



## **2014/2015 RPM Base Residual Auction Results**

### **Introduction**

This document provides information for PJM stakeholders regarding the results of the 2014/2015 Reliability Pricing Model (RPM) Base Residual Auction (BRA). The 2014/2015 BRA opened on May 2, 2011 and the results were posted on May 13, 2011.

The 2014/2015 RPM BRA is the first BRA conducted under new rules that establish two additional demand resource products - one available throughout the year (Annual DR) and another available for an extended summer period (Extended Summer DR). These new products have fewer limitations than the current Limited Demand Resource product (Limited DR). New auction rules recognize the greater reliability value associated with less limited resources by establishing and enforcing a minimum requirement on the commitment of less limited products. The Minimum Annual Resource Requirement is the minimum amount of capacity sought to be procured in each auction from Annual Resources (Annual Resources include generation capacity resources, energy efficiency resources and annual demand resources). The Minimum Extended Summer Resource Requirement is the minimum amount of capacity sought to be procured in each auction from Extended Summer Demand Resources and Annual Resources.

Minimum resource requirements are established for the RTO and each modeled LDA and the auction clearing process can select Extended Summer DR or Annual Resources out of merit order, if necessary, to procure the minimum required quantities, similar to the way in which RPM auctions can select resources out of merit order to address locational constraints. In those cases where one or both of the minimum resource requirements do bind in the auction solution, just as with resources selected to resolve locational constraints, resources selected to meet the necessary minimum resource requirements will receive an adder to the system marginal price of capacity (in addition to any locational price adder(s) received to resolve locational constraints).

This document begins with a high level Executive Summary of the BRA results followed by sections containing detailed descriptions of the auction results.

### **Executive Summary**

The 2014/2015 Reliability Pricing Model (RPM) Base Residual Auction (BRA) cleared 149,974.7 MW of unforced capacity in the RTO representing a 20.6% reserve margin. When the Fixed Resource Requirement (FRR) load is considered the actual reserve margin for the entire RTO is 19.6%.

The Resource Clearing Price for Annual Resources and Extended Summer DR located in RTO, the MAAC LDA and the PS-NORTH LDA is \$125.99/MW-day, \$136.50/MW-day and \$225.00/MW-day, respectively. The Resource Clearing Price for Limited DR in RTO, the MAAC LDA and the PS-NORTH LDA is \$125.47/MW-day, \$125.47/MW-day and \$213.97/MW-day, respectively. Since the Minimum Extended Summer Resource Requirement was a binding constraint for the RTO and the MAAC LDA and since both



## **2014/2015 RPM Base Residual Auction Results**

Annual Resources and Extended Summer DR may be used to satisfy this constraint, Annual Resources and Extended Summer DR received a higher Resource Clearing Price than did Limited DR. Also, since the PS-NORTH was a locationally constrained LDA in the BRA, all resources located in the PS-NORTH LDA received a higher Resource Clearing Price associated with the PS-NORTH Locational Price Adder.

A total of 4,170.3 MW of incrementally new capacity in PJM was available for the 2014/2015 Base Residual Auction. This incrementally new capacity includes new generation capacity resources, capacity upgrades to existing generation capacity resources, new demand resources, upgrades to existing demand resources, and new energy efficiency resources. 1100.6 MW of new generation resources and 473.2 MW of uprates to existing resources were offered into the 2014/2015 Base Residual Auction. The increase is partially offset by generation capacity derations to existing generation capacity resources to yield a net increase of over 2,602.2 MW of installed capacity.

The total quantity of demand resources offered into the 2014/2015 BRA was 15,545.6 MW (UCAP) which represents an increase of 2,592.9 MW (20%) over the demand resources that offered into the 2013/2014 BRA. Approximately 91% (14,118.4 MW) of these demand resources cleared in the auction. The majority of the increased participation by demand response was driven by the forward capacity market incentives.

The total quantity of energy efficiency (EE) resources offered into the 2014/2015 BRA was 831.9 MW (UCAP) which represents an increase of 10% over the EE resources that offered into the 2013/2014 BRA. Approximately 99% (822.1 MW) of these EE resources cleared in the auction.

MAAC, EMAAC, SWMAAC, PSEG, PS-NORTH, DPL-SOUTH, and PEPCO were modeled as Locational Deliverability Areas (LDAs) in the 2014/15 RPM Base Residual Auction; however, only the PS-NORTH LDA was a binding constraint that resulted in a Locational Price Adder for this LDA. The Resource Clearing Prices for Limited DR cleared in MAAC and PS-NORTH are \$125.47/MW-day and \$213.97/MW-day, respectively. Since the Extended Summer Resource Requirement in the MAAC LDA was a binding constraint resulting in an Extended Summer Price Adder of \$11.03/MW-day, the Resource Clearing Prices for Annual Resources and Extended Summer Demand Resources cleared in MAAC and PS-NORTH are \$136.50/MW-day and \$225.00/MW-day, respectively. The MAAC price decreased by \$89.65/MW-day compared to the 2013/2014 BRA. This price decrease was caused primarily by the reduced reliability requirement due to lower forecasted load and to the increase in capacity transfer margin into MAAC. The factors



## **2014/2015 RPM Base Residual Auction Results**

that resulted in the increased capacity transfer margins are detailed in the Planning Period Parameter report that was posted on February 1, 2011.<sup>1</sup>

All existing generation sell offers into the 2014/2015 Base Residual Auction were subject to market power mitigation through the application of the Market Structure Test (i.e., the Three-Pivotal Supplier Test). The RTO as a whole and the PS-NORTH LDA failed the Market Structure Test, resulting in mitigation of any existing generation resources. Mitigation was applied to a supplier's existing generation resources resulting in utilizing the lesser of the supplier's approved offer cap for such resource or the supplier's submitted offer price for such resource in the RPM Auction clearing. Suppliers in the MAAC LDA which had an offer price or offer cap price between the RTO Annual MCP and 150% times the MAAC Annual MCP were determined to have passed the Market Structure Test, and therefore the offers of the relevant existing generation resources were not mitigated.

A further discussion of the 2014/2015 Base Residual Auction results and additional information regarding the 2014/2015 Reliability Pricing Model (RPM) Base Residual Auction results are detailed in the body of this report. The discussion also provides a comparison of the 2014/2015 auction results to the results from the 2007/2008 through 2013/2014 RPM auctions.

---

<sup>1</sup> Link to the report is : <http://www.pjm.com/markets-and-operations/rpm/~/media/markets-ops/rpm/rpm-auction-info/20110102-rpm-bra-planning-parameters-2014-2015.ashx>



## 2014/2015 RPM Base Residual Auction Results

### 2014/2015 Base Residual Auction Results Discussion

Table 1 contains a summary of the RTO clearing prices resulting from the 2014/2015 RPM Base Residual Auction in comparison to those from 2007/2008 through 2013/2014 RPM Base Residual Auctions.

**Table 1 –RPM Base Residual Auction Resource Clearing Price Results in the RTO**

Auction Results	RTO							
	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012*	2012/2013	2013/2014**	2014/2015***
Resource Clearing Price	\$40.80	\$111.92	\$102.04	\$174.29	\$110.00	\$16.46	\$27.73	\$125.99
Cleared UCAP (MW)	129,409.2	129,597.6	132,231.8	132,190.4	132,221.5	136,143.5	152,743.3	149,974.7
Reserve Margin	19.2%	17.5%	17.8%	16.5%	18.1%	20.9%	20.2%	19.6%

\*2011/2012 BRA was conducted without Duquesne zone load.

\*\*2013/2014 BRA includes ATSI zone load

\*\*\*2014/2015 BRA includes Duke zone

The cleared UCAP is the amount of unforced capacity that was procured in the auction to meet the RTO demand for capacity. The 2014/2015 Reliability Pricing Model (RPM) Base Residual Auction cleared 149,974.7 MW of unforced capacity in the RTO representing a 20.6% reserve margin. When the Fixed Resource Requirement (FRR) load is considered the actual reserve margin for the entire RTO is 19.6%. The Reserve Margin presented in Table 1 represents the percentage of installed capacity cleared in excess of the RTO load (including load served under the Fixed Resource Requirement alternative).

The 2014/2015 Base Residual Auction results reflect very strong participation by demand resources, meaningful participation from energy efficiency resources, and growing development of renewable resources. Additionally, 1100.6 MW of new generation resources and 473.2 MW of uprates to existing resources were offered into the 2014/2015 Base Residual Auction.

### **Demand Resource Participation**

The total quantity of demand resources offered into the 2014/2015 BRA, 15,545.6 MW (UCAP), represented an increase of 20% over the demand resources that offered into the 2013/2014 BRA. Of the 15,545.6 MW of total demand response that offered in this auction, 14,118.4 MW cleared and will be awarded capacity payments. The cleared demand response is 4,836.5 MW greater than that which cleared in the 2013/2014 BRA representing a 52.1% increase. Of this increase, 1,365.7 MW cleared in the MAAC LDA and 3,470.8 MW cleared outside of the MAAC LDA.



## **2014/2015 RPM Base Residual Auction Results**

Existing DR followed a pre-registration process in order to become eligible for participation as Existing DR in the 2014/2015 Base Residual Auction, and Existing DR constituted over 59% of the total demand resources offered (9,248.8 MW UCAP). The pre-registration process allowed Curtailment Service Providers with Approved Load Response Registrations for the upcoming 2011/2012 Delivery Year to select those sites they expect to contract with for 2014/2015 and therefore register for the 2014/2015 Delivery Year as Existing Demand Resources. The remaining demand resources offered into the 2014/2015 BRA (6,296.8 MW UCAP) were comprised of Planned Demand Resources. Planned Demand Resources were required to meet the RPM credit requirements imposed on all new resources.

*Table 2A* contains a comparison of the Demand Resources Offered and Cleared in 2013/2014 BRA & 2014/2015 BRA represented in UCAP.



## 2014/2015 RPM Base Residual Auction Results

**Table 2A – Comparison of Demand Resources Offered and Cleared in 2013/14 BRA & 2014/15 BRA represented in UCAP**

Constrained LDA      Zone		Offered MW*			Cleared MW*		
		2013/2014	2014/2015	Increase in Offered MW	2013/2014	2014/2015	Increase in Cleared MW
EMAAC	AECO	122.1	268.2	146.1	122.1	205.4	83.3
EMAAC	DPL	245.7	470.9	225.2	245.7	391.5	145.8
EMAAC	JCPL	283.7	553.0	269.3	283.7	444.0	160.3
EMAAC	PECO	658.2	992.4	334.2	658.2	830.5	172.3
EMAAC	PSEG	1,119.2	1,140.1	20.9	1,119.2	964.2	(155.0)
EMAAC	RECO	32.4	42.0	9.6	32.4	31.2	(1.2)
<b>EMAAC Sub Total</b>		<b>2,461.3</b>	<b>3,466.6</b>	<b>1,005.3</b>	<b>2,461.3</b>	<b>2,866.8</b>	<b>405.5</b>
PEPCO	PEPCO	547.3	1,022.5	475.2	547.3	893.1	345.8
MAAC	BGE	1,102.5	1,450.9	348.4	1,102.5	1,341.3	238.8
MAAC	METED	318.1	469.9	151.8	318.1	398.4	80.3
MAAC	PENELEC	420.7	498.6	77.9	420.7	437.7	17.0
MAAC	PPL	1,021.2	1,505.3	484.1	1,021.2	1,299.5	278.3
<b>MAAC** Sub Total</b>		<b>5,871.1</b>	<b>8,413.8</b>	<b>2,542.7</b>	<b>5,871.1</b>	<b>7,236.8</b>	<b>1,365.7</b>
RTO	AEP	1,513.1	1,665.4	152.3	823.9	1,635.1	811.2
RTO	APS	721.9	912.0	190.1	523.2	886.8	363.6
RTO	ATSI	1,384.8	1,055.1	(329.7)	394.3	955.7	561.4
RTO	COMED	1,521.1	1,546.9	25.8	851.9	1,535.7	683.8
RTO	DAY	277.1	265.1	(12.0)	42.5	231.9	189.4
RTO	DEOK	-	60.4	60.4		54.6	54.6
RTO	DOM	1,435.0	1,381.3	(53.7)	632.7	1,359.5	726.8
RTO	DUQ	228.6	245.6	17.0	142.3	222.3	80.0
<b>Grand Total</b>		<b>12,952.7</b>	<b>15,545.6</b>	<b>2,592.9</b>	<b>9,281.9</b>	<b>14,118.4</b>	<b>4,836.5</b>

\*All MW Values are in UCAP Terms

\*\*MAAC Subtotal includes all MAAC Zones

Each demand resource (DR) offering into the 2014/2015 RPM BRA was identified by the DR provider as being one of three DR product types: (1) Annual DR, (2) Extended Summer DR or (3) Limited DR. A DR provider with a resource that can potentially qualify as more than one of the three DR product types may submit separate but coupled sell offers for each DR product type for



## 2014/2015 RPM Base Residual Auction Results

which it qualifies. By coupling separate DR offers, the seller informs PJM and the RPM auction clearing engine that only one of the coupled demand resources may clear at most. Submitting DR offers in a coupled manner is not a requirement; it is an optional offer type available to the seller in addition to the conventional, non-coupled offer type. DR offers that are not specified as being coupled offers are cleared independent of each other and each offer could potentially clear.

Table 2B shows a breakdown of Demand Resources Offered and Cleared in the 2014/2015 BRA grouped by the potential Demand Resource coupling scenarios.

**Table 2B – Breakdown of Demand Resources Offered versus Cleared by Product Type in the 2014/15 BRA represented in UCAP**

Coupling Scenario	Resource Offer MW (UCAP)			Cleared MW (UCAP)		
	Limited Product Type	Extended Summer Product Type	Annual Product Type	Limited Product Type	Extended Summer Product Type	Annual Product Type
Annual, Extended Summer, and Limited	8,622.1	8,766.6	8,701.0	6,712.5	1,139.0	20.2
Annual and Extended Summer	-	-	-	-	-	-
Annual and Limited	36.6	-	36.6	-	-	8.7
Extended Summer and Limited	455.3	454.4	-	413.5	41.8	-
Annual Only	-	-	515.4	-	-	482.6
Extended Summer Only	-	376.9	-	-	260.2	-
Limited Only	5,312.0	-	-	5,039.9	-	-
<b>Grand Total</b>	<b>14,426.0</b>	<b>9,597.9</b>	<b>9,253.0</b>	<b>12,165.9</b>	<b>1,441.0</b>	<b>511.5</b>

### Energy Efficiency Resource Participation

An energy efficiency (EE) resource is a project that involves the installation of more efficient devices/equipment or the implementation of more efficient processes/systems exceeding then-current building codes, appliance standards, or other relevant standards at the time of installation as known at the time of commitment. The EE resource must achieve a permanent, continuous reduction in electric energy consumption (during the defined EE performance hours) that is not reflected in the peak load forecast used for the Base Residual Auction for the Delivery Year for which the EE resource is proposed. The EE resource must be fully implemented at all times during the delivery year, without any requirement of notice, dispatch, or operator intervention. Of the 831.9



## **2014/2015 RPM Base Residual Auction Results**

MWs of energy efficiency that offered into the 2014/2015 Base Residual Auction, 822.1 MW of EE resources cleared in the auction and will be awarded capacity payments.

*Table 2C* contains a summary of the demand resources and energy efficiency resources that offered and cleared by zone in the 2014/2015 Base Residual Auction. Approximately 90.8% of the demand resources and 98.8% of the energy efficiency resources that were offered into the BRA cleared. The uncleared resources were offered at a price above the clearing price for the LDA in which the resource was offered.

*Figure 1* illustrates the demand side participation in the PJM Capacity Market from 2005/2006 Delivery Year to the 2014/2015 Delivery Year. Demand side participation includes active load management (ALM) prior to 2007/2008 Delivery Year, Interruptible Load for Reliability (ILR) and demand resources starting with 2007/2008 Delivery Year, and energy efficiency resources starting with the 2012/2013 Delivery Year. The demand side participation in the capacity market has increased dramatically since the inception of RPM in the 2007/2008 Delivery Year.



## 2014/2015 RPM Base Residual Auction Results

**Table 2C – Comparison of Demand Resources and Energy Efficiency Resources Offered versus Cleared in the 2014/15 BRA represented in UCAP**

Constrained LDA      Zone		Offered MW*			Cleared MW*		
		Demand	EE	Total	Demand	EE	Total
EMAAC	AECO	268.2	0.7	268.9	205.4	0.7	206.1
EMAAC	DPL	470.9	7.0	477.9	391.5	6.8	398.3
EMAAC	JCPL	553.0	2.2	555.2	444.0	2.0	446.0
EMAAC	PECO	992.4	8.4	1,000.8	830.5	6.6	837.1
EMAAC	PSEG	1,140.1	6.8	1,146.9	964.2	4.8	969.0
EMAAC	RECO	42.0	-	42.0	31.2	-	31.2
<b>EMAAC Sub Total</b>		<b>3,466.6</b>	<b>25.1</b>	<b>3,491.7</b>	<b>2,866.8</b>	<b>20.9</b>	<b>2,887.7</b>
PEPCO	PEPCO	1,022.5	43.3	1,065.8	893.1	42.9	936.0
MAAC	BGE	1,450.9	119.3	1,570.2	1,341.3	118.4	1,459.7
MAAC	METED	469.9	4.2	474.1	398.4	4.1	402.5
MAAC	PENELEC	498.6	3.9	502.5	437.7	3.6	441.3
MAAC	PPL	1,505.3	11.8	1,517.1	1,299.5	9.7	1,309.2
<b>MAAC Sub Total**</b>		<b>8,413.8</b>	<b>207.6</b>	<b>8,621.4</b>	<b>7,236.8</b>	<b>199.6</b>	<b>7,436.4</b>
RTO	AEP	1,665.4	9.8	1,675.2	1,635.1	9.2	1,644.3
RTO	APS	912.0	5.9	917.9	886.8	5.5	892.3
RTO	ATSI	1,055.1	3.0	1,058.1	955.7	2.7	958.4
RTO	COMED	1,546.9	546.2	2,093.1	1,535.7	546.2	2,081.9
RTO	DAY	265.1	3.7	268.8	231.9	3.7	235.6
RTO	DEOK	60.4	-	60.4	54.6	-	54.6
RTO	DOM	1,381.3	52.6	1,433.9	1,359.5	52.1	1,411.6
RTO	DUQ	245.6	3.1	248.7	222.3	3.1	225.4
<b>Grand Total</b>		<b>15,545.6</b>	<b>831.9</b>	<b>16,377.5</b>	<b>14,118.4</b>	<b>822.1</b>	<b>14,940.5</b>

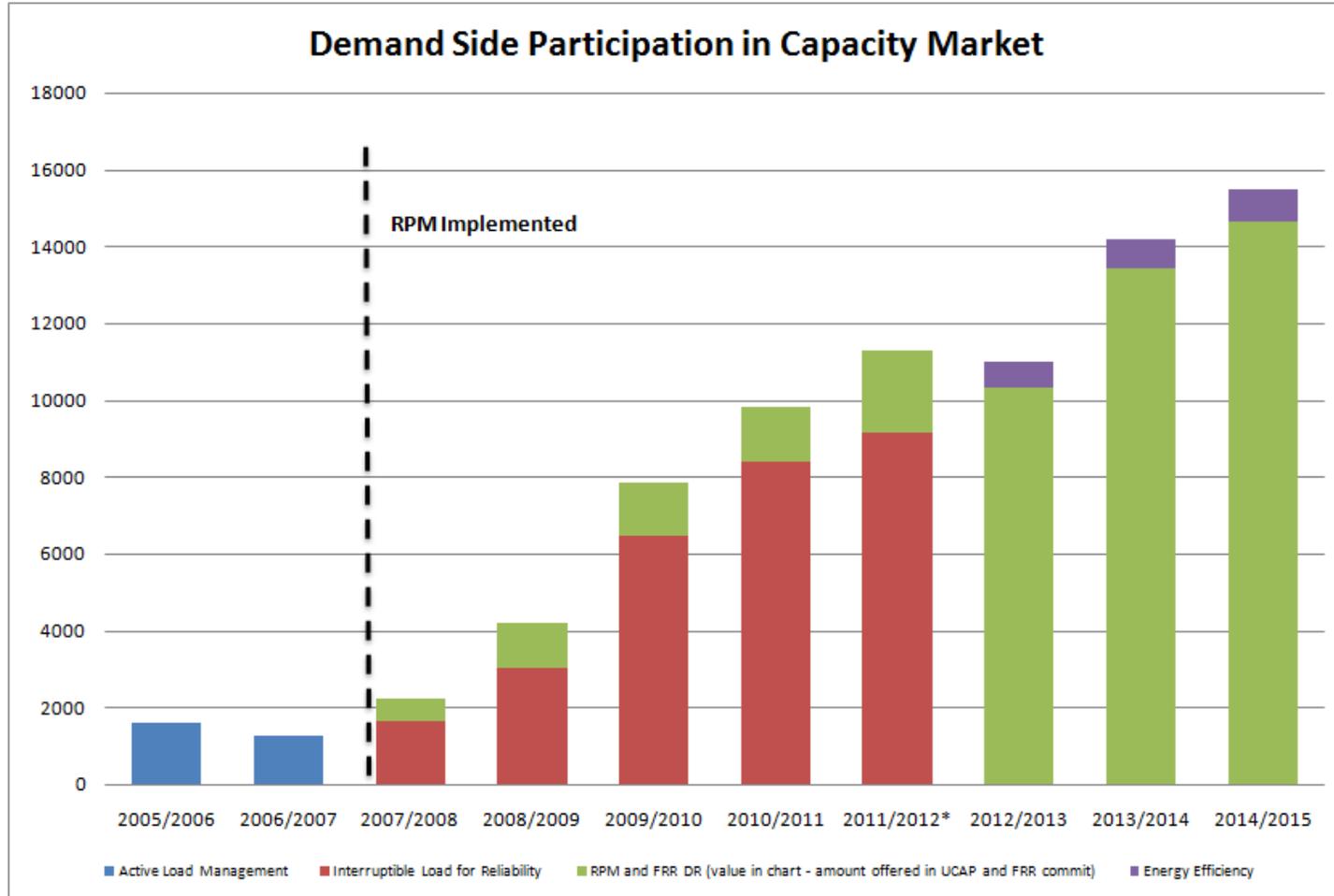
\*All MW Values are in UCAP Terms

\*\*MAAC Subtotal includes all MAAC Zones



## 2014/2015 RPM Base Residual Auction Results

Figure 1 – Demand Side Participation in the PJM Capacity Market





## **2014/2015 RPM Base Residual Auction Results**

\*Figure 1 represents in UCAP terms the DR offered into each Base Residual Auction and the DR nominated in an FRR plan, EE offered into the Base Residual Auction, actual ILR that was certified for 2007/2008 – 2010/2011 Delivery Years and estimated ILR for 2011/2012 Delivery Years (based on the 2011/2012 certification values that were approved by the opening of the 14/15 BRA. 2011/12 ILR total will not be final until 6/1/2011).

### **Renewable Resource Participation**

695.4 MW of wind resources were offered into the 2014/2015 Base Residual Auction. Of those, 695.4 MW of wind resources cleared in the auction. The capacity factor applied to wind resources is 13%, meaning that for every 100 MW of wind energy, 13 MW are eligible to meet capacity requirements. The 695.4 MW of cleared wind capacity translates to 5,349.2 MW of wind energy that is expected to be available in the 2014/2015 Delivery Year.

45.6 MW of solar resources were offered into the 2014/2015 Base Residual Auction. Of those, 45.6 MW of solar resources cleared in the auction. The capacity factor applied to solar resources is 38%, meaning that for every 100 MW of solar energy, 38 MW are eligible to meet capacity requirements. The 45.6 MW of cleared solar capacity translates to 120.0 MW of solar energy that is expected to be available in the 2014/2015 Delivery Year.

### **LDA Results**

Similar to the 2013/2014 Base Residual Auction, an LDA was modeled in the Base Residual Auction and had a separate VRR Curve if (1) the LDA has a CETO/CETL margin that is less than 115%; or (2) the LDA had a locational price adder in any of the three immediately preceding Base Residual Auctions; or (3) the LDA is likely to have a locational price adder based on a PJM analysis using historic offer price levels; or (4) the LDA is EMAAC, SWMAAC, and MAAC.

As a result of the above criteria, MAAC, EMAAC, SWMAAC, PSEG, PS-NORTH, DPL-SOUTH, and PEPCO were modeled as constrained Locational Deliverability Areas (LDAs) in the 2014/2015 RPM Base Residual Auction; however, only the PS-NORTH LDA was a binding constraint resulting in a Locational Price Adder for this LDA. A Locational Price Adder represents the difference in Resource Clearing Prices between a resource in a constrained LDA and the immediate higher level LDA.

*Table 3* contains a summary of the clearing results in the LDAs from the 2014/2015 RPM Base Residual Auction.



## 2014/2015 RPM Base Residual Auction Results

**Table 3 –RPM Base Residual Auction Clearing Results in the LDAs**

Auction Results	RTO	MAAC	SWMAAC	PEPCO	EMAAC	DPL-SOUTH	PSEG	PS-NORTH
Offered MW (UCAP)	160,486.3	70,885.4	12,457.8	5,875.2	34,519.6	1,600.4	8,183.8	4,169.5
Cleared MW (UCAP)	149,974.7	67,176.0	11,124.1	5,614.6	32,554.0	1,439.2	7,583.0	3,817.5
System Marginal Price	\$125.47	\$125.47	\$125.47	\$125.47	\$125.47	\$125.47	\$125.47	\$125.47
Locational Price Adder*	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$88.50
Extended Summer Price Adder**	\$0.52	\$11.03	\$11.03	\$11.03	\$11.03	\$11.03	\$11.03	\$11.03
Annual Price Adder	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Resource Clearing Price for Limited Resources	\$125.47	\$125.47	\$125.47	\$125.47	\$125.47	\$125.47	\$125.47	\$213.97
Resource Clearing Price for Extended Summer Resources	\$125.99	\$136.50	\$136.50	\$136.50	\$136.50	\$136.50	\$136.50	\$225.00
Resource Clearing Price for Annual Resources	\$125.99	\$136.50	\$136.50	\$136.50	\$136.50	\$136.50	\$136.50	\$225.00

\*Locational Price Adder is with respect to the immediate parent LDA

\*\*Annual Resources and Extended Summer DR receive the Extended Summer Price Adder

Since the PS-NORTH was a constrained LDA that is importing capacity, Capacity Transfer Rights (CTRs) will be allocated to loads in the constrained LDA for the 2014/2015 Delivery Year. CTRs are allocated by load ratio share to all Load Serving Entities (LSEs) in a constrained LDA that has a higher clearing price than the unconstrained region. CTRs serve as a credit back to the LSEs in the constrained LDA for use of the transmission system to import less expensive capacity into that constrained LDA and are valued at the difference in the clearing prices of the constrained and unconstrained regions.

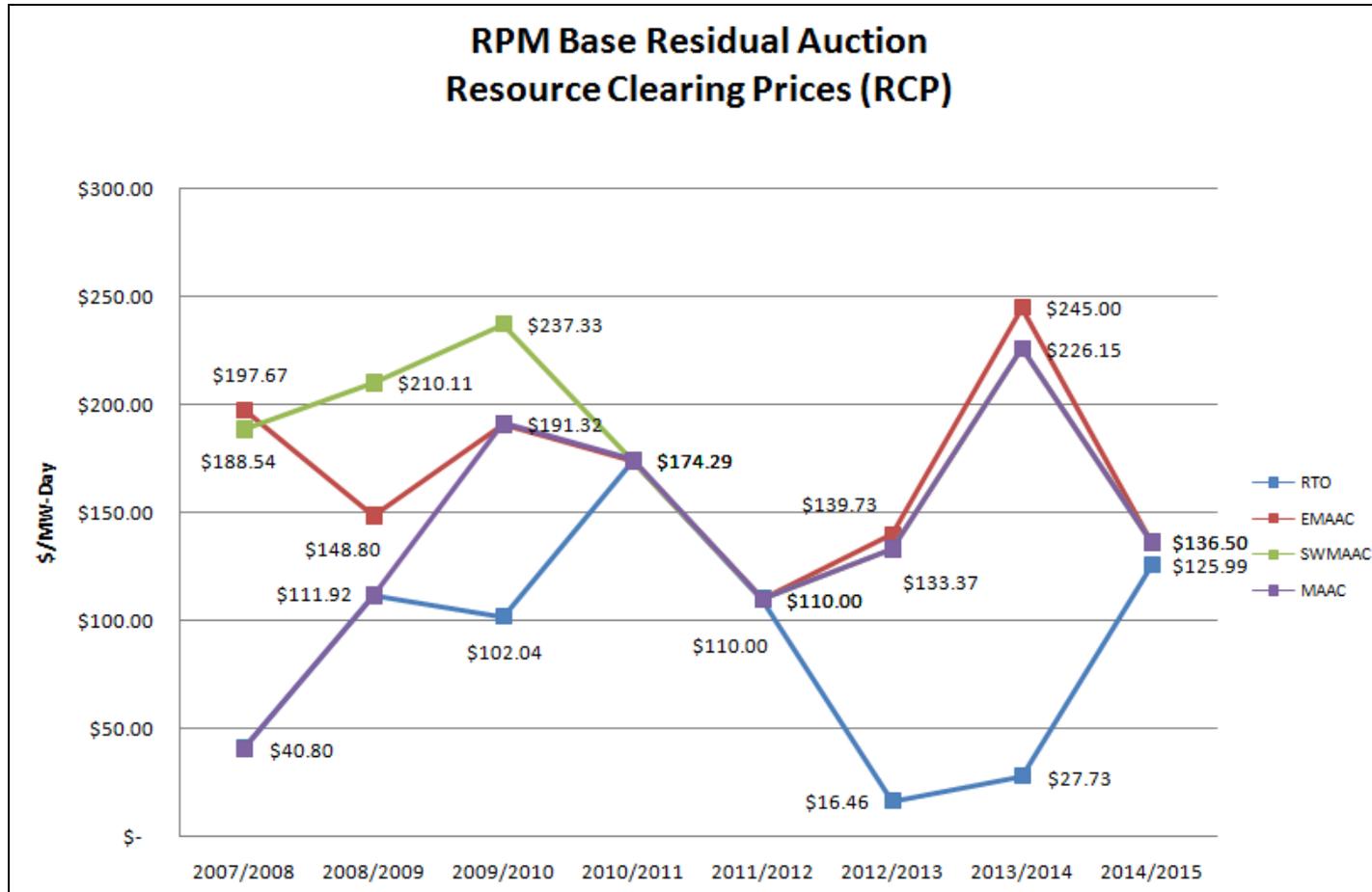
**Mitigation** – All existing generation sell offers into the 2014/2015 Base Residual Auction were subject to market power mitigation through the application of the Market Structure Test (i.e., the Three-Pivotal Supplier Test). The RTO as a whole and the PS-NORTH LDA failed the Market Structure Test, resulting in mitigation of any existing generation resources. Mitigation of a supplier’s existing generation resources results in utilizing the lesser of the supplier’s approved offer cap for such resource or the supplier’s submitted offer price for such resource in the RPM Auction clearing. Suppliers in the MAAC LDA which had an offer price or offer cap price between the RTO Annual MCP and 150% times the MAAC Annual MCP were determined to have passed the Market Structure Test, and therefore the offers of the relevant existing generation resources were not mitigated.



## 2014/2015 RPM Base Residual Auction Results

Figure 2 illustrates the trends in Resource Clearing Prices for the RTO, MAAC, EMAAC, and SWMAAC LDAs for each RPM Base Residual Auction cleared to date.

**Figure 2 – Base Residual Auction Resource Clearing Prices**



\* RTO and MAAC Resource Clearing Prices for the 2007/2008, 2008/2009, 2010/2011, and 2011/2012 BRA are equal.



## **2014/2015 RPM Base Residual Auction Results**

\*\*EMMAC and MAAC Resource Clearing Prices for the 2009/2010, and 2010/2011, and 2011/2012, 2014/2015 BRA are equal.

\*\*SWMAAC and MAAC Resource Clearing Prices for the 2010/2011, 2011/2012, and 2012/2013, 2014/2015 BRA are equal.

\*\*\*2014/2015 Prices reflect the Annual Resource Clearing Prices

*Table 4* contains a summary of the offer and resultant data in the RTO for each cleared Base Residual Auction from 2008/09 through the 2014/2015 Delivery Years. The summary includes all resources located in the RTO (including all LDAs within the RTO) and notes the capacity located outside the PJM footprint that was offered into the auction.

### **Table 4 –RPM Base Residual Auction Generation, Demand, and Energy Efficiency Resource Information in the RTO**



## 2014/2015 RPM Base Residual Auction Results

Auction Supply (all values in ICAP)	RTO <sup>1</sup>						
	2008/2009	2009/2010	2010/2011	2011/2012 <sup>2</sup>	2012/2013	2013/2014 <sup>3</sup>	2014/2015 <sup>4</sup>
Internal PJM Capacity	166,037.9	167,026.3	168,457.3	169,241.6	179,791.2	195,633.4	199,375.5
Imports Offered	2,612.0	2,563.2	2,982.4	6,814.2	4,152.4	4,766.1	7,620.2
<b>Total Eligible RPM Capacity</b>	<b>168,649.9</b>	<b>169,589.5</b>	<b>171,439.7</b>	<b>176,055.8</b>	<b>183,943.6</b>	<b>200,399.5</b>	<b>206,995.7</b>
Exports / Delistings	4,205.8	2,240.9	3,378.2	3,389.2	2,783.9	2,624.5	1,230.1
FRR Commitments	24,953.5	25,316.2	26,305.7	25,921.2	26,302.1	25,793.1	33,612.7
Excused	722.0	1,121.9	1,290.7	1,580.0	1,732.2	1,825.7	3,255.2
<b>Total Eligible RPM Capacity - Excused</b>	<b>29,881.3</b>	<b>28,679.0</b>	<b>30,974.6</b>	<b>30,890.4</b>	<b>30,818.2</b>	<b>30,243.3</b>	<b>38,098.0</b>
<b>Remaining Eligible RPM Capacity</b>	<b>138,768.6</b>	<b>140,910.5</b>	<b>140,465.1</b>	<b>145,165.4</b>	<b>153,125.4</b>	<b>170,156.2</b>	<b>168,897.7</b>
Generation Offered	138,076.7	140,003.6	139,529.5	143,568.1	142,957.7	156,894.1	153,048.1
DR Offered	691.9	906.9	935.6	1,597.3	9,535.4	12,528.7	15,043.1
EE Offered	0.0	0.0	0.0	0.0	632.3	733.4	806.5
<b>Total Eligible RPM Capacity Offered</b>	<b>138,768.6</b>	<b>140,910.5</b>	<b>140,465.1</b>	<b>145,165.4</b>	<b>153,125.4</b>	<b>170,156.2</b>	<b>168,897.7</b>
<b>Total Eligible RPM Capacity Unoffered</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>

<sup>1</sup>RTO numbers include all LDAs.

<sup>2</sup>All generation in the Duquesne zone is considered external to PJM for the 2011/2012 BRA.

<sup>3</sup>2013/2014 includes ATSI zone and generation

<sup>4</sup>2014/2015 includes Duke zone and generation

A total of 206,995.7 MW of installed capacity was eligible to be offered into the 2014/2015 Base Residual Auction. Of this eligible amount, 7620.2 MW were from external resources that had fulfilled the eligibility requirements to be considered a PJM Capacity Resource. A portion of the external resource total was included in FRR Capacity Plans, and the remainder was offered into the auction. As illustrated in *Table 4*, the amount of capacity exports decreased in the 2014/2015 auction compared to the previous auction. FRR commitments increased by 7,819.6 MW from the 2013/2014 Delivery Year due to the FRR Alternative election by load located in the DEOK Zone.



## **2014/2015 RPM Base Residual Auction Results**

A total of 168,897.7 MW of installed capacity was offered into the Base Residual Auction. This is a decrease of 1,258.5 MW from that which was offered into the 2013/2014 BRA. A total of 38,098 MW was eligible, but not offered due to either (1) inclusion in an FRR Capacity Plan, (2) export of the resource, or (3) having been excused from offering into the auction. Resources were excused from the must offer requirement for the following reasons: environmental restrictions, approved retirement requests not yet reflected in eRPM, and excess capacity owned by an FRR entity.

Participants' sell offer EFORd values were used to translate the generation installed capacity values into unforced capacity (UCAP) values. Demand resource (DR) sell offers and energy efficiency resource (EE) sell offers were converted into UCAP using the appropriate Demand Resource (DR) Factor and Forecast Pool Requirement (FPR) for the delivery year. In UCAP, a total of 160,486.3 MW were offered into the 2014/2015 Base Residual Auction, comprised of 144,108.8 MW of generation capacity, 15,545.6 MW of capacity from demand resources, and 831.9 MW of capacity from energy efficiency resources. Of those offered, a total of 149,974.7 MW of capacity was cleared in the auction.

Of the 149,974.7 MW of capacity that cleared in the auction, 135,034.2 MW were from generation capacity, 14,118.4 MW were from demand resources, and 822.1 MW were from energy efficiency resources. Capacity that was offered but not cleared in the Base Residual Auction will be eligible to offer into the First, Second and Third Incremental Auctions for the 2014/2015 Delivery Year.

*Table 5* illustrates the Generation, Demand Resources, and Energy Efficiency Resources Offered and Cleared in the RTO translated into Unforced Capacity MW amounts.



## 2014/2015 RPM Base Residual Auction Results

**Table 5 – Generation, Demand Resources, and Energy Efficiency Resources Offered and Cleared Represented in Unforced Capacity MW**

Auction Results (all values in UCAP**)	RTO*						
	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
Generation Offered	131,164.8	132,614.2	132,124.8	136,067.9	134,873.0	147,188.6	144,108.8
DR Offered	715.8	936.8	967.9	1,652.4	9,847.6	12,952.7	15,545.6
EE Offered	-	-	-	-	652.7	756.8	831.9
<b>Total Offered</b>	<b>131,880.6</b>	<b>133,551.0</b>	<b>133,092.7</b>	<b>137,720.3</b>	<b>145,373.3</b>	<b>160,898.1</b>	<b>160,486.3</b>
Generation Cleared	129,061.4	131,338.9	131,251.5	130,856.6	128,527.4	142,782.0	135,034.2
DR Cleared	536.2	892.9	939.0	1,364.9	7,047.2	9,281.9	14,118.4
EE Cleared	0.0	0.0	0.0	0.0	568.9	679.4	822.1
<b>Total Cleared</b>	<b>129,597.6</b>	<b>132,231.8</b>	<b>132,190.5</b>	<b>132,221.5</b>	<b>136,143.5</b>	<b>152,743.3</b>	<b>149,974.7</b>
Uncleared	2,283.0	1,319.2	902.2	5,498.8	9,229.8	8,154.8	10,511.6

\* RTO numbers include all LDAs

\*\* UCAP calculated using sell offer EFORd for Generation Resources. DR and EE UCAP values include appropriate FPR and DR Factor.

Table 6 contains a summary of capacity additions and reductions from the 2007/2008 Base Residual Auction to the 2014/2015 Base Residual Auction. A total of 4,170.3 MW of incrementally new capacity in PJM was available for the 2014/2015 Base Residual Auction. This incrementally new capacity includes new generation capacity resources, capacity upgrades to existing generation capacity resources, new demand resources, upgrades to existing demand resources, and new energy efficiency resources. The increase is partially offset by generation capacity derations to existing generation capacity resources to yield a net increase of 2,620.2 MW of installed capacity.

Table 6 also illustrates the total amount of resource additions and reductions over eight Delivery Years since the implementation of the RPM construct. Over the period covering the first seven RPM Base Residual Auctions, 13,164.8 MW of new generation capacity was added which was partially offset by 8,894.8 MW of capacity de-ratings or retirements over the same period. Additionally, 15,480.9 MW of new demand resources and 733.4 MW of new energy efficiency resources were offered in the 2014/2015 auction. The total net increase in installed capacity in PJM over the period of the last seven RPM auctions was 20,557.4 MW.



## 2014/2015 RPM Base Residual Auction Results

**Table 6 – Incremental Capacity Resource Additions and Reductions to Date**

Capacity Changes (in ICAP)	RTO*								Total
	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014***	2014/2015*	
Increase in Generation Capacity	602.0	724.2	1,272.3	1,776.2	3,576.3	1,893.5	1,737.5	1,582.8	13,164.8
Decrease in Generation Capacity	-674.6	-375.4	-550.2	-301.8	-264.7	-3,253.9	-1,924.1	-1,550.1	-8,894.8
Net Increase in Demand Resource Capacity**	555.0	574.7	215.0	28.7	661.7	7,938.1	2,993.3	2,514.4	15,480.9
Net Increase in Energy Efficiency Capacity**	0	0	0	0	0	632.3	101.1	73.1	806.5
<b>Net Increase in Installed Capacity</b>	<b>482.4</b>	<b>923.5</b>	<b>937.1</b>	<b>1503.1</b>	<b>3973.3</b>	<b>7,210.00</b>	<b>2,907.80</b>	<b>2,620.20</b>	<b>20,557.4</b>

\* RTO numbers include all LDAs

\*\* Values are with respect to the quantity offered in the previous year's Base Residual Auction.

\*\*\*Does not include Existing Generation located in ATSI Zone

+Does not include Existing Generation located in Duke Zone

Table 6A provides a further breakdown of the generation increases and decreases for the 2014/2015 Delivery Year on an LDA basis.



## 2014/2015 RPM Base Residual Auction Results

**Table 6A – Generation Increases and Decreases by LDA Effective 2014/2015 Delivery Year**

LDA Name	Uprates	Derates
EMAAC	834.4	-203.9
MAAC	1215.7	-451.8
<b>Total RTO</b>	<b>1582.8</b>	<b>-1550.1</b>

\*\*All Values in ICAP terms

\*MAAC includes EMAAC

\*\*RTO includes MAAC

\*\*Does not include Existing Generation located in Duke Zone

Table 6B provides a further breakdown of the new capacity offered and cleared in the 2014/2015 Base Residual Auction in UCAP terms.

**Table 6B – New Generation Capacity in the 2014/2015 BRA**

LDA	Offered			Cleared		
	Uprate	New Unit	Total	Uprate	New Unit	Total
EMAAC	82.7	695	777.7	82.7	74.2	156.9
MAAC	255.7	873.6	1129.3	186.3	252.8	439.1
<b>Total RTO</b>	<b>410.5</b>	<b>1036.3</b>	<b>1446.8</b>	<b>341.1</b>	<b>415.5</b>	<b>756.6</b>

\*All MW Values are in UCAP Terms

\*MAAC includes EMAAC

\*\*RTO includes MAAC

\*\*Does not include Existing Generation located in Duke Zone

Table 7 provides a further breakdown of the new capacity offered into the each BRA into the categories of new resources, reactivated units, and uprates to existing capacity, and then further down into resource type. As shown in this table, there was an increase in the amount of generating capacity from new resources offered into the 2014/2015 BRA in comparison with the 2013/14 BRA. The capacity offered in the 2014/2015 BRA resulted from both new generating resources and uprates to existing resources including gas,



## **2014/2015 RPM Base Residual Auction Results**

diesel, coal, wind, and nuclear resources. While the largest growth remains in gas turbines and combined cycle plants, a fair amount of incremental capacity in Steam (coal) and Nuclear was offered into the recent auctions.

*Figure 3* provides an illustration of the cumulative increase in new generation capacity by fuel type since the inception of RPM (June 1, 2007).



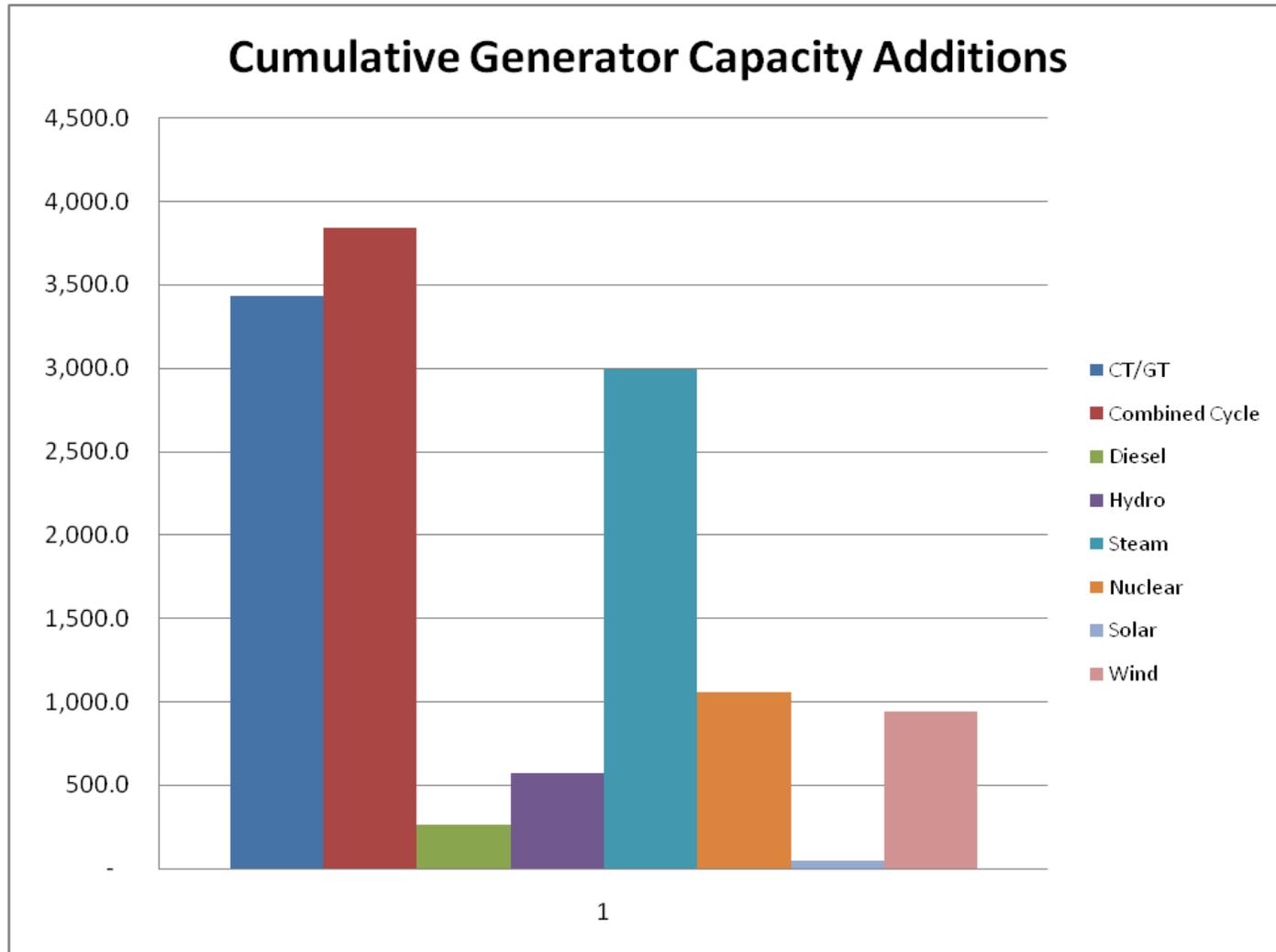
## 2014/2015 RPM Base Residual Auction Results

**Table 7 – Further Breakdown of Incremental Capacity Resource Additions from 2007/2008 to 2014/15**

	Delivery Year	CT/GT	Combined Cycle	Diesel	Hydro	Steam	Nuclear	Solar	Wind	Total
New Capacity Units (ICAP MW)	2007/2008			18.7	0.3					19.0
	2008/2009			27.0					66.1	93.1
	2009/2010	399.5		23.8		53.0				476.3
	2010/2011	283.3	580.0	23.0					141.4	1,027.7
	2011/2012	416.4	1,135.0			704.8		1.1	75.2	2,332.5
	2012/2013	403.8		7.8		621.3			75.1	1,108.0
	2013/2014	329.0	705.0	6.0		25.0		9.5	245.7	1,320.2
	2014/2015	108.0	650.0	35.1	132.9			28.0	146.6	1,100.6
Capacity from Reactivated Units (ICAP MW)	2007/2008					47.0				47.0
	2008/2009					131.0				131.0
	2009/2010									-
	2010/2011	160.0		10.7						170.7
	2011/2012	80.0				101.0				181.0
	2012/2013									-
	2013/2014									-
	2014/2015			9.0						9.0
Uprates to Existing Capacity Resources (ICAP MW)	2007/2008	114.5		13.9	80.0	235.6	92.0			536.0
	2008/2009	108.2	34.0	18.0	105.5	196.0	38.4			500.1
	2009/2010	152.2	206.0		162.5	61.4	197.4		16.5	796.0
	2010/2011	117.3	163.0		48.0	89.2	160.3			577.8
	2011/2012	369.2	148.6	57.4		186.8	292.1		8.7	1,062.8
	2012/2013	231.2	164.3	14.2		193.0	126.0		56.8	785.5
	2013/2014	56.4	59.0	0.3		215.0	47.0		39.6	417.3
	2014/2015	104.9		0.5	41.5	138.6	107.0	7.1	73.6	473.2
	<b>Total</b>	<b>3,433.9</b>	<b>3,844.9</b>	<b>265.4</b>	<b>570.7</b>	<b>2,998.7</b>	<b>1,060.2</b>	<b>45.7</b>	<b>945.3</b>	<b>13,164.8</b>

**2014/2015 RPM Base Residual Auction Results**

**Figure 3: Cumulative Generation Capacity Increases by Fuel Type**





## 2014/2015 RPM Base Residual Auction Results

Table 8 shows the changes that have occurred regarding resource deactivation and retirement since the RPM was approved by FERC. The MW values illustrated in Table 8 represent the quantity of unforced capacity cleared in 2014/2015 Base Residual Auction that came from resources that have either withdrawn their request to deactivate, postponed retirement, or been reactivated (i.e., came out of retirement or mothball state for the RPM auctions) since the RPM Settlement. This total accounts for 3,249.7 MW of cleared UCAP in the 2014/2015 BRA which equates to 4,225.3 MW of ICAP Offered.

**Table 8 – Changes to Generation Retirement Decisions Since RPM Approval**

Generation Resource Decision Changes	RTO*	
	ICAP Offered	UCAP Cleared
Withdrawn Deactivation Requests	2030.1	1505.7
Postponed or Cancelled Retirement	1917.2	1496.0
Reactivation	278.0	248.0
<b>Total</b>	<b>4225.3</b>	<b>3249.7</b>

Values Represent Offered ICAP and Cleared UCAP in the 2014/2015 BRA

\* RTO numbers include all LDAs

Note: Not all survey data has been returned by participants. Values represent latest totals.

### RPM Impact To Date

As illustrated in Table 4, for the 2014/2015 auction, the capacity exports were 1,230.1 MW and the capacity imports were 7,620.2 MW. The difference between the capacity imports and exports results is a net capacity import of 6,390.1 MW.

In the planning year preceding the RPM auction implementation, 2006/2007, there was a net capacity export of 2,616.0 MW. In this auction, PJM is now a net importer of 6,390.1 MW. Therefore RPM's impact on PJM capacity interchange is 9,006.1 MW.

The minimum net impact of the RPM implementation on the availability of Installed Capacity resources for the 2014/2015 planning year can be estimated by adding the net change in capacity imports and exports over the period, the forward demand and energy efficiency resources, the increase in Installed Capacity over the RPM implementation period from Table 7 and the net change generation retirements from Table 8. Therefore, as illustrated in Table 9, the minimum estimated net impact of the RPM



## 2014/2015 RPM Base Residual Auction Results

implementation on the availability of capacity in the 2014/2015 compared to what would have happened absent this implementation is 42,173.3 MW.

Table 9 shows the details on RPM's impact to date in ICAP terms.

**Table 9 – RPM's Impact to Date**

Change in Capacity Availability	Installed Capacity MW
New Generation	7,477.4
Generation Upgrades (not including reactivations)	5,148.7
Generation Reactivation	538.7
Forward Demand and Energy Efficiency Resources	16,287.4
Cleared ICAP from Withdrawn or Canceled Retirements	3,715.0
Net increase in Capacity Imports	9,006.1
<b>Total Impact on Capacity Availability in 2013/2014 Delivery Year</b>	<b>42,173.3</b>



## **2014/2015 RPM Base Residual Auction Results**

### **Discussion of Factors Impacting the RPM Clearing Prices**

The main factors impacting 2014/2015 RPM BRA clearing prices relative to 2013/2014 BRA clearing prices are:

- Lower reliability requirements due to lower forecasted load
- Increased capacity transfer limits due to addition of transmission upgrades
- Higher level of participation from demand resources

### **RTO Clearing Price**

The MCP for Annual Resources and Extended Summer DR is \$125.99/MW-Day in the RTO. Since the Minimum Extended Summer Resource Requirement was a binding constraint for the RTO and since both Annual Resources and Extended Summer DR may be used to satisfy this constraint, Annual Resources and Extended Summer DR received a higher Resource Clearing Price than did Limited DR. The Extended Summer Price Adder is \$0.52/MW-day for the RTO. The MCP for Limited DR is \$125.47/MW-Day in the RTO. This represents an increase of \$98.26/MW-day for Annual Resources and Extended Summer DR and an increase of \$97.74/MW-day for Limited DR from the 2013/2014 Base Residual Auction where the RTO clearing price was \$27.73/MW-day. The 149,974.7 MW of UCAP cleared in the auction represents a decrease in cleared UCAP of 2,768.6 MW over the 2013/2014 Base Residual Auction results and a reserve margin of over 19.6%.

### **MAAC Clearing Price**

The MCP for Annual Resources and Extended Summer DR is \$136.50/MW-Day in the MAAC LDA. Since the Minimum Extended Summer Resource Requirement was a binding constraint for the MAAC LDA and since both Annual Resources and Extended Summer DR may be used to satisfy this constraint, Annual Resources and Extended Summer DR received a higher Resource Clearing Price than did Limited DR. The Extended Summer Price Adder is \$11.03/MW-day for the MAAC LDA. The MCP for Limited DR is \$125.47/MW-Day in the MAAC LDA. This represents a decrease of \$89.65/MW-day for Annual Resources and Extended Summer DR and a decrease of \$100.68/MW-day for Limited DR from the 2013/2014 Base Residual Auction where the MAAC LDA clearing price was \$226.15/MW-day. The MAAC LDA was a constrained LDA in the 2013/2014 Base Residual Auction but was not constrained in the 2014/2015 BRA. This price decrease was caused primarily by the reduced reliability requirement due to lower forecasted load and to the increase in capacity transfer margin into MAAC.



## **2014/2015 RPM Base Residual Auction Results**

### **PS North Clearing Price**

The PS-NORTH LDA was a locationally constrained LDA in the BRA therefore all resources located in the PS-NORTH LDA received a higher Resource Clearing Price associated with the PS-NORTH Locational Price Adder of \$88.50. The MCP for Annual Resources and Extended Summer DR is \$225.00/MW-Day in the PS-NORTH LDA. Since the Minimum Extended Summer Resource Requirement was a binding constraint for the MAAC LDA and since both Annual Resources and Extended Summer DR may be used to satisfy this constraint, Annual Resources and Extended Summer DR received a higher Resource Clearing Price than did Limited DR. The Extended Summer Price Adder is \$11.03/MW-day for the MAAC LDA. The MCP for Limited DR is \$213.97/MW-Day in the PS-NORTH. This represents a decrease of \$20.00/MW-day for Annual Resources and Extended Summer DR and a decrease of \$31.03/MW-day for Limited DR from the 2013/2014 Base Residual Auction where the PS-NORTH LDA clearing price was \$245/MW-day. The PS-NORTH LDA was a constrained LDA in the 2014/2015 Base Residual Auction but was not constrained in the 2013/2014 BRA.

### **Significant Changes to RPM Design since the 2013/2014 Base Residual Auction**

FERC Order ER11-2288, dated January 31, 2011, accepted, subject to compliance and informational filings, PJM's December 2, 2010 filing that established two additional demand resource products - one available throughout the year (Annual DR) and another available for an extended summer period (Extended Summer DR). These new products have fewer limitations than the current Limited Demand Resource product (Limited DR). New auction rules recognize the greater reliability value associated with less limited resources by establishing and enforcing a minimum requirement on the commitment of less limited products. The Minimum Annual Resource Requirement is the minimum amount of capacity sought to be procured in each auction from Annual Resources (Annual Resources include generation capacity resources, energy efficiency resources and annual demand resources). The Minimum Extended Summer Resource Requirement is the minimum amount of capacity sought to be procured in each auction from Extended Summer Demand Resources and Annual Resources.

FERC Order ER11-2875, dated April 12, 2011, accepted, subject to compliance filing, PJM's February 11, 2011 Minimum Offer Price Rule (MOPR) filing that among other changes, updated the Net Asset Class CONE values for a CC and CT plant, increased the percentage screen factor to 90%, eliminated the "net short" precondition to the MOPR, eliminated the impact test, and clarified which resources will be subject to the MOPR.



## **2014/2015 RPM Base Residual Auction Results**

### **Changes that impacted the Demand Curve:**

- The majority of load in the DEOK Zone is being served under the FRR Alternative but a small portion (4.3%) of DEOK Zonal load was included in the RTO demand curve for 2014/2015.
- The Net Cost of New Entry (CONE) values that serve as the basis for price on the RTO and LDA demand curves increased by 7.6% (for the RTO) and by 5.3% to 6.5% (depending on the LDA) over the 2013/2014 values.<sup>2</sup> These changes are due to a 4.9% increase in the gross CONE coupled with updated Energy & Ancillary Services (E&AS) offset values. The Gross CONE value used in the BRA for the prior delivery year (2013/2014 DY) was adjusted using the most recently published twelve-month change in Total Other Plant Production Plant Index shown in the Handy Whitman (HWI) of Public Utility Construction Costs.

### **Changes that impacted the Supply Curve:**

- Supply resources in the DEOK Zone that were not committed to FRR load in the DEOK Zone were included in the RTO supply curve for 2014/2015.
- The Avoidable Cost Rate (ACR) default values used a Handy-Whitman indexing method such that the 2013/2014 Delivery Year default ACR data was increased based on the ten-year annual average rate of change in the applicable Handy-Whitman Index of Public Utility Costs. The default ACR values are the default offer caps that suppliers may elect to use in the event the Market Structure Test is failed and the supplier chooses not to calculate a unit-specific ACR data. The offer caps are calculated as the ACR less net revenues. Participants may choose either the technology specific default rate or to calculate their own based on unit-specific data.
- On March 16, 2011, the U.S. Environmental Protection Agency (EPA) issued a notice of proposed rulemaking in a proceeding to promulgate final maximum achievable control technology (MACT) emissions standards for hazardous air pollutants (HAP) from coal- and oil-fired electric utility steam generating units, pursuant to section 12(d) of the Clean Air Act. A final rule is

---

<sup>2</sup> Refer to 2014/2015 RPM BRA Planning Period Parameters Report



## **2014/2015 RPM Base Residual Auction Results**

due by November 16, 2011. Compliance from existing resources would be required approximately three years later, likely in early 2015, which implicates the 2014/2015 Delivery Year. Although the specific schedule and substance of the rules have not been settled through issuance of the March 16th NOPR, the specific proposed regulations provide a rational basis for decisions about the level of investment necessary to provide capacity three years forward. The cost of such investment, if adequately supported and documented, could be included in the cost calculations applicable to the 2014/2015 BRA for resources impacted by the rule.