

2023-2042 System & Resource Outlook (The Outlook)

**A Report from the New York
Independent System Operator**

Draft for May 14, 2024 ESPWG

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Executive Summary

[This section will be filled out in future versions of the draft report.]

System & Resource Outlook Overview

This second biennial System & Resource Outlook (the “Outlook”) evaluates the performance of and identifies the challenges for the New York power system under multiple future scenarios over the 20-year time period beginning 2023 and ending 2042. Each scenario projects a different possible future system with primary adjustments in energy demand profiles, generation capacity mixes, and approved proposed transmission and distribution projects. Each scenario is independently evaluated to inform on various potential future system outcomes. The Outlook primarily focus on select years 2025, 2030, 2035, 2040, and 2042 to highlight how the system is evolving through time to accommodate the anticipated energy transition over the next 20 years.

This 2023-2042 Outlook updates and builds upon the findings from the previous 2021-2040 System & Resource Outlook (hereinafter, the “prior Outlook”) published in September 2022. Like the prior Outlook, this report identifies challenges and opportunities for the New York power system as it continues a path towards decarbonization and policy target achievement. In addition, this Outlook evaluates the grid with an increased number of proposed generation and transmission projects in the near term in recognition of financial contracts awarded to renewable energy resources and approved transmission and distribution upgrades.¹ The scope of this Outlook was increased to evaluate five scenarios (as compared to four in the prior Outlook) to accommodate an additional set of modeling assumptions from State entities for further use in the Coordinated Grid Planning Process (CGPP).²

[placeholder for table to summarize key differences in scope and inclusion rules for the reference cases]

This Outlook evaluates various generation capacity mixes over the next 20 years, quantifies projected congestion on the transmission system, identifies transmission investment opportunities on the New York grid, and highlights challenges associated with full achievement of Climate Leadership and Community Protection Act (CLCPA) mandates and other policy objectives. Results and findings from the Outlook are intended to provide information to stakeholders, policymakers, Market Participants, and the public supported by the NYISO’s role to provide authoritative fact-based information to assist planning for a cleaner grid in the future. While analyses from the Outlook may inform other studies, such as the 2024 Reliability Needs Assessment (RNA) or aspects of the NYISO’s evaluation of proposed solutions in the Public Policy Transmission Planning Process, the Outlook is not a reliability study and it should not be

¹ Lock down date for the assumptions for this reference case was October 30, 2023

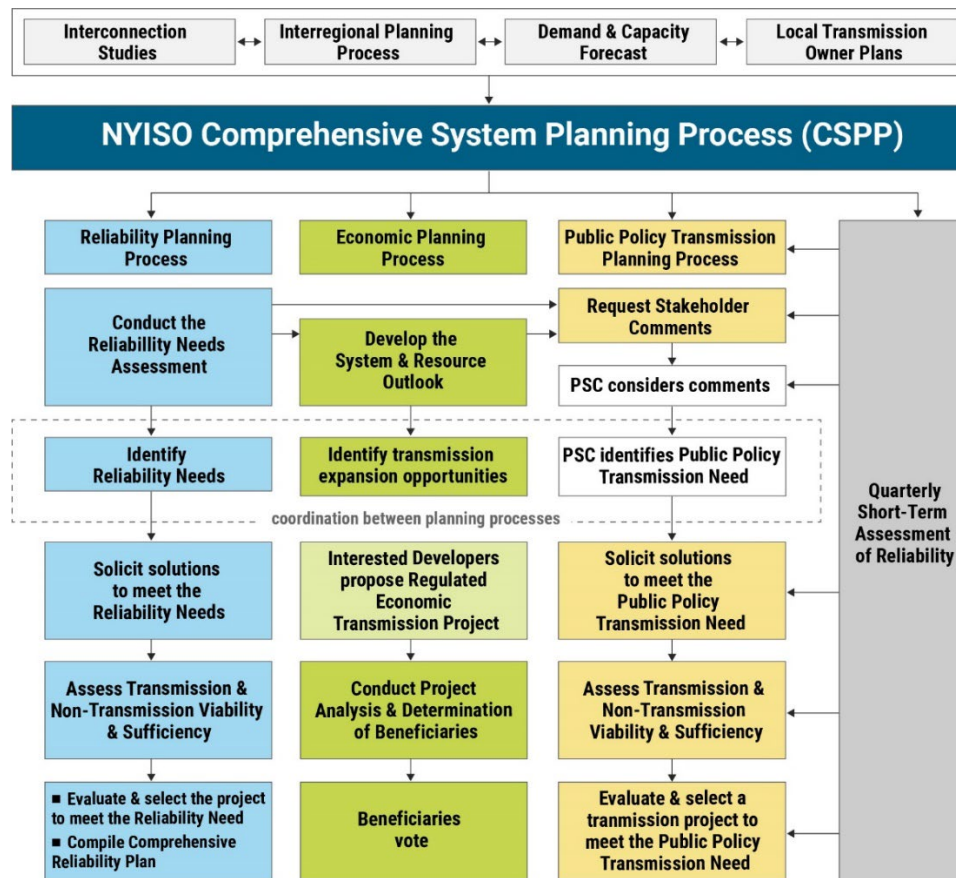
² While the NYISO developed four of the scenarios in consultation with Market Participants and other interested parties, the set of modeling assumptions that are intended to inform the CGPP (commonly referred to as the “State Scenario”) were implemented “as is” based on the direction of the applicable State entities.

presumed that the scenarios evaluated adhere to all reliability criteria. Additional assessments of reliability will need to be performed and evolve as the grid transitions to meet the policy mandates and goals.

State of System & Resource Planning

The Outlook is developed by NYISO System & Resource Planning through the Economic Planning Process, which is a component of the NYISO’s Comprehensive System Planning Process (CSPP). The Outlook provides a comprehensive overview of the potential system resource development and transmission constraints throughout New York, and highlights opportunities for transmission investment driven by economics and public policy. Through the CSPP, numerous assessments, evaluations, and plans are developed and relied upon by the NYISO to conduct system planning, including demand forecast and analysis, reliability planning, economic planning, public policy planning, interregional planning, and interconnection studies.

Figure X: NYISO’s Comprehensive System Planning Process

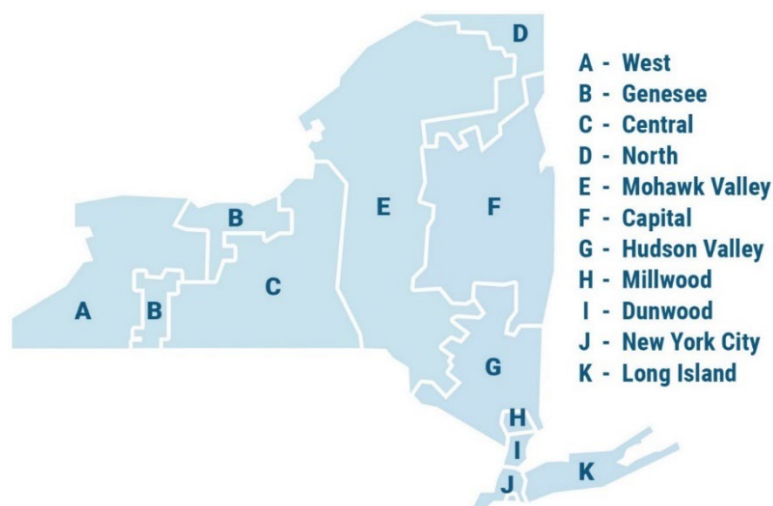


State of the New York Grid

The bulk power system in New York is evolving to comply with the state’s clean energy mandates. In addition to longer term assessments focused on evaluating the integration of new generation, load, and/or transmission projects on the system, the NYISO produces annual publications, such as the Load & Capacity Data Report³ (Gold Book) and Power Trends,⁴ to provide independent sources of information and analysis on New York’s complex electric system.

The New York Control Area (NYCA) is comprised of 11 geographical zones from western New York (Zone A) through Long Island (Zone K). These zones are referred to throughout this report to provide locational details regarding system demand, projected resource mixes, and anticipated transmission constraints. Additionally, extensive detail on the New York power system (*e.g.*, nodal representation, buses, generator specific production cost assumptions, monitored contingency pairs and local reliability rules) is included in the models for this Outlook to provide further insights on the power system evaluated in this study. A map of the NYISO load zones is shown below for reference.

Figure X: NYISO Load Zone Map



[placeholder for figures to show 2023 historic installed capacity and energy production by fuel source]

Energy and Peak Demand

As part of NYISO’s planning processes, the Gold Book report is produced annually to inform of load and capacity data of the current system, as well as forecasts for future years for the evolving New York grid. The Gold Book includes information, such as historic and projected energy and peak demand

³ [2023 Load & Capacity Data Report](#)

⁴ Power Trends

forecasts, existing and proposed generation capacity in the near term, and existing and proposed transmission facilities. These forecasts contain detailed information for components such as, among other things, energy efficiency, building electrification, behind-the-meter (BTM) solar, large loads, electrolysis (hydrogen production), and estimates for the transition from a summer peaking system to winter peaking system in New York. To accommodate various use cases, the Gold Book includes energy and peak demand forecasts for multiple scenarios with a range of assumptions for the factors outlined above.

Due to the timing of this publication, this Outlook primarily references long-term forecasts from the 2023 Gold Book.⁵

Generator Interconnections

Planned Generation

The Outlook uses the NYISO's Reliability Planning Process study inclusion rules for its firm new generator additions and retirements as a starting point for Outlook scenarios.⁶ The inclusion rules limit the amount of new generation projects that are assumed as firm new builds and adds generic future generation if needed to meet reliability requirements.

Additional generation capacity is assumed in the Contract and Policy Cases to accommodate resources that have been awarded contracts with NYSERDA.⁷ These generation projects account for approximately 16 GW of new renewable and energy storage resources that are assumed to be in service by 2030 to support the achievement of the 70% renewable resources by 2030 ("70 x 30") mandate in the CLCPA.

Interconnection Process

The NYISO's transmission expansion and interconnection processes are crucial to facilitating the development and interconnection of proposed generation, transmission, and load facilities to the NYCA. The transmission expansion and interconnection processes support grid reliability by requiring coordination among the NYISO, customers/developers, and associated Transmission Owners, as well as affected external regions, to identify and address potential violations of the applicable reliability criteria due to the proposed interconnection of projects. These processes are necessary to accommodate the significant portfolio of new projects, notably renewable energy and energy storage resources, that Interconnection Customers are proposing to interconnect to the grid in response to state policies.

Beginning in 2023, the Federal Energy Regulatory Commission (FERC) issued Order No. 2023 and

⁵ [2023 Load & Capacity Data Report](#)

⁶ See [Reliability Planning Process Manual, Manual No. 36](#), § 3.2.

⁷ Lock down date for these resource's inclusion was October 30, 2023.

subsequently Order No. 2023-A that required transmission providers to amend their interconnection procedures to, among other things, address interconnection queue backlogs, improve certainty, and prevent discrimination of new technologies seeking to interconnect to transmission systems. In response, the NYISO engaged in a significant effort to reform its interconnection procedures to comply with FERC's orders. The NYISO filed new Standard Interconnection Procedures that began on May 2, 2024⁸ and will impact future proposed interconnections to the NYCA. Due to the timing of this Outlook and the implementation of the new Standard Interconnection Procedures, any references to the NYISO's interconnection queue in this evaluation are based on, among other things, the historic queue (*i.e.*, interconnection requests and applications submitted prior to start of the proposed Standard Interconnection Procedures to comply with Order Nos. 2023 and 2023-A).

Transmission Planning

Under the CSPP, the NYISO is responsible for planning for the bulk transmission system through its Short-Term Reliability Process, Reliability Planning Process, Economic Planning Process, Public Policy Transmission Planning Process, and Interregional Planning Protocol. These processes can identify needs that must be addressed and/or opportunities for transmission development. The New York State Transmission Owners (TOs) are responsible under the Local Transmission Planning Process to plan for their respective Transmission Districts or facilities. In doing so, the TOs are responsible for identifying and addressing local needs through the development of a Local Transmission Owner Plan (LTP). The LTPs serve as inputs into the NYISO's planning studies.

In addition to the NYISO's CSPP, the New York State Public Service Commission (NYPSC) required certain utilities in New York (commonly referred to as the "Joint Utilities") to propose a coordinated planning process at the state level. The NYPSC approved the Coordinated Grid Planning Process (CGPP) in 2023, and the Joint Utilities are currently administering the first cycle of that process.

Public Policy Transmission Planning Process

Under the NYISO's Public Policy Transmission Planning Process, the NYISO Board of Directors selected four transmission projects to address the following Public Policy Transmission Needs: Western New York (Empire State Line), AC Transmission Segment A (Segment A Double Circuit), AC Transmission Segment B (Segment B Knickerbocker-PV), and Long Island Offshore Wind Export (Propel Alternate Solution 5). The major components of the transmission projects selected to address the Western New York, AC Transmission Segment A and AC Transmission Segment B needs are currently in service, while the Propel

⁸ See *New York Indep. Sys. Operator, Inc.*, Compliance Filing for Order No. 2023 and Order No. 2023-A; Conditional Request for Prospective Waivers, Docket No. ER24-1915-000 (May 1, 2024).

Alternate Solution 5 project is in the early stage of development with an identified in-service date of May 2030 to meet the need.

In June 2023, the NYPSC issued an order identifying the New York City Offshore Wind Public Policy Transmission Need and directed the NYISO to solicit proposed solutions to integrate at least 4,770 MW of offshore wind generation into New York City by January 1, 2033. The NYISO is currently administering its Public Policy Transmission Planning Process to address this New York City Offshore Wind Public Policy Transmission Need.

Joint Utilities' Coordinated Grid Planning Process

[This section will be filled out in future versions of the draft report.]

Reliability Planning Process and Short-Term Reliability Process

In addition to its Economic Planning Process and the Public Policy Transmission Planning Process, the NYISO's planning for the reliability of the system relies on several processes:

1. Each transmission owner conducts a public Local Transmission Planning Process for its transmission district that serves as an input into the statewide planning;
2. The quarterly Short-Term Assessments of Reliability (STARs) under the Short-Term Reliability Process address reliability needs that may arise within five years. This process assesses the potential for reliability needs arising from proposed generator deactivations, as well as other changes, such as revised transmission plans and updated demand forecasts;
3. The Reliability Needs Assessment (RNA), which is a part of the Reliability Planning Process, focuses on longer-term reliability needs for years four through ten of a ten-year, forward looking study period; and
4. The Comprehensive Reliability Plan (CRP)—also a part of the Reliability Planning Process—integrates all of the reliability planning studies into a ten-year reliability plan for New York.

Together, these processes enable the NYISO to identify reliability needs through a continuous study process ranging from localized needs to broader statewide needs arising over the next decade. Of the major reliability reports, the 2023-2032 Comprehensive Reliability Plan (CRP)⁹ was completed at the end of 2023 and provided information on reliability margins and potential risk factors for the evolving grid

⁹ <https://www.nyiso.com/documents/20142/2248481/2023-2032-Comprehensive-Reliability-Plan.pdf/>

over the next 10 years. The NYISO is currently performing the 2024 RNA and will leverage data from this Outlook to identify commitment and dispatch trends and related bulk power system reliability impacts that may be due to efforts to achieve New York State’s policy mandates.

Demand: Electrification Trends

Energy and Peak Demand Forecasts

Demand forecast is known to be a primary driver in simulation results in electricity system planning models. For this Outlook, four unique load forecasts were assessed in the five Outlook scenarios to evaluate a range of projected energy demand and peak forecasts values. Three of the load forecasts evaluated in this Outlook were produced in the 2023 Gold Book¹⁰ and the fourth load forecast that is used in the Policy Case “State Scenario” was developed by the Climate Action Council’s Integration Analysis¹¹ to support New York’s Final Scoping Plan.¹²

Critical components of the projected load forecasts include, but are not limited to:

- Building electrification,
- Energy efficiency;
- Electric vehicles, and
- Large loads (*e.g.*, expected load growth from certain load projects in the NYISO interconnection queue)

the charts below separate out each component of the projected load forecasts and quantify them either as an increase or decrease in projected energy demand. For example, behind-the-meter (BTM) solar resources (yellow) can be seen as a decrease in net demand energy, while electric vehicles (purple) increase net demand energy. All of the energy forecasts used in this Outlook project increased net demand energy through time. Notably, electrification and large loads have a significant impact on the projected increase; however, the extent to which these projections increase due to the applicable component vary by forecast.

¹⁰ The three load forecasts from the 2023 Gold Book include (1) the Baseline Forecast, (2) the Lower Demand Policy Scenario, and (3) the Higher Demand Policy Scenario. See Section I of the [2023 Load and Capacity Report](#).

¹¹ <https://climate.ny.gov/resources/scoping-plan/>

¹² <https://climate.ny.gov/-/media/Project/Climate/Files/NYS-Climate-Action-Council-Final-Scoping-Plan-2022.pdf>

Figure X: Baseline Demand Energy by Type (GWh)

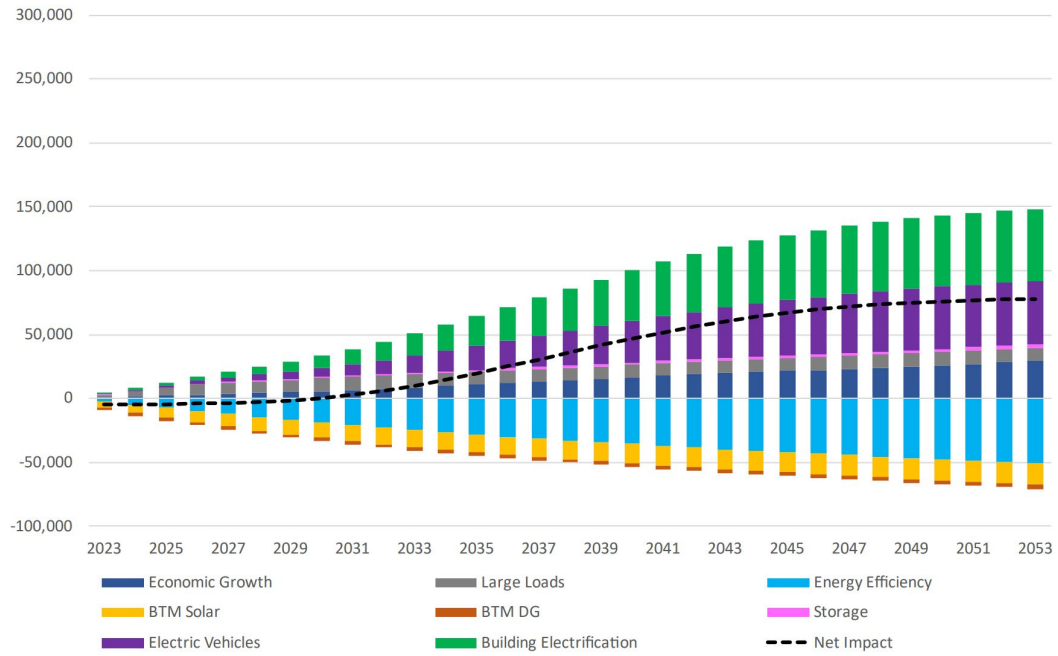


Figure X: Lower Demand Policy Scenario Energy by Type (GWh)

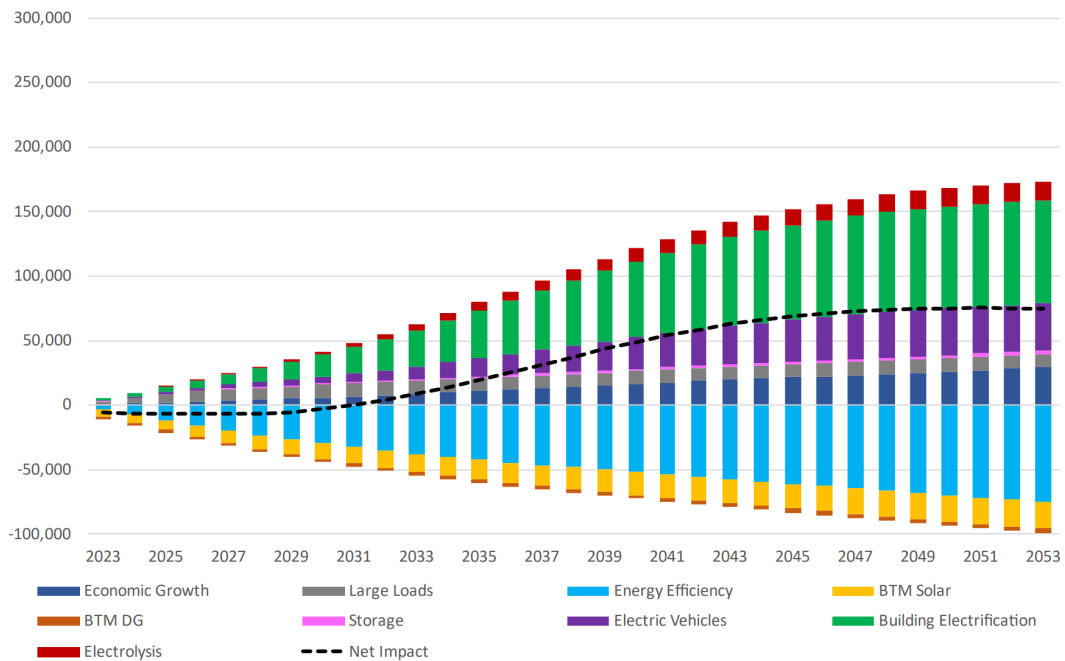
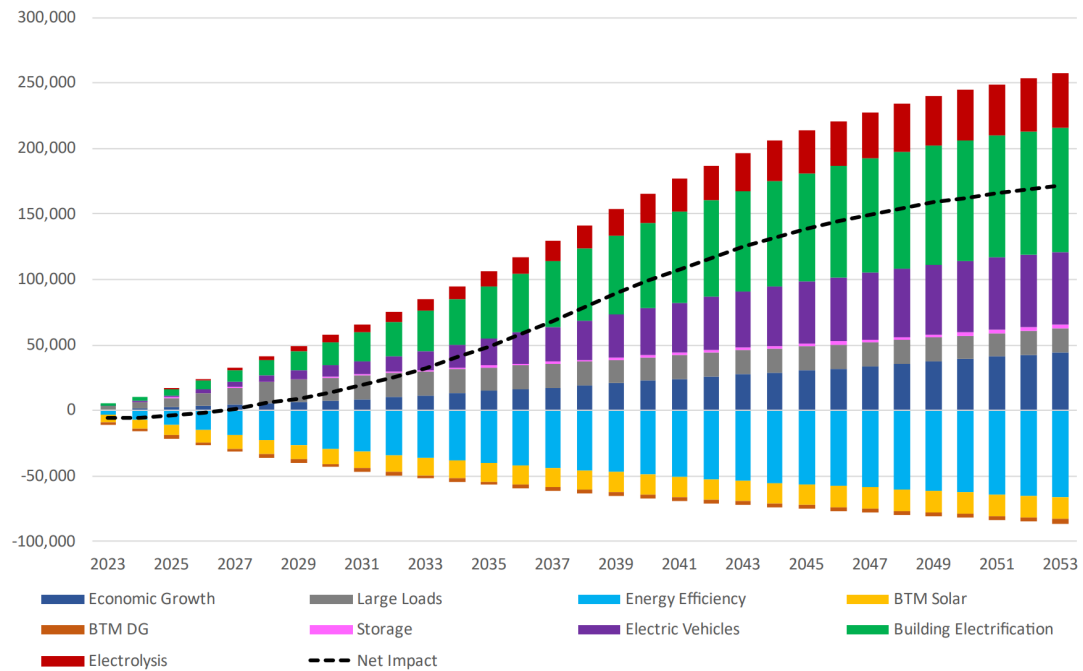


Figure X: Higher Demand Policy Scenario Energy by Type (GWh)



[placeholder for “State Scenario” figure to highlight components of energy forecast]

[placeholder for figure to compare the energy demand and peak forecasts assumed for the Outlook scenarios]

Key Takeaways

[This section will be filled out in future versions of the draft report.]

Resources: Pathways to Policy Achievement

Supply and Demand Analysis

[This section will quantify the generation supply and demand for each scenario assessed in the 2023-2042 Outlook. This section will be filled out in detail in future versions of the draft report.]

System Resource Scenarios

[This section will be filled out in future versions of the draft report.]

Dispatchable Emission Free Resources

[This section will be filled out in future versions of the draft report.]

System Performance

[This section will be filled out in future versions of the draft report.]

Key Takeaways

[This section will be filled out in future versions of the draft report.]

Transmission: Opportunities for Efficiency

Renewable Generation Pockets

Renewable generation pockets have been evaluated in NYISO's Economic Planning Process since 2019. For consistency of reporting, these pocket definitions are based on their geographic locations and have remained consistent throughout these planning cycles. Each pocket depicts a geographic grouping of renewable generators and transmission constraints in a local area. Within each pocket, a geographic grouping of renewable generators and transmission constraints are further focused into sub-pockets.

This Outlook assumes the inclusion of significant amounts of new renewable generation projects.¹³ These generation projects represent approximately 16 GW of new renewable resources assumed to be in service by 2030 to support the achievement of the CLCPA's 70 x 30 mandate. The figure below shows the breakdown of these renewable resource additions by NYISO load zone.

[placeholder for awarded renewable generation capacity modeled]

In addition to the assumption of new renewable generation projects, the NYISO assumed a number of transmission and distribution upgrades. Since the NYISO completed the prior Outlook, significant local transmission and distribution (LT&D) upgrades in New York have been approved by the NYPSC, including the Phase 1 and 2 transmission projects and the Brooklyn Clean Energy Hub.¹⁴ To account for these proposals, the NYISO included these projects as firm LT&D upgrades in many of the scenarios in this Outlook.

With changes to the system, such as generation mix, demand, and LT&D upgrades, the renewable generation pockets are evolving. In some instances, load growth and LT&D upgrades lead to a reduction in resource curtailment within renewable generation pockets. Conversely, increased penetration of renewable resources in the near term to achieve New York policy drives increased competition on the system and increases the risk of renewable curtailment. Through the use of renewable generation pockets,

¹³ Per the NYSERDA Renewable Energy Certification contracts database as of the lock down date October 30, 2023.

¹⁴ <https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b0C1FE2AF-2922-4BF5-809C-5C93F4F73121%7d>

this Outlook identifies (1) transmission constraints on the system, (2) quantifies energy deliverability, and (3) identifies the relative risk of renewable curtailment for years 2030 and 2035.

[placeholder for renewable generation pockets map]

In this Outlook, the extent of transmission and distribution upgrades included are assumed to be in service by 2030. Since the NYISO does not assume additional transmission upgrades in the later years of the study, there is additional congestion and renewable resource curtailment in the pockets due to increased renewable generation capacity to meet policy objectives.

Energy Deliverability

[This section will include results of energy deliverability analysis for the renewable generation pockets for each of the applicable scenarios. This section will be filled out in future versions of the draft report.]

Bulk Transmission Constraints

[This section will be filled out in future versions of the draft report.]

Key Takeaways

[This section will be filled out in future versions of the draft report.]

Next Steps and Recommended Actions

Next Steps

[This section will be filled out in future versions of the draft report.]

Recommendations and Observations

[This section will be filled out in future versions of the draft report.]