

M18 Updates for Capacity Performance Filing

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MRC Meeting
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- M18 updates for CP reviewed at following meetings:
 - March 9 Special MRC Meeting
 - March 26 MRC Meeting
 - June 18 Special MRC Meeting
 - June 25 MRC Meeting
 - July 15 Special MRC Meeting
- Updates for Section 4.8 Credit Requirements endorsed at July 15 Special MRC Meeting
- Endorsement being sought for remaining updates

Proposed Revision	Impacted M-18 Sections
<p>Update capacity product definition</p> <ul style="list-style-type: none"> Recognize two product types, Capacity Performance (new product type) and Base Capacity (redefined summer product), effective 2018/2019 & 2019/2020 Delivery Years. Transition solely to Capacity Performance product type effective 2020/2021 Delivery Year. 	<ul style="list-style-type: none"> 1.1 Overview of PJM Capacity Market 1.5 Transition to Capacity Performance (new section) 2.3.4 Capacity Import Limits 4.1 Overview of Supply in Reliability Pricing Model 4.3.1 Requirements of Load Management Products in RPM 4.3.3 Demand Resources 4.3.5 Pre-Emergency and Emergency Load Response Registration 4.4 Energy Efficiency Resources 4.4.1 Determination of Nominated Value of EE Resources 4.5 Qualified Transmission Upgrades 4.6.2 Entering Unit-Specific Bilateral Transactions 4.6.6 Auction Specific MW Transactions 4.6.7 Cleared Buy Bid Transactions 4.6.8 Locational UCAP Transactions 5.3.1 Resource-specific Sell Offer Requirements 5.4 Buy Bids in RPM 8.7 Replacement Resources 11.4.1 Resource Portfolio (FRR) Attachment B: Authorization to Self-Schedule Capacity

Proposed Revision	Impacted M-18 Sections
Eliminate Short Term Resource Procurement Target	1.3 Definition and Purpose of RPM 3.3 Parameters of Variable Resource Requirement 3.4 & 3.4.1 Plotting the Variable Resource Requirement Curve 3.5 Demand Curves in the Incremental Auctions 5.3 RPM Auction Parameters 5.7 Incremental Auctions
Conduct Transition Incremental Auction for 2016/2017 & 2017/2018 Delivery Years to procure Capacity Performance Resources	1.5 Transition to Capacity Performance (new section) 5.1 Overview of RPM Auctions 5.7 Incremental Auctions
Eliminate forced outage rates that are outside management control (OMC) from Pool-wide average EFORd and a unit's EFORd.	2.1.3 Pool-wide average EFORd 4.2.5 Equivalent Demand Forced Outage Rate (EFORd)
Replace Limited Resource Constraint & Sub-Annual Resource Constraint (to be effective for 2017/2018 only) with Base Capacity Demand Resource Constraint and Base Capacity Resource Constraint (effective 2018/2019 & 2019/2020 Delivery Years)	2.4.3A Limited Resource Constraint & Sub-Annual Resource Constraint 2.4.3B Base Capacity Demand Resource Constraint and Base Capacity Resource Constraint (new section) 2.4.4 Adjustments to RPM Auction Parameters for PRD 5.3 RPM Auction Parameters 5.6.2 Auction Clearing Mechanism – Base Residual Auction 5.7.5 Auction Clearing Mechanism – Incremental Auctions 11.1.3 Participation in FRR Alternative 11.3 Capacity Plan (FRR) 11.4.1 Resource Portfolio (FRR)

Proposed Revision	Impacted M-18 Sections
<p>Allow Aggregate Resources effective 2018/2019 Delivery Year</p> <ul style="list-style-type: none"> • May combine Intermittent Resources, Capacity Storage Resources, Demand Resources, Energy Efficiency Resources, or environmentally limited resource in same LDA to form single Aggregate Resource that satisfies Capacity Performance requirements. 	<p>4.1 Overview of Supply in the Reliability Pricing Model 4.6.2 Entering Unit-Specific Bilateral Transactions 4.6.6 Auction Specific MW Transactions 4.6.8 Locational UCAP Transactions 4.9 Aggregate Resources (new section) 5.3.1 Resource-specific Sell Offer Requirements</p>
<p>Replace minimum requirement of Impact Study Agreement to minimum requirement of Facilities Study Agreement for planned generation that is greater than 20 MW (effective 2019/2020 Delivery Year)</p>	<p>4.2.3 Planned Generation Resources –Internal 4.2.4 Planned Generation Resources –External</p>
<p>Elimination of DR Factor effective 2018/2019 Delivery Year</p>	<p>4.3.8 Determination of UCAP Value of Load Management 4.4.2 Determination of UCAP Value of EE Resource 4.7.2 Resource Position for Demand Resources 5.3 RPM Auction Parameters</p>
<p>Update RPM Auction Credit Rates</p> <ul style="list-style-type: none"> • Retain current RPM Auction Credit Rates for planned non-Capacity Performance Resources and propose new Auction Credit Rates for planned Capacity Performance Resources. • Specify Auction Credit Rate for QTU is based on LDA in which upgrade was to increase CETL. 	<p>4.8.3 Auction Credit Rates</p>

Proposed Revision	Impacted M-18 Sections
<p>Include Credit Milestones for Planned Generation Capacity Resources</p>	<p>4.8.2 RPM Credit Requirement 4.8.6 Credit Milestones for Planned Generation Capacity Resources (new section)</p>
<p>Allow Coupled Offers - may submit separate, but coupled Base and Capacity Performance sell offer segments for a capacity resource</p>	<p>5.3.1 Resource-specific Sell Offer Requirements</p>
<p>Include Capacity Performance Must-Offer Requirement (excludes Intermittent Resources, Capacity Storage Resources, Demand Resources, and Energy Efficiency Resources)</p>	<p>5.3.1 Resource-specific Sell Offer Requirements</p>
<p>Set default sell offer cap for Capacity Performance Generation Resource to be product of historical balancing ratio times the Net CONE for zonal LDA in which resource resides</p>	<p>5.3.1 Resource-specific Sell Offer Requirements</p>
<p>Replace Limited Resource Price Decrement and Sub-Annual Resource Price Decrement (to be effective for 2017/2018 only) with Base Capacity Demand Resource Price Decrement and Base Capacity Resource Price Decrement (effective 2018/2019 & 2019/2020 Delivery Years)</p>	<p>5.6.2 Auction Clearing Mechanism – Base Residual Auction 5.7.5 Auction Clearing Mechanism – Incremental Auctions 5.6.1 Zonal Capacity Prices</p>

Proposed Revision	Impacted M-18 Sections
<p>Include Non-Performance Assessment</p> <ul style="list-style-type: none"> • Effective 2018/2019 Delivery Year for all resources committed to RPM and effective 2016/2017 & 2017/2018 Delivery Year for generation resources with Capacity Performance commitments from a Transitional Incremental Auction. • Non-Performance Assessment replaces Peak Hour Period Availability, PSM Compliance, and Load Management Event Compliance effective 2018/2019 Delivery Year. 	<p>8.1 Overview of Resource Performance Assessments 8.4 Generating Unit Peak-Hour Period Availability 8.4A Non-Performance Assessment (new section) 8.4.7 Peak Season Maintenance (PSM) Compliance 8.5 Load Management Event Compliance 9.1.11 Non-Performance Assessment Charge/Bonus Performance Credit (new section) 11.3 Capacity Plan (FRR)</p>
<p>Added language to provide ability to request retroactive replacement capacity transactions meeting certain requirements within three business days after any delivery day that includes a Performance Assessment Hour. Allows for over-performing uncommitted capacity in a sellers account to replace under-performing committed capacity in that same account.</p>	<p>8.7 Replacement Resources</p>
<p>CP impact on FRR Entity's FRR Capacity Plan requirements effective 2019/2020 Delivery Year, including physical option for Non-Performance Assessment.</p>	<p>Section 11 Fixed Resource Requirement Alternative</p>

Appendix

- **New capacity products**
 - Capacity Performance
 - Base Capacity
- **Transition to Capacity Performance**
 - Base Capacity for 2018/19 and 2019/2020 DYs
 - CP only starting 2020/2021 DY
 - CP Transition Incremental Auction for 2016/17 and 2017/18 DYs

- New capacity product
- Capacity Performance Resource shall provide energy and reserves when called upon by PJM during emergencies during entire Delivery Year
- Subject to new Non-Performance Charge
- Eligible to offer into RPM Auctions effective 2018/2019 Delivery Year*
- Sole capacity product beginning 2020/2021 Delivery Year

**Generation Capacity Performance Resources may offer into proposed Transitional Incremental Auctions for 16/17 & 17/18 Delivery Years.*

- Redefined summer capacity product
- Base Capacity Resources are those capacity resources which provide enhanced assurance of delivery and reserves during hot weather operations
- Subject to Non-Performance Charge only when they fail to perform under emergency conditions during June through September
- Eligible to offer into RPM Auctions for 2018/2019 & 2019/2020 Delivery Years only

Capacity Performance - Capacity resource must be capable of sustained, predictable operation that allows the resource to be available throughout the Delivery Year to provide energy and reserves whenever PJM determines an emergency condition exists.

Base Capacity - Capacity resource that is not capable of sustained, predictable operation that allows the resource to be available throughout the entire Delivery Year; however, the resource is capable of providing enhanced assurance to provide energy and reserves during hot weather operations.

- Replace Limited and Sub-Annual Resource Constraints with Base Capacity Demand Resource Constraint and Base Capacity Resource Constraint effective 2018/2019 DY
- **Base Capacity Demand Resource Constraint** – maximum amount of Base Capacity Demand Resources and Base Capacity Energy Efficiency Resources that may clear in RPM Auctions for the Delivery Year
- **Base Capacity Resource Constraint** – maximum amount of Base Capacity Demand Resources, Base Capacity Energy Efficiency Resources, and Base Capacity Generation Resources that may clear in RPM Auctions for the Delivery Year
- Constraints still determined for PJM Region and each modeled LDA

- Elimination of the Short-Term Resource Procurement Target effective 2018/19 DY
- Replace Limited and Sub-Annual Resource Constraints with Base Capacity Demand Resource Constraint and Base Capacity Resource Constraint in Incremental Auction set-up

- Replace minimum requirement of Impact Study Agreement to Facilities Study Agreement for planned generation greater than 20 MW (effective 2019/2020 DY)
- Elimination of forced outages that are outside management control (OMC) from pool-wide average EFORd and individual resource EFORd
- Base Capacity DR and Capacity Performance DR replace Limited, Extended Summer and Annual DR
- Base Capacity EE and Capacity Performance EE replace Annual EE
- Elimination of DR Factor in determination of DR and EE UCAP Value
- Recognize CP and Base products in bilateral and buy bids
- Auction Credit Rate for CP Resources w/ new milestones for Planned Generation
- Aggregate Resources (discuss in more detail in Section 5 review)

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 (<i>Hours in EPT</i>)	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.

- Retain current RPM Auction Credit Rates for planned Base Capacity Resources and propose 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: <ul style="list-style-type: none"> • \$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: <ul style="list-style-type: none"> • \$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.

- Net CONE times Balancing Ratio as market seller offer cap for CP; submittal of ACR data 120 days prior to auction for caps greater than Net CONE times Balancing Ratio
- CP must-offer requirement (& exceptions)
- Coupled Sell Offers for Base and CP Resources
- Replace Limited and Sub-Annual price decrements with Base Capacity DR and Base Capacity Resource price decrements in Auction Clearing Results sub-sections

- 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 CP must-offer requirement
- Exceptions are permitted if seller can demonstrate that resource is reasonably expected to be physically incapable of meeting CP requirements with such request submitted no later than 120 days prior to auction

- A Generation Capacity Resource having a CP must-offer requirement may submit a coupled sell offer as both a CP and a Base Capacity Resource with price difference reflective of cost necessary to qualify as CP
- A Generation Capacity Resource having a CP must-offer requirement and an accepted CP market seller offer cap above (Net CONE times Balancing Ratio) must submit a coupled sell offer as both a CP and a Base Capacity Resource if offering above (Net CONE times Balancing Ratio)

- 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 shall mean 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.

Wind Resource	
Nameplate Capacity	100 MW
UCAP Value (CIRs)	13 MW
Weighted average output during expected performance hours in DY	26 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 from 0 MW to 13 MW as CP with any residual UCAP value offered as Base Capacity.

Solar Resource	
Nameplate Capacity	100 MW
UCAP Value (CIRs)	38 MW
Weighted average output during expected performance hours in DY	20 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 solar resource could reasonably offer from 0 MW to 20 MW as CP with any residual UCAP value offered as Base Capacity.

- DR Resources that meet the CP DR product requirements are eligible to offer as CP but are not required to offer as CP
- EE Resources that meet the CP EE 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

- 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 only
- 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)

	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

- 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.

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).

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	2	CP	2	2	0
			Base	0	0	0
Wind	PECO	39	CP	40	39	1
			Base	9	0	0**
Aggregate	EMMAC					1

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

**Performance Shortfall set to zero for Base generation resource commitments in non-summer period.

- **New Non-Performance Assessment replaces DR Event Compliance for Demand Resources and Peak-Hour Period Availability Assessment & Peak Season Maintenance Compliance for generation resources**

- New performance assessment that replaces DR Event Compliance for Demand Resources, and replaces Peak-Hour Period Availability Assessment & Peak Season Maintenance Compliance for generation resources
- 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

- Compare a resource's Expected Performance against Actual Performance for each Performance Assessment Hour
- 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

Performance is assessed for each hour (or partial hour) that PJM declares the following actions:

- Pre-Emergency Load Management Reduction Action
- Emergency Load Management Reduction Action
- Primary Reserve Warning
- Maximum Emergency Generation, Maximum Emergency Generation Action Trans
- Emergency Voluntary Energy Only Demand Response
- Voltage Reduction Warning, Voltage Reduction Action
- Manual Load Dump Warning
- Manual Load Dump Action

Emergency Action shall mean any emergency action for locational or system-wide capacity shortages that either utilizes pre-emergency mandatory load management reductions or other emergency capacity, or initiates a more severe action, including but not limited to, a Voltage Reduction Warning, Voltage Reduction Action, Manual Load Dump Warning, or Manual Load Dump Action.



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; <i>0 for Performance Shortfall calculation</i>	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

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

- 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

- Stop-Loss provision limits the total Non-Performance Charges assessed
- Limits maximum charges for a calendar year
 - Capacity Performance Resources:
 - For a year, the maximum Non-Performance Charge is $1.5 \text{ Net CONE} * \text{UCAP commitment on the resource}$
 - where UCAP commitment is the maximum daily UCAP commitment on resource during June 1 through the calendar month for which the charge is assessed
 - Base Capacity Resources
 - For a year, the maximum Non-Performance Charge = total capacity revenues due to resource for Delivery Year

- Non-Performance Charges will be distributed to resources (of any type, even if not Capacity Resources) that perform above expectations
- Bonus Performance will be assigned a share of the collected Non-Performance Charge revenues based on the ratio of its Bonus Performance to total Bonus Performance from all resources for the same Performance Assessment Hour
- All performance from a resource with no capacity commitment is considered Bonus Performance

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; 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

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; 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

Replacement Capacity Options for a Commitment

CP Commitment from Transitional IA (16/17-17/18 DY)	CP Commitment (Effective 18/19 DY)	Base Generation Commitment (18/19-19/20 DY)	Base DR/EE Commitment (18/19-19/20 DY)
Available MWs from generation capacity resource eligible to be committed as CP	Available MWs from generation, DR, or EE capacity resource eligible to be committed as CP	<p>Available MWs from a generation capacity resource eligible to be committed as CP or Base</p> <p>Available MWs from DR or EE Resource eligible to be committed as CP</p>	Available MWs from a generation, DR, or EE capacity resource eligible to be committed as CP or Base
	Cleared Buy Bid of CP product-type	Cleared Buy Bid of CP or Base Generation product type	Cleared Buy Bid of CP, Base Generation, or Base DR/EE product-type
Locational UCAP of CP product-type. Source of Locational UCAP must be generation capacity resource.	Location UCAP of CP product-type	Locational UCAP of CP or Base Generation product type	Locational UCAP of CP, Base Generation, or Base DR/EE product-type

Energy-only Resources cannot be used to replace a commitment on a capacity resource.



Resources Eligible for CP or Base Commitments

CP	Base
Internal Generation	Internal Generation
External Generation (meets CIL exception)	External Generation
Capacity Storage Resources	Capacity Storage Resources
Annual Demand Resources	Annual Demand Resources
Annual Energy Efficiency Resources	Annual Energy Efficiency Resources
	Base Demand Resources
	Base Energy Efficiency Resource

- Request must be submitted no later than 3 business days after a Delivery Day containing a Performance Assessment Hour
 - Replacement must be effective with the Delivery Day and replacement resource must meet the following criteria:
 - ★ 1) Must be in same account as resource being replaced
 - 2) Must have been included in same PAHs on Delivery Day as resource being replaced
 - ★ 3) Must have same or better temporal availability as resource being replaced
 - ★ 4) Must be located in same LDA (or a more constrained child LDA) as resource being replaced
- ★ Criteria exists under existing replacement capacity rules.



Example - Before Retroactive Replacement

Resource Position: July 1, DY, Assume DY EFORD=0

Resource	Location	ICAP Owned = UCAP Owned (MW)	CP Commitment (UCAP MW)	Base Commitment (UCAP MW)	Available ICAP = Available UCAP (MW)
Cap Resource 1	AE	100	100	0	0
Cap Resource 2	JCPL	150	75	25	50
Cap Resource 3	PECO	200	0	200	0
Energy Resource 1	AE	0	0	0	0

Cap Resource 2 has Available UCAP on Delivery Day and may be used as a replacement resource for Delivery Day.

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

Resource	Location	Output	Expected Performance (MW)	Actual Performance (MW)	Performance Shortfall* (MW)	Performance Assessment Charge/Credit
Cap Resource 1	AE	90	100	90	10	Charge
Cap Resource 2	JCPL	130	75 (CP)	105	-30	Credit
			25 (Base)	25	0	
Cap Resource 3	PECO	205	200	205	-5	Credit
Energy Resource 1	AE	300	0	300	-300	Credit

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



Example - After Retroactive Replacement

Resource Position: July 1, DY, Assume DY EFORd=0

Resource	Location	ICAP Owned = UCAP Owned (MW)	CP Commitment (UCAP MW)	Base Commitment (UCAP MW)	Available ICAP = Available UCAP (MW)
Cap Resource 1	AE	100	90	0	10
Cap Resource 2	JCPL	150	85	25	40
Cap Resource 3	PECO	200	0	200	0
Energy Resource 1	AE	0	0	0	0

Retroactively replaced 10 MW of CP commitment on Cap Resource 1 with 10 MW of Available UCAP on Cap Resource 2.

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

Resource	Location	Output	Expected Performance (MW)	Actual Performance (MW)	Performance Shortfall* (MW)	Performance Assessment Charge/Credit
Cap Resource 1	AE	90	90	90	0	No Charge
Cap Resource 2	JCPL	130	85 (CP)	105	-20	Credit
			25 (Base)	25	0	
Cap Resource 3	PECO	205	200	205	-5	Credit
Energy Resource 1	AE	300	0	300	-300	Credit

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

- CP implementation effective 2019/2020 Delivery Year for FRR Entities
- Replace Limited Resource and Sub-Annual Resource Constraints with Base Capacity DR and Base Capacity Resource Constraints in FRR Capacity Plan
- Election of non-performance charge or physical non-performance assessment prior to Delivery Year

- Performance Shortfall will be determined separately for CP and Base commitments on each resource in FRR Capacity Plan, where
 - Actual Performance first assigned to meet CP Expected Performance followed by assignment to Base Expected Performance.
 - Any remaining actual performance assigned as CP Bonus MWs if CP commitment on unit; otherwise Bonus MWs assigned as Base Bonus MWs
- Sum of CP Performance Shortfall less Sum of CP Bonus MWs establishes FRR Entity's Net Performance Shortfall related to CP commitments
- Sum of Base Performance Shortfall less Sum of Base Bonus MWs establishes FRR Entity's Net Performance Shortfall related to Base commitments.
- Negative Net Performance Shortfall related to CP commitments (over performance by CP) may be applied to offset positive Net Base Performance Shortfall.
- Negative Net Performance Shortfall related to Base Commitments (over performance by Base) may be applied to offset positive Net CP Performance Shortfall.

- Net Performance Shortfall multiplied by Physical Penalty Rate establishes the additional MW of capacity that FRR Entity must add to FRR Capacity Plan for subsequent Delivery Year.
 - Physical Penalty Rate applied to Net CP Performance Shortfall = 0.01667 MWs/PAH
 - Physical Penalty Rate applied to Net Base Performance Shortfall = $0.01667 * \text{Weighted Average Base RCP for LDA encompassing zone of FRR Entity/LDA Net CONE}$
- Maximum additional MW required as result of CP non-performance during delivery year = 50% of DY CP commitment
- Maximum additional MW required as result of Base non-performance during delivery year = 50% of DY Base commitment * $\text{Weighted Average Base RCP/LDA Net CONE}$



Example of FRR Entity's Physical Penalty for Non-Performance

Example assumes Summer Performance Assessment Hour, Balancing Ratio = 1

WARCP	\$	150.00
Net CONE	\$	300.00

Resource	CP Commitment = CP Expected Performance (MW)	Base Commitment = Base Expected Performance (MW)	Actual Performance (MW)	Actual MW used to meet CP Expected Performance	Actual MW used to meet Base Expected Performance	CP Shortfall MW	Base Shortfall MW	CP Bonus MW	Base Bonus MW
Gen A	100	-	90	90	-	10	-	-	-
Gen B	-	100	105	-	100	-	-	-	5
Gen C	50	50	80	50	30	-	20	-	-
Gen D	50	50	105	50	50	-	-	5	-
Totals						10	20	5	5

Physical Penalty Rate for CP = 0.01667 MW/PAH

Physical Penalty Rate for Base =
 $0.01667 * \$150/\$300 = 0.008335$ MW/PAH

	Net Performance Shortfall MW	Physical Penalty Rate	Additional MW required for subsequent DY FRR Plan
CP	5	0.01667	0.1
Base	15	0.008335	0.1

- CP Transition Incremental Auction for 2016/17 and 2017/18 DYs
- Separate document titled “Capacity Performance Transition Incremental Auctions – Rules, Schedule, & Planning Parameters” is posted on pjm website.
 - provides detailed explanation and examples of rules for auction participation, auction clearing, auction settlements and performance obligations of the CP Transition Incremental Auctions