PJM Energy Offer Verification Process Overview

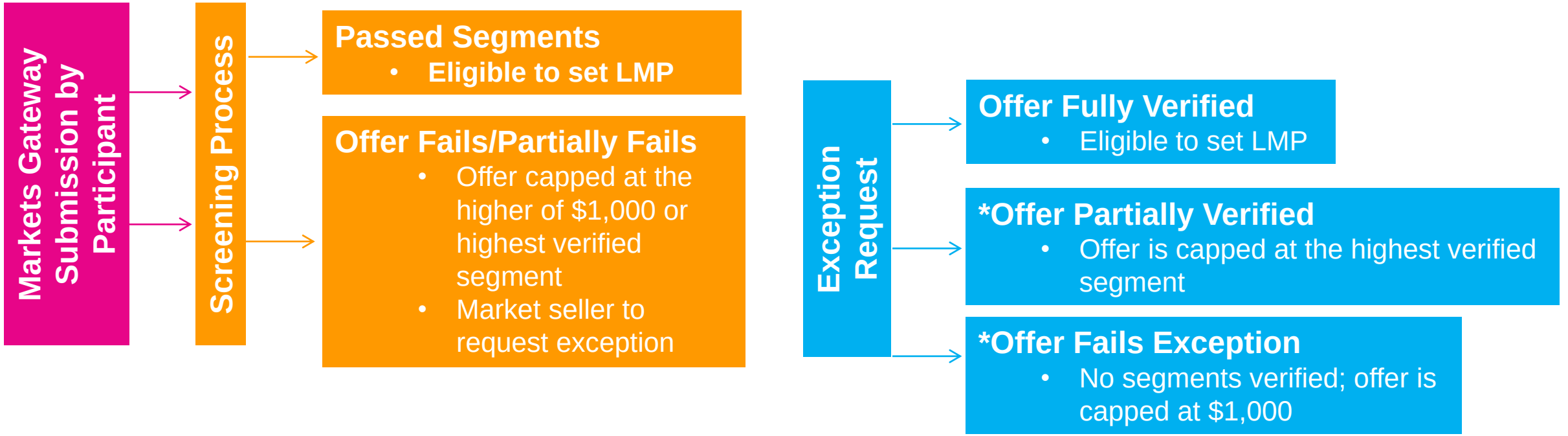
Vijay Shah
Lead Engineer, Real-Time Market Operations
Jennifer Warner-Freeman
Senior Economist, Performance Compliance

Energy Offer Verification Education Session
December 7, 2022

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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



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Overview

- 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

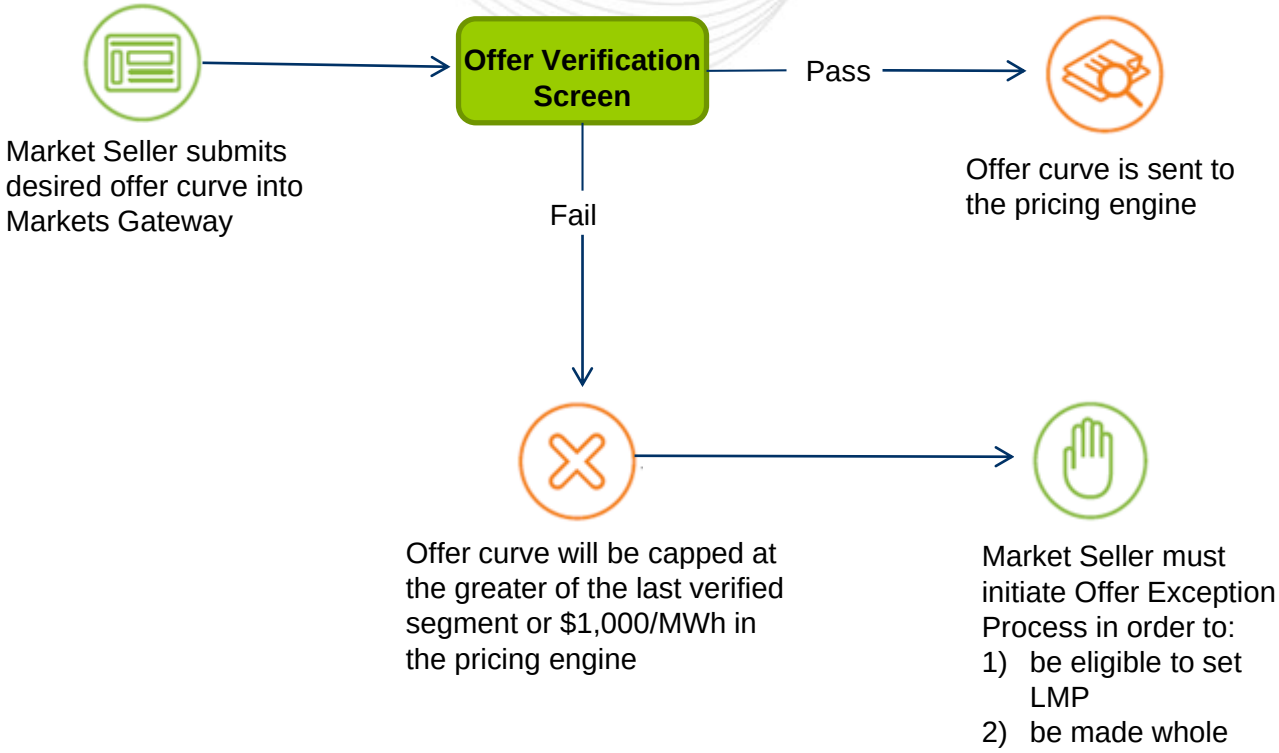
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Preparation for Offer Verification

- 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

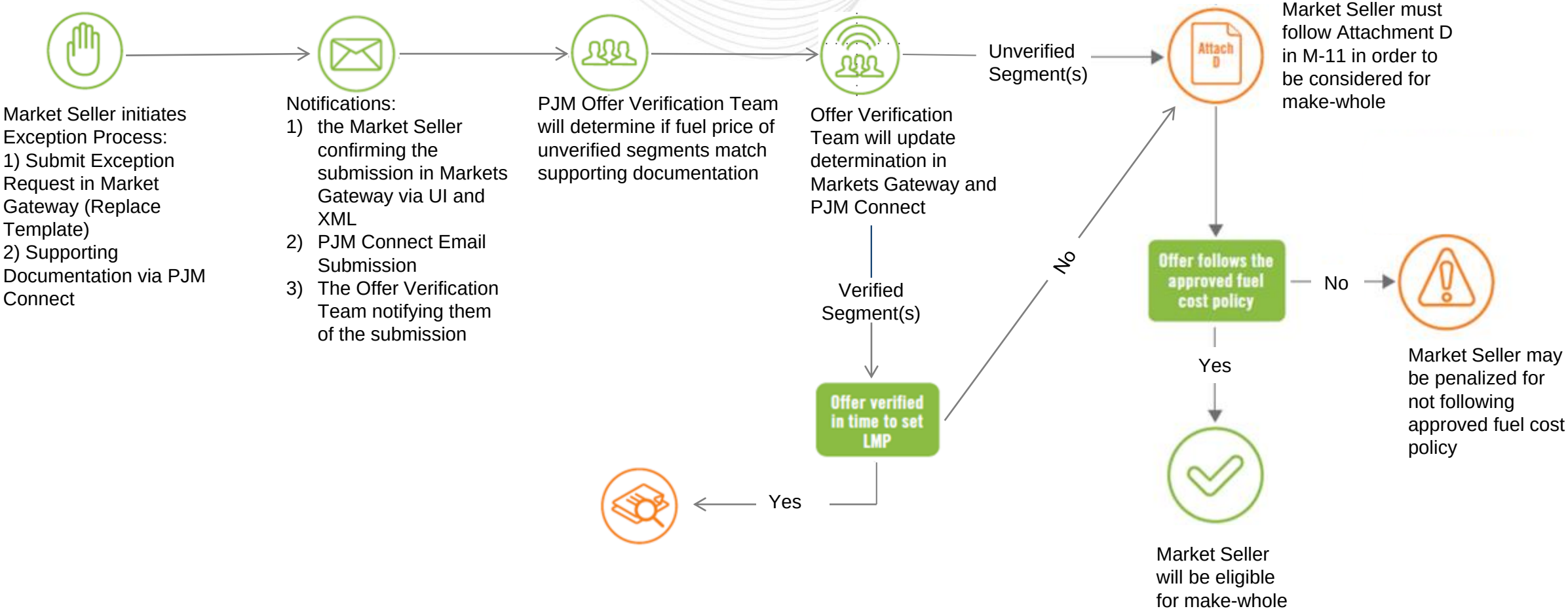
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Incremental Energy Offer Verification



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Exception Process – Incremental Offer



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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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Incremental Energy Offer Compliance



- 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

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10 % Adder Capping and Compliance

- 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

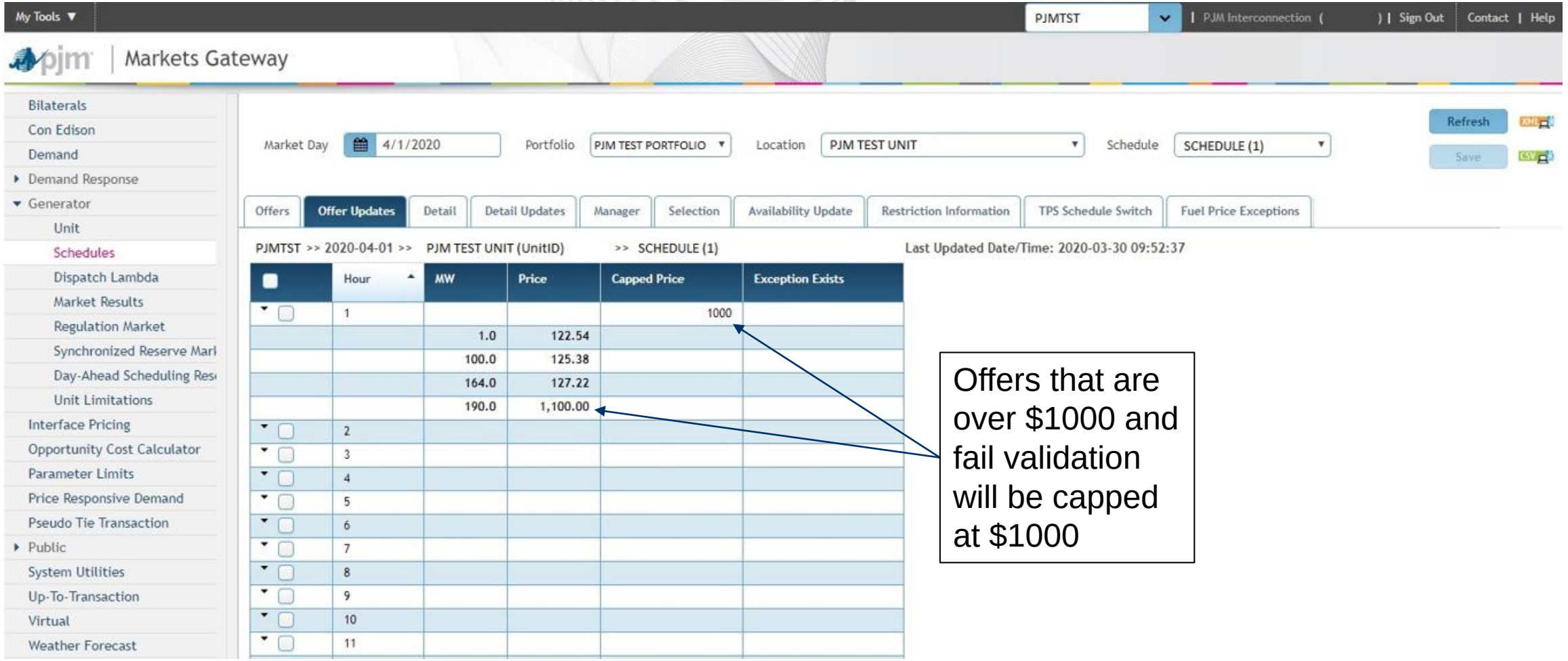
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Fuel Cost Policy Updates

- Fuel Cost Policy updates since Winter 2021/22:
  - **Weekend/Holiday Natural Gas Estimates.** Default assumption is that market participants are using weekend strip for commodity estimate, unless otherwise specified in their approved fuel cost policy.
  - **Rebid and Intraday Updates.** Rebid and intraday updates to the maximum allowable cost offer must follow the triggers (e.g. time window, pipeline events) specified in the fuel cost policy. Additional triggers must be identified in the approved fuel cost policy in order to update offers more than once per day.

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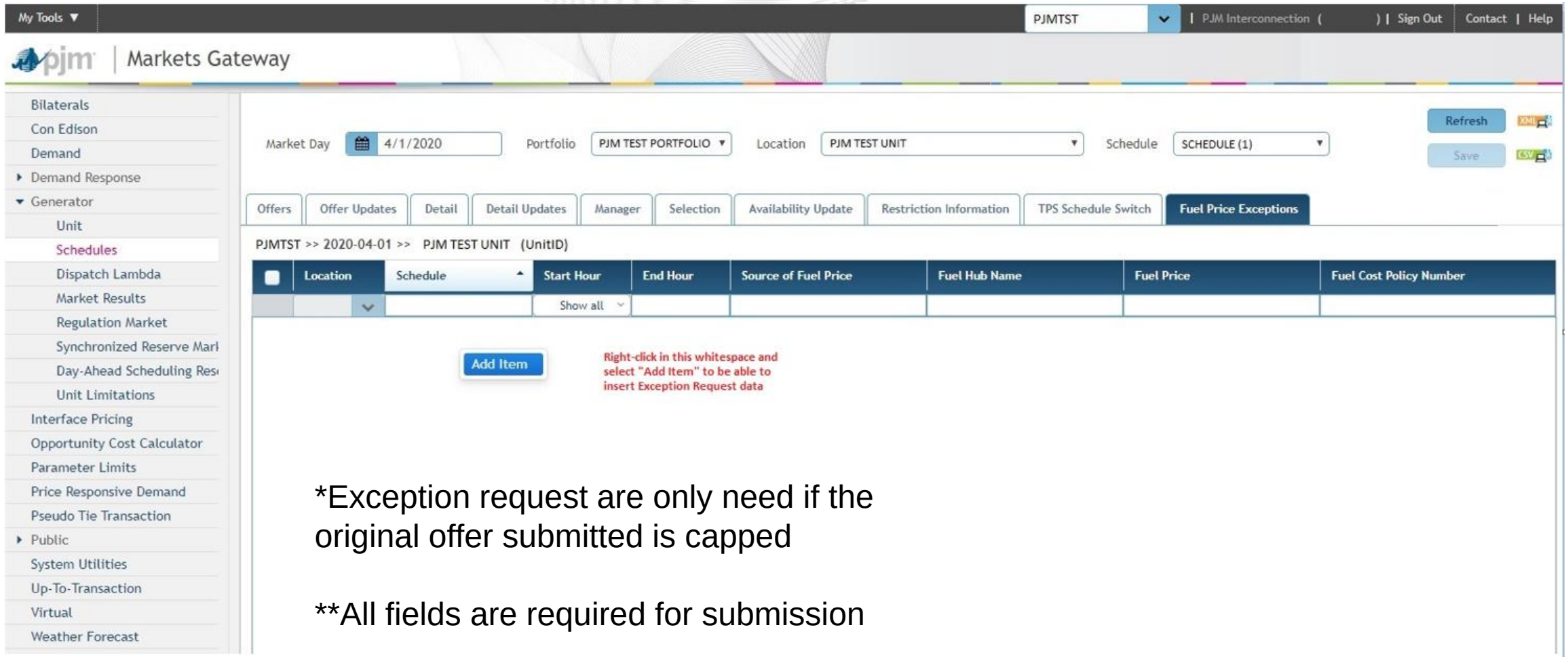
Step 1 - Submit Incremental Energy Offers on Offer Updates Screen



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

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Step 2 – Submit Exception Request Data

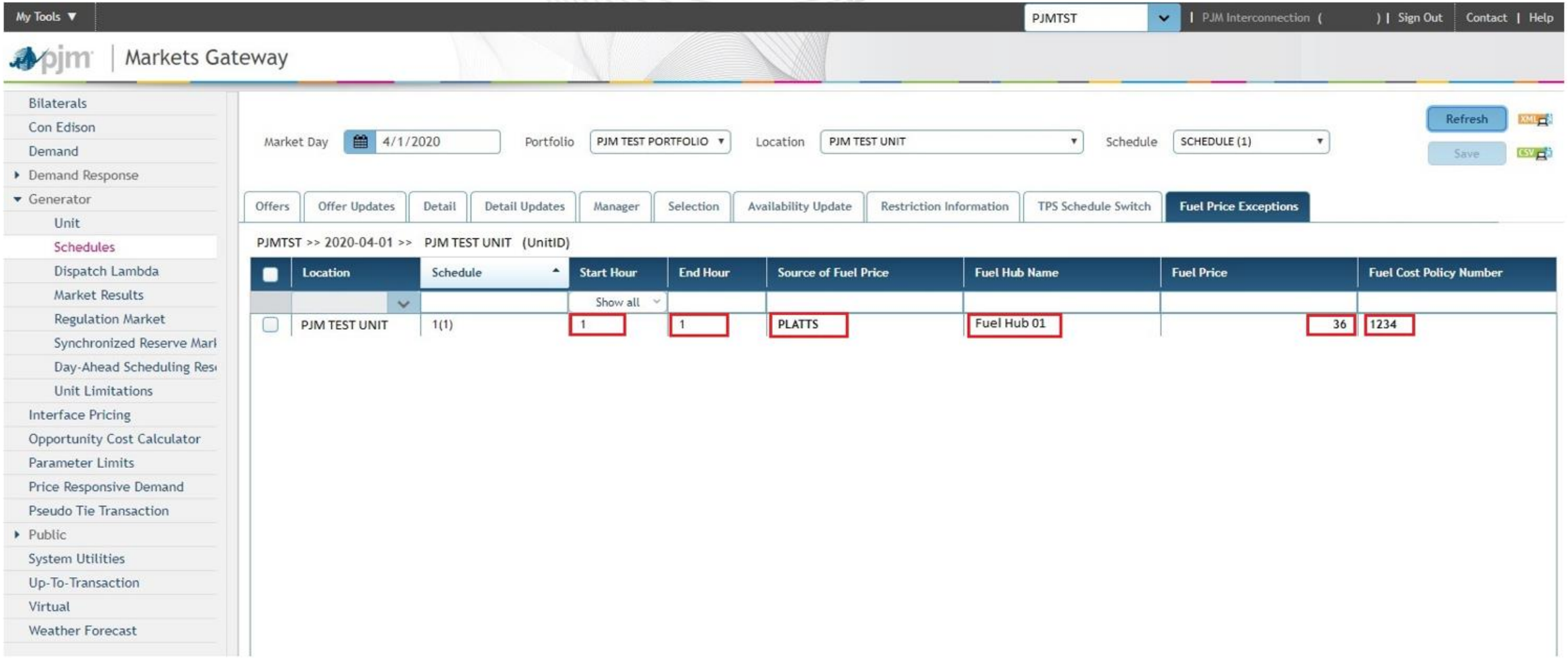


*Exception request are only need if the original offer submitted is capped

**All fields are required for submission

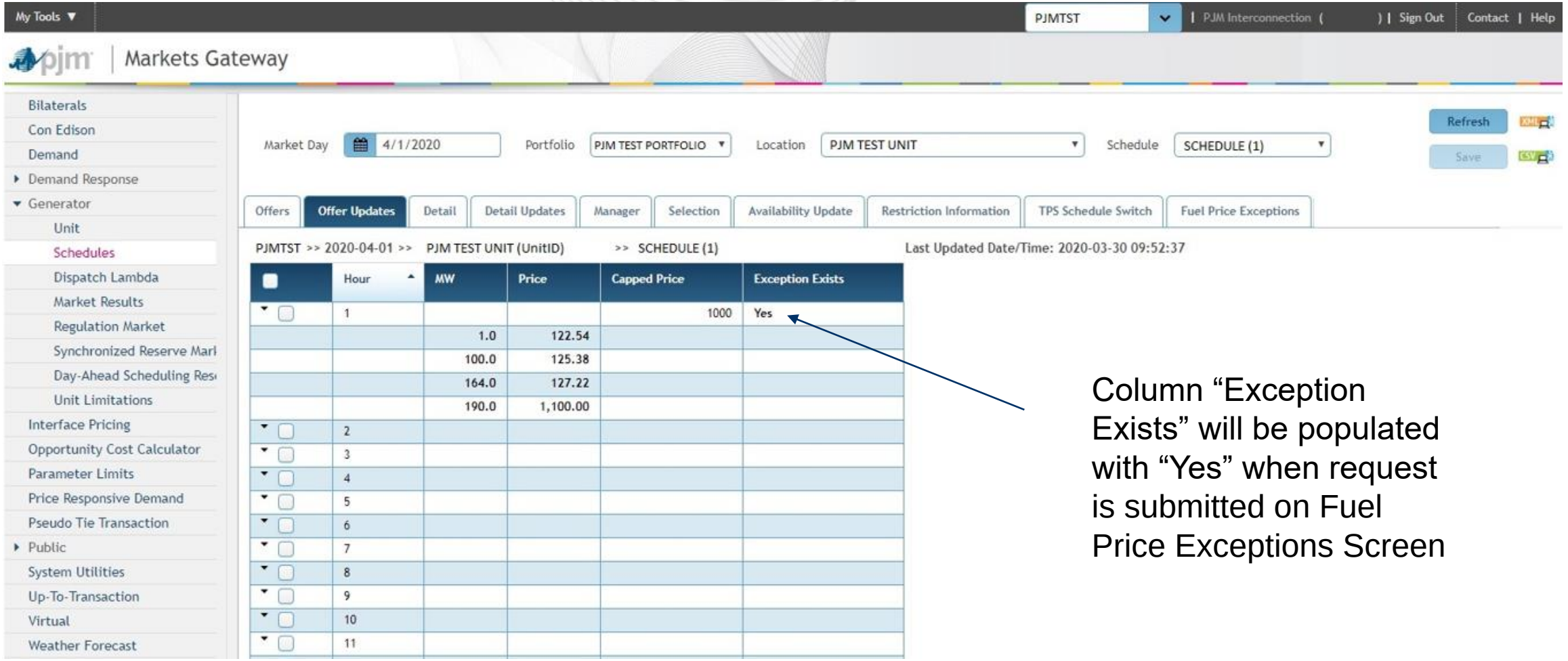
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Sample Submission



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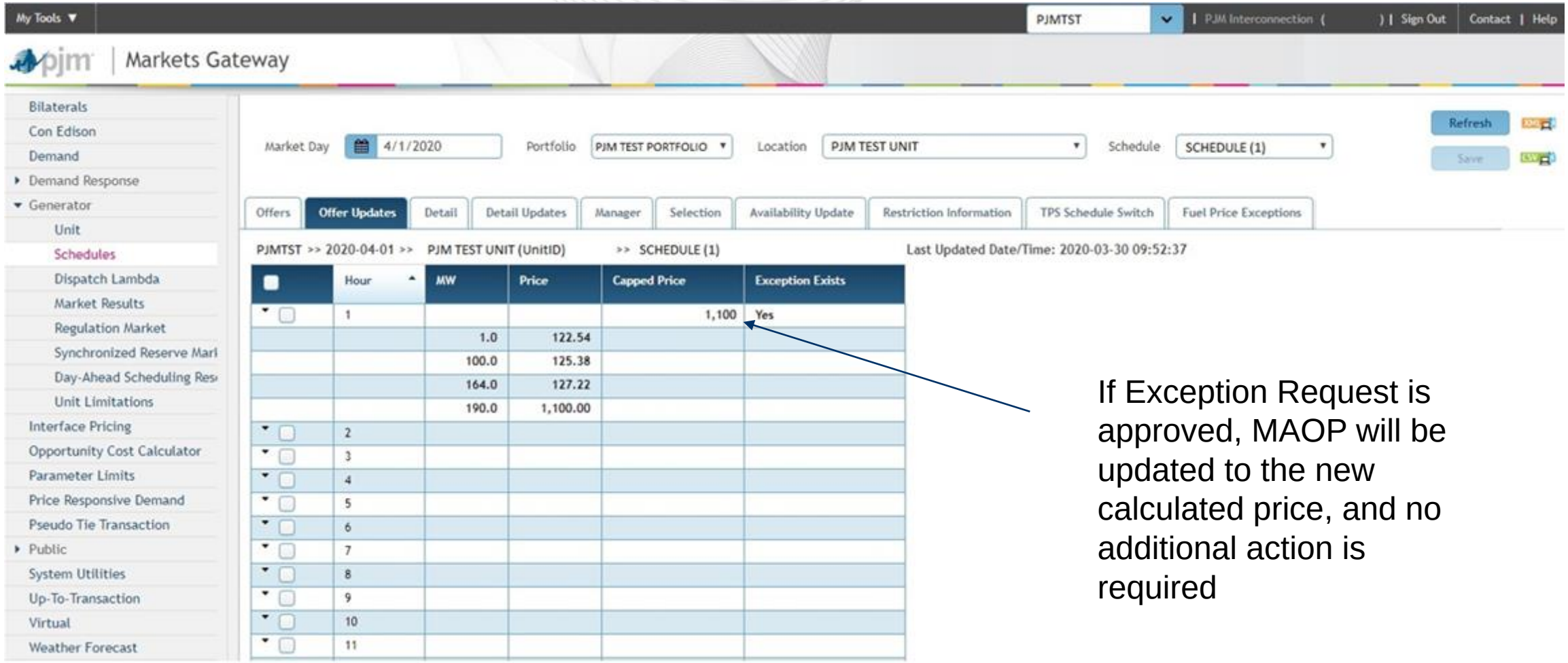
Step 3 – Verify Exception Request Submitted



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

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After Exception Request is Submitted



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

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After Exception Request is Submitted

- Submit supporting data to PJM Connect
  - Any Exception Request without supporting data may be rejected
  - User must specify which period the submission is for (i.e. Day-Ahead, Rebid, or Intraday) in the notes section of the form
  - *If multiple users from same company need access to the submission request, contact PJM Connect Support or Offer Verification Support*
- 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)

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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

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Market Based Energy Offers above $1000/MWh

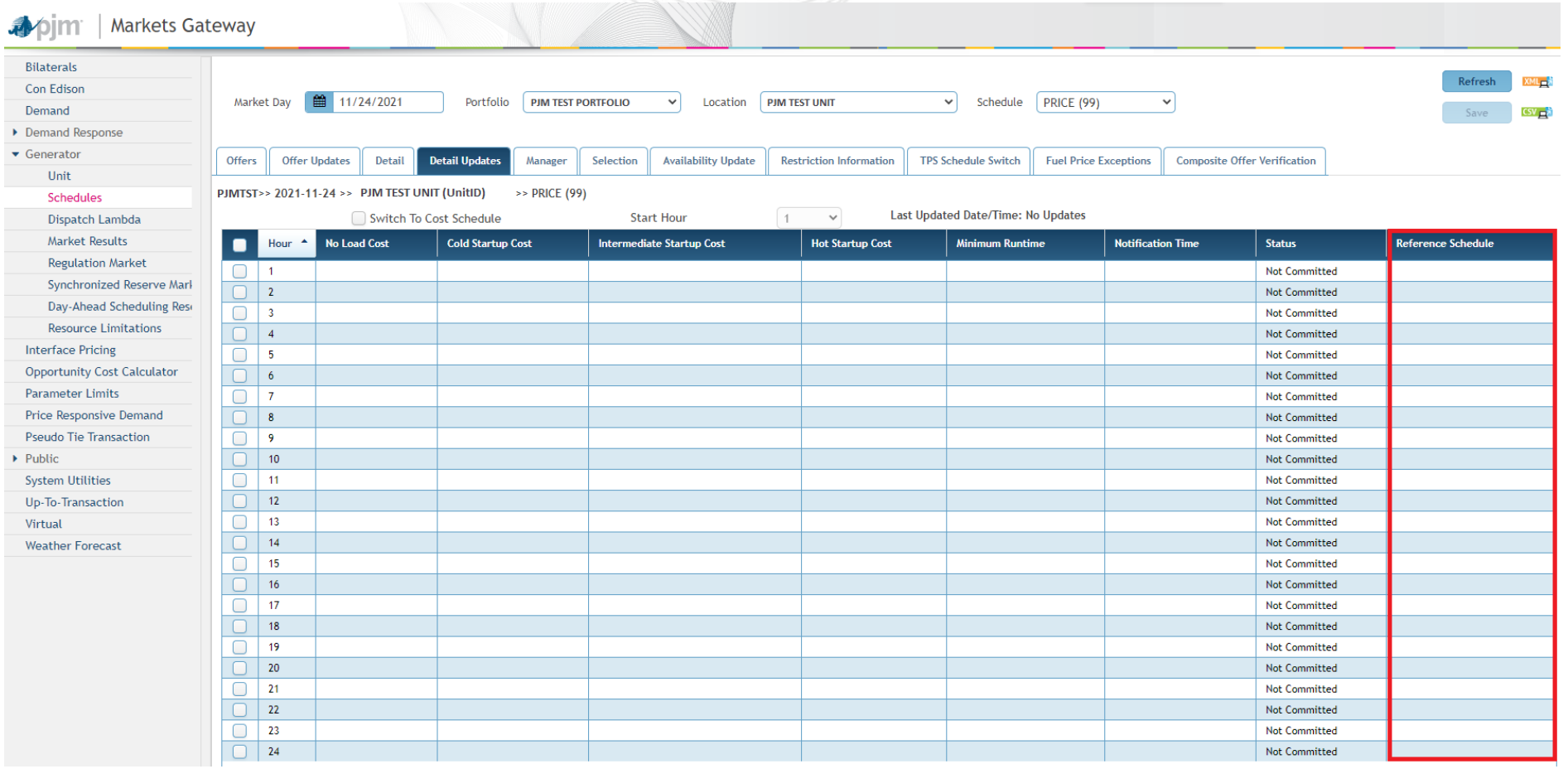
- Specify a reference Cost schedule for respective Market based offer (Price and/or PLS schedule)
- Have certain offer data identical to “Reference Cost-based Schedule”
  - MW Blocks
  - Use Bid Slope
  - Fuel Type
- Have offer values less than or equal to “Reference Cost-based Schedule”
  - Startup 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

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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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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

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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

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Markets Gateway Composite Energy Offer Display

- 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

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Markets Gateway Composite Energy Offer Display

Market Day [redacted]

Refresh

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

[redacted]

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	[redacted]	Cost-s (2)	1048.66	No	No	[redacted]	[redacted]	[redacted]	[redacted]	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

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Reference Materials

- 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

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Contact



PJM Energy Offer Verification Team:

EnergyOfferVerification@pjm.com

PJM Connect Support:

sharepoint_support@pjm.com

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

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Appendix

- Fast Start Eligible
- Fast Start Capable
- Fast Start Offer Verification Details
- Fast Start Offer Verification Examples

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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

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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

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Eligible Fast-Start Resources

- 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

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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

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

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

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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

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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

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Example 1

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 1,200	900	2 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.

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Example 2

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

Min Run Time	1 Hour
Ecomax	40 MW

Incr. Offer Curve		Submitted ASU ($/MWh)	Submitted ANL ($/MWh)	Uncapped Offer ($/MWh) 1	Incr. Offer Curve ($/MWh)	Effective ASU (($/MWh) 3	Effective ANL ($/MWh) 2	Modified Composite ($/MWh)
MW	($/MWh))							
40	725	200	100	1,025	725	175	100	1,000

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).

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Example 3

Scenario: Incremental offer is above $1000 with NL passed

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

Min Run Time	1 Hour
Ecomax	40 MW

Incr. Offer Curve		Submitted ASU ($/MWh)	Submitted ANL ($/MWh)	Uncapped Offer ($/MWh) 1	Incr. Offer Curve ($/MWh)	Effective ASU (($/MWh)	Effective ANL ($/MWh) 2	Modified Composite ($/MWh) 3
MW	($/MWh)							
40	1050	200	150	1,400	1050	0	150	1,200

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).

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