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# Can Smart Grid Technology Fix the Disconnect Between Wholesale and Retail Pricing?

*While the past 20 years have seen the rapid development of wholesale electricity markets, sophisticated wholesale pricing has largely failed to be replicated in state retail markets. The emergence of Smart Grid technology, including metering and use of the Internet, has the very real potential to reduce, if not entirely remove, the disconnect between wholesale and retail markets, and enhance overall economic and energy efficiency.*

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## I. Introduction

While the past 20 years have seen the rapid development of wholesale electricity markets, sophisticated wholesale pricing has largely failed to be replicated in state retail markets. While wholesale market pricing has increasingly reflected real-time costs, retail markets continue to be characterized by the prevalence of blended, average-cost rates, which offered limited opportunity for effective demand-side response.

The effect was that, even with approximately half of state retail markets opened to competition, many of the changes realized in retail markets were not as deep as the changes in wholesale markets. In short, states fell into two broad categories: one characterized by preservation of the monopoly, and a second that featured the somewhat superficial enabling of competition without fully empowering consumers to make the choices that are generally associated with

competitive markets, most notably to reduce demand in response to meaningful price signals.

There are a variety of reasons for this disconnect between wholesale and retail pricing. They include political concerns about passing on price spikes to customers, lack of technology, notably metering, that would allow real-time information to flow to customers and enable billing to reflect that reality, and economic disincentives inherent in the regulatory regimes in most states for incumbent utilities to invest in “smart” technology and/or demand-side activities.

The emergence of Smart Grid technology, including metering and use of the Internet, has the very real potential to reduce, if not entirely remove, the disconnect between wholesale and retail markets, and enhance overall economic and energy efficiency. Providing end users with real-time, actionable information on prices and market conditions and new ancillary service markets that value consumer action and incentivize efficiency can enable meaningful demand response. Smart switches, smart distribution devices, automation, communications, and selective redundancy, of course, can also dramatically improve reliability and power quality.

Incumbent<sup>1</sup> utilities in both restructured and non-restructured states have incentives and disincentives to

make Smart Grid technology investments. Whether they are the appropriate vehicle for implementing and managing the implementation of smart devices or technology to achieve greater demand-side participation in the marketplace is a critical question that needs thorough examination. What follows is a discussion of that question in a regulatory, behavioral, and economic context.

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## II. Traditional Utility Ratemaking Incentives

Smart Grid offers significant efficiency gains on both the utility and customer sides of the meter. On the supply side, utilities already have economic incentives to invest in smart grid technology in order to make investments that increase productivity on their side of the meter, absent certain risks that are discussed below. For Smart Grid potential to be fully realized, however, utilities will also need to make Smart Grid technology investment decisions that are consistent with energy efficiency by end users. Such end

use efficiency gains, however, are often seen as problematic by utilities because their profitability is linked to energy sales under traditional ratemaking methodology, and increasing energy efficiency means reducing kWh sales and, therefore, profits. Thus, absent ratemaking that reflects that reality, utilities have an economic incentive to resist aggressive demand-side management programs and may well be inclined to resist accommodating innovation – the products and services that would have the effect of reducing their sales. For regulators and policymakers promoting the deployment of Smart Grid technology, and demand-side programs in general, that is an important consideration because there are two fundamentally different, yet not mutually exclusive, regulatory paths available for deploying both Smart Grid and demand-side programs. The first is to rely on the incumbent utilities and provide them the appropriate incentives. The second alternative is to reduce the role of the incumbent monopoly provider and open the market up to new, more entrepreneurial entrants.

### A. Return on capital investment

The most basic incentive for utilities, of course, stems from the traditional utility ratemaking incentive to invest capital in order to earn a return. That incentive is not specifically targeted at Smart

Grid investments, but it is applicable to them. The positive incentive to invest capital can, however, be offset by three possibilities that might dampen a utility's enthusiasm for making such investments. The first relates to the fear of prudence disallowance. Only "prudent" investment is recoverable and eligible for a return not all investment. A regulatory agency, for example, could decide that a company has spent too much money on a technology or deployed inappropriate technology. While such findings are not common, they are not unprecedented, so the fear of such an outcome can drive the thinking of utility management.

The second is the issue of cost allocation and equity in deploying new technology. Arguments are already being heard from some consumer advocates that small consumers, particularly less sophisticated ones, gain nothing from Smart Grid investments and should, therefore, not be obliged to pay for them. Cost allocation disputes can be costly, protracted, and riddled with uncertainty.

The third is the possibility of inappropriate depreciation schedules. This is particularly important because Smart Grid technology is changing so rapidly. A Smart Grid asset may become technologically obsolete well before the end of its actual physical life. Depreciation schedule risk also raises the

prospect of shifting costs to the most demand-elastic customers, thereby creating the possibility of losing economic load. Thus, while the incentive for making Smart Grid investments exists, it is not without some level of ambiguity.

### B. Efficiency gains

A second incentive for incumbent utilities is, of course,

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that Smart Grid investments offer real possibilities for efficiency gains on the supply side as well as the demand side. Utilities will be able to recognize and respond more quickly and effectively to service problems, will be able to read meters and bill customers with less labor intensity, and will be able to connect and disconnect more customers remotely. Moreover, for incumbent utilities that rely on purchased power and wholesale energy markets to procure power supply, the ability to enhance load response and reduce capacity requirements is a net plus.<sup>2</sup>

In fact, with the looming prospect of increased distributed generation and plug-in cars (both hybrid and all-electric), the capability for both peak shaving and valley filling is very attractive to most incumbent distributors of electricity. That being said, of course, for vertically integrated utilities, the prospect of shedding capacity requirements and reducing spikes in demand may be less attractive than for non-vertically integrated incumbents simply because the scale of their capital investment and the source of their profits are tipped heavily toward their investment in generation.<sup>3</sup>

The reliability and customer responsiveness benefits of the Smart Grid, however, are undeniable and should be attractive to all utilities. While demand-side issues are important, it is clear that even with no demand-side response, a Smart Grid has enormous advantages in terms of reliability, quality of service, and responsiveness to consumer difficulties.

### C. Decoupling

A third consideration for load-serving entities in regard to any investment that leads to reduced sales of kWh, of course, is the lost-revenue question. Simply stated, under traditional U.S. cost-of-service rate making, and even in such incentive schemes as price caps and other performance-based ratemaking schemes, there is a very direct link between sales of kWh and profits for load-serving

entities. In short, load-serving entities have powerful financial incentives to focus their efforts on selling kWh and ignoring potential demand-side efficiencies which might have the effect of diminishing their profitability. The result is that utility incentives can be misaligned with the public interest in energy efficiency.

Advocates for demand-side management have long recognized the problem and proposed that profits and sales be decoupled.<sup>4</sup> The theory is that regulators identify the overall revenue requirements of a regulated company and set tariffs that are, given reasonably competent performance by management, likely to yield that level of revenue. If the utility fails to recover that amount because of its efforts to promote the efficient use of the product it sold, its rates would be adjusted to better enable the company to recover its full revenue requirements.<sup>5</sup> For the customer, in theory, the result may well be higher rates, but, because he/she is consuming less, a lower overall bill. Alternatively, where revenue caps are not put in use, regulators might also allow utilities to earn a rate of return on demand-side investments that are equal to, or perhaps, even superior to returns allowed on supply-side options, so that demand-side investments are either equally, or perhaps even more profitable than are supply-side investments.

Where such alternative mechanisms are in use, utilities should have no particular

reluctance to make investments in demand-side efficiency measures, including, but not necessarily limited to, Smart Grid technology.<sup>6</sup> Indeed, the fact that California uses less energy per household than any other state bears witness to the effectiveness of such incentives. While those incentives may well remove, or, at least, reduce, any reticence on the part of utilities to invest in Smart Grid

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technology, it is not clear that such incentives alone will cause an optimization of Smart Grid deployment.

In short, if the objective is encouraging conservation and demand response, incentives provided to load-serving entities may well accomplish much of that. If, however, the objective is to deploy the Smart Grid in an effort to substantially reconfigure the retail market to provide more competition and customer awareness, reliance on appropriate incentives for distributors may well be insufficient to accomplish the goal.

### III. Addressing Incumbent Market Power

The reason why focusing on the financial incentives of load-serving entities alone, particularly in monopoly markets, may be inadequate to make energy use more efficient is because ratemaking incentives are only one aspect of evaluating the role and interest of the incumbent in regard to the deployment of Smart Grid and optimizing its use. There are other critical questions regarding the role that incumbents play in deploying technology that will enable more efficient energy markets.

Those questions revolve around technological innovations and choices, access to customer databases, potential for and fears of bypass and stranded assets, and customer empowerment. On these issues, the incentives of the incumbents are far more complicated than mere financial incentives. What is at stake for them are the potential risks associated with exposure to more competition, a change in their relationships with customers, as well as the financial and other risks associated with new technology and diminution of monopoly power.

#### A. Historical approaches

As mentioned above, states have tried to deal with the inherent market power of incumbents through requiring either structural or functional



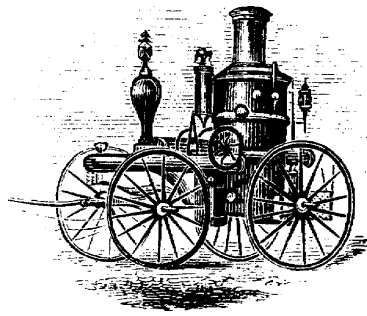
unbundling of their utilities. At the time of restructuring, those states that enabled retail competition imposed unbundling requirements on their regulated companies. In addition, because of FERC policy, most, if not all, states have required accounting unbundling in order to segregate accounts between transmission, generation, and distribution.

**R**estructured states fell into two basic categories regarding corporate disaggregation. Some either required or provided incentives to utilities to fully or partially disgorge their generating assets (e.g., Massachusetts and California). Other states, as well as FERC, chose not to compel or incentivize the disgorgement of assets, but, rather, to impose behavioral rules that prevented distribution and transmission personnel in the same company from providing information to their generating affiliates unless they provided the same data on the same terms and conditions to all interested generators.

Those two approaches are the traditional means by which regulators try to control the undue exercise of market power. Incumbent utilities may, in many ways be facing the same issue as they did with generation, but now in regard to the various aspects of their distribution activities, namely wires, metering, billing, and demand-side services. While the wires

business is likely to remain a monopoly (although the potential for distributed generation and micro-grids may diminish some of that monopoly power), the other services may well be contestable.

Mandated corporate restructuring and disgorgement of certain types of assets is the most dramatic response to market



power, and, undoubtedly, the easiest to enforce. Its use as a weapon to combat market power, however, is often constrained by other considerations such as tax consequences, credit and collateral arrangements. As a result, behavioral codes of conduct, which are more difficult to enforce, are often put in place to restrain the exercise of market power and to level the playing field between incumbent utilities and new market participants. Those experiences, of course, are mostly related to what happened to generation in the original restructuring. They may have to be revisited as we look toward the possibility of further opening of the retail markets that can be

enabled by Smart Grid investments.

## **B. Innovation and risk**

First, in regard to technological innovation, regulated companies tend to take conservative, non-innovative paths. The basic reason for such a path is that, as regulated companies, their potential upside from innovation is almost always limited by regulated returns. Moreover, a technology failing could lead to regulatory disallowances. Thus, technology innovation has little upside and potential downsides, namely an asymmetrical risk for management to take. A company could seek regulatory pre-approval for such investments. Regulators, given that they are dealing with the money of consumers they are sworn to protect, are likely to also be risk-averse, absent some compelling local economic interest to the contrary,<sup>7</sup> or some other enticement such as government subsidies of one form or another.<sup>8</sup>

The result is too much reliance on regulated utilities to take risks in terms of investing in technology which they will never be able to fully depreciate in the case of proven types of assets, or, as in the case of "cutting edge" technology, is probably misplaced. Other actors with more to gain and who are, therefore, less conservative about taking on risk, will need to take on a more significant role, if they can gain access to the market. In this respect, it might be instructive to

look at where the innovations came from in the telecommunications market. Despite the fact that the “Ma Bell” monopoly, unlike the electric utility industry,<sup>9</sup> did maintain a high level of research and development, most notably at the Bell Labs, the real drive to revolutionize the market came from outside of the regulated companies.

Another problem in unduly relying on electric utilities to bring on technological innovation is fear of where those innovations might lead. Again, the problem is rooted in the nature of the economic milieu within which

utilities operate. Utilities, to their credit, need to think over the long term. They make capital investments for the long term, and anticipate recovery of their costs over the long life of the assets which their capital buys. Changes in the industry’s business model or environment in which they operate during the life of assets not yet fully depreciated, can lead to very trying economic circumstances for utilities. As a result, they are generally not always as receptive to new technology as they might otherwise be.

There is a risk of generalizing and stereotyping in such an

analysis, and clearly not all electric company managers think alike. The economic model in which they conduct their business does, however, create difficulties for management to pursue innovative and risky courses of action in regard to bringing technologies online. This is because the use of these technologies could turn out to be contrary to the company’s interest financially, even though there may well be a compelling public interest in deploying it. Similarly, while the overall scope of the monopoly power of load-serving entities has been reduced in many jurisdictions, it still exists in



*The complex situation surrounding incumbents can constitute a formidable barrier to new entrants.*

some form or another in every state.<sup>10</sup>

## IV. Conclusion

The complex situation surrounding incumbents, the role they play, and incentives they are given to bring on new products, services, and opportunities through the deployment of new technology can constitute a formidable barrier to new entrants coming into the market. Examples of the issues that flow from status of the incumbent include who owns and controls the meters, who can access customer data and under what conditions, billing operations, interface and sharing information with customers (including price information), backup services for self-generators and micro-grid operators, and a host of other services that have traditionally been provided on a bundled basis by incumbent utilities. In fact, for each of these activities the incumbent can be a facilitator and/or a competitor to any would be provider of Smart Grid technology or the services enabled by smart grid. Policymakers and regulators in each jurisdiction will have to ponder how to approach incumbents. Give them incentives or reduce their role?■

### Endnotes:

1. Over the course of this analysis, the authors use the terms "incumbent," "utility," and "LSE," or variations thereof. The terms are varied for

stylistic and readability reasons, but are meant, for purposes of this article, to be synonymous.

2. In most jurisdictions, purchased power is simply a passthrough mechanism in which utilities have no opportunity to earn a profit, but do run the risk of a prudence disallowance by regulators. Thus, many have contended that for utilities, purchased power constitutes an asymmetrical risk with no upside but some downside risk.

3. It needs to be recognized that the role of the incumbent varies widely from jurisdiction to jurisdiction. As noted above, in some states the LSE's are distribution only. In the case of the Electric Reliability Council of Texas (ERCOT) service territories, they are wires companies only, whereas in Florida they are vertically integrated. In state such as Ohio and Illinois, they are vertical but functionally unbundled. In other states such as California and Colorado they are vertically integrated to some extent but not to the extent of their full requirements. These differences are worth noting because it biases the way that management views its self-interest in significant ways. The lost revenue issue, for example, to a vertically integrated company is a decidedly more consequential matter than to a wires company because it has far more capital at risk.

4. Some have contended that the issue is best addressed through traditional ratemaking by simply employing calculated and reasonable cost allocation shifts from fixed to variable.

5. There has been some controversy over how much precision should be required by regulators to ascertain exactly how much of the shortfall in the revenue requirement was due to company conservation programs, as opposed to revenues lost for other reasons such as weather, recession, or business migration out of the territory being served. Lack of precision, of course, has been seized upon by critics of decoupling, who argue that imprecise measures of demand-side efficiency gains achieved through utility programs have led to

socialization of risks best borne by utilities.

6. Obviously, governmental grants, matching funds, and other financial incentives that are discussed above also serve to reduce any residual reluctance by incumbents to invest in smart technology.

7. A good example where regulators might look more sympathetically on technology risks is where there is a large local economic development interest in a project, such as a "clean coal" plant in a coal producing state.

8. Regulators are very likely to be concerned about asymmetrical risk for consumers. Were they to pre-approve investment in new, unproven technology, or even new programs with proven technology, they would, in effect, be spreading all of the risks to cornhuskers. If the program proves to be a failure, cornhuskers pay. If it succeeds, other than having the benefit of the use, all other benefits, such as expertise or intellectual property, accrues to private actors who were shielded from the economic risks by regulatory pre-approval.

9. The electric utility industry ranks fairly low among major U.S. industries in undertaking and supporting research and development.

10. As the earlier discussion shows, the minimal monopoly found is in states such as Texas, where there is a single wires company to deliver electricity to end users. In other states, that monopoly extends to the meter, and perhaps billing as well. At the other end of the spectrum are states such as Florida which have vertically integrated monopolies, although it should be noted that even there, the utilities may go out for bid to secure power supply from generators rather than expanding their own generating assets. In between, of course, there are other variations on the degree of monopoly power such as mandated competitive procurement policies for LSEs, and various arrangements in states with nominally open retail markets, as to how default energy supply is procured.