New York ISO
Independent System Operator

Valuing Transmission Security: Reliability Planning Process Overview

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Previous Discussions

Previous Discussions

Date	Working Group	Discussion Points and Links to Materials
February 7, 2024	ICAPWG	Valuing Transmission Security: Project Kick Off: https://www.nyiso.com/documents/20142/42807168/Valuing%20Transmission%20Security%20Kick%20Off%20v2.pdf/389f28dd-a518-bd2f-775d-c93aaa11e1dc
March 4, 2024	ICAPWG	Valuing Transmission Security: Key Concepts Overview: https://www.nyiso.com/documents/20142/43315080/Valuing%20Transmission%20Security%20Key%20Concepts%20Overview%20ICAPWG%2003_04%20v3.pdf/b0c9148d-534a-a649-3d10-881764de2283

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Project Overview

Project Overview

- **As the grid evolves, reliability needs could be identified in both resource adequacy and transmission security evaluations**
- **The consideration of transmission security is incorporated in the ICAP market by utilizing Transmission Security Limits (TSLs) as floors in the Locational Minimum Installed Capacity Requirement (LCR) setting process**
  - However, transmission security requirements are not directly incentivized through the capacity market as it is designed to satisfy resource adequacy criterion
- **A resource may have different contributions to transmission security and resource adequacy**
  - Due to these potential differing contributions, when incorporating both resource adequacy and transmission security in the ICAP market, a unit may have different capacity values when an LCR is set by the TSL rather than by resource adequacy needs

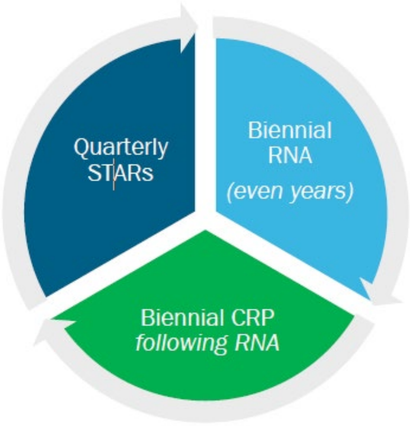
Project Overview

- This project will:
  - evaluate if and how bulk transmission security should be valued in the capacity market; and
  - investigate the effectiveness of ICAP market price signals when transmission security limitations are reflected in the capacity market
- Deliverable: Q4 Issue Discovery

Background

NYISO Reliability Studies

- **Performed pursuant to NYISO requirements**
- **Short-Term Assessments of Reliability (STARs)**
  - Conducted quarterly in direct collaboration with Transmission Owners
  - Five-year study with a focus on addressing needs arising in the first three years
- **Reliability Needs Assessment (RNA)**
  - Conducted biennially to identify long-term Bulk Power Transmission System (BPTF) Reliability Needs in years 4-10 using Base Case assumptions
  - Considers Transmission Owner LTPs, proposed generation, and proposed transmission that meet inclusion rules, demand forecasts, and updates to the system
- **Comprehensive Reliability Plan (CRP)**
  - Biennial report that documents the plans for a reliable grid over the 10-year planning horizon
  - If applicable, includes an assessment of viability and sufficiency and an evaluation and selection of the more efficient or cost-effective transmission solution to a Reliability Needs in years 4-10
- **All studies under the Short-Term Reliability Process and the Reliability Planning Process (collectively, "Reliability Studies") look at resource adequacy and transmission security**



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Applying Reliability Criteria

- **Reliability Criteria includes applicable NERC, NPCC, NYSRC Reliability Rules**
- **NYISO assesses Reliability Criteria on the BPTF as follows:**
  - Resource Adequacy
    - NYSRC (Reliability Rules A1.B.R1.1) and NPCC (Directory 1) criterion of "one day in ten years," or 0.1 event-days/year
    - If the analysis performed under the NYISO's Reliability Planning Processes shows that the NYCA system LOLE is not within the criterion for any year of the 10-year study period, the NYISO will follow the process described in the NYISO's Tariff (*e.g.*, Attachment Y, Attachment FF, RPP Manual), including identifying the amount of compensatory MW that would be needed to bring the NYCA LOLE to 0.1 days per year, and soliciting for market-based and regulated solutions
  - Transmission Security
    - For planning criteria, key standards and requirements are found in NERC TPL-001, NPCC Directory 1, and NYSRC Reliability Rules
    - The most stringent design criteria contingency combination for most of the New York transmission system is N-1-1; however, under the NYSRC Reliability Rules, certain areas of the Con Edison system are also required to be "designed and operated for the occurrence of a second contingency" (*see NYSRC Reliability Rules Rule G.1 R1*)

Resource Adequacy & Transmission Security Overview

Resource Adequacy

- **Resource adequacy is the "ability of the electric system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements"[1]**
  - Resource adequacy is assessed through a probabilistic analysis of the system's loss of load expectation (LOLE) of disconnecting firm load due to resource deficiencies, not to exceed 1 day in 10 years allowing for emergency transfer criteria
  - To maintain resource adequacy, the New York State Reliability Council (NYSRC) establishes an installed reserve margin (IRM) for the New York Control Area (NYCA) for each Capability Year
  - Resource adequacy is also assessed in NYISO's Reliability Studies

[1] See Section 3.2 of the NYSRC Reliability Rule & Compliance Manual

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Transmission Security

- **Transmission security is the "ability of the electric system to withstand disturbances such as electric short circuits or unanticipated loss of system elements"[1]**
  - Transmission security is a deterministic analysis of credible combinations of system conditions that stress the system. The system is assessed for its ability to withstand the loss of specified, representative and reasonably foreseeable design criteria contingencies (N-1, N-1-1, N-1-1-0) at projected customer demand and anticipated transfer levels. Design criteria are applied according to normal transfer criteria
  - Transmission security is assessed in the Reliability Studies and also incorporated into the Installed Capacity market by using Transmission Security Limit (TSL) floors in the LCR setting process

[1] See Section 3.2 of the NYSRC Reliability Rule & Compliance Manual

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Resource Adequacy & Transmission Security: Key Differences

- **Some of the key differences between resource adequacy and transmission security are:**
  - Transmission security utilizes Normal transfer criteria, while resource adequacy utilizes Emergency transfer criteria
    - See Appendix for a discussion of the Normal vs Emergency transfer criteria
  - Resource adequacy considers emergency operation procedures and emergency assistance from neighboring systems, whereas transmission security generally does not consider such actions for the identification of reliability needs
  - Transmission security utilizes a handful of system conditions at different load levels (e.g., summer peak, winter peak, light load, daytime light load), while resource adequacy probabilistically looks at 8760 hours of wide range of demand levels
  - Resource adequacy models resource availability probabilistically, whereas transmission security assesses the system in snapshots and models resource availability deterministically

Valuing Transmission Security in the ICAP Market

Valuing Transmission Security in the ICAP Market

- The consideration of transmission security is incorporated in the ICAP market by utilizing TSLs as floors in the LCR setting process
  - Bulk power transmission limits are studied by NYISO Operations using the transmission security approach, and considered in the process for determining TSL floor values
- TSL floors ensure ICAP requirements and ICAP market signals are established without being potentially misaligned with transmission security concerns identified through the NYISO's system planning processes
- NYISO establishes annual TSL floor methodology and values for Load Zone J, Load Zone K, and the G-J Locality

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TSL Floor Values Methodology

- **The TSL floor value methodology has been updated over the past few years to accommodate certain enhancements and changes in study inputs and maintain alignment with NYISO system planning practices**
- **In general, the calculation methodology consists of the following four main steps:**
  - Deduct transmission capability from the peak load forecast to establish the Unforced Capacity (UCAP) required to meet the forecasted load
  - Apply the zonal 5-year equivalent demand forced outage rate (EFORd) to the UCAP requirements to convert into Installed Capacity (ICAP)
  - Add Special Case Resources (SCR) MW to establish the ICAP requirements
    - Because SCRs are not utilized under Normal Transfer Criteria when determining the bulk power transmission limits, the LCR is increased by the amount of SCRs expected to participate in the market
  - Divide the calculated ICAP requirements by the peak load forecast. This is the TSL floor value expressed as a percentage
- **Methodology changes over the past few years include:**
  - For the 2022 –2023 Capability Year, in response to stakeholder feedback, the TSL floor values methodology was revised to align with the methodology for the Transmission Security Margin used in NYISO's 2020 Reliability Needs Assessment (RNA)
  - For the 2023 –2024 Capability Year, derating factors were added to the TSL floor values methodology to align with the consideration of generator outages in the Transmission Security Margin assessment for the 2022 RNA
  - For the 2024 –2025 Capability Year, the TSL floor values methodology was updated to capture the impact of LI/NYC net flow assumptions in response to stakeholder feedback. In addition, the difference in accounting for the offshore wind derating factor was implemented due to the inclusion of an offshore wind resource in the 2024-2025 IRM study

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Comparison of Inputs for Reliability Studies Resource Adequacy, Reliability Studies Transmission Security Margin & IRM Study

PARAMETER	Reliability Studies Resource Adequacy	IRM Study	Reliability Studies Transmission Security Margin
LOAD FORECAST			
Peak Load Forecast	Probabilistic	Probabilistic	Deterministic
RESOURCE TYPES			
Thermal Generators & Large Hydro	Transition Rates representing EFORd during demand periods over the most recent five-year period	Transition Rates representing the EFORd during demand periods over the most recent five-year period	Incorporates the NERC five-year class-average forced outage rate values (EFORd)
Existing and Proposed Land-based Wind Units	Model-based hourly data over the past 5 years (developed by DNV-GL). Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process	Actual hourly plant output over the past five years. Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process	Dispatch land-based wind (LBW) generation to the following percentage of nameplate capacity: • Summer 5% • Winter 15% • Light load 10%

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PARAMETER	Reliability Studies Resource Adequacy	IRM Study	Reliability Studies Transmission Security Margin
RESOURCE TYPES			
Proposed Offshore Wind Units	Model-based hourly data over the past 5 years (developed by DNV-GL). Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process	Model-based hourly data over the past 5 years (developed by DNV-GL). Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process	Dispatch off-shore wind (OSW) generation to the following percentage of nameplate capacity: • Summer 10% • Winter 20% • Light load 15%
Existing & Proposed Utility-scale Solar Resources	Program randomly selects from the model-based data shapes covering past 5 years, as developed by DNV-GL	Actual hourly plant output over the past five years. Program randomly selects a solar shape of hourly production over the five years for each model iteration	Utility-scale solar resources are dispatched at the same factor as the BTM solar resources for a given transmission security case
BTM Solar Resources	Past 5 years of 8,760 hourly MW profiles based on sampled inverter data. The MARS random shape mechanism randomly picks one 8,760 hourly shape (of five) for each replication year	BTM Solar is embedded in the modeled load shapes, and there is no separate modeling of the BTM Solar as resources	BTM solar reductions in load forecast are included in the Gold Book (Table I-9d) along with nameplate capacity (Table I-9a)

PARAMETER	Reliability Studies Resource Adequacy	IRM Study	Reliability Studies Transmission Security Margin
RESOURCE TYPES			
Existing Small Hydro Resources (e.g., run of river)	Actual hourly plant output over the past 5 years period. Program randomly selects a hydro shape of hourly production and that is multiplied by their current nameplate rating	Actual hourly plant output over the past five years. Program randomly selects a Hydro shape of hourly production over the five years for each model iteration	Fixed at their 5-year average based on GADS data for production during specific peak or light load hours. Dispatches at: • Summer 40% • Winter 60% • Light load 55%
Proposed front-of-meter Battery Storage	GE MARS 'ES' model is used. Units are given a maximum capacity, maximum stored energy, and a dispatch window.	GE MARS 'ES' model is used. Units are given a maximum capacity, maximum stored energy, and a dispatch window	As the starting point, modeled at 0 MW output. If a potential transmission security violation is observed, post-processing analysis is performed to understand the nature of the need and how the characteristics of the battery storage resources may address the need
SPECIAL CASE RESOURCES (SCRs)			
Special Case Resources (SCRs)	Modeled as duration-limited resources constrained to be called once in a day, when a loss of load event occurs, for 5 to 7 hours, which is determined based on historical SCR performance in the applicable zone	Modeled as duration-limited resources constrained to be called once in a day, when a loss of load event occurs, for 5 to 7 hours, which is determined based on historical SCR performance in the applicable zone	As the starting point, impact of SCRs are not modeled. If a potential transmission security violation is observed, post-processing analysis is performed to understand the nature of the need and how the characteristics of the SCRs may address the need

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Next Steps

Next Steps

- **Return to a July ICAPWG to:**
  - Continue stakeholder education if there are additional topics stakeholders would like the NYISO to elaborate on and answer any additional questions
  - Begin identifying and researching issues and discuss identified issues

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Questions?

Appendix

Normal Transfer Criteria

- Normal Transfer Criteria - Under normal transfer criteria, adequate facilities are available to supply firm load with the bulk power transmission system within applicable normal ratings and limits as follows:
  - Pre-contingency line and equipment loadings within normal ratings. Pre-contingency voltages and transmission interface flows within applicable pre-contingency voltage and stability limits
  - Post-contingency line and equipment loadings within applicable emergency (Long-Term Emergency or Short-Term Emergency) ratings. Post-contingency voltages and transmission interface flows within applicable post-contingency voltage and stability limits
    - All contingencies applied under normal transfer criteria are listed in Table C-1 "NYSRC Operating Transfer Capability Requirements"
- Normal Transfer Limit - The maximum allowable transfer is calculated based on thermal, voltage, and stability testing, considering contingencies, ratings, and limits specified for normal conditions. The normal transfer limit is the lowest limit based of these three maximum allowable transfers

Emergency Transfer Criteria

- Emergency Transfer Criteria - In the event that adequate facilities are not available to supply firm load within Normal Transfer Criteria, emergency transfer criteria may be invoked. Under emergency transfer criteria, transfers may be increased up to, but not exceed, emergency ratings and limits as follows:
  - Pre-contingency line and equipment loadings may be operated up to LTE ratings for up to four (4) hours, provided the STE ratings are set appropriately. Otherwise, pre-contingency line and equipment loadings must be within normal ratings. Pre-contingency voltages and transmission interface flows must be within applicable pre-contingency voltage and stability limits
  - Post-contingency line and equipment loadings within STE ratings. Post-contingency voltages and transmission interface flows within applicable post-contingency voltage and stability limits
    - All contingencies applied under normal transfer criteria are listed in Table C-1 "NYSRC Operating Transfer Capability Requirements"
- Emergency Transfer Limit -The maximum allowable transfer is calculated based on thermal, voltage, and stability testing, considering contingencies, ratings, and limits specified for emergency conditions. The emergency transfer limit is the lowest limit of these three maximum allowable transfers

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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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