



## 2016/2017 RPM Base Residual Auction Planning Period Parameters

### Introduction

The RPM Base Residual Auction (BRA) for the 2016/2017 Delivery Year is scheduled to be conducted in May of 2013. This document describes the 2016/2017 BRA planning period parameters and also provides a comparison of the 2016/2017 BRA planning parameters to those used in the 2015/2016 BRA. The detailed planning parameters spreadsheet is posted on the PJM RPM website under 2016/2017 Delivery Year information.

It should be noted that several of the parameters are dependent on the quantity of load that elects the FRR alternative and are subject to change based on any FRR elections that may be made prior to the March 13, 2013 FRR election deadline.

### Reserve Requirement Parameters

The Installed Reserve Margin (IRM) and Forecast Pool Requirement (FPR) represent the level of capacity reserves needed to satisfy the PJM reliability criterion of a Loss of Load Expectation (LOLE) not exceeding one occurrence in ten years. The IRM and FPR represent the same level of required reserves but are expressed in different terms of capacity value. The IRM expresses the required installed capacity reserve as a percent of the forecast peak load, whereas the FPR when multiplied by forecast peak load provides the total unforced capacity required. The FPR is equal to  $(1 + \text{IRM})$  times  $(1 - \text{Pool-wide Average EFORD})$ .

A PJM Reserve Requirement Study is conducted each year to determine the IRM. The reserve requirement parameters to be used in the 2016/2017 BRA are shown in Table 1. For comparison purposes, the values of these parameters used in the 2015/2016 BRA are also shown in Table 1.

**Table 1 – Reserve Requirement Parameters for 2015/2016 and 2016/2017 BRAs**

| <b>Reserve Requirement Parameters</b> | <b>2015/2016 BRA</b> | <b>2016/2017 BRA</b> | <b>Delta</b> |
|---------------------------------------|----------------------|----------------------|--------------|
| Installed Reserve Margin (IRM)        | 15.40%               | 15.60%               | 0.20%        |
| Pool Wide 5-Year Average EFORD        | 5.90%                | 5.69%                | -0.21%       |
| Forecast Pool Requirement (FPR)       | 1.0859               | 1.0902               | 0.0043       |

### PJM RTO Region Reliability Requirement

In the RPM clearing process, the PJM RTO Reliability Requirement is used to establish the target reserve level to be procured in an RPM BRA. The PJM RTO Region Reliability Requirement, valued in terms of unforced capacity (UCAP), is the RTO Peak Load Forecast, multiplied by the FPR, less the sum of the Unforced Capacity Obligations of any Fixed Resource Requirement (FRR)



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Entities in the PJM Region. The PJM RTO Region Reliability Requirement for the 2016/2017 BRA is compared to that of the 2015/2016 BRA in Table 2. The forecast peak load for the PJM RTO for the 2016/2017 Delivery Year is 165,424.9 MW including a peak load contribution of 2,213.1 MW for the EKPC Zone which was not included in the 2015/2016 BRA. The Reliability Requirement for 2016/2017 prior to adjustment for FRR obligation is the forecast peak load multiplied by the FPR or 180,346.2 MW.

**Table 2 – PJM RTO Reliability Requirement for 2015/2016 and 2016/2017 BRAs**

| <b>PJM RTO Reliability Requirement Parameters</b>                      | <b>2015/2016 BRA</b> | <b>2016/2017 BRA</b> | <b>Delta</b> |
|--|----------------------|----------------------|--------------|
| Forecast Peak Load (MW)  | 163,168.0            | 165,424.9            | 2,256.9      |
| Reliability Requirement (UCAP MW)                                      | 177,184.1            | 180,346.2            | 3,162.1      |
| Preliminary FRR Obligation (UCAP MW)                                   | 14,406.7             | (see Note (1))       | --           |
| Preliminary PJM RTO Reliability Requirement adjusted for FRR (UCAP MW) | 162,777.4            | (see Note (1))       | --           |

**NOTE:**

(1) Total FRR obligation and PJM RTO Reliability Requirement will be updated and finalized after the March 13, 2013 FRR election deadline.

The FRR alternative provides an LSE with the option to submit a FRR Capacity Plan to meet a fixed capacity resource requirement and avoid direct participation in RPM; therefore, the unforced capacity obligation of FRR entities is not included in the PJM RTO Reliability Requirement used in RPM auctions. The PJM RTO Reliability Requirement for use in the 2016/2017 BRA will be updated and finalized after the March 13, 2013 FRR election deadline.

**Locational Deliverability Areas**

The process of determining the IRM needed to meet the PJM reliability criterion assumes that the aggregate of all capacity resources can be delivered to the aggregate of all RTO load. This assumption is tested by Load Deliverability Analysis based on the Capacity Emergency Transfer Objective (CETO) and Capacity Emergency Transfer Limit (CETL) tests. These tests are applied to electrical areas called Locational Deliverability Areas (LDAs) within the PJM RTO to ensure that the needed capacity resources are deliverable to load. In the RTEP process, CETL is compared to CETO and transmission upgrades are planned if CETL is below CETO.

Prior to each BRA, the CETO and CETL are calculated for each of twenty-seven potential LDAs that are defined in Schedule 10.1 of the PJM Reliability Assurance Agreement (RAA). Pursuant to Section 5.10 of Attachment DD of the PJM Open Access Transmission Tariff (OATT), for any Delivery Year, a separate Variable Resource Requirement (VRR) Curve is established for each LDA for which (1) the CETL is less than 1.15 times its CETO; (2) the LDA had a Locational Price Adder in any one or more of the three immediately



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preceding BRAs; and (3) the MAAC, EMAAC and SWMAAC LDAs are modeled in a BRA regardless of the outcome of the CETL/CETO test or prior BRA results. An LDA not otherwise qualifying under the above three tests may also be modeled if PJM finds that such is required to achieve an acceptable level of reliability consistent with the Reliability Principles and Standards.

Based on an application of the above criteria, in addition to the MAAC, EMAAC and SWMAAC LDAs, the PS, PSNORTH, PEPCO, and ATSI LDAs will be modeled in the 2016/2017 BRA either because the CETL/CETO ratio for the LDA was less than 1.15 or the LDA had a Locational Price Adder in any one or more of the last three BRAs. Although the CETL/CETO ratio is 1.38, the recently created Cleveland LDA will be also be modeled in the upcoming 2016/2017 BRA because it is a sub-region of the ATSI LDA and shares the same reliability concerns and electrical characteristics associated with the ATSI LDA; i.e., supply located in the Cleveland LDA will alleviate reliability concerns associated not only with the Cleveland LDA but also the ATSI LDA. Although it has not had a Locational Price Adder in any of the last three BRAs, the DPLSOUTH LDA will be modeled in the 2016/2017 BRA since its CETL/CETO ratio of 1.18 narrowly exceeds the 1.15 threshold and relatively small future changes in key parameters such as forecasted load, internal capacity level and availability of internal capacity could cause this ratio to drop below the threshold.

CETO and CETL values were calculated for each of the twenty-seven potential LDAs defined in Schedule 10.1 of the PJM RAA and these values are shown on the detailed planning parameters spreadsheet posted on the PJM RPM website under 2016/2017 Delivery Year information. Note that unless an actual CETL value was required for a specific LDA, CETL analysis was considered to be complete once it was determined that an LDA's CETL was at least 115% of the LDA's CETO. For purposes of determining LDAs to be modeled in the upcoming BRA, the LDA CETO models assumed a level of demand response equal to the quantity of demand response located in the LDA that cleared in the 2015/2016 BRA reduced by the amount of existing generation located in the LDA that did not clear in the 2015/2016 BRA. This modeling assumption will more proactively identify locational supply concerns before they actually occur by recognizing and compensating for reliability concerns regarding the potential replacement of DR BRA commitments and the potential deactivation of existing generation capacity resources that did not clear the prior BRA. This modeling assumption has a minimal impact on the reliability requirement of an LDA but does increase an LDA's CETO by approximately the amount of DR reduced thereby increasing the chance that an LDA's CETL/CETO ratio falls below the 1.15 trigger. As no new LDAs were added this year as a result of the CETL/CETO ratio test, this assumption had no effect on the BRA model but PJM believes the approach to be prudent from a reliability perspective and will continue to investigate methods of more proactively identifying locational reliability concerns before they actually occur.

In RPM, a Reliability Requirement and a Variable Resource Requirement (VRR) Curve are established for each LDA that is modeled in the BRA and the LDA CETL acts as a maximum limit on the quantity of capacity that can be imported into the LDA. Table 3 shows the Reliability Requirement and the CETL for each LDA being modeled in the 2016/2017 BRA and compares these values to those used in the 2015/2016 BRA.



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**Table 3 – LDA Reliability Requirements and Capacity Import Limits for 2015/2016 and 2016/2017 BRAs**

| Locational Deliverability Area | 2015/2016 BRA                     |                | 2016/2017 BRA                     |                | Delta                             |                |
|--------------------------------|-----------------------------------|----------------|-----------------------------------|----------------|-----------------------------------|----------------|
|                                | Reliability Requirement (UCAP MW) | CETL (UCAP MW) | Reliability Requirement (UCAP MW) | CETL (UCAP MW) | Reliability Requirement (UCAP MW) | CETL (UCAP MW) |
| MAAC                           | 71,623                            | 6,156          | 72,299                            | 6,495          | 676                               | 339            |
| EMAAC                          | 39,370                            | 9,177          | 39,694                            | 8,916          | 324                               | -261           |
| SWMAAC                         | 17,238                            | 8,373          | 17,316                            | 8,342          | 78                                | -31            |
| PS                             | 12,824                            | 6,220          | 12,870                            | 6,581          | 46                                | 361            |
| PSNORTH                        | 6,462                             | 2,972          | 6,440                             | 2,936          | -22                               | -36            |
| DPLSOUTH                       | 3,062                             | 1,822          | 3,160                             | 1,864          | 98                                | 42             |
| PEPCO                          | 8,973                             | 6,522          | 9,012                             | 6,655          | 39                                | 133            |
| ATSI                           | 16,201                            | 5,418          | 16,255                            | 7,881          | 54                                | 2,463          |
| Cleveland                      | --                                | --             | 6,164                             | 5,245          | --                                | --             |

Notes: (1) Cleveland LDA was not modeled in 2015/2016 BRA

As shown in Table 3, LDA reliability requirements for the 2016/2017 BRA are generally consistent with and slightly higher than those of the 2015/2016 BRA. Table 3 also shows that LDA CETL values for the 2016/2017 BRA are generally consistent with those values of the 2015/2016 BRA with the exception of the ATSI LDA CETL. The increase in CETL for the ATSI LDA is attributable to several additional RTEP upgrades developed since last year and are needed to eliminate reliability violations associated with significant generation retirements in the ATSI LDA concentrated in the Cleveland area.

**Variable Resource Requirement Curves**

A Variable Resource Requirement (VRR) curve is established for the RTO and for each LDA modeled in the BRA. The VRR curve is a demand curve used in the clearing of the BRA that defines the price for a given level of capacity resource commitment relative to the



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applicable reliability requirement. The VRR curves for the PJM Region and each LDA are based on a target level of capacity and the Net Cost of New Entry (Net CONE).

### **Target Level of Capacity**

The target level of capacity resources to be procured for the PJM RTO Region is the PJM RTO Region Reliability Requirement less the Short Term Resource Procurement Target (STRPT) where the STRPT is equal to 2.5% of the PJM RTO Region Reliability Requirement. The target level of capacity for each LDA is the LDA Reliability Requirement less the STRPT allocated to the LDA where the PJM RTO STRPT is allocated to zones based on the ratio of forecast zonal peak load to forecast PJM RTO peak load adjusted for any FRR load.

### **Net Cost of New Entry (CONE)**

The Net CONE (in UCAP terms) is used in the development of the RTO VRR Curve and the VRR Curve for each modeled LDA. Table 4 shows the CONE values for the PJM RTO and each LDA to be modeled in the 2016/2017 BRA. For comparison purposes, the CONE values used in the 2015/2016 BRA are also shown in Table 4. The gross CONE values for each LDA area for 2016/2017 are based on updated Gross CONE values filed on November 21, 2012, in Docket No. ER13-513-000 and approved by FERC on January 31, 2013. The E&AS revenue offset is the annual average of the revenues that would have been received by the reference combustion turbine over a period of the three most recent calendar years. The E&AS revenue values are determined using the peak-hour dispatch method described in section 2.46 of Attachment DD of the PJM OATT. The Net CONE is determined by subtracting the Energy & Ancillary Services (E&AS) offset revenue from the applicable gross CONE value. The Net CONE (in ICAP terms) is divided by  $[(1 - \text{Pool-wide Average EFORD}) \times \text{number of days in a year}]$  to develop the Net CONE value in \$/MW-Day in UCAP terms.



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**Table 4 – Net CONE for PJM RTO and LDAs for 2015/2016 and 2016/2017 BRAs**

|           | 2015/2016 BRA              |                            |                            |                           | 2016/2017 BRA              |                            |                            |                           | DELTA                     |                   |
|-----------|----------------------------|----------------------------|----------------------------|---------------------------|----------------------------|----------------------------|----------------------------|---------------------------|---------------------------|-------------------|
|           | CONE                       | E&AS Offset                | Net CONE                   | Net CONE                  | CONE                       | E&AS Offset                | Net CONE                   | Net CONE                  | Net CONE                  | Net CONE          |
|           | ICAP Terms<br>(\$/MW-Year) | ICAP Terms<br>(\$/MW-Year) | ICAP Terms<br>(\$/MW-Year) | UCAP Terms<br>(\$/MW-Day) | ICAP Terms<br>(\$/MW-Year) | ICAP Terms<br>(\$/MW-Year) | ICAP Terms<br>(\$/MW-Year) | UCAP Terms<br>(\$/MW-Day) | UCAP Terms<br>(\$/MW-Day) | UCAP Terms<br>(%) |
| RTO       | 131,303                    | 20,877                     | 110,426                    | 320.63                    | 139,392                    | 23,415                     | 115,977                    | 330.53                    | 9.90                      | 3.1%              |
| MAAC      | 131,303                    | 39,136                     | 92,167                     | 267.61                    | 142,223                    | 44,707                     | 97,516                     | 276.90                    | 9.29                      | 3.5%              |
| EMAAC     | 141,973                    | 33,885                     | 108,088                    | 313.84                    | 152,460                    | 36,686                     | 115,774                    | 329.94                    | 16.1                      | 5.1%              |
| SWMAAC    | 131,303                    | 39,136                     | 92,167                     | 267.61                    | 142,223                    | 44,707                     | 97,516                     | 276.90                    | 9.29                      | 3.5%              |
| PS        | 141,973                    | 33,885                     | 108,088                    | 313.84                    | 152,460                    | 36,686                     | 115,774                    | 329.94                    | 16.1                      | 5.1%              |
| PS NORTH  | 141,973                    | 33,885                     | 108,088                    | 313.84                    | 152,460                    | 36,686                     | 115,774                    | 329.94                    | 16.1                      | 5.1%              |
| DPL SOUTH | 141,973                    | 33,885                     | 108,088                    | 313.84                    | 152,460                    | 36,686                     | 115,774                    | 329.94                    | 16.1                      | 5.1%              |
| PEPCO     | 131,303                    | 39,136                     | 92,167                     | 267.61                    | 142,223                    | 44,707                     | 97,516                     | 276.90                    | 9.29                      | 3.5%              |
| ATSI      | 134,314                    | 10,940                     | 123,374                    | 358.22                    | 139,485                    | 12,453                     | 127,032                    | 362.64                    | 4.42                      | 1.2%              |
| Cleveland | --                         | --                         | --                         | --                        | 139,485                    | 12,453                     | 127,032                    | 362.64                    | --                        | --                |

Table 4 shows that Net CONE values for the 2016/2017 BRA are higher than values used in last year’s BRA by anywhere from 1.2% to 5.1% depending on the LDA. The 2016/2017 E&AS Offset values differ from those used last year due to an update of the 3-year period for which the reference resource E&AS revenues were determined (the 2016/2017 values are based on LMPs from calendar years 2010 through 2012 whereas the 2015/2016 values were based on LMPs from calendar years 2009 through 2011).

**Minimum Resource Requirements**

Table 5 shows the target level of capacity (reliability requirement minus the short-term resource procurement target), the minimum annual resource requirement and the minimum extended summer resource requirement for the RTO and each modeled LDA. Note that the Target Reserve Level and Minimum Resource Requirements for the RTO are preliminary and will be updated and finalized after the March 13, 2013 FRR election deadline. The Minimum Annual Resource Requirement is the minimum amount of capacity sought to be procured from Annual Resources located in the RTO or LDA where Annual Resources include generation capacity resources, energy efficiency resources and annual demand resources. The Minimum Extended Summer Resource Requirement is the minimum



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amount of capacity sought to be procured from Extended Summer Demand Resources and Annual Resources located in the RTO or LDA. Minimum Resource Requirements are established for the RTO and for each modeled LDA.

The detailed calculations of the RTO and LDA Minimum Resource Requirements are shown on the planning parameters spreadsheet posted on the PJM RPM website under 2016/2017 Delivery Year information. Minimum Resource Requirement values are based on the forecast peak load and DR Reliability Target Values (and the CETL in the case of LDA Minimum Resource Requirements) so changes in Minimum Resource Requirements are driven by changes in any and all of these parameters.

**Table 5 – Target Capacity Levels and Minimum Resource Requirements for 2014/2015 and 2015/2016 BRAs**

| Locational Deliverability Area | 2015/2016 BRA                   |   |  | 2016/2017 BRA                   |   |  | Delta                           |   |  |
|--------------------------------|---------------------------------|---|--|---------------------------------|---|--|---------------------------------|---|--|
|                                | Target Capacity Level (UCAP MW) | Minimum Annual Resource Requirement (UCAP MW) | Minimum Extended Summer Resource Requirement (UCAP MW) | Target Capacity Level (UCAP MW) | Minimum Annual Resource Requirement (UCAP MW) | Minimum Extended Summer Resource Requirement (UCAP MW) | Target Capacity Level (UCAP MW) | Minimum Annual Resource Requirement (UCAP MW) | Minimum Extended Summer Resource Requirement (UCAP MW) |
| RTO                            | 158,708                         | 146,455                                       | 155,316  | 175,837                         | 162,262                                       | 171,735  | 17,129                          | 15,807  | 16,419   |
| MAAC                           | 69,964                          | 58,496  | 61,855   | 70,634                          | 58,109  | 61,861   | 670                             | -387  | 6  |
| EMAAC                          | 38,466                          | 24,395  | 28,122   | 38,786                          | 24,607  | 28,559   | 320                             | 212   | 437  |
| SWMAAC                         | 16,854                          | 6,693   | 7,970  | 16,932                          | 6,627   | 7,947  | 78                              | -66   | -23  |
| PS                             | 12,536                          | 4,808   | 5,888  | 12,581                          | 4,214   | 5,483  | 46                              | -594  | -405   |
| PSNORTH                        | 6,324                           | 2,587   | 3,147  | 6,300                           | 2,503   | 3,113  | -24                             | -84   | -33  |
| DPLSOUTH                       | 2,996                           | 894   | 1,100  | 3,094                           | 941   | 1,151  | 97                              | 47  | 52   |
| PEPCO                          | 8,787                           | 1,186   | 2,032  | 8,827                           | 941   | 1,904  | 40                              | -245  | -128   |
| ATSI                           | 15,840                          | 9,227   | 10,040   | 15,893                          | 6,201   | 7,668  | 52                              | -3,026  | -2,371   |
| Cleveland                      | --                              | --  | --   | 6,040                           | 0   | 677  | --                              | --  | --   |

**Note: Cleveland LDA was not modeled in 2015/2016 BRA**

**NOTE:** Target Capacity Levels and Minimum Resource Requirements to be procured through the RPM Auction are dependent on the quantity of load that elects the FRR alternative and are subject to change based on any FRR elections that may be made prior to the March 13, 2013 FRR election deadline. RTO values of Table 5 are significantly lower for the 2015/2016 BRA since the 2015/2016 values reflect final FRR elections made for the 2015/2016 Delivery Year.



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### **Summary**

- The preliminary forecast peak load for the PJM RTO for the 2016/2017 Delivery Year is 165,424.9 MW and reflects a peak load contribution of 2,213 MW for the EKPC Zone. The 2016/2017 BRA is the first BRA to include EKPC.
- The MAAC, EMAAC, SWMAAC, PS, PSNORTH, PEPCO, DPLSOUTH, ATSI and Cleveland LDAs will be modeled in the 2016/2017 BRA. These are the same LDAs as modeled in the 2015/2016 BRA plus the addition of the Cleveland LDA.
- LDA reliability requirements for the 2016/2017 BRA are generally consistent with LDA reliability requirements of the 2015/2016 BRA with most differences being less than 1%.
- LDA CETL values for the 2016/2017 BRA are generally consistent with LDA CETL values of the 2015/2016 BRA with the exception of the ATSI LDA CETL. The ATSI CETL increase of nearly 2,500 MW (from 5,418 MW to 7,881 MW) is mainly attributable to several additional RTEP upgrades developed since last year that are needed to eliminate reliability violations associated with significant generation retirements in the ATSI LDA concentrated in the Cleveland area.
- The Net CONE values for the 2016/2017 BRA are higher than values used in last year's BRA by 1.2% to 5.1% depending on the LDA. The gross CONE values for each LDA area for 2016/2017 are based on updated Gross CONE values filed on November 21, 2012, in Docket No. ER13-513-000 and approved by FERC on January 31, 2013.