types of electric utilities. Greater participation is seen for investor-owned and larger utilities. The results have important implications for policy aimed at wholesale markets and the transmission organizations, as the opportunities afforded by transparency may not be uniformly distributed across all market participants.

1. Introduction

On December 20, 1999, the Federal Energy Regulatory Commission (FERC or “the Commission”) issued Order No. 2000 in Docket No. RM99-2-000, a docket opened to explore the role of Regional Transmission Organizations (RTOs) in the restructured electricity marketplace. The role of a RTO is to administer the electric transmission system, ensuring open access to the grid for all electricity generators. The FERC noted that since FERC Order 888 was issued in 1996, trade in the bulk electricity markets had increased significantly. FERC also noted that during the Notice of Proposed Rulemaking process for the instant docket, the Commission had “reviewed evidence that traditional management of the transmission grid by vertically integrated electric utilities was inadequate to support the efficient and reliable operation that is needed for the continued development of competitive electricity markets, and that continued discrimination in the provision of transmission services by vertically integrated utilities may also be impeding fully competitive electricity markets.”

FERC further enjoined utilities, state officials, and affected interest groups to voluntarily develop RTOs. Despite the urging of FERC, there remain substantial portions of the United States electricity grid that are not administered by RTOs or Independent System Operators (ISOs). While there are structural differences between the two types of organizations, the basic function of providing transparency in wholesale electricity pricing remains. Since that is the function analyzed in the paper, the terms ISOs or RTOs as used here are effectively indistinguishable.

Coase (1960) observed that there are costs involved in carrying out transactions in the market, such as the cost "to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to the bargain, [and] to draw up the contract..." Milgrom and Roberts
of reliability. If electricity demand and the criteria under which the utility optimizes its portfolio (say, least cost) are taken as exogenous, then the utility’s only task is to determine which of its generating units will be dispatched at any given time. To this end, Alpha assesses the hourly marginal costs of its generating units, considers any constraints related to the units’ availability or operating characteristics, determines how much electricity to supply, and dispatches units sufficient to meet the prevailing demand at the lowest possible cost.

Now consider the existence of a neighboring electric utility, Beta, which becomes physically interconnected to Alpha. Operating as an island, Beta faces the same decision as Alpha. However, if both utilities seek to minimize costs and, in a particular hour, there is a difference between the utilities’ marginal costs of generation that is greater than the cost of coordinated transmission between Beta and Alpha, then an opportunity for Pareto improvement exists. If Alpha has a higher marginal cost of generation than Beta in a given hour, then Beta can generate that marginal kWh and sell to Alpha at a price somewhere between their respective marginal costs, and both utilities have lowered their effective average cost of generation; Alpha by buying the marginal kWh at less than it would cost to generate it with its own units and Beta by realizing a sales revenue offset to its cost to generate the marginal kWh.

But the costs that must be incurred in order to achieve this benefit are not limited to the cost of transmission and the transaction itself. As Milgrom and Roberts observe, coordination costs also arise. Each utility must expend resources to gather information about the electricity system around it. First, each must identify the number of potential trading partners. Second, each must be able to assess the costs and availability of electricity in any given hour and for every one of those potential trading partners, in order to identify profitable trading opportunities. Third, each must know how to make the arrangements necessary to have that electricity delivered to the purchasing utility system for agreed upon transactions. Before the advent of RTOs and ISOs, the first and third tasks were often performed in the U.S. by roughly 140 regional balancing authorities (Joskow, 2005), organizations registered by the National Electric Reliability Council (now the North American Electric Reliability Corporation or NERC) to integrate future resource plans; maintain the balance between load, interchange, and generation; and support real-time interconnection frequency for a given area. The second function was accomplished primarily through bi-lateral contacts between utilities, though confederations of utilities also existed. For example, before ISOs and RTOs existed, the Orlando Utilities Commission, the City of Lakeland, and the Florida Municipal Power Agency formed the Florida Municipal Power Pool in 1988 to centrally commit and dispatch all of the pool members’ generating resources to meet the collective load obligations in the most economical manner.

Today, by establishing a transparent wholesale marketplace, the RTO can fulfill the second task either by maintaining a centralized databank of hourly prices, or by collecting hourly bids and offers from utilities and generators interested in participating in the market. While the RTO can lower the costs required to gather this information, other costs to participate in the market still exist. Utilities must incur costs in order to conform to the rules and procedures of wholesale markets and the ability to trade with utilities belonging to other RTOs may be constrained. In a survey of RTO cost-benefit studies, Eto et al. (2005) report that while utilities will incur market participation costs, these costs had not been
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