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Analysis of the 2010/2011 RPM Third Incremental Auction

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The Independent Market Monitor for PJM

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Introduction

This report, prepared by the Independent Market Monitor for PJM (IMM, Market Monitoring unit or MMU), reviews the functioning of the 2010/2011 Reliability Pricing Model (RPM) Third Incremental Auction (IA). The MMU prepares a report for each RPM auction.

Under RPM, the Base Residual Auction (BRA) is held in May three years prior to the beginning of the delivery year, which runs from June 1 through May 31. After the BRA, Incremental Auctions are conducted. Prior to the 2012/2013 delivery year, Incremental Auctions are conducted to allow for replacement resource procurement and incremental procurement of resource commitments due to a load forecast increase. For the 2012/2013 delivery year and beyond, Incremental Auctions are conducted to allow for replacement resource procurement, procurement or release of capacity due to reliability requirement adjustments, and deferred Short-Term Resource Procurement. Prior to the 2012/2013 delivery year, up to three Incremental Auctions are held for each delivery year. Effective the 2012/2013 delivery year, First, Second, and Third Incremental Auctions are held for each delivery year, and in addition, a conditional incremental auction may be held to address significant unexpected changes that occur after the BRA, such as a delay in planned large transmission upgrades that results in the need for procurement of additional capacity. Prior to January 31, 2010, First, Second, and Third Incremental Auctions are conducted 23, 13, and four months, prior to the delivery year. Effective January 31, 2010, First, Second, and Third Incremental Auctions are conducted 20, 10, and three months prior to the delivery year.

Prior to the 2012/2013 delivery year, the First and Third Incremental Auctions are conducted to allow capacity resource providers to buy and sell capacity to accommodate adjustments to resource positions as a result of capacity and DR modifications to existing capacity resources, new capacity resources, resource retirements, resource cancellations or delays, changes in a generation resource's equivalent demand forced outage rate (EFORd), or cancellations or delays of a Qualifying Transmission Upgrade. Prior to the 2012/2013 delivery year, the demand curves in the First and Third Incremental Auctions are entirely a function of resource provider demand bids, and there is no administrative market demand curve. Effective the 2012/2013 delivery year, the demand curves in the First, Second, and Third Incremental Auctions may be comprised of buy bids submitted by participants; a buy bid created by PJM and submitted at 1.5 times net Cost of New Entry (CONE) to procure the increase in the RTO reliability requirement that exceeds a threshold of 500 MW or one percent of the reliability requirement in First and Second Incremental Auctions or a threshold of zero in Third Incremental Auctions; a buy bid submitted by PJM at 1.5 times net CONE to procure the designated RTO Short-Term Resource Procurement Target Allocation Share; or the increment of the updated Variable Resource Requirement (VRR) Curve if capacity committed in all prior auctions for the given delivery year is less than the PJM or LDA

reliability requirement less the PJM or LDA Short Term Resource Procurement Target in the most recent auction by 500 MW or one percent of the reliability requirement.

Prior to the 2012/2013 delivery year, the Second Incremental Auction is held only if PJM determines that an unforced capacity (UCAP) resource shortage exceeds 100 MW of unforced capacity due to a load forecast increase, and the demand curve in the Second Incremental Auction is an administrative demand curve. Effective the 2012/2013 delivery year, the Second Incremental Auction is not contingent upon a load forecast increase and is conducted in the same manner as the First and Third Incremental Auctions.

Prior to the 2012/2013 delivery year, the cost of the incremental commitments in the First and Third Incremental Auctions is allocated to resource owners that cleared buy bids in the auction, with no change in the locational reliability charge assessed to Load Serving Entities (LSEs) during the delivery year, and the costs of procurement from the Second Incremental Auction are allocated to LSEs serving load during the delivery year through the locational reliability charge. Effective with the 2012/2013 delivery year, the cost of the incremental commitments is allocated to resource providers that cleared buy bids in the auction and to LSEs, where buy bids submitted by PJM were cleared.

The capacity market is, by design, always tight in the sense that total supply is generally only slightly larger than demand. While the market may be long at times, that is not the equilibrium state. Capacity in excess of demand is not sold and, if it does not earn or does not expect to earn adequate revenues in other markets or does not have value as a hedge, may be expected to retire. The demand for capacity includes expected peak load plus a reserve margin, and points on the VRR curve exceed peak load plus the reserve margin. Thus, the reliability goal is to have total supply equal to or slightly above the demand for capacity. The level of purchased demand under RPM has generally exceeded expected peak load plus the target reserve margin, resulting in reserve margins that exceed the target. Demand is almost entirely inelastic because the market rules require loads to purchase their share of the system capacity requirement. The level of elasticity built into the RPM demand curve, called the Variable Resource Requirement (VRR) curve, is not adequate to modify this conclusion. The result is that any supplier that owns more capacity than the typically small difference between total supply and the defined demand is pivotal and therefore has structural market power.

The market design for capacity leads, almost unavoidably, to structural market power in the capacity market. The capacity market is unlikely ever to approach a competitive market structure in the absence of a substantial and unlikely structural change that results in much greater diversity of ownership. Nonetheless a competitive outcome can be assured by appropriate market power mitigation rules. Detailed market power mitigation rules are included in the RPM tariff. This represents a significant advance over the prior capacity market design. Reliance on the RPM design for competitive

outcome means reliance on the market power mitigation rules. Attenuation of those rules will mean that market participants will not be able to rely on the competitiveness of the market outcomes. However, the market power rules are not perfect and, as a result, competitive outcomes require continued improvement of the rules and ongoing monitoring of market participant behavior and market performance. In the capacity market, as in other markets, market power is the ability of a market participant to increase the market price above the competitive level or to decrease the market price below the competitive level. In order to evaluate whether actual prices reflect the exercise of market power, it is necessary to evaluate the competitive market offers. In RPM Incremental Auctions, both supply offers and demand bids must be evaluated.

These general conclusions may not apply to every incremental auction. As incremental auctions reflect only incremental supply and demand, the ownership structure of both supply and demand are unpredictable. Under the current rules, any participant may enter a demand bid into the auction for any reason. Suppliers may enter demand bids when they do not require additional capacity to meet their obligations. The MMU recommends that the PJM stakeholder process consider an explicit market power test for the Incremental Auctions related to market power on the buyer side. Market power could be exercised either to suppress the price below the competitive level or to increase the price above the competitive level. The issue of whether demand bids could be used to exercise market power by increasing the price above the competitive level remains to be addressed.

The MMU verified the reasonableness of offer data and calculated the derived offer caps based on submitted data, calculated unit net revenues, verified capacity exports, verified the reasons for MW not offered, verified the EFORd rates used, verified clearing prices based on the supply and demand curves and verified that the market structure tests were applied correctly. All participants in the RTO market failed the market structure test. The result was that offer caps were applied to those sellers that failed the test, excluding sell offers for planned generation resources for the first delivery year. The offer caps are designed to reflect the marginal cost of capacity. Based on these facts, the MMU concludes that the results of the 2010/2011 RPM Third Incremental Auction were competitive.

Offer Caps

Capacity resource owners that intended to have a non-zero offer cap were required to submit ACR or opportunity cost data to the MMU by two months prior to the 2010/2011 Third Incremental Auction reflecting the most current best information and updates

since the 2010/2011 BRA.[1] For the Third Incremental Auction, participants have the additional option of electing an offer cap for existing generation resources of 1.1 times the resource clearing price in the BRA for the relevant LDA. If a capacity resource owner failed the market power test for the auction and the submitted sell offer exceeded the offer cap, market power mitigation measures were applied such that the sell offer was set equal to the defined offer cap. The EFORd which was applied in this auction was the one-year EFORd for the period ending September 30, 2009, which is the final EFORd for the 2010/2011 delivery year.

All volumes which were offered but did not clear in the 2010/2011 BRA and which had not been used as replacement capacity were required to be offered into the 2010/2011 Third Incremental Auction while also taking into account EFORd changes between the Base Residual Auction and Third Incremental Auction. Total offered volumes declined from 133,092.7 MW in the 2010/2011 BRA to 4,553.9 MW in the Third Incremental Auction.[2] As shown in Table 1, 303 generation resources and 34 demand resources (DR) submitted offers. The total includes eight new wind resources (173.8 MW), two new diesel resources (2.4 MW) and three reactivated resources (127.7 MW) which were not offered into the 2010/2011 BRA. Unit-specific offer caps were calculated and elected for one resource (0.3 percent). Owners submitted unit-specific cost data and net revenue data for these units and the MMU calculated the unit-specific offer caps based on that data. Offer caps of all kinds were calculated and elected for nine resources (2.9 percent), of which seven (2.3 percent) were based on the technology specific default (proxy) ACR values posted by the MMU. The offer cap option of 1.1 times the BRA clearing price option was elected for 193 generation resources (67.1 percent). Of the 267 generation resources, the remaining 101 (30.0 percent) resources were price takers.

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1 For a more detailed explanation of avoidable costs, see "Analysis of the 2010-2011 RPM Auction Revised" (July 3, 2008) < http://www.monitoringanalytics.com/reports/Reports/2008/20102011-rpm-review-final-revised.pdf>

2 Unless otherwise specified, all volumes and prices are in terms of UCAP.

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Table 1 ACR statistics: 2010/2011 RPM Third Incremental Auction

Calculation Type	Number of Resources	Percent of Generation Resources Offered
Default ACR selected	7	2.3%
ACR data input (APIR)	1	0.3%
ACR data input (non-APIR)	0	0.0%
Opportunity cost input	1	0.3%
Default ACR and opportunity cost input	0	0.0%
Generation resources with offer caps	9	2.9%
Uncapped planned generation resources	0	0.0%
Generators with 1.1 times BRA clearing price offer cap	193	67.1%
Generation price takers	101	30.0%
Generation resources offered	303	100.0%
Demand resources offered	34	
Total capacity resources offered	337	

RPM Auction Results

MMU Methodology

The MMU reviewed the following inputs to and results of the 2010/2011 RPM Third Incremental Auction: [3]

- **Offer Cap –** Verified that the avoidable costs, opportunity costs and net revenues used to calculate offer caps were reasonable and properly documented;

- **Net Revenues –** Calculated actual unit-specific net revenue from PJM energy and ancillary service markets for each PJM capacity resource for the period from 2005 through 2007;

[3] Unless otherwise specified, all volumes and prices are in terms of unforced capacity (UCAP), which is calculated as installed capacity (ICAP) times (1-EFORd) for generation resources and as ICAP times the Demand Resource Factor and the Forecast Pool Requirement (FPR) for DR and EE resources. The EFORd values in this report are the EFORd values used in the 2010/2011 RPM Third Incremental Auction.

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- **Exported Resources –** Verified that capacity resources exported from PJM had firm external contracts or made documented opportunity cost offers;

- **Excused Resources –** Verified the specific reasons that capacity resources were excused from offering into the auction;

- **Maximum EFORd –** Verified that the equivalent demand forced outage rate (EFORd) values used were the one-year EFORd for the period ending September 30, 2009;

- **Clearing Prices –** Verified that the auction clearing prices were accurate, based on submitted sell offers and buy bids;

- **Market Structure Test –** Verified that the market power test was properly defined using the three pivotal supplier (TPS) test, that offer caps were properly applied and that the TPS test results were accurate.

Market Structure Tests

As shown in Table 3, all participants in the total PJM market failed the TPS test.[4] The result was that offer caps were applied to all sell offers of participants that did not pass the test, excluding sell offers of planned generation resources for the first delivery year. In the 2010/2011 BRA, all market participants failed the TPS test in all markets. Only those suppliers with incremental supply participated in the incremental auction. This reduced the number of participants from 68 in the 2010/2011 BRA to 47 in the corresponding Third Incremental Auction and the offered volumes from 133,092.7 MW to 4,553.9 MW. The supply considered in the TPS test for the RTO market includes all supply offered at less than or equal to 150 percent of the RTO cost-based clearing price. The supply considered in the TPS test for the constrained LDA markets includes the incremental supply inside the constrained LDAs which was offered at a price higher than the unconstrained clearing price for the parent LDA market and less than or equal to 150 percent of the cost-based clearing price for the constrained LDA. The demand consists of the incremental MW needed in the LDA to relieve the constraint.

Table 3 presents the results of the TPS test using the Residual Supply Index (RSI_3) as the metric. A generation owner or owners are pivotal if the capacity of the owners' generation facilities is needed to meet the demand for capacity. The results of the TPS are measured by the Residual Supply Index (RSI_3). The RSI_x is a general measure that

[4] See the *2009 State of the Market Report for PJM* (March 11,2010), Volume II, Section 2, "Energy Market, Part 1," and Volume II, Appendix L, "Three Pivotal Supplier Test" for a more detailed discussion of market structure tests.

can be used with any number of pivotal suppliers. The TPS test uses three pivotal suppliers. The subscript denotes the number of pivotal suppliers included in the test. If the RSI_x is less than or equal to 1.0, the supply owned by the specific generation owner, or owners, is needed to meet market demand and the generation owners are pivotal suppliers with a significant ability to influence market prices. If the RSI_x is greater than 1.0, the supply of the specific generation owner or owners is not needed to meet market demand and those generation owners have a reduced ability to unilaterally influence market price.[5]

Table 2 RSI results: 2010/2011 RPM Third Incremental Auction[6, 7]

	$RSI_{1\ 1.05}$	RSI_3	Total Participants	Failed RSI_3 Participants
RTO	0.77	0.53	47	47

RTO

As shown in Table 4, 4,553.9 MW were offered into the incremental auction while buy bids totaled 5,221.0 MW. The offered volumes came from uncleared internal generation offers from the 2010/2011 BRA (598.2 MW), new generation (176.2 MW), reactivated generation (127.7 MW), capacity modifications (cap mods) to existing generation resources (534.5 MW), additional UCAP due to improved EFORds since the BRA (1,425.5 MW), replacements (-264.0 MW), locational UCAP transactions (-135.6 MW), imports (395.2 MW), DR offers (1,451.6 MW) less a net change in FRR commitments (-401.4 MW), a net change in exports (-114.4 MW), a net change in unoffered MW in the 2010/2011 BRA (270.2 MW), and excused generation (1.0 MW). Buy bids were submitted to cover short positions due to deratings and EFORd increases or because participants wished to purchase additional capacity. Cleared volumes in the RTO were 1,845.8 MW, resulting in an RTO clearing price of $50.00 per MW-day compared to the RTO clearing price of $174.29 per MW-day in the 2010/2011 BRA. The 2,708.1 MW of uncleared volumes can be used as replacement volumes or traded bilaterally.

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5 The market definition used for the TPS test includes all offers with costs less than or equal to 1.50 times the clearing price. The appropriate market definition to use for the one pivotal supplier test includes all offers with costs less than or equal to 1.05 times the clearing price. See *2009 State of the Market Report for PJM* (March 11, 2010), Appendix L, "Three Pivotal Supplier Test" for additional discussion.

6 Participants are defined as parent companies.

7 The RSI shown is the lowest RSI in the market.

Although DPL South was constrained in the 2010/2011 BRA, supply offers in the incremental auction in DPL South (56.8 MW) exceeded DPL South demand bids (25.9 MW). The offered volumes came from uncleared internal generation offers from the 2010/2011 BRA (25.6 MW), capacity modifications (cap mods) to existing generation resources (-2.2 MW), additional UCAP due to improved EFORds since the BRA (34.0 MW), and replacements (-0.6 MW). Supply and demand curves resulted in a price less than the RTO clearing price. The result was that all of DPL South supply which cleared received the RTO clearing price.

Table 3 RTO offer statistics: 2010/2011 RPM Third Incremental Auction

	Offered (Supply)		Bid (Demand)
	ICAP (MW)	UCAP (MW)	UCAP (MW)
Generation	3,274.3	3,102.3	
DR	1,402.9	1,451.6	
Total	4,677.2	4,553.9	5,221.0
Cleared in RTO	1,947.6	1,845.8	1,845.8
Cleared in LDAs	0.0	0.0	0.0
Total cleared	1,947.6	1,845.8	1,845.8
Uncleared in RTO	2,729.6	2,708.1	3,375.2
Uncleared in LDAs	0.0	0.0	0.0
Total uncleared	2,729.6	2,708.1	3,375.2
Resource clearing price ($ per MW-day)		$50.00	