

Performance Impact of Multi-Schedule Model on the Market Clearing Engine

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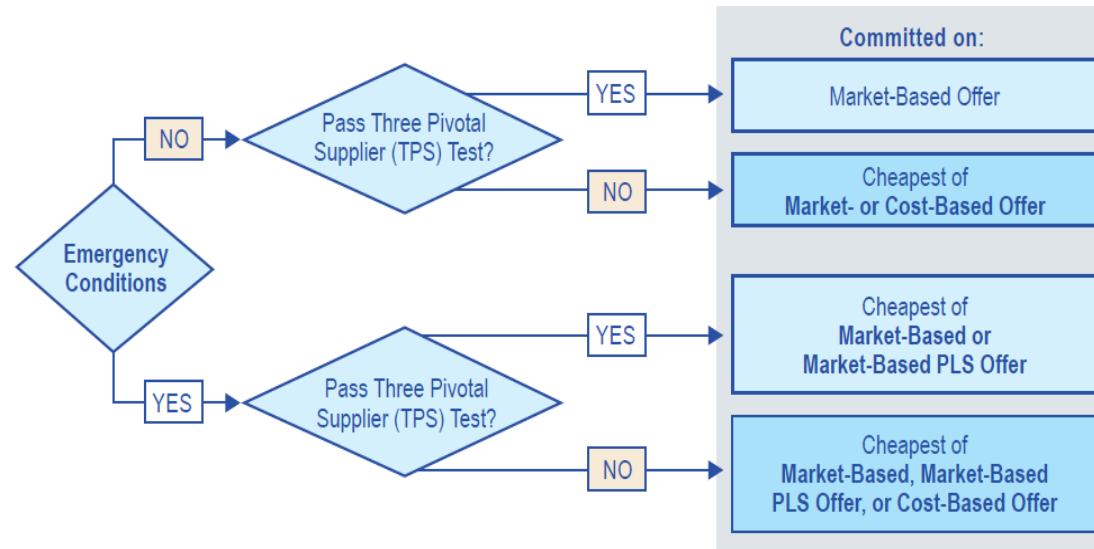
Action Required	Deadline	Who May Be Affected
No action required	Q3/Q4 2026*	All stakeholders



*Coincident with the Real-time nGEM MCE production deployment.

Currently, the day-ahead market software is designed to commit resources based on the appropriate schedule offers that results in the lowest total system production cost.

The process flow below determines how the appropriate schedule is selected:



The schedule selection is optimized by the market clearing engine (MCE) where each eligible schedule is modeled as a logical resource, increasing the problem's size.

With the addition of the Enhanced Combined Cycle (ECC) model and Energy Storage Resource (ESR)/Hybrid model as part of the Next Generation Markets project (nGEM) – **the optimization problem increases significantly.**

- This will increase the solution time past what is manageable in the 2.5 hour Day-ahead market clearing window.

MIC Special Session focused on the Performance Impact of a Multi-schedule Model on the Market Clearing Engine met to determine a process to perform the schedule selection outside of the MCE such that only one schedule will be passed to the MCE for commitment and dispatch purposes to address the performance impact.

At the October meeting, the MIC endorsed two packages:

MAIN MOTION	ALTERNATE MOTION
<p>The PJM package (A) was endorsed with 77% in favor and 23% opposed.</p>	<p>The PJM/GT Power group package (B) was endorsed with 66% in favor and 34% opposed.</p>
<p>A second vote showed stakeholders preferred the PJM package (A) over status-quo with 77% in favor and 23% opposed.</p>	<p>A second vote showed stakeholders preferred the PJM/GT Power package (B) over status-quo with 68% in favor and 32% opposed.</p>

- PJM Package (A) moves the selection of the offer schedule for a resource from within the MCE to outside of the MCE such that the MCE will only have one schedule to consider for the commitment and dispatch of a resource in the Day-ahead (DA) market.
- All design components remain the same as the status quo except the offer selection approach that will be used in the DA market.
 - Application of offer selection approach in DA will be the same as what is currently used in Real-time (RT)

The offer selection approach will **extend the formulaic approach** that is currently used in the RT market **to the DA market.**

DISPATCH COST FOR THE APPLICABLE HOUR =

$$[(\text{Incremental energy offer@economic minimum for the hour } [\$/\text{mwh}] * \text{economic minimum for the hour} [\text{mw}]) + \text{no-load cost for the hour } (\$/\text{h})]$$

TOTAL DISPATCH COST =

Sum of hourly dispatch cost* over a resource's minimum run time(\$) + start-up cost (\$)

The offer type that results in the lowest Total Dispatch Cost will be selected for commitment and dispatch purpose.

** NOTE: Total hourly dispatch cost will use the highest hourly cost for equivalent hours as the minimum run time.*

Application of offer selection approach in both DA and RT :

For all resource types other than those using configuration based models	For Combined Cycle Model	For Energy Storage and Hybrid Resource Model
Formulaic approach	Formulaic approach on the highest configuration that can start from plant offline state. The offer type selected on highest configuration will be used for all configurations.	Formulaic approach on discharge side of the offer curve.



Sec 6.4 of OATT Attachment K and OA Schedule 1 changes

6.4 Offer Price Caps.

6.4.1 Applicability.

(a) If, at any time, it is determined by the Office of the Interconnection in accordance with Sections 1.10.8 or 6.1 of this Schedule that any generation resource may be dispatched out of economic merit order to maintain system reliability as a result of limits on transmission capability, the offer prices for energy from such resource shall be capped as specified below. For such generation resources committed in the Day-ahead Energy Market, if the Office of the Interconnection is able to do so, such offer prices shall be capped for the entire commitment period, and such offer prices will be capped at a cost-based offer in accordance with section 6.4.2 and committed at the market-based offer or cost-based offer which results in the lowest dispatch cost in accordance with 6.4.1(g)~~overall system production cost~~. For such generation resources committed in the Real-time Energy Market such offer prices shall be capped at a cost-based offer in accordance with section 6.4.2 and dispatched on the market-based offer or cost-based offer which results in the lowest dispatch cost in accordance with 6.4.1(g) until the earlier of: (i) the resource is released from its commitment by the Office of the Interconnection; (ii) the end of the Operating Day; or (iii) the start of the generation resource's next pre-existing commitment.



Sec 6.4 of OATT Attachment K and OA Schedule 1 changes

(g) In the Real-time Energy Market and Day-ahead Energy Market, the schedule on which offer capped resources will be placed shall be determined using dispatch cost, where dispatch cost is calculated pursuant to the following formulas:

Dispatch cost for the applicable hour = ((Incremental Energy Offer @ Economic Minimum for the hour [\$/MWh] * Economic Minimum for the hour [MW]) + No-load Cost for the hour [\$/H])

- (i) For resources committed in the Real-time Energy Market at the time of commitment or committed in the Day-ahead Energy Market, the resource is committed on the offer with the lowest Total Dispatch cost, at the time of commitment as further detailed in the PJM Manuals,

where:

Total Dispatch cost = Sum of hourly dispatch cost over a resource's minimum run time [\$] + Start-Up Cost [\$]

- (ii) For resources operating in real-time pursuant to a day-ahead or real-time commitment, and whose offers are updated after commitment, the resource is dispatched on the offer with the lowest dispatch cost for the each of the updated hours.
- (iii) However, once the resource is dispatched on a cost-based offer, it will remain on a cost-based offer regardless of the determination of the cheapest schedule.



PJM/GT Power group proposal (B) – Alternate Motion



Summary of PJM/GT Power group proposal (B)- Alternate Motion

- Two of the several design components are changing in this proposal. All other identified design components remain same as status quo.
 - Eligible offers for commitment and dispatch purpose
 - Offer selection approach (DA, RT- Status quo)
 - Application of offer selection approach (Both DA and RT)

This proposal better addresses the market power mitigation issue raised by the IMM at the October MRC meeting for the PJM proposal (Package A).



Eligible offers for commitment and dispatch purpose (Price-based resources)

		Fail TPS test*	Does not Fail TPS test
Non-emergency Conditions	Capacity resource	<ul style="list-style-type: none"> Price-Based offer Cost-based offer(s) 	<ul style="list-style-type: none"> Price-based offer
	Energy-only resource	<ul style="list-style-type: none"> Price-Based offer Cost-based offer(s) 	<ul style="list-style-type: none"> Price-based offer
Emergency Conditions	Capacity resource	<ul style="list-style-type: none"> Price-Based offer Price-based PLS offer Cost-based offer(s) 	<ul style="list-style-type: none"> Price-Based offer Price-based PLS offer
	Energy-only resource	<ul style="list-style-type: none"> Price-Based offer Cost-based offer(s) 	<ul style="list-style-type: none"> Price-based offer

- All Cost based offer(s) will be used for cost-based resources under all conditions (i.e. emergency conditions, non-emergency conditions, resource fails TPS test, resource doesn't fail TPS test). If price-based offer is not submitted for price-based resource then price-based PLS offer will be used.

*Resource fails the TPS test and eligible for offer capping. Red striped texts are part of status-quo along with black texts.

The offer selection approach will **extend the formulaic approach** that is currently used in the RT market **to the DA market.**

DISPATCH COST FOR THE APPLICABLE HOUR =

[(Incremental energy offer@economic minimum for the hour [\$/mwh]*economic minimum for the hour[mw]) + no-load cost for the hour (\$/h)]

TOTAL DISPATCH COST =

Sum of hourly dispatch cost* over a resource's minimum run time(\$) + start-up cost (\$)

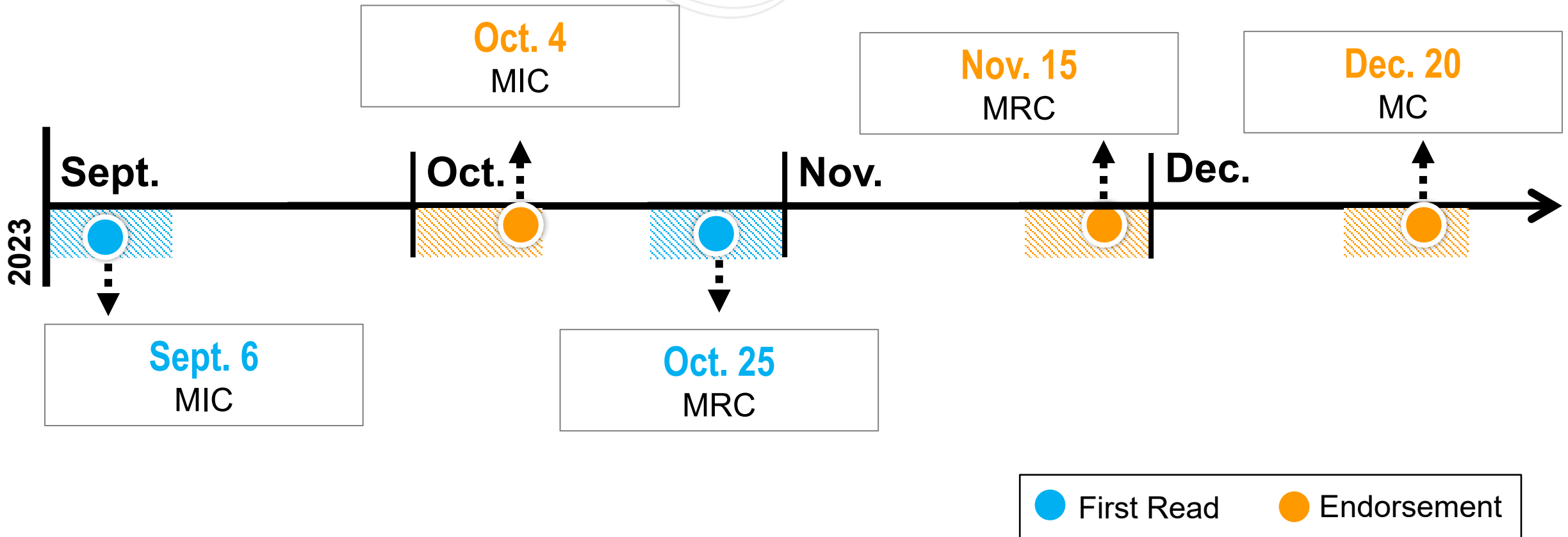
The cost offer that results in the lowest Total Dispatch Cost will be selected for commitment and dispatch purpose.

** NOTE: Total hourly dispatch cost will use the highest hourly cost for equivalent hours as the minimum run time.*

Application of offer selection approach in both DA and RT :

For all resource types other than those using configuration based models	For Combined Cycle Model	For Energy Storage and Hybrid Resource Model
Formulaic approach	Formulaic approach on the highest configuration that can start from plant offline state. The offer type selected on highest configuration will be used for all configurations.	Formulaic approach on discharge side of the offer curve.

Changes to sections 6.4 and 6.6 of OATT Attachment K Appendix and OA Schedule 1 are made for this proposal. These sections are identical for OATT and OA and hence only one set of changes are posted along with meeting materials.



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**[Performance Impact of Multi-Schedule
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Appendix

- [Options and Package Matrix](#)
- [Additional presentation material on packages](#)

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