2022/2023 RPM Base Residual Auction Planning Period Parameters

Introduction

The planning parameters for the 2022/2023 RPM Base Residual Auction (BRA) that is to be conducted in May of 2021 were posted on the PJM RPM website on February 8, 2021. This document describes the posted parameters and provides a comparison to the 2021/2022 BRA planning parameters.

The 2022/2023 BRA Planning Parameters reflect all tariff revisions proposed in PJM's Quadrennial Review filing (Docket No. ER19-105) which was fully accepted by the Federal Energy Regulatory Commission ("Commission") on April 15, 2019, and the reserve pricing filing to utilize the forward-looking net Energy and Ancillary Services (Docket No. EL 19-58), which was also fully accepted by the Commission on November 12, 2020. These revisions include:

- a 1% shift to the left of the downward-sloping Variable Resource Requirement ("VRR)" Curve,
- an update of the Reference Resource definition from a combustion turbine ("CT") plant configuration comprised of two General Electric Frame 7FA turbines to a single General Electric Frame 7HA turbine,
- an updated estimate of the Gross Cost of New Entry ("CONE") of the Reference Resource CT based on a detailed analysis of the construction, operation, and capital costs of the CT,
- the inclusion of a 10% cost adder in the methodology used to calculate the expected Net Energy and Ancillary Service ("EAS") revenues that the Reference Resource CT would earn in PJM's other markets, and
- the change in calculating the Net EAS value to calculating a forward Net EAS value by using projected EAS dispatch, forward hourly LMP, forward hourly ancillary service prices, and forward fuel prices.

PJM RTO Region Reliability Requirement

The PJM RTO forecast peak load, the PJM RTO Region Reliability Requirement and the parameters used to derive the requirement for the 2022/2023 BRA are shown and compared to the 2021/2022 BRA parameters in Table 1.

The forecast peak load for the PJM RTO for the 2022/2023 Delivery Year is 150,229 MW which decreased by 2,418 MW, or 1.6% compared to the forecast peak load of 152,647 MW for the 2021/2022 BRA. The forecast PJM system peak load is that reported in Table B-10 of the January 2021 RPM update of the PJM Load Forecast Report.[1] The PJM RTO Reliability Requirement for the

[1] The 2021 RPM Forecast is located at https://www.pjm.com/-/media/library/reports-notices/load-forecast/2021-load-report.ashx.

2022/2023 Delivery Year is 163,269 MW which decreased by 3,086 MW, or 1.9% compared to the 2021/2022 BRA value prior to adjustment for FRR obligation of 166,355 MW.[2]

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 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 reserve level in terms of installed capacity MW (ICAP) as a percent of the forecast peak load, whereas the FPR expresses the required reserve level in terms of unforced capacity MW (UCAP) as a percent of the forecast peak load. The FPR is equal to (1 + IRM) times (1 - Pool-wide Average EFORd). The PJM RTO Reliability Requirement expressed in terms of unforced capacity is used as the basis of the target reserve level to be procured in each RPM BRA and is equal to the forecast RTO peak load, multiplied by the FPR.

Table 1 – Reserve Requirement Parameters for 2021/2022 and 2022/2023 BRAs

Reserve Requirement Parameters	2021/2022 BRA	2022/2023 BRA
Installed Reserve Margin (IRM)	15.80%	14.50%
Pool Wide 5-Year Average EFORd	5.89%	5.08%
Forecast Pool Requirement (FPR)	1.0898	1.0868
Forecast Peak Load (MW)	152,647	150,229
PJM RTO Reliability Requirement (UCAP MW)	**166,355**	**163,269**
FRR Obligation (UCAP MW)*	13,194	
PJM RTO Reliability Requirement adjusted for FRR (UCAP MW)	153,161	

*The 2022/2023 BRA PJM RTO Reliability Requirement will be updated to reflect FRR load in April 2021.

[2] The total UCAP Obligation of all Fixed Resource Requirement (FRR) Entities is subtracted from the PJM RTO Reliability Requirement, and any applicable LDA Reliability Requirement, when determining the target reserve levels to be procured in each RPM BRA. The posted 2022/2023 BRA planning parameters will be updated to reflect the total UCAP Obligation of FRR Entities after FRR Capacity Plans are submitted and reviewed in April 2021.

Locational Deliverability Areas

Prior to each BRA, the Capacity Emergency Transfer Objective (CETO) and Capacity Emergency Transfer Limit (CETL) are calculated for each of twenty-seven potential Locational Deliverability Areas (LDAs) that are defined in Schedule 10.1 of the PJM Reliability Assurance Agreement.[3] 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 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 LDA is determined to be likely to have a Locational Price Adder based on historic offer price levels or if such LDA is required to achieve an acceptable level of reliability consistent with the Reliability Principles and Standards.

Based on an application of the above criteria, a separate VRR Curve will be established for the 2022/2023 BRA for each of the LDAs listed in Table 2. The list includes the same LDAs that were modeled with a separate VRR Curve in the 2021/2022 BRA. Of the LDAs listed on Table 2, the MAAC, EMAAC, ATSI, BGE, ComEd, DEOK and PS LDAs have cleared with a Locational Price Adder in one or more of the past three BRAs. While none of the other listed LDAs had a Locational Price Adder in any of the last three BRAs or had a CETL to CETO ratio less than 1.15, they will be modeled in order to maintain an acceptable level of reliability consistent with the Reliability Principles and Standards. Establishing a separate VRR Curve for an LDA does not predestine the LDA to clear the BRA with a Locational Price Adder; an LDA will only clear at a higher clearing price if reliability constraints are reached when attempting to import capacity into the LDA in the auction clearing.

A Reliability Requirement and a separate 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 2 shows the Reliability Requirement and the CETL for each LDA being modeled in the 2022/2023 BRA. For comparison purposes, the LDA Reliability Requirement and CETL values used in the 2021/2022 BRA are also shown in Table 2.

Changes in LDA reliability requirement are primarily driven by changes in the forecast peak load of the LDA and changes in the availability rate of capacity resources located in the LDA. The reliability requirement of an LDA will decrease for a decrease in the forecast peak load of the LDA and an increase in the availability rate of capacity resources located in the LDA. The reliability

[3] 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.

requirement of an LDA will increase for an increase in the forecast peak load of the LDA and a decrease in the availability rate of capacity resources located in the LDA.

Year-over-year changes in the CETL of an LDA are primarily driven by the addition or removal of transmission facilities, the magnitude and location of generation deactivations and generation additions, and changes in load distribution profile within the LDA. LDA CETL values for the 2022/2023 BRA vary significantly in some cases from those of the 2021/2022 BRA in both the upward and downward direction but, in general, the magnitude of the changes for most regions lies within the year-to-year changes historically experienced.

Of those LDAs that had a Locational Price Adder in one or more of the last three BRAs, the PS LDA CETL had the largest increase as compared to 2021/2022 and the BGE LDA CETL had the largest decrease as compared to 2021/2022. The PS LDA CETL is 1,724 MW higher for the 2022/2023 BRA, a 25% increase from the 2021/2022 BRA CETL. The BGE LDA CETL is 322 MW lower for the 2022/2023 BRA, a 5.4% decrease from the 2021/2022 BRA CETL. The increase in PS LDA CETL is attributable to the addition of transmission upgrades in the PSEG zone described on the "Key Transmission Upgrade" tab of the posted planning parameters, primarily the upgrades identified as n5564 and n5565. These same upgrades contributed to a 1,180 MW increase in the PS-North LDA CETL, a 37.1% increase from the 2021/2022 BRA CETL. The decrease in BGE LDA CETL is primarily attributable to the removal of the Dickerson and Chalk Point units from the model. The Dickerson units retired in August of 2020 consistent with a deactivation notification made in May of 2020. A deactivation notification was submitted for the Chalk Point units in August of 2020 with a requested deactivation date of June of 2021. The CETL of the COMED LDA, which had a Locational Price Adder in each of the last three BRAs, is also significantly higher for the 2022/2023 BRA, increasing by 1,265 MW, or 22.7% compared to the 2021/2022 BRA CETL. The change in COMED LDA CETL is primarily attributable to the removal of the Dresden nuclear units from the model. A deactivation notification was submitted for the Dresden units in January of 2021 with a requested deactivation date of November of 2021.

Table 2 – LDA Reliability Requirements and Capacity Import Limits for 2021/2022 and 2022/2023 BRAs

	2021/2022 BRA		2022/2023 BRA		Delta	
LDA	Reliability Requirement (UCAP MW)	CETL (MW)	Reliability Requirement (UCAP MW)	CETL (MW)	Reliability Requirement (UCAP MW)	CETL (MW)
MAAC	64,919.0	4,019.0	64,514.0	4,375.0	-405.0	356.0
EMAAC	35,994.0	9,000.0	35,884.0	9,173.0	-110.0	173.0
SWMAAC	15,259.0	9,082.0	14,934.0	8,310.0	-325.0	-772.0
PS	11,501.0	6,902.0	11,686.0	8,626.0	185.0	1,724.0
PS NORTH	5,810.0	3,180.0	6,180.0	4,360.0	370.0	1,180.0
DPL SOUTH	2,907.0	1,624.0	3,155.0	2,053.0	248.0	429.0
PEPCO	8,073.0	6,915.0	7,701.0	6,781.0	-372.0	-134.0
ATSI	15,598.0	8,439.0	15,011.0	9,119.0	-587.0	680.0
ATSI-Cleveland	5,258.0	5,256.0	5,761.0	5,229.0	503.0	-27.0
COMED	26,112.0	5,574.0	23,931.0	6,839.0	-2,181.0	1,265.0
BGE	7,910.0	6,005.0	7,828.0	5,683.0	-82.0	-322.0
PL	9,974.0	6,609.0	10,244.0	4,850.0	270.0	-1,759.0
DAYTON	3,979.0	3,502.0	3,950.0	3,941.0	-29.0	439.0
DEOK	7,557.0	4,959.0	7,407.0	5,465.0	-150.0	506.0

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 downward-sloping demand curve used in the clearing of the BRA that defines the price for a given level of capacity resource commitment relative to the 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). As shown on the posted planning parameters and as discussed in the Price Responsive Demand (PRD) section of this report , the VRR curve of the RTO and each affected LDA is shifted leftward along the horizontal axis to reflect any PRD that has elected to participate in the 2022/2023 Delivery Year BRA.

Target Level of Capacity
In the development of the VRR curve, the target level of capacity to be procured for the PJM RTO Region is the PJM RTO Region Reliability Requirement, and the target level of capacity for each LDA is the LDA Reliability Requirement.

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 3 shows the Net CONE values, and the components used to determine the Net CONE, for the PJM RTO and each LDA to be modeled in the 2022/2023 BRA. For comparison purposes, the CONE values used in the 2021/2022 BRA are also shown in Table 3.

The Net CONE for the RTO and each LDA is equal to the gross CONE applicable to the RTO and each LDA minus the applicable net energy and ancillary services ("EAS") revenue offset or forward net energy and ancillary services revenue offset for the 2022/2023 Delivery Year. The Net CONE decreased for the RTO and for all of the modeled LDAs. The Net CONE of the RTO decreased by 19.0% and the decrease in LDA Net CONE values ranged from 7.4% for the BGE LDA to 28.0% for the COMED LDA. The decrease in Net CONE across all LDAs is due to the lower Gross CONE values determined as part of the quadrennial review update and the new method of calculating forward EAS values. The Gross CONE values decreased in all LDAs, while the calculated Forward Net EAS decreased in all LDAs except for the COMED, DAYTON, and DEOK LDAs. The change in Net EAS values relative to those of last year's parameters is due to the new method for calculating the forward EAS values, the years used in the calculation, the reference resource type, and the 10% cost adder. The new forward EAS calculation uses projected EAS dispatch, forward hourly LMP, forward hourly ancillary service prices, and forward fuel prices. The Net EAS values for the 2022/2023 are based on LMPs from calendar years 2018 through 2020 for historical data and shaped using the 2022/2023 forward LMP data, whereas the Net EAS values for the 2021/2022 are based on LMPs from calendar years 2015 through 2017. The Net EAS calculation was also revised to reflect dispatch of a new Reference Resource CT, a General Electric Frame 7HA turbine, and to include a 10% cost adder.

Table 3 – Net CONE for PJM RTO and LDAs for 2021/2022 and 2022/2023 BRAs

	2021/2022 BRA				2022/2023 BRA				Change in Net CONE	
Location	Gross CONE ICAP Terms ($/MW-Year)	E&AS Offset ICAP Terms ($/MW-Year)	Net CONE ICAP Terms ($/MW-Year)	Net CONE UCAP Terms ($/MW-Day)	Gross CONE ICAP Terms ($/MW-Year)	E&AS Offset ICAP Terms ($/MW-Year)	Net CONE ICAP Terms ($/MW-Year)	Net CONE UCAP Terms ($/MW-Day)	Net CONE UCAP Terms ($/MW-Day)	Net CONE UCAP Terms (%)
RTO	$135,309	$24,851	$110,459	$321.57	$107,175	$16,924	$90,251	$260.50	-$61.07	-19.0%
MAAC	$134,831	$34,293	$100,538	$292.69	$107,627	$22,703	$84,925	$245.12	-$47.57	-16.3%
EMAAC	$133,144	$25,365	$107,779	$313.77	$108,000	$18,144	$89,856	$259.36	-$54.41	-17.3%
SWMAAC	$140,953	$49,968	$90,985	$264.88	$109,700	$25,530	$84,173	$242.95	-$21.93	-8.3%
PS, PS NORTH	$133,144	$19,580	$113,564	$330.61	$108,000	$14,997	$93,003	$268.44	-$62.17	-18.8%
DPL SOUTH	$133,144	$30,032	$103,112	$300.18	$108,000	$26,173	$81,827	$236.18	-$64.00	-21.3%
PEPCO	$140,953	$42,911	$98,043	$285.42	$109,700	$19,786	$89,914	$259.52	-$25.90	-9.1%
ATSI, Cleveland	$133,016	$27,607	$105,409	$306.87	$105,500	$25,642	$79,858	$230.50	-$76.37	-24.9%
COMED	$133,016	$14,728	$118,289	$344.36	$105,500	$19,626	$85,874	$247.86	-$96.50	-28.0%
BGE	$140,953	$57,026	$83,928	$244.33	$109,700	$31,273	$78,427	$226.37	-$17.96	-7.4%
PL	$134,124	$30,826	$103,298	$300.72	$105,500	$18,744	$86,756	$250.41	-$50.31	-16.7%
DAYTON	$133,016	$25,650	$107,366	$312.56	$105,500	$27,090	$78,410	$226.32	-$86.24	-27.6%
DEOK	$133,016	$25,567	$107,449	$312.80	$105,500	$28,023	$77,477	$223.63	-$89.17	-28.5%

Price Responsive Demand (PRD)

Price Responsive Demand is provided by a PJM Member that represents retail customers having the ability to predictably reduce consumption in response to changing wholesale prices. In the PJM Capacity Market, a PRD Provider may voluntarily make a firm commitment of the quantity of PRD that will reduce its consumption in response to real time energy price during a Delivery Year.

In order to commit PRD for a Delivery Year, a PRD Provider must submit a PRD Plan by January 22nd preceding the BRA for such Delivery Year that demonstrates to PJM's satisfaction that the nominated amount of PRD will be available by the start of the Delivery Year and that the Plan satisfies all requirements as described in section 3A of PJM Manual18: PJM Capacity Market.[4] A PRD Provider that is committing PRD in a BRA must also submit a PRD election in the Capacity Exchange system which indicates the Nominal PRD Value in MWs that the PRD Provider is willing to commit at different reservation prices ($/MW-day). The VRR curve of the RTO and each affected LDA is shifted leftward along the horizontal axis by the UCAP MW quantity of elected PRD where the leftward shift occurs only for the portion of the VRR Curve at or above the PRD Reservation price. Once committed in a BRA, a PRD

[4] PRD Providers must submit a PRD Plan by January 15th preceding the BRA for such Delivery Year during normal BRA scheduled auctions.

commitment cannot be replaced; the commitment can only be satisfied through the registration of price response load in the DR Hub system prior to or during the Delivery Year.

As shown in the 2022/2023 Planning Parameters, 230 MW of PRD across the RTO has elected to participate in the 2022/2023 BRA: 80 MW in the BGE LDA, 110 MW in the PEPCO LDA, and 40 MW in the EMAAC LDA (with 19.6 MW located in the DPL-South LDA). By comparison, 510 MW of PRD elected to participate in the 2021/2022 BRA: 240 MW in the BGE LDA, 195 MW in the PEPCO LDA, and 75 MW in the EMAAC LDA (with 35.7 MW located in the DPL-South LDA).

Summary

- The forecast peak load for the PJM RTO for the 2022/2023 Delivery Year is 150,229 MW which is 2,418 MW, or 1.6%, below the forecast peak load of 152,647 MW for the 2021/2022 BRA.

- The PJM RTO Reliability Requirement for the 2022/2023 Delivery Year is 163,269 MW which is 3,086 MW, or 1.9%, below the 2021/2022 BRA value prior to adjustment for FRR obligation. The Reliability Requirement will be updated to include FRR load in April 2021.

- The MAAC, EMAAC, SWMAAC, PS, PSNORTH, PEPCO, DPLSOUTH, ATSI, Cleveland, ComEd, BGE, PPL, DAYTON and DEOK LDAs will be modeled in the 2022/2023 BRA. These are the same LDAs that were modeled in the 2021/2022 BRA.

- 230 MW of PRD across the RTO has elected to participate in the 2022/2023 BRA: 80 MW in the BGE LDA, 110 MW in the PEPCO LDA, and 40 MW in the EMAAC LDA (with 19.6 MW located in the DPL-South LDA).

- With energy efficiency now explicitly reflected in the peak load forecast, the Reliability Requirement of the RTO and each affected LDA will be increased by the total UCAP value of all EE Resources for which PJM accepts an Measurement and Verification Plan for the BRA. PJM will post updated planning parameters to reflect these quantities prior to the opening of the auction window.