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Independent System Operator

Constraint Specific Transmission Shortage Pricing : Multiple Active Transmission Constraints

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Agenda

- Project Background
- Multiple Active Transmission Constraints due to Topology
- Next Steps

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Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
01-13-2021	BIC	Constraint Specific Transmission Shortage Pricing : Market Design Proposal https://www.nyiso.com/documents/20142/25263575/6%20CSTSP%20BIC%2010132021%20presentation.pdf
01-20-2022	ICAPWG/MIWG	Constraint Specific Transmission Shortage Pricing : Introduction on Multiple Active Transmission Constraints https://www.nyiso.com/documents/20142/27799605/20220120%20NYISO%20-%20CSTSP%20Managing%20Multiple%20Transmission%20Constraints%20vFinal.pdf

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Background

Project Background

- **The Constraint Specific Transmission Shortage Pricing project seeks to develop enhancements to the current transmission constraint pricing logic to enable the NYISO's market software to re-dispatch suppliers efficiently in the short term to alleviate constraints, as well as incentivize long-term investment in locations where suppliers could provide the greatest benefits.**
  - Stakeholders approved proposed enhancements to the current transmission constraint pricing logic as part of the 2021 project effort (see October 27, 2021 presentation at the Management Committee)
- **This project will also include exploring enhancements to address "Multiple Active Transmission Constraints" (MATCs) issue**
  - Given the expanded scope of graduated transmission demand curves envisioned by the stakeholder approved Constraint Specific Transmission Shortage Pricing proposal, the NYISO believes it is prudent to implement the enhancements developed for these efforts together
- **Project Deliverable for 2022:**
  - Develop Functional Requirement Specifications

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Multiple Active Transmission Constraints

- **MATCs can occur for two main reasons:**
  - Topology - Same transmission line represented as multiple segments in the network topology (long radial lines) or parallel line segments
    - Also referred as "Lines in Series/Lines in Parallel" or "MATCs due to topology"
  - Contingency Evaluation - Transmission facilities that are constrained in multiple scenarios (base case and contingency case scenarios) being evaluated
    - Referred as "MATCs on the same facility"
- **Today's discussion is focused on "MATCs due to topology". We will discuss "MATCs on the same facility" at a future meeting.**

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MATCs Due to Topology

MATCs Due to Topology Example

- **Consider the Huntley-Gardenville 38 Line**
  - This line is represented in the energy market transmission model as having 7 distinct segments.

  - Each segment is treated as an individual transmission facility to secure
- **The transmission demand curve mechanism applies separately to each segment and can result in establishing shadow prices for each segment.**

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MATCs Due to Topology: Why is it a problem?

- **When multiple binding segments are priced by the transmission demand curve (TDC) mechanism due to a lack of cheaper physical resources to provide the relief, excessive shadow prices may result for a single transmission line.**
  - This is because the TDC is applied independently to each constrained line segment without consideration of relief on any other segment.
  - This can lead to circumstances of potentially unnecessary, excessive shadow prices for a single transmission line as well as high LBMPs due to the additive nature of applying transmission shortage pricing to each constrained line segment.

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MATCs Due to Topology: Why is it a problem?

- **This MATCs pricing concern does not arise when market physical resources (e.g., generators or storage) are setting the price**
  - Ability of the physical resource to simultaneously provide relief to multiple segments is considered by the software. In such a case, only the most limiting segment will be priced.
- **The prevalence of this concern increases as we introduce lower price points on the transmission demand curve (which is part of the TDC enhancements approved by stakeholders in 2021) and as additional 115kV and 69kV facilities are secured within the energy market.**

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MATCs Due to Topology: Current Approach

- **In 2019 (see September 10, 2019 ICAPWG/MIWG presentation), the NYISO took action to remove multiple in-series segments from evaluation and model only the most limiting segment to largely avoid this MATCs pricing concern within the current market software.**
- **Limitations of the current approach:**
  - The current approach is static and is not able to identify the most limiting transmission constraint dynamically based on the network topology
  - The current approach does not address the potential for redundant transmission constraints on parallel lines segments.

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MATCs Due to Topology: Proposed Solution

- **The NYISO is proposing to develop functionality in the market software to identify redundant constraints across different transmission facilities.**
  - The most limiting constraint amongst the redundant transmission constraints would be binding and utilized for pricing purposes in application of the TDC.
  - Other redundant transmission constraints would be non-binding and not utilized for pricing purposes in application of the TDC.
  - Seeks to provide greater consistency in treatment for the use of physical resources versus the TDC in solving transmission constraints.

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MATCs Due to Topology: Proposed Solution (cont'd)

- **Identification of redundant constraints shall be performed by comparing the shift factors of different resources across all transmission constraints.**
  - Shift factor for resources that are "Off/Unavailable" or "Self-Committed Fix" for a dispatch run would not be compared.
- **Shift factor of a resource on the constraint represents the MW impact that 1 MW of injection/withdrawal this resource has on the constraint.**
  - Example: If the shift factor for a generator East of Center East were 0.5, it would take 2MW of generation from this unit to relieve Central East by 1 MW.
  - Injection from a resource at a location electrically close to a constraint would have a bigger impact on the constraint compared to resources that are electrically far.

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MATCs Due to Topology: Proposed Solution (cont'd)

- **The proposed approach can identify redundant transmission constraints across "Lines in Series" as well as "Lines in Parallel"**
  - Shift factor of resources across redundant "Lines in Series" constraints would be identical
  - Shift factor of resources across redundant "Lines in Parallel" constraints would be linearly dependent and related by a scalar factor
  - Example: Imagine there are only two Generators (G_1 and G_2) that impact a set of transmission constraints (Constraint 1 and Constraint 2)

	Shift factor of Generators for Constraint 1	Shift factor of Generators for Constraint 2
Lines in Series	G_1 : 0.9 and G_2 : 0.6	G_1 : 0.9 and G_2 : 0.6
Lines in Parallel	G_1 : 0.9 and G_2 : 0.6	G_1 : 0.3 and G_2 : 0.2 (Scalar factor is 3)

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Next Steps

Next Steps

- **Q2/Q3 2022**
  - Discuss proposal to address “MATCs on the same facility” issue with stakeholders
  - Work to finalize proposed solutions for MATCs pricing concerns
  - Develop and discuss tariff revisions to address proposed solutions for MATCs pricing concerns
- **Q3 2022**
  - Currently anticipated timeframe to seek stakeholder approval at BIC and MC of proposed enhancements for addressing MATCs pricing concerns

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Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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Questions?