MMU Comments on NYISO's Dynamic Reserve Market Design Proposal – Part 2

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Introduction

- Core elements of Dynamic Reserve design are excellent
  - ✓ Highly adaptable to changing system conditions
  - ✓ Essential for a system with high renewable penetration
- Several elements will lead to poor incentives or non-J&R settlements (see cites to NYISO Nov. 17 MIWG presentation):
  - ✓ An error in the calculation of DAM Congestion Rent (15-17)
  - ✓ Including Forecast Reserve Charge in DAM Congestion Rent (39-40)
  - ✓ Local 30-min reserve constraints based on Scheduled Load (32-33)
  - ✓ Treatment of DAM imports (41)
  - ✓ Settlements with largest and second largest contingencies (46)
- Our Nov. 27 presentation proposed solutions for the first two issues.
- The remaining three issues are discussed in this presentation.

DAM Congestion Rents: Considering Reserves & Forecast Reserve Charges

- On Nov. 27, the MMU discussed two errors in the proposed calculation of DAM Congestion Rents.
  - ✓ Reserve Payments – Failing to include congestion payments to local reserves as congestion costs is inconsistent with the market dispatch.
    - Leads to ***over-collection*** of DAM Congestion Rents
  - ✓ Forecast Reserve Charges – Failing to consider these charges in a manner consistent with the formulation of reserve requirements.
    - Leads to ***under-collection*** of DAM Congestion Rents
- These errors would result in arbitrary uplift charges to NYCA LSEs through Rate Schedule 4
- This is a new and potentially substantial cost shift that cannot be hedged with forward contracts.
  - ✓ When reserve charges are assigned to LSEs through the LBMP and FRC, they can be hedged using forward contracts.

Calculation of Local 30T Requirement: Introduction

- Currently, NYISO schedules energy to reduce flows below normal ratings and post-contingent flows below applicable ratings based on the Scheduled load in the DAM.
- NYISO's Nov. 27 presentation proposed to hold enough:
  - ✓ 10-min reserve to reduce post-contingent flows below applicable ratings based on Scheduled load in the DAM.
  - ✓ 30-min reserve to meet Normal Transfer criteria after a contingency based on the higher of Scheduled and Forecast load in the DAM.
    - This is equivalent to having two 30-minute reserve requirements for each limiting facility-contingency combination: one based on Scheduled load and one based on Forecast load.
    - This is excessive and costly.
- We recommend eliminating the 30-minute reserve requirement to satisfy Scheduled load in the DAM.

Calculation of Local 30T Requirement: Considering Reliability Needs in the DAM

- NYISO configures the DAM based on deterministic assumptions.
  - ✓ Operators may require sufficient resources to withstand the largest one or two contingencies (regardless of how unlikely).
- Market participants are better able to consider probabilistic factors, which may cause them to schedule more or less than forecasted load.
  - ✓ For example, when the risk of real-time price spikes increase, firms tend to schedule more load in the DAM.
- If NYISO schedules sufficient 30-minute reserves for the two largest contingencies, adequate 30-minute reserves will be available to satisfy requirements for 10-minutes reserves and energy in real time.
  - ✓ Basing DA energy and 10-min. requirements on Scheduled load, and 30-min. requirements on Forecast load strikes a reasonable balance.
  - ✓ The ISO proposal to model 30-minute reserve requirements based on Scheduled load is duplicative and unnecessarily costly.

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Calculation of Local 30T Requirement: Example of Thunderstorm Alert

- TSAs require NYISO to operate as if the largest contingency has already occurred.
  - ✓ Since the 30T requirement requires NYISO to hold reserves for Normal Transfer Criteria after the largest contingency, TSAs require converting reserves to energy before the contingency.
  - ✓ This is equivalent to holding reserves on the interface.
- For example, suppose a load pocket has forecasted load of 5 GW and import capability of 2 GW.
  - ✓ This results in internal generation requirement of 3 GW and a 30T reserve requirement of 1 GW based on the largest contingency.
  - ✓ In a TSA, reserves are converted to energy before the contingency, so 4 GW is generated internally and 0 GW are held as reserves.
  - ✓ This is equivalent to holding 1 GW of reserves as headroom on the import interface.

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Calculation of Local 30T Requirement: Example of Thunderstorm Alert – NYISO Proposal

DAM Expecting TSA

2 GW Cap → 2 GW Flow

Scheduled
Load = 5.6 GW
Gen = 3.6 GW
Res = 1.0 GW

RT Scheduling During TSA

2 GW Cap → 1 GW Flow

Actual
Load = 5.0 GW
Gen = 4.0 GW
Res = 600 MW

1 GW of headroom is held in reserve and 600 MW of reserves are held internally

- Anticipating the TSA, LSEs expect the RT price to increase, motivating them to over-schedule load by 600 MW.
- Under the NYISO proposed design, the DA 30T requirement results in a 600 MW excess of reserves in the load pocket.

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Calculation of Local 30T Requirement: Example of Thunderstorm Alert – MMU Proposal

DAM Expecting TSA

2 GW Cap → 2 GW Flow

Scheduled
Load = 5.6 GW
Gen = 3.6 GW
Res = 400 MW

RT Scheduling During TSA

2 GW Cap → 1 GW Flow

Actual
Load = 5.0 GW
Gen = 4.0 GW
Res = 0 MW

1 GW of headroom is held in reserve and 0 MW of reserves are held internally

- The MMU recommends setting the DA 30T requirement based on forecasted load only.
  - ✓ This results in the appropriate quantity of reserves being available in the RT market.

Treatment of All DAM Imports as Firm Supply: Introduction

- The Dynamic Reserves proposal relies on several key concepts:
  - ✓ Physical Generation ("PhysGen") – Internal resources that will be available if committed with sufficient lead time. These are generally counted toward satisfying 30T constraints based on Forecast Load.
  - ✓ Scheduled Load – Financial DA load purchases not considered in the 30T constraints based on Forecast Load. Equal to {Price-cap load} + {Bilateral load} + {Virtual load} – {Virtual supply}
- 30T reserve requirements will be primary market-based mechanism for NYISO & NYTOs to develop a reliable DA operating plan.
  - ✓ However, NYISO proposes to treat DAM-scheduled imports as PhysGen for satisfying 30T requirements based on forecast load.
  - ✓ This proposed assumption would be inappropriate because DAM-scheduled imports are not firm and many not be available in RT. resulting in two problems discussed on the next two slides.

Treatment of All DAM Imports as Firm Supply: Problem 1

- NYISO's proposed treatment of imports in the DA scheduling process *will under-procure* resources capable of satisfying need for 30T based on Forecast Load. For example, suppose:

  Transfer Limit(N-2) >= Load – PhysGen – Res30T – Imports

  1000 MW >= 2000 MW – 300 MW – 370 MW – 330 MW

  - ✓ If the imports are not backed by firm resources, NYISO operations will likely identify a 330 MW capacity deficiency, requiring an SRE.
  - ✓ Currently, DAM-scheduled imports include:
    - Imports backed by firm resources
    - Non-firm imports
    - "Virtual" imports
- It would be better to adopt a design that does not require SRE commitments for a reliable day-ahead operating plan.

Treatment of All DAM Imports as Firm Supply: Problem 2

- NYISO's proposed treatment will encourage more non-firm imports.
  - ✓ Currently, DA firm and non-firm imports receive the same LBMP.
  - ✓ However, NYISO's proposal would pay a premium to imports over virtual supply related to 30T constraints based on Forecast Load.
  - ✓ Increased DA scheduling of non-firm imports would reduce DA scheduling of internal generation, thereby exacerbating Problem 1.
- In the previous example, the local 30T constraint is satisfied with:
  - ✓ 300 MW of PhysGen + 370 MW of Reserves + 330 MW of Imports
  - ✓ If scheduled Imports rose to 530 MW because of the additional payment based on the 30T shadow price, then only 470 MW of PhysGen and Reserves would be needed to satisfy the constraint.
- Hence, this Dynamic Reserve formulation would actually increase the need for SREs. NYISO's proposed charge to imports that do not flow in RT would reduce the magnitude of Problem 2.

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Treatment of All DAM Imports as Firm Supply: MMU Proposal

- We recommend import transactions designate themselves as firm or not firm when offering into the DAM.
  - ✓ If scheduled by NYISO, firm transactions would be obligated to follow certain procedural steps, depending on source control area:
    - – ISO-NE: Must schedule export in ISO-NE's DAM (leading ISO-NE to commit sufficient resources to back the export if economic in RT) and offer import in RT.
    - – Quebec: Must line-up supply resource and transmission service, and offer import in RT.
    - – PJM: Must arrange firm service and offer import in RT.
    - – IESO: Must bid export at Ontario bid cap, have supply resource with ICAP sale to NYISO, and offer import in RT.
- This would ensure that imports receiving payment for being firm actually provide value to NYISO.

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Settlement with the Largest Two Contingencies: Introduction

- NYISO proposes to co-optimize scheduling of the largest two supply contingencies with the following three requirements:
  - ✓ 10-min spinning reserve – 50 percent of the largest contingency
  - ✓ 10-min total reserve – 100 percent of the largest contingency
  - ✓ 30-min total reserve – 100 percent of the largest contingency plus the second-largest contingency
- Consequently, increasing the energy schedule of the largest contingency by 1 MW will increase: (a) the 10-min spin requirement by 0.5 MW, (b) the 10-min total requirement by 1 MW, and (c) the 30-min total requirement by 1 MW.
- This design is efficient, but if settlement rules for the largest contingencies are not aligned with these marginal reserve cost impacts, their scheduling will not be efficient.
  - ✓ In particular, the NYISO proposal will likely lead to over-scheduling these contingencies.

Settlement with the Largest Two Contingencies: Example

- Suppose the largest resource offers energy at $18/MWh while:
  - ✓ The 10-min spin clearing price is $6/MWh,
  - ✓ The 10-min non-spin clearing price is $4/MWh,
  - ✓ The 30-min reserve clearing price is $3/MWh.
- Resource A: An additional MWh from the largest resource costs $23 based on:
  - ✓ $18 for 1 MWh of energy plus
  - ✓ $3 for 0.5 MWh of 10-min spinning reserves plus
  - ✓ $2 for 0.5 MWh of 10-min non-spinning reserves.
- Resource B: An additional MWh from a $23/MWh energy offer of a smaller resource costs $23 (and does not affect reserve procurement).
- Both resources are on the margin with system lambda of $23/MWh. NYISO proposes to pay each resource $23/MWh for energy.

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Settlement with the Largest Two Contingencies: Example

- To illustrate the arbitrariness of this settlement, consider that if 1 MW is scheduled from Resource B:
  - ✓ Resource B receives $23 for energy
  - ✓ LSEs pay $23 for energy
- If 1 MW is scheduled from Resource A:
  - ✓ Resource A receives $23 for energy
  - ✓ Reserve providers receive $5 for 10-minute spinning and non-spin
  - ✓ LSEs pay $28 for energy and reserves
- Since Resources A and B are both on the margin:
  - ✓ The settlement impact should be the same for LSEs, but it is not.
  - ✓ Both resources should earn a profit of $0, but Resource B earns a profit of $5.

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Settlement with the Largest Two Contingencies: Implications

- The inefficient settlement described above will distort incentives by encouraging large suppliers to offer below marginal cost.
- This incentive is created under the NYISO proposal because:
  - ✓ The market software will optimize recognizing the additional reserve cost incurred when the schedule rises on the largest contingencies.
  - ✓ Since NYISO proposes to settle with the largest contingencies at the LBMP, this will cause them not to be scheduled in intervals when their offer is substantially lower than the LBMP.
  - ✓ It is this lost profit that would motivate the largest contingencies to lower their offer prices.
- This incentive will undermine efficiency by causing the largest contingencies to be over-scheduled and increasing the costs of maintaining adequate reserves.

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Settlement with the Largest Two Contingencies: MMU Proposal

- To correct these incentives, we recommend:
  - ✓ Paying the largest two resources at the LBMP as proposed by NYISO, and
  - ✓ Charging the largest two resources for their incremental impact on the reserve requirements.
- For example, suppose the largest three resources are scheduled as follows: L1 = 1340 MW, L2 = 1260 MW, and L3 = 1200 MW, using the clearing prices on slide 14:
  - ✓ The second largest resource would be charged:

$$\{L2 – L3\} \times \{\text{30-minute reserve clearing price}\}$$

$$= \{1260 \text{ MWh} – 1200 \text{ MWh}\} \times \{\$3/\text{MWh}\} = \mathbf{\$180}$$

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Settlement with the Largest Two Contingencies: MMU Proposal

- ✓ The largest resource would be charged:

$$\{L1 - L3\} \times \{50\%\} \times \{\text{10-minute spin clearing price}\} +$$
$$\{L1 - L3\} \times \{50\%\} \times \{\text{10-minute non-spin clearing price}\}$$
$$= \{1340\ \text{MWh} - 1200\ \text{MWh}\} \times \{50\%\} \times \{\$6/\text{MWh}\} +$$
$$\{1340\ \text{MWh} - 1200\ \text{MWh}\} \times \{50\%\} \times \{\$4/\text{MWh}\} = \mathbf{\$700}$$

- ✓ Loads would be charged:

$$\{L3\} \times \{50\%\} \times \{\text{10-minute spin clearing price}\} +$$
$$\{L3\} \times \{50\%\} \times \{\text{10-minute non-spin clearing price}\} +$$
$$\{L3\} \times \{\text{30-minute reserve clearing price}\}$$
$$= 1200\ \text{MWh} \times (0.5 \times \$6/\text{MWh} + 0.5 \times \$4/\text{MWh} + \$3/\text{MWh}) = \mathbf{\$9600}$$

- This settlement treatment would: (a) ensure revenue adequacy, and (b) incentive compatibility for the largest contingencies.
  - ✓ Incentive compatibility will motivate efficient offers by the largest contingencies and, thus, optimal scheduling that minimizes costs.

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