

Capacity Obligations for Large Load Adjustments (COLA)

Discussion of Potential Solution Options

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Summary of Issue

- New data centers, and other emerging large-load industries, are driving significant forecasted load growth in certain areas of PJM.
 - These forecasted large load additions are incremental to the PJM Load Forecast
- These forecasted large load additions are leading to **an issue with the assignment of capacity obligations within a zone for future delivery years.**
 - Under the existing process, the capacity obligation is spread across all the LSEs within the zone.
 - This can create a misalignment in the capacity obligations and associated cost impacts of the forecasted load addition.
- **As sponsors of the Problem Statement and Issue Charge, AEP and Dominion Energy present the following to provide additional details to the identified interest areas and design elements for stakeholder consideration.**

Review of Interest Identification

- Ensures an unbiased, transparent, traceable process to receive inputs and easily administered calculation of LSE UCAP Obligation.
- Ensure solutions are applicable across all zones for any large load adjustment.
- Send appropriate signals to market participants; prior to the BRA, ensure accurate assignment of Large Load Adjustments between RPM (VRR Curve) and FRR Obligations within a single zone.
- Accurately assign large load adjustments capacity obligations to the appropriate entity.
- Ensure an unbiased, transparent, traceable process to receive inputs to the LSE UCAP Obligation.

Potential Solution Options for identified interests and design elements



- Define Large Load Adjustment (LLA) as any MW quantity that the Transmission Owner reports in Table B-9 by zone and that is reported in the annual PJM Load Forecast Report.
- Largely retain status quo in determining Base Zonal Scaling Factors for FRR and RPM LSEs, but excludes the LLA in the Base Zonal Scaling Factor determination if there is an LLA projected within the zone at time of the BRA.
- Largely retain status quo in determining Final Zonal Scaling Factors for FRR and RPM LSEs, but excludes the LLA in the Final Zonal Scaling Factor determination if there is an LLA projected within the zone at the time of Delivery Year.
- Method developed to include a new step to add the LLA to the UCAP Obligations of the appropriate Zone/Area, which consequently adds the LLA to the UCAP obligation of the appropriate LSE.

AEP and Dominion Energy Proposal Matrix

#	Design Components	Status Quo	AEP/DOM
*	Implementation		
1	Definition of Large Load Adjustment	n/a	Any MW quantity TO reports in Table B-9, by zone/area
2	Definition of Preliminary Zonal Peak Load Forecast used for the calculation of the scaling factors	Includes reported large load adjustments by zone submitted by TO	
3	Definition of Final Zonal Peak Load Forecast used for the calculation of the scaling factors	Includes reported large load adjustments by zone submitted by TO	
4	Calculation of Base Zonal FRR Scaling Factor	<p>FRR = Preliminary Zonal Peak Load Forecast divided by Zonal W/N Summer Peak Load. Calculated at time of BRA</p> <p>Defined in RAA Schedule 8.1 and Manual 18, Section 11</p>	Status quo, but exclude LLAs (only applies if there is an LLA in the zone)
5	Calculation of Base Zonal RPM Scaling Factor	<p>RPM = Preliminary Zonal Peak Load Forecast divided by Zonal W/N Summer Peak Load * (RTO UCAP Obligation for BRA divided by (RTO Preliminary Peak Load Forecast * FPR)). Calculated with BRA clearing results.;</p> <p>Defined in RAA Schedule 8 and Manual 18, Section 7</p>	Status quo, but exclude LLAs (only applies if there is an LLA in the zone)

AEP and Dominion Energy Proposal Matrix, continued...

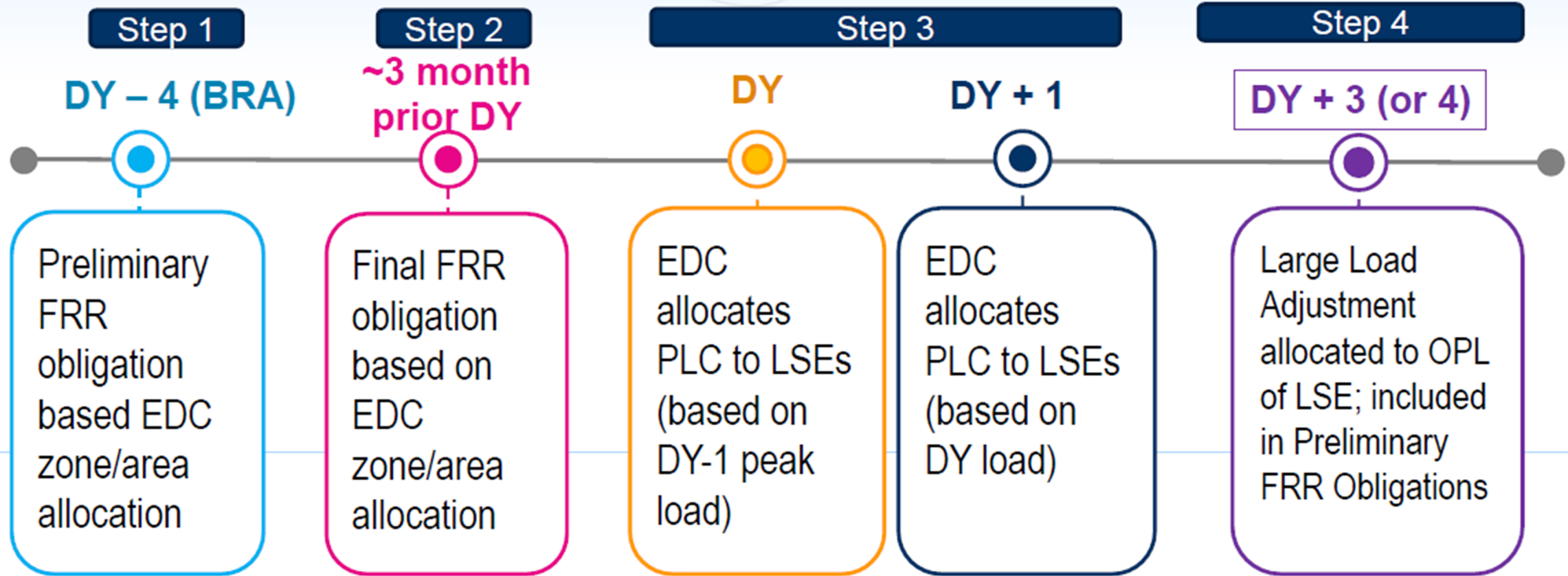
#	Design Components	Status Quo	AEP/DOM
6	Calculation of Final Zonal FRR Scaling Factor	<p>FRR = Final Zonal Peak Load Forecast divided by Zonal W/N Summer Peak Load. Calculated prior to DY.</p> <p>Defined in RAA Schedule 8.1 and Manual 18, Section 11</p>	Status quo, but exclude LLAs (only applies if there is an LLA in the zone)
7	Calculation of Final Zonal RPM Scaling Factor	<p>RPM = Final Zonal UCAP Obligation/(FPR*Zonal W/N Summer Peak Load). Calculated with 3rd IA clearing results.</p> <p>Defined in RAA Schedule 8 and Manual 18, Section 7</p>	Status quo, but exclude LLAs (only applies if there is an LLA in the zone)
8	Calculation of Obligation Peak Load (OPL)	Sum of Peak Load Contributions by LSE as submitted by EDC for the operating day, where sum must equal Zonal W/N Forecast	
9	Use of FRR Scaling Factors in determining preliminary and final daily FRR LSE UCAP Obligation	<p>$OPL * \text{Final Zonal FRR Scaling Factor} * FPR$;</p> <p>Defined in RAA Schedule 8.1 and Manual 18, Section 11</p>	No change to use of FRR Scaling Factor (as modified above); add new step to add $(LLA * FPR)$ to the UCAP Obligation of Zone/Area , and will consequently be added to appropriate LSE
10	Use of RPM Scaling Factors in determining preliminary and final daily RPM LSE UCAP Obligation	<p>$OPL * \text{Final Zonal RPM Scaling Factor} * FPR$</p> <p>Defined in RAA Schedule 8 and Manual 18, Section 7</p>	No change to use of RPM Scaling Factor (as modified above); add new step to add $(LLA * FPR * OPL \text{ Scaling Factor})$ to UCAP Obligation of the Zone/Area ,and will consequently be added to appropriate LSE

How do the potential solution options address the identified interest?

Does the following...	By doing...
<p>Ensures an unbiased, transparent, <u>traceable process to receive inputs and easily administered calculation of LSE UCAP Obligation.</u></p>	<p>Clearly defines LLA as any MW quantity the TO reports in the load forecast Table B-9; adds new step for determining FRR LSE and RPM LSE UCAP Obligation after excluding LLAs from calculation of Base Zonal Scaling Factors; administered by PJM.</p>
<p>Ensure solutions are applicable across all zones for any large load adjustment.</p>	<p>Applies to all zones to appropriate allocation and account for LLA between LSE's.</p>
<p>Send appropriate signals to market participants; prior to the BRA, ensure accurate assignment of Large Load Adjustments between RPM (VRR Curve) and FRR Obligations within a single zone.</p>	<p>Allocates the LLA to the appropriate Zone/Area prior to the Base Residual Auction for the applicable delivery year.</p>
<p>Accurately assign large load adjustments capacity obligations to the appropriate entity.</p>	<p>PJM, through coordination with EDCs, will assign and account for LLAs to the appropriate LSE's after applying adjusted Zonal Scaling Factors.</p>

PJM Example – Timeline from PJM Education Presentation (11/23 MIC)

FRR obligations are based on historic zone/area obligation peak loads



Proposed solution impacts Steps 1-3

PJM Example of Status Quo

**Provided by PJM in FRR/RPM Capacity Obligation Education Presentation
November 1, 2023, Markets Implementation Committee**

PJM Example: Step 1 (At time of BRA) Determine Preliminary FRR UCAP Obligation

BRA for 2024/2025 DY					
FPR	1				
2020 Zonal W/N Peak (A)	1,000				
2024 Forecast (B)	1,100				
Large Load Adjustment (C) (Table B-9)	100				
Total 2024 Forecast (D=B+C) (Table B-10)	1,200				
Final Zonal Scaling Factor (E=D/A)	1.20				
RPM/FRR	Zone/Area	Obligation Peak Load 2021 (based on 2020 load)	FRR UCAP Obligation for 24/25 DY		
RPM	Zone1/A	100			
RPM	Zone1/B	200			
RPM	Zone1/C	300			
FRR	Zone1/D	100	120		
FRR	Zone1/E	300	360		
	Total RPM	600			
	Total FRR	400			
	Grand Total	1,000			
	2024/2025 UCAP Obligations				Large Load Adjustment
	RPM 24/25 Obligation		720	60%	60
	FRR 24/25 Obligation		480	40%	40
	Total		1,200		

PJM Example: Step 2 (Prior to DY) Determine Final FRR UCAP Obligation

Pre - 2024/2025 DY					
FPR		1			
2023 Zonal W/N Peak (A)		1,075			
2024 Forecast (B)		1,100			
Large Load Adjustment (C) (Table B-9)		100			
Total 2024 Forecast (D=B+C) (Table B-10)		1,200			
Final Zonal Scaling Factor (E=D/A)		1.12			
RPM/FRR	Zone/Area	Obligation Peak Load 2024 (based on 2023 load)	FRR UCAP Obligation for 24/25 DY		
RPM	Zone1/A	130			
RPM	Zone1/B	225			
RPM	Zone1/C	300			
FRR	Zone1/D	120	134		
FRR	Zone1/E	300	335		
	Total RPM	655			
	Total FRR	420			
	Grand Total	1,075			
	2024/2025 UCAP Obligations				Large Load Adjustment
	RPM 24/25 Obligation		731	61%	61
	FRR 24/25 Obligation		469	39%	39
	Total		1,200		

PJM Example: Step 3 (During DY) Effect of LLA on LSE UCAP Obligation

During 2024/2025 DY				
FPR	1			
2023 Zonal W/N Peak (A)	1,075			
2024 Forecast (B)	1,100			
Large Load Adjustment (C) (Table B-9)	100			
Total 2024 Forecast (D=B+C) (Table B-10)	1,200			
Final Zonal Scaling Factor (E=D/A)	1.12			
FRR/RPM	Zone/Area	LSE	OPL DY (24/25)	LSE UCAP Obligation (OPL*FPR*Final RPM/FRR Scaling Factor)
RPM	Zone1/A	Competitive LSE1	130	145
RPM	Zone1/B	Competitive LSE2	225	251
RPM	Zone1/C	Public Power LSE3	150	167
RPM	Zone1/C	EDC LSE4	150	167
FRR	Zone1/D	FRRLSE	120	134
FRR	Zone1/E	FRRLSE	300	335
		RPM Total	655	731
		FRR Total	420	469
		Total	1,075	1,200

Assumes large load adjustment does not appear in DY, but may vary with EDC allocation methodology

LLA included in calculation of Final Scaling Factor

Implementation of Proposed Solution

Example of Large Load Adjustment in an FRR Area

Proposed Solution: Step 1 (At time of BRA) Determine Preliminary FRR UCAP Obligation

Example: Large Load Adjustment is in an FRR Area

BRA for 2024/2025 DY					
FPR		1			
2020 Zonal W/N Peak (A)		1,000			
2024 PJM Load Forecast (B)		1,100			
Large Load Adjustment for 2024 (C) (Table B-9)		100	<<< for this example, assume LLA is forecast in Area E (FRR)		
Total 2024 Forecast (D=B+C) (Table B-10)		1,200			
Base Zonal FRR Scaling Factor (E=D/A)		1.10	<<< Excludes LLA		
RPM/FRR	Zone/Area	Obligation Peak Load 2021 (based on 2020 load)	OPL * Base Zonal Scaling Factor	PJM adds Large Load Adjustment	UCAP Obligation for 24/25 DY
RPM	Zone1/A	100	110		110
RPM	Zone1/B	200	220		220
RPM	Zone1/C	300	330		330
FRR	Zone1/D	100	110		110
FRR	Zone1/E	300	330	100	430
	RPM 24/25 Obligation	600	660	-	660
	FRR 24/25 Obligation	400	440	100	540
	Grand Total	1,000	1,100		1,200

Based on Design Component 4: Calculation of Base Zonal FRR Scaling Factor excludes LLA

Ordinary load growth is still spread across all areas by the Zonal Scaling Factor

Based on Design Component 9: PJM adds (LLA*FPR) to the appropriate Zone Area

Proposed Solution: Step 2 (Prior to DY) Determine Final FRR UCAP Obligation

Example: Large Load Adjustment is in an FRR Area

Pre - 2024/2025 DY					
FPR		1			
2023 Zonal W/N Peak (A)		1,075			
2024 PJM Load Forecast (B)		1,100			
Large Load Adjustment for 2024 (C) (Table B-9)		100	<<< for this example, assume LLA is forecast in Area E (FRR)		
Total 2024 Forecast (D=B+C) (Table B-10)		1,200			
Final Zonal FRR Scaling Factor (E=D/A)		1.02	<<< Excludes LLA		
RPM/FRR	Zone/Area	Obligation Peak Load 2024 (based on 2023 load)	OPL * Base Zonal Scaling Factor	PJM adds Large Load Adjustment	UCAP Obligation for 24/25 DY
RPM	Zone1/A	130	133		133
RPM	Zone1/B	225	230		230
RPM	Zone1/C	300	307		307
FRR	Zone1/D	120	123		123
FRR	Zone1/E	300	307	100	407
	RPM 24/25 Obligation	655	670	-	670
	FRR 24/25 Obligation	420	430	100	530
	Grand Total	1,075	1,100		1,200

Based on Design Component 6: Calculation of Final Zonal FRR Scaling Factor excludes LLA

Based on Design Component 9: PJM adds (LLA * FPR) to the appropriate Zone Area

Proposed Solution: Step 3 (During DY) Effect of LLA on LSE UCAP Obligation

Example: Large Load Adjustment is in an FRR Area; LLA not included by EDC in OPL of LSE

During 2024/2025 DY						
FPR	1					
2023 Zonal W/N Peak (A)	1,075					
2024 Forecast (B)	1,100					
Large Load Adjustment (C) (Table B-9)	100	<<< for this example, assume LLA is forecast in Area E (FRR)				
Total 2024 Forecast (D=B+C) (Table B-10)	1,200					
Final Zonal FRR Scaling Factor (E=D/A)	1.02	<<< Excludes LLA				
FRR/RPM	Zone/Area	LSE	OPL DY (24/25)	OPL*FPR*Final RPM/FRR Scaling Factor	PJM adds Large Load Adjustment	LSE UCAP Obligation
RPM	Zone1/A	Competitive LSE1	130	133		133
RPM	Zone1/B	Competitive LSE2	225	230		230
RPM	Zone1/C	Public Power LSE3	150	153		153
RPM	Zone1/C	EDC LSE4	150	153		153
FRR	Zone1/D	FRRLSE	120	123		123
FRR	Zone1/E	FRRLSE	300	307	100	407
		RPM 24/25 Obligation	655	670		670
		FRR 24/25 Obligation	420	430	100	530
		Total	1,075	1,100		1,200
Assumes large load adjustment does not appear in DY, but may vary with EDC allocation methodology						

Requires coordination between PJM and EDC to confirm inclusion of LLA for the appropriate LSE and ensure no double-counting of the LLA.

Implementation of Proposed Solution

Example of Large Load Adjustment in an RPM Area

Proposed Solution: Step 1 (At time of BRA) Determine Preliminary FRR UCAP Obligation

Example: Large Load Adjustment is in an RPM Area

BRA for 2024/2025 DY					
FPR		1			
OPL Scaling Factor*		1			
2020 Zonal W/N Peak (A)		1,000			
2024 PJM Load Forecast (B)		1,100			
Large Load Adjustment for 2024 (C) (Table B-9)		100	<<< for this example, assume LLA is forecast in Area C (RPM)		
Total 2024 Forecast (D=B+C) (Table B-10)		1,200			
Base Zonal RPM Scaling Factor (E=D/A)		1.10	<<< Excludes LLA		
RPM/FRR	Zone/Area	Obligation Peak Load 2021 (based on 2020 load)	OPL * Base Zonal Scaling Factor	PJM adds Large Load Adjustment	UCAP Obligation for 24/25 DY
RPM	Zone1/A	100	110		110
RPM	Zone1/B	200	220		220
RPM	Zone1/C	300	330	100	430
FRR	Zone1/D	100	110		110
FRR	Zone1/E	300	330		330
	RPM 24/25 Obligation	600	660	100	760
	FRR 24/25 Obligation	400	440	-	440
	Grand Total	1,000	1,100		1,200

* OPL Scaling Factor is to account for level of UCAP procured in the auction

Based on Design Component 5: Calculation of Base Zonal RPM Scaling Factor excludes LLA

Based on Design Component 10: PJM adds (LLA * FPR * OPL Scaling Factor) to the appropriate Zone Area

Proposed Solution: Step 2 (Prior to DY) Determine Final FRR UCAP Obligation

Example: Large Load Adjustment is in an RPM Area

Pre - 2024/2025 DY					
FPR	1				
OPL Scaling Factor*	1				
2023 Zonal W/N Peak (A)	1,075				
2024 PJM Load Forecast (B)	1,100				
Large Load Adjustment for 2024 (C) (Table B-9)	100	<<< for this example, assume LLA is forecast in Area C (RPM)			
Total 2024 Forecast (D=B+C) (Table B-10)	1,200				
Final Zonal RPM Scaling Factor (E=D/A)	1.02	<<< Excludes LLA			

RPM/FRR	Zone/Area	Obligation Peak Load 2024 (based on 2023 load)	OPL * Base Zonal Scaling Factor	PJM adds Large Load Adjustment	UCAP Obligation for 24/25 DY
RPM	Zone1/A	130	133		133
RPM	Zone1/B	225	230		230
RPM	Zone1/C	300	307	100	407
FRR	Zone1/D	120	123		123
FRR	Zone1/E	300	307		307
	RPM 24/25 Obligation	655	670	100	770
	FRR 24/25 Obligation	420	430	-	430
	Grand Total	1,075	1,100		1,200

* OPL Scaling Factor is to account for level of UCAP procured in the auction

Based on Design Component 7: Calculation of Final Zonal RPM Scaling Factor excludes LLA

Based on Design Component 10: PJM adds (LLA * FPR * OPL Scaling Factor) to the appropriate Zone Area

Proposed Solution: Step 3 (During DY) Effect of LLA on LSE UCAP Obligation

Example: Large Load Adjustment is in an RPM Area; LLA not included by EDC in OPL of LSE

During 2024/2025 DY						
FPR	1					
2023 Zonal W/N Peak (A)	1,075					
2024 Forecast (B)	1,100					
Large Load Adjustment (C) (Table B-9)	100	<<< for this example, assume LLA is forecast for LSE4 in Area C (RPM)				
Total 2024 Forecast (D=B+C) (Table B-10)	1,200					
Final Zonal RPM Scaling Factor (E=D/A)	1.02	<<< Excludes LLA				
FRR/RPM	Zone/Area	LSE	OPL DY (24/25)	OPL*FPR*Final RPM/FRR Scaling Factor	PJM adds Large Load Adjustment	LSE UCAP Obligation
RPM	Zone1/A	Competitive LSE1	130	133		133
RPM	Zone1/B	Competitive LSE2	225	230		230
RPM	Zone1/C	Public Power LSE3	150	153		153
RPM	Zone1/C	EDC LSE4	150	153	100	253
FRR	Zone1/D	FRRLSE	120	123		123
FRR	Zone1/E	FRRLSE	300	307		307
		RPM 24/25 Obligation	655	670	100	770
		FRR 24/25 Obligation	420	430		430
		Total	1,075	1,100		1,200
Assumes large load adjustment does not appear in DY, but may vary with EDC allocation methodology						

Requires coordination between PJM and EDC to confirm inclusion of LLA for the appropriate LSE and ensure no double-counting of the LLA.

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