



# Energy Efficiency in PJM Capacity Market

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- Installation of more efficient devices or equipment or implementation of more efficient processes/systems exceeding building codes, appliance standards, or other relevant standards at the time of installation as known at the time of the commitment to the capacity market.
- Designed to achieve a continuous reduction in electric demand at the End-Use Customer's retail site that is not reflected in the peak load forecast prepared for the Delivery Year.
  - Value of EE installation is measured during defined EE Performance Hours
- Fully implemented at all times during the Delivery Year, without any requirement of notice, dispatch, operator intervention.
  - If dispatchable, it would be considered a Demand Resource.


- ✓ EE installation must be scheduled for completion prior to DY
- ✓ EE installation is not reflected in peak load forecast posted for the BRA for the DY initially offered
- ✓ EE installation exceeds relevant standards at time of installation as known at time of commitment
- ✓ EE installation achieves load reduction during defined EE Performance Hours
- ✓ EE installation is not dispatchable

## May Qualify

- Lighting
- Air Conditioner/Heat Pump – replacements or tune-ups
- Chiller replacements
- Appliance replacements (refrigerators)
- Motor replacements
- Variable Frequency Drives
- Building Weatherization
- Manufacturing process improvements


## Won't Qualify

- Removing devices (e.g., delamping)
- Behavioral changes
- Reducing load by switching off devices
- Behind the meter generation (back up generator, cogeneration, Combined Heat & Power (CHP), renewable generation)
- Programmable Thermostats
- Fuel switching
- Replacing conventional compressor-driven chillers with absorption chillers (powered either by a dedicated heat source or waste heat from an industrial process).
- Appliance recycling programs (unless tied to replacement)

Permanent 

Not User Controlled 

Exceeds standards 

Demand Reduction during EE Performance Hours 

*Some of these may qualify as Demand Resources in the PJM Capacity Market*

- EE Resource shall be EE project(s) or portion of EE project(s) in a zone that represents the installations of EE during a defined period of time from June 1 to May 31.
- EE Resources are eligible to be offered into RPM Auctions as Annual product
- EE Resource may be eligible to receive Capacity Market (RPM) revenue for up to four consecutive Delivery Years.

Installation Period	Fully Installed for Summer	Eligible DYs
June 2010-May 2011	2011	2011/2012, 2012/2013, 2013/2014, 2014/2015
June 2011-May 2012	2012	2012/2013, 2013/2014, 2014/2015, 2015/2016
June 2012-May 2013	2013	2013/2014, 2014/2015, 2015/2016, 2016/2017
June 2013-May 2014	2014	2014/2015, 2015/2016, 2016/2017, 2017/2018
June 2014-May 2015	2015	2015/2016, 2016/2017, 2017/2018, 2018/2019
June 2015-May 2016	2016	2016/2017, 2017/2018, 2018/2019, 2019/2020
June 2016-May 2017	2017	2017/2018, 2018/2019, 2019/2020, 2020/2021
June prior to DY – May prior to DY	DY	DY, DY+1, DY+2, DY+3

Nominated EE Value represents the ICAP Value of an EE Resource.

- **Nominated EE Value is expected average demand reduction (MW) during the defined EE Performance Hours in the Delivery Year.**
  - EE Performance Hours are between hour ending 15:00 EPT and hour ending 18:00 EPT during all days from June 1 through August 31, inclusive, of such Delivery year, that is not a weekend or federal holiday.
- EE value of weather sensitive equipment is based on standard zonal WTHI
- Measurement & Verification (M&V) Plan describes the method and procedures for determining the Nominated EE Value of an EE Resource and confirming the Nominated EE Value is achieved.
- The minimum Nominated EE Value accepted is 0.1 MW.

- ✓ Submit M&V Plan prior to RPM Auction
  - Single M&V Plan may be submitted to cover multiple EE Resources
  - Single M&V Plan must clearly document the Nominated EE Value of each EE Resource covered in the Plan
- ✓ Establish credit with PJM Credit Department prior to RPM Auction
- ✓ Submit Post-Installation M&V Reports
- ✓ Permit Post- Installation M&V Audit by PJM or Independent Third Party

- Initial Measurement and Verification (M&V) Plan
  - Project Description
  - M&V techniques that will be used to determine and verify the Nominated EE Value (i.e., demand reduction) of the EE Resource
  - Schedule for project installation and M&V activities
  - Location of EE Resource (transmission zone)
  - Anticipated Nominated EE Value
- Updated M&V Plan
  - Changes since prior M&V Plan submittal (e.g., changes to project status or relevant performance standards)
  - Updated Nominated EE Value

Initial M&V Plan required prior to offering in RPM Auction for first DY. Updated M&V Plan required prior to offering in RPM Auction for subsequent DYs.

M&V Plan requirements covered in PJM Manual 18B.



- Initial Post-Installation (PI) M&V Report
  - Changes since prior Updated M&V Plan submittal (e.g., changes between plan and as-built conditions)
  - Documentation of post-installation activities verifying that equipment/systems were installed and operating
  - Documentation of performance measurements conducted to validate the Nominated EE Value (if applicable in accordance with approved M&V Plan)
  - Updated Nominated EE Value
- Updated PI M&V Report
  - Changes since prior PI M&V Report submittal
  - Documentation of post-installation activities verifying that equipment/systems are still operating
  - Documentation of performance measurements conducted to validate the Nominated EE Value (if applicable in accordance with approved M&V Plan)
  - Updated Nominated EE Value

Initial PI M&V Reports are required prior to first DY that the EE Resource is committed. Updated PI M&V Reports are required prior to subsequent DYs that the EE Resource is committed in order to receive capacity value for the DY.

PI M&V Report requirements covered in PJM Manual 18B.

- An EE Resource Provider must demonstrate that it has the legal authority to claim the demand associated with such EE Resource.

Two options available to satisfy this requirement:

1. Submitting a written sworn, notarized statement of one of its corporate officers certifying that the EE Resource Provider has the legal rights and authority to claim the demand reduction associated with the EE installation(s) that constitute the Energy Efficiency Resource for the applicable Delivery Year.
2. Inserting the following statement directly into the Post-Installation Measurement & Verification Report:

“By submitting this Post-Installation Measurement & Verification Report to PJM, [insert company name] affirms and acknowledges that it has the legal authority to claim the demand reduction associated with the EE installation(s) that constitute the Energy Efficiency Resource for the applicable Delivery Year.”

## Types of Post- Installation M&V Activities

### Measurements

*Efforts to validate Nominated Value of EE Resource*

Track equipment replaced and replacement equipment at end-use site

Use manufacturer's equipment data

Measure Coincidence Factors (using time of use loggers)

Sub-meter equipment (measure kw or amps and voltage)

Use simulation models

Use Load Shape Analyses

Use utility billing data

### Verification

*Efforts to verify that EE installation was installed or still operating*

Sample surveys (via mail or phone)

On-site inspections

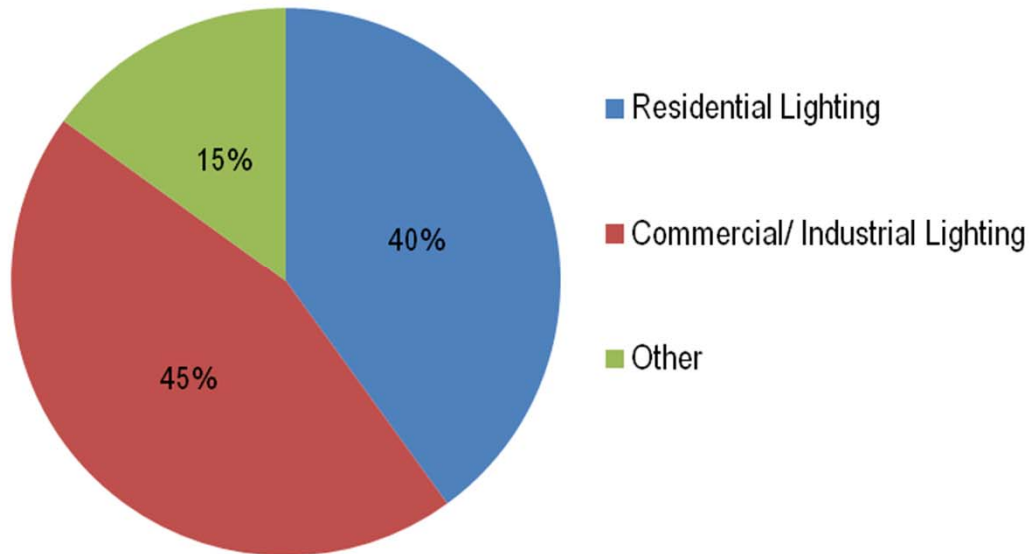
The sampling design for measurement or verification activities should meet a statistical accuracy and precision of no less than one-tailed 90% confidence level (equivalent to two-tailed 80% confidence level) and 10% relative precision.

- Commitment Compliance – demonstrate committed Nominated EE Value in Delivery Year Post-Installation M&V Report
- May be subject to Post-Installation M&V Audit by PJM or independent Third Party
  - Cost of audit charged to EE Provider

**Subject to deficiency charges for failure to perform to commitment level.**

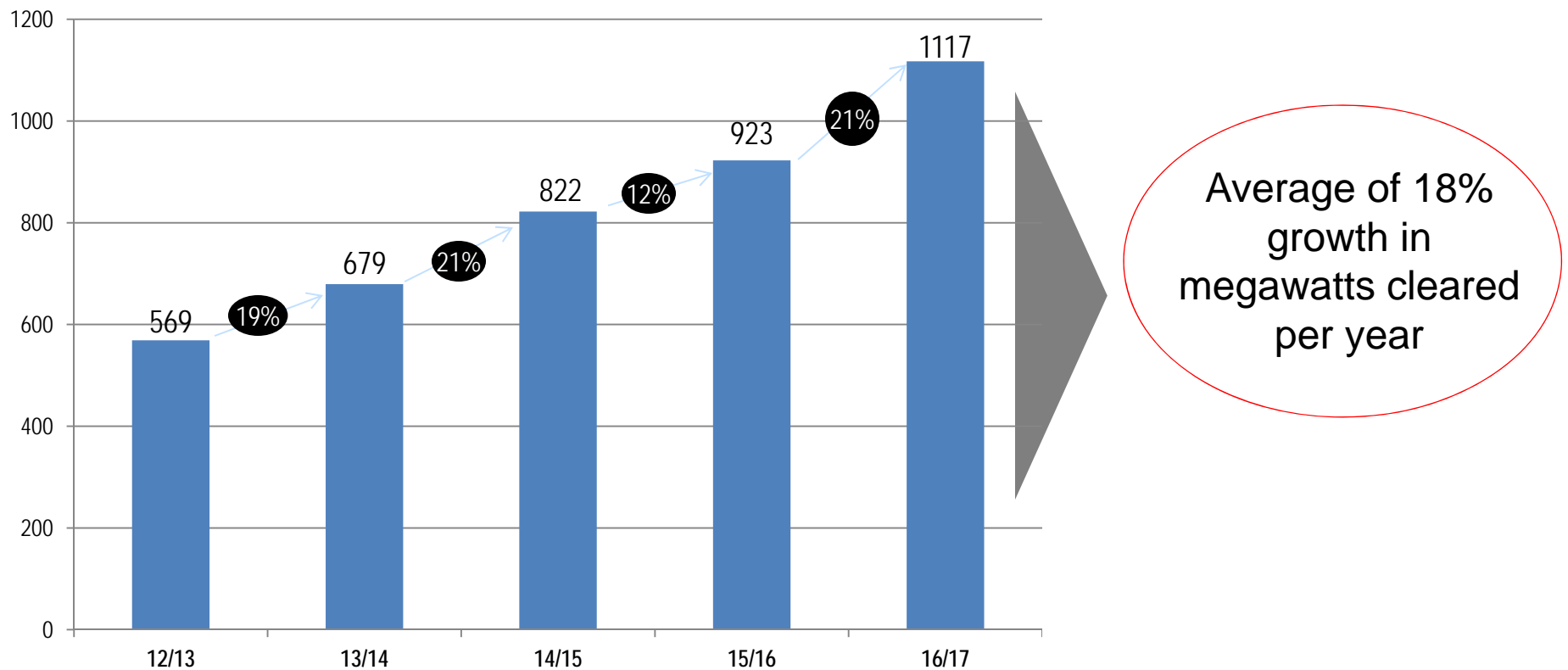
# Source of EE MWs in PJM Capacity Market

Source of EE MW's in PJM Capacity Market



- Commercial and Industrial lighting upgrades have been the largest source of energy efficiency megawatts in RPM
- Residential lighting is not far behind, accounting for 40% of MW's
- The "Other" category is comprised of HVAC (3%) and Appliance Turn-in (3%) while the remaining 9% is various other sources
- Although lighting has accounted for the vast majority of energy efficiency megawatts, there is an increasing interest in efficiency of mechanical devices, such as motors or variable frequency drives (VFD's)

## Energy Efficiency MW Cleared (in UCAP) in RPM Base Residual Auctions





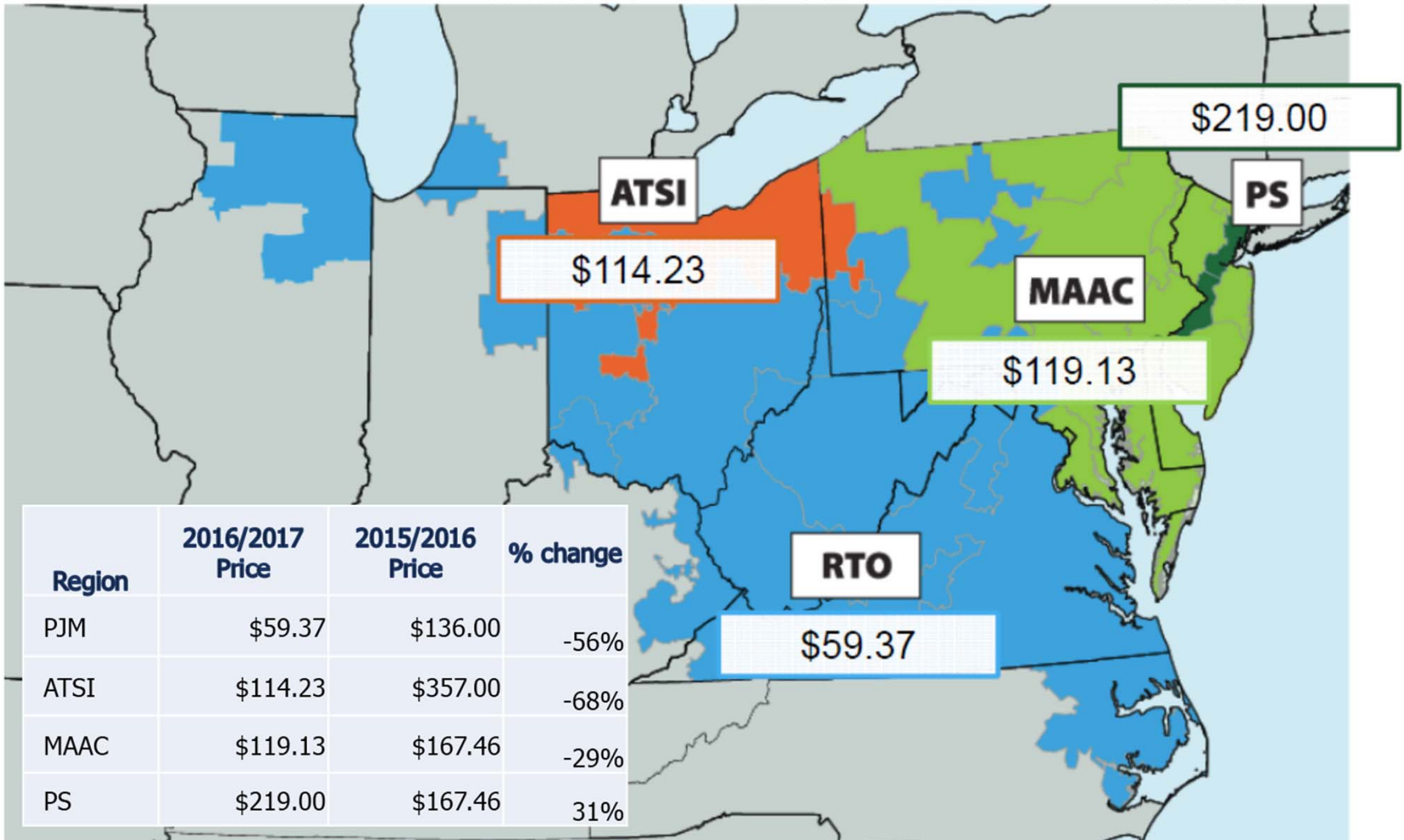
## Zonal DR & EE Offered & Cleared MWs in 16/17 BRA

LDA	Zone	Offered MW*			Cleared MW*		
		Demand	EE	Total	Demand	EE	Total
EMAAC	AECO	189.8	2.0	191.8	172.3	1.7	174.0
EMAAC/DPL-S	DPL	471.4	22.4	493.8	439.5	21.2	460.7
EMAAC	JCPL	252.0	10.2	262.2	222.7	4.9	227.6
EMAAC	PECO	592.9	14.6	607.5	531.1	11.5	542.6
PSEG/PS-N	PSEG	636.5	14.9	651.4	630.7	11.9	642.6
EMAAC	RECO	12.4	-	12.4	10.1	-	10.1
<b>EMAAC Sub Total</b>		<b>2,155.0</b>	<b>64.1</b>	<b>2,219.1</b>	<b>2,006.4</b>	<b>51.2</b>	<b>2,057.6</b>
PEPCO	PEPCO	683.8	83.7	767.5	663.9	83.5	747.4
SWMAAC	BGE	970.0	124.9	1,094.9	936.6	124.9	1,061.5
MAAC	METED	407.6	11.1	418.7	313.6	10.4	324.0
MAAC	PENELEC	452.0	10.6	462.6	431.5	9.9	441.4
MAAC	PPL	1,035.1	36.5	1,071.6	998.2	30.2	1,028.4
<b>MAAC** Sub Total</b>		<b>5,703.5</b>	<b>330.9</b>	<b>6,034.4</b>	<b>5,350.2</b>	<b>310.1</b>	<b>5,660.3</b>
RTO	AEP	1,720.6	118.9	1,839.5	1,377.2	118.7	1,495.9
RTO	APS	945.1	19.2	964.3	684.6	14.4	699.0
ATSI	ATSI	1,920.7	198.9	2,119.6	1,811.9	196.6	2,008.5
RTO	COMED	1,722.3	426.7	2,149.0	1,236.2	426.7	1,662.9
RTO	DAY	301.3	13.1	314.4	246.8	12.9	259.7
RTO	DEOK	394.9	5.7	400.6	304.4	5.2	309.6
RTO	DOM	1,457.5	30.2	1,487.7	1,120.6	28.4	1,149.0
RTO	DUQ	204.5	13.2	217.7	143.1	4.3	147.4
RTO	EKPC	136.8	-	136.8	133.1	-	133.1
<b>Grand Total</b>		<b>14,507.2</b>	<b>1,156.8</b>	<b>15,664.0</b>	<b>12,408.1</b>	<b>1,117.3</b>	<b>13,525.4</b>

\*All MW values are expressed in UCAP

\*\*MAAC sub-total includes all MAAC Zones

# 2016/2017 Base Residual Auction Clearing Prices (\$/MW-Day)



Prices reflect Annual Resource Clearing Prices.