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REGULATORY STUDIES PROGRAM

Public Interest Comment on
Electric Energy Market Competition Task Force Draft Report to Congress on Competition in the Wholesale and Retail Markets for Electric Energy [1]

The Regulatory Studies Program (RSP) of the Mercatus Center at George Mason University is dedicated to advancing knowledge of the impact of regulation on society. As part of its mission, RSP conducts careful and independent analyses employing contemporary economic scholarship to assess rulemaking proposals from the perspective of the public interest. Thus, this comment on the Electric Energy Market Competition Task Force Draft Report to Congress does not represent the views of any particular affected party or special interest group, but is designed to evaluate the effect of the report on overall consumer welfare.

I. Introduction

Section 1815 of the Energy Policy Act of 2005 established an interagency task force to conduct a study and analysis of competition within the wholesale markets and retail markets for electric energy in the United States. The Electric Energy Market Competition Task Force (Task Force), composed of representatives from the Department of Justice, the Federal Energy Regulatory Commission (FERC or Commission), the Federal Trade Commission, the Department of Energy, and the Department of Agriculture's Rural Utilities Service, has consulted with public and private entities and solicited comments from interested parties. As directed by the Energy Policy Act, FERC has published the Task Force's draft report and is soliciting public comments. [2]

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[1] Prepared by Lynne Kiesling, Northwestern University and the Interdisciplinary Center for Economic Science at George Mason University, and Michael Giberson, independent economist. Affiliations are listed for identification purposes only; the views expressed by the authors are their own. This comment is one in a series of Public Interest Comments from Mercatus Center's Regulatory Studies Program and does not represent an official position of George Mason University.

[2] Federal Energy Regulatory Commission, *Draft Report to Congress on Competition in the Wholesale and Retail Markets for Electric Energy*, Notice Requesting Comments on Draft Report, Docket No. AD05-17-000, 71 Fed. Reg. 34,083 (June 13, 2006). Hereafter referred to as "Report."

The Draft Report to Congress on Competition in the Wholesale and Retail Markets for Electric Energy (Report) provides a high quality overview of the current state of wholesale and retail electric competition in the United States. The Report describes well both the current status of restructuring and the continuing uncertainty about the regulatory rules that will govern the industry in the future. The Report also usefully draws out the critical nature of the link between retail and wholesale markets, and explains how retail rate policies cause that link to malfunction.

While the Report accomplishes much of the task it was assigned, it misses two points, both closely connected to the malfunctioning retail-wholesale market link:

- The most significant shortcoming of the Report is a failure to recognize that advances in electronics and communication systems are dramatically reshaping the potential for demand response. As policymakers have repeatedly recognized, activating consumer demand will encourage conservation, reduce consumer bills, mitigate market power in wholesale and retail markets, and enhance power system reliability.[3] The Report should emphasize that the technology is increasingly available to support active consumer participation in markets, and such participation would promote retail and wholesale competition.

- A second significant shortcoming of the Report concerns the too-brief discussion of capacity payment mechanisms. The Report overlooks the problematic justifications and troubled history of capacity payments in the electric power markets operated by Regional Transmission Organizations and Independent System Operators.[4] The underlying market problems that produce the justification for capacity markets result directly from the lack of active consumer participation in markets. However, recent federal regulatory action appears oriented toward permanently enshrining capacity payment systems in RTO market designs. Given the growing potential for active consumer participation in markets, these capacity payment constructs are likely to become just another further regulatory impediment to the emergence of retail competition. The Report should highlight the potential of advances in technology to activate demand and complete the missing link between wholesale and retail markets as an alternative to continued exploration of capacity payment mechanisms.

Addressing these two deficiencies in the Report will help present a full picture of the state of retail and wholesale competition in power markets.

[3] For example, International Energy Agency, *The Power to Choose: Demand Response in Liberalized Electricity Markets* (Paris: OECD/IEA, 2003).

[4] See the discussion of capacity payment mechanisms below for details. Regional Transmission Organizations and Independent System Operators will be jointly referred to as RTOs, and the markets they operate will be termed RTO markets. The technical regulatory differences between Regional Transmission Organizations and Independent System Operators do not concern us here.

II. Overview of Report

After providing a historical overview of industry and regulatory structure and the context for this study, the Report surveys competition in wholesale power markets. The authors state, clearly and honestly, the difficulty of evaluating whether or not existing wholesale competition has led to efficient resource allocation. It is important for policymakers to understand why that evaluation is difficult.

While the variety of state and federal policies can make evaluation of competition difficult, variation in policy can also make it easier to understand the consequences of policy choices. Uniformity in policy choices can foreclose opportunities to learn. In part, evaluating the efficiency of existing wholesale competition is difficult because concerns over generator exercise of market power have led to relatively uniform offer caps in wholesale markets. These offer caps frequently cut into scarcity profits as well as reducing the profits to withholding supply from the market. Distinguishing between scarcity rents and market power rents is difficult or impossible.[5] Potentially, market designs with offer caps could lead to higher prices than would have occurred without price caps, if the caps deter otherwise profitable investment in new generation capacity.

The Report discusses the use of capacity payments in some markets as a proxy for those lost scarcity rents, and the Report does a great job of pointing out the knowledge problem facing regulators and system operators who (erroneously) believe that they can analytically derive the right capacity payments in the absence of a two-sided market process. Buyers and sellers in wholesale markets have private information about their preferences and production costs, and about the opportunity cost of investing in new capacity relative to other investments. They are in the best position, therefore, to assess the relative risks and net benefits of new capital investment. Regulators cannot observe these private values in the absence of two-sided market processes to elicit and aggregate that information. Similarly, system operators focusing on optimal power flows overlook the economic value of those flows, and those values are private information until elicited via market processes.

It is also difficult to evaluate wholesale market competition because wholesale markets are not currently two-sided; like much of the market design in this industry, wholesale markets are overwhelmingly supply-focused. Without true demand-side participation in wholesale markets that reflects the preferences of retail end-use customers, competition in wholesale markets has been and continues to be incomplete (although there have been isolated efforts in improvement). The Report also goes into some useful detail on the interaction between regulatory intervention and returns to investment in generation and transmission.

[5] As noted in the Report, p. 3, pp. 64-66. See also Lynne Kiesling and Bart Wilson, "An Experimental Analysis of the Effects of Automated Mitigation Procedures on Investment and Prices in Wholesale Electricity Markets," *Journal of Regulatory Economics*, forthcoming. Available at http://faculty.econ.northwestern.edu/faculty/kiesling/Kiesling_Wilson_AMP_final.pdf.

The Report's analysis of retail competition is particularly clear and useful, and will provide timely perspective and context, given the scheduled removal of retail price regulations in some states juxtaposed with increasing fuel costs. The retail chapter looks at the right question: are customers able to see accurate price signals and to hedge price risk through freedom of contract choice? The authors do a good job of explaining how retail price caps in the transition to retail competition confound their ability to assess the effects of retail competition; in other words, retail competition is incomplete in the presence of such price caps, which distort price signals to customers and distort entry incentives to potential competitors.

Most importantly, the discussion of designing a provider of last resort (POLR) rate option in the transition to competition is splendid. The provider of last resort – frequently but not always the incumbent utility – is the provider that customers end up using if they cannot find satisfactory offers from competitors, or if they choose not to shop around for electricity. Few policymakers truly understand the extent to which POLR offerings can perpetuate entry barriers in retail markets; this Report articulates that problem clearly and succinctly:

> Over the past several years, the initial fixed discounts for POLR service have resulted in POLR service prices that are below market prices or occasionally above market prices, but never at the market price for long. When the POLR prices are below competitive levels, even efficient alternative suppliers cannot profit by entering or continuing to serve retail customers.[6]

While treating wholesale and retail competition separately, the Report accurately points out that wholesale and retail markets are inextricably linked: "... an important component of effective market operation is customer response to prices. The demand for wholesale power, however, is derived entirely from consumption choices at the retail level. The lack of electric power inventories only intensifies the direct link between wholesale and retail electric power markets. Yet state regulators set the prices for retail customers."[7] This integration makes the state/federal jurisdiction split between wholesale and retail all the more pressing to consider if we are to realize the efficiency and innovation benefits of competitive market processes in electric power.

Two-sided markets allow buyers and sellers to find each other and engage in mutually beneficial transactions. Details of two-sided market designs can vary. In most retail transactions, for example, two-sided markets take the form of retailers posting prices for goods and potential buyers looking at those prices as "take it or leave it" offers. In financial markets, multiple buyers and sellers make simultaneous bids and offers, with pre-determined rules governing the consummation of transactions. eBay's two-sided market simultaneously accommodates multiple supplier listings and buyer bidding.

[6] Report, pp. 90-91.

[7] Report, p. 44.

These examples of two-sided markets contrast markedly with the supply-oriented, single-sided market typical in electric power. Wholesale power markets are generally characterized by generators submitting offer curves, or a schedule of offers for different portions of their generation capacity, but without active bidding on the demand side it is still only a single-sided market. Single-sided markets with passive, inelastic demand tend to have higher prices than two-sided markets with active demand and supply.[8]

Consider, for example, a retail electric utility serving a variety of types of customers. These end-use customers have different preferences regarding how much price risk they are willing to bear, power quality, and service reliability. The utility is likely to maximize its profits by offering a menu of contracts and enabling customers to choose one that best meets their needs (thus making the customers better off in the process). The contract choices that these customers make will inform the electric utility about features of their demand, including price elasticity. Using this information, the utility will bid into wholesale markets, and enter long-term procurement contracts, in ways that communicate these end-use customer preferences, thus linking wholesale and retail markets. This model of linked wholesale and retail markets with active demand contrasts sharply with the historical, fixed, regulated retail rate that is an average over time to cover total cost. Mandatory average retail pricing gives the utility little reason to discover or communicate retail customer preferences to wholesale markets.

In a genuinely two-sided market, retail electric utilities take retail customers' contract choices into the wholesale market, and bid on behalf of the choices their customers have made. Note the crucial difference here between active demand and utilities bidding in the wholesale market on the basis of load shaping and average profiles. Active bidding through retail choice communicates more precise information about the preferences of consumers into both retail and wholesale markets, integrating them and consequently leading to better decisions and more efficient resource allocation. Bidding based on historical load duration curves and using administratively-determined customer classes dilutes the communication of end-use customer information into wholesale markets, thus distorting resource allocation and investment outcomes.

The Report does have shortcomings. The authors could be more emphatic about the effects that retail transition price caps (over times as long as a decade) have in deterring entry in retail markets. They could bring to the foreground a theme implicit in much of the discussion: we are shifting from regulatory policy to competition policy in this industry, and that shift requires thinking differently about transactions, contracts, and the role of regulators.

Perhaps the most significant shortcoming of the Report is a failure to address how advances in electronics and communication system have dramatically reshaped the potential for demand response. The text briefly mentions interval meters as a condition

[8] See, for example, Stephen Rassenti, Vernon Smith, and Bart Wilson, "Controlling Market Power and Price Spikes in Electricity Markets: Demand-Side Bidding," *Proceedings of the National Academy of Science* 100 (2003), pp. 2998-3003, and the other experimental research cited therein.

for responsive demand, but immediately conditions the prospect of demand response with a cautionary footnote suggesting that customers lack the equipment to respond and a follow up sentence suggesting that "conventional metering and billing systems are not adequate" to support responsive demand.[9] At one time, technology was a barrier to consumer participation. Now, as the Report observes but immediately overlooks, the barriers are not technology development, but are instead legacy metering and billing systems and archaic rate designs. Technological change, especially in building automation, advanced metering, and grid-friendly appliances, is empowering end-use customers and enabling true two-sided power markets; however, implementation has been slow because of legacy sunk costs and interests in prolonging the status quo.

This Report, intended to inform Congress on wholesale and retail competition, provides a clear, thorough analysis of the current state of competition policy relating to this industry. It captures the economic aspects of the issues well; throughout the Report the authors take care to point out both the benefits and costs of coordinating economic activity through regulation and through market processes. The Report appendices also provide extensive information, including detailed descriptions of retail competition market designs in seven states, which will enable readers to learn about the effects of different retail designs. Supplementing the draft Report with a fuller assessment of the growing potential for demand response, and the need to revise policy to overcome the effects of legacy meters, billing systems, and retail rate designs, would make this Report extremely valuable and informative.

III. Capacity Payment Mechanisms May Hamper Transition to Integrated, Competitive Wholesale and Retail Markets

The Report notes that offer caps in RTO markets can distort and reduce incentives to invest in generation, and may be to blame for a perceived growing inadequacy of generation resources in most such markets.[10] Capacity payments are one commonly pursued policy response to the consequences of inadequate investments, but as the Report states, "[l]ike any regulatory construct, however, capacity payments have limitations."[11] Indeed, capacity payment mechanisms that have been approved by FERC have been later found to be failures, and subject to constant revisions.[12]

[9] Report, p. 41.

[10] Report, pp. 61-69.

[11] Report, p. 68.

[12] For example, for PJM, see *PJM Interconnection*, 115 FERC ¶ 61,079, P 21 (2006): "The Commission finds that under section 206 PJM has demonstrated that its current capacity regime is not just and reasonable as a long-term capacity construct because it fails to address inadequacies in reliability, as discussed at length herein." On New England, see *Devon Power LLC*, 115 FERC ¶ 61,340, P 5-6 (2006) (*Devon Power LLC I)*; Peter Cramton, "Review of the Reserves and Operable Capability Markets: New England's Experience in the First Four Months," available at http://www.cramton.umd.edu/papers1995-1999/cramton-on-reserves-and-opcap-may-aug-1999.pdf.

Some of the continuous adjustments in capacity payments mechanisms may be seen as simple learning from experience – reflecting the still-developing understanding of how restructured wholesale power markets work best.[13] But placed in broader perspective, capacity payments mechanisms are intended as transitional elements on the way to more competitive electric power markets – needed now, because of inadequate demand-side participation in markets and the resulting protective regulatory structure placed on markets which distorts market incentives – but not expected to be necessary with more mature, fully competitive electric power markets. Yet, the Commission has recently approved elements of PJM's most recent capacity market construct, the Reliability Pricing Model (RPM), in which it explicitly denied requests suggesting the RPM would not be a permanent feature of the PJM electric power market. FERC explained:

> We think that accepting RPM as a temporary measure … would not likely help remedy the problems of insufficient capacity that currently face PJM. That is because accepting RPM only for the interim would create regulatory uncertainty that would fail to address the root causes of PJM's current infrastructure inadequacies. In regions within PJM where infrastructure is inadequate, revenues under the current market rules are below the cost of building new peaking units. Investors cannot be expected to finance needed new infrastructure based on a temporary source of additional revenues derived from a temporary RPM mechanism.[14]

Rather than directly addressing the market and regulatory policy flaws that contributed to the emergence of "regions within PJM where infrastructure is inadequate, [because] revenues under the current market rules are below the cost of building new peaking units," FERC's order instead approves key elements for another expensive field trial for capacity markets. Importantly, the "the root causes of PJM's current infrastructure inadequacies" were produced during a period in which consumers paid prices as high as $100 per megawatt-day through previously approved capacity market mechanisms.[15]

The pattern found in PJM – costly capacity markets failing to produce the desired results, followed by new capacity market proposals – has been repeated in other RTO markets. FERC has recently accepted a new capacity payments system design for New England, to replace the failing interim capacity payments program that replaced the regional market's initial capacity market design.[16] In the order, FERC reported some of the history of capacity markets at the ISO-New England (ISO-NE):

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[13] This perspective is a theme in Peter Cramton and Steven Stoft, "A Capacity Market that Makes Sense," *Electricity Journal* (August/September 2005), pp. 43-54.

[14] *PJM Interconnection*, p. 171.

[15] The average price per MW-day in the monthly and multi-monthly capacity market in 2001 was $100.43; over the period 1999-2005 prices ranged from the high of $100.43 to a low of $7.94 per MW-day. See Table 5-13, PJM, *2005 State of the Market Report*, (March 8, 2006), available at http://www.pjm.com/markets/market-monitor/som.html. See also *PJM Interconnection*, P 23.

[16] *Devon Power LLC I.*

> Beginning in 1998, ISO-NE began operating a bid-based market for ICAP. In 2000, as part of the region's development of wholesale power markets and market-based rates, the Commission first began to identify flaws in the ICAP market.[17]

FERC allowed ISO-NE to replace the flawed capacity auction with an administratively set deficiency charge, because the capacity auction "can produce inflated prices unrelated to the actual harm caused by ICAP [installed generation capacity] deficiencies."

> In 2002, the Commission further addressed deficiencies in New England's ICAP market, this time noting the lack of a locational element. In its order addressing the implementation of energy markets and locational marginal pricing in New England, the Commission identified the lack of a locational element as a significant flaw in the ICAP market, stating that it "believes that location is an important aspect of ensuring optimal investment in resources."[18]

Additional changes to the ISO-NE capacity markets proposal were initiated in early 2003, when several generators in capacity-deficient regions within Connecticut filed cost-based "Reliability Must Run" agreements. The generators asserted that current capacity and energy market revenues were not sufficient to keep the generators in business, yet the RTO indicated that the generators were required for system reliability. In an order addressing these and other Reliability Must Run filings, FERC directed establishment of interim bidding rule changes and development of capacity market program including locational elements.[19] After an extensive and contentious regional stakeholder process, FERC recently approved a new capacity markets program that provides for a multi-year transition to *the full forward capacity market*. No mention was made of any expectation of a transition to mature, fully operational and competitive power markets in New England.

The Report's too-brief discussion of capacity payments systems overlooks the problematic justifications and troubled history of such programs in the electric power markets operated by RTOs. Capacity market mechanisms are advocated based upon flaws in existing markets that arise from the lack of active retail participation and the resulting regulatory structures placed on the market. There is an increasing danger that transitional capacity markets will become permanently embedded in RTO market designs, outliving their underlying justifications, and becoming a further regulatory impediment to the emergence of retail competition. Rather than continuing to pursue expensive capacity market constructs intended to compensate for the lack of active demand participation in markets, the Report should highlight the potential of advances in

[17] *Devon Power LLC I,* P 5-6; also see *Devon Power LLC*, 111 FERC ¶ 63,063, P 2-36 (2005) (*Devon Power LLC II).*

[18] *Devon Power LLC I*, P 6.

[19] *Devon Power LLC*, 102 FERC ¶ 61,314 (2003); *Devon Power LLC*, 103 FERC ¶ 61,082 (2003); *Devon Power Company*, 104 FERC ¶ 61,123 (2003).

technology to activate demand and complete the missing link between wholesale and retail markets.

IV. Advances in Technology Increasingly Enable Active Demand

The Report surveys progress thus far toward the long-run objective of liquid, dynamic, competitive wholesale and retail markets. Given the incremental nature of such progress, a transition process is inevitable. In the previous section we discussed the administrative construction of capacity markets as a transition mechanism. Such a mechanism, though, may prolong the transition period and may deter the establishment of competition policy that focuses on technology-enabled active demand.

This long-run vision embodies a system in which:

> all suppliers and end-users [are] linked by high-speed telecommunications and information networks that provide real-time information about system capacities, demand, prices, and status. Integration of communications and information with the electricity system will facilitate competitive, efficient markets for power; enable each participant to actively manage its own production and consumption decisions; help the system balance supply and demand under both normal and stressful conditions; and in general provide diagnostic information and tools to better manage both system operations and end-user applications. [20]

Dynamic retail pricing through two-sided markets enables customers to shift demand away from peak periods with high prices, and/or to reduce their overall use. This economizing incentive, aligning benefits to consumers and costs to producers, is the source of the conservation benefits of two-sided markets. Market-based conservation reduces energy costs and increases energy efficiency. Conservation typically takes two forms – curtailing consumption (reducing overall use) and shifting use to non-peak hours. The primary effects are felt directly by the consumers who choose to curtail or shift use, and about 20 percent of the value of market-based pricing comes from this direct effect.[21] But an indirect effect creates even more value – the reduction in peak demand lowers wholesale prices for all other consumers of all power in that hour. So even if customers cannot shift away from peak, their prices can be lower and more stable because of the decisions of others to shift. Two-sided markets encourage customers to manage their own energy costs, and help bring market supply and market demand into balance at lower and less volatile prices.

[20] Walter S. Baer, Brent Fulton, and Sergej Mahnovski, "Estimating the Benefits of the GridWise Initiative, Phase I Report," Prepared for the Pacific Northwest National Laboratory by RAND Science and Technology, TR-160-PNNL (May 2004), p. 2 (Rand GridWise study)

[21] McKinsey & Company, "The Benefits of Demand-Side Management and Market-Based Pricing Programs" (May 2001).

Heterogeneous demand patterns across time and across customers create an opportunity to enhance overall efficiency of the electric power system, particularly through increased infrastructure capacity utilization. High and consistent capacity utilization is the hallmark of a dynamically efficient network. However, the obligation to serve requirement in conjunction with fixed rates means that the electric power infrastructure must be built to meet the highest possible peak demand. Those peak generation, transmission and distribution resources lie idle for most of the year. This capacity underutilization is grossly inefficient, and the opportunity cost of the investment in those underutilized assets is high.

A two-sided market that enabled customers to choose prices that reflect the real cost of providing them with power in that peak hour would lead to less underutilized peak-specific infrastructure, and the capital would be better used elsewhere. Market pricing would lead some customers to shift their demand to cheaper hours away from peak, thereby improving load factors and capacity utilization of existing infrastructure. Through this process, two-sided markets also elongate the time between required infrastructure investments and upgrades. Overall resource use would fall as generation and transmission capacity utilization and load factors rose, allowing us to meet both efficiency and environmental objectives simultaneously.

Market-based pricing also increases competitiveness of electricity markets and reduces the severity of price spikes. Customers modifying their use when they see price volatility help reduce the magnitude of price spikes. When consumers can receive price signals and can respond to them, some consumers will shift their demand to cheaper hours when they face high prices. Shifting demand from an expensive hour to a cheaper hour lowers equilibrium price in the expensive hour and may increase it in the cheaper hour.[22] "Marginal cost real-time pricing also opens the door to conservation and load management to all customer classes. Customers will 'discover' avenues to manage load that make economic sense. In most cases conservation and load response will be implemented before taking on the larger capital investments for on-site generation."[23]

This active demand feature of two-sided markets provides consumers with a direct tool for disciplining wholesale prices.[24] Two-sided markets integrate wholesale and retail markets, by transmitting information that causes retail prices to reflect costs more accurately. That integration means that customers bear wholesale electricity prices more directly, and therefore will be more likely to shift demand away from hours with high wholesale prices. During peak demand hours, if prices are fixed and demand is inelastic, market manipulators can increase profit by withholding. If active demand decreased

[22] Price might not rise in the less expensive hour because generators are often willing to accept lower prices to avoid having to shut off generators in that hour.

[23] Tobey Winters, "Retail Electricity Markets Require Marginal Cost Real-Time Pricing," *Electricity Journal* (November 2001), p. 77.

[24] Stephen Rassenti, Vernon Smith, and Bart Wilson. "Controlling Market Power and Price Spikes in Electricity Markets: Demand-Side Bidding." *Proceedings of the National Academy of Science* 100 (2003), pp. 2998-3003.

during price spikes, however, the opportunity for manipulation would decline. Therefore, enabling active demand disciplines firms that could exercise market power in a supply-focused market. In markets that have only one-sided supplier bidding, suppliers are more able to manipulate prices than in two-sided markets where consumers can express their preferences. Market-based pricing reduces the exercise of market power by changing the shape and size of load curves and load duration.

In addition to the resource allocation (static efficiency) and equity benefits of two-sided markets, they provide dynamic efficiency benefits. The interaction of supply and demand through market processes transmits information about what services and resources are more or less valuable, and market processes allow investors to act on that information over time. That process leads to further innovation, taking the form of new technologies, new value propositions, and new ways of organizing transactions. Indeed, the lack of such innovation in electric power suggests the sterility of the current regulatory regime. The major innovations in electric power have come from outside the industry, and most have not been implemented. For example, two-way digital metering could cost $100 per meter if installed in volume (500,000 premises), and if the installation is coupled with flexible pricing customers could actually save money and earn a return on the $100 quickly.[25] Yet we have not seen the implementation of such innovations, and the creation of complementary innovations, even though technological and cost-reducing digital dynamism of this sort infuses the rest of society.

Interoperability within the network will make active demand more possible, and more beneficial from a system perspective. The core of the concept of interoperability is information sharing, typically across organizational boundaries. The information exchanged is relevant to meaningful decisions that each party in the exchange will make. The parties have a shared understanding of the information's meaning, and an expectation of how parties will respond. The information exchange occurs through digital communication systems, and the information transmission and receipt and the decision-making can be automated. Digital communication technology increases the ease and value of operating interconnected, automated processes.

Thus, a digitally-enabled interoperable electric power network is defined by transactions and contractual relations, within the physical capabilities of the interconnected AC network. This combination of digital technology and interoperability thus strengthens and increases the value of both wholesale and retail markets, and the existence of competitive market processes increases the value of technology and interoperability. Interoperable technologies and competitive markets are symbiotic.

The centralized control room paradigm is premised on an analog world. Now we have a plethora of digital technologies, including those that enable distributed remote sensing and monitoring, that will make distributed, decentralized control possible. The options include automated sensing and response; both demand and supply resources can program

[25] Chris King and Sanjoy Chatterjee, "Predicting California Demand Response," *Public Utilities Fortnightly* (July 1, 2003), pp. 27-32.

sensors to take an action in response to either a voltage change, a frequency change, or a price change. Digital technology also makes demand aggregation easier and cheaper to bid into wholesale markets. When combined with contractual relations, digital technology also has the potential to make active demand response dispatchable. Consider a wholesale energy market in which a retail utility or a large end user can bid in a demand reduction within a given lead time as a resource. If that time frame commitment constitutes a legally binding contract, and the parties are operating in an information-rich integrated environment, then the control room operator is more able to classify that demand response as a dispatchable resource.

In aggregate, those distributed automated responses can provide reliability, in the form of greater voltage and frequency stability, and promote price stability. The distributed control and the greater availability and variety of resources enabled by digital technologies will make the control room operator's job easier, by allowing him to focus only on truly real-time unanticipated events, which may become even less frequent as the distributed technologies and price structures and contracts reduce the probability of cascading failures.

In addition to distributed digital technology throughout the grid, end-use digital technologies can provide further resources and distributed control. Advanced metering infrastructure (AMI) is the most advanced, with some states (e.g., California) and countries (e.g., Italy) implementing advanced metering installations to enable active demand response. Increasingly, though, other end-use innovations, such as building automation and grid-friendly appliances, are receiving attention, and researchers are analyzing and quantifying the individual and system benefits that are created by implementing such innovations.[26] To the extent that these end-use technologies enable automated responses to price signals, they will communicate customer preferences and integrate wholesale and retail markets, leading to more efficient investment decisions.

Such technologies do not exist, and cannot work, in a vacuum. Without retail rate flexibility, such technologies provide little value, and they give few incentives for customers to adopt them. Customers facing mandatory fixed rates have almost no incentive to install technology that will empower them to optimize their power use; thus those customers will also create no system benefits because they have no incentive to consume less when production costs are high, and when the network system is stressed. Enabling end-use technologies in conjunction with dynamic retail pricing gives customers control and incentives to shift use away from exactly the times when the system is most stressed. Distributed end-use digital technology and dynamic pricing enable active demand to contribute to resource adequacy and accurate investment signals, by creating the opportunity for end-use customers to provide excess capacity to the system when it is needed most.

[26] See, for example, research performed at the PIER Demand Response Research Center, Lawrence Berkeley National Laboratory, http://drrc.lbl.gov/, and "Impact Evaluation of the California Statewide Pricing Pilot," Charles River Associates (March 16, 2005).

One long-standing conundrum in electric power is that digital information technology has the potential to create many benefits and automate a range of costly real-time functions, but that it is not widely enough deployed. Exciting work at the Pacific Northwest National Laboratory (PNNL) is contributing to resolving that conundrum, through transactive control of grid-friendly appliances (GFAs). A GFA has a controller chip (which can cost $5 to $25 depending on how sophisticated the desired appliance response is) that enables the appliance to send and receive data and to take an automated action. In its simplest form, a hot water heater with the grid-friendly controller can send and receive information about its energy use, and it can be programmed to use less power at various triggers (such as peak hours). If programmed for more sophisticated response, the appliance can have an automated response to retail power price changes.

For example, suppose an end-use customer with a grid-friendly hot water heater chooses a contract with a retail provider in which the customer sees price fluctuations (real time, TOU, CPP, etc.). The customer could then program the hot water heater to turn down 5 degrees if the price goes to $0.09/kwh, another 5 degrees if the price goes to $0.12/kwh, and so on. Once programmed (probably by the customer's service-oriented retail utility in order to win the business), it is completely automated, and therefore user-friendly. As grid-friendly appliances evolve, changing them after the initial setup is likely to become even more straightforward.

This technology has profound implications, most importantly for network resiliency and reliability and for optimizing grid investment. PNNL estimates that widespread application of grid-friendly appliances could reduce required infrastructure investment by 10 percent. The nonlinear nature of peaking demand in this industry means that small reductions in peak consumption, enabled by such technologies, can be big enough to enhance reliability and control power prices. PNNL estimates that the combined savings to customers over 20 years could be $81 billion.[27]

V. Conclusion

Achieving competitive power markets requires active participation of the demand side of the market. Active participation does not require retail consumers to watch wholesale power prices constantly or bid into markets directly, but consumers must be allowed to choose to see and respond to real time prices. Consumers could choose between a fixed price that incorporates an "insurance premium" payment for price stability or full real-time pricing, in which the customer bears the financial risk of price volatility, but could see electricity bills fall by shifting or reducing use.

Insulating retail consumers from real time prices substantially eliminates incentives to conserve when prices are high or shift consumption from high-cost to lower-cost periods. The burden of adjustment is shifted to the supply side – to generators and transmission system operators – requiring more capital investment in power plants and transmission lines than would be necessary if consumers had incentives to respond economically.

[27] Rand GridWise study, pp. 27-29.

Reducing peak use contributes to greater operational security, as fewer reserves are necessary to maintain reliability, and eases stress on adequacy planning, as the need for system expansion to support ever greater system peak loads is diminished.

The relatively inelastic consumer demand created when consumers are insulated from real time prices also causes wholesale power prices to be more volatile and susceptible to the exercise of market power. Policymakers have sought to use offer caps and other tools to mitigate market power, but such efforts can diminish the scarcity rents necessary to signal the need for and incentives to build new generation. The lack of scarcity rents is cited by some specialists as requiring capacity payments for generation resources in addition to electric energy market payments. One set of policies leads to consequences cited as reasons to further intervene in the market. The alternative to layering additional rules and restrictions on wholesale power markets is to build the necessary link between wholesale and retail power markets.

Advances in technology make building that link possible, but complementary changes in retail rates and wholesale power market design are necessary. In wholesale power markets regulated by FERC, consumers have spent substantial sums on capacity payment mechanisms later judged by the Commission to have been failures. Such systems have been expensive, subject to abuse, and of suspect value to consumers. Consumers continue to make capacity payments through existing systems, and are paying more to develop new, more complex capacity payments mechanisms in PJM and New England. Rather than continue to spend consumers' money on "transitional," but long-lasting, capacity payments systems, policy should promote a transition to active consumer involvement in markets.

The Task Force Draft Report provides a good overview of the state of wholesale and retail competition in electric energy markets. The immense variety of state regulatory policies, retail choice programs, wholesale market designs and federal transmission and wholesale power market policies makes it difficult to assess the state of competition. Despite these difficulties, the Report usefully singles out the current flawed connection between retail and wholesale markets as hampering competition. The Report lacks a full assessment of the manner in which technological advancements now enable more active consumer market response, and the value of complementing the technological advancement with appropriate retail and wholesale market policies. In addition, the Report describes capacity payment systems without fully exploring how these presumably transitional mechanisms may contribute to undermining progress toward open, more competitive markets in electric power. Addressing these two aspects of the Report would give Congress a fuller view of the current state of retail and wholesale electric power competition.

APPENDIX I
RSP CHECKLIST

Element	Agency Approach	RSP Comments
1. Has the agency identified a significant market failure?	The Report highlights the incomplete and sporadic progress toward competitive wholesale and retail markets. The report does draw attention to market problems attributable to regulatory failures. **Grade: B+**	This Report is a product of a federal Interagency Task Force, which is required to report to Congress as per the Energy Policy Act of 2005 (EPAct 2005). The report takes as a given the current federal and state regulatory roles, rather than grounding its analysis of policy in identification of market failures.
2. Has the agency identified an appropriate federal role?	The Report directs little attention to examining the foundations for federal regulation of wholesale markets. **Grade: C+**	As noted above, the report takes as given the current federal role. Examining the foundations of federal and state regulation of electricity may be considered outside the scope of the EPAct 2005 directive.
3. Has the agency examined alternative approaches?	The report identifies some of the variation in state and federal policies, and identifies effects on competition. **Grade: B+**	The Report insufficiently examines the use of distributed digital technology to enable competition and create further integration of wholesale and retail markets.

Element	Agency Approach	RSP Comments
4. Does the agency attempt to maximize net benefits?	The Report does not present a benefit-cost analysis, but does discuss related cost-benefit studies conducted by others in an appendix. **Grade: A-**	The Task Force was directed to conduct a study of competition in wholesale and retail electricity markets, and not specifically directed to assess cost-benefit studies. By including such an assessment in the draft report, the Report promotes reasoned decision making.
5. Does the proposal have a strong scientific or technical basis?	The Report seeks to ground its assessment of wholesale and retail competition with reference to existing technical literature. **Grade: A-**	The open comment process (required by EPAct 2005) allows for additional scientific and technical information to be submitted.
6. Are distributional effects clearly understood?	The Report does not address the distributional consequences of the lack of competition. **Grade: N/A**	EPAct 2005 did not seek an assessment of distributional effects, and the Report does not address the distributional consequences of the lack of electric power market competition.
7. Are individual choices and property impacts understood?	The Report does not sufficiently address the individual choice impacts of the lack of wholesale and retail competition. **Grade: C**	The Report does not sufficiently address the individual choice impacts of the lack of wholesale and retail competition.