

2021 – 2040 System & Resource Outlook (The Outlook)

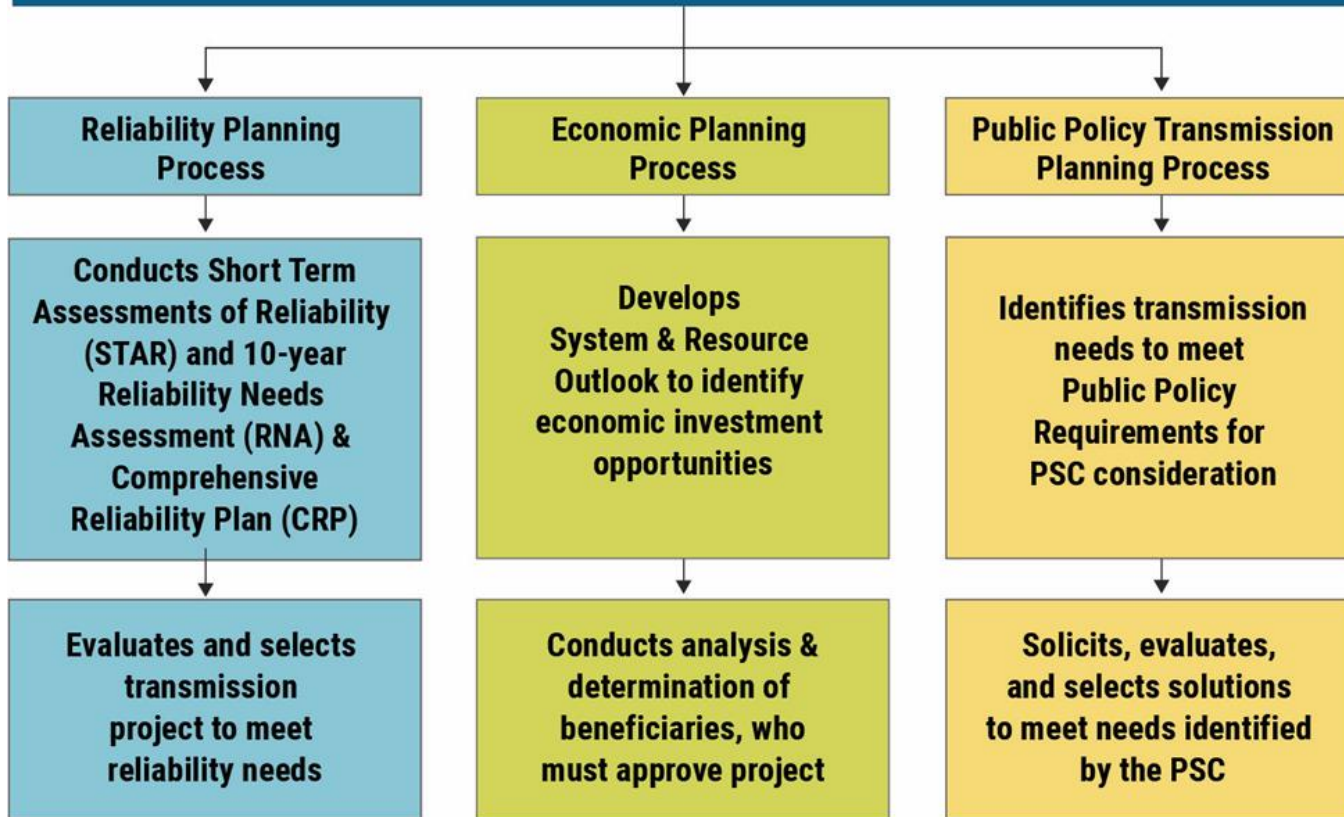
System & Resource Planning Department

Environmental Advisory Council

Wednesday October 5, 2022

NYISO's Economic Planning Process

NYISO Comprehensive System Planning Process



System & Resource Outlook: Objectives

1. Create a biennial report that summarizes the current assessments, evaluations, and plans in the biennial Comprehensive System Planning Process
2. Produce a twenty-year projection of system conditions for demand, generation, and transmission across the New York transmission system
3. Identify, rank, and group congested elements
4. Assess the potential benefits of addressing congestion
5. Develop informative scenario cases
6. Perform technical analyses to inform internal and external stakeholders

System & Resource Outlook Scope

**Model
Development**

**Congestion
Assessment**

Renewable
Pocket
Formation

Projected
Operations
& Market
Impact
Analysis

Reference
cases

Sensitives
and
Scenarios

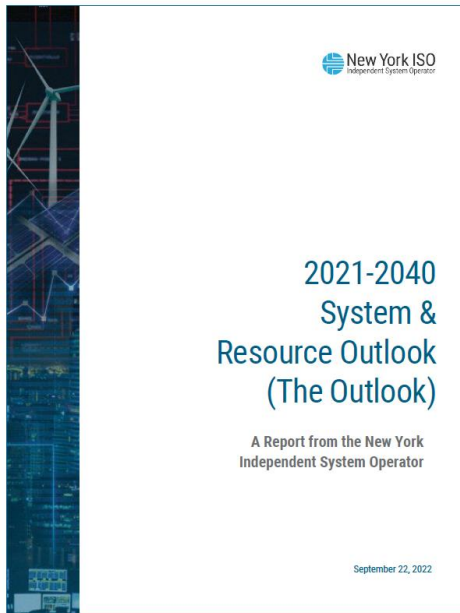
Historic &
Future
Transmission
Congestion

Congestion
Relief
Analysis

Energy
Deliverability
Assessment

2021 – 2040 System & Resource Outlook: Key Findings

Report and Datasheet



[Link: 2021-2040 Outlook Report \(nyiso.com\)](https://nyiso.com)

2021-2040 System & Resource Outlook (The Outlook) 20-Year Outlook Forecasts Transmission & Resources Needed to Meet Policy Objectives

The NYISO evolved its planning processes to produce the first-ever System & Resource Outlook. This new study includes a 20-year forecast that examines multiple cases and scenarios that identify transmission investment opportunities and project resource mixes for achieving 2030 and 2040 policy mandates while maintaining reliability. The Outlook will be updated every two years.

Key Findings

- State climate mandates are driving the need for unprecedented levels of investment in new generation to achieve decarbonization and maintain system reliability.
- Electrification of buildings and transportation required by state policies will rapidly increase peak and annual energy demand.
- Extensive transmission investment will be necessary to deliver renewable energy and address new constraints that appear across the electric system.
- To achieve an emission-free grid, Dispatchable Emission-Free Resources (DEFRTs) must be developed and deployed at scale well before 2040 to ensure reliability and meet climate mandates.



“The Outlook shows that unprecedented levels of transmission and generation investment will be necessary to achieve clean energy goals while continuing to meet grid reliability needs.”

— Zach G. Smith, VP System & Resource Planning, New York ISO

Generation Required to Meet CLCPA Mandates

**+20 Gigawatts
New by 2030**



Estimated 20 GW of New Renewable Generation Needed for 70% by 2030 Goal. Roughly seven years from now, an estimated 20 GW of additional renewable generation must be in-service to support the energy policy target of 70% renewable generation by 2030. For reference, 12.9 GW of new generation has been developed since wholesale electricity markets began more than 20-years ago in 1999.

**111-124 Gigawatts
Total by 2040**



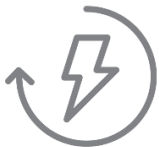
Total Installed Capacity Must Triple for 100% by 2040 Goal. At least 95 GW of new generation projects and/or modifications to existing plants will be needed. Over the past five years, 2.6 GW of renewable and fossil-fueled generators came on-line while 4.8 GW of generation deactivated. New York currently has approximately 37 GW of generating capacity.

New York ISO

[Link: 2021-2040 Outlook Datasheet \(nyiso.com\)](https://nyiso.com)



Key Findings



- ✓ **State climate mandates** are driving the need for unprecedented levels of investment in new generation to achieve decarbonization and maintain system reliability.



- ✓ **Electrification of buildings and transportation** required by state policies will rapidly increase peak and annual energy demand.



- ✓ **Extensive transmission capability** will need to be added to deliver renewable energy and address new constraints that appear across the electric system.



- ✓ **To achieve an emission-free grid**, Dispatchable Emission-Free Resources (DEFERs) must be developed and deployed at scale well before 2040 to ensure reliability and meet climate mandates.

Generation Required to Meet CLCPA Mandates

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Key Finding 1:

- ✓ **The pace of renewable project development is unprecedented and requires an increase in the pace of transmission development**

Each incremental advance towards policy achievement matters on the path to a greener and reliable grid in the future, not just at the critical deadline years. While the policy mandates targets years 2030 and 2040, resource and transmission expansion has historically taken many years from development to commercial deployment.

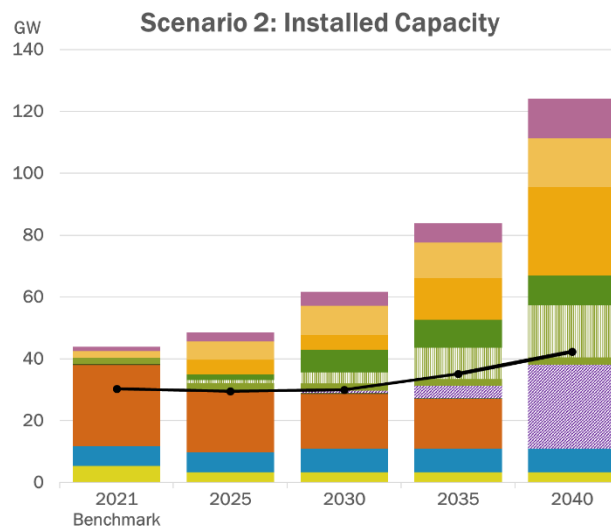
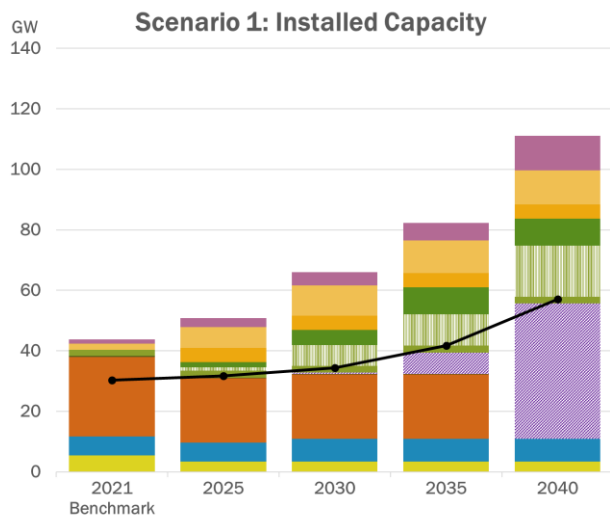
Key Finding 2:

- ✓ **Coordination of project additions and retirements is essential to maintaining reliability and achieving policy.**

Coordination of renewable energy additions; commercialization and grid integration of new, dispatchable, emission free technologies; fossil fuel plant operation; and staged fossil fuel plant deactivations over the next 18 years will be essential to facilitate an orderly transition of the grid.

Key Finding 3:

- ✓ Significant new resource development will be required to achieve CLCPA energy targets.



Key Finding 4:

- ✓ **To achieve an emission-free grid, dispatchable emission-free resources (DEFERs) must be developed and deployed throughout New York.**

Innovation of DEFERs that provide sustained on-demand power and system stability will be essential to meeting policy objectives while maintaining a reliable electric grid. Today DEFER technologies are not commercially viable at the utility scale required to transition to the grid of the future. Success requires committed public and private research and development efforts to identify efficient and cost-effective technologies with a view towards the development and eventual adoption of commercially viable, market-based resources.

Key Finding 5:

- ✓ **As the energy policies in neighboring regions evolve, New York's imports and exports of energy could vary significantly due to the resulting changes in neighboring grids.**

New York is fortunate to have strong interconnections with neighboring regions and has enjoyed reliability and economic benefits from such connections. The availability of energy for interchange is predicted to shift fundamentally as policy achievement progresses. Balancing the need to serve demand reliably while achieving New York's emission-free target will require continuous monitoring and collaboration with our neighboring states.

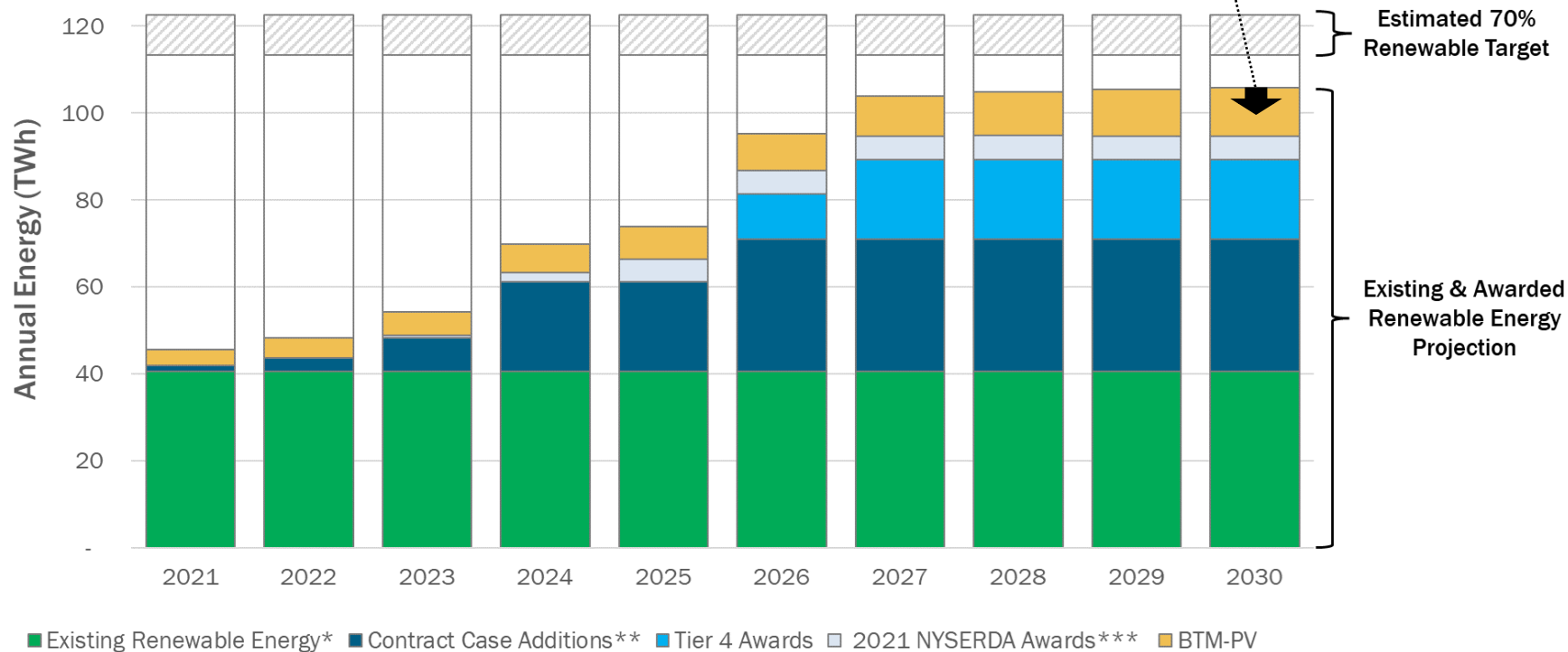
Key Finding 6:

- ✓ **Transmission limitations prevent full delivery of renewable energy.**

A minimum of 5 TWh of renewable energy in 2030 and 10 TWh in 2035 is projected to be curtailed due to transmission limitations in renewable pockets. This equates to roughly 5% less renewable energy that can be counted toward the CLCPA targets.

Progress Towards “70x30” Mandate

Estimated 5 TWh Reduction Due to Curtailment by 2030



Key Finding 7:

- ✓ **Transmission expansion is critical to facilitating efficient CLCPA energy target achievement.**

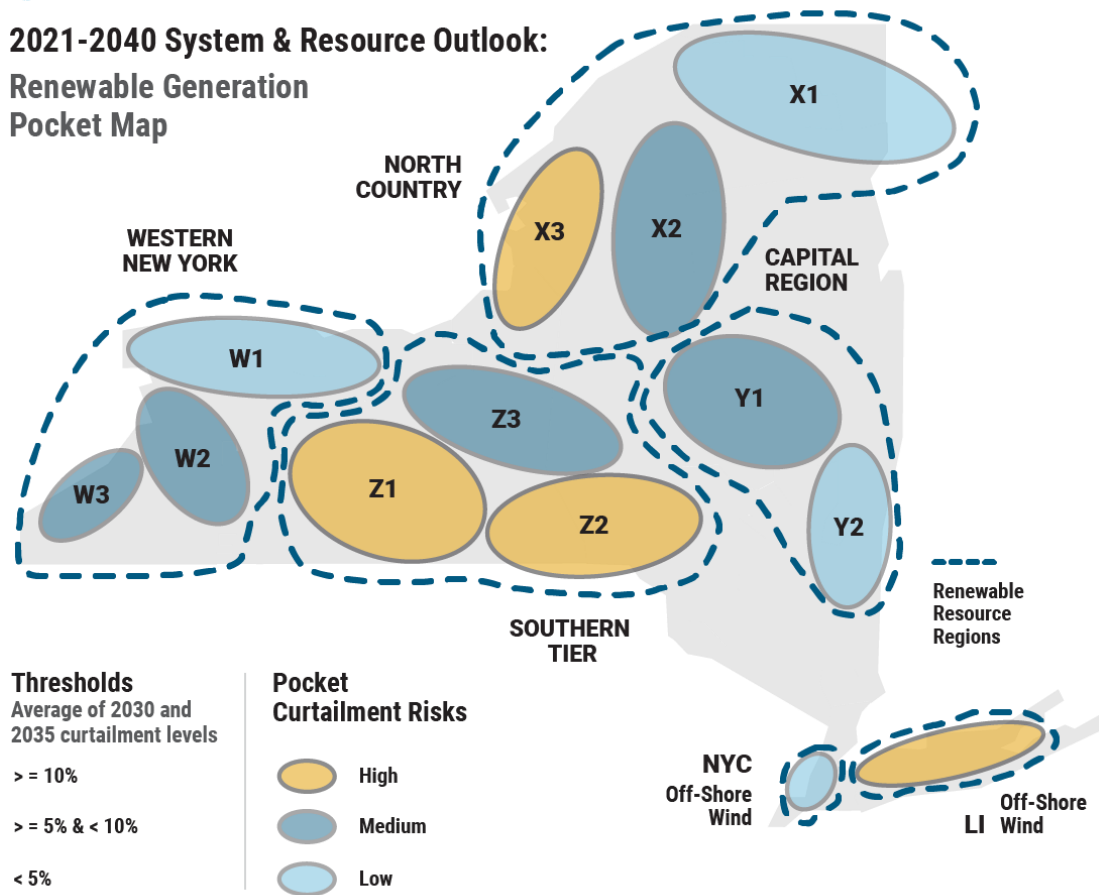
The current New York transmission system, at both local and bulk levels, is inadequate to achieve currently required policy objectives. Some renewable generation pockets throughout the State already face curtailments, more curtailments will be experienced in the future and will become more constrained as an increasing number of intermittent generation resources interconnect.

Key Finding 8:

- ✓ **Four pockets will particularly benefit from transmission expansion.**

The Finger Lakes (Z1), Southern Tier (Z2), Watertown (X3), and Long Island. Without investment in transmission, these areas of the New York grid will experience persistent and significant limitations to deliver the renewable power from these pockets to consumers in the upcoming years.

2021-2040 System & Resource Outlook: Renewable Generation Pocket Map



Questions, Feedback, Comments?

Email additional feedback to:
JFrasier@nyiso.com

2021-2040 Outlook Data Catalog

ESPWG/TPAS Presentations

May 20, 2021

Model Benchmark Results

September 22, 2021

System & Resource Outlook Update

October 25, 2021

Capacity Expansion Model Primer

System & Resource Outlook Update

November 19, 2021

System & Resource Outlook Update

December 19, 2021

System & Resource Outlook Update

January 25, 2022

System & Resource Outlook Update

February 9, 2022

System & Resource Outlook Update

Base & Contract Case Results

February 25, 2022

System & Resource Outlook Update

March 8, 2022

System & Resource Outlook Update

March 24, 2022

System & Resource Outlook Update

Contract Case Congestion Analysis

April 1, 2022

System & Resource Outlook Update

April 26, 2022

System & Resource Outlook Update

May 23, 2022

System & Resource Outlook Update

June 2, 2022

System & Resource Outlook Update

June 8, 2022

System & Resource Outlook Update

Updated 6/2 Presentation

June 21, 2022

System & Resource Outlook Update

August 8, 2022

System & Resource Outlook Update

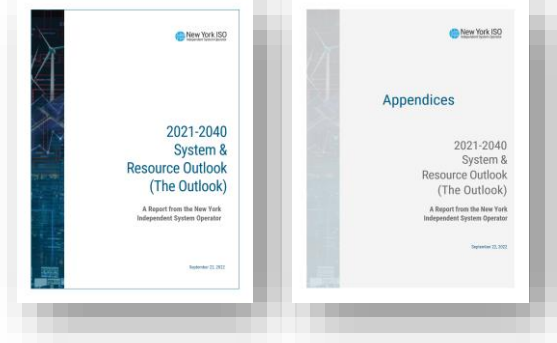
August 17, 2022 (BIC)

System & Resource Outlook Update

August 31, 2022 (MC)

System & Resource Outlook Update

Reports



Data Posted to ESPWG

Assumptions Matrix v1

Capacity Expansion Assumptions Matrix v1

Contract Case Renewable Projects

Emissions Price Forecast

Fuel Price Forecast

Capacity Expansion Assumptions Matrix v2 (Redline)

Capacity Expansion Assumptions Matrix v3 (Redline)

Production Cost Assumptions Matrix v2 (Redline)

Capacity Expansion Assumptions Matrix v4 (Redline)

Capacity Expansion Assumptions Matrix v5 (Redline)

Policy Case Hourly Load Forecasts

Policy Case Zonal Capacity Expansion Preliminary Results

Capacity Expansion Assumptions Matrix v6 (Redline)

Capacity Expansion Assumptions Matrix v7 (Redline)

S1 & S2 New Generator Additions

Hourly Load Forecasts

Capacity Expansion Assumptions Matrix – Final

Production Cost Assumptions Matrix – Final

Detailed Model Output Data File

DRAFT REPORTS

6/7 – Draft Report Chapter 1

6/16 – Draft Report Chapters 1-4

6/21 – Draft ES + Chapters 1-5

7/14 – Draft Report

7/14 – Draft Appendix

7/26 – Draft Appendix

8/8 – Draft Report

8/8 – Draft Appendix

8/17 – Draft Report

8/17 – Draft Appendix

8/31 – Draft Report

8/31 – Draft Appendix

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