# Transmission Security in the ICAP Market

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**ICAPWG**

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# Agenda

- Background
- Potential Concerns with how Transmission Security is Reflected in the ICAP Market
- Next Steps


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# Background


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# New York's Clean Energy Policies

## Policy Timeline

2019 **CLCPA Passed**

2025 **CLCPA Solar:** 6,000 MW mandate (distributed)
**$NO_X$ Rule:** In full effect
**Energy Storage :** 1500MW target

2030 **CLCPA:** 70% renewable electricity
**CLCPA Storage:** 3,000 MW mandate

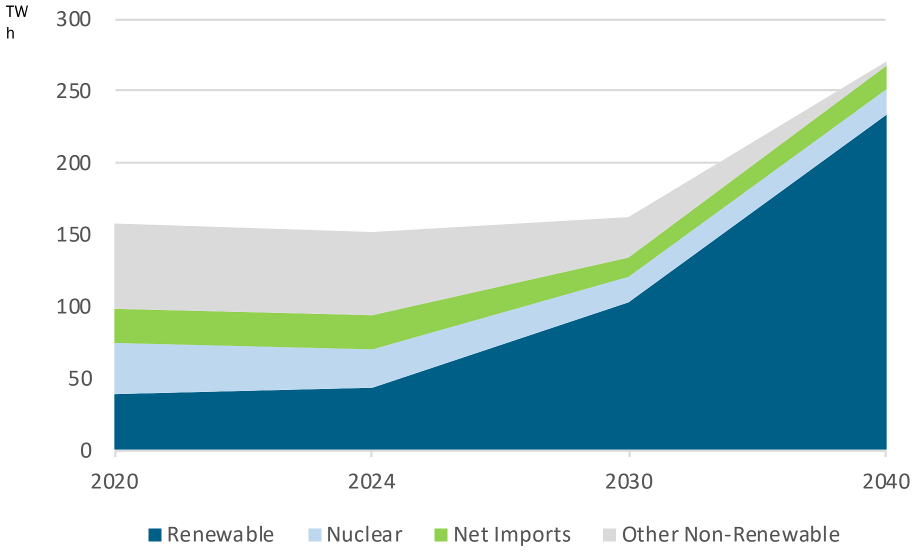
2035 **CLCPA OSW:** 9,000 MW mandate

2040 **CLCPA:** 100% zero emissions electricity

2050 **CLCPA:** 85% NY economy-wide decarbonization

## Annual Generation

A possible decarbonization path assuming a capacity addition model with "high electrification" load forecast, NYS policies and current wholesale market rules




Sources and Notes: RGGI Auction Allowance Price and Volumes Results, New York Public Service Commission Order Adopting a Clean Energy Standard. August 1, 2016, New York DEC Adopted Subpart 227-3, New York Senate Bill S6599, Chart adapted from New York's Evolutions to a Zero Emission Power System, Modeling Operations and Investment Through 2040 Including Alternative Scenarios, ICAP/MIWG, June 22.

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# A Path Forward in 2021

- **The NYISO's wholesale markets can serve as an effective platform for achieving New York State environmental objectives**
  - Through active engagement with stakeholders and policymakers, the NYISO is developing design improvements to meet the future challenges expected to arise with high levels of intermittent renewable and distributed energy resources
- **The plan includes a set of enhancements that work together coherently and efficiently to satisfy New York's changing grid reliability needs**
  - These opportunities are organized across three main points of focus (discussed on the next slide)
  - Some opportunities will require immediate attention while others might be something to consider as more information and experience becomes available


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# A Grid in Transition – A Multifaceted Approach

- **Aligning Market Incentives**
  - Carbon Pricing
  - Comprehensive Mitigation Review
- **Prepare for New Technologies**
  - DER Participation Model
  - Energy Storage
  - Participation Model
  - Hybrid Co-Located Model
  - Hybrid Aggregation Model
  - Large Scale Solar on Dispatch
- And more....

## Aligning Competitive Markets and New York State Clean Energy Objectives

- **Review Energy & Ancillary Services Design for Incenting Flexibility**
  - More Granular Operating Reserves
  - Regulation Up & Down Services
  - Ramping Services
  - Grid Services from Renewable Generators
- **Evolve the Day Ahead and Real-Time Markets to improve managing Forecast Uncertainty**
- **Track certain market metrics to evaluate incentives for flexible resources**
- And more....

## Valuing Resource & Grid Flexibility

- **Enhancements to Resource Adequacy Modeling**
- **Improving Installed Capacity Market Incentives**
- **Review Capacity Market Resource Ratings to Reflect Reliability Contribution**
  - Expanding Capacity Eligibility
  - Tailored Availability Metric

## Improving Capacity Market Valuation

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# Improving Installed Capacity Market Incentives

Slide from February 9 Presentation

- Short-Term or Underway
- Medium Term
- Long Term

- Explore multiple-value pricing, a fundamental capacity market redesign where different resource classes have different demand curves based on their characteristics
- Explore capacity requirements based on transmission security considerations
- Consider updates to the Demand Curve structure
  - Review the shape and zero crossing point
  - Consider modifying the translation of the annual revenue requirement for the demand curve unit into monthly demand curves that consider reliability value. (SOM-2019-4)
- Consider what would be needed to expand software to support additional localities
- Update design to allow for transition from summer peaking to winter peaking control area

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# Background

- **The expectation of the NYISO Installed Capacity (ICAP) market is to ensure sufficient capacity exists to satisfy both resource adequacy and Locality transmission security requirements, by ensuring revenue adequacy for supply resources**
  - The Installed Reserve Margin (IRM) set by the New York State Reliability Council (NYSRC) and Locational Capacity Requirements (LCRs) set by the NYISO have historically resulted in sufficient capacity to meet both resource adequacy and transmission security requirements

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# Background

- **At the March 25 ICAPWG/MIWG, the NYISO provided an overview of how resource adequacy and transmission security are evaluated to maintain the reliable operation of the New York power system**
  - Resource adequacy refers to the ability of the electricity 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
    - Resource adequacy is a probabilistic determination of the amount of capacity needed to meet a 1 in 10 year loss of load probability using Emergency Transfer limits
    - Assumptions are controlled though the NYSRC Process
  - Transmission security is the ability of the power system to withstand disturbances, such as electric short circuits or unanticipated loss of system elements, and continue to supply and deliver electricity
    - Transmission security is a deterministic look at the generation and transmission resources needed to avoid thermal, voltage, and stability issues when respecting more stringent transfer limit criteria
    - The analysis looks at meeting Normal Transfer Criteria (NTC) from a planning and operations perspective as expected by NERC, NPCC and NYSRC rules


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# Background

- **In 2017, the NYISO introduced the capacity optimizer into the LCR setting process as a way to minimize costs while still ensuring sufficient capacity to meet reliability**
  - Transmission Security Limits (TSLs) were introduced into the optimizer as a floor to maintain sufficient resources in each Locality to meet minimum transmission security requirements
  - TSLs in the LCR process serve to ensure that there is sufficient capacity to meet resource adequacy <u>and</u> transmission security requirements for each of the ICAP Localities
    - For an overview of the TSL Study, see the Appendix

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# Potential Concerns with how Transmission Security is Reflected in the ICAP Market

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# Transmission Security in the ICAP Market

- **As previously stated, the NYISO's ICAP market has historically been able to satisfy both resource adequacy and transmission security requirements through the ICAP market by relying on suppliers' Unforced Capacity (UCAP) values**
  - UCAP values represent a resource's reliability contribution for resource adequacy as well as its ICAP market valuation
  - UCAP is a probability-based metric that measures the average availability of a resource over a defined period in time (e.g. summer or winter peak load window)
    - Specific UCAP calculations can be found in Attachment J of the ICAP Manual


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# Transmission Security in the ICAP Market

- **UCAP has historically served as an effective reliability valuation for meeting transmission security requirements**
  - Operators have historically been able to rely on dispatchable resources without an energy duration limitation procured in the capacity market to also meet ICAP Locality transmission security needs
    - In meeting transmission security needs, a dispatchable resource can be depended on at its ICAP value to provide energy during a event, unless it is on a forced outage
  - UCAP values for resources with variable output or an energy duration limitation may not be able to be relied upon to meet transmission security requirements to the same extent as dispatchable resources without an energy duration limitation
    - The anticipated energy contribution of these resources during a specific time period is much less certain than for dispatchable resources without an energy duration limitation

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# Representative Example

- **The following is a representative example that shows a hypothetical situation where resource adequacy needs are met by a fleet of dispatchable and variable output resources**
  - In this example, sufficient capacity is available on the system in order to comply with the 1-day-in-10-years loss of load expectation (LOLE) resource adequacy requirement
  - However, during this specific hypothetical scenario, the energy production from variable output resources is significantly less than the modeled value from a resource adequacy perspective
  - This example is intended to show the potential impacts from procuring UCAP in order to solve for transmission security
    - It is not intended to depict a specific future, or present how the NYISO proposes to reflect these resources in transmission security studies

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# Representative Example: Assumptions

- **The following assumptions are used in the representative example shown on the next slide:**
  - Constrained Locality with 11,000 MW peak load and 3,000 MW of transfer capability
  - Dispatchable MW have an assumed derating factor of 10% for resource adequacy
  - Variable Output MW have an assumed derating factor of 75% for resource adequacy, but are operating at 5% of nameplate during this hypothetical scenario

| *UCAP Requirement* | 8000MW Variable Output Resources |
|---|---|
| Locality Peak Load | 11,000 |
| Transmission Security Limit | 3,000 |
| **UCAP MW Requirement** | **8,000** |
| *Installed Capacity MW* | |
| Dispatchable MW ICAP | **8,000** |
| Variable Output Resource MW ICAP | **8,000** |
| **Total ICAP** | **16,000** |
| *Resource Adequacy MW* | |
| Dispatchable MW UCAP | 7,200 |
| Variable Output Resource MW UCAP | 2,000 |
| **Total UCAP MW** | **9,200** |
| *Excess* | *15%* |
| *Event MW* | |
| Event Dispatchable MW Output | 7,200 |
| Event Variable Output Resource MW Output | 400 |
| **Total Event MW** | **7,600** |

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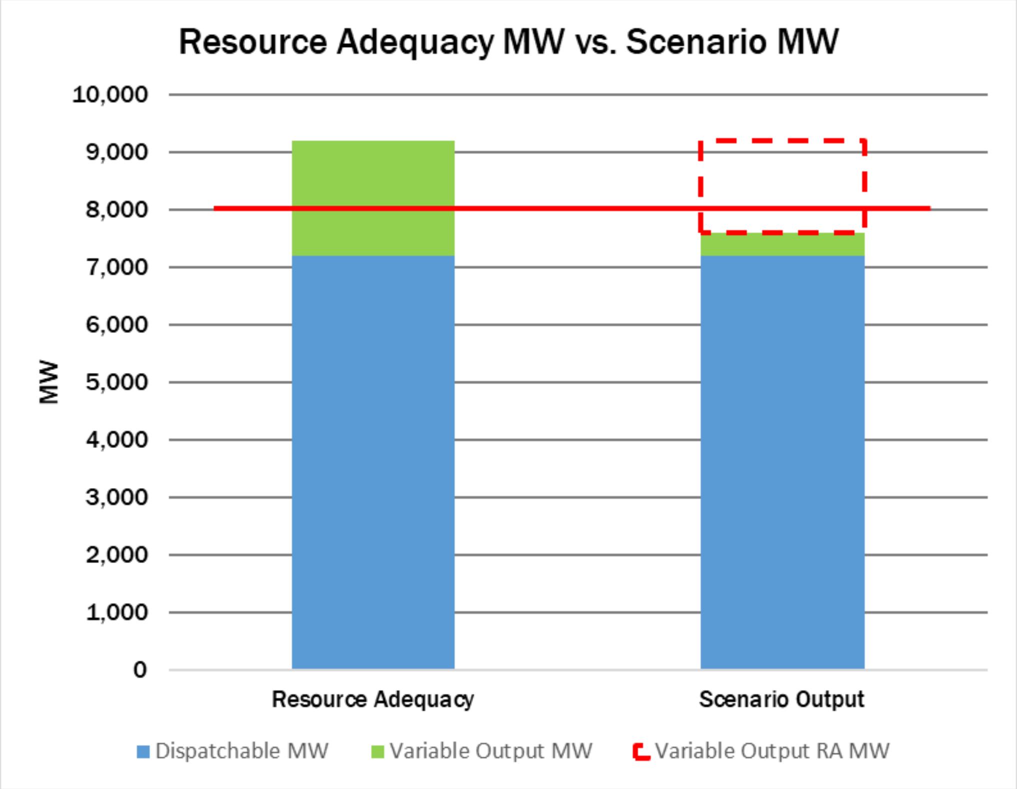
# Representative Example

- **This graph shows a hypothetical scenario where there is an 8,000 MW transmission security need for local generation, shown by the solid red bar**
  - The bar to the left shows that the system is in compliance with Resource Adequacy due to the probabilistic nature of the study
    - Dispatchable resource UCAP MW are shown in blue, and the variable output resource UCAP MW are shown in green
  - The bar on the right shows a potential situation where variable output resources are producing less energy than their resource adequacy contribution assumes, during a high load event
    - Dispatchable resource energy production is shown in blue, and variable output resource energy production is shown in green; the red dashed square shows the difference in the resource adequacy value of the variable output resource and the actual output during this event
- **In this scenario, there are insufficient energy resources available to meet the 8,000 MW transmission security need**

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# Defining the Need: Operations

- The ISO is required by the NYSRC to ensure sufficient supply resources are available to meet transmission security operational requirements and take action within prescribed operational timeframes to restore the transmission system to a secure operating state following the first contingency
- The NYSRC requires:
  - sufficient supply resources' energy is available within the prescribed operational timeframes; and
  - sufficient supply resources' energy is sustainable for the time period of transmission security need


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# Defining the Need: Operations

- **Historically, the hours of a transmission security need are aligned with exposure to higher load levels experienced on a peak or near-peak load day**
  - Operations has historically observed these higher load hours to be from HB12 to HB18 for the summer capability season in the NYC Locality
  - This timeframe aligns with the historical need for demand response activations in NYC
    - For more information on historic hot weather operations please see the Summer 2018 Hot Weather Operations presentation at:
      - https://www.nyiso.com/documents/20142/2800778/04%20Summer%202018%20NYISO%20Hot%20Weather%20Operating%20Cond.pdf/ad1b709d-1714-6161-d05d-ef8756b387c8

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# Defining the Need: Planning Studies

- **Planning studies transmission security as part of the Reliability Needs Assessment (RNA) and Short-Term Assessment of Reliability (STAR) through a deterministic analysis of the NY electric grid representing every hour between now and 10 years from now**
  - The analyses typically focuses on identifying the most likely system conditions that may result in reliability needs, such as summer peak, winter peak and light load conditions
  - Starting from an all-facilities-in-service base condition (N), system performance is evaluated for one contingency event (N-1) followed by another contingency event (N-1-1)
- **The design requirement is established by NERC, NPCC, and NYSRC**
  - NPCC and NYSRC are more stringent for a subset of facilities: all design contingencies are evaluated and virtually no load shedding is allowed
- **A reliability violation is identified when any allowable re-dispatch of the system cannot alleviate a thermal overload**
  - If overloads occur, system is dispatched to minimize overloads

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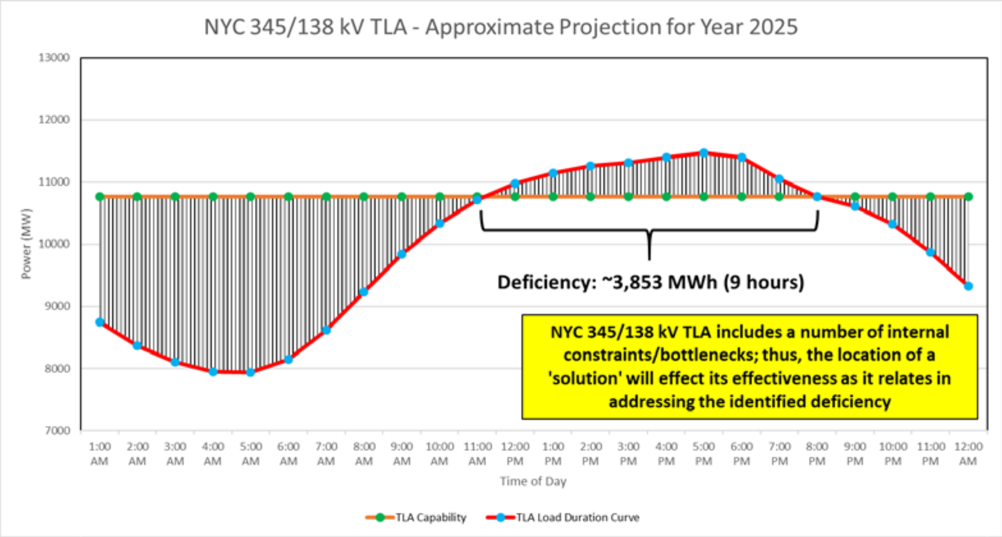
# Defining the Need: Planning Studies

- **In evaluating whether there are sufficient resources to secure the transmission system over the next 10 years, the 2020 RNA identified certain deficiencies on the Con Edison 345kV system under study conditions beginning in 2025**
  - The need in 2025 would last over 9 hours, with a maximum deficiency of 700 MW
  - By 2030, the need extended to 12 hours, with a maximum deficiency of 1,075 MW




- **The transmission security need identified in the 2020 RNA was the most limiting NYC requirement beginning in 2025**
  - The identified Reliability Needs have been mitigated, with a headroom of approximately 50 MWs by 2030
  - This serves as a good example of the importance of recognizing transmission security needs into the Capacity Market and defining the "hours of need" as part of developing a market design proposal for this project

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# Next steps


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# Next Steps

- **Soliciting written questions and feedback from stakeholders by June 4th**
  - Please send in comments and feedback to rpatterson@nyiso.com
  - We will return in late June or early July for additional discussions

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# Questions?

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# Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

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# Appendix

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# TSL Study Overview

- **TSLs used in the LCR setting process are determined each year though a study that is reviewed by stakeholders, consistent with NYSRC planning criteria**
  - The analysis uses the N-1-1 planning criteria for the G-J and K Localities, described as:
    - The largest contingency occurs (N-1); the system is redispatched to return to Normal Transfer Criteria (NTC), or the “normal” operating state, such that if a second contingency is suffered (N-1-1) the system remains below Long Term Emergency (LTE)
  - For the J Locality, the N-2-0 planning criteria is applied
    - The two largest contingencies occur (N-2); the system is redispatched to return to Normal Transfer Criteria (NTC), or the “normal” operating state; no consideration for an additional event
  - For this study, all contingencies occur on transmission lines
- **Today’s TSL study models the transmission system during a one hour peak load period**
  - Peak load MW value used for each Locality is the ICAP forecast
  - Transmission capability and line ratings are defined by the physical system
  - Modeled to maintain N-1-1 or N-2-0; LTE and STE rules are respected
- **Supply resources in the TSL study are modeled similarly to the IRM study**
  - All resources are operating as expected, accounting for entry and exit
  - Dispatchable resources are modeled at full output
  - Variable output resources are modeled at assumed levels that vary with the resource type and the season

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