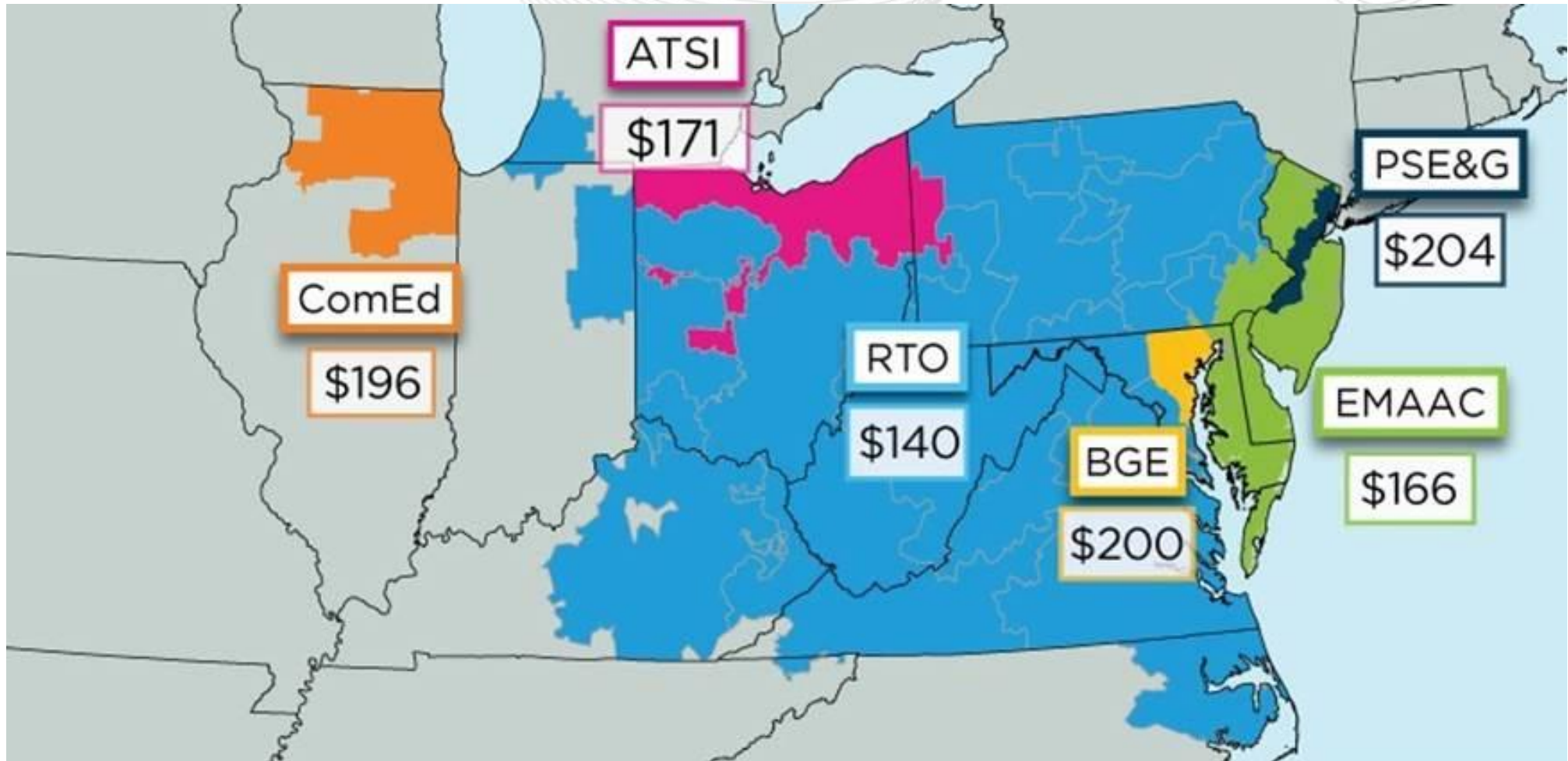


# Capacity Benefits Simulation for Market Efficiency Projects

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Market Efficiency Process Enhancement Task Force  
June 7, 2019

- BRA is conducted three years prior to the Delivery Year
- In the BRA, PJM procures capacity on behalf of LSEs using a Variable Resource Requirement (VRR) demand curve
- Planning Parameters are posted prior to each BRA on the RPM webpage (<https://www.pjm.com/markets-and-operations/rpm.aspx>) which include:
  - Reliability Requirements for the RTO and modeled LDAs
  - VRR demand curves for the RTO and modeled LDAs
  - Capacity Emergency Transfer Limit (CETL) of modeled LDAs w/ limiting facilities
- Capacity Market Sellers submit resource-specific sell offers during the auction bidding window
- An auction report and results spreadsheet are posted after the auction has been conducted on the RPM webpage





# Planning Parameters

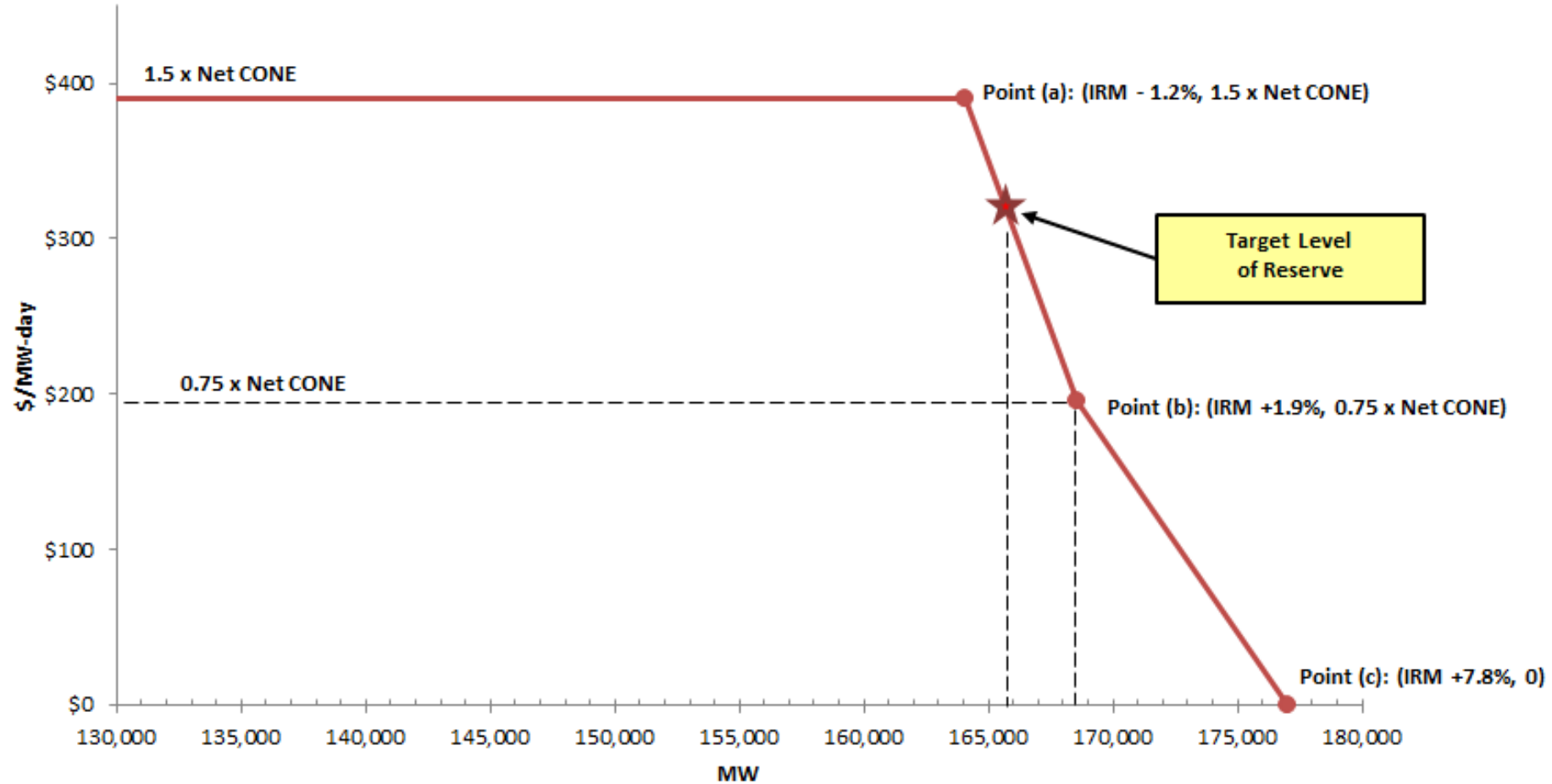
2022-2023 RPM Base Residual Auction Planning Parameters		5/1/2019								
	RTO	Notes:								
Installed Reserve Margin (IRM)	15.7%	2018 IRM Study								
Pool-Wide Average EFORD	5.90%	2018 IRM Study								
Forecast Pool Requirement (FPR)	1.0887	2018 IRM Study								
Preliminary Forecast Peak Load	152,312.8	Load data from March 2019 Load Report with adjustments due to load served outside PJM. Forecast includes Peak Shaving Adjustment programs included in								
Locational Deliverability Area										
	RTO	MAAC	EMAAC	SWMAAC	PS	PS NORTH	DPL SOUTH	PEPCO	ATSI	ATSI-Cleveland
CETO	NA	-8,380.0	2,370.0	3,580.0	5,540.0	2,690.0	1,010.0	1,750.0	7,590.0	3,950.0
<b>CETL</b>	NA	2,252.0	9,752.0	9,158.0	7,445.0	3,777.0	1,676.0	7,645.0	9,925.0	5,217.0
Reliability Requirement	165,822.9	64,964.0	36,302.0	15,044.0	11,557.0	6,131.0	2,924.0	8,104.0	15,038.0	5,141.0
Total Peak Load of FRR Entities (To be Updated)	0.0	0	0	0	0	0	0	0	0	0
Preliminary FRR Obligation	0.0	0	0	0	0	0	0	0	0	0
Reliability Requirement adjusted for FRR	<b>165,822.9</b>	<b>64,964.0</b>	<b>36,302.0</b>	<b>15,044.0</b>	<b>11,557.0</b>	<b>6,131.0</b>	<b>2,924.0</b>	<b>8,104.0</b>	<b>15,038.0</b>	<b>5,141.0</b>
Gross CONE, \$/MW-Day (UCAP Price)	\$312.04	\$313.35	\$314.44	\$319.39	\$314.44	\$314.44	\$314.44	\$319.39	\$307.16	\$307.16
<b>Net CONE, \$/MW-Day (UCAP Price)</b>	<b>\$260.43</b>	<b>\$250.66</b>	<b>\$266.47</b>	<b>\$231.78</b>	<b>\$273.85</b>	<b>\$273.85</b>	<b>\$244.95</b>	<b>\$257.27</b>	<b>\$236.03</b>	<b>\$236.03</b>
EE Addback (UCAP) (To be Updated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Variable Resource Requirement Curve:</b>										
Point (a) UCAP Price, \$/MW-Day	\$390.65	\$375.99	\$399.71	\$347.67	\$410.78	\$410.78	\$367.43	\$385.91	\$354.05	\$354.05
Point (b) UCAP Price, \$/MW-Day	\$195.32	\$188.00	\$199.85	\$173.84	\$205.39	\$205.39	\$183.71	\$192.95	\$177.02	\$177.02
Point (c) UCAP Price, \$/MW-Day	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Point (a) UCAP Level, MW	164,103.0	64,290.2	35,925.5	14,888.0	11,437.1	6,067.4	2,893.7	8,019.9	14,882.0	5,087.7
Point (b) UCAP Level, MW	168,546.0	66,030.8	36,898.1	15,291.0	11,746.8	6,231.7	2,972.0	8,237.1	15,285.0	5,225.4
Point (c) UCAP Level, MW	177,002.0	69,343.6	38,749.3	16,058.2	12,336.1	6,544.3	3,121.1	8,650.3	16,051.8	5,487.6

22/23 BRA Planning Parameters posted at <https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2022-2023/2022-2023-bra-planning-period-parameters.ashx?la=en>

- Reliability Requirements for the RTO and modeled LDAs are used to set the target level of reserves and establish the VRR demand curves
- RTO Reliability Requirement\* = RTO Forecasted Peak Load \* FPR
  - FPR: Forecast Pool Requirement (e.g. 1.0887)
  - Forecasted Peak Loads determined using most recent PJM Load Forecast Report
- LDA Reliability Requirement\* = LDA Internal Capacity + CETO
  - CETO: Capacity Emergency Transfer Objective of the LDA

*\*Note: Adjustments may be made to the Reliability Requirements for FRR, EE, and PRD*

# Variable Resource Requirement (VRR) Curve







# Auction Results and Zonal Capacity Prices

Summary of 2021/2022 Base Residual Auction Results

**Capacity Cleared & Resource Clearing Prices**

LDA/External Source Zone	Base Residual Auction	
	Total Resources Cleared for PJM LSEs (MW)	Resource Clearing Price (\$/MW-day)
RTO *	163,627.3	\$140.00
MAAC	67,365.9	\$140.00
EMAAC	29,288.5	\$165.73
SWMAAC	10,106.7	\$140.00
PS	5,367.6	\$204.29
PSNORTH	3,133.3	\$204.29
DPLSOUTH	1,673.8	\$165.73
PEPCO	5,948.8	\$140.00
ATSI	8,007.3	\$171.33
ATSI-CLEVELAND	1,248.0	\$171.33
COMED	22,358.1	\$195.55
BGE	1,937.7	\$200.30
PL	11,233.1	\$140.00
DAYTON	1636.7	\$140.00
DEOK	2733.3	\$140.00

Summary of 2021/2022 Base Residual Auction Results

5/23/2018

**Zonal UCAP Obligations, Zonal Capacity Prices, & Zonal CTR Credit Rates**

Zone	Base Residual Auction			
	Base Zonal UCAP Obligation (MW)	Adjusted Preliminary Zonal Capacity Price (\$/MW-day)	Base Zonal CTR Credit Rate (\$/MW-UCAP Obligation-day)	Preliminary Zonal Net Load Price (\$/MW-day)
AE	2,687.1	\$166.31	\$3.23	\$163.08
AEP *	12,707.7	\$140.53	\$0.00	\$140.53
APS	10,317.8	\$140.53	\$0.00	\$140.53
ATSI	14,464.9	\$171.86	\$13.87	\$157.99
BGE	7,435.0	\$203.19	\$41.57	\$161.62
COMED	24,983.0	\$196.08	\$3.40	\$192.69
DAYTON	3,786.2	\$140.53	\$0.00	\$140.53
DEOK *	5,189.8	\$140.53	\$0.00	\$140.53
DLCO	3,194.8	\$140.53	\$0.00	\$140.53
DOM	22,505.4	\$140.53	\$0.00	\$140.53
DPL	4,373.0	\$166.31	\$3.23	\$163.08
EKPC *	2,534.7	\$140.53	\$0.00	\$140.53
JCPL	6,538.6	\$166.31	\$3.23	\$163.08
METED	3,338.0	\$140.53	\$0.00	\$140.53
PECO	9,722.8	\$166.31	\$3.23	\$163.08
PENLC	3,206.4	\$140.53	\$0.00	\$140.53
PEPCO	7,116.0	\$140.53	\$0.00	\$140.53
PL	8,183.7	\$140.53	\$0.00	\$140.53
PS	10,901.1	\$204.92	\$20.88	\$184.03
RECO	441.3	\$166.31	\$3.23	\$163.08
<b>Total</b>	<b>163,627.3</b>			

\*Obligation affected by FRR quantities.

21/22 BRA Results posted at:

<https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2021-2022/2021-2022-base-residual-auction-results.ashx?la=en>



- Simulation ran using the most recent BRA engine
- Two cases: Base case and Project case
  - Project case includes CETL improvement by the proposal
- Simulated cases run for 3 future Delivery Years: RTEP, RTEP + 3, RTEP + 6
- VRR demand curves shifted for future Delivery Years based on latest PJM Load Forecast Report
- Supply offers used from most recent BRA
- Simulation Outputs
  - Zonal change in annual load capacity payments
  - Total annual capacity costs