Seasonal Resources & Resource Aggregation under CP

Seasonal Capacity Resources Senior Task Force

April 4, 2016 (Updated 8/8)*

*see update on slides 15 & 19

Topics

- High Level overview of CP product requirements
- Aggregate Resources
- 2018/2019 BRA Information

Capacity Performance Resource

- 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
- Non-performance charge rate and annual Stop Loss based on applicable Net CONE
  - Hourly charge rate = (Net CONE * number of days in DY) / 30 hours
  - Annual Stop Loss = 1.5 * Net CONE * UCAP MW Commitment

Base Capacity Resource

- 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
- Non-performance charge rate and annual Stop Loss based on applicable Resource Clearing Price (RCP)
  - Hourly charge rate = (RCP * number of days in DY) / 30 hours
  - Annual Stop Loss = total annual capacity revenues of resource

Non-Performance Assessment

- Assess performance of resources during Performance Assessment Hours (PAH) triggered by PJM declaration of Emergency Actions
- Compare a resource's Expected Performance against Actual Performance for each PAH
- Calculate shortfall/excess for each PAH separately
  - Shortfall subject to Non-Performance charge
  - Excess eligible for Bonus Performance credit
- Non-Performance Charges distributed to resources (of any type, even if not Capacity Resources) that perform above expectations

Transition to 100% CP

- Base Capacity and CP for 2018/19 & 2019/20 DYs
  - Base Capacity DR Constraint and Base Capacity Constraint determined for the RTO and each modeled LDA
  - Constraints establish maximum quantity of limited availability products to ensure reliability is maintained at close to “1 in 10” LOLE (10% increase in PJM LOLE)
  - Separate clearing prices if constraint(s) bind in auction
- Capacity Performance is sole capacity product starting 2020/21 DY
  - Base Capacity DR Constraints and Base Capacity Constraints are eliminated

CP Must-Offer Requirement

- 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)
  - Exceptions are permitted if seller can demonstrate that resource is reasonably expected to be physically incapable of meeting CP requirements
- Intermittent Resources, Capacity Storage Resources, Demand Resources and EE Resources are categorically exempt from the CP must-offer requirement

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.

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

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

Update (8/8):
PJM's current proposal in the SCRSTF, would not allow daily capacity commitment allocation for individual resources within an Aggregate Resource to exceed their CIRs. This change would be most evident in the example shown in Slide 19 of this presentation.

- 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 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.

2018/2019 BRA Sell Offers

		Offered MW (UCAP)		Cleared MW (UCAP)	
Resource Type	Product Coupling Scenario	Base Product Type	Capacity Performance Product Type	Base Product Type	Capacity Performance Product Type
Intermittent/Cap Storage	CP and Base	1,443.5	1,449.9	872.8	577.4
Intermittent/Cap Storage	CP Only	-	4,695.2	-	4,154.0
Intermittent/Cap Storage	Base Only	3,935.3	-	3,860.6	-
GEN Sub Total		**5,378.8**	**6,145.1**	**4,733.4**	**4,731.4**
DR	CP and Base	4,467.5	3,528.5	3,688.8	548.2
DR	CP Only	-	936.0	-	936.0
DR	Base Only	6,252.4	-	5,911.4	-
DR Sub Total		**10,719.9**	**4,464.5**	**9,600.2**	**1,484.2**
EE	CP and Base	652.9	657.4	65.1	592.4
EE	CP Only	-	314.7	-	294.9
EE	Base Only	332.7	-	294.1	-
EE Sub Total		**985.6**	**972.1**	**359.2**	**887.3**

Note: there were no Aggregate Resources offered into the 2018/2019 BRA

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.*

Update (8/8):
PJM's current proposal in the SCRSTF would not allow daily capacity commitment allocation for individual resources within an Aggregate Resource to exceed their CIRs, as is done for the wind resources in this example.

2018/2019 BRA Sell Offers

- For 2018/2019 and 2019/2020 BRAs, any resource that can meet requirements as CP may submit separate but coupled CP and Base Sell Offers
- Generation Capacity Resource CP and Base Sell Offers 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 required to submit a coupled sell offer as both CP and Base if offering CP above the default