

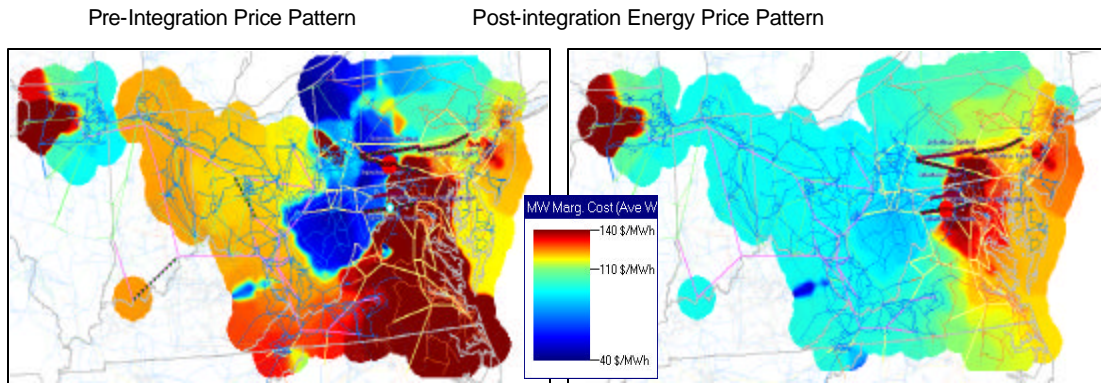
CAPACITY MARKETS IN PJM: THE ORIGIN AND PURPOSE OF RPM

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Miami, February 8, 2006

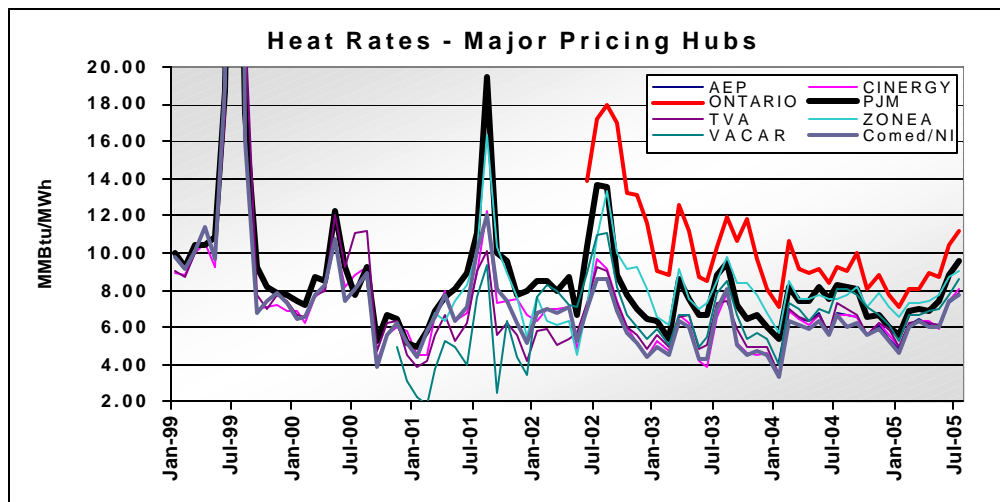
PJM's Reliability Pricing Model (RPM) originates in the context of PJM's commitment to competition as an organizing principle in electricity markets. Competitive forces are far better at producing efficiencies and innovation and allocating resources than any particular combination of utility executives and state and federal regulators. The new Energy Policy Act, for example, comes down squarely on the side of competition in the electric power industry. The RPM addresses the one of the areas where improvements are needed in the operation of PJM's competitive market.

ESAI MAP OF PRICE PATTERNS IN EXPANDED PJM



Experience demonstrates that competitive wholesale electricity markets have achieved benefits. An Energy Security Analysis, Inc. study, released in November 2005, shows fairly dramatic improvements in price patterns across the PJM area following the integration of new areas into PJM markets. Larger markets bring many efficiencies, particularly load and supply diversity. ESAI identified energy savings of more than \$500 million annually for wholesale customers as the result of PJM's market integrations, with the savings expected to grow significantly in the future. ESAI found that the region-wide energy price without the integrations would have been 78 cents per megawatt-hour higher in 2005.

ESAI CHART OF HEAT RATES



ESAI looked at market heat rates to see whether market efficiencies had changed. Heat rate reflects the efficiency of generation. ESAI calculated a heat rate by dividing the market price of electricity by the price of natural gas in order to correct for the effects of changing fuel prices. The study found improvements throughout the market in efficiency – exactly what you would expect when competitive pressures are in place.

Other studies, such as the work by Cambridge Energy Research Associates and Global Energy, are part of a growing body of evidence that indicates that as the wholesale electricity markets develop they are bringing the value of competition in terms of price and reliability to the electricity marketplace. CERA found that U.S. consumers have saved about \$34 billion since 1977 because of electric competition. Global Energy Decisions found that wholesale competition in the Eastern Interconnection produced total savings of \$15.1 billion for customers from 1999 to 2003.

Increases in the price of fuels used to generate electricity have, however, masked much of the gain achieved by competition. Moreover, because competitive markets prevent the kind of deferrals and price discrimination that characterize more traditionally regulated electricity systems, rapid increases in cost are often revealed far more quickly in competitive markets than elsewhere. (Of course, decreases are reflected more quickly as well, which was one of the driving factors behind introducing competition in the first place.) When adjusted for the changes in fuel prices, wholesale electricity prices in PJM have dropped every year since 2000, suggesting at the very least that competitive markets are consistent with increasing efficiency.

Nevertheless, competitive markets as they exist in PJM and other organized markets are not fully mature. Significant issues remain in at least three principal areas: Demand response, transmission planning, and supply adequacy. The discussion that follows focuses on the last of these, but I want to emphasize that all three are vital. Demand

response in particular is crucial to market maturity, and I'm pleased to say that we have made some significant strides at PJM recently in allowing demand responders to capture, on a par with generators, the value they bring to the market.

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Supply adequacy, however, remains a crucial public policy and economic issue. While the current energy market structure has shifted the risk of overbuilding (i.e. the risk of excessive surplus) away from consumers, the market has revealed a risk of "under building," in that the market does not currently appear to produce a reasonable expectation of sufficient revenues to encourage people to build soon enough to avoid shortages. Sufficient capacity is not enough on average; you need it all the time both for reliability and to prevent the exercise of market power in the energy market. The market system must also stimulate investment far enough in advance so that supply is there when needed.

Electricity as a commodity has some unique characteristics. It cannot be stored in any significant quantities. Thus production and consumption must match exactly all the time. Moreover, electricity so pervades our economic and social life that disruptions in its availability are likely to have severe economic and political impacts.

Thus, policymakers and those who administer markets, such as PJM, try to ensure that there is *always* enough supply in the system to ensure reliability. Both markets and reliability are best served when there is a persistently sufficient supply available. A succession of extreme price spikes or curtailed supply would be unacceptable. Moreover, where supply is short, there is a greater risk of the exercise of market power.

PROJECTION OF NEAR TERM RELIABILITY VIOLATIONS

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One of the drivers of PJM's development of a workable capacity model is our concern that further delay will lead to a succession of regional, and ultimately system-wide, shortages due to insufficient new investment. While the PJM region is in a good position for supply in the very near term, as load catches up, the region needs significant new supply investment. Under the RPM, where supply is long and likely to stay long for a while, prices remain at very low levels. However, there are areas where the need is immediate, as is now evident in New Jersey. In some cases, the need is so immediate that rapid deployment of new transmission and reliability must run contracts are needed to address reliability needs. The sooner the FERC decides on the right approach to the capacity issue, the sooner investors can make their decisions. PJM-wide capacity prices under the current system, which are the same no matter where the capacity is located, are not consistent with reliability needs in individual areas.

Net revenues have declined across the spectrum of PJM generation. Net revenues have been very low both from the energy and capacity markets for several years and, indeed, are likely to be inadequate for the long term. Investors in generation and owners of generation now in place see this pattern and have reacted by sharply curtailing their investment. Low prices have forced needed generation in certain areas to retire. But, because those units are needed for reliability, PJM prevents them from retiring and pays them a premium to stay on line under Reliability Must Run rules. We now appear to be in a situation where both load and supply are unwilling to contract any significant distance into the future because both load and supply believe, with some justification, that regulators will never allow prices to reach levels, even periodically, that are high enough to support new investment;

These factors, and a fair amount of analysis, led PJM to conclude that the best market structure is one that will provide a reasonably predictable and sufficient (but market disciplined) stream of revenues to any technology or combination of technologies (e.g. generation including distributed generation, generation linked to transmission, or demand response) that commit to, and deliver, the desired product where and when it is needed to ensure reliability and robust competition in the energy market. The Reliability Pricing Model is designed to do exactly that.

RPM DESIGN

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The Reliability Pricing Model:

- incorporates a long-term price structure;
- includes a locational pricing element to help put supply where it is needed;
- recognizes the system's need for specific generator operating characteristics; and

- continues to use self-supply and bilateral contracts.

Under RPM, need will be estimated out four years, including a target reserve margin. Binding commitments to provide capacity will be submitted both for self-supply and for bilateral contacts. Following that, a base residual auction will receive bids to supply capacity to cover what has not been committed in advance. A series of interim auctions prior to the target year will be used to replace resources that have become unavailable or to accommodate higher-than-expected load growth.

RPM employs a variable resource response curve to establish the price for capacity. It is really a mechanism to establish the capacity price – or, perhaps more accurately, the price to be paid for failing to secure supply in advance -- at varying levels of supply. The curve produces a relatively higher price when there is relatively less supply, and a relatively lower price when there is relatively more supply. Importantly, its effect is to smooth out the price over time, so it does not suffer the very sharp peaks and valleys of the current market, where the price when supplies are short is very high, and the price when long is low.

PRICE SEPARATION UNDER RPM

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The principles PJM used to guide its development of a new capacity construct were:

- Develop with input from stakeholders
- Use market forces to greatest extent possible
- Allow all substitutable products to play
- Recognize constraints on delivery
- Provide reasonable predictability while minimizing impacts of estimation error, and do so at reasonable cost

Develop with input from stakeholders

RPM is an outgrowth of a process that began in 2001. Over the course of several years and innumerable discussions, PJM stakeholders were not able to reach a consensus on a new capacity-market design, even though there was general (though not universal) agreement that it was a problem that needed to be resolved. This is not a flaw in the process: it reflects appropriately differing perspectives among members. Not entirely surprisingly, transmission owners focused on transmission; load interests were very concerned about anything that could increase price in the near term; and generators pushed for greater certainty and higher prices. PJM's responsibility is to system

reliability and the efficiency of the market; PJM developed a plan that reflects much balancing of interests and put it before the FERC.

Use market forces to greatest extent possible

It is difficult, if not impossible, to escape some amount of administrative determination if you want to be sure (not just hope) that supply will be persistently sufficient. The RPM includes competition among all resources for capacity payments. Energy Market competition essentially is unaffected; indeed, having greater supply increases competitive pressure and reduces opportunities for the exercise of market power.

Allow all substitutable products to play

An important feature of the RPM is the ability of demand response and transmission to offer their value into the market. Demand response and transmission solutions can be bid in the auction along with generation. In order to give demand response every opportunity to participate in the capacity market and receive the full value it provides, demand-side proposals can participate in the auctions throughout the four-year process leading up to the planning year. Demand response increasingly is recognized as the major “missing piece” of the market, and PJM wants to ensure that demand response has every opportunity to capture the value it brings to the market. The four-year time horizon increases opportunities for greenfield projects to participate and compete with existing resources.

Recognize constraints on delivery

Capacity does no good if the energy cannot get to where it is needed. Capacity needs vary widely across the PJM footprint. Under the RPM, prices separate exactly as they should: high where need is soon, low where it is more remote – and allows enough time to do something. The RPM:

- provides local incentives to solve a local problem;
- avoids socializing local costs to areas that have sufficient supply; and
- avoids raising payment levels to supply in regions with sufficient supply to the levels that are needed only in areas where new development must be stimulated.

Provide reasonable predictability while minimizing impacts of estimation error

A capacity structure must provide enough predictability of cost recovery for capacity suppliers to attract the levels of investment needed to produce the persistently sufficient supply – without re-creating the regulatory approach that once secured that investment by forcing customers to pay for it even if it was not needed. RPM links payments to future delivery. The evidence suggests providers of energy make decisions about the future based on their expectations of future revenue streams, not on today’s prices.

Some might argue that state regulators should just order people to build what is needed. This is the road to stranded costs. RPM allows the market to set the price for the amount of reliability needed for market and reliability purposes; the market also determines the type of asset that will fulfill the obligation. Because commitments are made only four years out, the customer risk of overbuying is reduced.

PJM's analysis shows that RPM will lead to lower average costs than the current capacity approach for capacity and energy costs. In other words, the failure to implement RPM will lead to substantially higher costs for consumers.

RPM will reduce costs over the long term by smoothing (at a lower average level) the payments for capacity, and by reducing the instances of very high energy prices that are more frequent when supply is relatively short. The alternative, cyclical shortages or very high energy prices (or both), will be more expensive. The right comparison is with prices as they are likely to be without a mechanism to ensure sufficient supply, not with prices as they exist today. The use of the variable resource requirement has been identified by Johns Hopkins University Professor Benjamin F. Hobbs and others as the least cost structure for achieving both long-term sufficiency and near and intermediate term predictability of revenue streams.

ESTIMATED IMPACT OF RPM COMPARED TO CURRENT CONSTRUCT
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In any case, as PJM noted in its RPM filing with the FERC, "What is just and reasonable is not merely the lowest rate to consumers, but the lowest reasonable rate that provides adequate assurance that suppliers will make the capital investments needed to meet reliably the needs of consumers."

Some suggest that the answer to the capacity issue is to move to an energy-only market. In an energy-only market, utilities or load-serving entities would not be required to acquire or contract for capacity. It contemplates that generators would be compensated for the costs associated with their capacity through enhanced profit margins earned from selling energy and ancillary services, rather than through direct payments designed to recover capacity costs.

PJM is not convinced that an energy-only market can provide the necessary assurance that needed capacity will be available when and where it is required by customers over the long run. In addition, there are some difficult issues with an energy-only approach, among them preventing the exercise of market power and obtaining a significant level of demand response participation in the market.

Just as important is the issue of whether an energy-only market will be credible to investors. Since the proponents of an energy-only market argue that price volatility is essential to produce operational reliability and long-run supply adequacy, will investors be convinced that regulators will not step in to protect retail customers by restraining price volatility if there are extended periods of high spot market prices or supply shortages?

Proponents of an energy-only market concede that it would take some time to implement and that additional time would be needed for sufficient demand response to emerge. In the interim, some mechanism would have to be put in place to ensure that new capacity is available when required.

Under current and foreseeable circumstances, PJM does not view an energy only market as one we can responsibly recommend to the FERC.

Market development is inevitably a series of decisions about how to balance various often competing interests. PJM and its members observed that, while the existing market produced substantial benefits and competitive pressures, it did not provide the pricing structure necessary for stimulating new investment in supply. To develop a new capacity structure, PJM had to balance:

- Long term vs. short term needs
- Relative certainty vs. estimation error
- Risk of over-investment vs. risk of under-investment

RPM is PJM's best assessment of how these interests should be balanced, always with an eye toward the structure that will ensure reliability and efficient prices in the long run. Resolution of the issue, one way or the other, is needed soon so market can have the sense of the certainty it needs.