



Additional Examples for PJM Stage 1 Proposal Supplement to [April 16-17th Presentation](#)

- PJM is proposing a 2-stage selection process
 - Stage 1: Gating criteria pass/fail evaluation
 - Stage 2: Selection based on MW-weighted average cost of capacity (UCAP) over the offered term

$$MW \text{ Weighted Average Offer Cost} = \frac{\sum (UCAP \text{ MW}_{DY} \times Offer \text{ Price}_{DY})}{\sum UCAP \text{ MW}_{DY}}$$

- PJM will select resources up to the RTO target MW value in least-cost order

Sell offers consist of **UCAP MW** and **price** for each **delivery year**.

Target = 8,000 MW

Example	29/30	30/31	31/32	32/33...	MW-Weighted Average Offer Cost for Selection
Supply 1: 100 MW ESR Term: 10 years	55 MW @ \$190	50 MW @ \$200	50 MW @ \$200	49 MW @ \$210	\$199.71
Supply 2: 2,500 MW CC Term: 15 years		2,150 MW @ \$280	2,150 MW @ \$280	2,200 MW @ \$250	\$269.85
Total	55 MW @ \$190	2,200 MW @ \$278.18	2,200 MW @ \$278.18	2,249 MW @ \$249.13	

If the target is set to 8,000 MW in this example, PJM will look to procure 8,000 MW, but may procure less, dependent on available supply – this example is less than the target for illustration purposes.



Sell offers consist of **UCAP MW** and **price** for each **delivery year**.

Selection Example

Target = 8,000 MW

Example	29/30	30/31	31/32	MW-Weighted Average Offer Cost for Selection
Supply 1:	550 MW @ \$200	500 MW @ \$200	500 MW @ \$200	\$200
Supply 2:		2,150 MW @ \$280	2,150 MW @ \$280	\$280
Supply 3:	1,800 MW @ \$290	1,800 MW @ \$290	1,800 MW @ \$290	\$290
Supply 4:	3,000 MW @ \$300	3,000 MW @ \$300	3,000 MW @ \$300	\$300
Supply 5:			550 MW @ \$310	\$310
Supply 6:	550 MW @ \$320	550 MW @ \$320	550 MW @ \$320	\$320
Total	5350 MW @ \$279.16	7,450 MW @ \$285.10	8,000 MW @ \$288.69	

- PJM would procure supply based on the MW weighted average offer cost until the target MW is met for any delivery year between the 2029/2030 and 2031/2032 Delivery Years.
- Supply 6 would not clear in this example, as the 8,000 MW is met with clearing Supply 5.



Example #2b – Resource Settlement

RBP Load Assignment > RPM Load Assignment

RBP Price < RPM Price

RBP Clearing		
Cleared MW (UCAP)	50	
Price (\$/MW-Day)	\$200	
Expected RBP Settlement	\$10,000	
RPM Clearing		
Cleared MW (UCAP)	50	
Price (\$/MW-Day)	\$350	
Settlements		
RPM Auction Credits	\$17,500	RPM Cleared MW * RPM Price
RBP Credits	(\$7,500)	RBP Cleared MW * (RBP Price - RPM Price)
Total Credits	\$10,000	

The RPM Revenues are more than the expected RBP Settlement resulting in a negative RBP Credit. The total amount paid to the RBP resource is equal to the Expected RBP Settlement.



Example # 2b – Load Settlement

RBP Load Assignment > RPM Load Assignment
RBP Price < RPM Price

RBP Clearing	
Target MW (UCAP)	50
Price (\$/MW-Day)	\$200
Expected RBP Charges	(\$10,000)
RPM Capacity Charges	
UCAP Obligation MW (UCAP)	30
Final Zonal Capacity Price (\$/MW-Day)	\$350
Settlements	
RPM Charges	(\$10,500)
RBP Charges	\$7,500
Total Charges	(\$3,000)

The RPM Charges are a function of the UCAP Obligation MW and can be lower than what is assigned via the RBP allocation. In our simplistic example of having only one load in the RBP, it would continue to be assessed all 50 MW of RBP Charges even if the actual load was lower.



Example #3a – Resource Settlement

RBP Commitment < RPM Commitment

RBP Resource Clears in Multiple Auctions

RBP Price > WARCP

RBP Clearing		
Cleared MW (UCAP)	50	
Price (\$/MW-Day)	\$200	
Expected RBP Credits	\$10,000	
RPM Clearing		
	BRA	3rd IA
Cleared MW	50	1
Auction Price	\$75	\$90
Weighted Average RCP (WARCP)	\$75.29	
Daily Committed MW (UCAP)	51	
Daily Owned MW (UCAP)	51	

In the event a resource clears in multiple Auctions, the Contract for Differences will be calculated as the difference between the RBP Price and the resource’s Weighted Average Resource Clearing Price.

The total amount paid to the RBP resource is above the Expected RBP Credits due to the extra 1 MW Committed in the IA at WARCP.

Settlements		
RPM Auction Credits	\$3,840	RPM Cleared MW * RPM Price
RBP Credits	\$6,235.29	RBP Cleared MW * (RBP Price - RPM WARCP)
Total Credits	\$10,075.29	Expected RBP Credits + (Incremental MW * RPM WARCP)



Example #3a – Load Settlement

RBP Commitment < RPM Commitment

RBP Resource Clears in Multiple Auctions

RBP Price > WARCP

RBP Clearing	
Target MW (UCAP)	50
Price (\$/MW-Day)	\$200
Expected RBP Charges	(\$10,000)
RPM Capacity Charges	
UCAP Obligation MW (UCAP)	50
Final Zonal Capacity Price (\$/MW-Day)	\$75.29

RPM Charges are less than the expected RBP Charges resulting in an RBP Charge.

The total amount paid by the RBP load is equal to the Expected RBP Charges. The RBP load does not pay for the additional RPM credits paid to the resource due to the IA clearing.

Settlements		
RPM Charges	(\$3,764.71)	UCAP Obligation MW* FZP
RBP Charges	(\$6,235.29)	RBP Credits
Total Charges	(\$10,000)	

Example assumes additional 1 MW of Cleared UCAP in 3rd IA is allocated to a non-RBP LSE



Example #3b – Resource Settlement

RBP Commitment = RPM Commitment

RBP Resource in IA Only

RBP Price > WARCP

RBP Clearing		
Cleared MW (UCAP)	50	
Price (\$/MW-Day)	\$200	
Expected RBP Credits	\$10,000	
RPM Clearing		
	BRA	3rd IA
Cleared MW	0	50
Auction Price	\$200	\$90
Weighted Average RCP (WARCP)	\$90	
Daily Committed MW (UCAP)	50	
Daily Owned MW (UCAP)	50	
Settlements		
RPM Auction Credits	\$4,500	RPM Cleared MW * RPM Price
RBP Credits	\$5,500	RBP Cleared MW * (RBP Price - RPM WARCP)
Total Credits	\$10,000	Expected RBP Credits + (Incremental MW * RPM WARCP)

In the event a resource clears in only in Incremental Auctions, the Contract for Differences will still be calculated as the difference between the RBP Price and the resource's Weighted Average Resource Clearing Price.

Example #3b – Load Settlement

RBP Commitment = RPM Commitment

RBP Resource in IA Only

RBP Price > WARCP

RBP Clearing		
Target MW (UCAP)	50	
Price (\$/MW-Day)	\$200	
Expected RBP Charges	(\$10,000)	
RPM Capacity Charges		
UCAP Obligation MW (UCAP)	50	
Final Zonal Capacity Price (\$/MW-Day)	\$195*	
Settlements		
RPM Charges	(\$9,750)	UCAP Obligation MW* FZP
RBP Charges	(\$5,500)	RBP Credits
Total Charges	(\$15,250)	

RBP Load can pay more than the Expected Charges in the event the Final Zonal Capacity Price is higher than the WARCP.

*Example assumes BRA procured majority of the RPM Obligation at \$200, causing the Final Zonal Capacity Price to be much higher than the IA Clearing Price.



Example #5a – RBP Resource Deficiency Full Shortfall with Must-Offer Exemption

RBP Clearing	
Cleared MW (UCAP)	50
Price (\$/MW-Day)	\$200
Expected RBP Credits	\$10,000
RPM Clearing	
Cleared MW (UCAP)	0
Price (\$/MW-Day)	\$75
Daily Committed MW (UCAP)	-
Daily Owned MW (UCAP)	-

Resource was granted an exemption to the must offer requirement ahead of the auction for a one-year COD delay.

Resource is not paid for the undelivered RBP MW, resulting in a \$0 RBP Credit payment. In addition, Resource is subject to RBP Shortfall Charge of 20% RBP Price.

Example assumes connect and manage is being allocated

Settlements		
RPM Auction Credits	\$0	RPM Cleared MW * RPM Price
RPM Commitment Deficiency MW	0	Daily Committed MW – Daily Owned MW
RPM Commitment Charge	\$0	RPM Commitment Deficiency MW * 1.2 * RPM WARCP
RBP Credits	\$0	Daily Owned MW * (RBP Price - RPM Price)
RBP Shortfall Penalty MW	50	RBP Cleared MW - min (RPM Cleared MW, Daily Owned MW)
RBP Shortfall Charges	(\$2,000)	RBP Shortfall Penalty MW * .2*RBP Price
Total Credits	(\$2,000)	Total Settlement is less than Expected due to non-delivery of full RBP and Deficiencies



Example #5a – RBP Load Allocation of Deficiency

RBP Full Shortfall; RPM Full Shortfall

RBP Clearing	
Cleared MW (UCAP)	50
Price (\$/MW-Day)	\$200
Expected RBP Charges	(\$10,000)
RPM Clearing	
UCAP Obligation MW (UCAP)	50*
Final Zonal Capacity Price (\$/MW-Day)	\$75

Load does not pay for the undelivered RBP MW, resulting in no RBP Charges. In addition, Load is allocated RBP Shortfall Charges collected.

Example assumes connect and manage is being allocated

Settlements		
RPM Charges	(\$3,750)	UCAP Obligation MW* FZP
RPM Commitment Deficiency Credits	\$0	
RBP Charges	\$0	Equal to RBP Credits
RBP Shortfall Credits	\$2,000	Allocated RBP Shortfall Charges
Total Charges	(\$1,750)	Load is credited due to non-delivery of RBP Commitment and RPM Commitment

*Example assumes the auction procured the RPM Obligation from other resources.



Contract for Differences for Supply Resources

Calculation of the CfD are determined based on the summation of credits for all resources.

New Unit Auction Results and Settlements

Unit	Zone	RBP				BRA			
		Cleared	Price	Cost	Owned	Offered	Cleared	Price	Credits
1	RTO	1,000	\$300	\$300,000	1,000	1,000	1,000	\$350	\$350,000
2	B	1,000	\$600	\$600,000	1,000	1,000	1,000	\$500	\$500,000
3	C	0	\$0	\$0	0	0	0	\$500	\$0
		2,000		\$900,000			2,000		

$$Avg\ Cost = \frac{\sum_i^n Cleared\ MW_i \times Price_i}{\sum_i^n Cleared\ MW_i}$$

$$Avg\ Cost = \frac{1,000\ MW \times \$300 + 1,000\ MW \times \$600}{1,000\ MW + 1,000\ MW}$$

CfD are determined through the supply resources, and then costs are allocated to affected zones.

Deliv MW	Price Diff	Credit	Shortfall	Shortfall \$
1,000	(\$50)	(\$50,000)	0	\$0
1,000	\$100	\$100,000	0	\$0
0		\$0	0	\$0
2000		\$50,000	0	\$0

Settlements				
RPM Credits	RBP Credits	Total	Penalty	Net Credit
\$350,000	(\$50,000)	\$300,000	\$0.0	\$300,000
\$500,000	\$100,000	\$600,000	\$0.0	\$600,000
\$0	\$0	\$0	\$0.0	\$0.0
\$850,000	\$50,000	\$900,000		

Total contract for difference amount are allocated back to the affected zones based on the RBP target MW.

Zone/EDC Load Settlements

		RBP					BRA		
EDC	LDA	Demand	Share	Alloc MW	Avg. Price	Cost	Cleared	Price	Credits
A	RTO	1,000	20%	400	\$450	\$180,000	12,000	\$350	\$4,200,000
B	B	2,000	40%	800	\$450	\$360,000	3,000	\$500	\$1,500,000
C	C	2,000	20%	800	\$450	\$360,000	9,000	\$500	\$4,500,000
		5,000		2,000		\$900,000	24,000		\$10,200,000

CfD for RBP resources are allocated to EDC.

This allocation is shared pro-rata across all EDCs which have RBP commitments.

UCAP Obligations and Prices

EDC	LDA	RPM Obl	FZCP
A	RTO	9,600	\$350
B	B	4,800	\$500
C	C	9,600	\$500
		24,000	

Settlements

EDC	LDA	RPM Credits	CfD Credits	RPM Charges	Alloc RBP Charges	CTR \$	Net Charge
A	RTO			\$3,360,000	\$10,000	\$0	\$3,370,000
B	B			\$2,400,000	\$20,000	\$270,000	\$2,150,000
C	C			\$4,800,000	\$20,000	\$90,000	\$4,730,000
			\$50,000	\$10,560,000	\$50,000	\$360,000	\$10,250,000