

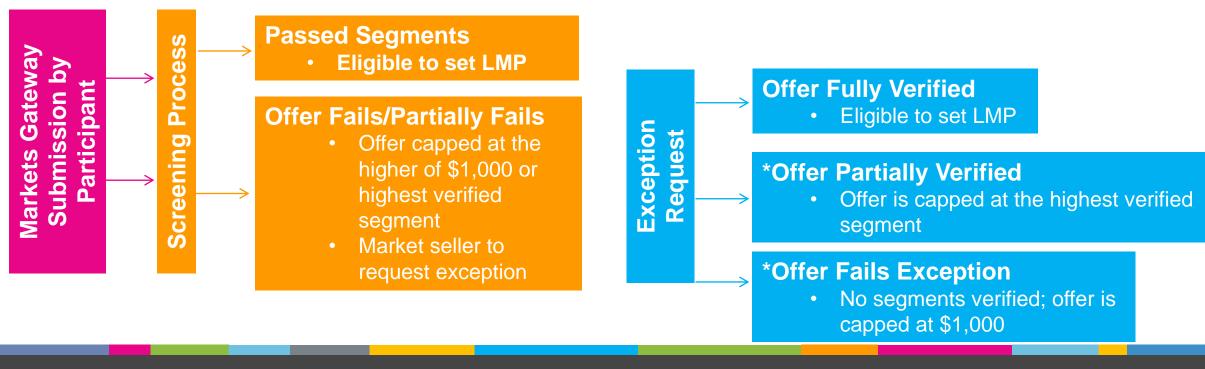
PJM Energy Offer Verification Process Overview

Vijay Shah Jennifer Freeman MIC Special Session – Offer Verification January 12, 2022



Energy Offer Verification Background

- 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

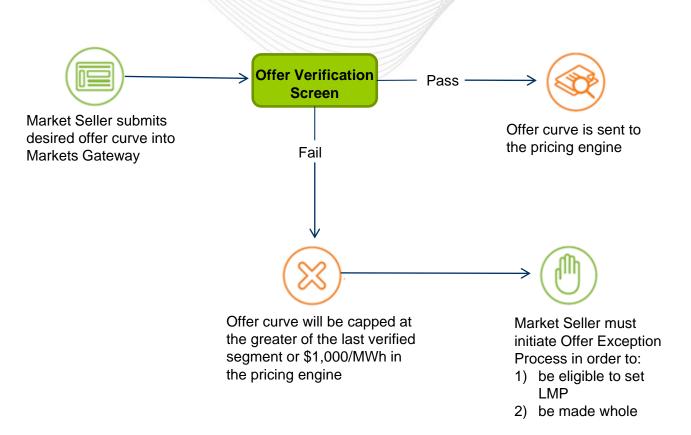


Preparation for Offer Verification

- 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

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Incremental Energy Offer Verification





Incremental Energy Offer Verification Process Overview

- 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



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Step 2 – Submit Exception Request Data

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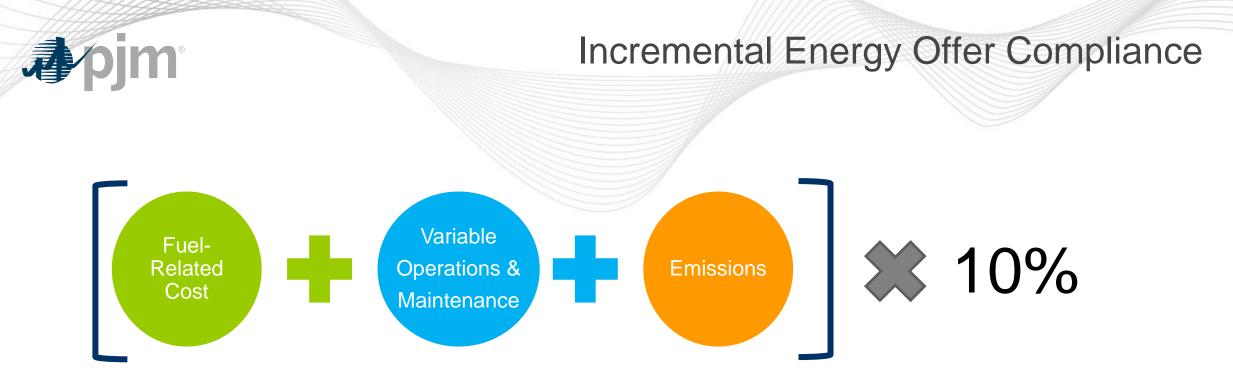
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- Submit supporting data to PJM Connect
 - Any Exception Request without supporting data may be rejected
- PJM will review the approved Fuel Cost Policy in addition to the data submitted to determine if exception should be granted
 - Highlight the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



- 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 <= \$1,000/MWh, adder is up to 10% of incremental cost
 - For incremental cost > \$1,000/MWh and <= \$1,900/MWh, adder is up to \$100/MWh (Capped)
 - For incremental cost > \$1,900/MWh and <=\$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

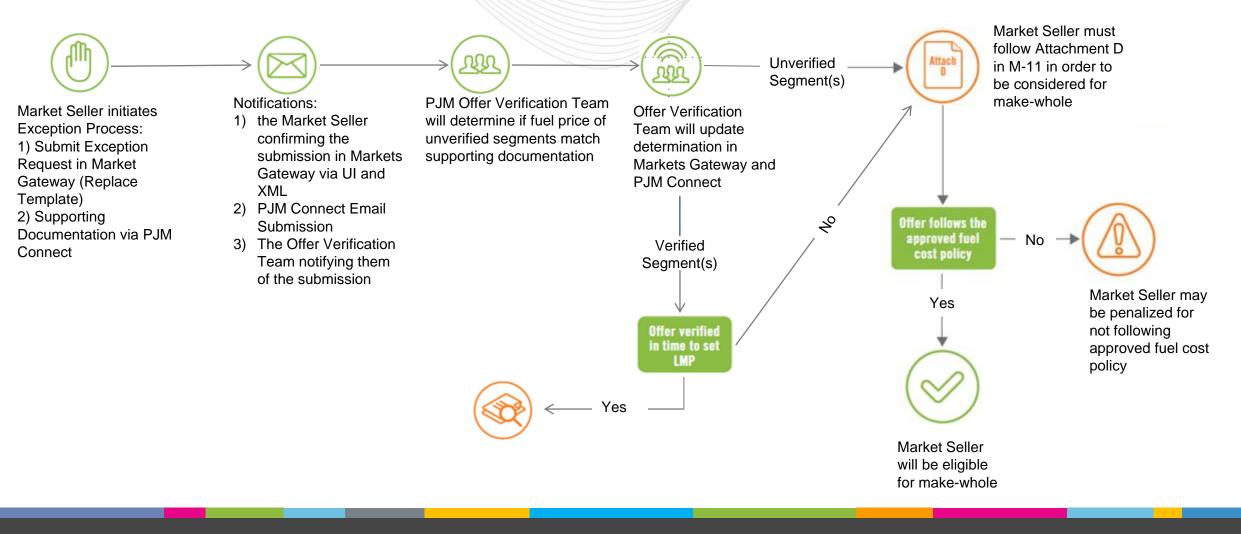


Exception Request Determination

- 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



Exception Process – Incremental Offer





Market Based Energy Offers above \$1000/MWh

- Specify a reference cost schedule for respective market based offers (Price and/or PLS schedule)
- Market based offer data identical to "Reference Cost-based Schedule"
 - MW Blocks
 - Use Bid Slope
 - Fuel Type
- Market based offer values less than or equal to "Reference Costbased 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

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

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- If an offer is submitted/approved and subsequently updated from participants then:
 - Offer Verification will be re-triggered
 - Offer will be capped at \$1000
 - Will need to be reviewed by PJM Offer Verification Team
 - Will need to be re-approved by PJM
 - Participants do not need to re-submit exception request unless required by FCP (in MG)
 - Updated fuel cost



Fast Start Offer Verification

- 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



Offer Verification - Effective Offers over \$1,000/MWh

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



Offer Verification - Effective Offers over \$1,000/MWh

 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					Subject to Offer Verification?
\$700	\$100	\$100	\$900	No	No
\$700	\$200	\$200	\$1,100	Yes	Yes



Example 1

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

	Submitted Amortized Cost	Validation Test Result	Incr. O	ffer Curve	ASU	Submitted ANL	Offer	Incr. Offer Curve	Effective ASU	Effective ANL	Modified
Startup		Fail	MW	(\$/MWh)	(\$/MWh)	(\$/MWh)	(\$/MWh)	(\$/MWh)	((\$/MWh)	(\$/MWh)	Composite (\$/MWh)
No Load	100	Pass	40	900	200	100	1,200	900	2 0	100	1,000
Min Run Tir Ecomax	ne	1 Hour 40 MW									

Original submitted composite offer is above \$1000; therefore, offer verification is triggered

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.



Example 2

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

Startup	Submitted Amortized Cost 200	Validation Test Result <mark>Fail</mark>	Incr. C MW)ffer Curve (\$/MWh)	d ASU	Submitted ANL (\$/MWh)	Uncapped Offer (\$/MWh) <mark>1</mark>	Incr. Offer Curve (\$/MWh)	Effective ASU 3 ((\$/MWh)	Effective ANL (\$/MWh) <mark>(</mark> 2	Modified Composite(\$/MWh)
No Load	100	Pass	40	725	200	100	1,025	725	175	100	1,000
Min Run Tir Ecomax	me	1 Hour 40 MW									

Original uncapped composite offer is above \$1000; therefore, offer verification is triggered

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).



Ecomax

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

	Submitted Amortized Cost	Validation Test Result
Startup	200	Fail
No Load	150	Pass
Min Run Tin	ne	1 Hour

40 MW

Incr. O MW	ffer Curve		Submitted ANL (\$/MWh)	Offer	Incr. Offer Curve (\$/MWh)	Effective ASU ((\$/MWh)	Effective ANL (\$/MWh) 2	Modified Composite (\$/MWh)
40	1050	200	150	1,400	1050	0	150	1,200

Original uncapped composite offer is above \$1000; therefore, offer verification is triggered
 Since No Load pass reasonability test, included it in the composite offer
 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).



Fast Start Offer Verification

- 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

TPS Schedule Switch Composite Offer Verification Offers Offer Updates Detail Detail Updates Manager Selection Availability Update Restriction Information Fuel Price Exceptions Hour . Location Schedule Calculated Composite Offer Noload Incremental Valid Cold Startup Cost Valid Noload Cost Cold Startup Incremental Offer At Economic Maximum Hot Startup Time Notification Time Use Slope Economic Maximum Minimum Runtime Cost Show all \sim ~ Show all ~ ~ \sim Cost-s (2) 1048.66 No No 0.25 0.1 1 2 No 2 2 0.25 Cost-s (2) 1048.66 No No 0.1 No 3 Cost-s (2) 1048.66 No No 2 0.25 0.1 No 4 1048.66 No No 2 0.25 0.1 No Cost-s (2) Cost-s (2) 2 5 1048.66 No No 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 1048.66 2 0.25 0.1 Cost-s (2) No No No 2 9 Cost-s (2) 1048.66 No No 0.25 0.1 No 10 1048.66 2 0.25 0.1 Cost-s (2) No No No 2 11 Cost-s (2) 1048.66 No No 0.25 0.1 No 12 1048.66 2 0.25 0.1 Cost-s (2) No No No 13 2 0.25 Cost-s (2) 1048.66 No No 0.1 No 14 1048.66 2 Cost-s (2) No No 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 2 0.25 Cost-s (2) 1048.66 No No 0.1 No 18 2 1048.66 No No 0.25 0.1 No Cost-s (2) 2 19 Cost-s (2) 1048.66 No No 0.25 0.1 No 20 Cost-s (2) 1048.66 No No 2 0.25 0.1 No 2 21 Cost-s (2) 1048.66 No No 0.25 0.1 No 22 Cost-s (2) 1048.66 No No 2 0.25 0.1 No 23 2 0.25 Cost-s (2) 1048.66 No No 0.1 No 2 24 Cost-s (2) 1048.66 No No 0.25 0.1 No

Refresh

XML

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Reference Materials

- Markets Gateway User Guide: <u>Offer Verification Exception</u> <u>Request</u>
 - Section 9.18
- XML Guide: <u>Submit Unit Fuel Price Exception</u>
 - Section 6.22
- PJM Connect Offer Verification Page
- PJM Offer Verification <u>Website</u>
- Member Information Reporting Application (MIRA) <u>Website</u>





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



Eligible Fast-Start Resources

- 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



Eligible Fast-Start Resources

- 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 <= 1 hour
 - Minimum Run Time <= 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