# Performance Impact of the Multi-schedule Model on the Market Clearing Engine

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

- The schedule selection is optimized by the market clearing engine (MCE) where **each schedule is modeled as a logical resource**, increasing the problem's size.
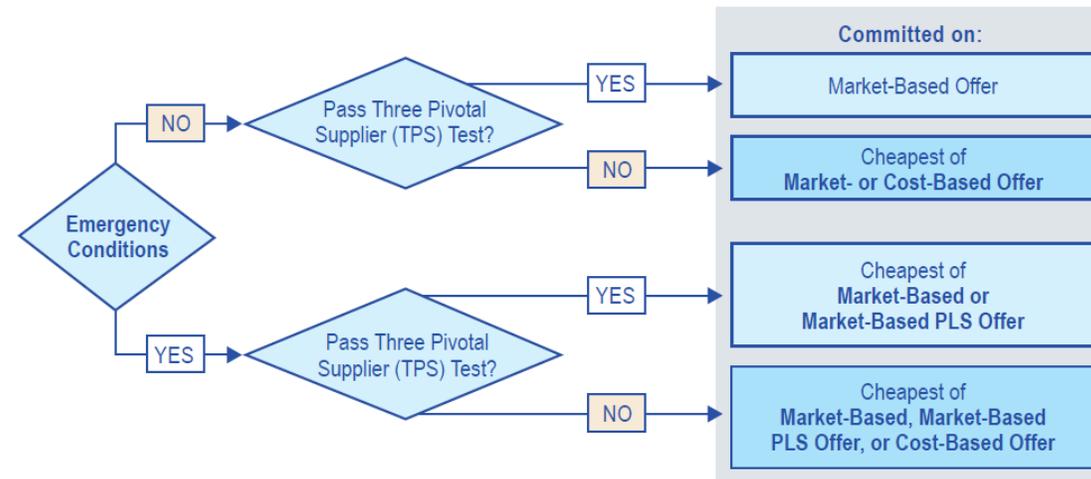
Multi-Schedule Model in the MCE increases the optimization solution time.

Currently manageable but will not be manageable in the future upon implementation of Configuration-based models for Combined Cycle, Energy Storage Resource and Hybrid Resource models.

Need to provide only one schedule for commitment and dispatch purposes to the MCE for implementation of configuration-based models in the MCE.

The flexibility provided by configuration-based models in committing resources will be important with high penetration of intermittent resources.
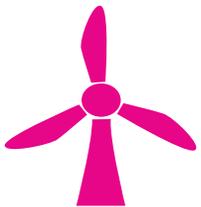
Configuration based combined cycle model saves approximately $187M in production cost per year (based on a study presented on July 17).

The proposed solutions will provide less optimal solutions than the status quo.

However, configuration-based models will provide more flexibility from the current and future fleet that existing models do not provide.

Evaluating the total system production cost impacts of different packages is extremely difficult without the software changes that include the configuration based models.

Comparison of packages Vs status quo

	PJM Package (A)	PJM/GT Power Package (B)	IMM/GT Power Package (C)	IMM (Option 1/ Package D)	IMM (Option 2/Package E)
Changes to the submission of offers (Design Component #1)?	No	No	No	PLS schedule no longer needed	PLS schedule no longer needed
Changes to available and eligible offers for commitment and dispatch purpose(Design Component # 2 & 3)?	No	Yes	Yes	Yes	Yes
Do Operating parameters and economic components of offers tie to a schedule? (Design Component #5)	Yes - Status Quo	Yes- Status Quo	Yes-Status Quo	For Price-based resources – No For Cost-based resources – Yes	For Price-based resources – No For Cost-based resources – Yes

The above provides a summary comparison, please refer to the posted matrix for full package details.

	PJM Package (A)	PJM/GT Power Package (B)	IMM/GT Power Package (C)	IMM (Option 1/ Package D)	IMM (Option 2/Package E)
Offer Selection Approach (Design Component #4)	Formulaic Approach Real-time Market - Status-Quo Day-ahead Market – Same approach as currently being used in RT and approved by FERC for RT	Limit the eligibility of schedule for commitment and dispatch purposes such that there is only one schedule for MCE. Under the conditions where there is more than one cost-based offer eligible for commitment and dispatch purpose after limiting the eligibility, use same formulaic approach currently being used in RT.	Limit the eligibility of schedule for commitment and dispatch purposes such that there is only one schedule for MCE as per the preference provided by Market Seller.	Price-based resources – select operating parameters and economic components of offers from various eligible schedules Cost-based resources – Status-Quo	Price-based resources – select operating parameters and economic components of offers from various eligible schedules Cost-based resources – Status-Quo

The above provides a summary comparison, please refer to the posted matrix for full package details.

	PJM Package (A)	PJM/GT Power Package (B)	IMM/GT Power Package (C)	IMM (Option 1/ Package D)	IMM (Option 2/Package E)
Application of offer selection approach (Design Component #4a)	<u>For resources other than those using configuration based models</u> - Formulaic Approach <u>Configuration-based combined cycle model</u> - Formulaic approach on highest configuration that can be started from plant offline state <u>Configuration-based energy storage and hybrid resource model</u> - Formulaic approach applied to discharge side of offer curve.	Same as PJM Package (A)	Market Seller will pre-designate a schedule for commitment and dispatch purpose from all eligible schedules	<u>For resources other than those using configuration based models</u> - most flexible parameter and least expensive economic component of offer among eligible schedules <u>Configuration-based combined cycle model</u> - same as above <u>Configuration-based energy storage and hybrid resource model</u> - same as above	<u>For Price-based resources</u> - Same as IMM(Option 1/D) <u>For Cost-based resources</u> - Status quo

	PJM Package (A)	PJM/GT Power Package (B)	IMM/GT Power Package (C)	IMM (Option 1/ Package D)	IMM (Option 2/Package E)
Is the package technically feasible?	Yes	Yes	Yes	Yes	Yes
Does the package supply the MCE with one schedule?	Yes	Yes	Yes	Yes	Partially

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