

Pennsylvania Public Utility Commission
En Banc Hearing

Testimony of Andrew Ott, Senior Vice President

PJM Interconnection
October 23, 2008



Good Afternoon, Chairman Cawley, Vice Chairman Christy and Commissioners of the Pennsylvania Public Utility Commission. I thank you for the opportunity to participate in this public hearing on Wholesale Energy Markets. My name is Andrew Ott, and I am Senior Vice President of Markets at PJM. My goal today is to discuss the operation of PJM's competitive wholesale energy markets and to elaborate on how these markets enable PJM to accomplish its core mission – to maintain electric system reliability for consumers in Pennsylvania and throughout the region we serve. I will explain how rising wholesale electricity prices are being caused by changes in wholesale market fundamentals, including the rise in the costs of fuel, and not because PJM's market is dysfunctional or incapable of containing prices to reasonable levels. PJM's wholesale market is competitive, and the prices established in the market are fair and reasonable. I will also discuss what is currently being done by PJM and others to mitigate increases to wholesale electricity costs, as well as what more can be done to put downward pressure on wholesale prices.

PJM, a Regional Transmission Organization (RTO), is one of the seven ISOs and RTOs located throughout the country, with approximately two-thirds of the United States living in an area served by either an ISO or RTO. PJM is responsible for 'keeping the lights on' for 51 million Americans in thirteen states and Washington DC, including almost all of Pennsylvania's 12.5 million residents. PJM's regional wholesale markets engage, by design, in interstate commerce and are regulated by the Federal Regulatory Energy Commission (FERC). PJM markets do not encompass retail transactions or the retail market. As an RTO, PJM does not own transmission or generation facilities, we do not generate electricity, we do not buy energy for resale, we do not have retail customers and we do not profit from the markets we operate. PJM, as the independent system operator, coordinates the operation of transmission and generation facilities so that all market participants have equal access to the benefits of the regional grid operation. The regional scope of the wholesale market provides benefits to consumers by providing access to a large portfolio of less expensive power resources through coordinated regional grid operations. In a broader regional market, customers have access to a larger number of resources because of the market's size and because barriers to trade are eliminated. Market participants also benefit from the large-scale regional market because it is competitive. As an independent system operator, PJM is free from undue influence by market participants. The PJM Market Monitor acts as the market watchdog, to ensure the marketplace is competitive and free from the exercise of market power.

To keep the lights on, PJM must perform the real-time balancing of the electrical grid - every second of every minute of every day, PJM matches electricity demand with the 'least-cost group' of electricity generation and demand response resources, while working within the constraints of the electric

transmission system and being prepared for the loss of generation or transmission at any moment. This challenging balancing of the grid is complicated by the unique physics of electricity. Electricity is not like oil which can be refined and stored easily for long periods until the time it is needed. Electricity must be generated at the near moment that it is required, and it travels at the speed of light through the grid; for all practical purposes, electricity cannot be stored in any significant quantity. If for some reason, electricity generation does not match the demand, within a small tolerance, the electrical grid can crash, which can cause the loss of electricity to cascade from region to region. In August we noted the fifth anniversary of the 2003 North East blackout that affected 40 million Americans. That situation developed in Ohio, and within a period of only nine seconds, the grid collapsed in areas across eight states. What took nine seconds to occur and four days to fix, the 2003 blackout had an economic cost of \$6 billion. This is only the estimated economic cost and does not include the social or human costs, which were undoubtedly much higher.

I have just outlined the importance of PJM balancing the grid on a continual basis – but just how does PJM go about performing this complex and vital task? We do that through the operation of our open and non-discriminatory wholesale electricity markets. The PJM wholesale market pricing system, Locational Marginal Pricing (LMP), ensures that PJM is able to operate the bulk power system consistently with regional grid reliability standards. The PJM pricing system is tightly integrated with the real-time generation dispatch function. It is a critical element to assure that the transmission system can handle all requested energy deliveries which are scheduled to maximize electricity transfers for the benefit of all customers in the region. The LMP system makes all market participants partners with the RTO in maintaining grid reliability through price signals. PJM's goal is to be certain, to the extent possible within reliability constraints, that at any moment in time, the least expensive set of generating resources is operating to serve the regional electricity demand. To assure this cost-effective outcome, PJM's market rules price energy from the spot market in a way that ensures that generators come on line and follow dispatch signals, and it ensures that loads will pay enough to cover this cost while paying no more than the cost they are willing to pay, as indicated by their bids. Spot market prices provide the correct incentives for all market participants to do what the RTO needs them to do to keep the lights on. Spot market participation in PJM is voluntary: market participants may self-schedule to meet their native load obligations, engage in bilateral transactions, curtail demand during high price periods, or they may choose to transact in PJM's wholesale energy market. PJM's market pricing system enables its system operators to re-dispatch generation facilities to avoid reliability violations, rather than rely on the previous regime of inefficient power curtailments resulting from Transmission Loading Relief (TLR) procedures. In the late 1990's, the electricity industry's dependence on TLRs to maintain system

reliability led to significant power disruptions in the Midwest and elsewhere. These disruptions spurred the development of the LMP market design, with the desire to assure reliable bulk power system operations.

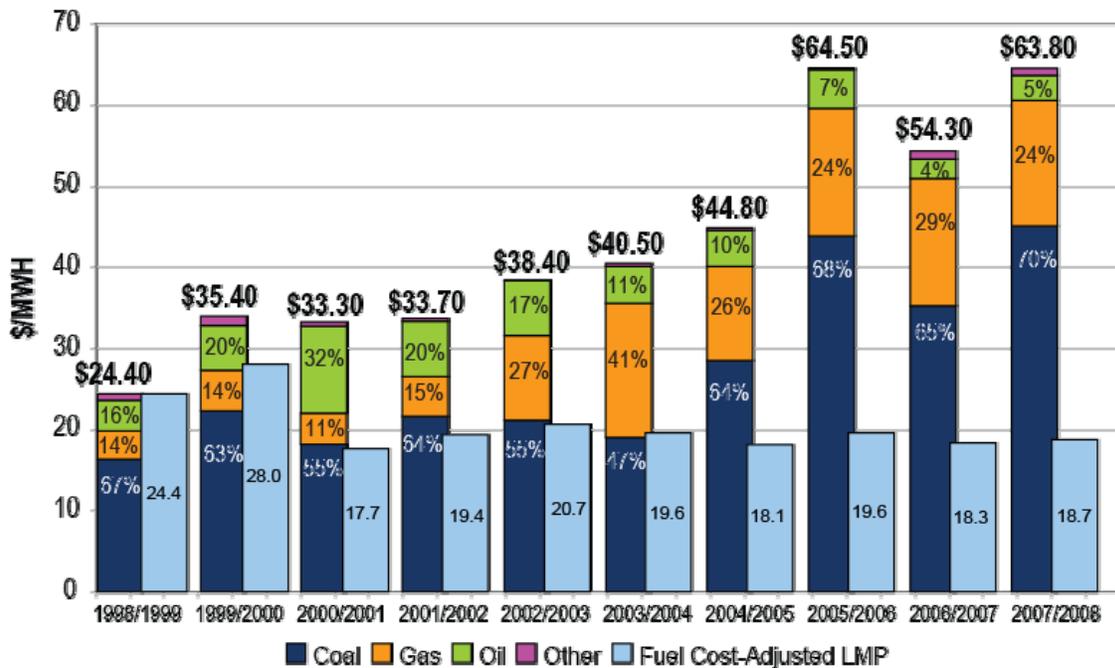
PJM's spot market design – an open, single clearing price auction establishing Locational Marginal Prices – not only plays a fundamental role in maintaining the short-term reliability of the high-voltage electricity transmission system, it also facilitates innovation, such as renewable energy sources, demand response solutions, energy efficiency and other advanced technology resources. It is also important to note, that every ISO or RTO in the country uses or is implementing a Locational Marginal Pricing mechanism to price electricity. I am going to say this again so that everyone understands that LMP is not just a tool used by PJM to ensure electricity reliability and to run efficient markets in Pennsylvania and thirteen other states – it is a tool that is in use or in the process of being implemented in every single ISO and RTO in the country. Even California, which experienced monumental problems with reliability and pricing in 2000 and 2001 that included massive loss of electricity in large service areas, is implementing an LMP-based energy pricing methodology this year, after trying and rejecting various pricing methods including a system using only bilateral contracts, in response to their problems.

Opponents of the use of LMP state that it results in unjustly high wholesale electricity prices due to unnecessary payments to generators, such as base-load coal plants. You may have heard how a base-load coal plant is sometimes being paid far above its bid, because a natural gas plant provided part of the electricity generation at a given time. It has been stated that this situation is not fair and that generators should only be paid their 'bid price' for electricity. This is a seemingly logical thought; however, it makes the assumption that under other wholesale pricing mechanisms, the same base-load plant would continue to bid into the market at its short-term marginal cost of generation, which they do currently in PJM's LMP-driven market. It should be noted that this short-term marginal cost of generation, often times sets the marginal price (approximately 70% of the time) at a level that is insufficient to fund the total costs of operating the plant. These base-load plants rely on revenue provided by higher LMPs during periods of higher demand. Experience has borne out that pricing mechanisms such as 'pay as bid', cause generators to bid into the market at the level they expect power to be worth, not at what it costs them to generate electricity in the short-run. This results in generators guessing what the demand for power will be, what the available supply will be, and what the ultimate clearing price will be, to determine what their bid will be into the market. This mentality would, at best, result in the same pricing outcome as LMP, but more likely would result in higher prices to consumers. More importantly, a 'pay as bid' system would result in increased operational uncertainty because of fluctuating bid patterns that can jeopardize reliable and efficient grid operation.

We have heard concerns about the profits of some generators in addition to questions about the terms of deregulation and how it was designed and implemented in Pennsylvania. PJM was not a part of the deregulation process and has no direct opinion on the subject; however, we do believe that while exploring these questions and possible remedies to perceived inequities due to the legacy of deregulation in Pennsylvania, the ultimate question becomes: is the wholesale market that encompasses thirteen states and the District of Columbia the proper place to address any deregulation legacy issues that exist in Pennsylvania? The specific agreement on generation rate caps, stranded costs and the sale of generating facilities to ownership separate from EDCs (although possibly affiliated) was unique to Pennsylvania, and any attempt to adjust the outcome of deregulation through a redesign of the wholesale markets involving thirteen states would clearly lead to more problems than solutions.

Currently there are multiple factors that are influencing the rising price of wholesale electricity. Let's look at one of these influences, the rise in fuel costs, and see what its impact has been on the price of wholesale electricity. Please take a look at Exhibit 1 of my testimony.

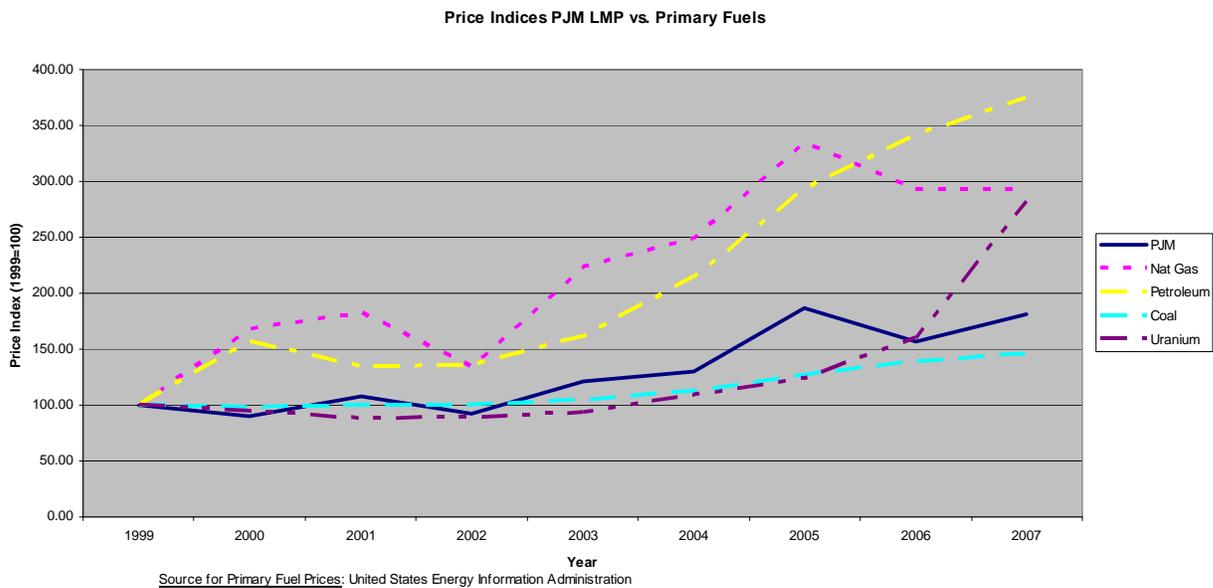
Exhibit 1. **PJM Load-Weighted and Fuel-Cost-Adjusted LMP by Fuel Factors**
 April 1 - March 31 Reporting Periods



This is a graph that provides various data relevant in the evaluation of electricity prices over the past decade. First, from the height of the column on the left, each year we can see that the average LMP price

within PJM has increased, year-over-year, except for a price spike in 2005/2006 and then a decrease afterward. We can also see from the light blue column on the right for each of these years, that when we account for the rising price of fuel (such as coal, oil, and natural gas), the fuel-price adjusted LMP has actually gone down more than 23% over the past 10 years. This comparison shows not only the influence of fuel on the price of wholesale electricity, but also the benefits of the increasing efficiencies of PJM's wholesale electricity markets. The efficiencies that have resulted in lower fuel-adjusted LMPs over the past ten years are a function of the shared resources of the regional market and the coordination of regional grid operations. Please refer to Exhibit 2 for a comparison between LMP indices and fuel indices since 1999 and compare the PJM price trend with the Coal price trend.

Exhibit 2 - Comparison of PJM Energy Price Indices vs. Primary Fuel Price Indices



The characteristic that the PJM electricity price index has tended to most closely follow the coal price index illustrate that PJM prices have generally tracked the price of coal which is consistent with the fact that coal sets the PJM marginal price most of the time.

On a current and positive note for consumers, almost all major commodity prices staged a reversal in price trend at the beginning of July, after steep increases in the previous months. Taking center stage in this reversal were energy prices. Oil dropped from nearly \$150 per barrel to just over \$90, and natural gas (for near term delivery) dropped from \$13.5 per Million BTU, to just over \$7, in two months. As expected, the sharp drops in fuel prices put downward pressure on PJM electricity prices as well in both the spot and

forward markets. Load-weighted average PJM LMP dropped to \$75.76 per MWH in August from \$102.95 in June and \$97.32 in July. PJM Western Hub peak contract for July 2009 dropped from \$139 per MWH to \$95 between early July and mid-September, for a 32% decrease. The chart below, Exhibit 3, depicts the trends in PJM Western Hub July 2009 (peak) contract electricity futures prices have been falling significantly over the past four months.

Exhibit 3 – Electricity Futures – PJM Western Hub Contract – Peak for July 2009



PJM anticipates that if any PUC modeling of future retail rates (based on wholesale electricity futures) has been done recently, it will reflect the impact of lower fuel gas prices on future wholesale electric prices, and any comparison to model results from earlier on in the summer will show a decline in any increases to anticipated retail rates when compared to previous estimates.

I would now like to address some of the other influences on the rise in wholesale electricity costs, including: increases in electricity demand, regulatory uncertainty, and the lack of new generation or transmission resources. As electricity demand rises (which it has in PJM's territory and is expected to continue) an average of 1.5 to 2% per year, the need for new generation and transmission (in a general sense and not referring to any specific transmission project) grows. Without new generation and transmission resources to handle increasing electricity demand, not only will reliability suffer because of lower reserve margins, but

prices will rise due to increased transmission congestion and the dependence on non-base-load generation for more electricity generation. As we look toward the future, the uncertainty in environmental regulations and lack of proven 'clean coal' technology has inhibited new coal plant development. Additionally, and with no specific project or projects in mind, the addition of transmission capacity could positively impact wholesale prices in many parts of the state. This is because transmission tends to lower congestion charges and enables power to flow from areas of cheaper generation to areas with more expensive generation.

A powerful tool in lowering peak electricity prices is demand response, or the reduction of electricity consumption by customers during times of peak demand and higher prices. PJM currently operates various wholesale markets which allow demand response participation, including the energy, synchronized reserve, scheduling reserve, and capacity markets. All of these markets allow customers to save money by receiving payments for being available to remove or removing their electric demand from the grid during peak demand times. One example of the power of demand response is to consider the savings achieved by wholesale customers during a peak day in 2006: in just one day over \$260 million was saved in the energy market alone by the cumulative impact of demand response on LMPs. The demand response of the customers that participated, not only saved money for themselves, but for all (nearly all) participants in the wholesale market through the lowering of LMPs throughout the RTO. PJM has been at the forefront of the expansion and evolution of the wholesale demand response markets, and we will continue to heavily promote and develop this valuable tool.

As far as what else can and is being done in Pennsylvania - last week's signing of House Bill 2200 by Governor Rendell will go a long way to reducing consumers' electricity costs. The mandated conservation and peak load demand reductions, coupled with the deployment of Smart Meter technology, will enable participating customers to make usage decisions based on price. All of these efforts will help limit electricity consumption at times when the most expensive generation resources are required; and moreover these efforts have the potential to help lower costs for all electricity consumers, not just those who participate in the specific programs, just as in the wholesale markets.

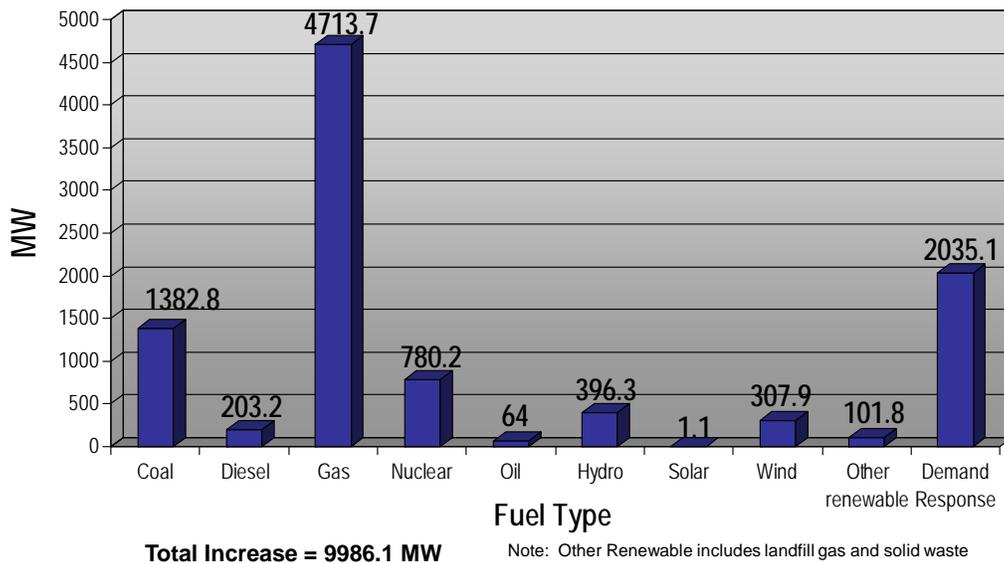
One of the markets that demand response plays an important role is in PJM's capacity market, or Reliability Pricing Model. RPM was instituted in the last two years and is designed to ensure that enough installed capacity exists to meet electricity demand. It is the necessary result of increasing electricity demand and tightening reserve margins. RPM has to date received heavy scrutiny and criticism of being unnecessarily costly. Specifically, PJM has heard that our capacity market is essentially making utility companies (and

ultimately their customers) 'pay for nothing'. This statement assumes that the capacity product was free in the past, which is not the case. While capacity prices were artificially low in 2004 through 2006, in 2001, the annual price of capacity was \$100.43 per MW day, which is comparable to the price result of \$111.10 from the recent RPM auction for 2011/2012.

In 2005, when PJM studied anticipated electricity demand growth and observed a significant lack in projected new generation investment, we saw a situation that would result in an unsafe gap between electricity demand and installed capacity – which would threaten electric reliability. In essence, a situation was developing where, without definitive action, an electricity shortage would have occurred that could result in widespread blackouts. Therefore, PJM asked for permission to reform its capacity market to help ensure grid reliability. The results of the first five RPM auctions, illustrated in Exhibit 4, have delivered investments to supply 9,986 MW of new resources, including a base-load coal plant, over 800 MW of renewable resources, and over 2,000 MW of new Demand Response resources.

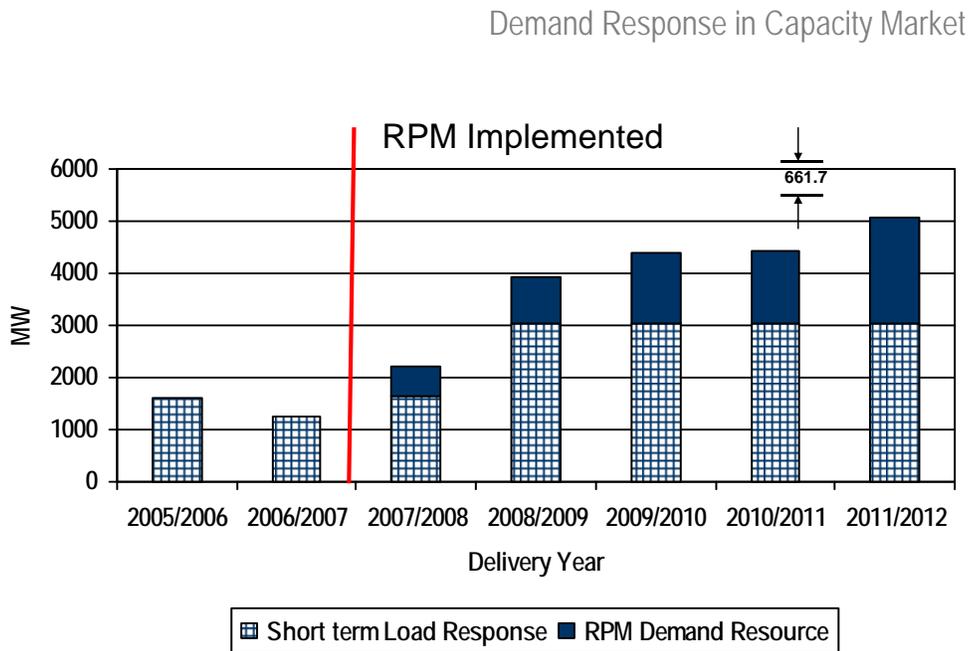
Exhibit 4 – Capacity Resource Additions in the first 5 RPM Auctions

Cumulative Increase in Capacity Resources by Fuel Type
 over First Five RPM Auctions (2007 – 2011)



Additionally, the trend of increase in overall demand response activity across the five RPM auctions has been significant as illustrated in Exhibit 5. Prior to RPM, PJM experienced a decline in customer willingness to provide curtailment during system emergency conditions which required PJM to seek more generation resources to supply PJM's reliability requirements. With the implementation of RPM, total load response in the capacity market has increased by over 3500 MW which is the equivalent of displacing the need to install 3 to 4 large base load generation plants.

Exhibit 5 – Demand Response Trend as a Result of RPM Implementation



An additional benefit of RPM was recently reported by the PJM Market Monitor and an independent consultant which indicated that existing generators have invested \$5.1 billion for environmental compliance and performance upgrades to allow over 10,000 MW of existing resources to remain operational. The facts indicate that RPM has benefited the regional grid and the Commonwealth of Pennsylvania by ensuring sufficient reliable supply for the five-year period covered by the RPM auctions. Also, as part of the Capacity Market Evolution Committee (CMEC) currently operating as part of the PJM stakeholder process, PJM and its members are working on modifying RPM to make it more effective and equitable through efforts, such as the incorporation of energy efficiency projects/efforts as a capacity resource. This would allow energy

efficiency projects to connect to additional revenue sources, which would make more projects economically feasible. This would undoubtedly increase the amount of energy efficiency projects undertaken by industrial and commercial electricity customers, and would lower the cost of capacity for all consumers in Pennsylvania and throughout the regional market. I encourage the Commission to continue to support the development of energy efficiency in Pennsylvania.

Now I would like to spend the remainder of my time discussing some additional beneficial value of PJM's competitive wholesale markets. Today, almost all consumers indicate that climate change is a significant concern. As you are aware, in response to this serious environmental concern, Pennsylvania established Alternative Energy Portfolio Standards (AEPS) in 2004, mandating the use of renewable energy by retail electricity customers. As part of the AEPS, by the year 2021, 8% of the retail electricity provided by Pennsylvania's Electric Generation Suppliers (EGS) and Electric Distribution Companies (EDC) must be developed by 'Tier 1' alternative energy sources, such as wind and solar. Last month, PennFuture, a very well respected and leading environmental group in Pennsylvania published a Newsletter entitled, "Competitive PJM Market Boosts Wind, Solar and Renewable Energy". I am just going to read the last few sentences of that newsletter as objective input into our discussion today of the value of wholesale electricity markets:

"The PJM-operated competitive market is an incredible asset to wind energy development in Pennsylvania and the entire PJM region. Thanks to the PJM market, Pennsylvania will enjoy more new investments in renewable energy. These investments will create a virtuous circle of increased grid capacity, energy resource diversity and environmental improvement. That all adds up to better electricity prices and more reliability for our customers too."

Mr. Chairman and members of the Commission, I very much appreciate your willingness to allow me to present PJM's position on the state of the current wholesale electricity market in Pennsylvania. I am happy to answer any questions that you may have.