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Independent System Operator

Constraint Specific Transmission Shortage Pricing : Multiple Active Transmission Constraints

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ICAPWG/MIWG
May 3, 2022

Agenda

- Project Background
- Multiple Active Transmission Constraints on the Same Facility
- Next Steps

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Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
04-5-2022	ICAPWG/MIWG	Constraint Specific Transmission Shortage Pricing : Multiple Active Transmission Constraints https://www.nyiso.com/documents/20142/29688278/CSTSP%20-%20MATC%20Topology%20Proposal%2004052022%20MIWG_final.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
10-27-2021	MC	Constraint Specific Transmission Shortage Pricing : Market Design Proposal https://www.nyiso.com/documents/20142/25598577/06%20CSTSP.pdf
10-13-2021	BIC	Constraint Specific Transmission Shortage Pricing : Market Design Proposal https://www.nyiso.com/documents/20142/25263575/6%20CSTSP%20BIC%2010132021%20presentation.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 on the same facility".**
  - The proposed approach for "MATCs due to topology" issue was discussed at the April 5, 2022 ICAPWG/MIWG meeting.

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MATCs on the Same Facility

MATCs on the Same Facility Example

- **Consider the Dunwoodie-Shore Rd Y50 Cable**
  - This cable is one of the major interconnection points between Long Island and the rest of the New York Control Area
  - The energy market software is designed to secure the Y50 to base flow violations (base case) and contingency violations
  - There can be situations where not enough cost-effective dispatchable generation is available to avoid a base flow violation and a contingency case such Y50 for the loss of the Neptune cable
- **Under the current pricing logic, transmission shortage pricing may be applied to establish the shadow price of both the base case Y50 constraint and Y50 for loss of Neptune constraint**
  - The transmission demand curve applies separately to each constraint on a particular facility/interface and any relief provided by a demand curve mechanism to a base case constraint is not considered in the evaluation of additional contingency constraints for the same facility/interface

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MATCs on the Same Facility: Why is it a problem?

- **When a transmission facility is constrained in multiple contingency evaluation scenarios, and these constraints 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 facility.**
  - This is because the TDC is applied independently to each constraint without consideration of relief on other constraints on the same facility.
  - This can lead to circumstances of potentially unnecessary, excessive shadow prices for a single transmission facility as well as high LBMPs due to the additive nature of applying transmission shortage pricing to each constraint

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MATCs on the Same Facility: Why is it a problem? (cont'd)

- When a physical resource is available to relieve a constraint on the transmission facility (e.g., Generators, ESRs, etc.), in most of the cases it would be able to provide relief against multiple constraints on the same facility
- The NYISO analyzed 2021 Real-Time Dispatch (RTD) binding transmission constraint data to evaluate the prevalence of multiple binding transmission constraints on the same facility.
  - For RTD binding transmission constraints resolved using only physical resources (no usage of TDC), multiple transmission constraints were binding on the same facility in less than 1% of cases
  - Appendix provides additional information regarding this historical data analysis

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MATCs on the Same Facility: Proposed Solution

- **The NYISO proposes to apply the TDC in a manner that considers the binding transmission constraints, collectively, for a given facility rather than applying the TDC individually to each binding transmission constraint on the same facility**
  - This approach is referred as "TDC by Facility" approach in this presentation
  - The shadow price is determined based on the worst overload across multiple constraints on the same facility
  - Slides 14-18 provide examples to help illustrate the NYISO's proposal
  - Under the current pricing logic, the relief from TDC is available per constraint
    - Current approach can be thought of as "TDC by Constraint" approach
    - In cases of multiple binding transmission constraints across the same facility, the TDC may set the shadow price for more than one (or potentially all) binding constraints resulting in a high (potentially excessive) aggregated shadow price across the facility

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MATCs on the Same Facility: Proposed Solution (cont'd)

- **Under the proposed approach, any resource capacity from the TDC shall be simultaneously applicable to all binding transmission constraints across a transmission facility**
  - The TDC acts similar to a physical resource that has a shift factor of 1 for all binding transmission constraints across a transmission facility
- **The proposed solution seeks to provide better alignment between the use of physical resources versus the TDC in solving transmission constraints.**
  - It also aligns with the operational philosophy that relieving the worst/most limiting constraint across a transmission facility would generally alleviate other transmission constraints across the facility

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MATCs on the Same Facility: Proposed Solution (cont'd)

- **"TDC by Facility" approach is intended to produce reasonable pricing outcomes, while mitigating the potential for unnecessarily excessive prices resulting from application of TDCs for constraints across contingency evaluation scenarios**
  - The shadow price across a transmission facility would not exceed the TDC cost to resolve the worst overload across that facility.
  - This outcome better aligns with the intent of transmission shortage pricing compared to the current "TDC by Constraint" approach
- **The proposed approach may increase the occurrence of instances where the TDC sets the shadow price for transmission constraints**
  - TDC may appear more economic as it can provide simultaneous relief on multiple transmission constraints across the same facility rather than a single transmission constraint as occurs under the current approach
    - More akin to the outcome resulting from the use of a physical resources that could simultaneously provide relief to multiple transmission constraints on the same facility

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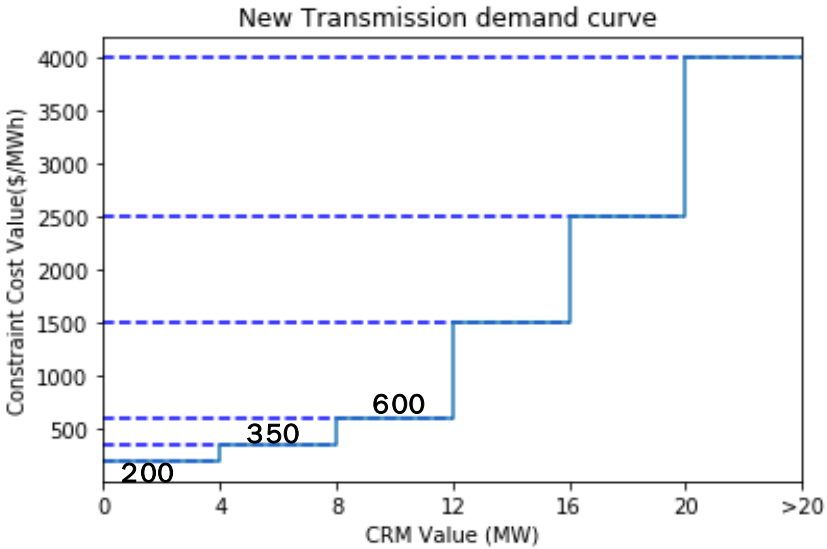
Examples of Proposed "TDC by Facility" Approach

- **Assumptions for hypothetical examples:**
  - A 20 MW CRM value is applied to a transmission facility ("Transmission Facility X")
  - Figure on this slide represents the applicable TDC for this facility pursuant to enhancements approved by stakeholders in 2021
  - For the proposed approach, the TDC values cap the maximum shadow price across the facility based on the worst overload. For example:
    - The shadow price can not exceed $200/MWh if the worst overload is < 4MW;
    - The shadow price can not exceed $350/MWh if the worst overload is ≥ 4 and < 8MW



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Examples of Proposed "TDC by Facility" Approach (cont'd)

- **Case 1: A base case and a contingency case constraint binding is developed on Transmission Facility X. Physical re-dispatch can relieve both constraints**
  - Contingency case constraint: Overload of 1 MW
  - Base case constraint: Overload of 2 MW
  - Cost of Physical re-dispatch : $150/MW
- **Pricing outcome:**
  - Aggregate shadow price across Facility X with "TDC by Facility" approach= $150/MW (2 MW from physical re-dispatch)
  - This outcome is unaffected by the proposal (i.e., same result would occur under the "TDC by Constraint" approach because physical re-dispatch is less expensive than the TDC price)

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Examples of Proposed “TDC by Facility” Approach (cont’d)

- **Case 2: Same as Case 1 but the physical re-dispatch is more expensive**
  - Contingency case constraint: Overload of 1 MW
  - Base case constraint: Overload of 2 MW
  - Cost of Physical re-dispatch : $300/MW
- **Pricing outcome :**
  - Aggregate shadow price across Facility X with “TDC by Facility” approach = $200/MW (2 MW from the TDC)
  - The “TDC by Constraint” approach would have resulted in a $300/MW aggregate shadow price across Facility X
    - $300/MW for 2 MW from physical re-dispatch as it is cheaper than the $400/MW aggregate cost to use the TDC to resolve each constraint individually

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Examples of Proposed "TDC by Facility" Approach (cont'd)

- **Case 3: A base case and a contingency case constraint is developed on Transmission Facility X. Subsequent physical re-dispatch can relieve only the contingency case constraint. Another dispatch is needed to relieve the base case constraint**
  - Contingency case constraint: Overload of 1 MW
  - Base case constraint: Overload of 2 MW
  - Cost of Physical dispatch 1: $ 130/MW; can relieve Contingency case constraint
  - Cost of Physical dispatch 2: $250/MW; can relieve Base case constraint
- **Pricing outcome:**
  - Aggregate shadow price across Facility X with "TDC by Facility" approach = $200/MW (2 MW from the TDC)
  - The "TDC by Constraint" approach would have resulted in a $330/MW aggregate shadow price across Facility X
    - Shadow price for contingency case constraint = $130/MW (1 MW from physical re-dispatch)
    - Shadow price for base case constraint = $200/MW (2 MW from the TDC)

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Examples of Proposed “TDC by Facility” Approach (cont’d)

- **Case 4: Same as Case 3 but with higher overloads**
  - Contingency case Constraint : Overload of 4 MW
  - Base case Constraint: Overload of 6 MW
  - Cost of Physical dispatch 1: $130/MW; can relieve Contingency case Constraint
  - Cost of Physical dispatch 2: $250/MW; can relieve Base case Constraint
- **Pricing outcome :**
  - Aggregate shadow price across Facility X with “TDC by Facility” approach = $250/MW (4 MW from the TDC and 2 MW physical re-dispatch from “physical dispatch 2”)
    - 4 MW from the TDC for base case overload can provide relief for contingency case overload as well, so “physical dispatch 1” is not used
  - The “TDC by Constraint” approach would have resulted in a $380/MW aggregate shadow price across Facility X
    - Shadow price for contingency case constraint = $130/MW (4 MW from physical re-dispatch)
    - Shadow price for base case constraint = $250/MW (4 MW from TDC and 2 MW physical re-dispatch)

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Next Steps

Next Steps

- **Q2/Q3 2022**
  - Work to finalize proposed solutions for MATCs pricing
  - Develop and discuss tariff revisions to address proposed solutions for MATCs pricing
- **Q3 2022**
  - Currently anticipated timeframe to seek stakeholder approval at BIC and MC of proposed enhancements for addressing MATCs pricing

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Our Mission & Vision

Mission

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?

Appendix – 2021 RTD Transmission Constraint Analysis

Historical Transmission Constraint Analysis

- **The NYISO analyzed 2021 RTD binding transmission constraint data to assess the frequency of multiple transmission constraints occurring on the same facility.**
  - The analysis compared the number of instances when multiple transmission constraints are binding on the same facility under two distinct scenarios
    - Scenario 1: Constraints resolved with no transmission demand curve (TDC) usage (i.e., resolved using only physical re-dispatch)
    - Scenario 2: Constraints resolved with some amount of TDC usage
- **For Scenario 1, the historical analysis showed that multiple transmission constraints were binding on the same transmission facility in less than 1% of cases**

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Historical Transmission Constraint Analysis (cont'd)

- **Analysis results**
  - The total number of unique RTD transmission constraints in 2021 = 200,822
    - Multiple transmission constraints on the same facility in the same time stamp are counted as a single unique RTD transmission constraint for the purposes of this analysis

		Scenario 1: Constraints resolved with no TDC usage		Scenario 2: Constraints resolved with some amount of TDC usage	
		Count	% of total in this Category	Count	% of total in this category
1.	Instances where only one constraint is active per facility	187,162	99.1%	11,024	92.4%
2.	Instances where one base case and one contingency case constraints are active on the same facility	241	0.1%	749	6.3%
3.	Instances where one base case and two or more contingency case constraints are active on the same facility	0	0%	17	0.1%
4.	Instances where two or more contingency case constraints are active on the same facility	1,489	0.8%	140	1.2%
	Total	**188,892**		**11,930**	