Wholesale Energy Markets: Setting the Right Framework for Price Responsive Demand

Market-based dynamic pricing, or price-responsive demand, has the potential to bring the energy industry a step closer to what was envisioned at the time of restructuring, by shifting incentives for resource adequacy investments to energy markets. This fundamentally requires a reform of wholesale energy markets and resource adequacy mechanisms so that they recognize the impact of future PRD from the onset.

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I. Introduction

In the U.S., the benefits from energy market reforms initiated more than a decade ago are now widely recognized. The implementation of ISO-operated bid-based generation markets in the late 1990s led to greater transparency in regional prices for energy, serving as a benchmark of the opportunity costs of bilateral transactions within a region and across geographical boundaries. Yet a number of key challenges prevail. Wholesale market designs continue to be constrained to varying degrees by regulatory measures, environmental policies, and technological barriers. Market participants are currently operating under a mix of market-based energy incentives and regulatory-influenced capacity prices. In this regard, the U.S. is no different from many other

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restructured energy markets in the world. To fully reap the potential efficiency gains from restructuring, additional work is needed to improve pricing mechanisms at both the wholesale and retail levels, involving both federal and state regulators.

A. Smart Grid and its potential to improve the existing market designs

Smart Grid technologies are bringing about fundamental changes to the energy industry. The term smart grid encompasses a number of advanced, digital technologies such as smart metering, high-performance line sensors and advanced measuring and communications, all of which enhance the ability of transmission and distribution system operators to ensure a more efficient and reliable provision of electricity. Smart meters are able to record usage in hourly or 15 minute intervals and are deployed along with two-way communications, allowing the utility to read loads remotely as well as to capture and store detailed energy-usage data using digital technology. To date, smart meters have been installed on a large scale in California, Florida, Georgia, and other states are planning full deployment over the next few years. A number of countries around the world, including Italy, Spain, Sweden, and Finland, are also at advanced stages of smart metering deployment. With the increased availability of smart meters, there are fewer reasons not to revamp retail prices so that they are more reflective of market prices. The notion is that by giving all electricity consumers a chance to see, respond to, and influence market clearing prices or locational marginal prices (LMPs) on an hourly basis, energy markets will be able to reduce the overall costs of electricity service. Retail market-based rates, when properly designed, can bring important efficiency and reliability benefits. As more consumers face economic incentives for market-based demand response on a day-ahead basis, the ISO should be able to rely less on costly ''day-of'' emergency calls. In addition, dynamic rate designs combined with automated technologies can contribute to reduce the cost of ancillary services. This is particularly important at a time when system operators need more flexible resources to keep system reliability intact, in presence of large volumes of wind and solar intermittent output. Rates can directly provide customers with incentives to ''store'' electricity when system demand is low and reduce load when the system has less available capacity.

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Despite the progress in deployment of smart meters, only a marginal amount of consumers are currently under dynamic rates.[1] The reasons for this range from public inertia to mistrust of the impact of smart rates and time-varying rates on consumers, who have largely grown accustomed to paying fixed electricity rates. There have also been arguments that these rates might prove inequitable for smaller, low-income users. Yet it is possible to design dynamic rates that preserve not just efficiency goals but also equitable allocations of costs among consumers. Fortunately, the mind-set across the country is largely shifting thanks to the proliferation of government-funded dynamic Smart Grid pilots in the last few years, which have generated very positive results.[2]

For economists and energy policymakers, the expansion of dynamic retail pricing presents an extraordinary opportunity to revisit the rationale of the existing wholesale market design. Every regional transmission organization (RTO) and independent system operator (ISO) has been forced to juggle a myriad of regulatory constraints when operating the wholesale markets. Many, if not all, of these