Capacity Performance Training

July 8, 2015

- Provide Capacity Market Sellers with information necessary to participate in the Reliability Pricing Model (RPM) under a Capacity Performance design
- Focus on updates to RPM that impact participation in 2018/2019 Delivery Year Base Residual Auction and the CP Transitional Incremental Auctions for 2016/2017 & 2017/2018 Delivery Years

- Training is targeted to Capacity Market Sellers
  - Generation Owners
  - Curtailment Service Providers
  - Energy Efficiency Providers

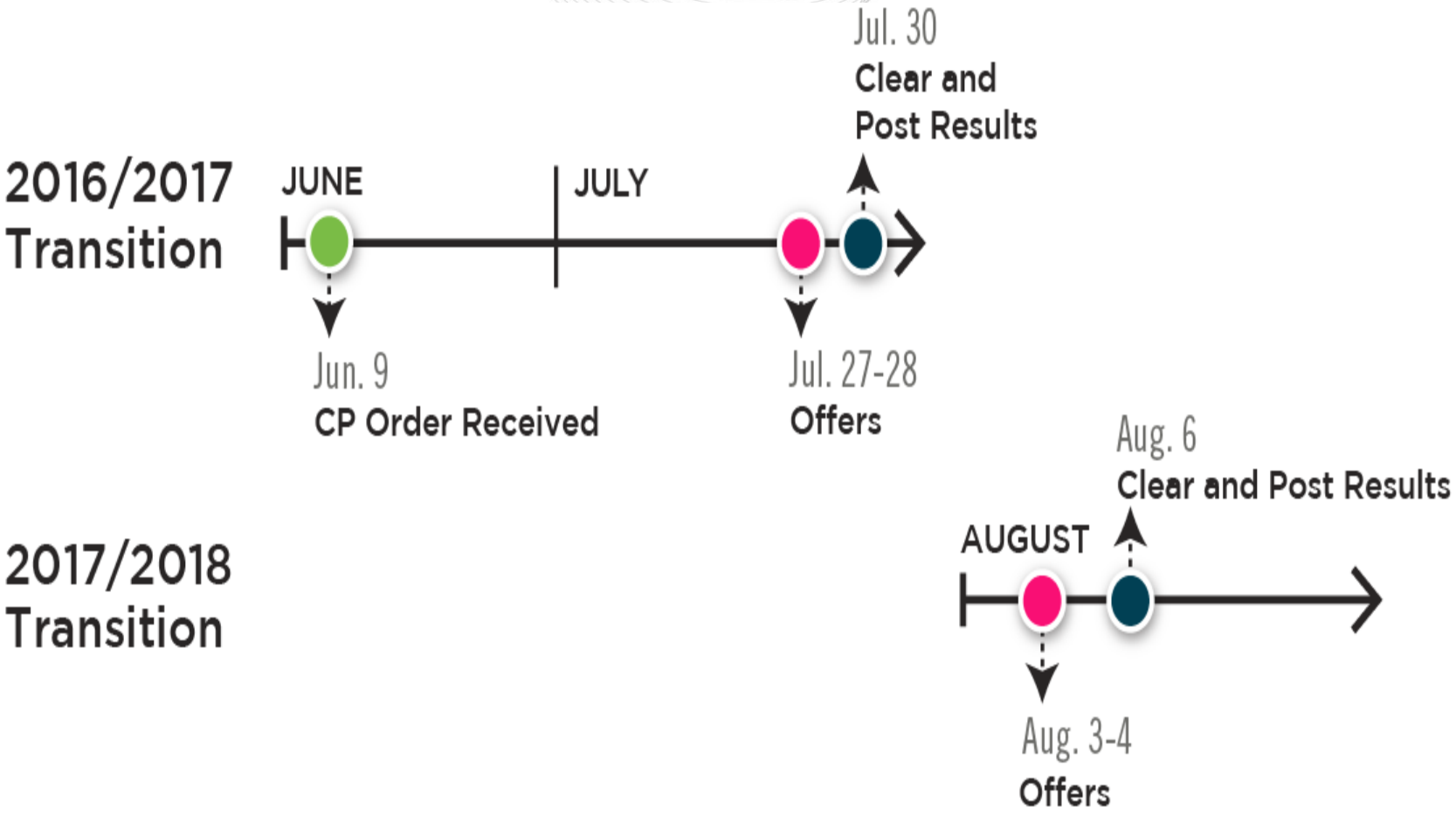
- Training developed for those that have an understanding of the current Reliability Pricing Model design and key provisions of the CP filing

Today's Agenda

- Auction Timeline
- CP Transition Incremental Auctions
- Capacity Performance & Base Capacity Products
- Participation in Base Residual Auctions
  - DR Sell Offer Plan Updates/EE M&V Plan Updates
  - Must-Offer Requirements
  - CP Market Seller Offer Caps
  - Intermittent and Capacity Storage Resources
  - Coupled Offers
  - Aggregate Resource
  - Credit Requirement
- Non-Performance Assessment

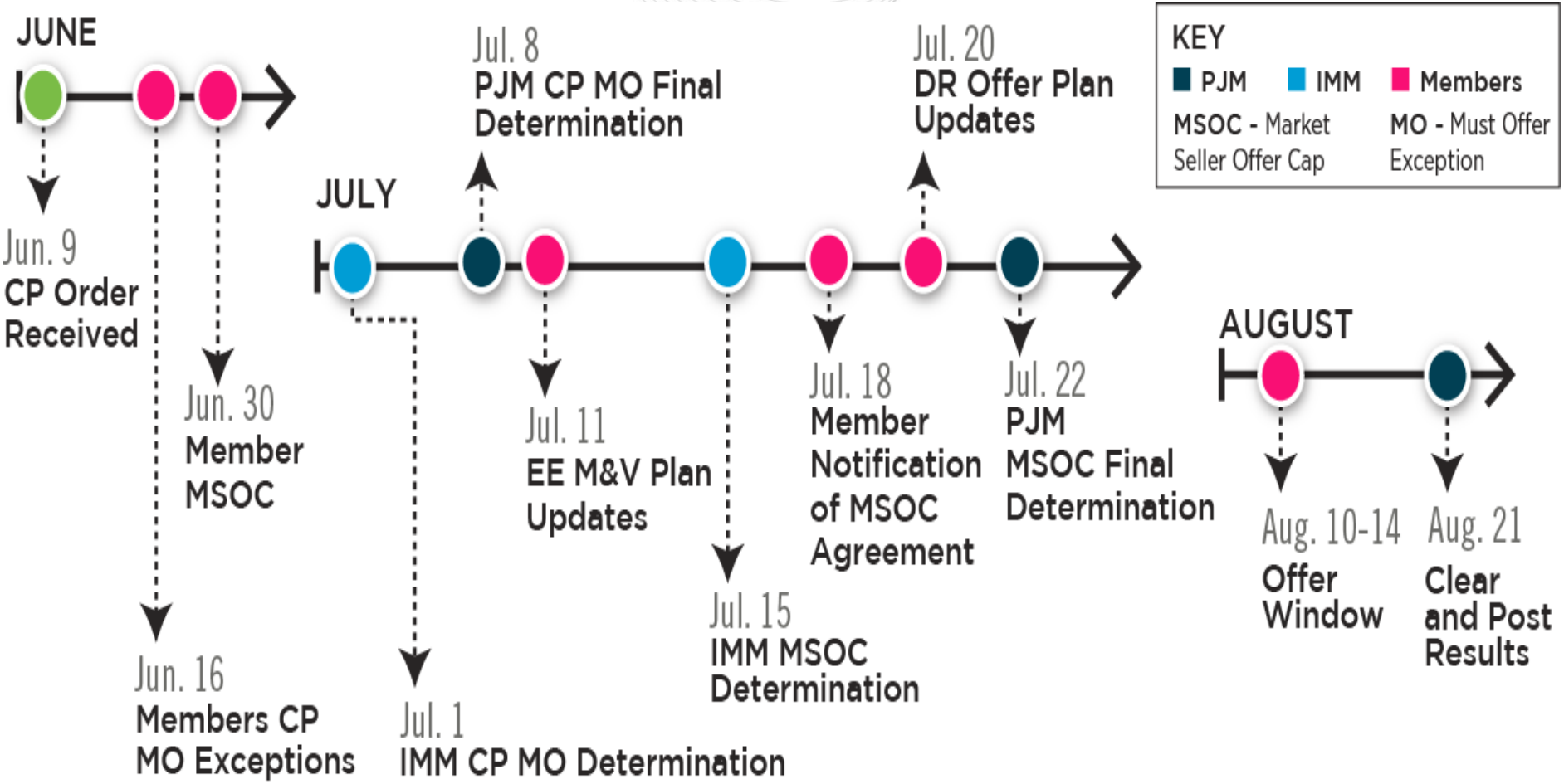
Auction Timeline

Transition Auction Schedule



Note:
2016/2017 DY 2nd Incremental Auction will be held July 13 –17 with results posted on July 24.

2018/2019 BRA



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CP Transition Auctions

- Please refer to posted document “Capacity Performance Transition Incremental Auctions - Rules, Schedule and Planning Parameters”
  - provides detailed explanation and examples of rules for auction participation, auction clearing, auction settlements and performance obligations of the CP Transition Incremental Auctions
- Rule numbers cited in this section of training material refer to rule numbers used in the posted “Rules, Schedule and Planning Parameters” document

CP Transition Auction Schedule

	Offer Window Opens	Offer Window Closes	Results Posted
2016/2017 CP Transition IA	Mon., July 27, 2015 at 12:00 AM EPT	Tues., July 28, 2015 at 4:00 PM EPT	Thurs., July 30,2015 after 4:00 PM EPT
2017/2018 CP Transition IA	Mon., Aug 3, 2015 at 12:00 AM EPT	Tues., Aug 4, 2015 at 4:00 PM EPT	Thurs., Aug 6, 2015 after 4:00 PM EPT

Target Procurement Quantities & Auction Clearing Price Caps

- Target CP procurement quantities for 2016/2017 & 2017/2018 Transition Auctions of 60% and 70%, respectively, of updated RTO Reliability Requirement
- Auction clearing price caps for 2016/2017 & 2017/2018 Transition Auctions of 50% and 60%, respectively, of RTO Net CONE
- No locational specific requirements; therefore, each auction will clear at a single clearing price

	Target Procurement	Auction Clearing Price Caps	
2016/2017 CP Transition IA	95,097 MW	50% of RTO Net CONE	$165.27/MW-day
2017/2018 CP Transition IA	112,194 MW	60% of RTO Net CONE	$210.83/MW-day

- Participation is voluntary in each Transition Auction
- Sell offers accepted from any generation capacity resource that can meet the requirements of a CP Resource, regardless of whether it is already committed to provide capacity for relevant Delivery Year, including:
  - External generation resources with CIL exception and reasonably expected to be pseudo-tied by the applicable Delivery Year
  - Planned generation resources with executed Interconnection Service Agreement (see Rules #16 - #18 for credit requirements)
  - Intermittent Resources and Capacity Storage Resources for that MW quantity that can meet the CP requirements
  - Resource must be capable of meeting CP requirements on a stand-alone basis; Aggregate Resource sell offers effective with 2018/2019 Delivery Year

Voluntary Participation

- A resource that does not participate will retain all commitments and revenues associated with clearing in prior auctions for the relevant Delivery Year
- A resource that clears in a CP Transition Auction will receive payment for each cleared CP MW based on the Transition Auction clearing price, replacing any prior commitments and revenues (Rule #14 provides details and examples of auction credit determination)
- Resource Sell Offers are not subject to mitigation
  - A resource may submit a sell offer at any price
  - No sell offer will be cost-capped; however, any sell offer in excess of the applicable auction clearing price cap will not clear the auction.

- PJM attempts to procure CP capacity in quantity up to the target procurement quantity at a price no higher than the auction clearing price cap
- Auction clearing price is set by the marginal resource offers when PJM procures the target procurement quantity
- Auction clearing price will equal the auction clearing price cap if the target procurement quantity is not cleared
- If two or more sell offers are marginal then the auction will be cleared to minimize total costs including make-whole payments (see Rule #10 for tie-break logic)

Transition DY Non-Performance Assessment

- CP MW commitments cleared in CP Transition Auctions are subject to Non-Performance Assessment Charges associated with CP commitments
- Non-Performance Charge Rate & Stop Loss is reduced during Transition Delivery Years (see Rule #11 for applicable rates and stop-loss values)
- Total Charges collected for each assessment hour are allocated only to over-performing CP resources during Transition Delivery Years

Transition DY Non-Performance Assessment (cont.)

- For any generation resource with both an Annual Resource and a CP commitment, Actual Performance will first be assigned to the resource's Expected Performance as a CP Resource, and next assigned to the resource's Annual commitment; any remaining Actual Performance is used for purposes of determining Bonus Performance
- 100 MW resource with 50 MW CP commitment and 40 MW Annual commitment. Metered output of 100 MW during event hour (assume Balancing Ratio of .9):
  (1) Expected Performance = 50 MW*0.9 = 45 MW
  (2) Annual ICAP MW Commitment = 40 MW
  (3) Bonus MW = 100 MW – 45 MW – 40 MW = 15 MW

Capacity Performance & Base Capacity Products

- Capacity Performance Resources must be capable of sustained, predictable operation that allows resource to be available to provide energy and reserves during performance assessment hours throughout the Delivery Year
- Subject to Non-Performance Charge assessed during emergency conditions throughout entire Delivery Year

- Base Capacity Resources are those capacity resources that are not capable of sustained, predictable operation throughout the entire Delivery Year; but are capable of providing energy and reserves during hot weather operations.
- Subject to Non-Performance Charge assessed during emergency conditions during June through September

Demand Resource Product Type Requirements

Requirement	Limited DR	Extended Summer DR	Annual DR	Base Capacity Demand Resource (18/19 & 19/20 DY only)	Capacity Performance Demand Resource (Effective 18/19 DY)
Availability	Any weekday, other than NERC holidays, during June – Sept. period of DY	Any day during June- October period and following May of DY	Any day during DY (unless on an approved maintenance outage during Oct. - April)	Any day during June-September of DY	Any day during DY (unless on an approved maintenance outage during Oct.-April)
Maximum Number of Interruptions	10 interruptions	Unlimited	Unlimited	Unlimited	Unlimited
Hours of Day Required to Respond *(Hours in EPT)*	12:00 PM – 8:00 PM	10:00 AM – 10:00 PM	Jun – Oct. and following May: 10 AM – 10 PM Nov. – April: 6 AM- 9 PM	10:00 AM – 10:00 PM	Jun – Oct. and following May: 10 AM – 10 PM Nov. – April: 6 AM- 9 PM
Maximum Duration of Interruption	6 Hours	10 Hours	10 Hours	10 Hours	No limit

Current Limited, Extended Summer, & Annual DR product definitions eliminated effective 2018/2019 DY.

Energy Efficiency Resource Product Type Requirements

Product-type	Load Reduction Provided	Requirement	Nominated EE Value
Base Capacity EE	During summer peak season	Provide a permanent, continuous reduction in load during the defined EE Performance Hours that is not reflected in the peak load forecast prepared for the Delivery Year.	Average demand reduction during EE Performance Hours
Capacity Performance EE	During summer and winter peak seasons	Provide a permanent, continuous reduction in load during the EE Performance Hours that is not reflected in the peak load forecast prepared for the Delivery Year. It also must have an expected average load reduction during defined winter hours.	Average demand reduction during EE Performance Hours, not to exceed average demand reduction during winter hours.

EE Performance Hours are defined as the hours ending 15:00 through 18:00 EPT during all days from June 1 through August 31, inclusive, of such Delivery Year, that is not a weekend or federal holiday.

Winter Hours are hour ending 8:00 through 9:00 EPT and hours ending 19:00 through 20:00 EPT during all days from January 1 through February 28, inclusive, of such Delivery Year, that is not a weekend or federal holiday.

Product-related Changes Impacting RPM Auctions (Effective 2018/2019 Delivery Year)

- Replace Limited DR and Sub-Annual DR Constraints with Base Capacity DR/EE and Base Capacity Resource Constraints
  - Base Capacity DR/EE Constraint – maximum amount of Base Capacity DR and EE that may be procured in RPM Auctions
  - Base Capacity Resource Constraint – maximum amount of Base Capacity DR and EE and Base Capacity Generation Resources that may be procured in RPM Auctions
  - Constraints determined for PJM Region and each modeled LDA
- Eliminate the DR Factor in determination of DR and EE UCAP value
- Include forced outages that are outside management control (OMC) in the calculation of pool-wide average EFORd and individual resource EFORd
- Eliminate the Short-Term Resource Procurement Target

Participation in Base Residual Auctions

DR Sell Offer Plan Updates for 2018/2019 DY BRA

- All previously submitted and approved DR Sell Offer Plans are valid and still considered to be in effect
- No need for the CSP to update or resubmit DR Sell Offer Plan unless the CSP now intends to offer a larger zonal DR quantity than initially approved
- Such updates must be submitted to PJM no later than the end of the day on July 20, 2015
- The DR Set-up window will open on July 15, 2015 and close on August 7, 2015 (further communication on the DR Set-up process will be forthcoming)

EE M&V Plan Updates for 2018/2019 DY BRA

- All previously submitted and approved EE M&V Plans are valid and still considered to be in effect
- Approved Nominated EE Values will be considered to be Base Capacity unless EE Provider provides a plan addendum establishing a CP value (the maximum amount of approved Nominated EE MW that may be offered as CP for an EE Resource)
- Addendums must be provided to PJM no later than the end of the day on July 11, 2015
- The addendum should be a brief document that concisely provides support for that portion of the prior approved Nominated EE values that can meet the requirements of CP

Overall Must-Offer Requirement

- All Existing Generation Capacity Resources must-offer available UCAP MWs into all RPM auctions, including external generation capacity that has CIL exception
  - Includes Planned generation not yet in-service but has cleared a prior auction
- Must-offer exceptions meeting specified requirements permitted with request submitted no later than 120 days prior to auction

- All Generation Capacity Resources that are capable or can reasonably become capable of qualifying as CP must be offered as CP (including external Generation Capacity Resources with CIL exception)
  - Intermittent Resources, Capacity Storage Resources, Demand Resources and EE Resources are categorically exempt from the CP must-offer requirement
- Exceptions are permitted if seller can demonstrate that resource is reasonably expected to be physically incapable of meeting CP requirements
- A resource that requires substantial investment to qualify as CP is not excused from CP must-offer requirement but is expected to include such costs in its CP sell offer

CP Market Seller Offer Cap (MSOC)

- The “default” CP MSOC for a CP Generation Capacity Resource is the Net CONE of the zonal LDA in which the resource resides multiplied by Balancing Ratio of 0.85
- Market Sellers may qualify to submit a CP offer above the default CP MOSC by submitting ACR/APIR data to the IMM and PJM
- A Generation Capacity Resource having a CP must-offer requirement and an accepted CP MSOC greater than the applicable default CP MSOC must submit a coupled sell offer as both a CP and a Base Capacity Resource if offering CP above the default MSOC

Intermittent & Capacity Storage Resource Sell Offers 2018/2019 & 2019/2020 DY RPM Auctions

- Intermittent Resources and Capacity Storage Resources must offer their full UCAP value into each auction but are exempt from requirement to offer as CP
- Such resources may offer as CP all or any portion of their UCAP value that qualifies as CP with remaining portion offered as Base Capacity
- The quantity of UCAP value that may qualify as CP for such resources may be based on expected output during summer and winter peak conditions

Intermittent Resources are generation capacity resources with output that can vary as a function of its energy source, such as wind, solar, landfill gas, run of river hydroelectric power and other renewable resources.
Capacity Storage Resources include any hydroelectric power plant, flywheel, battery storage, or other such facility solely used for short term storage and injection of energy at a later time.

CP Quantity Determination Example
Sample Solar Resource

Solar Resource	
Nameplate Capacity	100 MW
UCAP Value (CIRs)	38 MW
Avg output: summer performance hours	38 MW
Avg output: winter performance hours	2 MW
Avg output: all performance hours	20 MW
Acceptable CP MW Range	0-20 MW
Required Total Offer MW (Base + CP)	38 MW

Expected performance hours:

- Winter: hours ending 6 -9 &18-21 in months of January & February.
- Summer: hours ending 15-20 in months of June, July, & August.

Averaging hourly output from all peak-hour defined above is one acceptable method for determining CP quantity of intermittent resources. This approach, however, may result in significant non-performance risk for a resource with average expected seasonal output that varies significantly from the average expected output across all hours in peak-hour period.

- Example solar resource could acceptably offer from 0 MW to 20 MW as CP with increasing non-summer performance risk
- For 18/19 and 19/20 delivery years, that portion of the 38 MW UCAP value that is not offered as CP must be offered as Base Capacity

CP Quantity Determination Example
Sample Wind Resource

Wind Resource	
Nameplate Capacity	100 MW
UCAP Value (CIRs)	13 MW
Avg output: summer performance hours	13 MW
Avg output: winter performance hours	40 MW
Avg output: all performance hours	26 MW
Acceptable CP MW Range	0-13 MW
Required Total Offer MW (Base + CP)	13 MW

Expected performance hours:

- Winter: hours ending 6 -9 &18-21 in months of January & February.
- Summer: hours ending 15-20 in months of June, July, & August.

- Example wind resource could reasonably offer up to the full 13 MW UCAP value as CP (cannot offer MW quantities above the resource's CIR value)
- For 18/19 and 19/20 delivery years, that portion of the full 13 MW UCAP value that is not offered as CP must be offered as Base Capacity

Demand Resource and EE Resource Sell Offers

- DR and EE Resources that meet the CP product requirements are eligible to offer as CP but are not required to offer as CP
- Such Resources may offer as CP, or as Base Capacity or submit a coupled sell offer for both

Coupled Sell Offers

Coupled CP and Base Offers (Effective 2018/2019 and 2019/2020 DY)

- Any resource that can meet requirements as CP may submit separate but coupled CP and Base Sell Offers with a price difference reflective of the cost to meet requirements of CP
    - Generation Capacity Resource CP and Base Sell Offers are subject to respective offer caps
- Generation Capacity Resource having a CP must-offer requirement and an accepted CP MSOC greater than the applicable default CP MSOC must submit a coupled sell offer as both a CP and a Base Capacity Resource if offering CP above the default MSOC

Submitting Coupled Sell Offers

- Participants may submit coupled Sell Offers on the eRPM Resource Offer screen by entering offer data in both the CP and Base cells of a single Offer Segment
- Each coupled Sell Offer segment is cleared independently of one another
- A non-coupled Sell Offer can be submitted by only entering offer data for one of the products within the Offer Segment

GEN - PJM DUMMY RESOURCE - Annual

Delete

EFORd: 0.00000

Max Offer EFORd: **0**

New Unit Pricing:

MPCE:

EFORd Segment

EFORd Limit: null

Min MW	(null)
Max MW	(null)
Price	(null)

Available ICAP MW

Current	100
Max	100
Min	100

Offer Segments

		1	2	3	4	5	6	7	8	9	10
Capacity Performance	Min MW	0.0	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)
	Max MW	80.0	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)
	Price	300.00	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)
Base	Min MW	0.0	0.0	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)
	Max MW	80.0	20.0	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)
	Price	150.00	150.00	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)
Scheduling Option		Regular Schedule	Regular Schedule	(null)	(null)	(null)	(null)	(null)	(null)	(null)	(null)
Self Supply		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Clearing Coupled CP and Base Sell Offers

- The auction will only clear one of the products (at most) in a coupled Sell Offer segment and will choose the product that results in the least-cost solution for the system
- Although not guaranteed, the coupled offer will typically clear in a manner that results in the greatest apparent profit for the seller, i.e., the product cleared in the auction will be the product that shows the largest difference between the applicable resource clearing price and the applicable product sell offer price of the coupled offer

Product	Max MW	Offer Price	Clearing Price	Cleared MW	Apparent Profit (Clearing Price – Offer Price) * MW
CP	80	$300	$350	0	($350 - $300) * 80 = $4,000
Base	80	$150	$250	80	($250 - $150) * 80 = $8,000

- It is guaranteed that the auction will honor the sell offer prices of both products and will not clear a product if the applicable resource clearing price is below the applicable product sell offer price

Aggregate Resources

Aggregate Resource

- Effective with 2018/2019 Delivery Year, Capacity Resources which may not, alone, meet the requirements of a Capacity Performance product, may combine their capabilities and offer as a single Aggregate Resource
  - Applies to Intermittent Resources, Capacity Storage Resources, Demand Resources, Energy Efficiency Resources, and environmentally limited resources
  - Resources being combined must be located in the same modeled LDA and reside in a single Capacity Market Seller account
- Seller may offer the Aggregate Resource as Capacity Performance at a UCAP value that is representative of a capacity performance product (not to exceed the UCAP value of the individual resources that make up the aggregate)

2018/2019 DY - Locational Requirements for Resources Comprising Aggregate

Modeled LDA for Aggregate Resource	Resources comprising aggregate must reside in Zone(s)/Sub-zone
Rest of RTO	AEP, APS, DAYTON, DEOK, DLCO, DOM, or EKPC
Rest of MAAC	METED or PENELEC
Rest of EMAAC	AE, Rest of DPL, PECO, JCPL, or RECO
Rest of PS	Rest of PS
PS North	PS North
DPL South	DPL South
PEPCO	PEPCO
Rest of ATSI	Rest of ATSI
ATSI-Cleveland	ATSI-Cleveland
COMED	COMED
BGE	BGE
PPL	PPL

Example of Aggregate Resource

	Wind	Solar
Nameplate Capacity	100 MW	100 MW
UCAP Value (CIRs)	13 MW	38 MW
Avg output: summer performance hours	13 MW	38 MW
Avg output: winter performance hours	40 MW	2 MW
Avg output: all performance hours	26 MW	20 MW
Acceptable CP MW Range	0-13 MW	0-20 MW
Required Total Offer MW (Base + CP)	13 MW	38 MW

Aggregate Resource	
UCAP Value	51 MW
Acceptable CP MW Range	0-46 MW
Required Total Offer MW (Base + CP)	51 MW

- Aggregate Resource could reasonably offer up to 46 MW as CP (at significantly lower risk versus individual resource offers)
- For 18/19 and 19/20 delivery years, that portion of the full 51 MW UCAP value that is not offered as CP must be offered as Base Capacity

Aggregate Resource Process

- Market Seller that intends to create an Aggregate Resource must submit a written email request to rpm_hotline@pjm.com at least two weeks prior to the opening of the RPM.
  - Requests due no later than July 24, 2015 for 2018/2019 BRA
- Requests must specify:
  - ✓ Capacity resources that are being combined to form the Aggregate Resource
  - ✓ Installed capacity owned on each generation resource
  - ✓ Nominated DR Value for each Demand Resource
  - ✓ Nominated EE Value for each EE Resource
  - ✓ Requested UCAP value for Aggregate Resource
- Requests should include explanation of how aggregation allows one or more of the resources that are being combined to realize a higher level of CP (in UCAP MWs) than the individual resources could provide themselves, supporting data for the CP level of the aggregate resource & initial MW allocation among component resources
- PJM will review requests and provide notification to Market Seller of the UCAP value approved for the Aggregate Resource.
- PJM will model the Aggregate Resource in the eRPM system for the relevant Delivery Year.
- Once Aggregate Resource is modeled, the Market Seller will not be able to offer into RPM Auction or transact bilaterally for the relevant Delivery Year those individual resources that make up the Aggregate Resource.

Aggregate Resource Non-Performance Assessment

- The total committed quantity of an Aggregate Resource must be allocated by product type (Base, Base DR/EE, and Capacity Performance) to the underlying capacity resources prior to the start of the Delivery Year with adjustments permitted up to 12 noon EPT of the day preceding the delivery day
- Daily commitment allocations used in the calculation of Expected Performance for the underlying capacity resources in Non-Performance Assessment in order to properly determine Performance Shortfall/Bonus Performance of the Aggregate Resource
- Sum of the Performance Shortfall/Bonus Performance calculated for the underlying capacity resources that were required to perform during the Performance Assessment Hour establishes the Performance Shortfall/Bonus Performance for the Aggregate Resource for such Performance Assessment Hour.
- Non-Performance Assessment Charges/Credits will be assessed to the Aggregate Resource.

Aggregate Resource Non-Performance Assessment Example #1

Example #1: Aggregate Resource clears 42 MW of CP and 9 MW of Base Capacity. Emergency Action in EMAAC in Summer

DATE: July 1, DY		Daily Commitment Allocation (UCAP MW)	
Resource	**Location**	**CP**	**Base**
Solar	JCPL	31	7
Wind	PECO	11	2
Aggregate	**EMAAC**	**42**	**9**

Daily commitment allocation used to determine Expected Performance

Performance Assessment Hour in EMAAC: July 1, DY HR Ending 16:00
Assume Balancing Ratio = 1.0

Resource	Location	Output (MW)	Product	Expected Performance (MW)	Actual Performance (MW)	Performance Shortfall* (MW)
Solar	JCPL	48	CP	31	41	-10
			Base	7	7	0
Wind	PECO	8	CP	11	8	3
			Base	2	0	2
Aggregate	**EMMAC**					**-5**

**Negative Performance Shortfall represents over performance (Bonus Performance).*

Aggregate Resource Non-Performance Assessment Example #2

Example #2: Aggregate Resource clears 42 MW of CP and 9 MW of Base Capacity. Emergency Action in EMAAC in Winter

DATE: February 1, DY		Daily Commitment Allocation (UCAP MW)	
Resource	**Location**	**CP**	**Base**
Solar	JCPL	2	0
Wind	PECO	40	9
Aggregate	**EMAAC**	**42**	**9**

Daily commitment allocation used to determine Expected Performance

Performance Assessment Hour in EMAAC: February 1, DY HR Ending 08:00
Assume Balancing Ratio = 1.0

Resource	Location	Output (MW)	Product	Expected Performance (MW)	Actual Performance (MW)	Performance Shortfall*(MW)
Solar	JCPL	1	CP	2	1	1
			Base	0	0	0
Wind	PECO	45	CP	40	40	0
			Base	9	5	0**
Aggregate	**EMMAC**					**1 (CP)**

**Negative Performance Shortfall represents over performance (Bonus Performance).*
***Performance Shortfall set to zero for Base generation resource commitments in non-summer period.*

RPM Credit Requirements

RPM Auction Credit Rates

- Retain current RPM Auction Credit Rates for planned Base Capacity Resources and new RPM Auction Credits Rates for planned Capacity Performance Resources

Auction Credit Rate	Current RPM Auction Credit Rates (apply to planned Base Capacity Resources)	Proposed RPM Auction Credit Rates (apply to planned Capacity Performance Resources)
Pre-BRA	greater of (i) $20/ MW-day or (ii) .3 * RTO Net CONE (in $/MW-day), times the number of days in the Delivery Year.	greater of (i) 0.5*PJM LDA Net CONE ($/MW-day) or (ii) $20/MW-day, times number of days in the DY.
Post-BRA	greater of (i) $20/MW-day or (ii) .2 *applicable BRA RCP ($/MW-day), times the number of days in the Delivery Year.	greater of the following daily rates, times number of days in DY: • $20/MW-day • 0.20 times applicable BRA RCP ($/MW-day) • Lesser of (i) 0.5*LDA Net CONE or (ii)1.5*LDA Net CONE (in ICAP terms) minus the applicable BRA RCP.
Pre-IA	greater of (i) 0.3* RTO Net CONE or (ii) 0.24 times the applicable BRA RCP ($/W w-day), or (iii) $20 per MW-day, times the number of days in the Delivery Year.	greater of (i) 0.5*LDA Net CONE ($/MW-day) or (ii) $20/MW-day, times number of days in the DY.
Post IA	greater of (i) $20/MW-day or (ii) 0.2 * the applicable IA RCP, but no greater than the pre-clearing Incremental Auction Credit Rate for such Incremental Auction, times the number of days in the Delivery Year.	greater of the following daily rates, times number of days in DY: • $20/MW-day • 0.20 times applicable IA RCP ($/MW-day) • Lesser of (i) 0.5*LDA Net CONE or (ii)1.5*LDA Net CONE (in ICAP terms) minus the applicable IA RCP.

LDA Net Cone refers Net CONE for modeled LDA where resource resides.

Pre-Auction RPM Credit Requirement =

Planned MWs Offered * applicable Auction Credit Rate * RPM Credit Adjustment Factor

- If offering planned MWs as coupled CP and Base sell offer, CP Auction Credit Rate applies
- For Pre-Auction RPM Credit Requirement, the RPM Credit Adjustment Factor is only applicable to an existing external resource and is dependent on the amount of firm transmission service secured for complete transmission path.
- RPM Credit Requirement for planned generation resources (internal, external, financed, & non-financed) are reduced by the applicable Incremental Credit Reduction percentage as the resource attains stated milestones

- Participants are responsible for posting sufficient collateral to cover their planned resource sell offers prior to the close of the auction sell offer window
  - PJM recommends posting the collateral early to avoid any last minute issues that may arise
  - Planned resource sell offers that do not have sufficient credit in place will be removed at the close of the sell offer window
- PJM will update eCredit with the pre-auction credit requirements at the close of the auction sell offer window
  - PJM cannot accurately determine the credit requirements earlier due to the reliance on details submitted in the participant's sell offer (e.g. MW, Product Type, Product Coupling all impact the credit requirement)
- PJM will post a credit calculator to the RPM webpage to help participant's determine their pre-auction credit requirement for the 2018/19 BRA

Non-Performance Assessment

Non-Performance Assessment

- New Performance Assessment that replaces DR Event Compliance for Demand Resources, and replaces Peak-Hour Period Availability Assessment & Peak Season Maintenance Compliance for generation
- Assesses performance of capacity resources during emergency conditions
- Applies to both Base Capacity Resources and Capacity Performance Resources
- Base Capacity Resources exposed to Non-Performance Charges only for performance during Emergency Actions in summer months

Expected Performance vs. Actual Performance

- Compare a resource's Expected Performance against Actual Performance for each Performance Assessment Hour
  - If resource has both CP and Base commitments, actual performance is first assigned to meet CP Expected Performance followed by assignment to Base Expected Performance with any remaining actual performance assigned as Bonus MWs.
- Performance Assessment Hours delineated by PJM's declaration of Emergency Actions
- Demand Resource's performance will be evaluated if dispatched during Performance Assessment Hour
- Evaluate performance and calculate shortfall/excess for each Performance Assessment Hour separately
- Shortfall subject to Non-Performance Charge
- Excess (Bonus Performance) may be eligible for Performance Credit

Expected Performance vs. Actual Performance

		Summer Performance Assessment Hour (June - Sept)		Non-Summer Performance Assessment Hour	
Resource Type	**Product**	**Expected Performance**	**Actual Performance**	**Expected Performance**	**Actual Performance**
Generation/Storage	Capacity Performance	Committed UCAP * Balancing Ratio	Metered Energy Output + Reserve/Regulation Assignment	Committed UCAP * Balancing Ratio	Metered Energy Output + Reserve/Regulation Assignment
Generation/Storage	Base	Committed UCAP * Balancing Ratio	Metered Energy Output + Reserve/Regulation Assignment	Committed UCAP * Balancing Ratio; *0 for Performance Shortfall calculation*	Metered Energy Output + Reserve/Regulation Assignment
Demand Response	Capacity Performance	Committed ICAP	Load Reduction + Reserve/Regulation Assignment	Committed ICAP	Load Reduction (CBL Method) + Reserve/Regulation Assignment
Demand Response	Base	Committed ICAP	Load Reduction + Reserve/Regulation Assignment	0	Load Reduction (CBL Method) + Reserve/Regulation Assignment
Energy Efficiency	Capacity Performance	Committed ICAP	PJM Approved Post-Installation Load Reduction	Committed ICAP	PJM Approved Post-Installation Load Reduction
Energy Efficiency	Base	Committed ICAP	PJM Approved Post-Installation Load Reduction	N/A	N/A
Qualifying Trans. Upgrade (QTU)	Capacity Performance	Committed UCAP	Committed UCAP if In-Service; otherwise 0	Committed UCAP	Committed UCAP if In-Service; otherwise 0
Energy Only Resources	N/A	0	Metered Energy Output + Reserve/Regulation Assignment	0	Metered Energy Output + Reserve/Regulation Assignment
Energy Imports	N/A	0	Net Energy Import	0	Net Energy Import

$$\text{Balancing Ratio} = \frac{\text{Total Generation \& Storage Actual Performance + Net PJM Energy Imports + DR Bonus Performance}}{\text{Total Generation \& Storage Committed UCAP}}$$

Non-Performance Charge Rate

- Non-Performance Charge Rate is based on yearly Net CONE (Capacity Performance Resources) or yearly Resource Clearing Price (Base Capacity Resources) and a small divisor (i.e., an assumed 30 Emergency Action hours per year).
- Non-Performance Charge Rate for CP Resources ($/MWh) = [LDA Net CONE ($/MW-day) * number of days in Delivery Year]/30
  - If LDA Net CONE = $300/MW-day, the Non-Performance Charge Rate = [$300/MW-day * 365 days]/30 = $3,650/MWh
- Non-Performance Charge Rate for Base Capacity Resources ($/MW-hr) = [Weighted Average Resource Clearing Price ($/MW-day) for such resource * number of days in Delivery Year]/30

Appendix

Summer Performance Assessment Hour Example

Emergency Action called for entire RTO during Summer period

- Sample capacity resources below dispatched to their full MW capability except:
  - GEN RES 1 is backed down 30 MW by PJM for a transmission constraint
  - GEN RES 2 and 4 are on Partial and Full Forced Outages respectively
- Applicable LDA Net CONE (ICAP): $300/MW-day; Base WARCP: $150/MW-day
- Non-Performance Charge Rate for Capacity Performance Resources: $3,650/MWh
- Non-Performance Charge Rate for Base Resources: $1,825/MWh
- Generation & Storage Balancing Ratio: 80%

Resource	Product	Committed MW	Expected Performance	Actual Performance	Notes	Exempt MW	Performance Shortfall	Charge Rate ($/MWh)	Total Charges ($)	Bonus Performance	Total Credits ($)
GEN RES 1	CP	125.0	100.0	95.0	Dispatched down 30 MW for transmission constraint	5	0.0			0.0	
GEN RES 2	CP	125.0	100.0	44.0	Partial Forced Outage		56.0	$ 3,650.00	$204,400.00	0.0	
GEN RES 3	CP	100.0	80.0	100.0			0.0			20.0	$55,480.00
GEN RES 4	Base	80.0	64.0	0.0	Full Forced Outage		64.0	$ 1,825.00	$116,800.00	0.0	
DR RES 5	CP	30.0	30.0	28.0			2.0	$ 3,650.00	$7,300.00	0.0	
DR RES 6	Base	20.0	20.0	25.0			0.0			5.0	$13,870.00
EE RES 7	CP	20.0	20.0	15.0			5.0	$ 3,650.00	$18,250.00	0.0	
GEN RES 8	Energy	0.0	0.0	100.0			0.0			100.0	$277,400.00
							127.0		**$346,750.00**	**125.0**	**$346,750.00**

Winter Performance Assessment Hour Example

Emergency Action called for entire RTO during Winter period

- Sample capacity resources below dispatched to their full MW capability except:
  - GEN RES 1 is backed down 30 MW by PJM for a transmission constraint
  - GEN RES 2 and 4 are on Partial Forced Outages
- Applicable LDA Net CONE (ICAP): $300/MW-day; Base WARCP: $150/MW-day
- Non-Performance Charge Rate for Capacity Performance Resources: $3,650/MWh
- Non-Performance Charge Rate for Base Resources: N/A
- Generation & Storage Balancing Ratio: 77%

Resource	Product	Committed MW	Expected Performance	Actual Performance	Notes	Exempt MW	Performance Shortfall	Charge Rate ($/MWh)	Total Charges ($)	Bonus Performance	Total Credits ($)
GEN RES 1	CP	125.0	96.2	95.0	Dispatched down 30 MW for transmission constraint	1.2	0.0			0.0	
GEN RES 2	CP	125.0	96.2	75.0	Partial Forced Outage		21.2	$ 3,650.00	$77,380.00	0.0	
GEN RES 3	CP	100.0	77.0	100.0			0.0			23.0	$77,036.47
GEN RES 4	Base	80.0	61.6	50.0	Partial Forced Outage		N/A			0.0	
DR RES 5	CP	30.0	30.0	25.0			5.0	$ 3,650.00	$18,250.00	0.0	
DR RES 6	Base	20.0	0.0	1.0			N/A			1.0	$3,349.41
EE RES 7	CP	20.0	20.0	15.0			5.0	$ 3,650.00	$18,250.00	0.0	
GEN RES 8	Energy	0.0	0.0	10.0			0.0			10.0	$33,494.12
							31.2		**$113,880.00**	**34.0**	**$113,880.00**

Commitment Compliance

Commitment Compliance when Base Capacity & CP Commitments on Resource

- Assess whether a committed resource meet its daily RPM commitments (CP & Base)
- Determine daily shortfall due to CP commitments and daily shortfall due to Base commitments for a committed resource on the delivery day
  - Generation – UCAP value used to satisfy CP commitments prior to satisfying Base commitments
  - DR -determine shortfall of meeting CP commitments and shortfall of meeting Base commitments for such DR Resource based on approved product-specific registrations in eLRS linked to such DR
  - EE - determine shortfall of meeting CP commitments and shortfall of meeting Base commitments for such EE Resource based on Nominated EE Values approved as Base and CP in DY Post Installation M&V Report

Example of Commitment Compliance Shortfall for Generation Resource

DY ICAP Value = 200 MW, DY EFORd = 0.05

DY UCAP Value = 200 MW * (1-0.05) = 190 MW

UCAP value used to satisfy CP commitments prior to satisfying Base commitments.

	UCAP Commitment (MW)	Assigned UCAP Value (MW)	Commitment Shortfall (MW)
CP	105	105	0
Base	90	85	5
Total	195	190	5

Provider may cure 5 MW shortfall by specifying replacement capacity to reduce CP and/or Base commitments by a total of 5 MWs.

Daily Deficiency Rate

- Daily Deficiency Rate applied will be commitment-specific
- Daily Deficiency Rate for Shortfalls due to Base Commitments is based on party's Weighted Average RCP for base commitments for such resource
- Daily Deficiency Rate for Shortfalls due to CP commitments is based on party's Weighted Average RCP for CP commitments for such resource
- Daily Deficiency Rate = party's commitment-specific WARCP for such resource plus higher of [0.2 * commitment–specific WARCP for such resource OR $20/MW-day]

Example of commitment-specific Daily Deficiency Rate

Capacity Resource clears MWs in BRA & 2nd IA with Base & CP MWs Cleared

	BRA MWs Cleared (UCAP MWs)	BRA RCP ($/MW-day)	2nd IA MWs Cleared (UCAP MWs)	2nd IA RCP ($/MW-day)	Total Commitments (UCAP MWs)	WARCP ($/MW-day)	DDR ($/MW-day)
Base	90	$100	0	$120	90	$100.00	$ 120.00
CP	100	$200	5	$220	105	$200.95	$ 241.14
Total	190		5		195		

Base WARCP = [(90 MW *$100/MW-day)+(0 MW *$120/MW-day)]/90 MW = $100.00/MW-day
Base DDR = $100/MW-day + (0.2*100/MW-day) = $120/MW-day

CP WARCP = [(100 MW *$100/MW-day)+(5 MW *$220/MW-day)]/105 MW = $200.95/MW-day
CP DDR = $200.95/MW-day + (0.2*200.95/MW-day) = $241.14/MW-day