2020/2021 RPM Base Residual Auction Planning Period Parameters

Introduction

The planning parameters for the 2020/2021 RPM Base Residual Auction (BRA) that is to be conducted in May of 2017 were posted on the PJM RPM website on February 1, 2017. This document describes the posted parameters and provides a comparison to the 2019/2020 BRA planning parameters.

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 2020/2021 BRA are shown and compared to the 2019/2020 BRA parameters in Table 1.

The forecast peak load for the PJM RTO for the 2020/2021 Delivery Year is 153,915 MW which is 3,273 MW or about 2.1% below the forecast peak load of 157,188 MW for the 2019/2020 BRA. The PJM Load Forecast Report of January 2017 describes the peak load forecast model and provides a comparison to prior peak load forecasts[1]. The PJM RTO Reliability Requirement for the 2020/2021 Delivery Year is 167,644 MW which is 3,393 MW or about 2.0% below the 2019/2020 BRA value prior to adjustment for FRR obligation. [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.

[1] The January 2017 Load Forecast Report is located at: http://www.pjm.com/~/media/library/reports-notices/load-forecast/2017-load-forecast-report.ashx

[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 2020/2021 BRA planning parameters will be updated to reflect the total UCAP Obligation of FRR Entities after FRR Capacity Plans are submitted and reviewed in mid-April 2017

Table 1 – Reserve Requirement Parameters for 2019/2020 and 2020/2021 BRAs

Reserve Requirement Parameters	2019/2020 BRA	2020/2021 BRA
Installed Reserve Margin (IRM)	16.5%	16.6%
Pool Wide 5-Year Average EFORd	6.60%	6.59%
Forecast Pool Requirement (FPR)	1.0881	1.0892
Forecast Peak Load (MW)	157,188	153,915
PJM RTO Reliability Requirement (UCAP MW)	**171,037**	**167,644**
FRR Obligation (UCAP MW)*	13,944	
PJM RTO Reliability Requirement adjusted for FRR (UCAP MW)	157,092	

*The 2020/2021 BRA PJM RTO Reliability Requirement will be updated to include FRR load in mid-April 2017.

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 and with consideration given to potential future generation deactivations, a separate VRR Curve will be established for the 2020/2021 BRA for each of the LDAs listed in Table 2. The list includes the same LDAs that were modeled in the 2019/2020 BRA with the addition of the DAYTON and DEOK LDAs. Of the LDAs listed on Table 2, the EMAAC, ComEd and BGE LDAs had a Locational Price Adder in last year's 2019/2020 BRA and the PSEG LDA last experienced a Locational Price Adder in the 2017/2018 BRA. While none of the other listed LDAs had a Locational Price Adder in any of the last three BRAs nor had a CETL to CETO ratio less than 1.15, they will be modeled in order to maintain an acceptable level of reliability consistent

[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.

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 2020/2021 BRA. For comparison purposes, the LDA Reliability Requirement and CETL values used in the 2019/2020 BRA are also shown in Table 2.

As shown in Table 2, LDA reliability requirements for the 2020/2021 BRA are lower than those of the 2019/2020 BRA. 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 lower LDA reliability requirements for the 2020/2021 BRA relative to those of the 2019/2020 BRA are primarily due to lower forecast peak load levels for 2020/2021.

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 2020/2021 BRA vary significantly in some cases from those of the 2019/2020 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. The EMAAC, PS-NORTH and PL LDA CETL had the largest increases in terms of magnitude and percentage as compared to 2019/2020, while the COMED LDA CETL had the largest decrease in terms of magnitude and percentage as compared to 2019/2020. The EMAAC CETL is 2,112 MW higher for the 2020/2021 BRA, a 24% increase from the 2019/2020 BRA CETL. The PS-NORTH CETL is 1,054 MW higher for the 2020/2021 BRA, a 28% increase from the 2019/2020 BRA CETL. These increases are primarily driven by the expiration of the ConEd/PSEG Wheel Agreement effective May 1, 2017. Prior to the expiration of the Agreement, the NYISO JOA had specific requirements for the interface in the PJM load deliverability studies. After the expiration of the Agreement, these requirements will be removed from the JOA. This will enable additional power to be imported into these LDAs via the JK interface at Waldwick and the ABC interfaces at Hudson and Linden.[4] The PL CETL is 1,058 MW higher for the 2020/2021 BRA, a 17% increase from the 2019/2020 BRA CETL. This increase is primarily driven by the addition of two major

[4] The CETL values of the MAAC, EMAAC, PSEG and PS-North LDAs are sensitive to several critical modeling assumptions regarding the operation of Phase Angle Regulators (PARs) located at PJM-NYISO interface points at Waldwick, Hudson and Linden, as well as the extent to which PJM can rely on imports from NYISO and New England to provide assistance to an LDA that is experiencing a capacity emergency. PJM will be reviewing these important assumptions as they pertain to the CETL values of the MAAC, EMAAC, PSEG and PS-North LDAs, and may revise the currently posted values pending that review.

upgrades (b2752 and s1106) that were not included in the 2019/2020 BRA CETL power flow study. These two upgrades are included in the list of Key Expected Facilities that is posted along with the planning parameters. The COMED CETL is 926 MW lower for the 2020/2021 BRA, an 18% decrease below the 2019/2020 BRA CETL. This decrease is primarily driven by a 345 kV transmission facility in the AEP system that experienced a modest loading increase in the 2020/2021 CETL studies due to several factors including the addition of RTEP baseline upgrades in the area. This 345 kV transmission facility was identified as a reliability violation during the 2016 RTEP, and the PJM Board has approved an upgrade to reconductor the circuit by 6/1/2021. The other larger regional LDAs, MAAC and SWMAAC, each saw a modest decrease and increase in CETL respectively. The MAAC CETL is 186 MW lower for the 2020/2021 BRA, a 3% decrease from the 2019/2020 BRA CETL, and the SWMAAC CETL is 347 MW higher for the 2020/2021 BRA, a 4% increase from the 2019/2020 BRA CETL.

Table 2 – LDA Reliability Requirements and Capacity Import Limits for 2019/2020 and 2020/2021 BRAs

	2019/2020 BRA		2020/2021 BRA		Delta	
LDA	Reliability Requirement (UCAP MW)	CETL (MW)	Reliability Requirement (UCAP MW)	CETL (MW)	Reliability Requirement (UCAP MW)	CETL (MW)
MAAC	67,662.0	7,385.0	66,385.0	7,199.0	-1,277.0	-186.0
EMAAC	37,633.0	8,856.0	36,921.0	10,968.0	-712.0	2,112.0
SWMAAC	15,883.0	9,400.0	15,486.0	9,747.0	-397.0	347.0
PS	12,174.0	7,856.0	11,797.0	8,497.0	-377.0	641.0
PS NORTH	6,375.0	3,827.0	6,023.0	4,881.0	-352.0	1,054.0
DPL SOUTH	3,060.0	1,898.0	2,999.0	1,850.0	-61.0	-48.0
PEPCO	8,074.0	6,985.0	7,978.0	7,625.0	-96.0	640.0
ATSI	15,742.0	9,212.0	15,610.0	9,814.0	-132.0	602.0
ATSI-Cleveland	5,979.0	5,501.0	5,865.0	5,605.0	-114.0	104.0
COMED	26,509.0	5,160.0	26,224.0	4,234.0	-285.0	-926.0
BGE	8,401.0	6,234.7	8,132.0	6,246.0	-269.0	11.3
PL	10,565.0	6,168.0	9,829.0	7,226.0	-736.0	1,058.0
DAYTON	NA	NA	5,288.0	1,834.0	NA	NA
DEOK	NA	NA	7,500.0	4,907.0	NA	NA

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 2020/2021 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 2020/2021 BRA. For comparison purposes, the CONE values used in the 2019/2020 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 (E&AS) revenue offset. The gross CONE values for the 2020/2021 BRA are based on the gross CONE values used in the 2019/2020 BRA adjusted by the year-over-year change in the Bureau of Labor Statistics (BLS) Composite Index[5]. The Net 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 2020/2021 net E&AS values are based on LMPs from calendar years 2014 through 2016 whereas the 2019/2020 values were based on LMPs from calendar years 2013 through 2015.

[5] The BLS Composite Index is described in section 3.3.1 of PJM Manual 18: PJM Capacity Market.

Table 3 – Net CONE for PJM RTO and LDAs for 2019/2020 and 2020/2021 BRAs

	2019/2020 BRA				2020/2021 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	133,652	31,337	102,315	$ 299.30	134,480	34,601	99,879	$ 292.95	-6.35	-2.1%
MAAC	133,775	44,204	89,571	$ 262.02	134,520	48,466	86,054	$ 252.40	-9.62	-3.7%
EMAAC	133,332	36,376	96,957	$ 283.63	134,310	37,788	96,522	$ 283.10	-0.53	-0.2%
SWMAAC	134,299	55,700	78,600	$ 229.93	136,733	67,715	69,019	$ 202.43	-27.5	-12.0%
PS, PS NORTH	133,332	29,652	103,680	$ 303.30	134,310	29,668	104,642	$ 306.92	3.62	1.2%
DPL SOUTH	133,332	43,678	89,654	$ 262.27	134,310	47,378	86,932	$ 254.97	-7.3	-2.8%
PEPCO	134,299	50,810	83,489	$ 244.23	136,733	59,498	77,235	$ 226.53	-17.7	-7.2%
ATSI, Cleveland	132,665	42,399	90,266	$ 264.06	133,413	44,367	89,046	$ 261.17	-2.89	-1.1%
COMED	132,665	20,388	112,277	$ 328.44	133,413	20,967	112,446	$ 329.81	1.37	0.4%
BGE	134,299	60,589	73,710	$ 215.62	136,733	75,931	60,802	$ 178.33	-37.29	-17.3%
PL	134,311	39,368	94,943	$ 277.74	133,465	42,320	91,145	$ 267.33	-10.41	-3.7%
DAYTON	132,665	37,856	94,550	$ 277.35	133,413	40,287	93,126	$ 273.14	-4.21	-1.5%
DEOK	132,665	34,408	97,988	$ 287.43	133,413	37,109	96,304	$ 282.46	-4.97	-1.7%

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 the January 15th 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. A PRD Provider that is committing PRD in a BRA must also submit a PRD election in the eRPM 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.

As shown in the 2020/2021 Planning Parameters, 558 MW of PRD across the RTO has elected to participate in the 2020/2021 BRA: 330 MW in the BGE LDA, 170 MW in the PEPCO LDA, and 58 MW in the EMAAC LDA (with 23 MW located in the DPL-South LDA). The VRR Curve of the RTO and each affected LDA is shifted leftward along the horizontal axis by the UCAP MW value of these quantities at the PRD Reservation Price. Once committed in a BRA, a PRD commitment cannot be replaced; the commitment can only be satisfied through the registration of price response load in the eLRS system prior to or during the Delivery Year.

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Summary

- The forecast peak load for the PJM RTO for the 2020/2021 Delivery Year is 153,915 MW which is 3,273 MW or about 2.1% below the forecast peak load of 157,188 MW for the 2019/2020 BRA.

- The PJM RTO Reliability Requirement for the 2020/2021 Delivery Year is 167,644 MW which is 3,393 MW or about 2.0% below the 2019/2020 BRA value prior to adjustment for FRR obligation.

- The MAAC, EMAAC, SWMAAC, PS, PSNORTH, PEPCO, DPLSOUTH, ATSI, Cleveland, ComEd, BGE, PPL, DAYTON and DEOK LDAs will be modeled in the 2020/2021 BRA. These are the same LDAs that were modeled in the 2018/2019 and 2019/2020 BRAs with the addition of the DAYTON and DEOK LDAs.

- LDA Reliability Requirements for the 2020/2021 BRA are lower than those of the 2019/2020 BRA primarily due to lower forecast peak load levels for 2020/2021.

- 558 MW of Price Responsive Demand has elected to participate in the 2020/2021 Base Residual Auction: 330 MW in the BGE LDA, 170 MW in the PEPCO LDA, and 58 MW in the EMAAC LDA (with 23 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.