New York ISO
Independent System Operator

Update on Grid In Transition Related Work and Plan for 2022

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December 2, 2021 – via Webex

Agenda

- Background
- Review the NYISO 2021 progress
  - Tracking & Metrics
  - Energy, Ancillary Services, and Capacity Market Improvements
- 2022 plan
- Next Steps

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Background

- At MIWG/ICAPWG meetings throughout 2020, the NYISO reviewed the recommendations included in the Gap Analysis included in the Grid in Transition report.
  - The NYISO reviewed a categorized list (by both area and time horizon) of specific components of those recommendations in the Grid in Transition report, the Gap Analysis, and the Climate Change Phase II report and received feedback from stakeholders.
  - These recommendations were categorized into short-, medium- and long-term items
- The NYISO evaluated the list of recommended components and proposed to work on a subset of the list to inform the 2021 Master Plan and the 2022 Project Prioritization Process.
- This presentation will review the areas we focused on in 2021 and the areas we propose to target in 2022.

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Previous Presentations

- Dec. 7, 2020 – Proposed Approach for Considering Grid in Transition Recommendations
- Jul. 28, 2020 – Reliability and Market Considerations for a Grid in Transition: Reliability Gap Assessment Potential Market Design Improvements Part 3
- Jul. 7, 2020 – Grid in Transition: Reliability Gap Assessment Potential Market Design Improvements Part 2
- Jun. 22, 2020 – Reliability and Market Considerations for a Grid in Transition: Reliability Gap Assessment Potential Market Design Improvements
- Jun. 10, 2020 – Reliability and Market Considerations for a Grid in Transition: Operations Reliability Considerations
- Feb. 9, 2021 – Proposed Approach for Considering Grid in Transition Recommendations in 2021
- Mar. 19, 2021 – Reliability Gaps and Market Performance Metrics
- Apr. 6, 2021 - Grid in Transition: Real Time Learning Session & Forecast Latency Discussion
- Apr. 20, 2021 – Preparing the Capacity Market for the Grid in Transition*
- Apr. 20, 2021 – Reliability Gaps and Market Performance Metrics, Part II
- Sep. 20, 2021 - Reliability Gaps and Market Performance Metrics, Part III

*For a list of all the Capacity Market and Accreditation presentations please see the appendix of the November 17 2021 MC presentation

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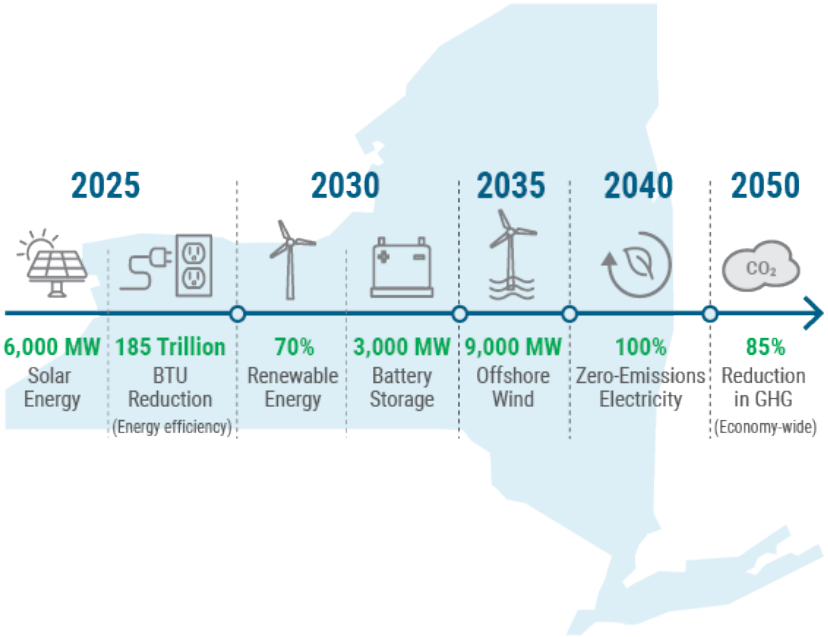
A Grid in Transition – A Multi-Faceted Approach

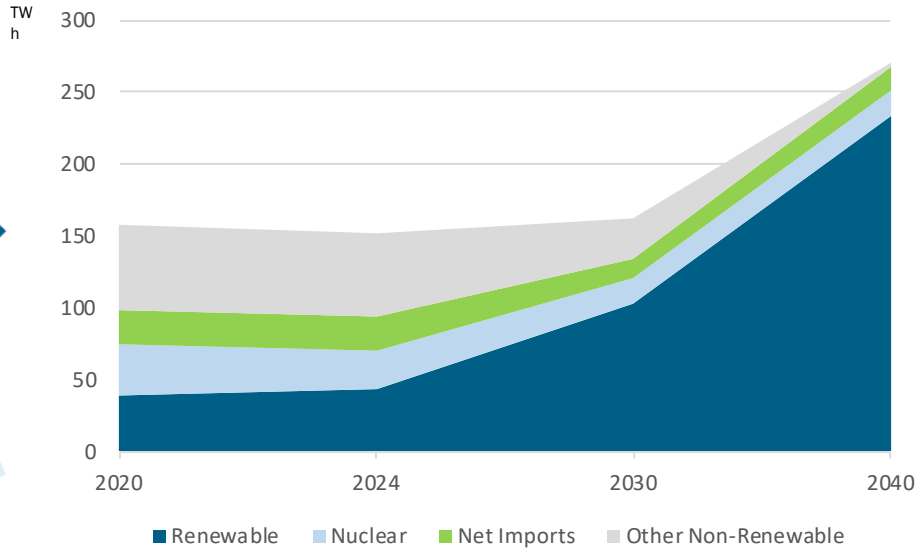
New York's Clean Energy Policies

Policy Timeline



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.

Grid in Transition – Key Takeaways & Studies

- **Climate Change Study[1]**
  - This study simulates the potential impacts of climate change and climate policy on the reliable operation of the New York power system
- **Grid In Transition Report[2]**
  - Describes emerging reliability and economic challenges facing New York's electricity sector
  - Proposes a path forward
- **Gap Analysis[3]**
  - Identifies gaps and new challenges to meet NYISO's mission to support a reliable and economically efficient electric system that are created by New York's decarbonization policies
- **Reliability Needs Assessment ("RNA")[4] and Comprehensive Reliability Plan (CRP)[5]**
  - Provide an evaluation and review of the reliability of the New York bulk electric grid through 2030.
  - The CRP concludes that the New York State Bulk Power Transmission Facilities as planned will meet all currently applicable reliability criteria for forecasted system demand in normal weather but that events beyond current transmission security design criteria would create tipping points resulting in system deficiencies.

[1]The Climate Change Impact and Resilience Study – Phase II: An Assessment of Climate Change Impacts on Power System Reliability in New York State was published October 15, 2020 and can be found under Climate Change Study at https://www.nyiso.com/ny-power-system-information-outlook

[2]The Reliability and Market Considerations for a Grid in Transition report ("Grid in Transition Report") was published on December 20, 2019, and can be viewed here: https://www.nyiso.com/documents/20142/2224547/Reliability-and-Market-Considerations-for-a-Grid-in-Transition-20191220%20Final.pdf/61a69b2e-0ca3-f18c-cc39-88a793469d50

[3]The Reliability Gap Assessment can be found in Appendix B of the Reliability and Market Considerations for a Grid in Transition report published December 20, 2019 https://www.nyiso.com/documents/20142/2224547/Reliability-and-Market-Considerations-for-a-Grid-in-Transition-20191220%20Final.pdf/61a69b2e-0ca3-f18c-cc39-88a793469d50

[4] The 2020 RNA Report https://www.nyiso.com/documents/20142/2248793/2020-RNAReport-Nov2020.pdf/64053a7b-194e-17b0-20fb-f2489dec330d

[5] The 2021-2030 Comprehensive Reliability Plan https://www.nyiso.com/documents/20142/26119798/06_DraftReport.pdf/a435d1b0-b08c-9540-c3a3-0fcbb4a543b7

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.

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
- 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
- **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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The Approach

- The Master Plan* identifies market reforms within the energy, ancillary services and capacity markets that address the challenges posed to the grid with increased intermittent resource penetration. These market design changes along with planning process improvements are intended to place the NYISO-administered wholesale electricity markets in the best position to attract and retain the necessary resources and infra-structure to reliably operate the grid.

* 2021 Mater Plan September Draft https://www.nyiso.com/documents/20142/24565336/2021%20Master%20Plan_Draft_09.14.2021.pdf/54d53801-cb96-2edd-7394-838a682cde13 the final draft is expected in December.

Update on 2021 Market Improvements

2021 Market Improvements in other projects and initiatives

- The next three slides provide brief overviews of these items. For more information please see the individual project descriptions in BPWG materials and in project presentations

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Current Market Improvements

Underway or Completed

- **Carbon Pricing [2021 Software Design]**
  - The proposal proceeded through the NYISO stakeholder process, and now awaits support from New York State. This phase of the NYISO's carbon pricing project will deliver a Software Design to effectuate the NYISO's carbon pricing proposal.
- **Comprehensive Mitigation Review [2021 MDC]**
  - Explore further modifications to the BSM tests
  - Capacity accreditation
- **DER Participation Model [2021 Deploy SD-WAN, Dev. Comp. for BSS & Billing Simulator and 2022 Deploy]**
  - SD-WAN is implemented and available for use (none yet). It was deployed to production on October 13, 2021.
  - BSS & Billing Simulator code development goal is on track for completion by end of year (this does not factor in recent JU proposal on metering changes)

Note: Updates on active projects will be done as part of their respective projects

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Current Market Improvements

Underway or Completed

- **Hybrid Co-Located Model [2021 Implementation expected mid-December]**
  - This project is a continuation of the 2020 Hybrid Storage model Market Design Complete commitment and will work to integrate the rules and software needed to enable large-scale weather dependent and energy storage resources to participate as co-located resources behind a single interconnection point. The 2021 project deliverable is Deployment for software changes necessary to support market participation.
- **Regulation Service [Completed 9/1/20]**
  - Continue to monitor fleet changes and appropriately update statewide regulation procurement requirements.
- **Hybrid Aggregation Model (Hybrid Storage) [2021 MDC]**
  - Earlier this year NYISO presented (over multiple presentations) portions of an HSR model, since that time NYISO has been resource constrained due to the DER project and FERC order 2222
  - NYISO is continuing to work on the proposal (with consideration for stakeholder input received) throughout the rest of the year and is targeting an updated HSR proposal (MDC) in early Q1 2022

Note: Updates on active projects will be done as part of their respective projects

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Current Market Improvements

Underway or Completed

- **Operating Reserves**
  - Valuing statewide 10- and/or 30-minute operating reserve requirements
    - Ancillary Services Shortage Pricing [Implemented July 2021]
    - Reserves for Resource Flexibility [Implemented June 2021]
  - Reserve Enhancements for Constrained Areas (RECA) [2021 Study]
    - Develop reserve requirements dynamically including dynamic modeling of reserve locations and transmission congestion (includes SOM-2015-16)
    - Explore dynamic procurement of reserves based on largest source contingency and dynamic allocation of reserves based on available transmission capability
    - More Granular Operating Reserves [Included in RECA study]
      - Increasing locational thirty-minute total operating reserve requirements
        - » Consider modeling local reserve requirements in New York City load pockets (SOM-2017-1)
    - The Study Report is on target for December 2021

Note: Updates on active projects will be done as part of their respective projects

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Current Market Improvements

Underway or Completed

- **Planning Initiatives**
  - Provide more granular forecasts further out into the future [COMPLETED 2020]
    - 2020 Gold Book includes 30-year forecasts with granular data of forecast components
  - Provide transparent behind-the-meter solar forecasts [COMPLETED 2020]
    - Posted BTM solar forecasts and actuals beginning Nov. 2020
  - Revise the Economic Planning Process to include broader identifications of constraints and assessments of energy deliverability of future resources [COMPLETED 2020]
    - Implementation pending FERC acceptance of tariff revisions, expected April 2021
  - Perform system assessments for future resource mix scenarios [ONGOING]
    - 2020: Climate Change Study, CARIS 70x30 Scenario, RNA
    - 2021-2022: Comprehensive Reliability Plan, System & Resource Outlook

Note: Updates on active projects will be done as part of their respective projects

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Tracking & Metrics considered

Potential Tracking & Metrics

- The goal is to establish a baseline and an early warning system to review if the market rules are consistent with what is needed for reliability. Starting with a focus on BPCG payments to gas fired generation in DAM and RT
- As the proportion of starts that are uneconomic at market prices increases and resources are more often made whole with uplift payments that can be an indication that more review is needed
- We propose that the two metrics for BPCG trends be:
  - The proportion of economic starts receiving BPCG.
  - The relationship between BPCG and Margins
- We also propose to track the impact of Forecast Pass commitments of long start generation as measured by:
  - The total Megawatt Hours scheduled in final scheduling pass on long start units committed in forecast load pass.
- The NYISO will be looking to incorporate new BPCG metrics into existing reporting in 2022

Notes: For more information on the metrics see today's Reliability Gaps and Market Performance Metrics, Part IV presentation.
The operations plans for addressing the potential reliability concerns can be found in the June 10 2020 presentation Reliability and Market Considerations for a Grid in Transition: Operations Reliability Considerations

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Market Improvements that were considered in 2021

Real-Time Forecasting Issue Discovery

- **Examined Real-Time Load Forecast, BTM Solar Forecast, and Wind Energy Forecast for latency and accuracy**
  - These represent the key real-time forecasting functional inputs to dispatch decisions that may be impacted by the considerations captured in the Gap Analysis, such as increased intermittent resource penetration
- **Facilitated initial discussion in April,[1] and introduced concepts for potential further investigation.**
  - Collected feedback on possible avenues for study
- **Began initial study framework to outline 2022 deliverable.**

[1] *Grid in Transition: Real Time Learning Session & Forecast Latency Discussion*, April 6, 2021 ICAPWG: https://www.nyiso.com/documents/20142/20486949/Grid%20In%20Transition%20-%20Real%20Time%20Learning%20Session%20%20Forecast%20Latency%20Discussion.pdf/ccde2d1f-2e78-aee5-29cf-f87751391cd2

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Real-Time Forecasting – Grid in Transition

- **Load Forecast – Continued evaluating timesteps and system processing latency to determine if improvements will be viable and beneficial to improving the forecast.**
- **BTM Solar Forecast – Identified ongoing NYISO effort to improve forecast data latency from vendor.**
  - NYISO 2022 Enterprise Project: *BTM Solar Forecasting Demand Product Enhancements*
    - This effort implements the necessary software to reduce time of BTM data refresh from hourly to a 15-minute frequency
      - With data refreshed on a 15-minute basis rather than an hourly basis, NYISO MetrixIDR may incorporate BTM Solar data with less latency, reflecting BTM Solar performance closer to real time commitment and dispatch decisions by RTC/RTD
- **Wind Energy Forecast – Continued evaluating for possible areas of improvement.**
- **Forecast Accuracy – Investigating potential for new accuracy metrics to provide additional details to existing operations reporting.**

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Energy & Ancillary Services Market Improvements

- Operating Reserves
  - Improve combined cycle (CC) Modeling of Slow Ramp region
  - NYISO 2022 Project: Market Design Concept Proposed deliverable

Capacity Market Improvements

- **Enhancing Resource Adequacy Modeling**
  - Enhanced the IRM study with a more refined model of load forecast uncertainty including revising the Transmission Security Limit (TSL) and TSL Floor implementation.
    - https://nysrc.org/PDF/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20245/AI%207.1%20-%20LFU_Study_Phase_1_Overview_ICS_20210330.pdf
    - https://www.nyiso.com/documents/20142/24415247/Transmission%20Security%20Limit%20Method_Final.pdf/926bd2bd-ae0c-9f5f-1f42-f66c942e23d9
  - Reassessed the merits of incorporating load forecast updates between the IRM and LCR studies. Stakeholders agreed with our recommendation to align the two studies. And added additional information to the LCR process that helps provide greater transparency
    - LCR improvements and additional transparency were kicked off here: https://www.nyiso.com/documents/20142/19520392/ICAP%20Requirements%20-%20Enhancements.pdf/c5b56caf-4eb9-b4f8-4f38-847a8ce306d0
    - LCR enhancements (load forecast, additional transparency) recommending PPT: https://www.nyiso.com/documents/20142/21189817/LCR_Process_Updates_ICAPWG.pdf/906476a5-f38d-6cf7-dfc1-f2ab04a24101
  - NYSRC is also conducting a review of the resource adequacy processes which will include transmission security, at the NYISO's recommendation.

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Plan for 2022

Related Energy projects for 2022

- **Balancing Intermittency**
  - Dynamic Reserves – Concept proposed
  - Grid in Transition – Study Complete
- **Improving Price Formation**
  - Constraint Specific Transmission Shortage Pricing – Functional Requirements
  - Carbon Pricing – awaiting New York State guidance

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Related Capacity projects for 2022

- Comprehensive Mitigation Review – Deployment
- Capacity Accreditation Measures – Market Design Complete
- Capacity Improvements to Support reliability
  - CRIS Expiration Evaluation – Market Design complete

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Related New Resource Integration projects for 2022

- **Enabling New Resources and Capabilities**
  - DER Participation Model – Deployment
  - Hybrid Aggregation Model – Functional Requirements
  - Internal Controllable Lines – Concept Proposed
- **Improving Market Models**
  - Improve duct Firing Modeling – Concept Proposed

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Related Planning for the Future projects for 2022

- **Load Forecasting Enhancements**
  - BTM Solar Demand Forecasting Product Enhancements – Functional requirements
  - System Demand End- Use and Electrification Forecasting Enhancements – Study Complete

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Grid in Transition Project

- The Master Plan anticipates the Review of Real-Time Market Structure project starting in 2025. But we are thinking that it might be good to begin discussions about the existing structure and different ideas for what changes should be considered because those discussions are likely to take time.
- We are looking for stakeholder feedback. Would it be fruitful to spend time on this?

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Next Steps

Next Steps

- Q1 – begin discussions of Real-Time Market structure, if desired
- The NYISO welcomes stakeholder input. Feedback can be provided at today's meeting or in writing after today's meeting.
  - Please send any written feedback to Debbie Eckels DEckels@nyiso.com

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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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Questions?