BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Pennsylvania Public Utility Commission
Motion concerning Policies to Mitigate
Potential Electricity Price Increases : Docket No. M-00061957

Comments of PJM Interconnection, LLC

In response to Pennsylvania Public Utility Commission Motion concerning Policies to Mitigate Potential Electricity Price Increases

PJM Interconnection, LLC (PJM) is pleased to respond to the Pennsylvania Public Utility Commission's initiative concerning ways that customers can mitigate electricity price increases. PJM looks forward to working with the Commission on this initiative, and to providing whatever information and analysis the Commission may require concerning PJM's role in ensuring reliability of the bulk transmission grid and administering the competitive wholesale electric market.

We are acutely aware that recent prices experienced in the PJM region and elsewhere around the country have caused considerable anxiety among retail customers and policy makers. This is understandable. PJM believes, however, that competitive wholesale markets are part of the solution, and not the problem. We remain committed to wholesale electricity markets as the best vehicle for ensuring efficient use of our resources and long term consumer benefits. I will focus on the issues of the intersection of the wholesale and retail markets (#6), and how to reduce peak demand (#3), in describing how PJM's wholesale market provides a solid foundation upon which to address the Commission's concerns.

I. Competitive Wholesale Markets Support Retail Markets

Transparent wholesale markets provide competitive prices[1] that will benefit customers over time by increasing efficiency and by providing vital information and transparency. For example, the competitive wholesale market provides information not available elsewhere about the cost of energy use and allows customers to make informed choices about whether to consume at a particular time, whether to seek alternative sources of energy supply, and whether to take initiatives to use energy more efficiently. This information also serves regulators and other policy makers in their assessments of what initiatives and policies they may wish to undertake to fulfill their respective obligations.

Economists and others continue to assess the operation and value of organized wholesale markets. There is, in our view, a growing body of evidence that such markets produce substantial benefits. I have submitted with this response (as Attachment A) a short paper prepared by PJM outlining the value of organized markets. Additional support can be found in the State of the Market Report prepared by the Independent Market Monitor (found at http://www.pjm.com/markets/market-monitor/som.html), and a study prepared by ESAI (found at http://pjm.com/documents/downloads/reports/20051101-impact-pjm-expansion.pdf). These studies show that the PJM market is competitive, that PJM's market has stimulated efficiency and lowered production costs, and that when adjusted for changes in fuel prices, wholesale electricity prices have fallen relative to where they were before the market was implemented.

The Role of Transparency

Absent a transparent competitive wholesale market, it is difficult if not impossible to determine the cost, at any given moment, of consuming electricity. That information was masked behind a system of average rates, deferrals, and even cross-subsidies. The

[1] In most commodities, "competitive" results are the main tool for ensuring that customers see the best price possible and are not subject to artificially high prices. Consequently, the main objective in these markets is to make sure there are no barriers to entry or exit from the market and therefore the conditions exist for multiple buyers and sellers so that no segment of the market can dictate price. While electricity is still not "de-regulated" *per se* and wholesale prices are still subjected to the "just and reasonable" standard under the Federal Power Act, competitive results are an important factor that policy makers use to ensure that wholesale prices meet the standard.

wholesale market as operated by PJM, on the other hand, with transparent and granular prices, provides reliable information about the cost of producing electric energy.

The prices produced in the wholesale market are normally the basis upon which suppliers and buyers of wholesale power will offer prices that may then be reflected in retail prices. In this sense, the relationship between the wholesale and retail electricity markets in electricity mirrors that in other commodities markets: the wholesale prices established by the buying and selling of commodities in exchanges such as the Chicago Board of Trade (CBOT) or the New York Mercantile Exchange (NYMEX) ultimately flow through to retail prices for grain, metals, gasoline or natural gas.

The immediacy and form in which wholesale prices are reflected in retail rates will depend upon a variety of choices by customers, and/or their contractual or regulatory intermediaries. Customers where retail choice is available may sign up for power supply over the long-term (one year to multiple years) or may even decide to build or contract to build power supply of their own. Regulators may, through provider of last resort systems, smooth the impact of the price variability that is inherent in the wholesale market. Different sellers and buyers are likely to have differing views about how best to balance long term risk and uncertainty, leading to a variety of terms and lengths of contracts or other arrangements.

Under any retail approach, however, the existence of a competitive wholesale short-term market provides information upon which to make decisions about how to price and how to procure electric energy.

Pricing Methods

Recently, prices in both the wholesale electric market and most retail markets have risen and have resulted in numerous questions regarding the structure of both. Specific to the wholesale market, some have argued that the "single price auction" or the "locational marginal price" (LMP) are the cause of, or exacerbate, the increases. This question was raised in comments attached to this motion by Commissioner Shane as well.

We believe the evidence is very strong that the LMP market, as administered by PJM, in fact produces the most efficient results and thus ultimately the best prices for consumers. In PJM's market, buyers and sellers submit bids and offers for each hour and the market is cleared at the price that balances supply and demand. The market is "cleared" using a stack of bids starting with the lowest to the highest needed to satisfy the actual demand and this last "marginal" unit is used to set the price for all other suppliers who cleared the market. This method is used in virtually all wholesale electric markets, and, in fact, in virtually all commodities markets throughout the country and the world.

The concern expressed by some, that a clearing price market inflates prices, is not new. The allegation was made, for example, before the Federal Energy Regulatory Commission (FERC) during the 2000-01 California Market disruption. At that time, several well known economists such as Paul Jaskow and others submitted a paper to FERC as part of a "blue ribbon" panel which concluded that uniform or marginal pricing led to a price that was more reflective of actual marginal costs to serve the load than if other methods, such as "pay as bid," were employed. Nevertheless, PJM was interested in asking the question in response to customers' more recent concerns and commissioned a paper by Dr. Peter Cramton of the University of Maryland and Dr. Steven Stoft, an independent consultant. Both have written extensively on wholesale electric market design.

The conclusion that Cramton and Stoft reached was the same as Dr. Jaskow and others in 2001. Uniform or marginal pricing does *not* result in overpayment for electricity. The paper goes into an explanation of the general reasons why prices have risen in the wholesale market and concludes that they are not driven by the use of the uniform price. Most specific to the questions raised by Commissioner Shane and others, it also explains why moving to a "pay as bid" market would not help and would probably hurt. Cramton and Stoft relate the experience of the market in Great Britain, which is the only market that uses a "pay as bid" market, to make this point. In that market there is a significant "spread" between seller offers and buyer bids. The reason appears to be that under this

scheme, supplier offers are based more on what they think the highest price that will clear the market will be rather than bidding their own costs. The Cramton/Stoft paper can be found at http://www.cramton.umd.edu/papers2005-2009/cramton-stoft-clearing-price-markets.pdf#search='Cramton%20and%20Stoft%3A%20Clearing%Price%20Markets.

The role of fuel in price

The Cramton/Stoft paper also addresses the effect fuel prices for oil, natural gas and coal have on wholesale electricity prices. As the Commission is aware, these fuels are the "feedstock" for a majority of the units in PJM and throughout the country. While competitive wholesale markets can provide incentives to manage fuel more aggressively than in traditional regulated models, where fuel cost may be treated as a "pass through," much of this cost must be reflected in overall electricity prices. Indeed, according to analyses done both by the Market Monitor and by PJM's staff, wholesale electricity prices in PJM, when adjusted for fuel costs, are lower than they were in 1998 and in the past few years have generally held steady.

Transmission

The ability to bring less expensive power from one area to another – in effect to take advantage of the geographic and generation diversity in PJM's vast system – is another critical factor in the intersection between the wholesale and retail markets. PJM has long engaged in regional transmission planning. Until recently, however, PJM's regional transmission expansion plan (RTEP) had focused on maintaining reliability standards in the relatively near term and interconnecting generation in a non-discriminatory manner. While congestion has been part of electric systems since the beginning of the industry, prices in markets such as PJM have made the costs associated with congestion more noticeable (i.e., transparent). As a consequence of congestion, which has become persistent in some parts of its market, PJM has recently focused efforts to take a longer term analysis of the system needs, looking ahead 15 years instead of only 5, and to factor in the economic benefits associated with transmission expansions.

This approach began to take shape last year when PJM articulated the "Mountaineer" transmission concept. This was an effort on PJM's part to illustrate the need for new bulk transmission to move baseload units being developed in the western part of PJM to load centers in the East, where siting of generation is increasingly difficult. Indeed, today PJM has put before its Board a number of new transmission projects to be approved for construction and a number of other large, high voltage projects for further study. PJM is also in the final stages of establishing metrics for measuring the economic benefits of certain large transmission projects compared to their costs. These are all designed to make the market more efficient and to allow the freer movement of power to where it is needed. This will have the effect of moving prices in certain areas closer to the prices experienced in lower cost areas.

II. How to reduce peak demand

PJM is committed to ensuring that demand response can play a role in the wholesale market in a manner similar to supply. While competition between sources of supply is vital, the full potential of electric markets will not be reached until supply and demand both interact fully in the market. While most aspects of how "demand" is priced are a matter of state jurisdiction, PJM has sought to provide the platform upon which demand response initiatives can flourish.

To this end, PJM has had made a number of changes to its demand response programs over the years. It has had an "active load management" (ALM) system since the late 1990s which allows customers to put in a bid at which point they can be curtailed by PJM at a set price. PJM also has programs to compensate for curtailment during emergency situations (where the gap between available supply and load narrows too much), and for load reductions for "economic" reasons to impact the wholesale price. PJM recently obtained approval from FERC to make these programs, which had been pilot programs, permanent so that load serving entities and curtailment service providers could count on these programs being available year after year and therefore could make them a standard part of service to retail customers or use them to manage their own load. PJM has also

recently received approval to allow demand to be bid in as part of PJM's synchronized reserve (formerly spinning reserve) market and be counted the same as generation.

All these efforts are consistent with PJM's goal to put demand, to the extent possible, on the same level with supply to influence price in the wholesale market. We believe that the active participation by the demand side of the market can have a profound effect on lowering price. PJM is in the process of working with the states to further demonstrate the effects on price by demand response and distributed resources. In response to work done by several states in PJM[2] in the Mid Atlantic Distributed Resources Initiative (MADRI), PJM and the associated states have agreed to fund a study to further document the effect that demand response can have on price. The results of this study will, we expect, help encourage both providers and policy makers to increase the availability and use of demand response in the market.

Conclusion

The wholesale market operated by PJM provides the information and efficiencies necessary for a sound approach to retail pricing. That market also provides, in particular by allowing Demand Side Response to capture fully the value it brings into the market on a par with other forms of supply, the tools for customers to manage their costs and at the same time help reduce peak usage.

PJM looks forward to continuing to work with the Commission to provide information that may be useful to the Commission as it continues this initiative.

Respectfully submitted,

Thomas L. Welch
Vice President, External Affairs
PJM Interconnection, LLC

Dated: June 15, 2006

[2] The District of Columbia, Delaware, Maryland, New Jersey and Pennsylvania.

ATTACHMENT A
Docket No. M-00061957

An Examination of Transmission Reliability and Organized Markets

Executive Summary

The U.S. electric grid is one of the most complex and valuable systems ever devised. Reliable electric service is an essential commodity that is indisputably central to the nation's long-term economic well-being.

PJM Interconnection, a regional transmission organization (RTO), operates the world's largest competitive wholesale electricity market. In addition to coordinating electricity flow across13 states and the District of Columbia, it is responsible for developing a long-term planning approach for the system's infrastructure. PJM provides transparent information about the state of the system and prices, enabling market participants to assess the economics and manage the risks of wholesale power transactions and their supply options.

Experience shows that customers in organized competitive wholesale energy markets administered by independent RTOs have received the benefits of improved reliability and lower costs that would not have been achievable under more tightly regulated market structures. Some of those benefits include:

Enhanced electric grid reliability. Organized wholesale electric markets, supported by RTOs, enhance reliability by making the operation of the grid transparent through "locational" prices, superior information and better system-management tools. For example, PJM runs a "security analysis" every minute, processing 68,000 data points every 10 seconds and evaluating almost 4,000 contingencies. This analysis gives system operators information to ensure that an unexpected event does not cascade and disrupt the entire system.

Facilitated regional transmission system planning. PJM performs regional system planning over a 15-year horizon. The regional planning process identifies what transmission system upgrades are necessary to meet customers' operational, economic and reliability requirements. It evaluates the feasibility, effect and cost of transmission upgrades and other projects that can mitigate system constraints and reliability problems. The process has enhanced transmission investments in the grid so that since 2000, nearly $2 billion in improvements have been approved.

Lower costs. Effectively competitive wholesale electric markets produce economic savings for customers. The savings result from access to a broader range of generating plants across a larger geographic area and increased efficiency. Independent estimates of the effect of increased competition in the electric market strongly demonstrate that competition has served customers better than a more tightly regulated market structure would have. According to analysis of Energy Information Administration data, U.S. customers have paid less from 1984 to 2004 as a result of competitive markets than they would have if a more tightly regulated structure had stayed in place. Another study found that the region saves about $500 million a year as a result of the recent PJM integrations.

Clean energy generators and demand response providers capturing their full value in furtherance of federal and state government policy preferences. Because RTOs are independent, they select resources based on economic merit. Several PJM programs bring a broad range of power technologies, such as demand response, to customers and enable all types of resources to realize their full economic worth. More than 6,000 commercial and industrial customers and more than 45,000 small commercial and industrial customers participate in PJM's expanded demand-response programs, with the amount of electric load doubling since 2003 to 2,803 megawatts (MW). In addition, there are 296 MW of wind power in operation and 5,168 MW of wind projects in the interconnection study process.

As in other industries that have transitioned from reliance on strict regulation to greater reliance on market forces, the benefits of wholesale electric competition will become more measurable over time. Ongoing efforts like the Electric Energy Market Competition Task Force will focus on ways to further advance wholesale competitive markets and increase the resulting customer benefits.

Introduction

The U.S. electric grid is one of the most complex and valuable systems ever devised. Although most people generally understand that there is an electric system serving homes and businesses, they are less clear about what it takes to maintain the reliability of that system or the added value of organized markets for the buying and selling of wholesale power. The two are intertwined and mutually reinforcing. Reliability is strengthened by the transparency of the markets and the latter are enhanced by the stability of a well-operated transmission grid. Two-thirds of the U.S. population is served by independent grid operators, like PJM Interconnection, that manage markets with varying degrees of sophistication. PJM operates the world's largest competitive wholesale market and is considered the model by many in the industry. This paper describes how PJM and other regional transmission organizations (RTOs) can bring together markets and managed generation dispatch to best serve customers and their members.

Organized competitive wholesale energy markets administered by regional transmission organizations increase system reliability, lower costs and allow customers to capture the full value of diverse power technologies.

Experience shows that organized wholesale competitive energy markets administered by independent system operators (ISOs) and RTOs:[1]

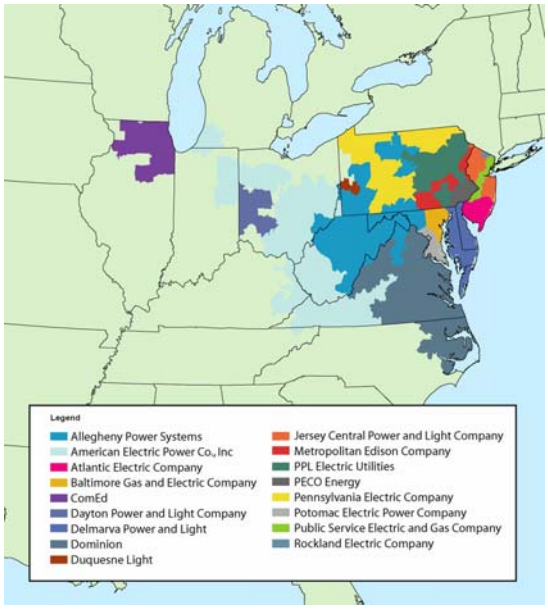
- ***Improve electric grid reliability*** through enhanced monitoring technologies and processes;
- ***Facilitate regional transmission system planning*** based on a geographically broad and holistic view of the power system;
- ***Lower costs*** by providing access to lower priced and more diverse power sources; and,
- ***Allow clean energy generators and demand response providers to capture their full value***, in furtherance of federal and state government policy preferences.

This paper explains each of these benefits. As competitive markets and the structures to facilitate them continue to advance, the scope and depth of the advantages will expand.

1 Independent system operators (ISOs) and regional transmission organizations (RTOs) coordinate generation and transmission across a wide geographic area and match generation to the demand for electricity in real time. ISOs are established under Federal Energy Regulatory Commission (FERC) Order 888. RTOs perform similar or expanded functions and have met the requirements of FERC Orders 2000 and 2001.

What is PJM?

PJM is the independent operator of the world's largest competitive wholesale electricity market. That means PJM manages the largest centrally dispatched control area in North America by coordinating electricity flows in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. The PJM footprint spans the service areas of many transmission companies across these states. PJM optimizes the use of the transmission system to benefit the region's 51 million people and serve its more than 390 members.



An independent system operator is similar to an air traffic controller. PJM does not own transmission assets but oversees their operation to ensure safe and reliable service. PJM operates more than 1,250 power plants and manages the flow of electricity across 56,070 miles of transmission lines and 6,038 bulk power stations. Importantly, PJM has no financial interest in any market segment. It is entirely indifferent as to the type of resource used to meet customer needs – be it transmission, large or small generation from near or far, or demand response.

PJM operates a competitive wholesale market for electricity, serving, in effect, as an exchange. All of the electric transmission companies and generators that are members of PJM can participate in this market. PJM enables market participants to trade the following products: day-ahead energy, real-time energy, ancillary services (such as spinning reserves) and capacity. Some jurisdictions in the PJM region have provided retail customers with the opportunity to participate directly in the market as well. A critical element of a competitive retail market, of course, is a workably competitive wholesale market.

The centerpiece of an effectively competitive wholesale market is publicly available, timely and accurate information. Another central function of PJM, therefore, is to provide transparent information about the state of the system and prices. This allows market participants to assess the economics and manage the risks of wholesale power transactions and their supply options.

PJM also provides a variety of related energy market services, from regional transmission system planning to a Generation Attribute Tracking System, which are discussed below.

In executing many of these functions, PJM makes broad use of a collaborative stakeholder process. Stakeholders include participants that produce, buy, sell, transmit or regulate electricity at the retail level. For example, through a collaborative process, PJM adopted the

rules and processes to facilitate power plants' interconnection to the grid. The rules treat all power plants equally, provide market certainty and preserve the integrity of the electric grid.

Organized competitive wholesale electric markets administered by RTOs increase electric grid reliability.

Reliable electric service is essential in everyday life. Reliability over the long term, in the form of adequate resources to meet increased demand associated with economic growth, is also indisputably central to the region's economic well-being. Through PJM, the transmission systems and generation resources owned by entities across 13 states and Washington, D.C., function as a unified power delivery system and operate with increased reliability and efficiency. Organized wholesale electric markets supported by RTOs enhance grid reliability through locational prices, superior information and better grid-management tools.

Real-time wholesale market price information enhances reliability

The economic incentives in an organized competitive wholesale market contribute to system reliability. Effectively competitive markets use clear and timely information about grid conditions to communicate simultaneously with all market participants. This means that monitoring equipment is not the only way to determine when and where the system is stressed. Prices also tell market participants when congestion or supply shortages arise and allow them to respond.

To illustrate, research by University of Wisconsin Professor Fernando Alvarado and Rejesh Rajaraman[2] suggests that a locational marginal pricing market would have revealed increasing system stress related to the August 14, 2003, blackout in time for action prior to the catastrophic failure. As conditions changed – and before they became irreversible – the market would have revealed extremely high prices in certain areas as they started to overload. The prices may have prompted market participants and system operators to explore the reasons for the price spikes and to determine whether the price spikes were caused by operational conditions or something else.[3]

RTOs have a wide 'field of vision'

The field of vision of system activity of the RTO footprint allows operators to identify emerging factors that could affect grid conditions and alleviate problems as they emerge. For example, PJM's state estimator model contains close to 13,000 busses, with data fed by systems spanning 13 states and the District of Columbia. The broader field of vision helps PJM operators mitigate any operational problem they see quickly, before problems cascade.

RTOs also work collaboratively to improve reliability across even larger geographic regions. RTOs' grid reliability and coordination efforts advanced in 2004 through an historic

[2] Both of Christensen Associates.

[3] Alvarado and Rajaraman: "The 2003 Blackout: Did the System Operator Have Enough Power?" August 18, 2003.

agreement among PJM, the Midwest Independent Transmission System Operator, Inc. (Midwest ISO) and the Tennessee Valley Authority. The Joint Reliability Coordination Agreement allows the three organizations to exchange operational data about interregional congestion management, operations, emergency protocols and system planning. The RTOs' agreement strengthens coordination of the three systems' operations, transmission and transactions and gives each other a view into the others' footprint. The agreement advances reliability for 43 percent of the Eastern Interconnection, or one-third of the United States.

RTOs have improved system monitoring capabilities

Reliable grid operations require substantial monitoring, communications technology and data. RTOs have improved considerably the quality of technologies and processes used to monitor and manage the grid.

Some other examples of the ways PJM provides sophisticated system monitoring for improved reliability include:

- ***Day-Ahead Unit Commitment:*** PJM schedules generators on a day-ahead basis through a regional unit commitment process, which takes into account transmission limitations. This ensures sufficient generation resources are scheduled to meet reliability standards.

- ***Real-Time Contingency Analysis and Generation Dispatch:*** PJM runs a "security analysis" every minute. It processes 68,000 data points every 10 seconds and evaluates almost 4,000 contingencies. This gives system operators near real-time information on the potential consequences of transmission and generation contingencies to help make sure an unexpected event does not cascade.

- ***Real-Time Voltage Analysis:*** Regional power transfers can significantly affect voltage performance during contingency events. PJM monitors power transfers by re-calculating regional system voltage characteristic curves every 10 minutes. This gives system operators up-to-the-minute information and avoids the potential for operating near voltage-collapse conditions.

ISOs and RTOs have scored well in this area. At a FERC technical conference on information technology for reliability and markets, Dr. Frank Macedo, a consultant to FERC, offered a list of best practices and minimum requirements for reliability software.[4] The list reviewed critical reliability tools such as network analysis capabilities, monitoring and real-time enablers.[5] Most ISOs' and RTOs' information technology systems meet Dr. Macedo's criteria for "best practices" reliability tools. In contrast, NERC's reliability readiness reviews

[4] Dr. Frank Macedo, "Reliability Software – Minimum requirements and best practices," with additional detail in a companion presentation, presented at the FERC July 14, 2004 technical conference on Information Technology for Reliability and Markets, available at: http://www.ferc.gov/EventCalendar/EventDetails.aspx?ID=1102&CalType=%20&Date=7%2f14%2f2004&CalendarID=0.

[5] This list is now being used in a reliability tools study by NERC's Operations Committee.

indicate that many non-RTO control areas' reliability tools are closer to the minimum standard than to best practice capabilities, if they have the tools at all.[6]

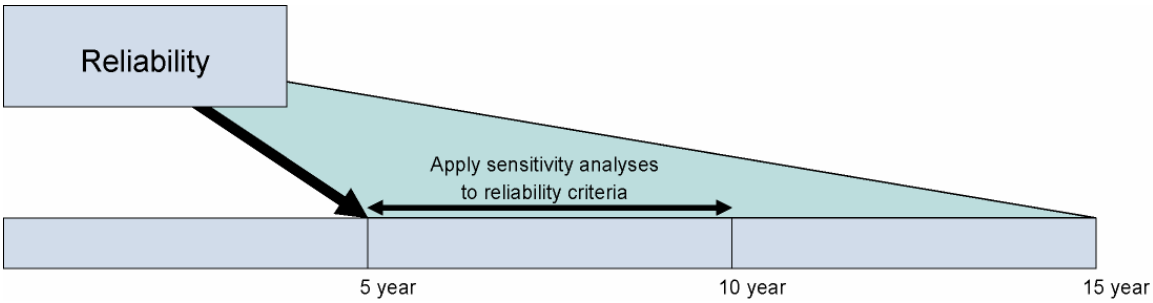
These more sophisticated system-monitoring technologies and processes have not cost consumers more than they paid for reliability operating costs in the past. In 1996, the last year reliability was provided through a "power pool," reliability operating costs were 9.7 cents per MWh of load. PJM's 2006 budgeted reliability operating costs are 9.5 cents per MWh of load. In both years, a typical residential customer paid about $1 a year in reliability operating costs.

PJM's regional planning process leads to transmission system investment necessary for effectively competitive wholesale markets.

PJM performs regional system planning through a process called the Regional Transmission Expansion Planning (RTEP) process. The RTEP process identifies what transmission system upgrades are necessary to meet customers' operational, economic and reliability requirements. It evaluates the feasibility, effect and cost of transmission upgrades and other projects that can mitigate system constraints and reliability problems.

The RTEP considers the full range of factors such as: transmission projects identified by owners and others needed to alleviate congestion; requests for long-term firm transmission service; generation interconnection requests; distributed and renewable generation developments, power plant retirements and demand response and energy efficiency programs. This holistic regional approach enables more efficient decisions about transmission grid expansion.

Figure 1.



PJM recently increased the planning horizon from 5 to 15 years to accommodate better planning for reliability improvements and for upgrades that make sure the electric grid best supports economic sales of power around the region. PJM is developing through a stakeholder process an "Economic Planning Process" so that planning will consider additional economic impacts as well as reliability.

[6] See report entitled "The Value of Independent Grid Operators" by the ISO-RTO Council dated November 2005 at p. 16.

Experience shows PJM's planning process works. Transmission investments approved through PJM's RTEP process since 2000 total nearly $2 billion. This includes $1.4 billion in reliability system upgrades and $533 million in upgrades to interconnect new generation. The generation-related upgrades consist of projects adding up to 17,021 megawatts of new generation and 3,897 megawatts more of new generation now under construction.

Organized competitive energy markets administered by RTOs increase market efficiency and lower prices.

Effectively competitive wholesale electric markets produce economic savings for customers. The savings result from access to a broader range of generating plants across a larger geographic area and increased efficiency. These economic benefits have been documented in a number of technical studies. The following are a few examples of the findings.

Customer prices are lower in organized competitive energy markets than they would have been had the historic regulatory structure continued.
It is impossible to know with certainty what power prices in organized competitive wholesale energy markets currently administered by RTOs would have been had markets not organized. Although precision is impossible, independent estimates of the effect of increased competition in the electric market strongly indicate that competition serves customers better than the more tightly regulated market structure would have.

To test this, Cambridge Energy Research Associates built a model to estimate what residential customers would have paid had the regulatory system prior to 1997 remained in place through 2004.[7] The analysis assumes 1997 is a reasonable dividing line between the historical monopoly structure and today's more competitive marketplace.[8]

The analysis concludes that overall, today's actual prices are below the estimate of what regulated prices would have been absent the competitive market structure. Customers across the United States paid about $34 billion (in 1997 dollars) less during the 1998 to 2004 time period in today's more competitive regulatory market than they would have had the prior, more tightly regulated structure stayed in place.[9]

The savings from the market structure advances are due to the predictable consequences of greater competitive pressure in the power business: increased efficiency, greater innovation and cost discipline.[10]

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[7] See report entitled "Beyond the Crossroads" CERA dated September 2005.

[8] In April 1996, FERC issued Order 888 requiring open non-discriminatory access to transmission facilities. Further, in the years between 1996 and 1999, independent system operators were formed and began operating in the PJM region, New York, Texas, New England and California. CERA at Ch I p 1.

[9] See report entitled "Beyond the Crossroads" by CERA dated September 2005 Ch. I at p. 5.

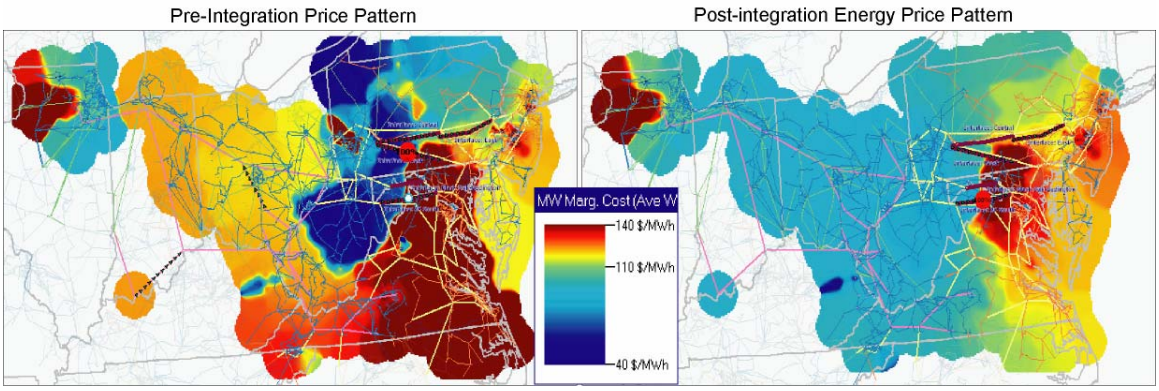
[10] Id.

Energy prices for the PJM region as a whole have declined when new areas have integrated into PJM's organized markets.

When new geographic areas have integrated into the PJM system, energy prices for the region as a whole have declined.[11] The reason is that there is surplus, relatively low-cost energy in the western part of PJM's region that can be shipped east. States with low-cost energy can preserve this low-cost generation for their own use and ship only surplus power to other areas. Increased power flow across the region is due to PJM's central dispatch and the regulatory decision, supported by PJM's system, to eliminate incremental charges by each utility as power moves across utility territories.

To test this effect, Energy Security Analysis Inc. constructed a model to calculate the prices at each node. This enabled the load-weighted average prices in each area, before and after integration, to be measured.[12] The analysis shows that the price of energy across the expanded PJM market is $0.78 per MWh lower after integrating with PJM than it was before. Since the total electric energy consumption in 2005 in the PJM market was about 700 terawatt-hours, a $0.78 MWh reduction in the area's energy price would save the region as a whole about $500 million a year.

Figure 2.



The analysis demonstrates that the organized market administered by PJM is working as intended to bring the benefits of more competitive markets to consumers while improving system reliability.

PJM's ability to increase electricity trading provides customers with access to lower-priced and more diverse power.

A primary function of organized markets is to facilitate electricity trading. PJM assists trade by providing the necessary contractual, regulatory and planning framework. For geographic areas that import more power, higher trading activity will typically provide lower-cost power

[11] See report entitled "Impacts of the PJM RTO Expansion" by Energy Security Analysis, Inc. dated November 2005 at pages 56 - 59.

[12] The price levels are determined by assumptions, including fuel inputs.

and increase the diversity of power sources. For areas that export more power, increased trade is an opportunity to maximize the use of existing resources or to build new capacity.[13]

Trading activity with the areas merged recently into PJM illustrates that an organized market increases trade and optimizes dispatch. For example, American Electric Power (AEP), which covers parts of western Virginia, eastern Kentucky, Ohio, Indiana and Michigan, integrated into PJM in September 2004. Prior to AEP's integration, AEP-to-PJM power transfers on peak averaged 1,550 MW. After AEP's integration, AEP's power transfers on peak have averaged 2,300 MW, an increase of 750 MW.[14]

The increase in power flows across PJM brings precisely the economic benefits the market was designed to achieve for customers: access to lower-priced and more diverse power sources for some areas and the increased use of existing power plants in other areas.[15]

Additionally, as PJM has integrated new areas, it has been able to lower the reserve margin of installed capacity required to meet demand. In the mid-Atlantic region, the ability to share reserves has allowed the reserve margin to be reduced by about 2,000 MW, which translates into capacity-payment savings.[16]

Prices in PJM states were, on average, lower in 2004 than they were in 1993.
It is difficult to compare with precision the effect of competitive wholesale markets on retail prices on a state-by-state basis.[17] First, the transparent market information that organized markets publish is not available for unorganized markets. Second, organized markets show true costs: price increases in organized markets are visible in real time. That is not the case in areas without organized markets. Additionally, factors such as multi-year retail-rate freezes or state commission cost-deferral practices inhibit direct price comparisons. Wholesale electricity cost efficiencies and savings may or may not be passed through to retail customers, depending on whether a state has retail competition and, if traditional regulation is employed, how state regulators handle the utility's rate base and other cost recovery.[18]

Nevertheless, a review of 1993 and 2004 historical electricity prices compiled by the Energy Information Administration (EIA), the independent statistical agency of the U.S. Department of Energy, suggests that customers in the competitive wholesale energy market administered

[13] See report entitled "Impacts of the PJM RTO Expansion" by Energy Security Analysis, Inc. dated November 2005 at page 74.

[14] Id. at 77.

[15] Areas with lower-priced power can preserve it for their own customers and sell excess power elsewhere.

[16] See report entitled "The Value of Independent Grid Operators" by the ISO-RTO Council dated November 2005 at 15.

[17] There appears to be general agreement on this point. In comments on Wholesale and Retail Electricity Competition in FERC Docket No. AD05-17-000, the Carnegie Mellon Electricity Industry Center, for example, said it is not clear whether competition in the wholesale markets has benefited retail customers. See, CEIC Comments dated November 18, 2005 at page 2. CEIC also set forward a figure on which each point represented the difference between the annual percentage change of industrial price after the phase in of competition and the annual change before the phase-in for one state. CEIC opined that "[t]here is no statistically significant correlation between restructuring and improved industrial prices." See, CEIC Comments dated November 18, 2005 at page 3.

[18] DOE Report: "The Value of Economic Dispatch" dated November 7, 2005 at page 29.

by PJM were better off economically than customers not served by organized markets.[19] To the degree that a snapshot of EIA's historic retail price data reflects a price trend, it is that retail customers in the PJM region have benefited from competitive wholesale markets.

For purposes of this review, the year 2004 was selected because it is the most recent year for which EAI has published price data on a state-by-state basis. The year 1993 represents the market well before the introduction of competitive and organized markets. The states included in the PJM region for purposes of this review are those in its original footprint: Pennsylvania, New Jersey, Delaware and Maryland, as well as the District of Columbia. States included as non-RTO states are those entirely outside RTOs and ISOs, in addition to those states with very small geographic areas in an RTO, such as Arkansas and Louisiana.[20]

The prices that residential customers paid for electricity in the PJM states were lower on average in 2004 than in 1993 (data unadjusted for inflation)[21] and the prices that industrial customers paid were marginally higher. Conversely, the prices residential and industrial customers paid in unorganized market states were higher on average in 2004 than in 1993.

Table 1.

	Historic PJM States		Unorganized Market States	
1993 Average Residential	9.625		7.174	
2004 Average Residential	9.493		8.028	
		-1.4%		+11.9%
1993 Average Industrial	6.195		4.259	
2004 Average Industrial	6.328		4.718	
		+2.1%		+10.8%
(expressed in cents per kilowatt-hour)				

To the extent historic retail price data, as compiled by EIA, allow any conclusion to be drawn about the effects of a more competitive energy market administered by PJM, it is that residential and industrial customers in that market are better off economically than those in unorganized markets.

PJM's efficient market has helped moderate the impact of rising fuel prices.
In a study of auctions in wholesale electricity markets, Peter Cramton and Steven Stoft[22]

[19] These data are, by virtue of the manner in which they are aggregated and collected, necessarily approximate. Nevertheless, in broad outline they are likely to show broad trends and relative positions among the reported jurisdictions.

[20] The states include: ARK, MS, AL, GA, SC, NE, CO, LA, WA, OR, ID, MT, WY, NV, UT, AZ, NM, NC, TN, FLA. Some, such as ARK and LA have very small areas in an RTO region. Hawaii and Alaska are excluded.

[21] Beginning in 2003 DOE eliminated the "Other Sector" from its data. Data previously assigned to the "Other Sector" have been reclassified as follows: Lighting for public buildings, streets, and highways, interdepartmental sales, and other sales to public authorities are now included in the Commercial Sector; agricultural and irrigation sales where separately identified are now included in the Industrial Sector; and a new sector, Transportation, now includes electrified rail and various urban transit systems (such as automated guideway, trolley, and cable) where the principal propulsive energy source is electricity. The data presented here does not accommodate these reclassification changes.

[22] Cramton and Stoft: "Uniform-Price Auctions in Electricity Markets," March 18, 2006

rejected arguments that large electricity prices increases that have occurred recently demonstrate that wholesale electricity markets do not work.

While they identified a number of factors involved in pushing up electricity prices, including the expiration of retail price caps in some states, they demonstrated that by far the largest factor has been sharp increases in fuel prices, especially for natural gas, over the past five years.

Noting that these higher fuel costs would have driven up electricity prices even under traditional rate regulation, the authors pointed out that the efficient performance of PJM's market has had the effect of moderating the impact. From 1998 to 2005, the authors concluded, the spot market energy price in PJM increased to about $70/MWh from $25/MWh. However, when adjusted for the cost of fuel, the price dropped to about $20/MWh from $25/MWh and has remained at that level for the past six years. The authors concluded that this demonstrates that fuel-price increases caused the electricity price increase, not any failings in the market.

Other states with organized markets have seen similar results.

The positive impact of organized markets on retail electricity prices has been demonstrated in regions other than PJM as well.

A study by the staff of the New York State Public Service Commission[23] found that real (inflation-adjusted) electricity prices for a typical residential customer in that state dropped by an average of 15.9 percent between 1996 and 2005. Similar reductions benefited the typical commercial and typical industrial customer in New York, with reductions of 17.7 and 14.7 percent, respectively, the report found.

These reductions came despite rising natural gas prices. Adjusting for fuel prices, wholesale electricity prices were essentially flat during the 2002-2005 period. The overall cost of supply in upstate New York in 1996, prior to restructuring, was $50/MWh. The cost was the same in the post-restructuring 2002-2004 period, the March 2006 report found.

In Texas, the Public Utility Commission of Texas (PUCT), responding to a legislative request, analyzed how retail pricing in that state's competitive market compared with an estimate of what rates would have been if regulation had continued in the state.

In its February 2006 report[24], the commission found that "the competitive market has provided customers with prices that were significantly below the estimated rates that would have been in effect in a regulated environment" over the 2002-2005 period.

The commission estimated the savings at $1,450 for a typical residential customer in the Houston area who switched to a competitive provider in January 2002 and then switched

[23] See "Staff Report on the State of Competitive Energy Markets: Progress to Date and Future Opportunities," New York Department of Public Service, March 2, 2006.

[24] See "Electricity Pricing in Competitive Retail Markets in Texas," Public Utility Commission of Texas, Feb. 3, 2006.

annually to the lowest-cost provider, compared with what the customer would have paid under regulated rates over the four-year period. The same customer in the Dallas area would have saved about $800, the report estimated.

RTOs' institutional independence increases customer access to the value of diverse power technologies.

A fundamental purpose of RTOs is to ensure that every resource has an equal opportunity to meet customers' energy needs reliably. RTOs are uniquely suited to do this because as institutions they are independent. RTOs have no financial interest in, and are therefore indifferent to the relative success of, demand response, renewable energy, distributed generation, energy delivered from near or far, or over regulated or merchant transmission lines. RTOs select resources based on economic merit and their ability to provide the product when and where needed.

Several PJM programs illustrate the way its independence and market neutrality bring the broad range of power technologies to customers and enable all resources to realize their full economic worth. These programs also further various state and federal policy preferences.

Expanded Demand-Response Programs

Demand response, or customers' ability to see the cost of electricity and to adjust their use accordingly, is central to the effectiveness of wholesale power markets. PJM's demand-response programs enable customers to receive revenue for reducing their electricity consumption when wholesale prices are high or when electric grid reliability is in jeopardy.

More than 6,000 commercial and industrial customers and more than 45,000 small commercial and residential customers participate. The amount of load participating has more than doubled since 2003, to 2,803 MW. The number of customer sites participating has increased tenfold, to approximately 5,000. The participation trend indicates that customers value the potential opportunity to reduce power use and save money. Their participation contributes to reliability and system efficiency as well.

PJM is adjusting demand-side programs to provide generation, transmission and demand response comparable opportunities to capture their economic value. In other words, to the extent demand-side measures decrease the cost of electricity, those decreases should be transparent and available to demand-response providers and their customers. To that end, PJM is moving to:

- Allow demand response to provide certain ancillary services (such as spinning reserves) and to allow the higher value of those services to be passed onto the demand-response customer.
- Allow demand response to participate as an emergency resource, which will put it on a comparable footing economically with generation when it participates in emergency situations.

- Make permanent the central demand-response tool, the Economic Load Response program.

Renewable Energy Generation Attribute Tracking

In 2005, PJM implemented the Generation Attribute Tracking System (GATS).[25] The GATS tracks the environmental and emissions characteristics of generators – large and small – by creating a certificate for each megawatt-hour of electricity produced. Data in the GATS includes the following: megawatt-hours produced, emissions data, fuel source, location, state program qualification and ownership of attributes. The GATS provides state regulatory commissions, environmental agencies, market participants and customers with a single regional integrated system to document and track power generation attributes. The system is generally considered important to increase the liquidity of the clean power markets created by legislatures and regulators. [26]

Whether a state requires electric suppliers to include a specific percentage of renewable resources in the electricity they sell to customers (i.e., a renewable portfolio standard) or requires suppliers to tell customers about their fuel sources or emissions' profile, the GATS enables suppliers to demonstrate compliance with state requirements. Similarly, it allows clean-power suppliers to prove to customers that their power sources are in fact clean.

The GATS also allows owners of renewable generators to obtain the full value of the resource by letting them use the energy produced and then separately sell the renewable energy certificate associated with it to suppliers who need clean energy, or certificates, to comply with state renewable portfolio standards.

Systematic accommodation of intermittent generation resources

Many generation sources can be counted on to run at specific times. Wind power, on the other hand, is considered difficult for system operators to schedule. To facilitate wind power's participation in the market and to enable it to realize its full economic worth, PJM has developed procedures to calculate the capacity values for wind. PJM's wind power procedures will also improve grid operations by giving system operators information on how much electricity to expect from those resources during an operating hour.

PJM's process to accommodate wind power and its access to a large wholesale market furthers state and federal government policies that have increased wind power development. The PJM region currently has 296 megawatts of wind power in operation; 5,168 megawatts of wind projects

[25] Through PJM Environmental Information Services.

[26] Market liquidity occurs when buyers and sellers can readily transact at the prevailing price because there are sufficient buyers and sellers to accommodate trading at market prices. Prices in markets with greater liquidity tend to be less volatile.

are in the interconnection study process.

The cost to consumers to secure the benefits of organized wholesale markets and other RTO-administered programs is low.

The benefits of the organized competitive wholesale market administered by PJM are clear. It is also clear that implementing a new market structure gives rise to costs. A natural question is whether the benefits are worth the price.

For the average residential customer, the cost of operating PJM is 24 cents per month. As noted, the costs specifically associated with reliability operations are estimated to be slightly lower in 2006, as provided by PJM, than they were in 1996, the last year in which reliability was provided through a power pool.

PJM's costs are declining: PJM's service charges to its members have decreased, as measured by dollar market activity, from 3.4 percent in 1996 to an estimated 1.5 percent in 2006.[27] This decline was achieved notwithstanding the increased sophistication and breadth of reliability and market services that PJM now provides.

Conclusion

As in other industries that have transitioned from reliance on strict regulation to greater reliance on market forces, the benefits of wholesale electric competition will become more apparent and measurable over time. Because competition in wholesale electric markets is more advanced in some regions of the country than others, Congress created the "Electric Energy Market Competition Task Force" in the Energy Policy Act of 2005 to analyze competition in the wholesale and retail electric markets.[28] The Task Force currently is gathering information on the elements required for effective competition, the impediments and suggestions for further progress.

While that inquiry will bring forward facts and put focus on how to further advance effective wholesale competition, it is clear today that customers in organized wholesale energy markets have received the benefits of improved reliability and lower costs that would not have been achievable under more tightly regulated market structures.

[27] See report entitled "The Value of Independent Grid Operators" by the ISO-RTO Council dated November 2005 at page 38.

[28] The Task Force includes the Federal Energy Regulatory Commission, Department of Energy, Department of Justice, Federal Trade Commission, and the Department of Agriculture.