Comments of Andrew Ott, PJM Vice President, Markets

Good Morning, my name is Andrew Ott, I am Vice President of Markets at PJM. I appreciate the opportunity to speak to you today regarding the PJM long term resource adequacy program which is called the "Reliability Pricing Model" or "RPM". RPM is PJM's recently implemented long term resource adequacy construct that replaced, as of June 1, 2007 the previously PJM capacity market construct. My comments today will briefly cover the theory and efficacy of the RPM construct, including the major components of the model that were implemented in order to address reliability concerns and infrastructure investment issues that were identified by PJM and PJM stakeholders. I will also discuss the available short-term "outcomes" observed based on the result of the first four auctions that have been completed to date and will offer my observations concerning whether the initial RPM results are working as intended to address the reliability issues and to increase the availability of capacity resources in the PJM footprint. I must emphasize, however, that since RPM has been in place less than one year it is too soon to draw definitive conclusions regarding the long term effectiveness of the RPM construct.

We will soon be announcing the results of the May RPM auction. Up to this point, the auctions have been transitional in nature and have come relatively rapidly, one after the other with forward periods shorter than three years. The May auction results will provide a better picture of the RPM workings in incenting new investment based on a three year forward period. I will update the Commission and all stakeholders concerning those results as soon as they are available.

As you know, PJM is a Regional Transmission Organization with responsibility for ensuring safe and reliable grid operations, for administration of the regional wholesale electricity market, and for performing coordinated regional transmission planning in the region we serve. PJM is responsible for keeping the wholesale power flowing over the grid to keep the lights on. Therefore PJM is vitally interested in making certain that there are sufficient resources to keep the lights on today and for the future.

Capacity market issues are difficult, and, as has been the case in other regions of the country, have been the subject of extensive stakeholder debate. The appropriate construct by which PJM and its members procure and price capacity has been under discussion by PJM stakeholders for the past 7 years. The RPM design was developed through a multi-year stakeholder discussion and through a FERC settlement process. The primary driver behind the development of RPM was to address projected reliability concerns and infrastructure investment issues identified by PJM and by stakeholders during 2004-2006. Specifically, RPM was intended to address the following concerns:

- Generation Net Revenue Shortfall resulting in:
    - Increased generation retirements in locations where more generation was required
    - Lack of New Capacity
    - Need for short-term corrective action (reliability must run contracts)
- Inconsistency between capacity pricing and reliability requirements
- Reduction in capacity-based demand response

- Lack of integration between capacity market and regional transmission planning process
- Lack of forward commitment requirement for capacity obligations
- Lack of forward investment signals
- Reliability Violations projected to occur in summer 2008

The key design features of RPM that were developed to address these issues are as follows:

- **Three Year Forward Auctions**
  - Residual auction after specification of self-supply and bilaterals.
  - Provides price signal and forward commitment process that allows new entry to participate or existing units to retire with forward notification.
- **Locational Constraints**
  - Recognize limited ability to import capacity in certain areas due to transmission, voltage, or stability limitations (as identified in PJM's RTEP analysis).
  - Higher capacity prices in constrained areas
  - Lower capacity prices in areas with significant excess capacity
- **Variable Resource Requirement (VRR)**
  - Recognizes the Cost of New Entry.

  - Recognizes the value of additional capacity above the reserve margin thereby reducing volatility in capacity prices.
  - Sloped demand curve reduces market power concerns.
- **Ability of Transmission and Demand Resources to participate**
  - Allows direct competition between various options including new generation resources and demand response to address reliability requirements.
  - Provides opportunity for incremental transmission upgrades to provide solutions to capacity import limitations

To understand the RPM design features, it is always helpful to go back to the reasons that drove the development of RPM. I have attached testimony which we presented to this Commission back in 2005 detailing the very real problems we were facing as a result of announced retirements in generation. At that time, PJM was facing the prospect of persistent and worsening imbalances between supply and demand—the result of load growth, lagging generation additions, and generation retirements—that required progressively more complex and expensive transmission upgrades. Increasing reliability criteria violations were projected in eastern PJM for 2007 – 2010 which could not be corrected through transmission upgrades alone.

To further assist with understanding the results of the RPM auctions to date, I have also attached PJM's comments on a paper entitled "Raising the Stakes on Capacity Incentives: PJM's Reliability Pricing Model (RPM)" that was included in the March 19, 2008 motion of the RPM Buyers for a technical conference concerning the Reliability Pricing Model.

RPM Auction Results

During the first year of transition to the RPM construct, PJM has conducted four Base Residual auctions for the delivery years, 2007/2008, 2008/2009, 2009/2010 and 2010/2011. Currently, PJM is conducting the Base Residual Auction for 2011/2012 which is the first auction we will conduct with the full three year forward lead time. The results of this auction will be posted by May 16, 2008. The capacity prices resulting from the first four auctions are listed in Table 1 below.

Table 1 – RPM Base Residual Auction Pricing Results

	Resource Clearing Price($/MW Day)				Net Load Price ($/MW Day)		
	2007/2008	2008/2009	2009/2010	2010/2011	2007/2008	2008/2009	2009/2010
Rest of RTO (Dominion, AEP, Comed and Dayton zones)	$ 40.80	$ 111.92	$ 102.04	$ 174.29	$ 40.69	$ 113.22	$ 102.04
MAAC plus APS (Penelec, PPL,Met-ed and Allegheny zones)	$ 40.80	$ 111.92	$ 191.32	$ 174.29	$ 40.69	$ 113.22	$ 188.55
Eastern MAAC (New Jersey, Delmarva, Southeast PA)	$ 197.67	$ 148.80	$ 191.32	$ 174.29	$ 177.00	$ 145.24	$ 188.55
SouthWest MAAC (Baltimore and Washington)	$ 188.54	$ 210.11	$ 237.33	$ 174.29	$ 139.67	$ 183.03	$ 218.12

The capacity prices in the first four auctions are consistent with expected results based on the resource offers and the parameters of the variable resource requirement curve that are specified in the PJM tariff. The interaction of the variable resource requirement curve and the resource supply curve indicate that in the long term, the RPM auction pricing results would be expected to perform as follows:

- The RPM auction prices will be less than the net cost of new entry when cleared capacity reserve amount is greater than the PJM installed reserve margin plus one percent
- The RPM auction prices will be equal to the net cost of new entry when cleared capacity reserve amount is equal to the PJM installed reserve margin plus one percent

- The RPM auction prices will be greater than the net cost of new entry when cleared capacity reserve amount is less than the PJM installed reserve margin plus one percent

For example, the most recent RPM auction for the 2010/2011 Delivery year resulted in a cleared reserve amount of the installed reserve margin plus 1 percent with a corresponding RTO clearing price of the net cost of new entry specified in the PJM tariff (approximately $174 per MW day).

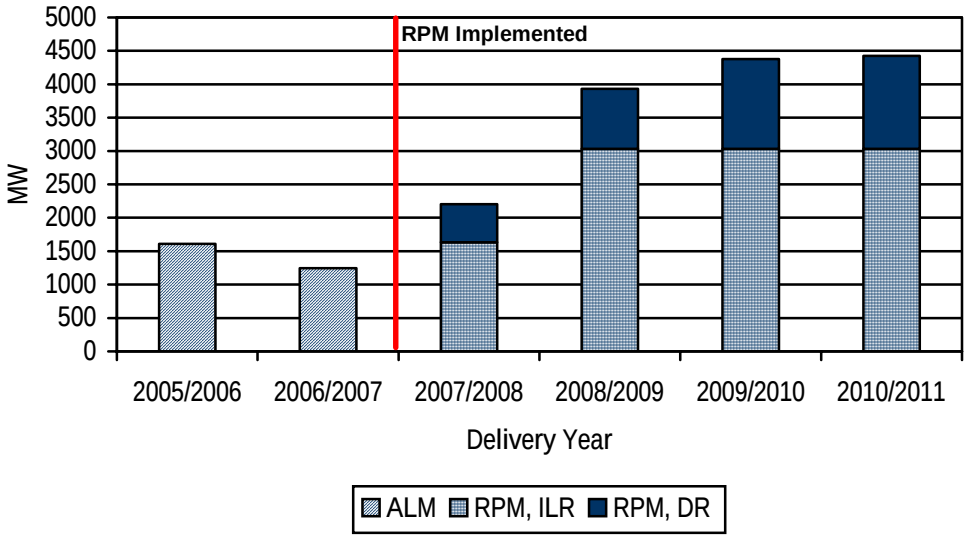
For each of the four RPM auctions, the entire RTO failed the market power screens therefore all existing resources in the auctions were offer-capped at avoidable cost-based offers.

In order to evaluate the initial performance of RPM, the auction results were analyzed to determine the impacts on demand response participation trends, generation retirement trends, capacity import / export trends and new capacity additions.

Demand Response Trends

In the years prior to the RPM implementation, PJM had observed decreasing participation by demand response in the capacity market. Upon implementation of RPM, each of the first four RPM auctions had increasing levels of participation by demand response resources as illustrated in Figure1. Demand Response can participate as a capacity resource in RPM in two ways. Demand response providers can elect to participate directly in the Base Residual auction as a Demand Resource (DR) or they may elect to participate immediately preceding the delivery year as Interruptible Load for Reliability (ILR).

Figure 1 – Trend of Demand Response Participation before and after RPM Implementation



Note: ILR participation in 2009/2010 and 2010/2011 is estimated

The demand response participation trends illustrated in Figure 1 indicate a significant increase in demand response participation in the capacity market as a result of RPM.

Generation Retirement Trends

In the years prior to the implementation of RPM, PJM and its stakeholders identified significant concerns regarding a trend of increasing generation retirements in areas where more generation was required to resolve reliability issues identified in the PJM regional transmission planning process. The generation retirement decisions created reliability violations that could not be resolved quickly enough with transmission upgrades. The result was a series of reliability must run type contracts to defer the generation retirements. The RPM design included a three year forward auction to address the issues. After the implementation of RPM, the trend of generation retirements has reversed, 1787 MW of generation has withdrawn their retirement requests that had previously been

submitted to PJM, and at least 1095 MW of generation has indicated a decision to cancel or postpone planned retirements in the future. Additionally, 384 MW of generation that had been retired or mothballed have been reactivated and cleared over the four RPM auctions that have been completed to date. These initial results have demonstrated a reversal of the trend of unit retirements, especially in eastern PJM, with the RPM implementation.

Capacity Imports and Exports

In the planning year preceding the RPM auction implementation, 2006/2007, there was a net capacity export of 3,383.3 MW. Based on the results of the 2010/2011 auction, the capacity exports were 3,378.2 MW and the capacity imports were 2,982.4 MW resulting in a net capacity export of 395.8 MW. Although PJM is still a net exporter of capacity in the 2010/2011 planning year, the net change in capacity available to PJM as a result of reductions in exports and increases in imports over the period of RPM implementation was an increase of 2987.5 MW.

New Generation Additions and Generation Upgrades

Although the first four RPM auctions were held over an eight month transition period with relatively short lead time for new entry, increasing quantities of new generation and uprates to existing generation have been offered into each Base Residual Auction during the transition period. Table 3 shown on page 10 provides a summary of new generation additions, generation upgrades and generation reactivations by unit class for the four RPM auctions. Over the four auctions completed to date, 1036.1 MW of new generating units have been offered, 2989.9 MW of generation upgrades have been offered and 348.7

MW of generation has been reactivated. Therefore to total new capacity offered over the first four auctions was 4374.7 MW.

RPM Impact to Date

The total impact on the availability of capacity resources for the 2010/2011 delivery year can be estimated by adding the new capacity additions, upgrades to existing generation, generation reactivation, postponed and canceled retirements, forward Demand Resources and incremental net capacity imports/exports that occurred over the first four RPM auctions. Table 2 summarizes these impacts.

Table 2 – Impact on Capacity Availability in 2010/2011

Change in Capacity Availability	Installed Capacity MW
New Generation	1,036.1
Generation Upgrades	2,989.9
Generation Reactivation	348.7
Forward Demand Resources	1,373.0
Withdrawn or Canceled Retirements	3,082.0
Net increase in Capacity Imports	2987.5
Total Impact on Capacity Availability in 2010/2011 Delivery Year	**11,817.2**

As I previously indicated, it is premature to comprehensively evaluate the long term performance of RPM since it has only been in place for one year. However the initial RPM results indicate that RPM has encouraged new entry, has provided incentive for

increased demand response participation and has reversed the trend of generation retirements that were threatening the continued safe and reliable operation of the grid. Given the continued importance of successful RPM results, PJM has committed to performing an evaluation of the effectiveness of RPM and has commissioned the Brattle group to perform an analysis of the RPM results. The evaluation will include a review of RPM performance for incenting investment in Demand Side Response, in new generation, in generation upgrades and in reversing the trend of retiring key generators that are required for reliability. The evaluation report will include suggested enhancements to RPM if necessary. The report will be issued by the end of the June 2008. Following the release of the report, PJM will commence a stakeholder process to discuss the report recommendations and to consider other issues raised by stakeholders concerning RPM. We had previously detailed a timeline for the commencement of this process and are open to modifications as proposed by the stakeholders if additional time is needed for this review:

I appreciate the opportunity to address this important issue with you today and I am happy to answer any questions you may have.

Table 3 - Summary of Generation Capacity Additions in RPM Auctions

	New Capacity Units (MW)					New Total	Capacity from Reactivated Units			Reactivation Total	Uprates to Existing Capacity Units (MW)							Uprate Total	Grand Total
Delivery Year	CT/GT	Diesel	Hydro	Steam	Wind		CT/GT	Diesel	Steam		CC	CT/GT	Diesel	Hydro	Nuclear	Steam	Wind		
2007/2008		18.7	0.3			19			47	47		114.5	13.9	80	92	235.6		536	602
2008/2009		27			66.1	93.1			131	131	34	108.2	18	105.5	38.4	196		500.1	724.2
2009/2010	399.5	23.8		53		476.3					209	152.2		162.5	194.4	61.4	16.5	796	1,272.3
2010/2011	283.3	23			141.4	447.7	160	10.7		170.7	743	117.3		48	160.3	89.2		1,157.8	1,776.2
Grand Total	682.8	92.5	0.3	53	207.5	1,036.1	160	10.7	178	348.7	986	492.2	31.9	396	485.1	582.2	16.5	2,989.9	4,374.7

Attachments

PJM Interconnection's Comments on
"Raising the Stakes on Capacity Incentives:
PJM's Reliability Pricing Model (RPM)"

The paper "Raising the Stakes on Capacity Incentives: PJM's Reliability Pricing Model (RPM)", prepared for and distributed by the American Public Power Association, offers seven "Principal Observations and Conclusions" which are intended to demonstrate that the new PJM capacity construct is flawed.

Although long on criticisms, the paper provides no suggested solutions to what are labeled as critical design flaws of the RPM. Many of the arguments in the paper are premature, speculative conclusions drawn using inaccurate or insufficient information. Some of the arguments contradict each other, while others are simply opinions. They are either not backed with any supporting analysis, or are based on a comparison and historical view of PJM's previous capacity construct which did not accurately value capacity and has been shown to produce results that were unjust and unreasonable.

The paper's main points – that capacity sellers are withholding and that the demand and supply curves overstate the need for capacity – are both incorrect and not supported. There has been no evidence of withholding in any of the RPM auctions, and strict Tariff provisions around offering capacity and market power mitigation exist to ensure that withholding concerns are directly addressed. The paper also argues that PJM's reliability requirements are overly conservative are based on incorrect assertions and calculations which seems to imply that the supporters of the paper believe PJM's reliability-based generation adequacy requirements are too restrictive. PJM believes the erroneous conclusions of the paper are not supported by credible analysis and require a response.

It's also worth noting, as previously stated in a letter from Andrew L. Ott, Vice President of PJM Market Operations, to the PJM Members, that PJM has commissioned the Brattle Group to perform an assessment of the RPM's performance, which will be concluded by June, 30 2008. This evaluation will analyze RPM auction results and key RPM design criteria and will offer suggestions with a view toward improving its performance in maintaining resource adequacy consistent with the relevant reliability requirements. It is anticipated that the results of this assessment will be reviewed as part of a PJM stakeholder process, which also will consider other relevant issues related to the RPM. The review was commissioned with the full expectation that a new capacity construct of this magnitude, or any major PJM program for that matter, would require a thorough examination once there was enough information from the first five auctions to do so.

The following section of this document provides PJM's responses to the paper's "Principal Observations and Conclusions".

The capacity prices resulting from the RPM auctions are not the result of market manipulation, nor do they indicate a fundamental design flaw.

The primary conclusion throughout the paper is that higher prices alone are evidence of market manipulation and a fundamental flaw in the RPM design. It attempts to validate

these allegations of market manipulation by focusing on the clearing results for the Southwestern MAAC (SWMAAC) region. More specifically, the paper analyzes the 2008/2009 and 2009/2010 supply curves for SWMAAC and concludes that gaming exists because resources are offered in at a high cost in one year and not in the prior. The fact that resources within this region have elected to utilize the capital cost recovery provision in the PJM Tariff and therefore have a higher resource-specific avoidable cost rate than in a previous year, does not mean they are economically withholding capacity or intentionally attempting to increase prices in the SWMAAC area. In reality, this scenario is an example of how the transparency of the market, and the application of a demand curve that caps the clearing price at a predetermined price, provides an incentive to capacity sellers to offer their capacity at the lowest possible cost to clear as much as possible.

As can be seen in the 2009/2010 Base Residual Auction (BRA) results, the high priced capacity the paper references did not fully clear. This capacity was on the margin and therefore set the SWMAAC clearing price at its avoidable cost rate of $237.33/MW-day. What the paper fails to state is that the same capacity offered into the 2010/2011 BRA at lower cost so that it would fully clear for that delivery year. This results in an increase in cleared capacity and reliability in this region with an over 25% reduction in the capacity clearing price in 2010/2011. This can be readily observed through the reduction RPM clearing prices for the SWMAAC region from $237.33/MW-day in 2009/2010, to $174.29/MW-day in 2010/2011. It is unclear why the paper fails to mention this increase in system reliability at a reduced price.

Because there is significant amount of information posted prior to each BRA, (i.e., demand curves, reliability requirements, resource models, import limits, etc.,) and the mechanics of clearing the auction are transparent[1], the incentives are in place to motivate capacity sellers to offer at the lowest possible cost, even below their actual, unit-specific net avoidable cost, to clear as much as possible. This benefits the sellers as they collect capacity revenues to offset their fixed costs, and it benefits buyers by increasing system reliability at the lowest cost.

The PJM Market Monitoring Unit (MMU) also performs rigorous analysis in order to detect and mitigate market power and to verify the unit-specific avoidable cost applicable to each resource. Both the Preliminary Market Structure Screen (PMSS) and the Three-Pivotal Supplier (TPS) Test are tools the MMU uses for each auction. As a result of these tests, all capacity sellers have been mitigated in each BRA. The unit-specific, net avoidable cost applicable to each resource represents the maximum allowable offer for that resource, but the owner of the resource is free to offer it into RPM auctions below that amount. The MMU produces a report for each RPM auction that is posted on the PJM website.[2]

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[1] The RPM Optimization formulation was posted to the public on December 12th, 2007. (http://www.pjm.com/markets/rpm/downloads/20071212-rpm-optimization-formulation.pdf)

[2] MMU analysis of RPM auction results can be found at: http://www.pjm.com/markets/market-monitor/downloads/mmu-reports/20092010-rpm-review.pdf, http://www.pjm.com/markets/market-monitor/downloads/mmu-reports/20082009-rpm-review-with-att-a.pdf, http://www.pjm.com/markets/market-monitor/downloads/mmu-reports/20070820-analysis-2007-2008-rpm-auction.pdf,

The RPM auctions have worked as expected and intended.

Drawing a comparison between RPM auction clearing prices and capacity prices immediately prior to the implementation of RPM is misleading and irrelevant. PJM's previous capacity construct did not result in prices that reflected the true value and/or cost of capacity, and as a result was found by the Federal Energy Regulatory Commission (FERC) to be fatally flawed, unjust and unreasonable.

The paper fails to recognize that the intent of the RPM was to reflect the true cost of long-term reliability through accurate capacity prices and as a result, the RPM prices were expected to be higher than those recently resulting from the previous capacity construct. The short term benefits of RPM have been to reverse the trend of generation retirement and export decisions and to encourage increases in Demand Response and uprates to existing generating capacity. Additionally, the paper recognizes the amount of new generating capacity available to be offered into the 2011/2012 BRA as, "a substantial quantity of planned generation eligible to be offered into the auction"[3].

For further support of the opinion that the RPM is not working as intended, the paper draws a parallel between the RPM simulations PJM provided to participants to illustrate the mechanics of the market and the results of capacity auctions to date[4]. The argument presented in the paper is that the inability to reconcile the differences between the simulations and the auction results is proof that the market is flawed and wrought with market manipulation. As PJM has stated previously, and the paper confirms, those simulations were "'illustrative only' and not intended as a forecast or prediction of RPM results."[5]

PJM is concerned that certain parties have chosen to misrepresent the intent of these simulations. The simulations that PJM performed were intended to illustrate how the various features of the RPM design functioned, the simulations were not intended to be predictive models of future auction outcomes. During these discussions, PJM staff highlighted the fact that the simulations involved sample input data that were created based on a 2004 resource adequacy model. In fact, each slide of PJM's presentation of the sample results contained the following note[6]:

> "The data reflected herein is provided by PJM solely as a sample of the operation of the Reliability Pricing Model RPM). These results are preliminary and are for illustration purposes only, and do not represent past, current or future actual market data, results or conditions."

However, during the stakeholder discussions on the RPM design, PJM had commissioned a consultant, Professor Hobbs of John's Hopkins University, to perform long-term simulations of RPM prices and investment response performance. The

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[3] James F. Wilson, "Raising the Stakes on Capacity Incentives: PJM's Reliability Pricing Model (RPM)", p. 7.

[4] Further detail on the paper's comparison can be found in James F. Wilson, *Raising the Stakes on Capacity Incentives: PJM's Reliability Pricing Model (RPM)*, p. 35-36.

[5] James F. Wilson, "Raising the Stakes on Capacity Incentives: PJM's Reliability Pricing Model (RPM)", p. 35.

[6] Refer to PJM website at the following link to view one such presentation http://www.pjm.com/committees/working-groups/pjmramwg/postings/updated-rpm-prototype-simulations.pdf.

simulation results provided by Professor Hobbs indicated that the expected value of the RPM clearing price in the long run was the net cost of new entry[7]. The interaction of the variable resource requirement curve and the supply curve indicate that in the long term, the RPM auction pricing results would be expected to perform as follows:

- The RPM auction prices will be less than the net cost of new entry when cleared capacity reserve amount is greater than the PJM installed reserve margin plus one percent
- The RPM auction prices will be equal to the net cost of new entry when cleared capacity reserve amount is equal to the PJM installed reserve margin plus one percent
- The RPM auction prices will be greater than the net cost of new entry when cleared capacity reserve amount is less than the PJM installed reserve margin plus one percent

The results of the first four RPM auctions are consistent with the expected results as outlined by this analysis. For example, the recent RPM auction for the 2010/2011 Delivery year resulted in a cleared reserve amount of approximately the installed reserve margin plus 1 percent with a corresponding RTO clearing price of approximately the cost of new entry (approximately $170 per MW day). This result is consistent with the Hobbs analysis that was presented to stakeholders in January 2006. PJM expects to provide additional analysis related to the performance of the first five RPM auctions as part of the RPM evaluation process.

The RPM is accurately reflecting the need for new capacity.

The paper's explanation supporting the observation that the RPM overstates the need for capacity insinuates that capacity sellers are withholding capacity from RPM auctions to artificially raise prices and that this withholding, in concert with what the paper claims are conservative reliability requirements, forces capacity prices to be higher than what they actually should be.

The assertion that capacity sellers are withholding is not supported by facts. The paper fails to recognize that the PJM Tariff (Attachment DD, Section 6.6(a)) mandates a must-offer requirement for all existing generation resources that will be available to supply capacity for that delivery year. The existence of this requirement negates this argument. This requirement is enforced by the PJM Market Monitoring Unit (MMU) and has been upheld by the MMU for every Base Residual Auction. Information supporting this requirement has been provided in table 2 of each RPM report. There has been no withholding, economic or otherwise, in any RPM auction.

Aside from the allegations that capacity sellers are withholding, the paper also states that the supply curves used in RPM auctions are not reflective of the actual supply available. It contends they do not include capacity that was not eligible at the time of the auction, capacity that was exported, or capacity that a Fixed Resource Requirement (FRR) entity could not offer into RPM as it would exceed the existing sales cap. This is a true statement but contrary to the paper's assertion, this is an expected and necessary result based on reliability requirements. Capacity that is not eligible at the time of the auction and capacity that is being exported from PJM is not counted as part of the

[7] Dr. Hobbs analysis results are detailed in his affidavit attached to PJM's 9/26/07 RPM settlement filing

capacity supply because it is not recallable by PJM in an emergency. The explicit purpose of RPM is to support the reliability of the bulk power system and to ensure that capacity committed to satisfy PJM's resource adequacy requirements is not counted as a reliability resource elsewhere.

If certain resources are not available to PJM at the time of an emergency, for a physical or commercial reason, they cannot earn a capacity payment and therefore are not part of the capacity supply curve. Capacity that an FRR entity can not offer due to the FRR sales cap was a negotiated part of the RPM settlement and, per the PJM Tariff, cannot be counted as supply and cannot be counted on during an emergency.

The PJM capacity requirement is fulfilling its role in preserving reliability in accordance with official standards.

The aggregate PJM capacity requirement, as well as the locational capacity requirements established for each Locational Deliverability Area (LDA), is calculated in accordance with the applicable Loss of Load Expectation (LOLE) criteria required to meet established regional reliability organization standards. The paper's claim, that the conservative reliability requirements of the LDAs cause them to clear at a high price with a reserve margin well in excess of the installed reserve margin (IRM), is supported using a calculation that is incorrect. The paper estimates 21% as the reserve margin for the EMAAC and SWMAAC LDAs for each auction.

In the calculation, the paper appears to be expressing the LDA reliability requirement as a function of the coincident peak load. This is incorrect. The correct way to perform this calculation would be to use the non-coincident peak load which is the same load value that is used in the CETO study. More fundamentally, the reserve level the author calculates represents a combination of generation and demand resources and transmission import capability into the LDA and it should not be compared with IRM which represents generation and demand resources required for the RTO. The LDA reliability requirement is used to determine the LDA internal resources to be cleared when there is a limit on resources that can be imported. The amount and price of these LDA internal resources would determine the clearing price in the LDA. It is important to note that the zonal capacity obligations for load serving entities are determined based on the IRM and zonal coincident peak load and not based on the LDA Reliability Requirement or the corresponding reserve level for the LDA.

Further adding to the confusion in this section is the fact that the paper, which consistently argues that RPM prices are too high, states that PJM used a "low, outdated Cost of New Entry (CONE) value" in these auctions. The CONE is the basis for the Variable Resource Requirement (VRR) curve and therefore has a significant impact on the prices resulting from a given RPM auction. Therefore, suggesting that the CONE value is too low would infer that capacity prices in general were too low. While PJM does agree that the current CONE is too low based on recent analysis by our consultants, the statements in the paper are contradictory and confusing.

RPM auction results accurately reflect supply and demand conditions.

RPM clearing prices are dependent on supply and demand. The paper asserts that RPM is flawed, because a 0.2% change in supply changed the clearing price of the 2009/2010 Base Residual Auction by 4.0%. While these statistics are correct, the paper fails to recognize that under the previous capacity construct, which set demand using a vertical curve, a small change in supply could change the clearing price from the deficiency rate, roughly the net CONE value used in the RPM VRR curves, to zero. Therefore the RPM design actually reduces capacity price volatility.

Because there are several variables involved in determining clearing prices, PJM posts a significant amount of data well in advance of opening an RPM Auction Bid Window.

> ***Supply:***
> PJM posts a list of internal resources as well as their locations, and installed capacity ratings on the PJM website. This list is intended to provide participants with an understanding of the supply component of the RPM Auctions. While additional supply from outside the PJM footprint may be offered into an auction, this list provides a minimum in terms of supply that expected to be offered into the Base Residual Auction.
>
> ***Demand:***
> The Variable Resource Requirement curve, which sets the demand for Base Residual Auctions, is made up of three data points relative to the net CONE and the Reliability Requirement for the RTO or deliverability area. The data points that make up this curve, as well as the Interruptible Load for Reliability Obligation are posted to the PJM website for each delivery year. This posting provides an understanding of the demand component for RPM Auctions.

Other parameters also impact RPM auction results.

Because RPM is a reliability mechanism, additional factors such as transmission values and the planning parameters used to create the reliability requirement and Variable Resource Requirement curve can also have an impact on the eventual clearing prices. The criteria PJM utilizes to determine whether key transmission upgrades and additions are included in the models used to determine locational capacity requirements are the subject of thorough stakeholder debate. PJM vets all such decisions critical to the outcome of RPM auctions and therefore effective reliability planning through its active stakeholder process.

> ***Other Key Planning Parameters:***
> The transfer limits of each deliverability area, as well as a list of transmission upgrades that were used to determine those limits, are also posted on the PJM website for participant review. Other key postings include the IRM, the forecast pool requirement, and load forecast, which are used to calculate the Reliability Requirement. The calculations and methodology for determining these values is available in the PJM Manuals.

For participants that are new to PJM or wish to have a deeper understanding of RPM and the parameters involved in setting prices, PJM conducts training courses at least twice a year. In addition, training materials and manuals are available on the PJM website. For participants with specific questions, PJM provides an email hotline to address participant queries.

The PJM MMU has validated that no withholding has occurred in any of the RPM auctions.

The paper states that capacity sellers, especially those in concentrated, constrained areas, have incentive to withhold capacity in an effort to drive up prices for their existing resources that will clear in the market. As previously stated in this document, there has been no withholding in any RPM auction. Adherence to the must-offer requirement in the Tariff is validated by the PJM MMU as part of each RPM auction clearing process and all capacity to which this requirement applies is categorized in table 2 of each auction report.

The RPM market power mitigation mechanism has been effective in ensuring competitive RPM auction results.

Similar to the energy market, PJM uses a Three Pivotal Supplier (TPS) test to test for the presence of structural market power. The TPS test determines whether there are three jointly pivotal suppliers that can exert market power and influence market prices through price-based offers. If three jointly pivotal suppliers are found, all pivotal suppliers are offer capped to their avoidable cost rate or opportunity cost as determined in the PJM Tariff and calculated by the MMU. In each RPM Base Residual Auction, all capacity suppliers have been mitigated to their applicable offer cap thus eliminating the possibility of economic withholding.

The incentive to withhold supply to maximize the economic value of a portfolio of resources exists in virtually any market where supply is limited. This is particularly true in a market such as one for capacity, where the most efficient result is to only have just enough supply to meet the required demand. The potential for exercise of market power is exactly the reason why the RPM market power mitigation mechanism exists. The presence of the RPM must-offer requirement and this market power mitigation mechanism and make physical and economic withholding in RPM auctions extremely unlikely. The PJM MMU has concluded in its 2007 State of the Market Report that, as a direct result of the rules surrounding capacity offers, the results of the RPM auctions held to date have been competitive.

RPM has attracted new capacity.

Even in the transition year, auctions conducted to date where the timeframe for which capacity was being procured was relatively short, RPM has attracted new capacity, as noted in table 4 of the RPM Auction Reports. The RPM is not expected to attract more capacity than is needed to maintain the reliability of the PJM system. To the extent that the RTO is “long” on capacity by a substantial margin, capacity prices would not be expected to support new entry, and in fact are not intended, to attract additional capacity.

RPM has resulted in the retention of older capacity.

While the paper makes a valid point that RPM pricing may not always be great enough to retain existing capacity, it has contributed to delayed retirement and reactivation of existing units, as noted in table 5 of the RPM Auction Reports. The capital investment required to retain older resources may not always be the cost-efficient method of meeting reliability requirements. Therefore, RPM is not intended to always result in prices that will keep older capacity in service, but rather to provide price signals to attract new investment, as well as the most efficient mix of all resources, including demand response, to meet resource adequacy and reliability requirements.

RPM is aligned with state energy policies.

RPM provides several means of accommodating state energy policies with regard to demand reduction, renewable resources, and energy efficiency. Should new energy policies arise, RPM is flexible enough to accommodate any changes necessary to reflect new requirements. Demand Resources are accepted as supply in the RPM Auctions, and Interruptible Load resources may be certified just three months prior to a Delivery Year. Renewable resources such as wind may offer as supply into RPM Auctions with established mechanisms for determining the capacity value such resources provide. Incorporation of Energy Efficiency in RPM is currently under discussion in the PJM stakeholder process and is expected to be included in the RPM by the 2009/2010 Delivery Year.

RPM reflects the actual cost of maintaining reliability and through continued competitive results will ensure cost-effective outcomes.

The paper asserts that the RPM is not a cost-effective method of pricing long-term reliability simply because RPM clearing prices are higher than previous capacity prices and a majority of RPM payments go to existing units. This line of logic ignores the fact that existing units require continual capital investment to continue operating. As the PJM MMU pointed out in previous State of the Market reports prior to the institution of RPM, no class of generator was able to recoup its total cost of operation, including fixed and variable costs, through combined revenues from the PJM capacity, energy and ancillary service markets. This was a clear indication that the previous capacity market did not accurately reflect the true cost of building and maintaining capacity resources in PJM. RPM is intended to address the capacity shortfall through the explicit use of a carefully calculated, regularly updated and reviewed value for constructing new capacity in the establishment of capacity prices.

Comments on the RPM's design features

The paper also comments on some of the key design features of RPM. Below are PJM's responses and comments on those opinions.

Locational capacity incentives have resulted in new resources:

In section describing RPM's locational pricing, the paper contends that the locational capacity prices set through RPM auctions may not be enough to impact resource location choices because the prices vary from year to year. It is too early to draw this

conclusion as there has not been adequate time for new projects to propagate through the interconnection processes and fulfill all requirements to be eligible to offer into an auction. What is known is that there have been increases in demand response participation and uprates to existing resources that correlate with locational RPM prices. These values can be seen in each RPM auction report.

The paper also comments that locational prices in an LDA for a single year are meaningless if a planned transmission upgrade would eliminate the constraints in the next year. It states that these yearly prices will only serve to entice existing capacity resources to delay retirement, which is an inefficient and costly solution. This solution is actually the most cost-effective one for a short-term problem. The paper may support an alternative such as not modeling this region in an RPM auction; however, this would cause less capacity to be committed in that region and would result in an unreliable system. Another option that the paper would seemingly support would be to build new generation in the constrained region to support the locational need for capacity. This is also a more costly solution as that new generation would only be needed in the short-term, yet the load would have to subsidize its cost over the lifetime of the resource. The most cost effective solution is to provide a price signal to allow new resources and investment in existing resource or demand response to compete to provide reliability solutions.

Forward capacity commitment:

The paper discusses the forward looking aspect of the RPM auctions in this section and also asserts opinions on the validity of that look-ahead period, in addition to the single year capacity commitment resulting from an RPM auction. It says that the RPM three-year-forward structure may be an “especially poor choice” as it introduces uncertainty to the forecasted parameters used in the auction while not allowing enough time for new projects to participate in an auction. Using this logic, it would seem that any forward commitment of capacity, or any product for that matter, is inefficient. We know this is not true.

The paper’s comments on the term of the capacity commitment seem to contradict this logic however as it states that, “a longer RPM commitment (3, 5 or ten years at a single price, or with some other assurance as to price) would provide a better incentive to develop new resources and better support financing for them.” One would infer that this long-term commitment would require some forward-looking analysis to determine a price for this contract which the paper seems to be against.

The paper also provides no solution to the perceived problem with the RPM’s forward-looking capacity procurements. What is important to note is that the RPM design that was initially filed with the FERC was for a four-year-forward auction that was changed to three years as a result of negotiations for the RPM Settlement Agreement. Regardless of the length of the look-ahead period, the intent is to give forward price certainty to existing resources for capital investments and allow adequate time for planned resources to fulfill all requirements and studies necessary prior to participating in an auction. Because the RPM has not reached the steady state period where auctions will

be run three years ahead, drawing the conclusion that a three-year-forward capacity auction will not work is conjecture that is not be supported with any meaningful data.

Multi-year capacity commitments were also discussed at the FERC as part of the RPM design proceedings and were not agreed to as part of the RPM Settlement Agreement. As experience is gained with the RPM construct and more complete analysis of auction results becomes possible, PJM will continue to look to refine the model. This should result in improvements in its ability to predict the need for new capacity and provide the timeframe necessary for new resources to participate in the auctions.

Demand curve parameters (etc):

The shape of the Variable Resource Requirement (VRR) Curve (i.e., demand curve) was established through the FERC-approved Settlement Agreement. Professor Benjamin F. Hobbs of John Hopkins University performed a long-run dynamic simulation of the relative performance (in terms of both reliability and cost) of the VRR Curve. Professor Hobb's simulations showed that the VRR Curve is likely to lead to reserves levels meeting or exceeding the Installed Reserve Margin 95% of the time; whereas, a vertical demand curve[8] is likely to meet or exceed IRM only 52% of the time. The long-term costs to consumers were estimated at $82/peak kW/year for the VRR Curve versus $123/ peak kw/year for the vertical demand curve.

Although the simulation modeling showed that the shape of the VRR Curve provides reasonable assurance that the PJM region will continue to meet its reliability objectives, the Settlement Agreement preserved PJM's ability to address any issues promptly if that expected level of reliability is not achieved. The Settlement Agreement left in place the originally filed tariff provisions that require PJM to evaluate the need for changes to the VRR Curve or its parameters at least every three years.

Single round auction:

PJM stakeholders were informed of the benefits and drawbacks of numerous auction formats including sealed bid 'reverse English auction', a sealed bid receive-as-offer auction, and a descending clock auction. These options were explored through a February 2003 study on centralized resource adequacy markets performed by the National Economic Research Associates, Inc. (NERA) on behalf of ISO New England, New York ISO, and PJM. The RPM auction format, a single round auction, was established through the FERC-approved Settlement Agreement and remains a competitive mechanism to procure capacity for the PJM RTO. The RPM auction involves an optimization-based market clearing mechanism that has the objective of minimizing capacity procurement costs given the supply offers, demand curve, and locational constraints.

The Reliability Pricing Model Early Results are Promising:

[8] Often referred to as the "No Demand Curve" case that is effectively a vertical line at the IRM, capped at a price of twice the CONE minus energy and ancillary services revenue offset.

Although PJM agrees with Mr. Wilson that it is too early to draw definitive conclusions on RPM's performance thus far, there are some observations that can be made that are unmistakably rooted in the actual data from the auctions already completed.

- The RPM has been effective in attracting new capacity. In each Base Residual Auction during the transition period, RPM has attracted increasing quantities of new generation, uprates to existing generation, reversals in retirement decisions, and demand side response capacity. We have yet to see how the RPM performs during the steady state period.
- The RPM provides a level playing field for generating capacity and demand response by permitting them to participate in the same competitive capacity auction. Nearly 1,000 MW of demand response cleared in the 2010/2011 BRA.
- The RPM has significantly decreased the amount of net capacity exports from the PJM region from over 3000 MW in 2006 to less than 500 MW in 2010/2011.
- The RPM has provided the needed revenue stream to allow generation owners to make significant investments in existing capacity resources in order for them to remain in service.
- The RPM has provided the incentive for previously retired units to be reactivated.
- The RPM's strict must-offer requirement and market mitigation provisions have eliminated any opportunity for market manipulation.
- The PJM Generation Interconnection Queues have seen a significant increase in activity since the approval of the RPM.

- As published in the 2010/2011 Base Residual Auction Report, the RPM's impact to date has been an increase in excess of 10,000 MW. This comes from annual increases in new generating and demand response capacity, postponed or delayed retirements, unit reactivations and the aforementioned significant decrease in capacity exports.
- RPM prices have trended towards the Net CONE as indicated by the Hobb's analysis.

Given the infancy of the RPM implementation, drawing further conclusions about the RPM's performance over a longer period of time is speculative at best. What is known is that the financial incentives provided by the RPM have, and continue to, attract new capacity in the locations where the clearing prices support the need for that capacity.