

# DR implementation process for CP

DRS

September 29, 2015

- DR participation in Transition Auctions
  - Accelerates DR CP implementation (registration through compliance process) by 3 years
  - Overlap with existing products
- Implementation approach will leverage existing process for multiple products
  - Annual DR (ADR)
  - Extended Summer DR (XDR)
  - Limited DR (LDR)

# RPM Products, eRPM modelling & eLRS registrations

Product modelled as individual eRPM resource

1 resource modelled in eRPM with multiple commitments

Product	15/16	16/17	17/18	18/19	19/20	20/21
Limited DR	X	X	X			
Extended Summer DR	X	X	X			
Annual DR	X	X	X			
Base DR				X	X	
Capacity Performance DR		X	X	X	X	X

-- Customers are registered in eLRS by Product --

*\*FRR – LDR/XDR/ADR through 18/19, 19/20 Base/CP, 20/21 CP*



# CP Demand Resource transition to be more consistent with other capacity resources

Requirement	(Today) Limited DR (15/16 – 17/18)	(Today) Extended Summer DR (15/16 – 17/18)	(Today) Annual DR (15/16 – 17/18)	(CP) Base Capacity DR (18/19 & 19/20 DY only)	(CP) Capacity Performance DR (16/17 DY & beyond)
Availability	Non-NERC holiday weekday, June – Sept	June – Oct & May	Any day during DY*	June - Sep	Any day during DY*
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	June – Oct & May: 10 AM – 10 PM Nov. – April: 6 AM- 9 PM	10:00 AM – 10:00 PM	June – Oct. & May: 10 AM – 10 PM Nov. – April: 6 AM- 9 PM
Maximum Duration of Interruption	6 Hours	10 Hours	10 Hours	10 Hours	June – Oct : 12 hours Nov – April: 15 hours

\*unless on an approved maintenance outage during Oct – Apr.

- 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

- Same as existing Load Management registration process except:
  - All registrations for CSP with CP commitment (or Base that wants to receive non-summer bonus payments) will need to go through RRMSE to determine CBL to measure non-summer CP capacity compliance unless tariff is changed through planned tariff clean up process.
    - Emergency/Pre-Emergency
    - Full (includes energy) and Cap Only (may be used as substitute in the future)
    - LDR/XDR/ADR/Base (may be used as substitute in the future)
  - CSP may use alternative CBL (same process as economic registration) if more accurate than default CBL.
- Capacity nomination is same as today (use the PLC)

Intention was to leverage DRS approved Emergency Energy M&V rules which did not require RRMSE to use default CBL but was postponed due to EPSA  
-Propose change at 10/2 GDECS meeting with tariff clean up items-

- The CBL Certification process will identify variable load customers. All customers use a CBL with an error (RRMSE) no greater than 20% unless otherwise approved by PJM.
- If a customer's CBL error is greater than 20% then the customer is considered to be a variable load customer.
- CBL Certification is performed prior to submitting the registration.
  - Input Load Data
  - CSP should run RRMSE
  - Standard CBL with SAA must be run
  - CSP may run other alternative CBLs
- If registration has “successful” RRMSE  $\leq 20\%$  for CBL selected on registration with 30 CBL test days AND RRMSE is lower than Standard CBL THEN CSP may submit and PJM does not need to approve.
- Load Data used must be contiguous where most current date of load data is  $\leq$  current date minus 60.
- If there were prior curtailments in load data used for RRMSE, CSP should identify and notify PJM so an adjustment can be made – this is same process used today for economic registrations.

RRMSE will need to be complete and CBL established for each registration before start of DY – CBLs will not be changed during the DY



- CSP must ensure that sum of nominated MWs on registrations reflect product capability.

eRPM resource	Registration	EDC Acct #	Summer Capability (MW)	Winter Capability (MW)	Capacity Nomination
PECO resource	Registration A	1029384710	10	0	10
		999128347	0	10	

10 MW is annual capability

PJM will allow locations to be aggregated on same registration if they have “season only” capability

- PJM expect to dispatch products together like current protocol but may dispatch on product specific basis if necessary.
  - CPDR will be treated similar to ADR
- PJM will look to respect CP/Base lead time but all Load Management resources may need to reduce load upon dispatch to ensure grid reliability.
  - This is similar to rules for generation
- PJM will use same notification process as today
  - PJM will provide list of registrations dispatched in real time
  - Work in Progress – PJM will clarify whether or not registration must respond immediately or has until end of lead time to fully reduce load.
- PJM will do Sub-Zonal dispatch same as today (LDR, XDR, ADR) for CP and Base

CP/Base performance will be aggregated for all DR dispatched in RTO unless there are different Emergency Action Area. Different EAAs only established if DR in one location will not help grid issue in another location

- CSPs may use substitute registrations of a different Product Type to cover the commitment of under-performing registrations that are dispatched by PJM during a DR event
  - The substitute and under-performing registration must...
    - be located in the same geographic location (dispatch area)
    - have comparable capacity commitments
    - have the same designated lead time

# DR Event Compliance: Product Substitution Details

- One or more substitute registrations may be used to cover the commitment of one or more under-performing registrations
  - CSPs must map the substitute registration(s) being used as replacement to their corresponding under-performing registration(s)
  - The sum of nominated values for substitute registration(s) must be comparable (within  $\pm 25\%$  or  $\pm 0.5$  MW) to the total nominated value of their corresponding under-performing registration(s)
- The list of under-performing registrations and their corresponding substitutes must be provided to PJM by the end of the event day (23:59:59 EPT)
  - All substitute registrations provided to PJM must submit compliance data for that event
- The reduction values of substitute registrations are used when calculating compliance on the corresponding under-performing registration(s)
  - Substitute reduction values will not be capped to prevent over-performance on their corresponding under-performing registration(s)
  - If one or more substitute registrations are mapped to multiple under-performing registrations, the reduction value(s) of the substitute registrations will be distributed pro rata using the under-performing registrations' nominated values

# DR Event Compliance: Product Substitution Example

- PJM calls a DR event for Long, Short and Quick Lead time for the Annual Product Type in the PECO zone on December 15th
- CSP has the following sites registered in the PECO zone, three of which are Annual and must respond to the DR event (Total Annual commitment = 4.6 MW ICAP)

PECO Registrations					
Registration ID	Location	Product Type	Lead Time	Nominated MW (ICAP)	Registration Commitment Share (ICAP)
❌ 10000001	PECO	Annual	Long	0.5	0.5
10000002	PECO	Annual	Long	1.0	1.0
❌ 10000003	PECO	Annual	Short	3.1	3.1
10000004	PECO	Limited	Long	0.8	-
10000005	PECO	Limited	Short	1.4	-
10000006	PECO	Limited	Short	1.1	-

- During preparation for the event, CSP discovers that two of their Annual registrations (10000001 and 10000003) cannot respond, and therefore self-dispatches their Limited registrations as substitutes

# DR Event Compliance: Product Substitution Example

- CSP provides the following substitution data to PJM by the end of the event day

Substitute Registrations							
Under-Performing Registration ID	Product Type	Lead Time	Nominated MW (ICAP)	Substitute Registration IDs	Substitute Product Type	Substitute Lead Time	Substitute Nominated MW (ICAP)
10000001	Annual	Long	0.5	10000004	Limited	Long	0.8
10000003	Annual	Short	3.1	10000005	Limited	Short	1.4
				10000006	Limited	Short	1.1

- PJM reviews the submitted data to ensure that the under-performing registrations and their corresponding substitutes are valid
  - Substitutes are within same dispatch area
    - PECO
  - Substitutes are of the same lead type
    - 10000001 and 10000004 have Long Lead Times
    - 10000003, 10000005, and 10000006 have Short Lead Time
  - Substitutes have comparable capacity commitments
    - 10000001 (0.5 MW) and 10000004 (0.8 MW) fall within 0.5 MW tolerance
    - 10000003 (3.1 MW) and [10000005 (1.4 MW) + 10000006 (1.1 MW)] fall within 25% tolerance

# DR Event Compliance: Product Substitution Example

- CSP submits reduction data in eLRS for all dispatched registrations (including substitutions) for the DR event

Submitted Event Reduction				
Registration ID	Location	Product Type	Lead Time	Reduction MW (ICAP)
10000001	PECO	Annual	Long	-
10000002	PECO	Annual	Long	1.1
10000003	PECO	Annual	Short	-
10000004	PECO	Limited	Long	0.8
10000005	PECO	Limited	Short	1.2
10000006	PECO	Limited	Short	1.1

- PJM calculates shortfall using the substituted reduction MW values
  - Shortfall MW = Committed MW Share – Adjusted Reduction MW

Substitute Registrations								
PJM Dispatched Registration ID	Product Type	Lead Time	Nominated MW (ICAP)	Committed MW Share (ICAP)	Reduction MW (ICAP)	Substitute Registration IDs	Adjusted Reduction MW (ICAP)	Shortfall MW (ICAP)
10000001	Annual	Long	0.5	0.5	-	10000004	0.8	-0.3
10000002	Annual	Long	1.0	1.0	1.1		1.1	-0.1
10000003	Annual	Short	3.1	3.1	-	10000005 10000006	2.3	0.8

- PECO Net Shortfall =  $(-.03 + (-0.1) + (0.8)) = \mathbf{0.4 \text{ MW (ICAP)}}$ 
  - Net Shortfall MW without substitution =  $(0.5) + (-0.1) + (3.1) = 3.5 \text{ MW}$

- Retroactive Replacement Capacity is only for RPM Resources with Uncommitted Available Capacity MWs that have also been dispatched by PJM.
- PJM currently allows each DR registration to respond with full amount.
- PJM already aggregates performance for all DR registrations dispatched in Emergency Action Area and therefore there is no apparent need for DR retroactive replacements.
- Product Substitution allows CSP to substitute a registration that was not dispatched during product specific dispatch with a registration that was dispatched.



- **Commitment compliance (“daily deficiency charge”)**
  - Similar to today (check nominated capacity on registration linked to eRPM resource OR eRPM product specific commitment for resource)
- **Non-performance assessment (“event compliance”)**
  - Performance measured hour by hour (may or may not include lead time, depends on situation)
  - Non-summer measured based on CBL, summer based on similar approach as today
  - Performance aggregated for all registration dispatched for area defined by Emergency Action (instead of CAA)
- **Test non-performance**
  - Same as today

- 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 & 2<sup>nd</sup> IA with Base & CP MWs Cleared

	BRA MWs Cleared (UCAP MWs)	BRA RCP (\$/MW-day)	2 <sup>nd</sup> IA MWs Cleared (UCAP MWs)	2 <sup>nd</sup> 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 =  $[(90 \text{ MW} * \$100/\text{MW-day}) + (0 \text{ MW} * \$120/\text{MW-day})] / 90 \text{ MW} = \$100.00/\text{MW-day}$

Base DDR =  $\$100/\text{MW-day} + (0.2 * 100/\text{MW-day}) = \$120/\text{MW-day}$

CP WARCP =  $[(100 \text{ MW} * \$100/\text{MW-day}) + (5 \text{ MW} * \$220/\text{MW-day})] / 105 \text{ MW} = \$200.95/\text{MW-day}$

CP DDR =  $\$200.95/\text{MW-day} + (0.2 * 200.95/\text{MW-day}) = \$241.14/\text{MW-day}$

- 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 defined by PJM's declaration of Emergency Actions
- Demand Resource's performance will be evaluated if registrations 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 Bonus Payment

All DR registrations dispatched by PJM will be measured for performance, capacity commitment is based on product requirements (CP vs Base)



# 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

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

- 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.

Allocation is done to eRPM 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
DR	JCPL	31	7
Wind	PECO	11	2
<b>Aggregate</b>	<b>EMAAC</b>	<b>42</b>	<b>9</b>

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)
DR	JCPL	48	CP	31	41	-10
			Base	7	7	0
Wind	PECO	8	CP	11	8	3
			Base	2	0	2
<b>Aggregate</b>	<b>EMMAC</b>					<b>-5</b>

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

Example #1: Aggregate Resource clears 42 MW of CP and 9 MW of Base Capacity.  
Emergency Action in EMAAC in **Winter and JCPL/PECO DR dispatched**

DATE: July 1, DY		Daily Commitment Allocation (UCAP MW)	
Resource	Location	CP	Base
DR	JCPL	22	9
Wind	PECO	20	0
<b>Aggregate</b>	<b>EMAAC</b>	<b>42</b>	<b>9</b>

Daily commitment allocation used to determine Expected Performance

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

Resource	Location	Output (MW)	Product	Expected Performance (MW)	Actual Performance (MW)	Performance Shortfall* (MW)
DR	JCPL	22	CP	22	10	12
			Base	0	12	-12
Wind	PECO	22	CP	20	22	-2
			Base	0	0	0
<b>Aggregate</b>	<b>EMMAC</b>					<b>-2</b>

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



- 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

- Any excess DR capacity load reductions will be eligible for bonus payment
  - Performance is first aggregated across products and across Emergency Action area for all registrations dispatched by PJM for the hour.
  - CSP must ensure Expected Load Reductions reported to PJM are accurate
  - Volume of load reduction eligible for bonus payment is based on capacity compliance calculation for registrations dispatched.
    - FSL/GLD in summer
    - CBL in non-summer

- Emergency Action Area = MAAC
- PJM dispatches DR in summer or winter: JCPL/PSEG/PECO, Emergency/Pre-Emergency, 30/60/120 lead time, CPDR/BaseDR.
- DR performance will be aggregated across all registrations dispatched
  - Over-compliance will receive bonus payment
- Product substitution is not applicable (all products dispatched)
- Retroactive replacement transactions not applicable (performance already aggregated)

BaseDR will count toward performance in Winter

- Same requirements as today.

- Energy Settlement will continue to use same CBL process as today:
  - Use hour before method unless there is an economic registration
  - If there is an economic registration then use the economic CBL.

This means emergency energy settlement may use different CBL than CBL used for non-summer capacity compliance

- What happens if Emergency Action hour is not a full wall clock hour?
  - PJM intends to use 30 minute or greater rule deployed for DR today because of metering issues.
- What happens if PJM dispatches all 4 products in 16/17 or 17/18 DY
  - CP compliance and penalties based on CP rules
  - LDR/XDR/ADR compliance and penalties based on existing rules
  - CP performance will not be aggregated with LDR/XDR/ADR performance if all are dispatched.
- Are registration capacity nomination broken into summer vs winter nomination?
  - No, all nominations are based on PLC. CSP needs to ensure Expected Load reductions are accurate. Expected load reductions may need to be registration specific in the future.