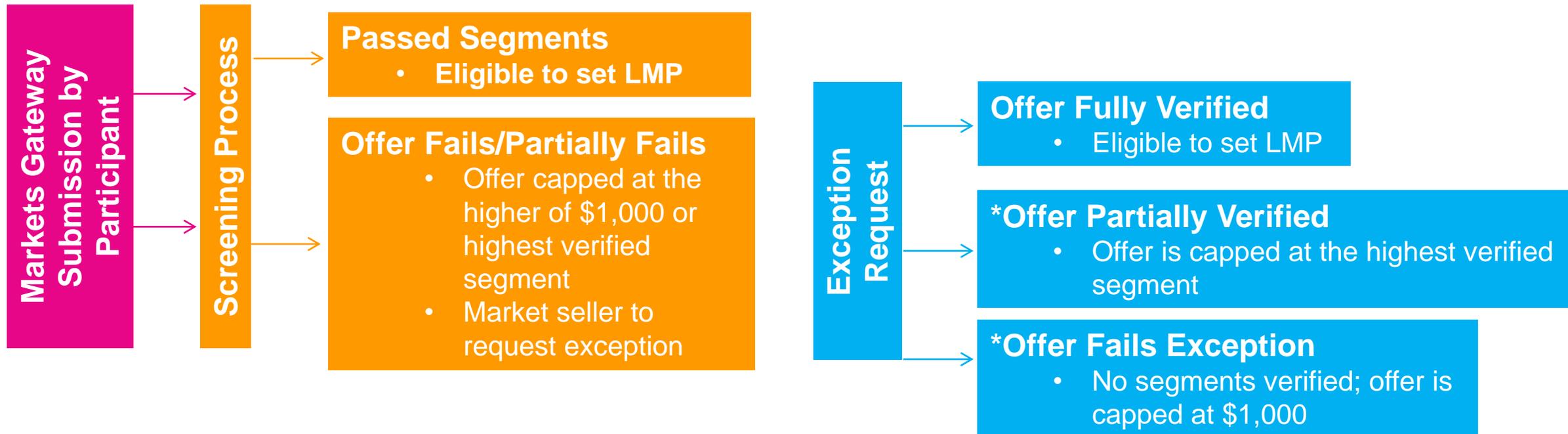




PJM Energy Offer Verification Process Overview

November 23, 2021

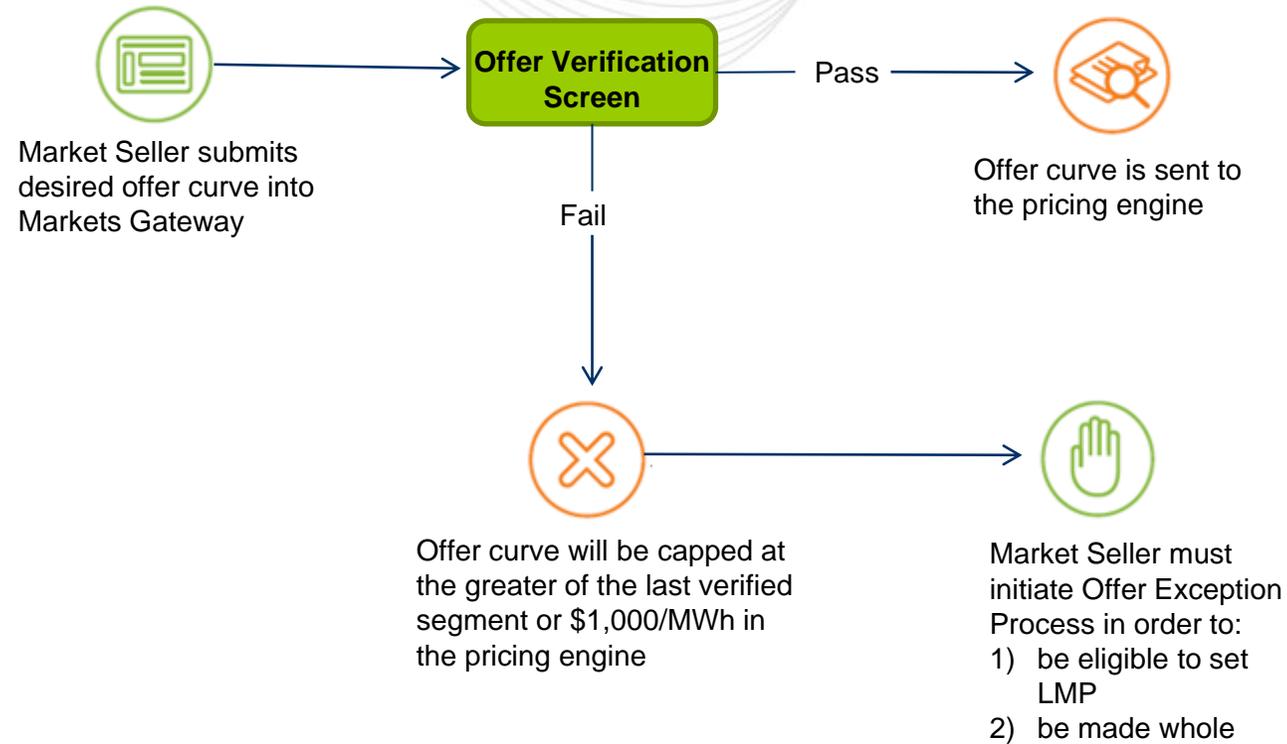
- Order 831 requires validation of incremental energy offers above \$1000 prior to being eligible to set LMP
- Composite Energy Offers above \$1000/MWh require validation before being eligible to set LMP



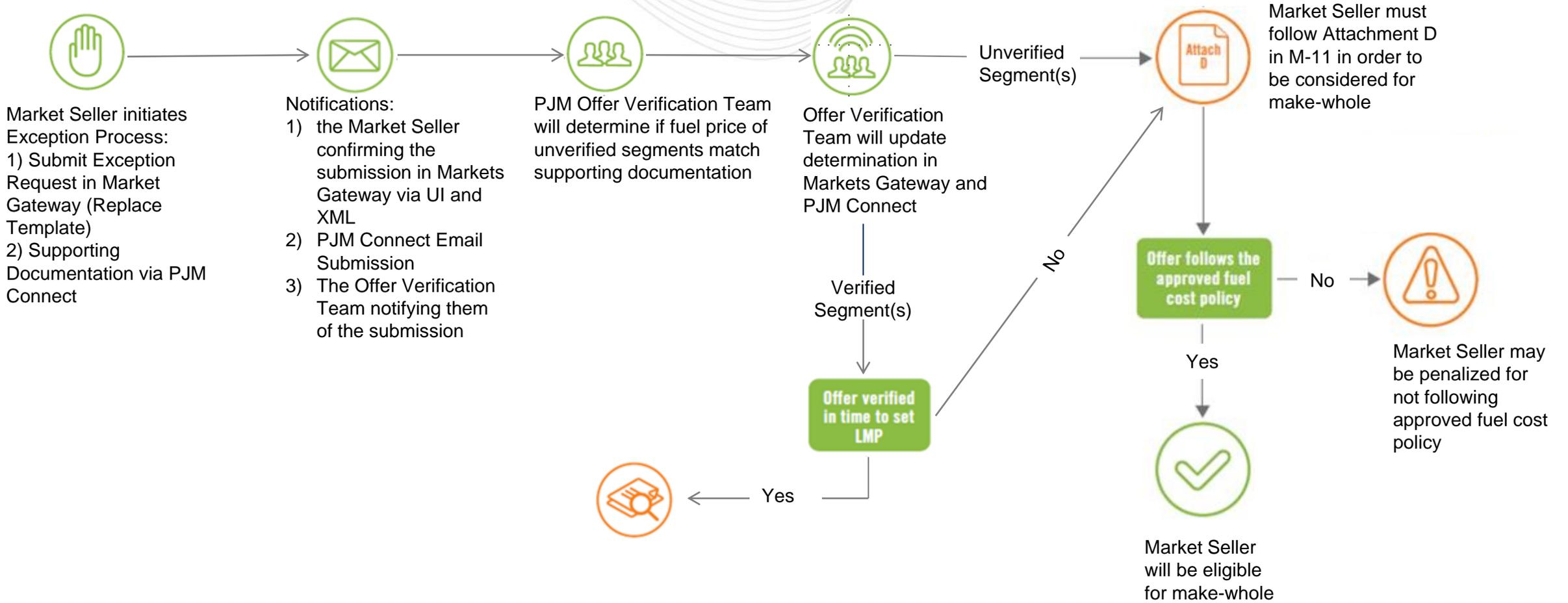
- Preparation for Energy Offer Verification
- Review Offer Verification process for Incremental Offers above \$1000
 - Review Exception Request Process
- Review Offer Verification process for Composite Offers above \$1000

Education session to review the Offer Verification Process will be held on January 12, 2022

- Ensure participants have access to:
 - PJM Markets Gateway
 - PJM Connect
- Member Information Reporting Application (MIRA):
 - Fuel Cost Policies are up-to-date
 - All cost offer information in the COA MIRA module is accurate and complete
 - For example, the heat input curve, fuel adders and other relevant inputs are consistent with the submitted energy offers
- XML Setup for Fuel Price Exception Display in Markets Gateway
 - XML setup not required but may be helpful



Exception Process – Incremental Offer



- Submit Incremental Offers to the Offer Updates Screen in Markets Gateway
- Incremental Offers submitted over \$1000 are subject to Markets Gateway automated screen validation
- Incremental Offers that fail validation will be capped at \$1000 or highest approved segment
- Stakeholders have the opportunity to submit an Exception Request for Incremental offers that fail validation via the new screen, Fuel Price Exception
- Exception Requests that are submitted via the new screen are only valid for offers over \$1000 and fail validation



- Fuel-Related Costs must follow the approved Fuel Cost Policy
- Variable Operating Cost and Maintenance Adders must be approved by PJM in order to be included
- Emissions rates must be approved by PJM in order to be included

- The 10% adder for incremental costs above \$1,000/MWh is gradually reduced to zero:
 - For incremental cost \leq \$1,000/MWh, adder is up to 10% of incremental cost
 - For incremental cost $>$ \$1,000/MWh and \leq \$1,900/MWh, adder is up to \$100/MWh (Capped)
 - For incremental cost $>$ \$1,900/MWh and \leq \$2,000/MWh, adder is up to \$2,000 minus incremental cost
 - For incremental cost $>$ \$2,000/MWh, adder is equal to zero.
- Cost-based offers that do not adhere to the limitations of 10% adder will be subject to penalties

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Market Day Portfolio Location Schedule

Offers Offer Updates Detail Detail Updates Manager Selection Availability Update Restriction Information TPS Schedule Switch Fuel Price Exceptions

PJMTST >> 2020-04-01 >> PJM TEST UNIT (UnitID) >> SCHEDULE (1) Last Updated Date/Time: 2020-03-30 09:52:37

<input type="checkbox"/>	Hour	MW	Price	Capped Price	Exception Exists
<input type="checkbox"/>	1			1000	
		1.0	122.54		
		100.0	125.38		
		164.0	127.22		
		190.0	1,100.00		
<input type="checkbox"/>	2				
<input type="checkbox"/>	3				
<input type="checkbox"/>	4				
<input type="checkbox"/>	5				
<input type="checkbox"/>	6				
<input type="checkbox"/>	7				
<input type="checkbox"/>	8				
<input type="checkbox"/>	9				
<input type="checkbox"/>	10				
<input type="checkbox"/>	11				

Offers that are over \$1000 and fail validation will be capped at \$1000

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Markets Gateway

Market Day: 4/1/2020 | Portfolio: PJM TEST PORTFOLIO | Location: PJM TEST UNIT | Schedule: SCHEDULE (1)

Refresh | Save

Offers | Offer Updates | Detail | Detail Updates | Manager | Selection | Availability Update | Restriction Information | TPS Schedule Switch | **Fuel Price Exceptions**

PJMTST >> 2020-04-01 >> PJM TEST UNIT (UnitID)

	Location	Schedule	Start Hour	End Hour	Source of Fuel Price	Fuel Hub Name	Fuel Price	Fuel Cost Policy Number
			Show all					

[Add Item](#) Right-click in this whitespace and select "Add Item" to be able to insert Exception Request data

*Exception request are only need if the original offer submitted is capped

**All fields are required for submission

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Market Day Portfolio Location Schedule

Offers | Offer Updates | Detail | Detail Updates | Manager | Selection | Availability Update | Restriction Information | TPS Schedule Switch | **Fuel Price Exceptions**

PJMTST >> 2020-04-01 >> PJM TEST UNIT (UnitID)

<input type="checkbox"/>	Location	Schedule	Start Hour	End Hour	Source of Fuel Price	Fuel Hub Name	Fuel Price	Fuel Cost Policy Number
<input type="checkbox"/>	PJM TEST UNIT	1(1)	1	1	PLATTS	Fuel Hub 01	36	1234

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Market Day Portfolio Location Schedule

Offers Offer Updates Detail Detail Updates Manager Selection Availability Update Restriction Information TPS Schedule Switch Fuel Price Exceptions

PJMTST >> 2020-04-01 >> PJM TEST UNIT (UnitID) >> SCHEDULE (1) Last Updated Date/Time: 2020-03-30 09:52:37

<input type="checkbox"/>	Hour	MW	Price	Capped Price	Exception Exists
<input type="checkbox"/>	1			1000	Yes
		1.0	122.54		
		100.0	125.38		
		164.0	127.22		
		190.0	1,100.00		
<input type="checkbox"/>	2				
<input type="checkbox"/>	3				
<input type="checkbox"/>	4				
<input type="checkbox"/>	5				
<input type="checkbox"/>	6				
<input type="checkbox"/>	7				
<input type="checkbox"/>	8				
<input type="checkbox"/>	9				
<input type="checkbox"/>	10				
<input type="checkbox"/>	11				

Column “Exception Exists” will be populated with “Yes” when request is submitted on Fuel Price Exceptions Screen

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Market Day: 4/1/2020 Portfolio: PJM TEST PORTFOLIO Location: PJM TEST UNIT Schedule: SCHEDULE (1) Refresh Save

Offers Offer Updates Detail Detail Updates Manager Selection Availability Update Restriction Information TPS Schedule Switch Fuel Price Exceptions

PJMTST >> 2020-04-01 >> PJM TEST UNIT (UnitID) >> SCHEDULE (1) Last Updated Date/Time: 2020-03-30 09:52:37

<input type="checkbox"/>	Hour	MW	Price	Capped Price	Exception Exists
<input type="checkbox"/>	1			1,100	Yes
		1.0	122.54		
		100.0	125.38		
		164.0	127.22		
		190.0	1,100.00		
<input type="checkbox"/>	2				
<input type="checkbox"/>	3				
<input type="checkbox"/>	4				
<input type="checkbox"/>	5				
<input type="checkbox"/>	6				
<input type="checkbox"/>	7				
<input type="checkbox"/>	8				
<input type="checkbox"/>	9				
<input type="checkbox"/>	10				
<input type="checkbox"/>	11				

If Exception Request is approved, MAOP will be updated to the new calculated price, and no additional action is required

- Submit supporting data to PJM Connect
 - Any Exception Request without supporting data may be rejected
- PJM will review the approved Fuel Cost Policy in addition to the data submitted to determine if exception should be granted
 - Highlight the relevant portion of the Fuel Cost Policy to help expedite the review process
- Required documentation to be submitted:
 - Screenshot of ICE, brokers quote, etc. to verify estimated fuel cost
 - Relevant portion of the approved Fuel Cost Policy
 - Excel document showing the construction of the fuel cost if transportation or other adders are included (only required when fuel cost is > what is provided in the screenshot)

- If Exception Request is approved, the Max Allowable Offer Price (MAOP) will be updated and any segments at or below MAOP will be considered passed
- No additional action will be required if Exception Request is approved
- Exception Request and MAOP approval can be viewed via Markets Gateway Screens

- Specify a reference Cost schedule for respective Market based offer (Price and/or PLS schedule)
- Have certain offer data identical to “Reference Cost-based Schedule”
 - MW Blocks
 - Use Bid Slope
 - Fuel Type
- Have offer values less than or equal to “Reference Cost-based Schedule”
 - Startup and No-load offers
 - Incremental energy curve prices per segment
- Participants can alternatively select “Switch to Cost” and remove the market based schedule from consideration

- Reference Cost Schedule for Market based offers can be entered in Markets Gateway under Generator > Schedules > Detail Updates page

Markets Gateway

Market Day: Portfolio: Location: Schedule:

PJMTST>> 2021-11-24 >> PJM TEST UNIT (UnitID) >> PRICE (99)

Switch To Cost Schedule Start Hour: Last Updated Date/Time: No Updates

<input type="checkbox"/>	Hour	No Load Cost	Cold Startup Cost	Intermediate Startup Cost	Hot Startup Cost	Minimum Runtime	Notification Time	Status	Reference Schedule
<input type="checkbox"/>	1							Not Committed	
<input type="checkbox"/>	2							Not Committed	
<input type="checkbox"/>	3							Not Committed	
<input type="checkbox"/>	4							Not Committed	
<input type="checkbox"/>	5							Not Committed	
<input type="checkbox"/>	6							Not Committed	
<input type="checkbox"/>	7							Not Committed	
<input type="checkbox"/>	8							Not Committed	
<input type="checkbox"/>	9							Not Committed	
<input type="checkbox"/>	10							Not Committed	
<input type="checkbox"/>	11							Not Committed	
<input type="checkbox"/>	12							Not Committed	
<input type="checkbox"/>	13							Not Committed	
<input type="checkbox"/>	14							Not Committed	
<input type="checkbox"/>	15							Not Committed	
<input type="checkbox"/>	16							Not Committed	
<input type="checkbox"/>	17							Not Committed	
<input type="checkbox"/>	18							Not Committed	
<input type="checkbox"/>	19							Not Committed	
<input type="checkbox"/>	20							Not Committed	
<input type="checkbox"/>	21							Not Committed	
<input type="checkbox"/>	22							Not Committed	
<input type="checkbox"/>	23							Not Committed	
<input type="checkbox"/>	24							Not Committed	

- Implemented September 1, 2021
- Fast Start Capable resources Composite Energy Offer above \$1000/MWh will be subject to Offer Verification
 - Generation Resources
 - Economic Load Response Resources
- Composite Energy Offer = incremental offer + Amortized No Load + Amortized Startup
 - Startup and No load are always considered for Offer Verification Purposes
- See appendix for information on FS capable and eligible resources

For Generation Resources:

- If the Composite Energy Offer is calculated to be above \$1,000/MWh at the resource's economic maximum
 - Startup cost and no load cost plus incremental offer will automatically be validated
 - New display in Markets Gateway to provide validation results
 - No changes to existing logic for validating incremental energy offers above \$1,000/MWh
 - Applies to both cost and price-based offers
 - Each component of the price-based offer must be less than or equal to the reference cost based components
- Composite Energy Offers cannot be above \$2,000/MWh for the purpose of setting LMP

For Economic Load Response (ELR):

- If Composite Energy Offer is above \$1,000/MWh:
 - Shutdown cost must be validated by the ELR team
 - The Market Seller is to provide PJM supporting documentation in **advance** that supports the end use customer's incremental and shutdown costs if they exceed \$1,000/MWh
 - No changes to the existing logic for validating incremental energy offers
- Composite Energy Offers cannot be above \$2,000/MWh for the purpose of setting LMP

- The following rules will be applied if the composite energy offer above \$1000/MWh needs to be capped

Startup	No Load	Composite Offer	Adjustment (If needed)
Pass	Pass	Incr + SU + NL	None
Pass	Fail	Incr + SU + adjustment	Take from No Load to get offer to \$1000, up to submitted value
Fail	Pass	Incr + NL + adjustment	Take from Startup to get offer to \$1000, up to submitted value
Fail	Fail	Incr + adjustment	Take from No Load first, up to submitted No Load, then from Start Up, to get to \$1000



Effective Offers over \$1,000/MWh - Example

- For each segment on the incremental offer curve:
 - **Composite Energy Offer** = incremental offer + (no load (\$) / EcoMax (MWh)) + (startup (\$) / (EcoMax (MWh)*min run time))
- Reasonability Check for Startup Cost
 - **Startup Cost (\$)** = [[(Performance Factor) x (Start Fuel) x (Fuel Cost)] + Start Maintenance Adder + Additional Start Labor + Station Service Cost] x (1.1)
- Fast Start Resource Example:

Incremental Offer	Amortized Startup Cost	Amortized No Load	Composite Energy Offer	Offer above \$1,000/MWh	Subject to Offer Verification?
\$700	\$100	\$100	\$900	No	No
\$700	\$200	\$200	\$1,100	Yes	Yes

Scenario: Startup Fails, No Load passes with uncapped composite offer above \$1000 at Economic Maximum

	Submitted Amortized Cost	Validation Test Result
Startup	200	Fail
No Load	100	Pass

Incr. Offer Curve		Submitted ASU (\$/MWh)	Submitted ANL (\$/MWh)	Uncapped Offer (\$/MWh)	Incr. Offer Curve (\$/MWh)	Effective ASU (\$/MWh)	Effective ANL (\$/MWh)	Modified Composite (\$/MWh)
MW	(\$/MWh)							
40	900	200	100	1,200	900	0	100	1,000

Min Run Time	1 Hour
Ecomax	40 MW

- 1 Original submitted composite offer is above \$1000; therefore, offer verification is triggered
- 2 Since Startup failed, exclude Startup cost from verified composite offer

*After the minimum run time has been met, the modified composite offer at the bid in Economic Maximum will remain at \$1000 as the updated verified composite offer is \$1000.

Scenario: Verified composite offer below \$1000 and failed startup is needed to cap offer at \$1000

	Submitted Amortized Cost	Validation Test Result
Startup	200	Fail
No Load	100	Pass

Incr. Offer Curve		Submitted ASU	Submitted ANL	Uncapped Offer	Incr. Offer Curve	Effective ASU	Effective ANL	Modified Composite
MW	(\$/MWh)	(\$/MWh)	(\$/MWh)	(\$/MWh)	(\$/MWh)	(\$/MWh)	(\$/MWh)	(\$/MWh)
40	725	200	100	1,025	725	175	100	1,000

Min Run Time	1 Hour
Ecomax	40 MW

- 1 Original uncapped composite offer is above \$1000; therefore, offer verification is triggered
- 2 Since No Load pass reasonability test, included it in the composite offer
- 3 Since verified offer is below \$1000, additional startup cost is needed to get the composite offer to \$1000
 - A. \$175 amortized Startup cost is needed [$\$1000 - (725+100)$]

*After the minimum run time has been met, the verified composite offer is \$825 (\$725 incremental offer + \$100 of amortized No Load).

Scenario: Incremental offer is above \$1000 with NL passed

	Submitted Amortized Cost	Validation Test Result
Startup	200	Fail
No Load	150	Pass

Incr. Offer Curve		Submitted ASU (\$/MWh)	Submitted ANL (\$/MWh)	Uncapped Offer (\$/MWh)	Incr. Offer Curve (\$/MWh)	Effective ASU (\$/MWh)	Effective ANL (\$/MWh)	Modified Composite (\$/MWh)
MW	(\$/MWh)							
40	1050	200	150	1,400	1050	0	150	1,200

Min Run Time	1 Hour
Ecomax	40 MW

- 1 Original uncapped composite offer is above \$1000; therefore, offer verification is triggered
- 2 Since No Load pass reasonability test, included it in the composite offer
- 3 Capped composite offer during minimum run time is \$1,200 (Exclude Startup)

*After the minimum run time has been met, the verified composite offer would *still* be \$1,200 (\$1,050 + \$150 No Load).

- No changes to the existing logic for validating incremental energy offers submitted to Markets Gateway
 - If incremental energy offer > \$1000
- No Exception process to adjust Startup and/or No Load if it fails validation
- Fast Start resources with Composite Energy Offer above \$1,000/MWh, will be screened and validated each time a variable affecting the Composite Energy Offer calculation is changed
- Parameters that may affect Composite Energy Offer calculation
 - Incremental Offer
 - Startup Cost
 - No Load Cost
 - Economic Maximum MW
 - Minimum Run Time

- New display added to Markets Gateway to provide information if the Composite Energy Offer is above \$1,000/MWh for Fast Start Resources
- Display details
 - Read-only display
 - All inputs used to calculate the composite offer
 - Composite Energy Offer calculated at Ecomax
 - Results of automated validation of Startup Cost and No Load Cost (For Generators only)
 - Shutdown Cost for Economic Load Response
 - Results can be viewed by participant or individual unit level
 - Supports XML



Markets Gateway Composite Energy Offer Display

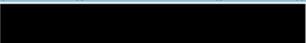
Market Day



Refresh



- Offers
- Offer Updates
- Detail
- Detail Updates
- Manager
- Selection
- Availability Update
- Restriction Information
- TPS Schedule Switch
- Fuel Price Exceptions
- Composite Offer Verification



Hour	Location	Schedule	Calculated Composite Offer	Noload Incremental Valid	Cold Startup Cost Valid	Noload Cost	Cold Startup Cost	Incremental Offer At Economic Maximum	Economic Maximum	Minimum Runtime	Hot Startup Time	Notification Time	Use Slope
Show all			Show all			Show all	Show all	Show all	Show all	Show all	Show all	Show all	
1		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
2		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
3		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
4		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
5		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
6		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
7		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
8		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
9		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
10		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
11		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
12		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
13		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
14		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
15		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
16		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
17		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
18		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
19		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
20		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
21		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
22		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
23		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No
24		Cost-s (2)	1048.66	No	No					2	0.25	0.1	No

- Markets Gateway User Guide: [Offer Verification Exception Request](#)
 - Section 9.18
- XML Guide: [Submit Unit Fuel Price Exception](#)
 - Section 6.22
- PJM Connect – [Offer Verification Page](#)
- PJM Offer Verification – [Website](#)
- Member Information Reporting Application (MIRA) – [Website](#)

PJM Energy Offer Verification Team:
EnergyOfferVerification@pjm.com



Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

- Fast Start Eligible
- Fast Start Capable
- Fast Start Capable Request Process

- Units must first be classified as Fast-Start capable in order to qualify for Fast-Start Pricing
- Generators based on technology type are pre-defined as Fast-Start Capable by default
- Resource not classified as Fast-Start capable may seek to be Fast-Start capable during the annual review period
 - Deadline to submit request: April 15
 - PJM review period (includes consultation with IMM): April 15 – May 31
 - Effective: June 1 and onwards
- Supporting data must be provided to prove unit can startup within one hour
- If unit cannot meet their bid in parameters, may lose Fast-Start capable designation
 - To be reconsidered, the unit may submit supporting data during the annual review period

- Resources classified as FS capable by default:
 - Generation Type:
 - Fuel Cells
 - All CTs
 - Diesels
 - Hydro
 - Battery
 - Solar
 - Landfill
 - Wind
 - All Economic Load Response
- Resource classified not FS capable by default*:
 - Combined Cycle
 - Steam
 - Nuclear
- *Resources may request to be considered FS Capable

- Once a unit is deemed Fast-Start capable, they must also meet the following requirements in order to qualify for Fast-Start Pricing:
 - Notification Time + Startup Time \leq 1 hour
 - Minimum Run Time \leq 1 hour
 - Resources must be online and running for PJM
- Pumped Hydro resources using the PJM Hydro Optimizer, partially Pseudo-tied resources, and dynamically scheduled resources are not eligible for Fast-Start Pricing