New York State Energy Plan

New York State Transmission and Distribution Systems Reliability Study and Report

NEW YORK STATE ENERGY PLANNING BOARD | July 2025

Contents

Figures

Tables

Acknowledgements

This study was compiled with assistance from Energy and Environmental Economics, Inc. (E3) and GE Vernova, Inc. (GE) with input from staff at the New York State Independent System Operator, the New York State Reliability Council, the New York State Department of Public Service, the New York Department of State Utility Intervention Unit, the New York State Energy Research and Development Authority, the New York Power Authority, the Long Island Power Authority, the New York State Department of Environmental Conservation, National Grid, New York State Electric & Gas Corporation / Rochester Gas and Electric Corporation, Central Hudson Gas & Electric Corporation, and Con Edison Company of New York, Inc. / Orange and Rockland Utilities, Inc.

Acronyms

AC	Alternating Current
ACE	Affordable Clean Energy
ACP	Alternative Compliance Payments
ALR	Adequate Level of Reliability
AMI	Advanced Metering Initiatives
ARRA	American Recovery and Reinvestment Act
ASU	Automatic Sectionalizing Unit
ATR	Area Transmission Review
BART	Best Available Retrofit Technology
BE	Beneficial Electrification
BES	Bulk Electric System
BPS	Bulk Power System
BPTF	Bulk Power Transmission Facilities
BTA	Best Technology Available
BTU	British Thermal Unit
CAIDI	Customer Average-Interruption Duration Index
CAIR	Clean-Air Interstate Rule
CARIS	Congestion Assessment and Resource Integration Study
CATR	Comprehensive Area Transmission Review
CC	Combined Cycle
CEF	Clean Energy Fund
CES	Clean Energy Standard
CHP	Combined Heat and Power
Climate Act	Climate Leadership and Community Protection Act
CMEP	Compliance Monitoring and Enforcement Program
CPP	Clean Power Plan
CRIS	Capacity Resource Interconnection Service
CRP	Comprehensive Reliability Plan
CSAPR	Cross-State Air Pollution Rule
CSP	Curtailment Service Providers
CSPP	Comprehensive System Planning Process
CSRP	Commercial System Relief Program
DADRP	Day Ahead Demand Response Program

DCE	DER Coordination Entity
DCEA	DER Coordination Entity Aggregator
DCS	Dynamic Control Systems
DER	Distributed Energy Resource
DG	Distributed Generation
DLC	Direct Load Control
DLM	Dynamic Load Management
DLRP	Distribution Load Relief Program
DOE	U.S. Department of Energy
DPS	New York State Department of Public Service
DR	Demand Response
DSIP	Distribution System Implementation Program
DSM	Demand-Side Management
DSP	Distribution System Platform
DSPP	Distribution System Platform Provider
DSWG	Defensive Strategies Working Group
EDRP	Emergency Demand Response Program
EE	Energy Efficiency
EEPS	Energy Efficiency Portfolio Standard
EGU	Electric Generation Unit
EIA	U.S. Department of Energy, Energy Information Administration
EIPC	Eastern Interconnection Planning Collaborative
ELR	Energy Limited Resource
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act of 2005
ERAG	Eastern Interconnection Reliability Assessment Group
ERO	Electric Reliability Organization
ESPWG	Electric System Planning Working Group
ESR	Energy Storage Resource
EV	Electric Vehicle
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas
GMD	Geomagnetic Disturbances
GW	Gigawatt
GWh	Gigawatt Hour
HVDC	High Voltage direct current
ICAP	Installed Capacity
ICS	New York State Reliability Council Installed Capacity Subcommittee
IEEE	Institute of Electrical and Electronics Engineers
IESO	Independent Electric System Operator
IFRO	Interconnection Frequency Response Obligation
IOU	Investor-Owned Utility
IP	Indian Point
IPPTF	Integrating Public Policy Task Force
IPSAC	Inter-Area Planning Stakeholder Advisory Committee
IRI	Integrated Reliability Index
IRM	Installed Reserve Margin

ISO	Independent System Operator
ISO-NE	New England Independent System Operator
JIPC	Joint ISO/RTO Planning Committee
JOA	Join Operating Agreement
kV	Kilovolt
LBMP	Locational-Based Marginal Pricing
LCR	Locational Minimum Installed Capacity requirements
LFG	Landfill Gas
LIPA	Long Island Power Authority
LOEE	Loss of Energy Expectation
LOGMOB	Loss-of-Gas Minimum Oil-Burn Rule
LOLE	Loss of Load Expectation
LTP	Local Transmission Plan
LTPP	Local Transmission Planning Process
M2M	Market-to-Market
MACT	Maximum Achievable Control Technology
MATS	Mercury and Air Toxics Standards
MIWG	Market Issues Working Group
MMBtu/h	Million British Thermal Units per Hour
MMU	Market Monitoring Unit
MSW	Municipal Solid Waste
MW	Megawatt
MWh	Megawatt Hour
NAAQS	National Ambient Air-Quality Standards
NAESB	North American Energy Standards Board
NBSO	New Brunswick System Operator
NCEP	National Council on Electricity Policy
NCSP	Northeast Coordinated System Plan
NEPOOL	New England Power Pool
NERC	North American Electric Reliability Council
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOx	Nitrogen Oxides
NPCC	Northeast Power Coordinating Council
NRC	Nuclear Regulatory Commission
NRDC	Natural Resources Defense Council
NREL	National Renewable Energy Laboratories
NSPS	New Source Performance Standards
NYCA	New York Control Area
NYCEDC	New York City Economic Development Corporation
NYCRR	New York Codes Rules and Regulations
NYISO	New York Independent System Operator
NYPA	New York Power Authority
NYPP	New York Power Pool
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric and Gas
NYSERDA	New York State Energy Research and Development Authority
NYSRC	New York State Reliability Council
NWA	Non-Wires Alternatives

O&R	Orange and Rockland Utilities, Inc.
OATT	Open-Access Transmission Tariff
OBF	Operational Base Flow
OREC	Offshore Wind Renewable Energy Credit
OSTF	Operating Studies task Force
PAR	Phase Angle Regulator
PBR	Performance-Based Rate
PCC	Point of Common Coupling
PEV	Plug-in Electric Vehicle
PJM	Pennsylvania-New Jersey-Maryland Interconnection
PMU	Phasor Measurement Unit
PPTN	Public Policy Transmission Need
PPTPP	Public Policy Transmission Planning Process
PRLWG	Price-Responsive Load Working Group
PSC	New York State Public Service Commission
PTID	Point Identifier
PV	Photovoltaic
RACT	Reasonably Available Control Technology
RCA	Reliability Compliance and Assessment Group
RCMS	Reliability Compliance Monitoring Subcommittee
RE	Reliability Entity
REC	Renewable Energy Credit
RES	Renewable Energy Standard
REV	Reforming the Energy Vision
RFC	Reliability First Corporation
RG&E	Rochester Gas & Electric
RGGI	Regional Greenhouse Gas Initiative
RICE	Reciprocating Internal Combustion Engine
RIP	Responsible Interface Parties
RMR	Reliability Must Run
RNA	Reliability Needs Assessment
RPM	Reliability Performance Mechanisms
RPS	Renewable Portfolio Standard
RTO	Regional Transmission Operator
SA	Situational Awareness
SAIFI	System Average-Interruption Frequency Index
SBC	System Benefits Charge
SCADA	Supervisory Control and Data Acquisition
SCR	Special Case Resource
SeRN	SERC East-RFC-NPCC
SENY	Southeast New York
SEPB	State Energy Planning Board
SERC	Southeastern Reliability Council
SIS	System Impact Study
SO2	Sulfur Dioxide
SOAS	System Operations Advisory Subcommittee
SOL	System Operating Limit
SOM	State of the Market

SOR	State of Reliability
SPDES	State Pollution Discharge Elimination System
SRIS	System Reliability Impact Study
SPS	Special Protection Systems
STARS	Strategic Transmission and Reliability Study
TADS	Transmission Availability Data System
TCC	Transmission Congestion Contracts
TDRP	Targeted Demand Response Program
TIP	Transmission Interconnection Procedures
TO	Transmission Owner
TOP	Transmission Operator
TPL	Transmission Planning
TTC	Total Transfer Capability
TWh	Terawatt hour
UPNY	Upstate New York
VDER	Value of Distributed Energy Resource
VER	Variable Energy Resource
WECC	Western Electric Coordination Council
ZEC	Zero-Emissions Credit

A. Introduction

This report provides a comprehensive overview of the systems, regulatory frameworks, and policy contexts that shape electric grid reliability in New York State. The electric grid consists of two core infrastructure components – **transmission** and **distribution** – which work in tandem to deliver power from generating sources to consumers. **Reliability**, in this context, refers to the ability of these systems to provide consistent and uninterrupted electricity, even in the face of operational disturbances, infrastructure constraints, or evolving external pressures. Each chapter of this report explores a distinct element of the electric grid, outlining the structures, practices, and oversight mechanisms in place to uphold reliability.

The first chapter, *Transmission System Reliability*, introduces the foundational concept of reliability as applied to the high-voltage transmission system. It outlines the historical evolution of transmission oversight in the U.S., explains key reliability metrics – resource adequacy and operating security – and describes the regulatory landscape and operational procedures that grid planners and operators use to maintain a secure and dependable transmission network.

The second chapter, *Transmission System Planning*, details how New York forecasts and prepares for future transmission needs through formal planning processes. It explains the distinction between reliability and economic planning, describes key planning processes (including the Comprehensive System Planning Process), and outlines the mechanisms for review and oversight at both state and regional levels. It also discusses how planning is coordinated across transmission system boundaries through regional and interregional planning efforts.

The third chapter, *Distribution System Reliability*, shifts focus to the lower-voltage distribution system that delivers power from the transmission system directly to end users. It reviews the structure of distribution utility operations in New York, the reliability performance standards enforced by the Department of Public Service, and the strategies utilities are using to adapt their systems to new reliability risks, including those posed by climate change.

The fourth chapter, *Investment and Expenditure Issues*, examines how utility spending decisions – both in capital projects and operations and maintenance – impact reliability. It explains how utilities develop plans, like the Distributed System Implementation Plans and long-term capital investment plans, to align spending with system needs while balancing cost impacts on consumers. This chapter also reviews how spending is monitored and regulated over time.

The fifth chapter, *Environmental Regulations*, outlines the layers of environmental oversight that affect electricity generation and indirectly shape transmission and distribution system reliability. It describes relevant federal, state, and local regulations and how they influence the siting, emissions, and operations of generation resources.

The sixth chapter, *Energy Policy Initiatives*, explores how federal, regional, and state-level energy policies influence grid structure, investment, and operations. These policies increasingly intersect with grid planning and reliability as New York pursues decarbonization goals and adapts to changing patterns of electricity demand and supply.

The seventh and concluding chapter, *Future Transmission and Distribution Reliability Issues and Next Steps*, draws from current trends and policies outlined in the report to summarize emerging challenges facing grid planners, operators, and regulators. This chapter highlights the key issues that decision-makers in New York are facing and will continue to address to maintain system reliability while pursuing long-term environmental and economic goals.

Taken together, this report provides a technical review of the systems, structures, and oversight processes that govern electric grid reliability in New York. In doing so, the report also identifies the critical future challenges that will shape how reliability is maintained in an increasingly complex and dynamic energy landscape.

This document examines the processes, policies, and regulations affecting the reliability of New York's transmission and distribution systems, incorporating developments up to February 28, 2025.

This document is primarily intended to summarize existing processes and procedures, and synthesizes a large number of reports, planning manuals, and other documents. The relevant source that information is drawn from in specific sections and sub-sections is generally included in a footnote the first time it is referenced; to the extent that the rest of the paragraph or section draws from the same source, the citation is not repeated for ease of readability.

B. Transmission System Reliability

Transmission system reliability is a critical component in maintaining the overall reliability and performance of the electricity grid. Reliability, within the context of the bulk electric grid, describes the grid's ability to consistently and dependably deliver electricity to consumers exactly when, where, and at the quality level required. This chapter provides an overview of the efforts of grid operators and planners to maintain reliability.

The first section describes the *history* of transmission reliability efforts in the United States, tracing its development from early days of generation and distribution through the current restructured market system. This history is critical to understanding how the major actors developed into their current roles and responsibilities.

The second section *defines* transmission system reliability through two key metrics: first, resource adequacy, or having sufficient resources to provide customers with a continuous supply of electricity at the proper voltage and frequency virtually all of the time; and second, operating security, or the bulk power system's ability to withstand sudden, unexpected disturbances, such as short circuits, natural causes, and intentional human security threats. [1] Grid operators and planners work to balance these two goals to ensure system reliability.

The third and fourth sections outline the major actors involved in the *regulatory and oversight framework* tasked with enforcing *reliability standards and criteria.* Reliability is subject to multiple regulatory bodies and different government echelons with different levels of authority and oversight.

The final section describes the *transmission system operations* processes undertaken to execute these requirements. The multi-layered nature of these operations, from real-time response to day-ahead plans to multi-month planning, seeks to meet the needs of consumers within the guidelines established by the major oversight bodies.

[1] NERC, March 2023 NERC Frequently Asked Questions: https://www.nerc.com/news/Documents/March%202023%20NERC%20Frequently%20Asked%20Questions%20FAQ.pdf

B.1. History

Reliability standards and criteria used for planning and operations have been an integral part of the electric power industry since the first systems were developed in the late 19th century. Standards and criteria were codified and became increasingly important as power systems expanded and merged to form what we now know as synchronous interconnections or "grids." Early "central station" systems were relatively simple. A major disturbance or "contingency" could, at worst, shut down electric service in a small area; in the case of Thomas Edison's early direct current systems, approximately one square mile. The introduction of high-voltage alternating-current technology permitted the use of long lines at higher voltages and shared generator dispatch across a larger footprint, which reduces the associated risk of a single generator outage or comparable reliability event. This led to power systems that span significantly larger areas.

This process took place through most of the 20th century and eventually power systems in most of the U.S. and Canada consolidated into four large synchronous interconnections. The largest of the interconnections, known as the Eastern Interconnection ("EI"), stretches from the Eastern Seaboard to the Rockies, and from the Canadian Maritime Provinces to Florida. With systems this large, reliability became a major concern, in turn making operational coordination a critical requirement. Both operational coordination and maintaining an acceptable level of reliability require effective and consistent reliability standards.

During the first half of the 20th century, each individual power system developed and applied its own reliability criteria. With the dramatic growth of synchronous interconnections and the increasing use of the system to transmit power over long distances, the limitations of such an approach became obvious. When the Northeast Blackout of 1965 occurred, it became clear that a more coordinated approach was necessary.

By 1965, the Pennsylvania-Jersey-Maryland ("PJM") system covering the mid-Atlantic states was already functioning with a uniform set of reliability criteria. The northeast systems involved in the 1965 blackout soon followed suit, forming the Northeast Power Coordinating Council ("NPCC") covering the northeastern United States and eastern Canada shortly after the blackout. The U.S. portion of NPCC formed two new power pools to establish a coordinated generation dispatch among investor-owned utilities within each respective pool. These constituent areas of NPCC became the New York Power Pool, which evolved into the NYISO, and the New England Power Pool, which eventually led to the creation of ISO-NE.

The regional reliability councils also formed the North American Electric Reliability Corporation (NERC) in 1968 to coordinate activities nationally and develop overall reliability guidelines for their collective systems.

B.1.1. Impact of Electric Industry Restructuring

Restructuring of the electric industry in the 1990s effectively separated ownership of generating resources from transmission in New York. In much of the country, electric power supply resources are now provided through wholesale competitive markets rather than through vertically integrated utility monopolies. The parts of the country where single-system planning and operating power pools already existed, include the New York Power Pool, the New England Power Pool, and PJM, adjusted more readily than other parts of the country. These organizations were able to transition to Independent System Operators (ISOs) and Regional Transmission Operators (RTOs) with little change in reliability protocols. Further, the Energy Policy Act of 2005 (EPAct) established new procedures for drafting nation-wide reliability standards and measuring compliance in restructured markets.

The NYISO and NPCC each have a long history of developing reliability criteria, monitoring compliance, and adapting to the new mandatory enforceable reliability standard environment. Moreover, because of their control-area-wide operational and planning responsibilities and independence from any financial interest in generation or transmission facilities, as well as increased efforts at interregional coordination reduction of "seams" and enhancements in technology, the reliability of day-to-day system operations and planning efforts in these regions exceeds what was given in the past.

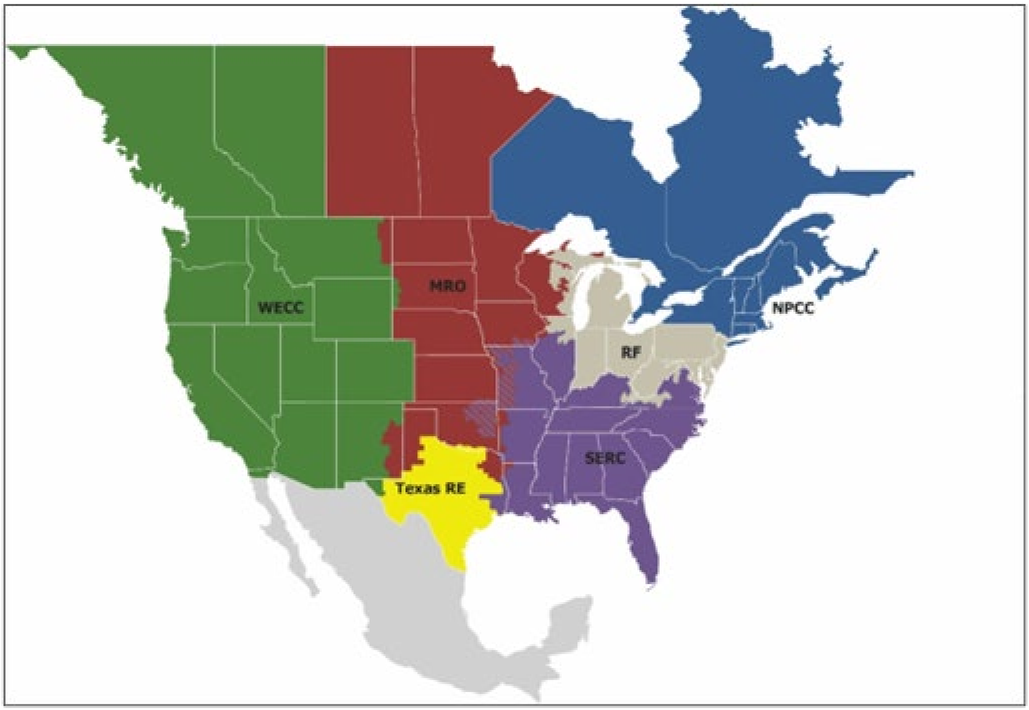
In 1999, as part of FERC's approved restructuring of the wholesale electric industry in New York State, and in recognition of unique characteristics and reliability considerations of the electric grid in New York State, the New York State Reliability Council (NYSRC) was created and separated from the market governance structure to develop, maintain and enforce reliability rules and criteria uniquely required to maintain bulk electric system reliability in New York. This delineation from the market was developed to ensure that reliability was not compromised by market interests.[2] Additionally, the New York Public Service Commission has a process for adopting the NYSRC Reliability Rules as state regulations.

On August 14, 2003, the blackout of the Midwest and Northeast United States and Ontario, Canada resulted in major industry changes codified in the EPAct, passed by the U.S. Congress. The EPAct amended the Federal Power Act (FPA) to include a new Section 215 which provides for an independent Electric Reliability Organization (ERO), certified by FERC to develop and enforce mandatory reliability standards for reliable operation of the nation's bulk power system. NERC restructured as the North American Electric Reliability Corporation and was designated by FERC as the ERO to be responsible for the development and enforcement of mandatory reliability standards.

In 2007, FERC approved agreements by which NERC delegates its authority to monitor and enforce compliance to seven Regional Entities. The Regional Entity for the northeastern United States and Canada is the NPCC. The members of the Regional Entities are a broad representation of the electricity industry: investor-owned utilities; federal power agencies; rural electric cooperatives; state, municipal, and provincial utilities; independent power producers; power marketers; and end-use customers. These entities account for virtually all the electricity supplied in the United States, Canada, and the northern portion of Baja California, Mexico. Figure B-1 illustrates the Regional Entities in the lower 48 states, Canada, and a portion of northern Baja California, Mexico.

[2] NYISO, NYSRC Agreement: https://www.nysrc.org/wp-content/uploads/2023/03/1999-NYSRC-NYISO-Agreement-signed.pdf

Figure B-1: NERC Regional Entities



Source: NERC, 2024[3]

B.1.2. Aging of Transmission Lines

As part of the 2012 New York State Transmission Assessment and Reliability Study (STARS) Phase II Study Report, the report collaborators convened a Condition Assessment Working Group to determine the long-term needs of the grid related to aging transmission infrastructure.[4] The Group concluded that over the following 30 years, over 40% of New York's transmission infrastructure over 115 kV would need replacing, constituting an estimated $25 billion of capital investment. Not replacing over-aged lines makes them more susceptible to failure (unplanned outages) and requires more outage times for maintenance (planned outages), increasing reliability risks.

In 2021, NYSERDA and the DPS released an Initial Report on the New York Power Grid Study.[5] The report emphasizes proactive planning to synergistically address aging grid infrastructure considerations while simultaneously integrating the land-based renewable resources needed to advance the Climate Act's 2030 targets. For example, the Segment A & B AC transmission projects (selected in 2019) were identified to increase transfer capability from Central NY to Southeast NY, replace aging 115 kV and 230 kV lines with modern 345 kV line, and reduce congestion.

[3] "NERC, NERC Regions Map: https://www.nerc.com/AboutNERC/keyplayers/PublishingImages/Regions%20Map.jpg

[4] STARS Technical Working Group, New York State Transmission Assessment and Reliability Study Phase II Study Report: https://www.nyiso.com/documents/20142/1398242/Phase_1_Final_Report_1_13_2010.pdf/9b1b6673-1be9-f7f9-6baa-cd3e1918347b

[5] New York State Public Service Commission, Initial Report on the New York Power Grid Study: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/NY-Power-Grid/full-report-NY-power-grid.pdf

B.2. Definitions

The following subsection defines several key terms and concepts relevant to the ways reliability is measured and enforced in the transmission system.

B.2.1. Bulk Electric System (BES) Definition

NERC standards are applicable to the "Bulk Electric System." FERC has argued for applicability of NERC standards to all transmission facilities 100 kV and higher, unless facilities are granted exemptions. Some of the regions, notably NPCC and the Western Electric Coordinating Council (WECC), have argued that a "one size fits all" approach will not improve reliability. The existing BES definition generally applies to facilities rated at 100 kV or higher but can include some lower voltage facilities that may impact the overall BES.

By NERC's definition, the BES constitutes all facilities 100 kV and above subject to inclusions and exclusions that do not receive exemptions.[6] NPCC as a NERC Regional Entity uses a functional definition model to identify what entity is required to comply with a particular NERC Standard. Currently, NYISO is registered as the sole Balancing Authority, Reliability Coordinator, and Planning Coordinator for New York State, which is not expected to change. NYISO is also registered as a Transmission Operator (TOP) for certain identified higher voltage facilities over which the New York Transmission Owners have granted the NYISO authority. NYISO has also registered as a Transmission Planner for certain Bulk Power Transmission Facilities as listed in relevant agreements. The New York Transmission Owners are responsible for all other NERC BES facilities in New York State that the NYISO has not otherwise been identified as the registered NERC Transmission Operator or Transmission Planner.

B.2.2. Assessing Bulk Electric System Reliability

For the purposes of this report, BES reliability can be broadly categorized into two categories used by NERC: resource adequacy and transmission security.[7]

Resource adequacy is a measure of the ability of a portfolio of resources to meet load across a wide range of expected system conditions, accounting for variability of supply and demand and outage risks. Transmission security reflects the ability of the system to "withstand sudden, unexpected disturbances" and reliably deliver power to customers.

---

[6] For a detailed definition of the BES with Inclusions and Exclusions, please see the NERC Definition of the BES. NERC, BES Definition Approved by FERC 3-20-14:
https://www.nerc.com/pa/RAPA/BES%20DL/BES%20Definition%20Approved%20by%20FERC%203-20-14.pdf

[7] NERC, Frequently Asked Questions:
https://www.nerc.com/news/Documents/March%202023%20NERC%20Frequently%20Asked%20Questions%20FAQ.pdf

B.2.2.1. Resource Adequacy

As reflected by the various metric processes described in this section, resource adequacy is assessed on a probabilistic basis. Resource adequacy modeling is performed using loss-of-load probability models, which assign probabilities to supply resource availability and expected demand based on historical weather conditions and other factors. Using these probabilities, resource adequacy models simulate total resource availability and demand across all hours of the year and under multiple sets of weather conditions to identify the frequency at which resources are insufficient to meet demand. The New York Control Area, like many regions in North America, uses a resource adequacy planning standard of a loss-of-load expectation (LOLE) of 0.1 day/year; i.e. the system is planned such that a loss of load event due to insufficient supply resources should occur at most one day in every ten years.

B.2.2.2. Transmission Security

Transmission system security is examined on a deterministic basis. Transmission security modeling is performed using various models such as power flow, dynamics, and short circuit models, which contain a detailed representation of electricity flows across the entire transmission network and capture the physics of the transmission system. Because of their computational complexity, these models are typically run for "snapshot" periods to test that reliability is maintained under credible combinations of system conditions (NPCC and NYSRC rules). The reliability of the system is then further tested under a range of contingencies to ensure that the system is capable of "withstand[ing] sudden, unexpected disturbances" as defined by NERC, NPCC, and the NYSRC with more detail on how those contingencies are defined and tested is provided in the NERC Reliability Standards, NPCC Criteria section.

The means and metrics for assessing the reliability of the bulk transmission system, which conveys power across and between large control-areas for wholesale delivery, are necessarily different from those applicable to the distribution system in which LSEs (e.g., local utilities) distribute power to individual retail customers. The distribution system can readily quantify reliability in terms of frequency, duration, and percentages of individual customer outages through metrics such as SAIFI and CAIDI (discussed under Distribution System Reliability). Distribution system reliability is discussed in Chapter E.

The most visible measure of electric power system reliability, and arguably most meaningful to electric customers and public officials, is whether the system operator (NYISO) has had to curtail service or provide load relief measures to maintain stable system operation. Other than the events of the 2003 Northeast blackout, which was caused by a sudden severe power surge originating outside the New York Control Area, the NYISO, and before that, the New York Power Pool has not had to provide load relief measures at the bulk power system level to maintain reliability since 1996.

B.3. Regulatory / Oversight Framework

The following is a summary of the roles of the major entities involved in the regulation and oversight of transmission and the development of transmission reliability rules. A brief discussion of standards and criteria is provided as background and to facilitate a better understanding of the mechanisms that may be needed to mitigate potential impacts to reliability identified in various studies described later in this section.

B.3.1. FERC

The Federal Energy Regulatory Commission ("FERC", formerly the Federal Power Commission) is the independent federal agency that regulates sales for resale of electricity, gas[8], and oil in interstate commerce including the transmission of electricity and the maintenance and enhancement of the reliability of the bulk power system. Among other electric energy-related responsibilities, the EPAct gave FERC additional responsibilities in the areas of hydropower facility licensing[9] and interstate electric transmission siting and planning. Specific FERC responsibilities include:

- Regulation of the transmission and wholesale sales of electricity in interstate commerce;
- Adoption and enforcement of standards to protect the reliability of the high-voltage interstate transmission system (i.e., the Bulk Electric System) through mandatory reliability standards;
- Enforcement of regulatory requirements through imposition of civil penalties and other means;
- Review of certain mergers and acquisitions, property transfers and corporate transactions by electricity companies;
- Review of the siting application for electric transmission projects under limited circumstances; and
- Monitoring and investigation of energy markets.

FERC does **not** regulate local distribution facilities, retail electricity or natural gas sales to consumers, have the authority to order or approve the physical construction of electric generation facilities other than hydroelectric facilities, or regulate the retail service activities of the municipal power systems, or of federal power marketing agencies or most rural electric cooperatives.

B.3.2. NERC

The North American Electric Reliability Corporation ("NERC") is an international, independent, not-for-profit corporation with the responsibility to ensure the reliability of the North American Bulk Electric System through the establishment and enforcement of reliability standards.[10] NERC oversees eight regional reliability entities and encompasses all the interconnected power systems of the contiguous United States, Canada, and a portion of Baja California in Mexico. Within the U.S. boundary, NERC serves as the FERC-designated Electric Reliability Organization ("ERO"). ERO activities in Canada related to the reliability of the bulk-power system are recognized and overseen by the appropriate governmental authorities in that country.

NERC responsibilities include:

- Working with stakeholders and Reliability Entities ("REs") to develop and enforce standards;

---

[8] As part of the Natural Gas Act of 1938, the Federal Power Commission (FPC) was given control over regulation of interstate natural gas sales. The FPC was eventually dissolved and became part of FERC in 1977. Several policy act updates have since further characterized FERC's various roles and responsibilities.

[9] Hydropower facility licensing was a responsibility originally derived from the Federal Power Act of 1920 and updated/restated via the EPAct.

[10] NERC is governed by a 12-member Board of Trustees consisting of 11 independent directors and the CEO. The independent directors are appointed by the sector-based Member Representative Committee. NERC is funded by the Federal Governments of the U.S., Canada, and Mexico.

- Educating, training, and certifying industry personnel; and
- Investigating and analyzing the causes of significant power system disturbances.

Originally reporting to a board composed mostly of regional reliability council executives, during electric industry restructuring NERC evolved to governance by an independent board. New NERC standards may be proposed by REs or FERC and are ultimately approved by FERC.

NERC standards apply to the entire country, from areas that are vertically integrated with little interaction with neighboring control areas to other areas that have separated generation from transmission with a single grid operator overseeing the markets and generation dispatch. In all instances, the power system must be operated in a secure and reliable manner. Because of this hybrid structure, NERC developed categories to specify tasks required to maintain reliability rather than a generic title, as was the case prior to deregulation. These categories, or functional entities, are described in the Organization Registration and Certification Manual and the Compliance Registry Criteria in Appendices 5A and 5B, respectively, of FERC-approved NERC Rules of Procedure.[11] All organizations that are users, owners and operators of Bulk Electric System facilities must register with NERC as one or more of the functional entities.

In general, the NERC Bulk Electric System (BES) includes all Transmission Elements operated at 100 kV or higher, as well as Real Power and Reactive Power resources connected at 100 kV or higher. The BES does not include facilities used in the local distribution of electric energy.[12] NERC Reliability Standards define the reliability requirements for planning and operating the North American bulk power system. Standards are developed using a results-based approach that focuses on performance, risk management, and entity capabilities. The Reliability Functional Model defines the functions that need to be performed to ensure the BES operates reliably and is the foundation upon which the Reliability Standards are based.

B.3.3. NPCC

The Northeast Power Coordinating Council (NPCC)[13] encompasses a geographic region that includes the State of New York and the six New England states as well as the Canadian provinces of Ontario, Québec, New Brunswick, and Nova Scotia. NPCC's responsibilities include:

- Development of regional reliability standards and regional-specific criteria, compliance assessment, monitoring, and enforcement;
- Administration and enforcement of continent-wide and regional standards for the BES facility definition in coordination with NERC; and
- Coordination of system planning, design, operations, and reliability assessment among member planning areas, transmission owners, and others.

---

[11] The NERC Functional Model, which previously governed these tasks, was retired as of October 2019, and are no longer being actively maintained.

[12] For a detailed definition of the BES with Inclusions and Exclusions, please see the NERC Definition of the BES. NERC, BES Definition Approved by FERC 3-20-14: https://www.nerc.com/pa/RAPA/BES%20DL/BES%20Definition%20Approved%20by%20FERC%203-20-14.pdf

[13] NPCC Board of Directors consists of fourteen (14) Stakeholder Directors, two (2) Independent Directors, an independent Board Chair and the President and CEO. The sectors appoint their representatives while the Board selects the independent member. The estimated 2024 budget is approximately $21.65 million. NPCC, NPCC 2024 Business Plan and Budget: https://cdn.prod.website-files.com/666c8295c6dc4ff2358b572d/67047907da2efd193aa79505_npcc-2024-business-plan-and-budget-final.pdf

As a regional entity, NPCC operates under a delegation agreement with NERC. This agreement recognizes that NPCC qualifies for delegation by NERC of certain roles, responsibilities, and authorities as defined by Section 215 of the Federal Power Act and Canadian provincial regulatory agreements. As with other regional reliability councils, NPCC effectively functions both as the agent and administrative arm of NERC at the regional level, including:

- Administration of compliance processes
- Leading compliance audits and compliance functions
- Administration processes of NERC with respect to notices of alleged violations and proposed penalties or sanctions; and
- Conducting investigations, hearings, and negotiations for potential and alleged violations of reliability standards.

As previously mentioned, NPCC also establishes its own regional reliability criteria that are more specific or more stringent than NERC reliability standards. NPCC's regional reliability criteria applies only to a set of defined Bulk Power System ("BPS") facilities, which constitute the interconnected electrical system facilities within northeastern North America, on which faults or disturbances can have a significant adverse reliability impact outside of the local area. Under the NPCC impact standard, there are fewer BPS facilities that are subject to NPCC regional reliability criteria than there are NERC defined BES facilities subject to NERC Standards. Today, NPCC remains the regional reliability organization for New York State and, pursuant to EPAct, the international reliability standards developed by the ERO (NERC) do not pre-empt actions by regional or state reliability entities to ensure a higher-level safety, adequacy, or reliability, *provided that* they are consistent with NERC standards. Thus regional, state, or local reliability organizations may have their own more stringent or more specific reliability criteria, provided they are consistent with NERC standards at a minimum. NPCC criteria are more stringent or more specific than the national standards promulgated by NERC and endorsed by FERC.

B.3.4. NYSRC

Pursuant to Section 215 of the FPA, the State of New York may promulgate and enforce reliability standards that are more specific or more stringent than NERC standards or NPCC criteria as long as those standards do not degrade reliability outside of New York. The NYSRC's Reliability Rules set forth requirements that are more stringent or specific than either NERC standards or NPCC criteria and are adopted by the New York Public Service Commission (PSC).[14] FERC approved formation of the NYSRC as part of the comprehensive restructuring of the bulk power system and wholesale electricity market in New York State in 1999 to help maintain and enhance the reliability of the bulk electric grid in the State. The NYSRC is governed by a 13-member Executive Committee comprised of majority representation by transmission owners, as well as representatives of generators, large consumers, municipal power agencies, and unaffiliated individuals.[15]

The NYSRC's responsibilities include:

---

[14] For example, NPCC/NYSRC n-1-1 standard that prepares the system to withstand sequential outages is more stringent than NERC. Also, NERC does not have a federal resource adequacy standard, whereas NPCC/NYSRC apply a loss of load expectation of one in 10 years..

[15] Each transmission owner and sector appoints their representative to the Executive Committee and unaffiliated members are appointed by the Executive Committee of the Reliability Council.

- Development of bulk power system and local reliability rules that meet or are more stringent or specific than NPCC and NERC standards and criteria, and that are necessary to meet the special physical, geographic, and demographic system requirements of New York's bulk electric grid;
- Assessment of NYISO and NYISO market participant compliance with those reliability rules through independent compliance reviews; and
- Establishment of the annual statewide installed capacity requirement (*i.e.* the Installed Reserved Margin) for the New York Power System. The Installed Reserve Margin represents the amount of generation capacity that must be available to ensure an acceptable level of resources to maintain bulk power system reliability.

The NYSRC imposes on the NYISO the responsibility to meet all applicable NYSRC rules by developing tariffs, procedures, and manuals to effectuate these rules. The NYSRC's monitoring activities are performed by the Reliability Compliance Monitoring Subcommittee (RCMS). The data required from the NYISO are reviewed and considered by the RCMS as evidence of compliance with NYSRC rules.

The NYSRC also is responsible for the establishment of the annual statewide installed capacity requirement (i.e., Installed Reserved Margin) for the New York Power System. The IRM represents the amount of generation capacity that must be in place to ensure an acceptable level of resources to maintain bulk power system reliability.

B.3.5. NYISO

The New York Independent System Operator (NYISO) was formed as part of the restructuring of the wholesale electric markets in New York State. It was approved by FERC and commenced operation in 1999. The NYISO is an independent, not-for-profit entity, the responsibilities of which include:

- Operation and management of the State's bulk electric grid to maintain and enhance regional reliability;
- Administration of open and fair wholesale electric markets;
- Planning for the future of the bulk electric system;
- Serving as an authoritative source of information for policy makers, stakeholders, and investors; and
- Developing and implementing technology improvements on the bulk power system, including smart grid projects.

In the New York Control Area, the NYISO is currently registered with NERC in the following functional capacities: Balancing Authority; Planning Coordinator; Reliability Coordinator; Transmission Operator; and Transmission Planner. As such the NYISO has significant responsibility for overall bulk electric system planning and system operations, as well as for administration of the FERC jurisdictional markets for capacity, energy, and ancillary services.

B.3.6. Transmission Owners

Transmission Owners (TOs) are the public utilities, authorities, or merchant transmission providers that own transmission, distribution facilities, or both, and provide transmission services under FERC approved tariffs, registered with NERC, and state regulatory oversight. Transmission owners are responsible for the operation, assessment and planning of transmission and distribution on their own systems and for meeting the requirements of all NERC, NPCC, and NYSRC reliability standards and criteria they are responsible for.

B.3.7. New York State Public Service Commission (PSC)

The PSC regulates the State's electric, gas, steam, telecommunications, and water utilities, and is charged by law with responsibility for setting rates and ensuring the provision of safe and adequate service by the utilities it regulates. While the EPAct provided FERC the authority to establish a process for developing and approving national reliability standards for the bulk electric system, it also granted New York State the authority to establish rules that result in greater reliability within New York State, provided that such actions do not result in reduced reliability outside the State than that provided by FERC-approved standards. To clearly establish New York State's oversight role, the PSC, by order dated February 9, 2006, adopted in their entirety the reliability rules established by the NYSRC, and periodically adopts updates to those rules. Additionally, unlike FERC, the PSC has the authority to direct a New York Transmission Owner (TO) to develop a plan to mitigate any deficiency that could include construction of additional generating facilities or transmission infrastructure necessary to serve the public interest.

B.3.8. State Energy Planning Board (SEPB)

Article 6 of NYS Energy law calls for the development of a State Energy Plan by the SEPB that includes broad policy recommendations to guide the State in maintaining reliability while meeting its future energy needs. The State Energy Plan assesses current and future status of various energy systems (i.e., electric, natural gas, petroleum, coal), energy costs, and public health and environmental impacts.

B.4. NERC Reliability Standards, NPCC Criteria and NYS Reliability Rules

Ensuring the reliable delivery of bulk electricity from generators to distributors requires the transmission grid meet certain reliability standards and criteria. The following section defines these standards and criteria, outlines their development process, and describes their application to the New York transmission system.

B.4.1. Definition of Standards, Criteria, and Rules

The terms “standards” and “criteria” and “rules” as used in the context of electric reliability are often confused. Current electric industry use generally refers to reliability “standards” as the mandatory requirements developed and enforced by NERC (with FERC approval), and “criteria” as the requirements independently maintained and enforced by the regional Reliability Entities (e.g. NPCC) and that meet or exceed NERC standards. Furthermore, reliability “rules” are independently maintained by the NYSRC.

B.4.2. Development of Standards, Criteria, and Rules

National reliability standards are drafted through a NERC process that includes industry participation from the proposal through the approval stage.[16] All proposed standards must be approved by a super-majority of registered entities throughout the industry, including each of the various industry sectors. The next step is review and approval by the NERC Board. The final step is review and approval by FERC. Technically, FERC may propose and ultimately approve these standards, but may not unilaterally impose new standards or modifications to existing standards on its own. Given its review and approval powers, FERC is given considerable deference in this area.

NPCC criteria are developed through a similar procedure. Any person or entity materially affected by an existing criterion or with the need for new or revised criteria may initiate the process. After drafting and posting for comment, a final version must be approved by the NPCC Reliability Coordinating Committee and a weighted super-majority vote of the NPCC membership.

At the State level, a modification of an existing rule or a new reliability rule can be initiated by the NYSRC, NYISO, or NYISO Market Participants. All requests for a new or modified rule are reviewed by the NYSRC Reliability Rules Subcommittee. The subcommittee reviews, assesses, and, if determined to be appropriate, seeks Executive Committee approval to develop a draft rule. All draft rules are posted for comments, which are taken under consideration by the Reliability Rules Subcommittee; however, the Executive Committee has the authority to approve the final rule. The NYSRC also is an active participant in NERC and NPCC Reliability Standards Development Process.

The Reliability Rules Subcommittee reviews and comments on all new or revised NERC and NPCC Standards. It also drafts revisions of the NYSRC reliability rules as necessary to comply with NERC and NPCC standards.

TOs may establish local transmission planning criteria that go beyond NERC and NPCC requirements. These criteria typically address local system performance, voltage stability, and contingency planning to ensure an acceptable level of reliable service for customers within their service territories.

B.4.3. Application of Standards, Criteria, and Rules

Even before enactment of the EPAct, compliance with the regional council reliability criteria was mandatory for entities within the NPCC membership. While NPCC did not endorse or assign monetary penalties for non-compliance, NPCC criteria were given great weight with a compliance program that included the equivalent of peer review and reporting of violations to the NPCC Reliability Coordinating Committee.

Today, the NYISO, TOs, generating companies and other market participants are subject to the mandatory reliability standards established by NERC. NYISO carries many compliance obligations under NERC such as those listed in Table B-1.[17]

---

[16] These are international standards, since Canadian systems are involved, but this discussion focuses on the United States.

17 NYISO, 2024 RNA Figure 76: https://www.nyiso.com/documents/20142/48283847/2024-RNA-Appendices.pdf/87c9ea6c-89eb-bcc0-a705-0d5ca17dd7df

Table B-1: List of NERC Standards for Planning Coordinators and Transmission Planners

Standard name	**Title**	**Purpose**
FAC-002	Facility Interconnection Studies	To study the impact of interconnecting new or materially
FAC-014	Establish and Communicate System Operating Limits	To ensure that System Operating Limits (SOLs) used in the reliable operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies and that Planning Assessment performance criteria is coordinated with these methodologies.
IRO-017	Outage Coordination	To ensure that outages are properly coordinated in the Operations Planning time horizon and Near-Term Transmission Planning Horizon.
MOD-026	Verification of Models and Data for Generator Excitation Control System or Plant Volt/VAR Control Functions	To verify that the generator excitation control system or plant volt/var control function model (including the power system stabilizer model and the impedance compensator model) and the model parameters used in dynamic simulations accurately represent the generator excitation control system or plant volt/var control function behavior when assessing Bulk Electric System (BES) reliability

MOD-027	Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions	To verify that the turbine/governor and load control or active power/frequency control model and the model parameters, used in dynamic simulations that assess Bulk Electric System (BES) reliability, accurately represent generator unit real power response to system frequency variations.
MOD-031	Demand and Energy Data	To provide authority for applicable entities to collect Data, energy and related data to support reliability studies and assessments to enumerate the responsibilities and obligations of requestors and respondents of that data.
MOD-032	Data for Power System Modeling and Analysis	To establish consistent modeling data requirements and reporting procedures for development of planning horizon cases necessary to support analysis of the reliability of the interconnected transmission system.
MOD-033	Steady State and Dynamic System Model Validation	To establish consistent validation requirements to facilitate the collection of accurate data and building of planning models to analyze the reliability of the interconnected transmission system.
PRC-002	Disturbance Monitoring and Reporting Requirements	To have adequate data available to facilitate analysis of Bulk Electric System (BES) Disturbances

PRC-006	Automatic Underfrequency Load Shedding	To establish design and documentation requirements for automatic underfrequency load shedding (UFLS) programs to arrest declining frequency, assist recovery of frequency following underfrequency events and provide last resort system preservation measures.
PRC-006- NPCC	Automatic Underfrequency Load Shedding	The NPCC Automatic Underfrequency Load Shedding (UFLS) regional Reliability Standard establishes more stringent and specific NPCC UFLS program requirements than the NERC continent-wide PRC-006 standard. The program is designed such that declining frequency is arrested and recovered in accordance with established NPCC performance requirements stipulated in this document.
PRC-010	Undervoltage Load Shedding	To establish an integrated and coordinated approach to the design, evaluation, and reliable operation of Undervoltage Load Shedding Programs (UVLS Programs).
PRC-012	Remedial Action Schemes	To ensure that Remedial Action Schemes (RAS) do not introduce unintentional or unacceptable reliability risks to the Bulk Electric System (BES).

PRC-023	Transmission Relay Loadability	Protective relay settings shall not limit transmission loadability; not interfere with system operators' ability to take remedial action to protect system reliability and be set to reliably detect all fault conditions and protect the electrical network from these faults.
PRC-026	Relay Performance During Stable Power Swings	To ensure that load-responsible protective relays are expected to not trip in response to stable power swings during non-Fault conditions.
TPL-001	Transmission System Planning Performance Requirements	Establish Transmission system planning performance requirements within the planning horizon to develop a Bulk Electric System (BES) that will operate reliably over a broad spectrum of System. conditions and following a wide range of probable Contingencies
TPL-007	Transmission System Planned Performance for Geomagnetic Disturbance Events	stablish requirements for Transmission system planned performance during geomagnetic disturbance (GMD) events.

Additionally, the NYISO, TOs, generating companies and other industry participants are subject to the NPCC Criteria and the NYSRC Reliability Rules. TOs each have supplemental transmission planning reliability criteria applicable to their transmission districts as well. NYISO and the TOs also adhere to various NYISO documents (procedures, guidelines, etc.) that define or strongly relate to practices for system operations and assessment of the transmission system for planning purposes. Planning criteria, documents, procedures, and guidelines pertaining to the design of the New York Transmission System are filed annually with FERC as part of the NYISO Annual Transmission Planning & Evaluation Report filed as FERC Form 715.

B.4.4. FERC ISO/RTO Common Metrics Reports

In 2008, based on recommendations of the U.S. Senate Committee on Homeland Security and the Government Accountability Office, FERC undertook an effort to standardize and update measures to track the performance of ISO/RTO operations and markets and to report the performance results to Congress and the public.[18]

The performance metrics developed through that process now form the basis for an ISO/RTO Metrics Report, filed with FERC for the first time in 2010. The reports establish and examine metrics with respect to three broad areas: Reliability, Markets, and Organizational Effectiveness. With respect specifically to Reliability, the metrics established by FERC require information to be provided on:

- NERC Reliability Standards Compliance;
- Load forecast accuracy;
- Long-term supply resource and transmission planning; and
- Transmission outage coordination.

Following the 2011 Report, FERC developed performance metrics for non-RTO regions and developing common metrics for both ISOs/RTOs and non-RTO regions that would allow for comparisons across all electric regions and markets, and further evaluation of the performance results in future years. The first Common Metrics Report released in 2014 identified 30 metrics that have a common definition to ISOs, RTOs, and utilities outside of ISO and RTO markets as suitable for performance evaluation. The 2014 report, however, did not evaluate performance of ISOs, RTOs, and utilities against those metrics.

The most recent Common Metrics Report released in January 2024 was a review of the performance metrics for ISOs, RTOs, and utilities over the 2019 through 2022 period, collected through FERC-922, "Performance Metrics for ISOs, RTOs and Regions Outside ISOs and RTOs" (OMB Control No. 1902-0262). Highlights from this report include:

- RTOs and ISOs managed the dispatch of energy from a diverse set of generating fuel-types from 2019-2022. Most RTOs and ISOs report managing an increasing share of energy from renewable generation and fluctuations in the relative amounts of energy provided by natural gas-fired generation and coal-fired generation.
- RTO and ISO regions experienced varying levels of demand response implementation from 2019 to 2022.Load-weighted, fuel-adjusted locational marginal prices varied across RTOs and ISOs from 2019 to 2022.
- In the four RTOs and ISOs with capacity markets, the net number of generating capacity units added to service varied significantly from 2019 to 2022. The four RTOs/ISOs also reported the net number of additions and retirements changing over time.
- Across the four RTOs/ISOs with capacity markets, the net increase in megawatt capacity supply obligations varied significantly both across and within the RTOs/ISOs. Capacity with a capacity supply obligation represents the amount of generating capacity that cleared in an auction that has a resulting obligation to offer into the energy market during the reporting period.

[18] FERC, RTO/ISO Performance: https://www.ferc.gov/industries/electric/indus-act/rto/rto-iso-performance.asp

Table B-2: FERC Common metrics included in information collection FERC-922

Metric No.	Name	Description
Administrative and Descriptive Metrics (Group 1: 1-7)		
1	Reserve Margins	The anticipated reserve margin metric is designed to measure the amount of generation capacity available to meet expected demand.
2	Average Heat Rates	A heat rate measures the efficiency of a resource to convert thermal power into electric power.
3	Fuel Diversity	The fuel diversity metric represents the different amounts of installed generating capacity and the different quantities of energy produced by various technology types.
4	Capacity Factor by Technology Type	The capacity factor metric measures the actual energy produced at a generation station as a fraction of the maximum possible energy that could have been produced if it were operating at full capacity 24 hours a day, 365 days a year.
5	Energy Emergency Alerts (EEA)	The energy emergency metric provides information on the frequency of energy emergencies (EEA level 1 or higher).
6	Performance by Technology Type during EEA Level 1 or Higher	The performance by technology type under the shortage metric provides information on aggregate performance of technologies during EEA Level 1 or higher alerts by measuring the total five-minute intervals when an alert is present and how the generators, by technology type, performed.
7	Resource Availability (EFORd)	The resource availability metric measures the forced outage rates across different technology types. A forced outage occurs when a generator is unavailable to provide energy its capacity.
Energy Market Metrics (Group 2: 8-19)		
8	Number and Capacity of Reliability Must-Run Units	The reliability must-run (RMR) metric provides a measure of the number and capacity of units that an RTO/ISO must depend on to support critical facilities and to maintain reliability.
9	Reliability Must-Run Contract Usage	The RMR contract usage metric measures the usage of RMR contracts. This metric should include information from contracts that are in effect in any portion of the reporting period.
10	Demand Response Capability	The demand response capability metric measures the total amount of demand response available.
11	Unit Hours Mitigated	The number of unit hours mitigated metric provides an indication of the frequency and magnitude that resources have been mitigated to protect against the exercise of market power.
12	Wholesale Power Costs by Charge Type	The wholesale power cost metric disaggregates costs paid by load, thereby providing an assessment of RTO/ISO market costs.
13	Price Cost Markup	The price cost markup metric measures the difference in system-wide price that would result from using as-submitted offers and cost-based offers/reference levels.

14	Fuel Adjusted Wholesale Energy Price	The load-weighted, fuel-adjusted locational marginal price metric measures the wholesale price of energy across the RTO/ISO for a given reporting period and is derived by holding fuel costs constant over a defined time period.
15	Energy Market Price Convergence	The energy market price convergence metric measures how closely the day-ahead and real-time energy prices align.
16	Congestion Management	Congestion represents the cost to customers of paying for more expensive energy because physical transmission line limits do not allow full delivery of the least-cost energy resources.
17	Administrative Costs	The administrative costs metric examines the total financial cost of operating the RTO/ISO and measures the ability of RTOs/ISOs to manage the growth rate of administrative costs as the growth rate of system load changes.
18	New Entrant Net Revenues	The new entrant net revenues metric measures the total revenues from the energy and ancillary services (as defined in the RTO/ISO Tariff) markets that a new entrant could be expected to receive, based on proxy resources, for both a combustion turbine and a combined cycle.
19	Order No. 825 Shortage Intervals and Reserve Price Impacts	The shortage intervals and reserve price impact metric measures the size, duration, and impact that shortage events will have on reserve market clearing prices.
	Capacity Market Metrics (Group 3: 20-29)	
20	Net Cost of New Entry (Net CONE)	The Net CONE metric represents the revenues a resource could be expected to earn in the capacity market after netting out revenues from the energy and ancillary services market. The Net CONE metric is usually based on a proxy resource, such as a combined cycle or combustion turbine.
21	Resource Deliverability	The resource deliverability metric measures the import limitations into the RTO/ISO or sub-RTO/ISO zone, taking into account any local generation requirements in the sub RTO/ISO.
22	New Capacity (Entry)	The new capacity metric measures whether there has been any new capacity added in the RTO/ISO since the previous capacity auction, measured by both RTO/ISO-wide and for specific sub-RTO/ISO regions that were modeled separately from the rest of the RTO/ISO.
23	Capacity Retirement (Exit)	The capacity retirement metric measures whether there has been any capacity that has been taken out of service since the last capacity auction.
24	Forecasted Demand	The forecasted demand metric measures the coincident peak demand of a sub-RTO/ISO region during a binding auction for capacity delivered during the reporting period and compares it to the realized coincident peak demand for that reporting period.

25	Capacity Market Procurement and Prices	The capacity market procurement metric measures the total capacity offered and procured through the central capacity market as well as the associated capacity price on an RTO/ISO-wide basis, as well as per individual zones that were modeled and/or cleared differently from the rest of the RTO/ISO
26	Capacity Obligations and Performance Assessment Events	The capacity obligations and performance metric measures the total cleared capacity eligible for bonus payments for over-performance and subject to penalties for underperformance, along with the number and duration of performance events.
27	Capacity Over-Performance	The capacity over-performance metric measures the total number of units that overperformed during a performance assessment period.
28	Capacity Under-Performance	The capacity under-performance metric measures the total number of units that underperformed during a performance assessment period.
29	Total Capacity Bonus Payments and Penalties	The total capacity bonus payments and penalties metric measures the total bonus payments and penalties charged to capacity resources with supply obligations that under-performed or over-performed during a performance period.

Source: Commission staff based on Comment Request in Docket No. AD19-16-000. January 2024. https://www.ferc.gov/sites/default/files/2024-01/2023_Common_Metrics_Report.pdf

B.4.5. NPCC Directories

The NPCC publishes its reliability criteria in the form of directories:[19]

1. Design and Operation of the Bulk Power System
2. Emergency Operations
3. Maintenance Criteria for Bulk Power System Protection (retired April 1, 2015)
4. Bulk Power System Protection Criteria
5. Reserve
6. Reserve Sharing Groups
7. Special Protection Systems
8. System Restoration
9. Verification of Generator Gross and Net Real Power Capability
10. Verification of Generator Gross and Net Reactive Power Capability
11. Disturbance Monitoring Equipment Criteria
12. Under Frequency Load Shedding Program Requirements

[19] NPCC, Standards – Directories: https://www.npcc.org/Standards/Directories/Forms/Public%20List.aspx

NPCC Directory 1 focuses on Design and Operation of the Bulk Power System:

- For planning, each Transmission Planner and Planning Coordinator must plan its BPS to have sufficient transmission capability to meet the contingencies specified within Directory 1 while serving the forecasted demand. Credible combinations of systems conditions that stress the system must also be modeled during the planning process, including forecasted load, transfers within and between areas, transmission configuration, active and reactive resources, generator availability, and other dispatch scenarios.
- For operations, each Reliability Coordinator and Transmission Operator is required to establish normal and emergency transfer capabilities for its portion of the BPS that will meet the performance requirements for the contingencies defined with the Directory.

The purpose of Directory 1 is to provide an approach for BPS planning and operation that will achieve a level of reliability that will avoid instability, voltage collapse and widespread cascading outages. The loss of small portions of a system (such as radial portions) may be tolerated provided these do not jeopardize the reliability of the remaining bulk power system. In NPCC, this level of reliability can be achieved by requiring the BPS to be designed and operated to meet the performance requirements for the contingencies specified in within Directory 1. Model simulations are used to assess and analyze the impact of these contingencies while various BPS elements and the resulting performance requirements are monitored. If an entity becomes aware of a contingency not on a BPS element that results in a significant adverse impact outside the local area, that entity must design and/or operate the system to respect that event.

B.4.6. Resource Adequacy Standards

Resource adequacy is a measure of the ability of a portfolio of resources to meet load across a wide range of expected system conditions, accounting for variability of supply and demand and outage risks.

B.4.6.1. Key Standards

B.4.6.1.1. Loss of Load Expectation (LOLE)

Loss of load expectation is defined by NERC as:

> “The expected number of days in the year when the daily peak demand exceeds the available generating capacity. It is obtained by calculating the probability of daily peak demand exceeding available capacity for each day and adding these probabilities for all the days of the year.”

It currently is applied in New York as well as other control areas in the United States and is the standard used in the reliability rules of the NPCC and NYSRC.

This widely accepted standard has been further defined by the NYSRC as the probability of the need to disconnect any firm load due to resource deficiencies, on average not more than once in 10 years[20] or, no more than 0.1 day per year. A wide range of inputs goes into the complex computer modeling used to arrive at LOLE forecasts of the amount of installed capacity required to meet the 1-in-10 criterion, including:

- Load forecast uncertainty due to factors such as weather and economic conditions;

[20] Also referred to as "one day in 10 years" or "1-in-10".

- Variables of generating resource availability, such as retirements, forced outages, maintenance, and seasonal de-ratings; and
- The status and emergency capability of transmission connections to other systems.

In conducting resource adequacy planning, accurate outage information must be collected for all generating units and other sources. The decision to add generation to maintain a desired LOLE is now the responsibility of the NYISO marketplace, pursuant to NYISO administration and procedures, supported by "regulated backstop solutions" which are transmission projects triggered by the NYISO with cost allocation and cost recovery if the NYISO marketplace does not respond. The NYISO may also invoke regulated transmission solutions to resource adequacy needs that arise due to the deactivation of a generator, through its Generator Deactivation Process.

The resource adequacy rule has several applications, the primary being its use by the NYSRC to calculate and establish the amount of installed capacity required to maintain the resource adequacy criteria. In that regard, it plays a significant role in the NYISO marketplace establishing installed capacity (ICAP) prices. It can be applied by the NYISO for the economic assessment of proposed transmission projects versus new generation resources or to calculate the reliability benefits of transmission connections to neighboring systems.

NYSRC and NYISO resource adequacy analysis incorporates a model of New York State Transmission System emergency transfer capability between NYISO load zones reflecting the capability of the transmission system to deliver capacity between zones and the benefits of interconnections with neighboring systems to assess whether sufficient capacity exists in the localities to meet LOLE criterion.

B.4.6.1.2. Other Reliability Metrics

LOLE has been used as the primary reliability metric within New York State for many years. However, there are several other valuable resource adequacy metrics being reported for informational purposes today. These include the following: [21]

- **Loss of Load Hours (LOLH):** This metric is generally defined as the expected number of hours in a given time period (typically one year) when a system's hourly demand is projected to exceed the available generating capacity. This metric is calculated using each hourly load in the given period (or the load duration curve).
- **Loss of Load Events (LOLEV):** This metric, which is sometimes referred to as loss of load frequency, is defined as the number of events in which system load is not served in a given time period. A LOLEV counts the expected frequency of continuous LOLH.
- **Loss of Load Probability (LOLP):** This metric is defined as the probability of power system daily peak or hourly demand exceeding the available resource capacity during a given period. The probability can be calculated either by using only the daily peak loads (or daily peak variation curve) or all the hourly loads (or the load duration curve) in each study period.
- **Expected Unserved Energy (EUE):** This metric is the aggregate of the expected number of megawatt hours that will not be served in a given time period as a result of demand exceeding the available capacity across all hours. EUE focuses solely on energy and allows for the measurement of both magnitude and duration for all hours within a given time period.

[21] NYSRC, NYSRC Resource Adequacy Metrics and Their Applications: https://www.nysrc.org/wp-content/uploads/2023/03/Resource-Adequacy-Metric-Report-Final-4-20-20206431.pdf

- **“Normalized EUE”:** This metric, related to the previous, is the total expected firm load shed due to supply shortages (MWh) as a percentage of the total system net energy for load, and therefore represents an overall percentage of system load that cannot be served.

The utilization of metrics such as LOLH and EUE allows for the duration and magnitude risk characteristics, respectfully, to be calculated and assessed. As the New York power system continues to evolve and incorporate higher levels of intermittent energy-limited generation resources, continued evaluation of these various criterion will be critical in assessing future system risk.

B.4.6.2. Requirements

Resource adequacy requirements for a region are determined by several overlapping requirements, which often vary across grid geographies. The following subsections describe the requirements for the New York Control Area.

B.4.6.2.1. New York Control Area Installed Capacity Requirement

The Installed Reserve Margin (IRM) represents the amount of generating capacity that must be in place to maintain resource adequacy. It is measured by the amount of generation and other capacity resources relative to forecasted peak load that must be available to meet the 1-in-10 resource adequacy criterion. The NYSRC Installed Capacity Subcommittee (ICS) conducts an annual reliability study that consists of a base scenario case and multiple sensitivities. The NYSRC reviews and approves the IRM study and uses the study to establish the annual statewide IRM for the New York power system. Both FERC and PSC then approve the IRM.

The IRM study uses probabilistic computer modeling techniques to calculate the probability of an unplanned loss of firm electric load due to the occurrence of generator or transmission system contingencies.[22] New York follows the NPCC and NYSRC resource adequacy criterion that at any given time, the probability of an involuntary disconnection of firm load should not exceed one occurrence in 10 years. Extensive work goes into developing, reviewing, and approving voluminous input data. Through the NYSRC stakeholder process, the ICS reviews and approves the data, while the NYISO runs the model and reports the results. Following NYSRC approval of the IRM, the NYISO establishes the amount of installed capacity that New York LSEs must purchase via NYISO-administered Installed Capacity auctions. Using the approved IRM, the NYISO also establishes the amount of generating capacity that must be located within certain transmission-constrained regions, or “Localities”, such as the lower Hudson Valley (G-J Locality), New York City (Zone J) and Long Island (Zone K).

The most recent IRM study covers the period of May 1st, 2025 through April 30th, 2026. The study was performed pursuant to the NYSRC Policy to set the installed reserve margin. The report shows that the calculated NYCA IRM for the 2025-2026 Capability Year is 24.4% under final base case assumptions. This IRM satisfies the NYSRC resource adequacy criterion of a Loss of Load Expectation (LOLE) of no more than 0.1 Event-Days/year. In addition to calculating the LOLE, the analysis also determined that

[22] For many years, the New York power industry has pioneered the application of probability methods for capacity planning, including the development of computer models, reliability evaluation techniques and methods, and resource adequacy criteria. Studies for establishing statewide capacity requirements using probabilistic techniques were implemented during the late 1960s by the New York Power Pool.

the Hourly Loss of Load Expectation (LOLH) was 0.374 hours per year, and the Expected Unserved Energy (EUE) was 216.980 MWh per year. NYSRC does not have criteria for LOLH or EUE but utilizes them for comparison against other electrical systems around the world. LOLH is typically less than 3 to 8 hours a year, and Normalized EUE is typically less than 0.002%. Thus, it was determined that both the NYCA results represent a significantly higher level of reliability than the typical LOLH and EUE values.[23]

The yearly IRM can fluctuate based on the results of the IRM study process. Despite this, it should be recognized that variations of required IRM levels from year to year do not increase or decrease New York State's electric system reliability. The IRM results adjust to core variables each year such as changes in system demand (or load), new generator builds (or retirements), and new transmission lines or line outages, amongst others, and seek to maintain a consistent, targeted LOLE.

B.4.6.2.2. Locational Capacity Requirements (LCRs)

NYISO's installed capacity (ICAP) market rules require all LSEs to secure their portion of this statewide minimum capacity, based on each LSE's coincident peak load. Due to physical constraints on how much transfer capability is available on interfaces in the transmission system, LSEs with customers in certain transmission-constrained areas (Localities) must fulfill a portion of their respective capacity obligation from capacity resources electrically located within those areas (known as Locational Minimum Installed Capacity Requirements, or LCRs). The NYISO has designated three such Localities: the G-J Locality (load zones G, H, I, and J in the Lower Hudson Valley); New York City (Zone J), which is nested within the G-J Locality; and Long Island (Zone K). 24

B.4.6.2.3. LCR Methodology

In June 2018, the NYISO submitted proposed tariff changes to FERC to implement a new method for determining LCRs that would begin with the May 2019 Capability Year. This methodology represents an update from the prior "Unified Method" and determines the LCRs for the Localities in a way that minimizes the total statewide cost of capacity at the level of excess condition defined in the tariff (e.g., the size of one peaking unit). The NYISO's calculations maintain the LOLE of less than 0.1 days/year, use the NYSRC- approved IRM, follow Transmission Security Limits established annually by NYISO, and use data and models consistent with the NYSRC IRM study, updating the load forecast and resource changes.

In October 2018, FERC issued an Order accepting the NYISO tariff filing in October 2018. The NYISO implemented the Alternative LCR Methodology to calculate LCRs beginning with the 2019-2020 Capability Year.

---

[23] NYSRC, New York Control Area Installed Reserve Requirement Technical Study Report: https://www.nysrc.org/wp-content/uploads/2024/12/2025-IRM-Study-Technical-Report_Final_12062024_clean.pdf

[24] Every four years, the NYISO utilizes a tariff-driven process to evaluate whether a new Locality is needed. The last study, entitled "2023/2024 New Capacity Zone Study" was released in December 2023. NYISO, 2023/2024 New Capacity Zone Study: https://www.nyiso.com/documents/20142/42276797/2023-2024%20NCZ%20Study%20Report.pdf/5b65aa29-8fb5-8b3e-512b-24246389fd01

B.4.6.2.4. *Locational Minimum Installed Capacity Requirement Study Results: 2025-2026 Capability Year*

On December 6, 2024, the NYSRC Operating Committee approved the following LCRs using the approved 2025-2026 IRM study results with a state-wide IRM value of 24.4 percent:[25]

G-J Locality	78.8%
NYC	78.5%
Long Island	106.5%

The results identified the 2025-2026 final transmission security limit ("TSL") floor values as binding for Load Zone J (NYC) and the G-J Locality, while maintaining the target LOLE of 0.1 event-days/year.[26]

B.4.7. Transmission Security

Transmission security efforts aim to ensure the transmission system can withstand unexpected negative events without significant disruption to electricity service. This type of contingency planning is critical to building and maintaining a resilient system.

B.4.7.1. Transmission Security for Planning and Operations

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.

The methodology includes the following steps to identify TSL floors:

1. Use transmission security modeling to identify transmission capability into each LCR and then deduct transmission capability from the peak load forecast to establish the Unforced Capacity (UCAP) required to meet the forecasted load.
2. Apply the zonal 5-year equivalent demand forced outage rate (EFORd) to the UCAP requirements to convert into Installed Capacity (ICAP)
3. 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 number of SCRs expected to participate in the market).
4. Divide the calculated ICAP requirements by the peak load forecast. This is the TSL floor value expressed as a percentage.

The following methodology changes have occurred over the last few years:

- For the 2022 –2023 Capability Year: 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).

---

[25] NYISO, Final Locational Minimum Installed Capacity Requirement Results: 2025-2026 Capability Year: https://www.nyiso.com/documents/20142/48947506/Final%202025-2026%20LCR%20Results%20-%2001072025%20ICAPWG_FINAL.pdf/0dcb9f35-3aaf-7858-23cc-51eb67039d27

[26] Transmission Security Limits, or TSLs, are installed capacity "floors" used within the NYISO's capacity optimizer algorithm to maintain sufficient resources in ICAP localities to meet ICAP locality transmission security requirements while still minimizing costs. When a TSL is said to be "binding", it means the value represents a "hard" floor not to be violated.

- 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: 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.[27]

B.4.8. NYSRC Reliability Rules

NYSRC maintains the Reliability Rules & Compliance Manual for Planning and Operating the New York State Power System[28] (Reliability Rules) applicable to the New York State (NYS) BPS[29] portions of the NYS Power System.[30] Maintaining the reliability of the BPS provides protection for the entire NYCA system from widespread and cascading outages. As a result, the Reliability Rules help to ensure that the NYS Power System is operated and planned in a reliable manner.

The Reliability Rules also include compliance elements for aiding in the administration of NYSRC's compliance monitoring responsibilities. The NYISO is required to comply with all the Reliability Rules; Market Participants are responsible for complying with many of these Reliability Rules. The NYISO is responsible for Market Participant compliance with the Reliability Rules through its tariffs, procedures, and agreements.

The Reliability Rules include requirements for Transmission Planning and Transmission Operation.

B.4.8.1. Transmission Planning

The NYS Bulk Power System transmission capability is evaluated under a credible combination of system conditions in the event of representative and reasonably foreseeable design criteria for contingencies as specified by NERC, NPCC, and the NYSRC. Should a criteria violation be observed, a plan to resolve the deficiency is developed, documented, and tracked. Analysis of these contingencies include thermal, voltage, and stability performance as defined by various reliability criteria. The loss of small or radial portions of the system is acceptable provided the performance requirements are not violated for the remaining bulk power system. In addition to the representative contingencies, an assessment of extreme system conditions is also required to measure the robustness of the transmission system and evaluate the risks and consequences. Extreme contingency assessments examine several

[27]NYISO, Valuing Transmission Security: https://www.nyiso.com/documents/20142/44935892/Valuing%20Transmission%20Security%2005_30%20ICAPWG%20v7.pdf/2ba588c2-f9ec-5032-9804-125370370853

[28] NYSRC, Reliability Rules & Compliance Manual for Planning and Operating the New York State Power System: http://www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.html

[29] The New York State Bulk Power System (NYS Bulk Power System) is that portion of the Bulk Power System within the New York Control Area, generally comprising generating units 300 MW and larger, and generally comprising transmission facilities 230 kV and above. However, certain smaller generating units and lower voltage transmission facilities on which faults and disturbances can have a significant adverse impact outside of the local area are also part of the NYS Bulk Power System.

[30] New York State Power System (NYS Power System) – All facilities of the New York State Transmission System, and all those generators located within New York State or outside New York State, some of which may be from time-to-time subject to operational control by the NYISO.

specific contingencies to provide an indication of system strength and determine the extent of a widespread system disturbance, given a low probability of occurrence.

B.4.8.2. Transmission Operation

The Reliability Rules establishing operating transmission capabilities, post contingency operation, outage coordination, and other aspects of transmission operation, primarily:

- Normal and emergency operating transfer capabilities are to be established to operate the NYS Bulk Power System to a level of reliability that will not result in the loss or separation of a major portion of the system.
- Immediately following the occurrence of a contingency event, the status of the NYS Bulk Power System shall be assessed, and transfer levels shall be adjusted, if necessary, to prepare for the next contingency.
- The NYISO shall schedule outages and notify adjacent control areas of scheduled and forced outages that may impact the reliability of the interconnected Bulk Power System.
- The NYISO shall maintain procedures and systems which allow for more stringent than normal operating restrictions prior to, and during severe weather conditions and solar magnetic disturbances.
- Fault duty levels at each NYS Bulk Power System station shall be within appropriate equipment ratings.

B.4.9. Exceptions to the NYSRC Reliability Rules

Requests to obtain exceptions to the NYSRC Reliability Rules can be submitted to the NYSRC for approval. Typically, these exceptions are location-specific and are based upon certain operating procedures or conditions and contingencies.

NYSRC Reliability Rule C.7 describes the process and requirements for submitting, granting, and modifying exceptions. The NYISO or any member of the NYSRC Executive Committee may submit a request for an exception to the NYSRC Executive Committee in accordance with NYSRC Policy 1, "Procedure for Reviewing, Developing, Modifying, and Disseminating NYSRC Reliability Rules." In general:

1) Each TO must assess its exceptions (no less than annually) and determine whether a request to renew, modify, remove, or request a new exception with the NYSRC is needed.
2) The NYISO will process requests from the NYSRC to review applications for new exceptions, or the renewal or modification of current exceptions.
3) The NYISO will notify and provide supporting documentation to the NYSRC if it recommends that the NYSRC approves and grants the new exception, or whether the current exception should be removed or modified as requested by the TO.

The current list of exceptions to the NYSRC Reliability Rules can be found on the NYSRC website.[31]

[31] Exceptions to the NYSRC Reliability Rules. New York State Reliability Council, Reliability Rules & Compliance Manual: http://www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.html

B.5. Transmission System Operations

The operation of the New York State Power System is coordinated by the NYISO Control Center in conjunction with each TO's Control Center and requires instantaneous exchange of scheduling information. The operating policy of NYISO and operational role of the TOs are described in the NYISO Transmission and Dispatching Operation and the Emergency Operations Manuals. Under the terms of the NYISO Agreement, the NYISO/Transmission Owner Agreement, and the NYSRC Agreement, the NYISO has the authority to direct the operation of the New York State Power System to maintain system reliability in accordance with good utility practice and applicable Reliability Rules. NYISO is responsible for the coordination of the operation of those facilities under its Operational Control with the responsible TOs. The TOs are responsible for physically maintaining and operating facilities under direction and control of the NYISO to assure secure operation of the NYISO Secured Transmission System in the New York Control Area. The TOs are also responsible for operating Local Area Transmission System Facilities, provided it does not compromise the reliable and secure operation of the NYS Transmission System.

Transmission System Operations addresses three general timeframes:

- Operations planning, which looks ahead over the next six-month electric system capability period;
- Day-ahead of actual real-time system operations; and
- Real-time operations. Each timeframe is focused on maintaining system reliability and security. Compliance with all reliability rules is monitored to maintain system conditions for voltage, frequency, stability, and thermal limits within acceptable levels.

Transmission System Operators are obligated to follow three sets of reliability requirements. The first are the Standards implemented by NERC, which apply to all North America. Second are criteria of NPCC, which apply to the northeastern United States and Canada. Third, operators must follow rules developed and implemented by NYSRC, which are New York specific rules that are more specific or more stringent than NERC Standards and NPCC Criteria. These standards include requirements to perform operations planning studies, develop day-ahead plans, continuously monitor real-time operations, and have qualified and properly trained system operators monitoring and operating the system on a 24x7 basis year-round.

B.5.1. Operations Planning

Operations Planning evaluates the next operating season and performs reliability assessments in preparation for the next operating season capability period. These studies are commonly referred to as the Operating Studies and focus on determining and monitoring transfer limits on key interfaces between neighboring systems to better understand anticipated conditions for the next capability period. The results are presented to NYISO System Operations and System Operators in preparation for the next capability period. These studies are coordinated with the New York TOs, other NYISO stakeholders, and neighboring electric systems.

B.5.1.1. Day-Ahead Operating Plan

The NYISO uses a Security Constrained Unit Commitment[32] in the Day-Ahead Analysis that provides a least cost economic commitment of supply resources that is a secure Day-Ahead Operating Plan.

This study performs a security constrained economic dispatch observing reliability rules, including local reliability rules established by the NYSRC. For the Day-Ahead Analysis, this assessment produces a day-ahead operating plan that is provided to the NYISO system operators and TOs in New York in preparation for the next day operations.

B.5.1.2. Real-Time Operations

NYISO System Operations evaluates system conditions and secures the system in real time by performing real-time assessments with State Estimation, Contingency Analysis and Real-Time Security Constrained Commitment / Dispatch processes. A series of assessments are performed while monitoring system conditions as they change through the day, including unplanned events, and observing reliability rules and always maintaining system reliability.

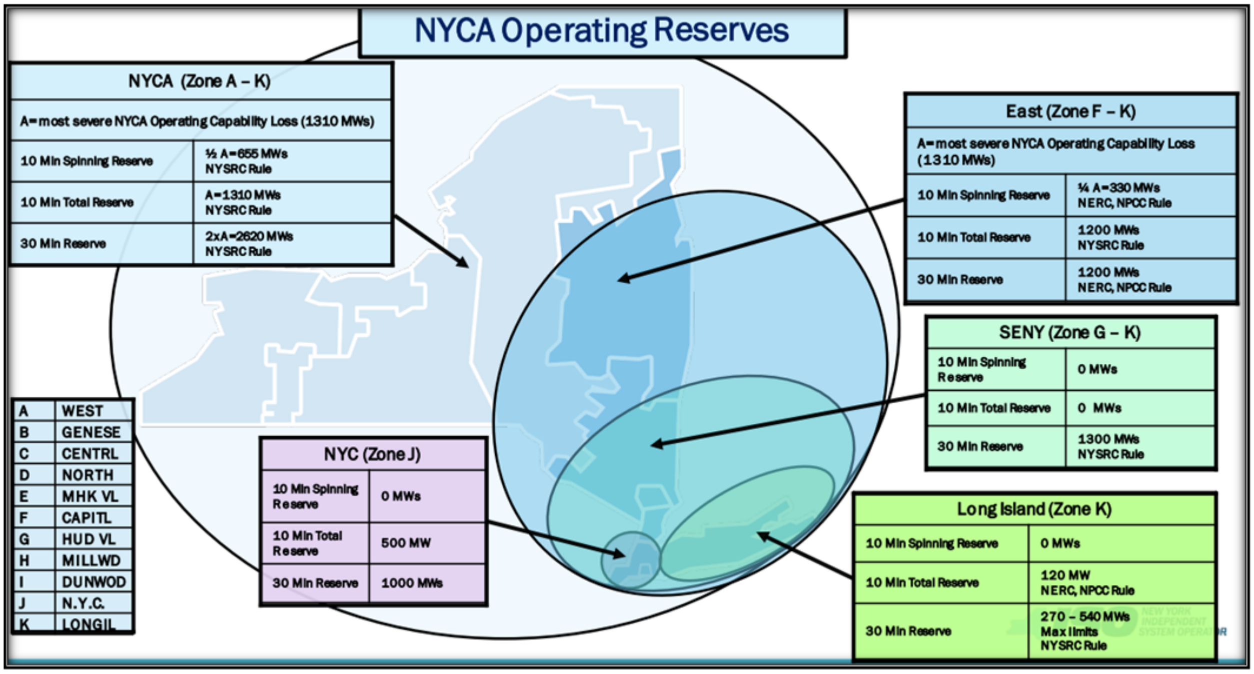
The system operators monitor system conditions such as thermal, voltage, and stability limits, in addition to system frequency, and "area control error," which represents the amount of actual net interchange at any given moment in variation from scheduled interchange power flows. As system conditions change, conditions may deviate from the normal states due to unplanned events. Operators issue corrective actions to be implemented that are scaled to how far the system has deviated from normal state and the urgency of the situation. These corrective actions are assigned to different Operating States.

In the past few State of the Market Reports, the NYISO's Market Monitoring Unit (MMU) recommended that NYISO implement local reserve requirements within NYC load pockets and consider restructuring payments for reserve service to align with generator performance and consider discounting these payments based on past performance. In its 2019 more granular operating reserves initiative, NYISO included a new NYC reserve region (implemented in June 2019) where NYISO procures 500 MW of 10-minute reserves and 1,000 MW of 30-minute reserves for Zone J, evaluating reserve requirements within identified NYC load pockets, and evaluating the performance of resources scheduled to provide reserves. Figure B-2 below illustrates static operating reserves currently applied on different regions within NYCA.[33]

[32] Terms that are capitalized are defined in the NYISO's tariffs. NYISO, Tariff Document: https://nyisoviewer.etariff.biz/viewerdoclibrary/mastertariffs/9fulltariffnyisomst.pdf

[33] NYISO, More Granular Operating Reserve: https://www.nyiso.com/documents/20142/9043618/More%20Granular%20Operating%20Reserves%20-%20BIC%2011062019.pdf/13ac0d1c-67dc-fb8c-6e1e-b9b543617a29

Figure B-2: Static Operating Reserves Currently Applied on Different Regions within NYCA



In addition to the NYC region, NYISO evaluated establishing a 30-minute reserve requirement in the Day-Ahead and Real-Time markets for three load pockets within NYC.

- Astoria East/Corona/Jamaica (325 MW)
- Astoria West/Queensbridge/Vernon (225 MW)
- Greenwood/Staten Island (250 MW)

The static modeling of reserves, specifically locational requirements, does not consider the available transmission capability that could be used to procure reserves from more cost-effective reserve regions. Further, it may not optimally reflect the varying needs in response to the evolving conditions of the grid. For example, the current static reserve requirement does not account for the potential for the largest source contingency to change based on operating system conditions. Impacts associated with static approach can become more significant as the NYCA grid transitions toward a significantly different resource mix.

Currently, NYISO is working on the design and prototyping of dynamic reserve requirement, a novel approach that will explore more efficient scheduling of reserves resources. Dynamic Reserves can enhance the current modeling by allowing the adjustment of the minimum operating reserve requirements based on the single largest source contingency or risk for simultaneous loss of energy from similarly situated generation (e.g., offshore wind or natural gas). In addition, it accounts for transmission capability when determining reserve needs within a constrained area. The NYISO finalized a Market Design Concept Proposal in 2022 and continues to work on completing the design with tariff provisions.

In 2024 NYISO finalized the design with stakeholders and prototype work. In 2025 NYISO will file the design with FERC and develop a software design specification.[34]

The NYISO will also add a new reserve product called "Uncertainty Reserves" as part of NYISO's "Balancing Intermittency" project to address the variability and forecast uncertainty introduced by higher levels of renewable generation on the grid. As the share of wind and solar resources increases, net load forecasts can become more prone to error due to fluctuations in weather-dependent production. Uncertainty Reserves would ensure that sufficient flexible capacity is available to handle these unanticipated changes, thereby maintaining system reliability. In practice, this means holding additional generation or demand response in reserve that is ready to respond quickly.[35] Uncertainty Reserves may be rolled out in two phases starting in 2026.[36]

B.5.1.3. NYISO Operating Study

The NYISO Draft Operating Study Winter 2024-25[37] and Operating Study Summer 2024[38] both concluded that for the capability period studied, the New York interconnected bulk power system could be operated in accordance with NYSRC Reliability Rules for planning and operating the New York State power system and the NYISO system operating procedures. Operating Studies are performed by the NYISO for each upcoming Summer and Winter capability period.

B.5.1.4. Transmission Availability Data System (TADS)

Consistent with NERCs obligations under Section 215 of the Federal Power Act, on October 23, 2007, the NERC Board of Trustees approved the collection of the Transmission Availability Data System (TADS) data beginning in calendar year 2008. TADS collects transmission outage data in a common format for:

- AC circuits ≥ 200 kV (overhead and underground)
- Transformers with ≥ 200 kV low-side
- AC/DC back-to-back converters with ≥ 200 kV AC on both sides
- DC circuits with ≥ ±200 kV DC voltage

The TADS effort began in 2006 with the formation of the TADS Task Force under the NERC Planning Committee. This task force designed TADS and the associated processes for collecting TADS data. On June 30, 2009, the task force issued its first reports for data collected in 2008. NERC uses the information to develop transmission metrics that analyze outage frequency, duration, causes, and many other factors related to transmission outages. NERC also issues an annual public report showing

---

[34] NYSRC, NYISO Markets Report Attachment 7.2: https://www.nysrc.org/wp-content/uploads/2025/01/7.2-2025.01.15-NYISO-Markets-Report-Attachment-7.2.pdf

[35] NYISO, Balancing Intermittency: https://www.nyiso.com/documents/20142/47460232/06%20Balancing%20Intermittency.pdf/ae738971-537a-06b6-dc5a-df14bf1dd614

[36] NYISO, BI CIA for Posting: https://www.nyiso.com/documents/20142/46679593/BI%20CIA%20FOR%20POSTING.pdf/8c26d7b0-2b74-8a05-47c8-272d3ff4ea9f

[37] NYISO, NYISO Draft Operating Study Winter 2024-25: https://www.nyiso.com/documents/20142/47402002/Winter2024-25%20Operating%20Study%20Report%20DRAFT.pdf/9e5188aa-6f9f-0b43-117d-24906bb04ecd

[38] NYISO, NYISO Operating Study Summer 2024: https://www.nyiso.com/documents/20142/3691300/Summer2024-OperatingStudy-OC-Approved.pdf/63282bf9-5e31-720b-49ab-3e7ad71ad1c9

aggregate metrics for each NERC region. Each transmission owner reporting TADS data will be provided a confidential copy of the same metrics for its facilities.

While TADS is not intended to provide deterministic performance measures, it is used to quantify certain performance aspects. In addition to collecting simple transmission equipment availability, TADS collects detailed information about individual outage events that, when analyzed at the regional and NERC level, provides data that may be used to improve reliability. Specific equipment outages are linked to disturbance reports filed with NERC, enabling better association of transmission outages with load and generation outages. Additionally, outages by one TO are now being tracked to outages of other TOs so that any relationship between multiple outages can be established.

B.5.1.5. NYISO Monthly Operations Performance Metrics Report

Each month the NYISO also submits a report on a range of reliability and market performance metrics to the NYSRC and the NYISO market participants and posts it on its website at the following link: https://www.nyiso.com/library. The standard reliability performance metrics reported include a rolling 13-month performance trend of each the identified reliability metrics and currently include:

- Alert State Declarations
- Major Emergency State Declarations
- Interconnection Reliability Operating Limit Exceedance Times
- Balancing Area Control Performance
- Reserve Activations
- Disturbance Recovery Times
- Load Forecasting Performance
- Wind Forecasting Performance
- Behind the Meter Solar Performance
- Behind the Meter Solar Forecasting Performance
- Net Wind and Solar Performance
- Net Load Forecasting Performance
- Net Load Ramp Trends
- Day-Ahead Market Capacity Unavailable
- Lake Erie Circulation and ISO Schedules.

B.5.2. System Operating States

The NYISO system has five different Operating State classifications: Normal, Warning, Alert, Major Emergency, and Restoration. Over the last ten years, the NYISO has declared Major Emergency conditions on multiple occasions. These emergencies were accompanied by abnormal frequency, voltage, and equipment overloads that posed serious risk to the reliability of the New York State power system. As the main objective of the NYISO is to operate the New York State Power System within the Normal State, corrective action is taken immediately once a Major Emergency is declared. Broadly, System Operators are alerted when the system enters into any one of these five states, which allows the Operator to take a predefined set of actions to return the system to normal. These actions include re-dispatching, returning equipment to service, adjusting reactive devices, adjusting phase angle regulator taps, activating Emergency Demand Response Programs (EDRP) and/or Special Case Resources, (SCRs) purchasing emergency power, and others, up to and including load shedding when in a Major Emergency State.

The System Operating States provide a means for operators to communicate the status of the system while having available an escalating set of actions to address non-normal system conditions to return the system to normal state.

In cooperation with the NYISO, the NYSRC periodically assesses the reliability rules, testing requirements, and compliance monitoring procedures for the NYISO's System Restoration Plan and TOs' restoration plans for re-energizing the New York State bulk power system following a system-wide blackout. One element critical to the success of this plan is to maintain adequate "black start" generating capacity throughout the system, but especially in the New York City area. By definition, black start generators have the capability, following a major or total system blackout, to independently start-up and energize a portion of the system without an outside electric supply. Failure to provide sufficient black start resources to restore the electric system promptly could have significant adverse consequences, particularly in New York City. NYISO maintains black start capacity by preparing testing procedures, performing tests, and maintaining records of generators with black start capability. Black start capabilities are remunerated within NYISO's ancillary services marketplace.

B.5.3. Operations Communications

Communication protocols have been developed between the NYISO, each of the New York TOs, and with neighboring power systems. These protocols include communications during normal and emergency operations to coordinate actions to take in anticipation of and during system emergencies.

The NYISO works closely with the TOs in day-to-day operations with well-established processes and procedures. The NYISO also works closely with the neighboring power systems to respond to requests or help maintain or return the system back to normal conditions.

The NYISO has redundant voice communication paths to the TOs and Neighboring Control Areas. Those paths consist of direct hardwire phone circuits, dial up phones, hot line phone, satellite phones, and cell phones. The normal path of voice communication from the NYISO to the generators is through the appropriate TOs. This provides the TOs with operational awareness of the request by the NYISO or generators within their footprints to support local reliability requirements.

The NYISO does not have direct physical control over each component of the transmission system. Instead, the system operators receive telemetered information on system conditions and provide direction to the TOs and generators regarding actions needed to operate the system. For example, following an indication that a generator has tripped offline, the NYISO will confirm information received through the NYISO telemetered data with the TO to which the generator interconnects, and the TO will confirm the generator trip.

B.5.4. Operator Training

NERC recognizes the NYISO as a continuing education provider. The NYISO Grid Operations Training Group develops, implements, and administers specialized training for NYISO and TO Operations staff based on all NERC, NPCC, NYSRC, and NYISO requirements.

The NYISO System Operator Training Program is structured to assure reliable interconnected system operation by experienced and highly qualified personnel, including through the initial and ongoing training of system operators.

The standard NYISO Operator shift schedule protocol has a training week built into the schedule every six weeks. During the training week, NERC Certified Operators participate in classroom lectures, training exercises, simulation sessions and seminar programs with local, regional, and national organizations.

The NYISO Training Simulator environment, used in initial and ongoing operator training, includes the same Emergency Management System model and displays used on the operating floor. The market information system is integrated into the simulator to allow the operators the full use of tools and indications they would have available in real time operation. Challenging and realistic scenarios are presented to the operations crew during these simulator sessions to prepare them for real time normal and emergency conditions.

During spring training, NYISO Operators train with the New York TOs using a simulator environment to restore the NYISO Bulk Power System Backbone following a blackout condition. These sessions are designed to be realistic and have proven effective in communications, coordination, and system response during system restoration.

B.5.5. Workforce Challenges

In 2023, the Reliability Issues Steering Committee (RISC) which advises the NERC Board of Trustees (Board) on reliability considerations released the ERO Reliability Risk Priorities Report. [39] The main objective of this report is to identify key risks to the BPS that merit attention and to recommend mitigating actions that align with those risks. One of the key risks identified is related to the workforce challenges that the industry is facing. The "Human Performance and Skilled Workforce" risk was ranked, in terms of severity of the risk, as 10 out of a total of 11 within the report, largely being viewed as a "moderate" risk in the near term.

That said, as the grid grows more complex, it demands a highly skilled workforce capable of managing new technologies and evolving system dynamics. However, high turnover in technical expertise is compounding this issue. The demand for skilled workers has surged as multiple entities—utilities, developers, and technology firms—compete for the same limited talent pool to support expanding grid transformation efforts.

Adding to the challenge, the rapid technical evolution of the energy sector has created a pressing need for professionals with expertise in several critical areas:

- **Electromagnetic transient modeling**, crucial for advanced grid studies, yet only a small number of specialists are equipped with this skillset.

[39] NERC, 2023 ERO Reliability Risk Priorities Report: https://www.nerc.com/comm/RISC/Related%20Files%20DL/RISC_ERO_Priorities_Report_2023_Board_Approved_Aug_17_2023.pdf

- **Cybersecurity**, as increasingly interconnected and "smart" grid infrastructure is becoming a prime target for cyber threats.
- **Renewable energy and storage technologies**, where expertise is needed to integrate energy storage, hybrid resources, and demand-side flexibility into the grid.

The ERO Report states that addressing these workforce challenges requires a proactive approach to attract, train, and retain the next generation of engineers and grid operators. Measures such as expanding educational pathways—from vocational training programs to advanced degrees—will be essential in building a stronger talent pipeline. At the same time, mid-career transition opportunities should be developed to bring professionals from other industries into the energy sector. Specialized training in cybersecurity, advanced modeling, and emerging grid technologies must also be enhanced to meet the sector's evolving demands.

B.5.6. NYISO/Neighboring Control Joint Operating Agreements (JOAs)

The NYISO and each of the neighboring regions (New England, PJM, Quebec, and Ontario) maintain Joint Operating Agreements that provide a structure and framework to:[40]

1) Develop and issue operating instructions and interregional security limits
2) Coordinate operation of their respective transmission systems
3) Developing and adopting operating criteria and standards
4) Conducting operating performance reviews of the Interconnection Facilities
5) Implementing each Party's respective Standards Authority requirements with regard to each regional Transmission Systems
6) Exchanging information and coordination regarding system planning
7) Providing mutual assistance in an Emergency and during system restoration

[40] NYISO and PJM, Joint Operating Agreement: https://www.pjm.com/~/media/documents/agreements/nyiso-joa.ashx

C. Transmission System Planning

Transmission system operators work to meet the reliability standards through *Transmission Planning*. Transmission planning is the process by which an entity forecasts, analyzes, and addresses future transmission system needs. These needs usually arise from changes in electricity demand and supply, policy requirements, or transmission assets reaching the end of their expected lifetime. This chapter describes how this planning is conducted in New York State.

The first section frames the two main types of transmission planning: *reliability and economic planning*. These planning efforts seek to identify future challenges to maintaining both the reliability and economic efficiency of the transmission system and identify any solutions to those challenges.

The second section describes how New York operationalizes its planning processes through the *Comprehensive System Planning Process (CSPP),* a planning framework comprised of sub-processes designed to forecast, analyze, and select solutions for future threats to system reliability and efficiency.

The third section describes the *NYISO Interconnection Process.* Interconnection assesses the effects a specific transmission project will have on the system, ensuring new resources entering the transmission system do not end up having adverse reliability impacts. Interconnection queues also help inform the CSPP.

The fourth and fifth sections discuss two processes which review the CSPP: the *Area Transmission Review*, required by the New York State Reliability Council and the Northeast Power Coordinating Council, and the *NERC Reliability Assessment*, conducted independently by the North American Electric Reliability Corporation. These separate processes add additional oversight to the planning process and add regional and national perspectives to the goals of reliability and efficiency.

The sixth section describes *Regional and Interregional Planning*, or the practice of coordinating planning efforts for certain grid upgrades across transmission territories; for example, coordination between NYISO and PJM or NYISO and ISONE. The eastern interconnection is one large, interconnected system. Changes in one RTO/ISO territory affect the others and resources and assets in one may more efficiently or effectively address a reliability or efficiency need in another.

The last section describes the *enforcement mechanisms* used to ensure its subordinate Transmission Owners comply with these standards. The transmission grid is subject to overlapping layers of enforcement authorities, and different echelons levy different requirements on different transmission system entities involved in ensuring a reliable and efficient electric grid.

C.1. Defining Transmission Planning Categories

Transmission planning in New York falls into two general categories: reliability and economic / long-term planning. While both types are included in the NYISO-wide Comprehensive System Planning Process, they are driven by different objectives.

C.1.1. Reliability Planning

NYISO conducts reliability planning on both a near-term and long-term basis to ensure that the system is designed to maintain reliability, using both resource adequacy and transmission security modeling to identify any future system needs. The reliability planning process involves several stages including:

- Developing loss-of-load probability models and power flow models of the New York State Bulk Electric System to examine resource adequacy and transmission security, respectively (see Definitions section);
- Using these models to assess the reliability of the system for a range of operating conditions and contingencies, meeting relevant criteria and standards as defined by NERC, NYSRC, the TOs, and others (see Standards and Criteria section);
- Identifying whether any reliability needs exist over the time period evaluated; and
- As needed, developing and evaluating a range of solutions to address any identified reliability needs and selecting the preferred solution, considering the time needed to place the solution in service.

The three primary reliability planning studies are:[41]

- Short-Term Assessment of Reliability (STARS). This study examines future electricity system needs over a 5-year future, focused on addressing needs arising in the first three years, and is conducted quarterly in direct collaboration with transmission owners.
- Reliability Needs Assessment (RNA). This study examines long-term reliability needs occurring 4-10 years into the future, incorporating transmission owner long-term plans, and is conducted biennially. If the Assessment identifies a need, NYISO issues competitive solicitations to address reliability needs and requires transmission owners to propose regulated backstop solutions.
- Comprehensive Reliability Plan (CRP). This study examines future electricity system reliability needs over a 10-year planning horizon and is conducted biennially. As part of the CRP, NYISO evaluates and selects transmission solutions proposed in response to reliability needs identified in the RNA.

The identification of future system reliability needs is largely focused on "firm" changes to the New York electricity system, relying on the Gold Book load forecast, planned generator additions and retirements, and planned changes to the transmission network. However, consideration of economic and policy uncertainty is becoming increasingly intertwined with future reliability needs, and NYISO's reliability planning process has evolved accordingly to explore potential reliability needs across a number of future scenarios within the RNA and CRP, thus increasing the interdependence and coordination between reliability planning and economic and long-term planning. 42

[41] NYISO, CSPP Overview 2022: https://www.nyiso.com/documents/20142/28331683/07_NYISO_CSPP-overview_2022-02.pdf/7488bdb6-baff-1508-6487-235265a0738e

42 NYISO, Scenario Planning Helps Identify Reliability Risks: https://www.nyiso.com/-/scenario-planning-helps-nyiso-identify-reliability-risks-solutions-for-new-york-s-grid-in-transition

C.1.2. Economic and Long-Term Planning

In parallel to reliability planning studies, there are also several processes in New York that are designed to identify economic and policy-driven opportunities for changes to the transmission system. Although not strictly necessary to maintain system reliability, these opportunities may help lower costs for New York ratepayers and/or facilitate the achievement of public policy goals.

Just as reliability planning has evolved to consider additional sources of economic and policy uncertainty, New York's economic and long-term planning processes have also changed considerably in recent years to comprehensively evaluate future economic and policy-driven needs.

NYISO has developed a planning study referred to as the "System and Resource Outlook", which conducts capacity expansion modeling over a 20-year period.[43] Capacity expansion modeling consists of least-cost optimization to select future resource portfolios that minimize total investment and operating costs, while meeting reserve margin and local capacity requirements, as well as any policy targets. The resource portfolios selected in the capacity expansion model are then assessed using a nodal production cost model, which simulates the operational costs of the generation portfolio at a higher level of temporal and spatial granularity, representing security-constrained economic dispatch across the entire transmission network. This two-pronged modeling process is used to identify areas of future congestion where there may be economic opportunities for new transmission, under varying economic and policy scenarios.

C.1.3. Coordinated Grid Planning Process

In 2020, the New York State Legislature passed the Accelerated Renewable Energy Growth and Community Benefits Act, which includes a requirement to plan for the bulk and local transmission and distribution upgrades that are projected to be required to facilitate advance the renewable energy targets set forth in the Climate Act.[44] The Public Service Commission directed the TOs to develop a proposal for a transmission planning process that addresses this requirement, which resulted in the development of the Coordinated Grid Planning Process (CGPP).[45] This is a state-led process coordinated with the NYISO and other EPPAC members. As part of its Order modifying and approving the CGPP (CGPP Order) in August 2023, the Commission directed the TOs and DPS Staff to coordinate closely with NYISO to leverage the same capacity expansion modeling framework used for the System and Resource Outlook to perform its analysis of future scenarios.

The results of the capacity expansion modeling will then be used to study system reliability needs that will be incurred under future load and resource portfolio projections. The TOs, in collaboration with NYISO and DPS, engage in a multi-stage process to study the impacts of up to three scenarios on their local transmission systems, which will culminate in a comprehensive set of proposed local and bulk

[43] The System and Resource Outlook replaced NYISO's Congestion Assessment and Resource Integration Study (CARIS), which performed an assessment of economic congestion for future resource portfolios based primarily on planned additions and retirements and long-term changes in demand, fuel prices, and other economic factors. The System and Resource Outlook builds on the former CARIS process by conducting capacity expansion modeling to examine a broader set of potential futures.

[44] NYSERDA, Accelerated Renewables Fact Sheet: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Fact-Sheets/Accelerated-Renewables-Fact-Sheet.pdf

[45] NYS Department of Public Service, Proceeding on Motion of the Commission to Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={101C058A-0000-C45D-9CD3-A87E49DF7A99}

transmission upgrade opportunities for Commission approval. As indicated in the CGPP Order, a core objective is to "accurately and comparably capture the interdependence of distribution, local transmission, and bulk transmission in the various portions of the State's power grid." Bulk transmission projects approved in the CGPP will be referred as a need in the NYISO Public Policy Transmission Planning process or the New York Power Authority as a Priority Transmission Project.

C.2. NYISO Comprehensive System Planning Process (CSPP)

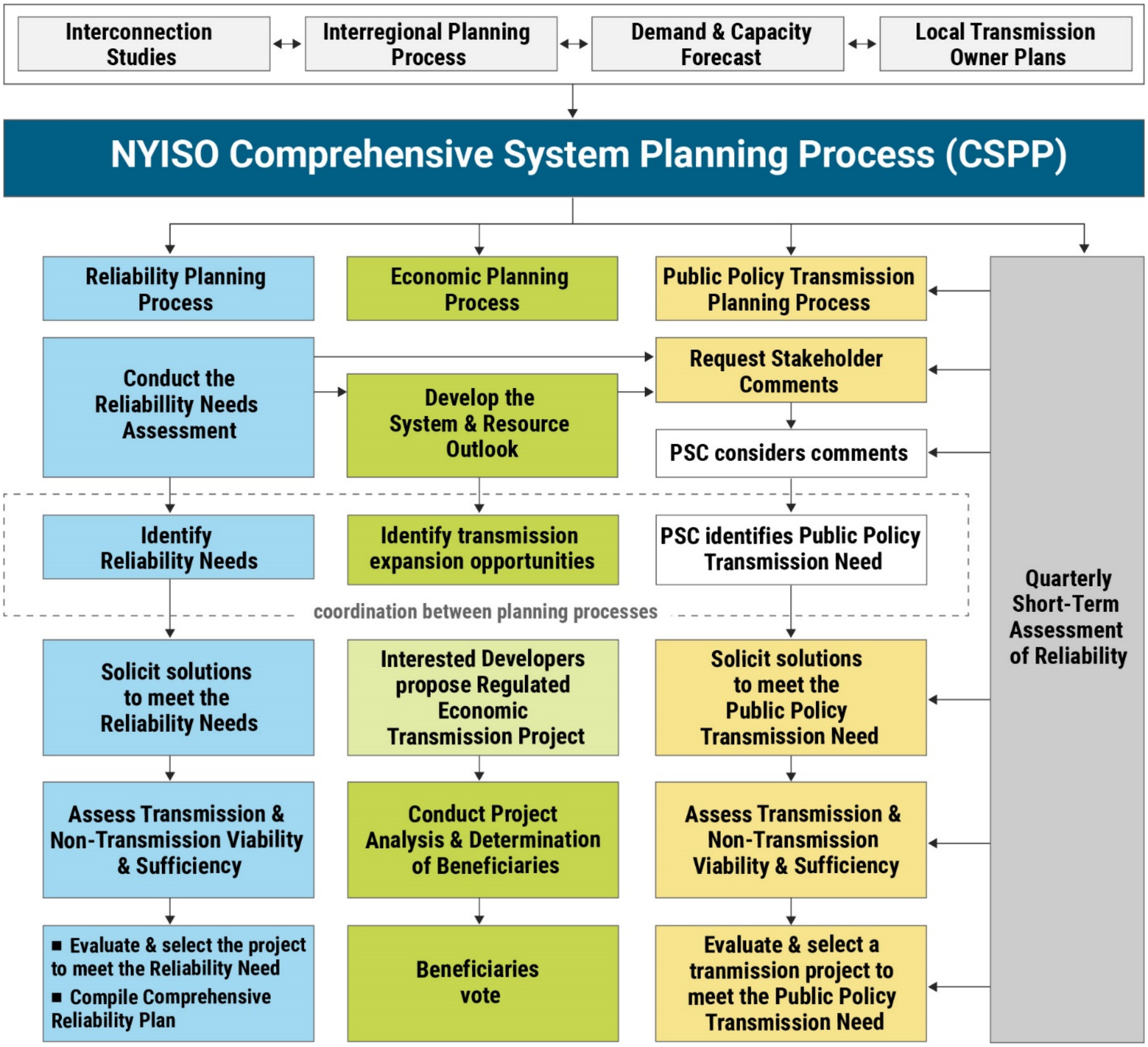
Planning for the bulk electric system in a restructured environment, in which resources are acquired through wholesale competitive markets is, in some respects, very different and more complex than under a vertically integrated "command-and-control" paradigm.[46] Today, the traditional planning aspects of grid operations are inextricably linked to the workings of the competitive markets. Thus, the NYISO, as a federally registered Control Area Operator responsible to FERC for overall bulk system operations and planning in the NYCA, developed the Comprehensive System Planning Process.

The CSPP has four components—the Local Transmission Planning Process (LTPP), the Reliability Planning Process (RPP), the Economic Planning Process, and the Public Policy Transmission Planning Process ("Public Policy Process").[47] Figure C-1 illustrates the components and their interaction in the CSPP.

[46] NYISO, Reliability Planning Process Manual: https://www.nyiso.com/documents/20142/2924447/rpp_mnl.pdf/67e1c2ea-46bc-f094-0bc7-7a29f82771de?t=1695144397681

[47] As part of the LTPP, local Transmission Owners perform transmission security studies for their BPTFs in their transmission areas according to all applicable criteria. Links to the Transmission Owner's LTPs can be found on the NYISO's website. The LTPP provides inputs for the RPP.

Figure C-1: Comprehensive System Planning Process Components



Source: NYISO, 2024 Comprehensive System Planning Process Flowchart.[48]

C.2.1. Inputs to the CSPP

While it involves original analysis, the CSSP is informed by a set of analyses conducted by other NYISO processes and the NYISO's subordinate transmission owners. This includes interconnection studies and projects that have reached a certain threshold in the interconnection queue process are included as "firm" additions for transmission planning purposes. Interconnection processes are covered in greater detail in Section C.3. This section covers other key inputs like NYISO's Gold Book and Transmission Owners' Local Transmission Planning Processes.

[48] NYISO, CSPP Filing Webpage: https://www.nyiso.com/csppf

C.2.1.1. 2024 Load & Capacity Data Report (Gold Book) by the New York ISO

The NYISO's 2024 "Gold Book" reflects current planning data and assumptions for years 2024 through 2054 (2034 for generating capacity), including:[49]

- Historical and forecast seasonal peak demand, energy usage, and energy efficiency impacts;
- Existing and proposed generation and other capacity resources; and
- Existing and proposed transmission facilities.

The Baseline load forecasts report the expected NYCA load and include the expected impacts of energy efficiency programs, building codes and standards, building electrification, large loads, distributed energy resources, impacts of electric vehicle usage and behind-the-meter solar photovoltaic power (solar PV). The Topline forecast shows what the expected NYCA load would be if not for these impacts, with the impacts listed added back onto the Baseline forecast. These underlying forecasts are based on information obtained from the DPS, NYSERDA, state power authorities, TOs, the U.S. Census Bureau, and the U.S. Energy Information Administration. The Baseline and Topline forecasts reflect a combination of information provided by TOs for their respective territories and forecasts prepared by the NYISO. The Baseline and Topline forecasts have also been extended through 2054 for use in longer term studies.

The 10-year average annual growth rate in the Baseline Summer Peak Demand forecast is up, from 0.5% in the 2023 Gold Book to 0.8% in the 2024 report. In terms of energy, the 2024 Baseline forecast is also higher, from a 10-year average annual growth rate of 1.0% in the 2023 Gold Book to 1.7% in the 2024 report. The positive 10-year forecasted growth in energy usage and summer peak demand can largely be attributed to the addition of new large-load facilities like data centers and industrial plants, EV charging, and growth in building electrification.

The Total Resource Capability in the NYCA for the Summer of 2024 is 40,872 MW, which is an increase of 610 MW from Summer 2023. This is due to changes in existing NYCA generating capability, changes in SCRs, and changes in net purchases of capacity from other control areas.

The total resource capability for 2024 includes:

Table C-1: Total Resource Capability in the NYCA for the Summer of 2024

Fossil:	25,299 MW
Nuclear:	3,330 MW
Pumped Storage:	1,410 MW
Wind:	2,454 MW
Hydro:	4,274 MW
Grid-Connected Solar:	254 MW
Other Renewables:	334 MW
Special Case Resources:	1,281 MW
Increases in Net Generating Capacity:	631 MW
Net Long-Term Purchases:	1,585 MW
TOTAL	**40,872 MW**

[49] NYISO 2024 Load & Capacity (Gold Book). https://www.nyiso.com/documents/20142/2226333/2024-Gold-Book-Public.pdf

Beyond 2024, the resource capability in the NYCA will be affected by additions of new generation, re-rates of currently operating units, and the deactivation of existing generators.

The detailed list of existing NYCA transmission facilities is redacted, as the information may contain Critical Energy Infrastructure Information. Individuals may obtain the information upon request to the NYISO. Summary data on existing transmission facilities is available in the report (mileage of overhead and underground transmission circuit miles by voltage class by Transmission Owner), as well as more detailed information on proposed transmission facilities (owner/developer, proposed in-service date, voltage, ratings, terminals, circuit miles and construction type).

C.2.1.2. Transmission Owner's Local Transmission Planning Process (LTPP)

Each TO in New York State is required to plan for the needs of its local transmission system through the LTPP.[50] The planning process results in an LTP for each TO with a 10-year horizon, based on the TO's assessment of its system's reliability and other needs. The LTP is reviewed annually and formally updated and presented to market participants biannually. The TOs are responsible for administering their own LTPP, including providing adequate time for stakeholder input, as well as adhering to procedures for disseminating information relative to the LTP, presentations with comment opportunities, and a dispute resolution process.

Each LTP is required to include identification of:

- The planning horizon;
- Data, models, and assumptions used;
- Needs and issues addressed;
- Potential solutions under consideration; and
- A description of the transmission facilities covered by the plan.

Any planning criteria or assumptions by the TOs must meet or exceed any applicable NERC, NPCC, or NYSRC criteria. The LTPs are integrated into the NYISO processes by tariff and serve as major input and basis for the RNA and other studies.

C.2.2. CSPP Reliability Planning Process

The Reliability Planning Process (RPP) consists of two studies:

1) **The Reliability Needs Assessment (RNA).** This study evaluates resource and transmission adequacy and transmission security of the NY BPTF over its study period which encompasses years 4 through 10 following the year in which the RNA is conducted. In this study NYISO identifies Reliability Needs in accordance with applicable Reliability criteria. The report is reviewed by NYISO stakeholders.
2) **The Comprehensive Reliability Plan (CRP).** After the RNA is complete, the NYISO solicits market-based solutions to satisfy the identified Reliability Needs. NYISO evaluates the viability

[50] NYISO, Local Transmission Owner Planning Process (LTPP): https://www.nyiso.com/documents/20142/3632262/Local-Transmission-Owner-Planning-Process-LTPP.pdf

and sufficiency of proposed solutions to select an efficient / cost-effective solution. The CRP sets forth NYISO's findings regarding proposed solutions and is reviewed by stakeholders.

C.2.2.1. 2023 Comprehensive Reliability Plan

The 2023 Comprehensive Reliability Plan (CRP) followed from the 2022 Reliability Needs Assessment and incorporates findings and solutions from the quarterly Short-term Reliability Process as available.[51] This CRP concluded that the planned New York State Bulk Power Transmission Facilities as assessed in the 2022 RNA will meet all applicable Reliability Criteria over the 2026 through 2032 study period under normal weather. NYISO identified several risk factors that could potentially lead to the identification of new reliability needs in the 2024 RNA:

1) **Delayed implementation of projects** in this CRP (e.g., Champlain Hudson Power Express).
2) **Higher load levels**. Energy use and peak demand are forecast to increase significantly driven primarily by the addition of large loads (e.g., data centers, microchip fabrication facilities), along with electrification of buildings and transportation. As statewide baseline demand grows at a rate greater than buildout of generation and transmission, reliability margins decrease and approach deficiency in 2030 under higher demand scenarios or even sooner under extreme weather conditions.
3) **Additional generator deactivations**. Since the enactment of the Climate Act, more than twice the capacity of generation has deactivated than has been added to the system. Should this trend continue, additional reliability needs may be identified. Additional deactivations of dual-fuel generation beyond what is planned could exacerbate winter reliability risk during gas supply shortages as the state becomes winter peaking.
4) **Reliance on neighboring systems to meet reliability**. New York's current reliance on neighboring systems is expected to continue through the next ten years. Without emergency assistance from neighboring regions, New York would not have adequate resources to maintain reliability.
5) **Extreme weather poses a threat to reliability**. Extreme events such as heatwaves or storms could result in deficiencies statewide, especially in New York City. At the time of the 2023 CRP, planning for extreme weather was not included in established design criteria. However, NERC TPL-008, which was recently approved, requires assessing transmission security for extreme temperature events.

While no long-term actionable reliability needs were identified in this CRP, NYISO did identify a near-term Reliability Need beginning in summer 2025 in New York City driven by the combination of higher peak load and the unavailability of certain combustion turbines due to NYSDEC's Peaker Rule. This Reliability Need was addressed in NYISO's Short-Term Reliability Process.[52]

[51] NYISO, 2023-2032 Comprehensive Reliability Plan: https://www.nyiso.com/documents/20142/2248481/2023-2032-Comprehensive-Reliability-Plan.pdf/c62634b6-cdad-31dc-5238-ee7d5eaece04?t=1701203618895
[52] NYISO, 2023 Q2 Short-Term Reliability Process Report: https://www.nyiso.com/documents/20142/15930753/2023-Q2-Short-Term-Reliability-Process-Report.pdf/ccb826e3-e31d-157d-89a0-d2d11f600699

It should be noted that there were several scenarios modeled within the 2023 CRP that showed a more favorable outlook in the form of improvements to reliability margins and metrics. These included scenarios around added Demand Response, added offshore wind, and added policy-driven resources.

C.2.2.2. 2024 Reliability Needs Assessment

The 2024 Reliability Needs Assessment (RNA) evaluates the reliability of the New York bulk electric grid from 2028 through 2034 given changes in load, transmission upgrades, and shifting generation mix.[53]

Key takeaways of the 2024 RNA include:

1. **Significant demand growth & uncertainty:** Over the next ten years, peak demand is forecasted to grow by 7,300 MW in winter and 2,300 MW in summer. Most of this growth is due to projected electric vehicle adoption, building electrification, and the interconnection of new large loads from advanced manufacturing, particularly electrolytic hydrogen facilities, semi-conductors, advanced micro-chips, data centers. The uncertainty of the impacts of these factors is highly uncertain. Higher levels of uncertainty around load growth projections are mostly driven by uncertainty around the interconnection of discrete large loads.
2. **Narrowing Statewide Reliability Margins**: While adequacy criteria are met through 2034, NYISO observes a decline in state-wide resource margins. Loss of load expectation approaches the 0.1 event-days per year criterion in 2034 indicating that no surplus power remains without further resource development. It is expected that by 2034 the system will be at criterion and thus will need to rely on receiving assistance from neighboring systems and large load flexibility during system peaks.
3. **Significant uncertainties could result in further Reliability Needs**: RNA scenario analysis showed that the combination of uncertainty in future demand growth with uncertainties in the future supply buildout could exacerbate the Reliability Needs identified in the RNA base case.
4. **Base case resource adequacy criterion is met, but additional reliability metrics show potential elevated risks**: Resource adequacy criterion of 0.1 event-days / year loss of load expectation (LOLE) is established by the NPCC and NYSRC. While additional metrics such as LOLH (Loss of Load Hours) and EUE (Expected Unserved Energy) allow for more insight into reliability event duration and magnitude as compared to LOLE, there currently are no reliability criteria for such metrics. In this RNA base case, while LOLE criteria of 0.1 event-days / year was met throughout the study period 2025 – 2034, LOLH and EUE showed a sharp increase by 2034. Such a sharp increase in LOLH and EUE may highlight areas of additional reliability risk that are not addressed by current reliability criteria.

Please note that the initial release of the 2024 RNA included a transmission security-related Reliability Need in New York City beginning in 2033 driven by increases in peak demand, limited additional supply, retirement of small gas plants based on state legislation and unavailability of generators given the NYSDEC Peaker Rule. After considering system updates since the release of the 2024 RNA, NYISO analysis showed that the revised system margin through 2034 would be positive and therefore the

[53] NYISO, 2024 Reliability Needs Assessment (RNA): https://www.nyiso.com/documents/20142/2248793/2024-RNA-Report.pdf

identified Reliability Need would be addressed. However, narrowing reliability margins continue to be a concern for the NYISO.

A base case scenario was studied from resource adequacy and transmission security perspectives to assess Reliability Needs while multiple other scenarios were studied to identify risks associated with uncertainties in the base case. The other scenarios considered were:

- Additional Queue Projects Scenario: Adds roughly 5,000 MW of additional generation projects that are currently in the pipeline but have not yet meet the Base Case inclusion rules.
- Offshore Wind Scenario: Includes the entire 9 GW of OSW target set out in the Climate Act.
- Additional Firm Gas Generation Scenario: Models the availability of non-firm gas generation during winter peak conditions in response to the NYSRC's reliability rule.
- Demand Response in Transmission Security Scenario: Considers the impact of 1,200 MW of flexible demand (beyond the flexible large loads) across the system on the transmission security results.
- High Demand Forecast Scenario: Utilizes forecasts from the 2024 Gold Book where the forecast is 3,270 MW higher for NYCA in summer compared to the base demand forecast in year 10.[54]
- CHPE Unavailability Scenario: This scenario delays the CHPE project from entering service until after this RNA's study period
- Additional Generation Retirements Scenario: This scenario is intended to show the impact of additional generation deactivations driven by the aging thermal generation fleet in the State of New York assuming they do not meet the current RNA deactivation rules in the Reliability Planning Process Manual.

The 2034 (10-year) snapshot results from this scenario analysis are as follows:

2034 Reliability Metric	Base Case	Mitigation Scenarios				Risk Scenarios		
		Demand Response (1,200 MW)	Additional Firm Gas (700 MW)	OSW (additional 7,000 MW)	Additional Q Projects (5,000 MW)	Without Large Load Flexibility	High Demand	CHPE Unavail-able
LOLE (Event-days/year)	0.094	0.094	0.049	0.031	0.03	0.289	2.744	0.119
Winter Peak Power Flow Margin (MW) (1)	-675	-190	25	725	1075	-1875	-5565	-675
Summer Peak Power Flow Margin (MW) (1)	620	1410	620	1320	2470	-580	-2650	-630
Summer NYC TSM (MW)	-97	142	-97	421	868	-97	-1137	-797

Notes: (1) The Power flow margin represents the MW deficiency (for negative values) or MW in excess (for positive values) of generation necessary for modeling 1,310 MW of reserve and resolving all thermal constraints.

[54] NYISO, 2024 Gold Book: https://www.nyiso.com/documents/20142/2226333/2024-Gold-Book-Public.pdf

The 2025 Comprehensive Reliability Plan will build upon the 2024 Reliability Needs Assessment.

C.2.2.3. Short-Term Reliability Process

NYISO's Short-Term Reliability Process ("STRP") evaluates the first five years of the planning horizon with a focus on needs arising in the first three years of the study period.[55] Longer-term needs are identified and resolved via the Reliability Needs Assessment (RNA) and Comprehensive Reliability Plan ("CRP").

The first step in the STRP is the Short-Term Assessment of Reliability ("STAR"). STARs are performed quarterly to proactively address reliability needs arising within five years due to various changes to the grid such as generator deactivations, revised transmission plans, and updated demand forecasts

2024 Quarter 3 Short-Term Assessment of Reliability ("STAR")

This STAR report covers the 2024 Quarter 3 findings for the study period July 15, 2024 through July 15, 2029 considering forecasts of peak power demand, planned transmission upgrades, and generation mix changes.[56] As of the cutoff data for this report, this was the most recent issued STAR. This STAR included the retirement of Astoria Generating Company L.P.'s Astoria GT 1 (Zone J, 16MW). No new reliability needs were identified in this STAR following the retirement of Astoria GT 1.

2023 Quarter 2 Short-Term Assessment of Reliability[57]

This STAR report covers the 2023 Quarter 2 findings for the study period April 15, 2023 through April 15, 2028. This report is being highlighted here because the assessment found a reliability need beginning in summer 2025 within New York City primarily driven by a combination of forecasted increases in peak demand and the assumed unavailability of certain generation in New York City affected by the "Peaker Rule."

To ensure continued reliability of electric service in New York City, the NYISO designated the generators on the Gowanus 2 and 3 and Narrows 1 and 2 barges to temporarily remain in operation after the NYSDEC Peaker Rule compliance date until permanent solutions to the Need are in place, for an initial period of up to two years (May 1, 2027).

C.2.3. CSPP Economic Planning: 2023 System & Resource Outlook

The NYISO's economic planning process, the System & Resource Outlook (the "Outlook"), provides a comprehensive overview of potential resource development over the next 20 years (2023-2042), highlighting opportunities for economic and policy-driven transmission investment.[58] This is the first

[55] NYISO, Short-Term Reliability Process Overview: https://www.nyiso.com/short-term-reliability-process
[56] NYISO, 2024 Q3 STAR Report: https://www.nyiso.com/documents/20142/16004172/2024-Q3-STAR-Report-final.pdf/2d633076-10c5-3628-32bc-ba7352cdb6be
[57] NYISO, 2023 Q2 STAR Report: https://www.nyiso.com/documents/20142/16004172/2023-Q2-STAR-Report-Final.pdf/5671e9f7-e996-653a-6a0e-9e12d2e41740
[58] NYISO, 2023–2042 System & Resource Outlook: https://www.nyiso.com/documents/20142/46037414/2023-2042-System-Resource-Outlook.pdf

step of the Economic Transmission Planning Process portion of the NYISO CSPP as described earlier in this section:

1) Develop the System & Resource Outlook
2) Identify Transmission Expansion Opportunities
3) Receive Propositions from Interested Developers to construct Regulated Economic Transmission Projects
4) Conduct Project Analysis & Determination of Beneficiaries
5) Beneficiaries Vote

This Outlook examines five potential futures:

1) A **"Base Case"** in which the future looks very similar to today.
2) A **"Contract Case"** which evaluates the impact of ~16 GW of additional renewable capacity procured by New York State.
3) **Three "Policy Case" scenarios** for advancing New York's Climate Act policy targets:
    a. A **"State Scenario"** is based on inputs specified by the NYDPS, NYSERDA and Joint Utilities and closely aligned with NYSERDA's Scoping Plan Integration Analysis. This scenario serves to support the initial cycle of the Coordinated Grid Planning Process (CGPP) which addresses the Joint Utilities' local transmission and distribution planning to achieve the Climate Act targets.
    b. A **"Higher Demand"** scenario
    c. A **"Lower Demand"** scenario

Key findings were as follows:

<u>New generation resource challenges:</u>

1) **At least 20 GW of Dispatchable Emission-Free resource (DEFRs) capacity would be needed by 2040** to replace the current 25.3 GW of fossil generation in support of the Climate Act target. These resources, along with the suite of other resources available on the system, would be required to provide essential grid services such as operating reserves, ramping, regulation, voltage support, and black start which are currently provided largely by fossil units. Potential DEFR technologies could include long-duration batteries, small modular nuclear reactors, hydrogen-powered generators or fuel cells.
2) **New York will require three times the capacity of the current generation fleet to meet electricity demands in 2042.** This increase in required generation capacity is due to the forecasted growth in demand and the type of generators that serve resources in the future.
3) **Coordination of generation retirements and additions is essential to maintaining reliability.** To maintain reliability and achieve policy mandates, coordination of generator additions and retirements will be essential. For instance, coordinating the integration of renewable energy resources, the development and commercialization of DEFRs, the operation of fossil-fuel generators, and the staged deactivations of fossil fuel generators over the next 15 years will be critical to facilitate a reliable transition of the grid. The NYISO identified this concern in the prior Outlook and it remains a challenge going forward.

4) **Uncertainty in renewables siting could lead to delays in or inefficient expansion of the transmission and distribution systems.** Transmission development goes hand-in-hand with the location of generation on the system. Uncertainty associated with siting of renewable resources may impact the timely buildout of the transmission and distribution network for efficient deliverability.

<u>Transmission challenges:</u>

1) **Historic levels of investment in the transmission system are happening but more will be needed**. Despite several significant transmission projects that have been built and approved to be built, this Outlook identified opportunities to expand the transmission system efficiently and cost-effectively to achieve Climate Act targets.
2) **Additional dynamic reactive power support must be added to the upstate New York grid to alleviate congestion and fully utilize the transmission capability of the Central East interface.** To achieve policy mandates by 2040, a minimum of 15 GW of new renewable generation is expected to be sited in Western, Central, and Northern New York, upstream of the Central East transmission interface. As the fossil units that support Central East voltage performance are retired, flows across this interface will be limited and renewables may be curtailed.
3) **Opportunities for further transmission investment in Western and Northern New York should be monitored as resources are developed in those regions.** Western and Northern New York are two renewable resource regions with significant opportunities for additional renewable generation development. With heavily utilized transmission corridors in both regions, changes in siting could result in congestion and curtailment of renewable resources.
4) **Planned energy exchange with neighboring systems is becoming more complex and will be increasingly so in the future as each system transitions to more decarbonized systems.** Solar, land-based wind, and offshore wind production is relatively coincident across the NYISO and its neighboring systems. As neighboring systems approach achievement of carbon-free mandates, the availability of excess power to support neighboring systems may be limited given the coincidence in times of low renewables.

With these identified challenges, the NYISO provides the following observations:

1) Bulk transmission constraints are no longer a major impediment to achievement of the 70% renewable by 2030 policy mandate.
2) Solar and wind will become less effective at meeting peak load after a significant amount of capacity is built.
3) This Outlook identifies three transmission expansion opportunities:
    a. Central East interface dynamic reactive power support
    b. Western New York/Southern Tier bulk transmission to accommodate further generation resource development.
    a. Northern New York bulk transmission to accommodate further generation resource development.

C.2.4. Public Policy Transmission Planning Process (PPTPP)

The Public Policy Transmission Planning Process (PPTPP) provides for the NYISO's evaluation and selection of transmission solutions to satisfy a transmission need driven by public policy requirements. The process encourages both incumbent and non-incumbent transmission developers to propose projects in response to an identified need. The PPTPP was developed in consultation with NYISO stakeholders and the New York PSC and approved by FERC under Order No. 1000. NYISO is responsible for administering the Public Policy Transmission Planning Process in accordance with Attachment Y to its OATT; the PSC has the primary responsibility for the identification of transmission needs driven by Public Policy Requirements.

The PPTPP typically commences every two years following the posting of the draft RNA study results, and consists of the following core steps:

- NYISO's solicitation of feedback on potential Public Policy Requirements that could lead to a Public Policy Transmission Need (PPTN) and subsequent filing of those responses with the PSC;
- PSC consideration of potential Public Policy Requirements and potential identification of a Public Policy Transmission Need;
- NYISO conducts a solicitation for proposed solutions if requested by the PSC;
- Evaluation of the Viability and Sufficiency of the Proposed Public Policy Transmission Projects and Other Public Policy Projects; and
- Comparative evaluation of the viable and sufficient projects for the NYISO Board of Directors to select the More Efficient or Cost-Effective Public Policy Transmission Project that satisfies the Public Policy Transmission Need, if the PSC confirms that there is a need for transmission.

Under the PPTPP, proposed solutions fall into two categories: public policy transmission projects, and other types of public policy projects. Additionally, the PSC may declare a PPTN at any time independent of the NYISO's biennial planning process.

C.2.4.1. Public Policy Transmission Projects

A transmission project or a portfolio of transmission projects proposed by a qualified Developer to satisfy an identified Public Policy Transmission Need and for which the Developer seeks to be selected by the NYISO for purposes of allocating and recovering the project's costs under the NYISO OATT.

C.2.4.2. Other Public Policy Projects

A non-transmission project (*i.e.,* generation, other resources, or demand-side projects) or a portfolio of transmission and non-transmission projects proposed by a Developer to satisfy an identified Public Policy Transmission Need.

Public Policy Transmission Projects are eligible for cost allocation and cost recovery under the NYISO's OATT. The NYISO will determine whether an Other Public Policy Project is viable and sufficient to meet a Public Policy Transmission Need; however, an Other Public Policy Project is not entitled to cost allocation and recovery under the NYISO OATT.

The PPTPP, through the NYISO Board of Directors, has selected four projects to address public policy transmission needs:

1) Western New York (Empire State Line) – In service
2) AC Transmission Segment A (Central East Energy Connect) – In service
3) AC Transmission Segment B (Segment B Knickerbocker-PV) – In service
4) Long Island Offshore Wind Export (Propel Alternate Solution 5 Early-stage development, in-service date May 2030.

C.2.4.3. Long Island Export PPTN (aka Propel NY Energy) (June 2023):

The Long Island Export Public Policy Transmission Need ("Long Island PPTN") is the most recent project to be selected via the PPTPP process.[59] The NYISO commenced a detailed evaluation of 16 viable and sufficient transmission project proposals. The NYISO considered metrics such as capital costs, voluntary cost cap, cost per MW, expandability, operability, performance, property rights and routing, development schedule, production cost savings, capacity savings, locational marginal price savings, emission savings and congestion. The NYISO staff recommended that the Board of Directors select Propel NY's T051 Alternate 5 proposal," Propel NY Energy", as the more efficient or cost-effective transmission solution to satisfy the Long Island Need, with low probability of and severity of risk. Propel NY Energy proposes the following elements:

- East Garden City – Tremont 345 kV PAR-controlled line
- 2 x Shore Rd – Sprain Brook 345 kV PAR-controlled lines
- Barrett – East Garden City 345 kV PAR-controlled line
- Ruland Rd – Shore Rd 345 kV line
- Ruland Rd – East Garden City 345 kV PAR-controlled line
- Shore Rd – East Garden City 345 kV line
- Syosset – Shore Road 138 kV PAR-controlled line

Thus, the Propel NY Energy project adds a strong 345kV backbone to the Long Island Transmission system, addresses the existing Barrett-Valley Stream 138 kV constraint, which could lead to additional production cost savings, and could also unbottle more offshore wind power for the state. The required project in-service date is May 2030.[60]

C.2.4.4. New York City PPTN

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 4,770MW of offshore wind generation into New York City by January 1, 2033.[61]

---

[59] NYISO, Long Island Offshore Wind Export Public Policy Transmission Planning Plan (2023-6-13): https://www.nyiso.com/documents/20142/38388768/Long-Island-Offshore-Wind-Export-Public-Policy-Transmission-Planning-Plan-2023-6-13.pdf/03712cc1-6da6-ee89-2f63-176d2d7a9296?t=1687290255402

[60] NYISO, Draft Long Island Offshore Wind Export PPTN Evaluation (ESPWG 4/3/2023): https://www.nyiso.com/documents/20142/36837429/07_08_b_Draft_Long_Island_Offshore_Wind_Export_PPTN_Evaluation_ESPWG04032023.pdf/891223b8-47ab-bbed-bd40-74bc8ee1d921

[61] NYISO, PSC Order on NYC PPTN: https://www.nyiso.com/documents/20142/1406395/PSC-Order-NYC-PPTN.pdf

The Viability & Sufficiency Assessment is complete and was filed with the PSC on 29 October 2024, with the more detailed evaluation commencing in January 2025.[62]

C.2.4.5. 2024-2025 PPTPP

The 202-2025 cycle of the PPTPP commenced in August 2024 with a request to interested parties for proposed transmission needs being driven by Public Policy Requirements. The Proposed Public Policy Transmission Needs were published, by NYISO on behalf of the interested parties, in the New York Register on 24 December 2024, with public comments closing 60 days after.[63] NYISO published 17 proposals for public comment.

C.2.4.6. CGPP

The identification of local transmission needs will be an outcome of the CGPP, which is undergoing its first cycle. The CGPP report is scheduled to be filed no later than January 2nd, 2026. As noted above, the CGPP analysis is intentionally structured to reflect the interdependence of bulk and local transmission solutions, and thus will be closely coordinated with the assessment and identification of bulk system needs within the Public Policy process.

In Stage 1 of the Coordinated Grid Planning Process (CGPP), NYISO developed three scenarios to assess future transmission and distribution needs aligned with New York's clean energy goals:

- **The State Scenario** reflects official climate policy targets, including 70% renewable energy by 2030 and a zero-emissions grid by 2040, serving as the baseline for system planning.
- **The Low Transmission Impact Scenario** emphasizes local generation and distributed energy resources to minimize the need for new transmission infrastructure.
- **The High Transmission Impact Scenario** assumes higher electrification-driven peak loads and reliance on remote renewable generation, requiring significant transmission expansion to meet growing demand and advance climate targets.

C.3. NYISO Interconnection Process

The interconnection process ensures "open access" to the transmission grid for new resources seeking to enter operation. The process is coordinated by the NYISO but requires significant involvement by electric utilities and project developers. NYISO analyzes three types of interconnection requests: generator additions, new transmission projects, and certain large load interconnections.[64]

All new generation, transmission, and large load projects must enter an "interconnection queue" where the proposed projects undergo a series of studies that serve three key functions:

[62] NYISO, NYC Offshore Wind PPTN Viability and Sufficiency Assessment: https://www.nyiso.com/documents/20142/40894368/New-York-City-Offshore-Wind-PPTN-Viability-and-Sufficiency-Assessment.pdf/f0f11b6f-bd1f-93ec-89bf-452fc280d626

[63] NYS Department of State, NYS Register/December 24, 2024: https://dos.ny.gov/system/files/documents/2024/12/122424.pdf

[64] NYISO, 2023 NYISO Interconnection Process Report: https://www.nyiso.com/documents/20142/35688159/2023-NYISO-Interconnection-Process-Report.pdf/300e1077-93ff-6e37-d920-2b7bfe19099e?t=1683560946199

1) Does adding the new resource create reliability issues on the transmission system?
2) If the resource does impact reliability, what upgrades are necessary to maintain reliability and how much will these upgrades cost?
3) If a facility is applying for CRIS rights, what are the effects of the transmission grid on the resource's ability to deliver power during specific windows (i.e. what is the resource's resulting capacity deliverability (CRIS))?

The NYISO interconnection process for generators generally involves successive engineering studies:

1) **Optional Feasibility Study**: Evaluation of the configuration and local system impacts to inform developers of potential issues with the point of interconnection.
2) **System Impact Study**: Evaluates the impact of the proposed project on the existing electric system including power flows and protection. This study determines whether the project triggers the need for system upgrades.
3) **Facilities Study**: Evaluates the cumulative impact of a group of projects known as the "class year." This study identifies system upgrades and assigns costs.

The interconnection process for large loads

C.3.1. Emerging Interconnection Requirements

Federal and State authorities have been pursuing new requirements to reform interconnection requirements in response to changes in interconnection queues and general system needs.

Through a 2022 project initiative, NYISO has been developing additional reforms to the interconnection process to support state policy goals while preserving reliability.[65]

In August 2024, NYISO launched a new "Cluster Study" process to reduce the time needed to assess projects. Under the new approach, interconnection requests will be evaluated collectively rather than individually, making the process more efficient for the NYISO, utilities and developers.

C.3.1.1. NYSRC Reliability Rule B.5: Establishing New York Control Area (NYCA) Interconnection Standards for Large IBR Generating Facilities

In 2024, the NYSRC implemented Reliability Rule B.5 "Establishing New York Control Area (NYCA) Interconnection Standards for Large IBR Facilities" based on IEEE Standard 2800-2022. Prior to implementation of this rule, the NYISO Interconnection Queue as of June 30, 2023 had approximately 120,000 MWs of Large Facility (>20MW) Inverter Based Resources (i.e., wind, solar, batteries)[66] and the NYSRC did not have specific IBR interconnection criteria in its Reliability Rules. Going forward, all IBR projects seeking interconnection into the NYCA must comply with B.5.

The need for Reliability Rule B.5 is based upon:

---

[65] NYISO, Interconnection Improvements Fact Sheet: https://www.nyiso.com/documents/20142/35688159/Interconnection-Improvements-Fact-Sheet.pdf/193b451c-7334-b874-3725-2aa0727d82a7?t=1729866360199
[66] NYSRC, RR-151 Procedure Document (2/9/2024): https://www.nysrc.org/wp-content/uploads/2024/02/RR-151-Procedure-Document-2-9-2024.pdf

1) Recent disturbances in Utah, Texas and California where IBRs failed to perform reliably creating system supply deficits.
2) The cumulative expected magnitude of IBRs in NYCA.
3) NYISO's interconnection queue as of 6/30/23 having greater than 120,000 MWs of Large Facility Inverter-Based Resources.
4) NERC's recommendation for Authorities Governing Interconnection Requirements (AGIR) to immediately adopt IEEE 2800-2022
5) FERC's Order 901 on Reliability Standards to address inverter-based resources.
6) FERC Order 2023 on Improvements to Generator Interconnection Procedures and Agreements.

This new reliability rule mandates that developers demonstrate compliance with IEEE 2800 as a measure to address the recent IBR-related reliability events in WECC.[67][68] Such a measure is critical to NYCA reliability as NYCA transitions to higher penetration of inverter-based resources.

C.3.1.2. FERC Order 2023

In July 2023, responding to historically backlogged queues causing delays in renewable generation deployment, FERC issued a ruling to reform nationwide interconnection queue processes.[69] The key reforms include:[70]

1. Moving from a "first come, first served" serial approach to interconnections to a "first ready, first served" requiring generator to prove commercial readiness to advance through the process.
2. Adopting a cluster study process where the impact of multiple generators is considered together as opposed to the previous serialized approach. The cost allocation is assigned by cluster and uses the proportional impact method for network upgrade costs
3. Mandating standardized, timely, and transparent interconnection processes and studies. Including financial penalties for transmission providers that fail to do so.
4. Allows co-located resources, such as batteries and renewable generators, to share an interconnection request
5. Requires the consideration of alternative transmission technologies such as grid-enhancing technologies (GETs) to provide slack to the grid to more easily interconnect new generation.[71] This is distinct from the requirements for ambient-adjusted line ratings required in Order 881.

[67] A request for a new exception to a Reliability Rule, or the removal or modification of a current exception to a Reliability Rule (an Exception Change) must be submitted to the Executive Committee for approval. An Exception Change request to the Executive Committee shall be initiated in one of three ways: (1) a request by a transmission owner following an annual transmission owner review of current exceptions, (2) a request made at any time by a market participant, or (3) a request by the NYISO or any member of the Executive Committee
[68] NYSRC, RR-151 Procedure Document (2/9/2024): https://www.nysrc.org/wp-content/uploads/2024/02/RR-151-Procedure-Document-2-9-2024.pdf
[69] FERC, Order 2023: https://www.ferc.gov/explainer-interconnection-final-rule
[70] ICF, FERC Order 2023: Solving Interconnection Queue Bottlenecks: https://www.icf.com/insights/energy/ferc-order-2023-solve-interconnection-queue-bottlenecks
[71] FERC, Order 1920: https://www.ferc.gov/news-events/news/ferc-strengthens-order-no-1920-expanded-state-provisions

6. At the request of the interconnecting customer, transmission providers should use storage operating profiles reflective of the asset's expected charging behavior.

These reforms may significantly impact NYISO's transmission planning processes and considerations. Not only might these reforms accelerate new generation deployment, but the inclusion of GETs into the transmission planning process may shape future grid development. NYISO filed its compliance plan with FERC on 01 May 2024.[72] NYISO is currently awaiting FERC approval of its filing but have proceeded with the transitional Cluster Study in the meantime.[73]

FERC notes that the existing LGIP does not include modeling requirements for non-synchronous generators such as IBRs. Accurate models are necessary to assess the facility's ability to reliably respond to transmission system disturbances. From a reliability perspective, NERC contends that the existing interconnection process does not provide sufficiently accurate and validated models for IBRs. New modeling requirements include:

1. A validated user-defined dynamics model.
2. A generic dynamics model.
3. A validated electromagnetic transients (EMT) model if EMT modeling is performed.

C.3.1.3. FERC Order 901: "Reliability Standards to Address Inverter-Based Resources

According to NERC, the rapid integration of IBRs is "the most significant driver of grid transformation" on the Bulk Power System. NERC's Reliability Standards first approved in 2007 were developed to apply nearly exclusively to synchronous generation resources.[74] As a result, these NERC Reliability Standards may not account for the material technological differences between the response of synchronous generators (i.e., rotating generators) and the response of inverter-based resources to the same disturbances (i.e., faults, trips) on the Bulk Power System.

In this order, FERC is directing NERC to develop new or modified Reliability Standards that address reliability gaps related to inverter-based resources in the following areas:

1) Data sharing
2) Model validation
3) Planning and operational studies
4) Performance requirements

FERC is taking action finding that current NERC Reliability Standards do not ensure that system operators have the necessary tools to plan and interconnect IBRs into the bulk power system. NERC's new or modified Reliability Standards are to be submitted to FERC by November 2026. FERC proposed

[72] NYISO, Order 2023 Compliance Filing Letter: https://nyisoviewer.etariff.biz/ViewerDocLibrary/Filing/Filing5173/Attachments/20240501_NYISOFlngLtr_Order2023Cmplnc.pdf
[73] NYISO, Order 2023 Compliance Plan and Tariff Revisions (ESPWG 5/14/2024): https://www.nyiso.com/documents/20142/44646498/04a_Order%20No.%202023%20Compliance%20Plan%20and%20Tariff%20Revisions_IITF_ESPWG%2020240514_Final.pdf/0de0e681-dc01-6173-69ba-00e959624bc4
[74] FERC, Order 901: https://www.ferc.gov/media/e-1-rm22-12-000

accepting NERC's proposition on 21 January 2025, with a public comment period ending on March 24th.[75]

C.3.1.4. Large Load Interconnection

NYISO Load interconnection procedures apply to Load interconnections that are either:

- Greater than 10 MW connecting at a voltage level of 115 kV or above, or
- 80 MW or more connecting at a voltage level below 115 kV[76]

As described in section 2024 Reliability Needs Assessment, New York State has seen a surge of large load interconnection requests in the past 3–5 years due to the surge in development of data centers, cryptocurrency mining farms, and new manufacturing plants such as advanced semiconductor. In between 2022 and 2024 alone, over 1,700 MW of large load interconnection requests were added, increasing the total queue capacity from a little over 1,000 MW to 2,700 MW, almost tripling the total capacity in the queue. Most of these large load interconnection requests are concentrated in the upstate region of New York State.

This increase in interconnection volume led the NYISO to update its peak demand forecast for large loads from 630 MW in 2025 to 2,239 MW by 2033 in the 2024 Gold Book—compared to the 1,224 MW forecast by 2033 in the 2023 Gold Book. [77,78]

C.4. Area Transmission Review (ATR)

The Area Transmission Review is an NPCC- and NYSRC-required annual reliability assessment of the planned bulk power transmission system conducted by NYISO. The purpose of this assessment is to demonstrate that the NYCA planned bulk power transmission system complies with NPCC criteria and the NYSRC reliability rules. This is distinct from the biannual RNA which, while incorporating many of the same analyses, is intended to inform the larger NYISO CSPP. For each annual review, the study year is four to six years from the reporting date to allow for minimum lead times required for construction, and the ability to alter plans or facilities. The reviews may be conducted for a longer term beyond six years to address identified marginal conditions that may have longer lead-time solutions. A Comprehensive ATR (CATR) is required at least once every five years with Intermediate or Interim Reviews conducted in the years between Comprehensive Reviews to address changes in the system. The most recent CATR was in 2020 (2025 study year). The most recent Interim ATR was in 2023 (2028 study year).

---

[75] Federal Register, Reliability Standards for Frequency and Voltage Protection Settings and Ride-Through: https://www.federalregister.gov/documents/2025/01/21/2025-00263/reliability-standards-for-frequency-and-voltage-protection-settings-and-ride-through-for

[76] NYISO, Manual 23 Transmission Expansion and Interconnection: https://www.nyiso.com/documents/20142/2924447/M-23-TEI-v4.2-Memo-Final.pdf/94a26e65-fd68-98e1-535b-fc41a9536607

[77] NYISO, 2024 Gold Book: https://www.nyiso.com/documents/20142/2226333/2024-Gold-Book-Public.pdf#:~:text=1646%20P%26M%20Brick%20LLC%20POWI,listed%20in%20the%20NYISO%20Interconnection

[78] NYISO, 2023 Gold Book: https://www.nyiso.com/documents/20142/2226333/2023-Gold-Book-Public.pdf#:~:text=%282%29%201465%20Digihost%20Technologies%2C%20Inc,2

C.4.1. 2020 Comprehensive Area Transmission Review

The NYCA system representation for the 2020 Comprehensive ATR was developed from the NYISO 2020 FERC 715 filing power flow models with updates according to the NYISO 2020 Gold Book.[79] The system representations of neighboring areas are from the interregional transmission planning coordination conducted under the NPCC and Eastern Interconnection Reliability Assessment Group (ERAG) Multiregional Modeling Working Group (MMWG) processes. For the 2020 CATR, the external area representation is from the 2019 ERAG MMWG series library cases. The New York Bulk Power Transmission Facilities (BPTF) included all the facilities designated by the NYISO to be part of the BPS as defined by NPCC and the NYSRC; additional non-BPS facilities are also included in the BPTF. Although the 2020 CATR analyzed the BPTF, only BPS facilities are subject to NPCC Directory #1 and the NYSRC Reliability Rules.

The 2020 CATR included **five assessments** and **two reviews**. Overall, the 2020 CATR found the planned New York State BPS to be in conformance with applicable NPCC Directory #1 and NYSRC Reliability Rules. Results from the 2020 CATR are summarized below.

The **first assessment** focused on evaluating transmission security and stability for the planned 2025 system. Full implementation of NYSDEC's "Peaker Rule" by 2025, as studied in the 2020 RNA, meant that several 345kV circuits in Zone J would not meet thermal transmission security requirements equating to a deficiency of 700MW for approximately nine hours. Additional dynamics transmission security issues were observed with a deficiency of 1,020 compensatory MVA. Before the 2020 CATR was completed, three updates were received that resolves these issues:

1) Lower 2025 forecasted load due to COVID-19 impacts: 240MW lower NYCA summer peak, and 323MW lower Zone J peak.
2) Con Edison Local Transmission Plan additions to address thermal deficiencies: three new 345/138kV PAR-controlled feeders at Rainey-Corona (by 2023), Gowanus-Greenwood (by 2025), and Goethals-Fox Hills (by 2025).
3) Con Edison changes to the status of several series reactors in response to a solicitation in the NYISO Short-Term Reliability Process (STRP) for a reliability need beginning in 2023.

With these three updates, all thermal and stability violations were resolved.

The **second assessment** included a power flow and stability analysis to evaluate the performance of the BPS for low probability extreme contingencies as defined in NPCC Directory #1 and NYSRC Reliability Rules. Results from the power flow analysis indicated that the extreme contingencies do not cause significant thermal or voltage violations over a widespread area. While the results from the stability analysis indicated that the system remains stable for most extreme contingencies, a few extreme contingencies may result in loss of local load or generation reduction within an area due to low voltage or thermal violations.

The **third assessment** focused on the fault current duty at BPTF buses in the short circuit representation. No over-dutied breakers were observed in this assessment.

[79] NYISO, 2020 Comprehensive Area Transmission Review: https://www.nyiso.com/documents/20142/1397660/2020-Comprehensive-Area-Transmission-Review.pdf/

The **fourth assessment** evaluated extreme system conditions with a low probability of occurrence (for example, high peak load conditions resulting from extreme weather and the loss of fuel (gas) supply). For both high peak load and loss of gas supply, the power flow analysis results indicated that no thermal or voltage violations on the BPTF.

The **fifth assessment** evaluates other requirements specific to NYSRC Reliability Rules including: System Restoration Assessment and Local Operation Area criteria. The 2025 planned system met these NYSRC reliability rules.

The **first review** conducted for this CATR evaluated Special Protection Systems (SPS). New York added new SPS since the 2015 CATR, some SPS have been retired, following NPCC evaluation and approval process. System conditions have not changed sufficiently to impact the operation or classification of existing SPS.

The **second review** evaluated exclusions to NPCC Directory #1 criteria. NYCA had no existing exclusions or requests for new exclusions to NPCC Basic Criteria.

C.4.2. 2023 Interim Area Transmission Review

The NYISO 2023 Interim ATR was the third Interim ATR since the 2020 NYISO CATR and the most recent ATR as of the cut-off date for this report.[80] The Guidelines and Procedures for NPCC Area Transmission Reviews required each Area to conduct a CATR at least every five years and either an Interim or an Intermediate ATR in each of the years between CATRs, as appropriate.

The 2023 Interim ATR assessed the reliability impacts of changes in forecasted system conditions and planned New York BPTF since the 2020 CATR and is conducted for Year 2028. Those forecasted conditions and planned facilities were based on changes in the load forecast, capacity resources, and transmission facilities as reported in the 2023 NYISO Gold Book for the year 2028. These changes were assessed as not impactful to the BPS. Therefore, no impacts to the reliability of the BPS were identified, and no Corrective Action Plans were required.

C.4.3. 2024 Comprehensive Area Review of Resource Adequacy

The NYISO is required by the NPCC and the NYSRC to conduct a Comprehensive Area Review of Resource Adequacy for the New York State BPS every three years, analyzing five-year forward-looking period. In the two interim years between the comprehensive reviews, an Interim Area Review of Resource Adequacy is required, analyzing a minimum of the remaining years of the five-year period studied in the Comprehensive Review of Resource Adequacy.

The 2024 Comprehensive Area Review of Resource Adequacy demonstrates compliance with applicable NPCC resource adequacy planning requirements and the NYSRC Reliability Rules covering the 2025-2029 study period and reflects study assumptions from the NYISO's 2024 RNA and the NYISO's 2024 Q3 STAR base cases. Additionally, the NYISO performed a scenario for informational purposes, using a high demand forecast. The NYCA LOLE for this scenario, while higher, is still below the criterion for the five study years.

---

[80] NYSRC, B.1 R1-R4 2023 Dec NYISO Interim ATR Study Year 2028: https://www.nysrc.org/wp-content/uploads/2024/02/B.1-R1-R4-2023-Dec-NYISO-Interim-ATR-Study-Year-2028.pdf

The 2023 Interim New York Area Review of Resource Adequacy demonstrated compliance with the applicable NPCC resource adequacy planning requirements and the NYSRC Reliability Rules covering the 2024-2026 study period. The review highlighted the NYISO's 2023 Q2 Short-Term Assessment of Reliability (STAR) report and the actionable near-term reliability need in New York City locality. This 2023 interim review reflects study assumptions from the NYISO's Reliability Planning Process, the 2023 Gold Book, and transmission upgrades and projects approved in 2022-23. The report concluded that the NYCA will meet the NPCC and NYSRC resource adequacy criterion of no more than 0.1 days/year under the Base Case peak demand forecast.[81]

C.5. NERC Reliability Assessments

The NERC 2024 Long-Term Reliability Assessment (LTRA) and NERC State of Reliability (SOR) Report provide key insights into the current and future reliability of the bulk power system (BPS) across North America. The LTRA evaluates long-term system adequacy, focusing on factors such as planning reserve margins, resource adequacy, and transmission developments, while highlighting emerging reliability challenges in regions like New York. In contrast, the SOR Report offers a retrospective analysis of system performance, assessing trends in reliability metrics and identifying actionable risks. Together, these reports inform industry stakeholders and policymakers about critical reliability concerns, guiding future planning and investment decisions.

C.5.1. NERC 2024 Long-Term Reliability Assessment

With its designation by FERC and Canadian authorities as the ERO for North America, pursuant to Commission regulation, NERC files annual Long-Term Reliability Assessments (LTRA) with FERC. While these Assessments are based on data and self-assessment summaries provided by the eight regional reliability organizations (based on established criteria and metrics), the key findings, summaries, and recommended actions represent NERC's independent judgment. Thus, the underlying metrics supporting the Assessment are standard metrics and criteria currently used in the industry.

As presently structured, the LTRA examines:

- Planning Reserve Margins
- Peak-Demand and Energy Projections
- Demand Response
- Distributed Energy Resources
- Generation Resources (including projected wind and solar additions)
- Fuel Mix (including supply and delivery vulnerabilities)
- Capacity Transfers
- Transmission

[81] NPCC, 2023 Interim New York Area Review of Resource Adequacy: https://www.nyiso.com/documents/20142/4011643/2023NPCC-NYISOReviewRA-FinalDec5RCC.pdf/88f8d5ce-aafd-5eaa-1201-ec4463221a26

In the 2024 LTRA, with respect to the New York Control Area, NERC reported the following:[82]

- Recent assessments reveal that reliability margins are shrinking. Electrification programs are increasing the demand for electricity and placing New York on a trajectory to be a winter-peaking system in the future.
- Largely in response to public policies, fossil fuel generators are retiring at a faster pace than new renewable supply is entering service. The potential for delays in construction of new supply and transmission, higher than forecasted demand, and extreme weather could threaten reliability and resilience of the New York grid.
- NYISO's reliability studies identified actionable reliability needs starting 2025 in New York City. The reliability need is primarily driven by a combination of forecasted increases in peak demand and the assume unavailability of certain generation in New York City affected by state legislation and regulations promulgated by the New York State Department of Environmental Conversation, commonly known as the Peaker Rule, to limit emissions. Following a solicitation for proposed solutions to the reliability need, NYISO retained several plants in New York City that would have otherwise been deactivated to comply with the Peaker Rule.
- NYISO's 2024 Reliability Needs Assessment (RNA), targeting completion in the fourth quarter of 2024, identifies transmission security violations of reliability criteria primarily driven by a combination of forecasted increases in peak demand, limited additional supply, and the assumed retirement of generation in New York City in response to state law and regulations.
- Driven by public policies, new supply, large loads, and transmission projects are seeking to interconnect to the grid at record levels. NYISO's interconnection process balances developer needs with grid reliability. Efforts are underway to make this process more efficient while protecting grid reliability.
- New transmission is being built, but more investment is necessary to support and delivery of offshore wind energy and to connect new resources upstate to downstate load centers where demand is greatest. Planning for new transmission to support offshore wind is underway in NYISO's Public Policy Transmission Planning Process.
- To advance the targets of the Climate Act, new dispatchable emission-free resources (DEFR) with the necessary reliability services will be needed to replace the capabilities and attributes of today's generation. These types of resources, which can achieve the necessary attributes by a combination of solutions, must be significant in capacity and have attributes similar to traditional generation plants, such as the ability to come on-line quickly, stay on-line for as long as needed, maintain the system's balance and stability, provide ERSs, and adapt to meet rapid, steep ramping needs. Such new emission-free supply is not yet available on a commercial scale.
- New wholesale electricity market rules are supporting the grid in transition. These markets are critical for a reliable transition. Wholesale electricity markets are open to significant investment in wind, solar, and battery storage as well as distributed energy resources.

---

[82] NERC, 2024 Long Term Reliability Assessment: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_Long%20Term%20Reliability%20Assessment_2024.pdf#:~:text=This%202024%20LTRA%20is%20the%20ERO%E2%80%99s%20independent%20assessment

- Demand management programs are also under development as a measure to facilitate advancement of Climate Act targets. By lowering the peak load and avoiding system buildout to serve the highest demand hour, fewer DEFRs and fossil fuel-fired plants will be needed to meet lower peaks during the transition.

C.5.2. NERC State of Reliability Report

The NERC State of Reliability (SOR) report represents NERC's independent view of on-going bulk power system reliability trends. The report objectively analyzes the state of reliability based on metric information and provides an integrated view of reliability performance. Key findings and recommendations serve as technical input to NERC's Reliability Standards and project prioritization, compliance process improvement, event analysis, reliability assessment, and critical infrastructure protection. The SOR report not only provides an industry reference for historical bulk power system reliability, but also offers analytical insights towards industry action, and enables the discovery and prioritization of specific actionable risk control steps.

The first SOR report was issued in May 2012 and found the bulk power system reliability was stable over the period from 2008 to 2011 since the metrics showed no significant upward or downward trends.

The most recent SOR report issued in 2024 focused on the reliability of the BPS during 2023 as measured by a predetermined set of reliability indicators (metrics). Based on those metrics, the BPS provided improving or stable metrics, except for M-1: Reserve Margin which is actionable The report states that the Quebec Interconnection needs to monitor their interconnection frequency response (M4), inertia and rate-of-change-of-frequency (M-4.1), and interconnection reliability operating limit exceedance (M-8). Both the Eastern and Quebec Interconnections need to monitor their interconnection reliability operating limit (IROL) exceedance (M-8). In addition to identifying reliability risks, NERC highlighted significant work by industry to improve reliability.

NERC's analysis of the 2023 events and data produced the following key findings:

1) The <u>BPS shows overall resilience</u>. While there was an overall absence of extreme weather, BPS was still reliable while experiencing patterned severe weather. In 2023, severe wildfires were recorded in Canada, however, there was little impact on BPS' reliability. BPS performed better on average in 2023 on the worst performing days than previous years, especially in their restoration time of transmission outages which decreased by 10-20%.
2) <u>Forced outages due to generation remains high.</u> As mentioned above, 2023 had no abnormal, extreme weather events, however the weighted equivalent forced outage rates (WEFOR) remained consistently high with historical rates, resulting in high conventional generator outages. As wind resources' forced outage rate grows, it becomes more of an issue as the dependence and introduction of this resource also grows. Since more reporting requirements have been adopted in 2024, there is hope for a more detailed and accurate analysis of resources.
3) <u>BPS reliability is and will continue to be negatively impacted by inverter-based resources</u>. Several events in 2023 related to IBR disturbance response challenge reliability. The unexpected loss of generation and lack of ride-through support from these types of resources create system stability challenges. IBR resources include solar, wind and battery energy storage systems.

C.6. Regional / Interregional Planning

The New York transmission system is physically connected to the broader Eastern Interconnection. Changes within the New York grid affect adjacent zones and vice versa. Both voluntary interregional planning processes and federal planning requirements aim to increase the efficiency of the Eastern Interconnection as a whole by facilitating cross-ISO transmission planning and coordination.

C.6.1. FERC Orders 890 & 1000

On February 16, 2007, FERC issued Order No. 890, which reformed FERC's *pro forma* open access transmission tariff (OATT) established in Order No. 888 to provide for an open, transparent, and coordinated planning process at both a regional and a local level. FERC stated that "each of the Commission-approved RTOs in the Northeast, Midwest, Southwest, as well as California, provides for a coordinated and regional planning process with stakeholder input from every industry segment" and that it "fully supports these existing efforts…" FERC further recognized that in regions where significant planning processes already existed, such as in RTOs and ISOs, those processes may not need to be drastically changed to comply with Order No. 890.

Most significantly, to comply with the Order No. 890 transmission planning principles, the NYISO created the Comprehensive System Planning Process. The NYISO developed a process that incorporated FERC's planning principles, including coordination, openness, transparency, information exchange, comparability, dispute resolution, regional participation, economic planning studies, and cost allocation for new projects. The CSPP built on the NYISO's existing reliability planning process to add a new economic planning process, add a local transmission planning component, and introduce cost allocation and recovery for regulated reliability and economics projects. Ultimately, the Commission accepted all the NYISO's planning processes.

FERC Order No. 1000. In July 2011, FERC issued Order No. 1000, a major ruling on transmission planning and cost allocation. The Commission stated that Order No. 1000 is intended to build on Order No. 890's planning requirements to achieve two "primary objectives:"

1) transmission planning processes at the regional level consider and evaluate, on a non-discriminatory basis, possible transmission alternatives and produce a transmission plan that can meet transmission needs more efficiently and cost-effectively; and
2) costs of transmission solutions chosen to meet regional transmission needs are allocated fairly to those who receive benefits from them.

Order No. 1000 requires participation by public utility transmission providers in regional transmission planning processes. These regional processes must "evaluate transmission alternatives at the regional level that may resolve the transmission planning region's needs more efficiently and cost-effectively than alternatives identified by individual public utilities in their local transmission planning processes," including the consideration of needs driven by Public Policy Requirements. FERC also directs the improvement of coordination across regional planning processes and the establishment of cost allocation methods for interregional transmission facilities that are included in regional transmission plans. Additionally, Order No. 1000 mandates that cost allocation for new transmission facilities be based on the "beneficiaries pay" principle and directs that costs "not be involuntarily allocated to entities that do not receive benefits." Regional and inter-regional transmission plans must consider transmission facilities proposed by all entities. Order No. 1000 also requires that "generation, demand resources, and transmission be treated comparably in the regional transmission planning process."

In response to Order No. 1000, the NYISO expanded its regional transmission planning tariffs to add the following processes:

- A new Public Policy Transmission Process to address transmission needs identified by the NYPSC that are driven by federal, state and local laws and regulations, including a new Public Policy Requirement established by the NYPSC after public notice and comment;
- Qualifying developers to propose Public Policy Transmission Projects and Reliability Transmission Project;
- Ranking and selecting the more efficient and cost-effective transmission projects in response to reliability and public policy needs;
- Expanding NYISO's planning protocol with ISO-NE and PJM and considering interregional transmission projects located in New York and another region to meet regional transmission needs;
- Subscribing non-incumbent developers to provide transmission service under the NYISO's tariffs, including project development and facility operating agreements; and
- Allocating and recovering the costs of selected transmission projects.

C.6.1. FERC Order 881

On December 16, 2021, FERC Issued Order 881 to improve the accuracy and transparency of transmission line ratings. Order 881 requires transmission operators such as NYISO do the following:[83]

- Implement Ambient Adjusted Ratings (AARs) (i.e. line ratings adjusted for temperature forecasts) when evaluating near-term (ends within 10 days of the request for service) transmission service, and seasonal ratings for longer-term transmission service. The AARs typically only account for temperature effects online capacity.
- Establish and implement systems and procedures to enable transmission owners to implement hourly dynamic line ratings (DLRs) in the RTO/ISO markets, if they choose to do so. DLRs would be more accurate than AARs, because they utilize additional data for increased precision and have more granular temporal requirements than AARs (per FERC definitions).
- Use uniquely determined emergency ratings for contingency analysis in the operations horizon and in post-contingency simulations of constraints. Separately, transmission owners must also share these line ratings and associated methodologies with transmission providers, market monitors, and RTO/ISOs.

The initial Order 881 compliance deadline was November 12, 2024. NYISO submitted their initial compliance filing on July 12, 2022, and a further compliance filing on June 20, 2023 addressing

[83] FERC, Staff Presentation – Final Order on Transmission Line Ratings: https://www.ferc.gov/news-events/news/staff-presentation-final-order-regarding-managing-transmission-line-ratings

deficiencies in the initial filing.[84] Following an extension request filed on January 30, 2024, FERC has extended NYISO's compliance deadline until December 31, 2027, to account for the completion of hardware and software upgrades necessary to maintain reliability and efficiency while implementing the Order's requirements.[85]

C.6.2. FERC Order 1920 and 1920-A

Issued in May and November of 2024, Orders 1920 and 1920-A expand the long-term planning requirements for the transmission planning regions.[86] This is the first Order in more than a decade addressing regional transmission policy, and the first time the Commission has directly addressed the need for long-term planning. This order was issued partially in response to recent forecasts of significant electricity demand growth in the next decade, but also to address several issues left unresolved from the Commission's previous efforts. The Commission's last effort was Order 1000, issued in 2011, which intended but largely failed to spur additional interregional transmission development.[87] Specifically, the new Orders aim to increase the efficiency of the planning process, reduce fragmentation in planning efforts, and realign cost allocation to encourage investment in transmission infrastructure.[88] Key points include:

- FERC Order 1920
  - The planning processes must occur every 5 years and consider multiple scenarios for a 20-year time horizon.
  - Planners must use scenario-based transmission planning to anticipate potential changes in grid conditions.
  - Planners may evaluate transmission portfolios instead of individual projects, with benefits calculations assessed at the portfolio-level.
  - Planners must consider "right-sizing" transmission projects by modifying existing facilities instead of constructing entirely new projects.
  - Planners must make a good faith effort to coordinate with relevant state entities during the planning process, enabling states to voice their needs and highlight permitting barriers.
  - Planners must consider a selection of emerging transmission technologies, including alternative transmission technologies and grid-enhancing technologies such as dynamic

[84] NYISO, FERC Order 881 Day-Ahead Market Congestion Settlement Enhancements: https://www.nyiso.com/documents/20142/41135762/Order%20881%20-%20AAR%20Congestion%20Settlement%20Enhancements.pdf
[85] NYISO, FERC Order Filing ER22-2350-000: https://nyisoviewer.etariff.biz/ViewerDocLibrary/FercOrders/20240329-3036_ER22-2350-000_34925.pdf
[86] FERC, Order 1920 Fact Sheet: Building the Future Through Electric Regional Transmission Planning: https://ferc.gov/news-events/news/fact-sheet-building-future-through-electric-regional-transmission-planning-and
[87] Utility Dive, FERC Chair Hints at a New Order 1000: https://www.utilitydive.com/news/with-new-transmission-urgently-needed-ferc-chair-hints-at-a-new-order-1000/555586 /
[88] NASEO, FERC Order 1920 Explainer: https://www.naseo.org/Data/Sites/1/documents/tk-news/ferc-order-1920-explainer-final.pdf

line ratings and advanced power flow controls. These are distinct from Order 881's requirements.

  - Planners must share their long-term planning assumptions, solutions, and needs with neighboring regions to ensure representation of interregional interactions in planning studies and promotes efficient load service.
  - States may create a State Agreement Process to handle the cost allocation provisions required by FERC Order 1000. This process allows individual states or groups of states to voluntarily cover the cost of transmission projects that address economic or public policy objectives when parties cannot agree on an allocation methodology.
- FERC Order 1920-A
  - Requires transmission providers include state input into its future scenario planning processes and state-agreed cost allocation proposals.
  - Transmission providers must include cost allocation methods or state agreement processes in their compliance filings
  - Transmission providers may craft, in addition to the three required Long Term Transmission Planning Scenarios required in Order 1920, any number of additional scenarios that do not need to strictly adhere to Order 1920's scenario requirements (as long as they engage in a robust planning process and meet transparency requirements).
  - Transmission providers must develop a reasonable number of scenarios at the request of Relevant State Entities to inform their cost allocation methods.

These Orders were drafted by FERC to ensure that electricity rates remained just and reasonable, with a compliance date of June 12, 2025, for compliance with regional requirements and August 12, 2025, for the interregional requirements.

C.6.3. Eastern Interconnection Planning Collaborative

The Eastern Interconnection Planning Collaborative was formed in early 2009 to foster an open and collaborative process for conducting technical analyses of transmission planning within the Eastern Interconnection. The efforts of this group are summarized in a "State of the Eastern Interconnection Report."

C.6.3.1. EIPC State of the Grid Report - 2021

In August 2018, the EIPC published its first report containing a description of EIPC activities and summary of results from studies and analyses on the collective transmission plans in the Eastern Interconnection.[89] [90] This report chronicles the work of EIPC since its inception focusing on the work done on its roll-up cases. The report serves as an informational tool for policymakers and regulators by providing objective information from those directly charged with the responsibility to plan a reliable,

[89] EIPC, Study Documents Archive: https://eipconline.com/eipcstudydocuments
EIPC, State of the Eastern Interconnection: https://static1.squarespace.com/static/5b1032e545776e01e7058845/t/61b8f9ae4172c60bdd3a72ad/1639512495712/2021+EIPC+State+of+the+Grid+12-7-21.pdf

transmission grid in the Eastern Interconnection. It addresses the present and future state of transmission planning for bulk power grid reliability and the interregional coordination of those efforts. In this sense, the report provides a firm, factual basis that policymakers and regulators can use when considering questions such as *"Is the bulk power grid in the Eastern Interconnection being planned in a manner that adequately addresses bulk power reliability on a broad interconnection-wide basis?"*

The State of the Eastern Interconnection report concludes that the Eastern Interconnection grid is being planned in a coordinated manner facilitated in part by the work of EIPC. Furthermore, studies done by EIPC support the following conclusions:

- The Eastern Interconnection is being successfully planned to meet reliability requirements;
- Coordination of planning is being conducted on an interconnection-wide basis;
- The roll-up analyses demonstrate that the respective Planning Coordinator transmission planning and interconnection processes, which explicitly include requirements for coordination, have yielded transmission plans that are well coordinated on a regional and interconnection-wide basis; and
- Planning Coordinator regional transmission plans, including generator retirements and additions, will require continued study enhanced by broader interconnection-wide coordination to demonstrate that individual regional plans do not conflict with other regional plans.

C.6.3.2. EIPC Support of State and Federal Agencies

EIPC has supported state and federal agencies with relevant and technically sound information from results of its studies. In the past, EIPC worked with the Eastern Interconnection States' Planning Council (EISPC) on the DOE Interconnection Studies Grant through AARA funding as noted above. Today, the EISPC has transformed itself into the National Council on Electricity Policy (NCEP). EIPC continues to work with NCEP on topics of mutual interest and support their activities with technical information and results from EIPC studies.

EIPC continues to support DOE as the single point of contact for information, feedback, and analyses from the Planning Coordinators in the Eastern Interconnection. EIPC has provided input to:

- Earlier publications of the Annual Transmission Data Report;
- Periodic Congestion Studies;
- Regional Transmission Planning Reports;
- Eastern Renewable Generation Integration Study (ERGIS) conducted by NREL; and
- Two current DOE Grid Modernization projects - East-West Grid Ties and Grid Valuation.

C.6.3.3. Future EIPC Activities

EIPC continues to engage in collaborative activities that will enhance the transmission planning and coordination activities among the Planning Coordinators in the Eastern Interconnection. The EIPC continues its work on periodic interregional transmission gap analysis and linear transfer analysis as it had in prior Roll-up studies, and to expand its collaborative coordination into additional areas where that coordination will further benefit the entire Eastern Interconnection. The planned efforts will leverage the earlier work undertaken by EIPC on roll-up case development and analyses and will allow EIPC and its members to stand ready to provide relevant, timely, and technically sound information on issues impacting the interconnection.

C.6.4. Northeast Coordinated System Plan

ISO-NE, the NYISO, and the PJM each produce its own regional plan covering the needs of the region that each ISO/RTO serves.[91] In addition, these ISOs/RTOs work jointly under the Amended and Restated Northeastern ISO/RTO Planning Coordination Protocol which was expanded under Order No. 1000 and describes the processes and procedures to coordinate the interregional planning activities. The intent of this collaboration under the joint planning protocol is to plan on a wider interregional basis in a proactive and well-coordinated manner.

The current protocol describes:

- The structures and functions of the two committees that implement the Protocol's procedures (Section 2);
- The data and information to be exchanged among the Parties, and the procedures by which the exchange is undertaken (Section 3);
- Procedures used to coordinate the evaluation of certain interconnection and transmission service requests (Sections 4 and 5);
- Procedures for conducting periodic comprehensive interregional assessments (Section 6);
- Procedures for identification and evaluation, pursuant to the requirements of FERC Order 1000, of potential interregional transmission projects that can address regional needs in a manner that is more efficient or cost-effective than separate regional solutions (Section 7);
- The contents of the Northeast Coordinated System Plan (NCSP) prepared pursuant to the Protocol (Section 8);
- How costs are allocated among the Parties, including the costs of Interregional Transmission Projects approved under the procedures described in Section 7 (Section 9); and
- The mechanisms for the resolution of disputes among the Parties and other general provisions (Section 10).

To implement the protocol, the Joint ISO/RTO Planning Committee (JIPC) was formed that includes representation of all the ISOs and RTOs, and an open stakeholder group called the Interregional Planning Stakeholder Advisory Committee (IPSAC) was created to discuss work conducted by the JIPC.

C.6.4.1. Amended and Restated Northeastern ISO/RTO Planning Coordination Protocol

The 2023 NCSP documents planning activities during 2022 and 2023 under the provisions of *Amended and Restated Northeastern ISO/RTO Planning Coordination Protocol*.[92] These protocols describe the foundation for processes and procedures through which coordination of system planning activities will be implemented by the ISOs and RTOs of the northeastern United States and Canada. The protocols were last updated in 2015.

---

[91] ISO-NE, 2023 Northeastern Coordinated System Plan: https://www.iso-ne.com/static-assets/documents/100011/2023_ncsp_pjm_nyiso_iso_ne_final.pdf

[92] ISO-NE, Northeastern ISO/RTO Planning Coordination Protocol: https://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/othr/ipsac/rto_plan_prot/planning_protocol.pdf#:~:text=The%20Northeastern%20ISO%2FRTO%20Planning%20Coordination%20Protocol%20%28%E2%80%9CProtocol%E2%80%9D%29%20describes,RTOs%20of%20the%20northeastern%20United%20States%20and%20Canada

The 2023 NCSP builds upon the 2022 NCSP and demonstrates that PJM, ISO-NE, and NYISO have successfully implemented the Amended Planning Protocol through the following activities:

- Continued coordination and exchange of data;
- Provision of regional and interregional stakeholder opportunities for reviewing and recommending regional and interregional transmission planning needs and solutions;
- Review of transmission needs and solutions proposed by neighboring systems and coordination of necessary planning studies across interregional boundaries;
- Coordination of the interconnection queue, long-term firm transmission service and transmission projects that potentially affect or could affect interregional system performance; and
- Coordination of other internal planning studies across ISO/RTO boundaries.

The 2023 NCSP discusses system needs and plans for meeting these needs. Key findings and conclusions include:

- Regional and interregional stakeholders provide the ISO/RTOs with key input for system planning activities through an open process;
- The ISO/RTO regional and interregional planning activities conducted during 2022 and 2023 reviewed regional needs and solutions and did not identify any need for new interregional transmission projects for cost allocation that would be more efficient or cost effective in meeting the transmission system needs of multiple regions than proposed regional system improvements included in the ISO/RTOs' respective regional plans;
- Queue interconnection studies remain well coordinated across ISO/RTO boundaries, including studies of additional generating and transmission facilities that could affect interregional system performance; and
- The ISO/RTOs demonstrate compliance with all planning criteria and regulatory requirements.

The ongoing nature of planning studies allows the ISO/RTOs to effectively align the timing of their interregional planning activities and studies. Interregional studies for resource adequacy, transmission planning, economic performance, and other issues have been well coordinated through the ISO/RTO interregional planning efforts described in this report. Interregional issues, such as the effects of environmental regulations and the development of renewable/intermittent resources, have also been well coordinated through the JIPC, EIPC, and the ISO/RTO Council.

C.6.5. Eastern Interconnection Reliability Assessment Group

The purpose of the Eastern Interconnection Reliability Assessment Group (ERAG) is to further augment the reliability of the bulk power system in the Eastern Interconnection through periodic studies of seasonal and longer-term forecasted transmission system conditions.

As part of the joint ERAG agreement signed by the six reliability regions in the Eastern Interconnection, the SERC East-RFC-NPCC (SeRN) Steering Committee, under the direction of the ERAG Management Committee, conducts appraisals of the SeRN interregional system performance. On a regular basis, the SERC East-RFC Working Group and the RFC-NPCC Working Group, under the guidance of the SeRN Steering Committee, performs the interregional transfer capability studies. The studies, which are used to measure system strength and evaluate system performance, are completed semi-annually with anticipated operating conditions of the near-term summer and winter peak load conditions. Long-term studies are periodically performed.

C.7. Compliance and Enforcement

The New York transmission grid is subject to multiple overlapping layers of compliance and enforcement authorities. These authorities aim to enforce compliance of the transmission system reliability standards and criteria, and levy different requirements on different transmission system entities.

C.7.1. Authorities for Compliance and Enforcement

At the highest level, FERC plays a significant role in maintaining and enhancing the reliability of the bulk power system through enforcement of compliance with applicable standards and criteria. FERC oversees NERC (the ERO) and the eight Regional Entities, including the NPCC. The NYISO and the TOs are charged with day-to-day reliability responsibilities, with oversight by NYSRC, NPCC, and NERC. All three conduct audits and investigations relating to reliability programs and potential violations; FERC processes Notices of Penalty to the registered entity assessed by NERC or the Regional Entities for violations of electric reliability standards.

FERC can investigate alleged violations of reliability standards independently or in coordination with NERC, or review conduct that is the subject of a Notice of Penalty filed with FERC. FERC investigations primarily focus on violations resulting in actual harm, either through the loss of load or through some other means, as well as cases involving repeat violations of reliability standards or a violation of a standard that carries a substantial actual risk to the system. Reliability investigations may result in detailed compliance plans, reliability enhancements, and significant civil penalties being imposed of up to one million dollars per day per violation.

FERC conducts reliability observation, independence, and standards audits on a proactive basis to ensure:

- Regional Entities are conducting their own robust audits;
- Regional Entities are properly carrying out their responsibilities in an independent manner; and
- Regional Entities comply with the Reliability Standards. In some cases, FERC performs these audits in conjunction with NERC.

Under FERC-approved procedures, NERC files Notices of Penalty, which detail findings and resolution of violations or alleged violations by NERC or the Regional Entities. A Notice of Penalty may result in a settlement agreement and also describes mitigation efforts and factors considered by NERC or the Regional Entity in determining the appropriate remedy. FERC's enforcement program attempts to work in coordination with other FERC efforts on reliability, such as the review and approval of new Reliability Standards, educating the regulated community about FERC's reliability efforts, and promoting excellence in electric utility operational practices designed to enhance reliability.

In New York State, while NERC performs overall reviews, primarily through periodic on-site audits, the NPCC monitors compliance from a regional perspective through its task force structure. The NYSRC also conducts independent compliance reviews through its Reliability Compliance Monitoring Subcommittee, ultimately reporting to the NYSRC Executive Committee. As noted earlier, the PSC has adopted the NYSRC requirements as state regulations, enforcing compliance with those requirements when necessary.

C.7.2. Control Area / NYISO

As the NERC registered entity for several functions within the New York Control Area, primary responsibility for overall bulk electric system planning and operations rests with the NYISO. Responsibility for certain transmission operating and planning functions are split between the NYISO and Transmission Owners (that are registered entities for many of the same functions as the NYISO) under a Coordinated Functional Registration model.

The NYISO's program for maintaining compliance with electric power industry reliability and business standards is administered by an internal reliability compliance group.[93] This group monitors mandatory and enforceable reliability standards, coordinates the NYISO's compliance reporting, and oversees the NYISO's adherence to the requirements and rules promulgated by NERC, NPCC, NYSRC, and the North American Energy Standards Board (NAESB).[94]

Each year NERC, NPCC, and NYSRC identify a set of standards, criteria, and rules that will be monitored.

The NYISO provides certifications of compliance with NYSRC Reliability Rules to that organization's Reliability Compliance Monitoring Subcommittee every year. In addition, NERC and NPCC conduct periodic on-site audits and off-site spot audits.

C.7.3. Transmission Owners (TOs)

As owners of the transmission facilities in the State of New York, the TOs are responsible for compliance with applicable NERC standards and associated requirements. Since NERC standards became mandatory, NERC can and has conducted audits to monitor and ensure compliance. In functional areas of bulk system operations where the NYISO is registered with NERC, it must rely on the New York Transmission Owners to execute certain tasks.[95] The New York TOs also are responsible for compliance with applicable requirements and criteria of NERC, NPCC and the NYSRC.

C.7.4. Generators

Generators located in the New York Control Area are required to register with NERC as Generator Owners and, as applicable, Generator Operators and are responsible to meet and comply with the applicable NERC standards and associated requirements. Since NERC standards became mandatory in 2007, NERC can and has scheduled audits of the New York Generator Owners. With respect to

[93] NYISO, Reliability & Compliance Overview: https://www.nyiso.com/reliability-compliance1

[94] NAESB serves as an industry forum for the development and promotion of business standards that provide an efficient marketplace for wholesale and retail natural gas and electricity, as recognized by its customers, business community, participants, and regulatory entities.

[95] NERC, Coordinated Functional Registration: https://www.nerc.com/pa/comp/Pages/Registration.aspx

generator compliance with the NYSRC Reliability Rules, NYISO develops rules and procedures, typically through its manuals, procedures, and tariffs approved by FERC, that require the New York Generators to comply with applicable NYSRC Reliability Rules.

C.7.5. Market Monitoring Unit

The core functions of the NYISO's Market Monitoring Unit (MMU) include reporting on market outcomes, evaluating the competitiveness of the wholesale electricity markets, identifying market flaws, and recommending improvements to the market design.[96] The 2023 State of the Market Report (SOM), released in May 2024, presents the MMU's assessment of the operation and performance of the wholesale electricity markets administered by the NYISO in 2023.[97] Overall, the MMU found that the NYISO markets performed competitively in 2023.

The NYISO operates competitive wholesale markets to satisfy the electricity needs of New York. The energy and ancillary services markets are supplemented by the installed capacity market, which provides incentives to satisfy NYISO's planning reliability criteria over the long-term by facilitating efficient investment in new resources and retirement of older uneconomic resources.

The SOM Report also analyzes the impact of congestion along major transmission paths on market prices in the day-ahead and real-time markets. Congestion arises when the transmission network does not have sufficient capacity to dispatch the least expensive generators to satisfy demand. When congestion occurs, the market software establishes clearing prices that vary by location to reflect the cost of meeting load at each location. These LBMPs reflect that higher-cost generation is required at locations where transmission constraints prevent the free flow of power from the lowest-cost resources.

Transmission constraints on the high voltage are managed by scheduling resources in the day-ahead and real-time markets to provide relief. Congestion on the low voltage network is managed through out-of-market actions by the operators (not managed through the day-ahead and real-time markets). Out-of-market actions have become increasingly common in recent years due to the retirement of generation on the low-voltage network.

Congestion charges are included in purchases and sales (including bilateral transactions) in the day-ahead and real-time markets based on the congestion components of the day-ahead and real-time LBMPs. Market participants can hedge their congestion charges in the day-ahead market by owning TCCs, which entitle the holder to payments corresponding to the congestion charges between two locations. While most of the congestion revenues are collected in the day-ahead market (where most generation is scheduled), congestion in the real-time market is important because it drives day-ahead congestion in a well-functioning market.

The MMU analyzes the impact of congestion on the NYISO markets by summarizing:

<u>Day-Ahead Congestion Revenues</u> are collected by the NYISO when power is scheduled to flow across congested transmission lines in the day-ahead market.

---

[96] Potomac Economics serves as the Market Monitoring Unit (MMU) to the New York ISO Board of Directors. As the MMU, Potomac Economics reports directly to the New York ISO's Board of Directors and monitors each of the markets administered by the New York ISO. The objective of this monitoring is to identify conduct by market participants or market rules that compromise the efficiency or distort the outcomes of the markets.

[97] Potomac Economics, 2023 State of the Market Report for the New York ISO Market: https://www.potomaceconomics.com/wp-content/uploads/2024/05/NYISO-2023-SOM-Full-Report__5-13-2024-Final.pdf

Day-Ahead Congestion Shortfalls (uplift) occurs when the day-ahead congestion revenues collected by the NYISO are less than the payments to TCC holders. This is caused when the amount of TCC sold by the NYISO exceeds the transmission capability of the power system as modeled in the day-ahead market.

Balancing Congestion Shortfalls (uplift) result when day-ahead scheduled flows over a constraint exceed what can be scheduled to flow in the real-time market.

Day-Ahead Congestion Revenues fell by 69 percent from 2022 values, totaling $311 million in 2023. This drop is revenues was largely brought about by transmission bottlenecks across the Central-East interface being alleviate through a) fewer planned transmissions outages related to construction of the AC Public Policy Transmission Projects, b) the increased transfer capability from the newly built projects, and c) mild winter weather conditions which helped reduce congestion on gas pipelines flowing into eastern New York. Most of the congestion in 2023 fell between two corridors: the Central-East Interface (accounting for 53% of all congestion), and Long Island (accounting for 19% of all congestion.)

D. Distribution System Reliability

Distribution system reliability is conceptually similar to transmission system reliability, but as applied to the distribution system. Since the distribution system is both smaller in scale and scope than the transmission system, it is governed and overseen by different entities. However, it is no less important than the transmission system as it delivers electricity "the last mile" to consumers.

The first section provides an introduction to the major distribution utilities in New York. Whereas the transmission grid is operated by NYISO, the many statewide distribution grids are operated primarily by investor-owned utility companies.

The second section discusses the distribution system reliability performance standards these distribution utilities are held to by the New York Department of Public Service under the New York Public Services Commission. These state bodies keep records of service interruptions, assess the reliability of the system, and enforce compliance with relevant laws and regulations.

The third section discusses the reliability and resiliency improvements undertaken by utilities to improve their performance metrics. These programs are tailored against the constantly shifting array of threats to system reliability, and utilities are now required to specifically plan for the effects of climate change on their systems.

D.1. Introduction to Electric Distribution System in New York State

This section provides an introduction to the distribution utilities in the state including Consolidated Edison of New York, Orange & Rockland Utility, National Grid (Niagara Mohawk), New York State Electric and Gas (NYSEG), Rochester Gas & Electric (RG&E), Central Hudson Gas & Electric (Central Hudson), New York Power Authority (NYPA), and Long Island Power Authority (LIPA)/ Public Service Enterprise Group (PSEG-LI).

D.1.1. Consolidated Edison of New York (CECONY)

CECONY provides electric distribution service to approximately 3.7 million customers in all of New York City (except a part of Queens) and most of Westchester County, an approximately 660 square mile service area with a population of more than nine million customers.98 Additionally, CECONY provides distribution of natural gas to approximately 1.1 million customers in Manhattan, the Bronx, parts of Queens and most of Westchester County.

[98] Consolidated Edison, Consolidated Edison 2023 Annual Report: https://investor.conedison.com/static-files/f53f00f0-94eb-4e98-9736-9dd4aea9124c

D.1.2. Orange & Rockland Utility

Orange and Rockland (O&R) and its utility subsidiary, Rockland Electric Company (together referred to herein as O&R) provide electric service to approximately 0.3 million customers in southeastern New York and northern New Jersey, an approximately 1,300 square mile service area.[99] Additionally, O&R provides distribution of natural gas to approximately 0.2 million customers in southeastern New York.

D.1.3. National Grid (Niagara Mohawk)

National Grid USA is a public utility holding company with regulated subsidiaries engaged in the generation of electricity and the transmission, distribution, and sale of both electricity and natural gas.[100] The company operates multiple lines of business within the United States, but its wholly owned New York State electric utility subsidiary is Niagara Mohawk Power Corporation ("Niagara Mohawk").

Niagara Mohawk is engaged principally in the regulated energy delivery business in New York State. The company provides electric service to approximately 1.7 million customers in the areas of eastern, central, northern, and western New York and sells, distributes, and transports natural gas to approximately 0.6 million customers in the areas of central, northern, and eastern New York.[101]

Additionally, National Grid supplies natural gas delivery services to 0.6 million customers in Nassau and Suffolks counties in Long Island, New York and the Rockaway Peninsula in Queens, New York through its KeySpan Gas East Corporation wholly owned subsidiary, and to 1.3 million customers in the boroughs of Brooklyn and Staten Island, as well as two-thirds of the borough of Queens, all within the New York City footprint.

D.1.4. New York State Electric & Gas (NYSEG)

New York State Electric & Gas (NYSEG), a subsidiary of Avangrid, serves electric and natural gas customers across more than 40% of the upstate New York geographic area between Buffalo, Brewster, and Plattsburgh.[102] The utility provides electric service to approximately 920,000 customers and sells, distributes, and transports natural gas to approximately 272,000 customers across 42 counties, 151 cities and villages, and 379 towns.

D.1.5. Rochester Gas & Electric (RG&E)

Rochester Gas & Electric (RG&E), also a subsidiary of Avangrid, serves electric and natural gas customers within a nine-county region in the western New York geographic area including 28 cities and villages and 58 towns, centered around the city of Rochester.[103] The utility provides electric service to

---

[99] Consolidated Edison, Consolidated Edison 2023 Annual Report: https://investor.conedison.com/static-files/f53f00f0-94eb-4e98-9736-9dd4aea9124c

[100] National Grid, National Grid USA 2023-2024 Annual Report: https://www.nationalgrid.com/document/152536/download

[101] National Grid, National Grid US Annual Reports 2023-2024: Niagara Mohawk Holdings: https://www.nationalgrid.com/document/152396/download

[102] Avangrid, Avangrid 10K - Annual Report 2023: https://www.avangrid.com/documents/453723/4c4b4be3-6265-57a2-c98b-f0d4ce373bfc

[103] Avangrid, Avangrid 10K - Annual Report 2023: https://www.avangrid.com/documents/453723/4c4b4be3-6265-57a2-c98b-f0d4ce373bfc

approximately 392,000 customers and sells, distributes, and transports natural gas to approximately 325,000 customers.

D.1.6. Central Hudson Gas & Electric (Central Hudson)

Central Hudson Gas & Electric, or Central Hudson, is a utility serving approximately 315,600 electric and 84,000 natural gas customers in parts of eight counties in New York's Mid-Hudson River Valley, including Albany, Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, and Ulster.[104] Approximately 70% of Central Hudson's customer base is located within its Kingston, Newburgh, and Poughkeepsie operating divisions. Central Hudson is a subsidiary of CH Energy Group, Inc., which in turn is a subsidiary of Fortis, Inc.

D.1.7. New York Power Authority (NYPA)

The New York Power Authority (NYPA) is the largest state power organization in the United States, with 16 generating facilities and more than 1,400 circuit miles of transmission lines.[105] NYPA provides electric service statewide to more than 1,000 public, municipality/rural electric co-op, non-profit, and business customers. These primary customers are determined via state and federal regulations. Additionally, NYPA sells a portion of its power to the open market, where it is purchased by other utilities to serve retail customers. Lastly, NYPA also sells the use of its transmission grid for moving power from generating facilities to power distribution centers.[106]

D.1.8. Long Island Power Authority (LIPA) / Public Service Enterprise Group (PSEG-LI)

Long Island Power Authority (LIPA) is a not-for-profit public utility that serves the regions of Long Island and the Rockaways.107 LIPA was created by the New York State Legislature in 1986 as a corporate, municipal agency and political subdivision of the State of New York. LIPA owns the electrical transmission and distribution system service its approximately 1.2 million customer-base but outsources most of the management services and power supply used to operate its electric grid to PSEG-LI.

PSEG-LI is a subsidiary of PSEG Incorporated, a publicly traded diversified energy company. PSEG-LI oversees the majority of management services, power delivery, and customer service for LIPA, with LIPA acting as an oversight body with the ultimate authority and control over the region's electrical assets.

---

[104] CH Energy Group, CH Energy Group About Us: https://www.chenergygroup.com/
[105] NYPA, Meet NYPA: The New York Power Authority: https://www.nypa.gov/about/the-new-york-power-authority
[106] NYPA, NYPA Customers: https://www.nypa.gov/power/customers/nypa-customers
[107] LIPA, LIPA: About Us: https://www.lipower.org/about-us/

D.2. Distribution System Reliability Performance In New York

The purpose of this section is to review electric distribution reliability performance in New York. New York's key distribution reliability targets are defined by two general categories: frequency and duration of customer outages. Frequency is influenced by factors such as system design, capital investment, maintenance, and weather. Duration is affected by workforce levels, management of workforce, and geography. The state's investor-owned utilities have been required to report interruption statistics to the DPS for decades. DPS has been keeping electronic records of these statistics since 1989. The reporting requirements for utilities are set forth in 16 NYCRR (New York Code of Rules and Regulations), Chapter 2, Part 97. This regulation requires electric corporations and municipalities subject to the Commission's jurisdiction to maintain a record of each interruption of service to its customers having a duration of five minutes or more for at least six years. PSEG-LI also maintains interruption data consistent with these rules on behalf of LIPA.

Utilities are required to prepare both monthly summary reports of service interruptions, and annual reports analyzing their reliability performance for each of their operating areas. The PSC establishes performance targets for individual operating areas. Although failure to meet operating area targets does not result in a revenue adjustment. The utility would be required to present a corrective action plan as part of its annual report.

The reliability of New York's distribution systems is measured by sustained interruptions (longer than five minutes) as defined by the following indices:[108]

- The **CAIDI** or Customer Average-Interruption Duration Index measures the average time that an affected customer is out of electric service. It represents the number of customer hours divided by the number of customers affected.
- The **SAIFI** or System Average-Interruption Frequency Index measures the average number of interruptions experienced by customers served by a utility. It represents the number of customers affected divided by the number of customers served at the end of the previous year.

For both indices, a mechanism based on an individual utility's performance was developed to ensure a high level of reliability. These standards are part of reliability performance mechanisms (RPMs) that the PSC has incorporated into investor-owned utilities' rate plans. The RPMs include company-wide targets for outage frequency and duration. If an investor-owned utility does not meet their electric reliability targets, excluding major storms, they are subject to negative revenue adjustments. Unlike the investor-owned utilities, the Commission does not establish rate plans or RPMs for PSEG-LI; however, PSEG-LI does have performance metrics associated with reliability set as part of an Operating Service Agreement.[109]

Additional metrics are used when analyzing distribution reliability. Regulation 16 NYCRR, Chapter 2, Part 97, has specific interruption definitions, data requirements, record retention, and filing requirements for information that must be contained in monthly reports to the PSC. The section breaks out the types

[108] NYS Department of Public Service, NYS DPS 2023 Electric Reliability Performance Report: https://dps.ny.gov/system/files/documents/2024/09/70923690-0000-c613-bf9e-41b85aab90b2.pdf
[109] LIPA, Second Amended and Restated Operations Services Agreement Between LIPA and PSEG-LI: https://www.lipower.org/wp-content/uploads/2022/04/2nd-AR-OSA-in-effect-on-4-1-2022.pdf

of interruptions into 10 separate classifications based on the type of interruptions, including: major storm, tree contacts, apparatus errors, events on services, and for incidents outside of the utility's control. Analysis of this classification data ("cause code data") then enables the utilities and their staff to identify areas where increased capital investment or maintenance is needed. As an example, if outage data shows that a circuit is prone to lightning-caused interruptions, the utility could install arrestors on that circuit to minimize the effect of future lightning strikes.

D.2.1. 2023 Electric Reliability Performance Report

Investor-owned electric utilities also are required by the PSC for annual reliability reports by March 31st of each year. The reports include sections on:

- Overall Assessment of reliability performance (inclusive of historic performance for the preceding five years)
- Outage trends in the utility's various geographic regions
- Projects/Investments to enhance distribution reliability
- Analysis of worst performing feeders and, where needed, corrective action plans
- Reliability Programs including:
- ▪ Power Quality
- ▪ Circuit Performance (Network)

The DPS staff uses these reports to help it meet its statutory obligation that utilities provide safe and adequate service and to guide its oversight of investor-owned utility infrastructure investment.

The DPS staff then take these reports and compile them into an annual assessment entitled "Electric Reliability Performance Report" for the most recent service year. DPS most recently published its 2023 Annual Report as of June 2024.

D.2.2. Assessing Distribution Reliability

The statewide interruption frequency performance for 2023 was 0.58, which is better than the preceding year, as well as the preceding five-year average. The three major causes for interruptions (excluding severe weather/storms), which accounted for approximately 77% of all outages, were: (1) equipment failures, (2) tree contacts, and (3) prearranged outages, or outages resulting from actions deliberately taken by the utility upon advance notice to the customer affected.

Figure D-1 below summarizes the statewide five-year outage frequency history (excluding major storms).[110] The figures are shown with and without Con Edison's inclusion. This is because Con Edison serves the largest number of customers in the state, and the nature of its system includes many large, highly concentrated distribution networks which are less prone to interruptions when compared against the overhead systems used upstate.

[110] NYS Department of Public Service, 2023 Electric Reliability Performance Report: https://dps.ny.gov/system/files/documents/2024/09/70923690-0000-c613-bf9e-41b85aab90b2.pdf

Figure D-1: Statewide Five-Year Outage Frequency History (Excluding Major Storms)

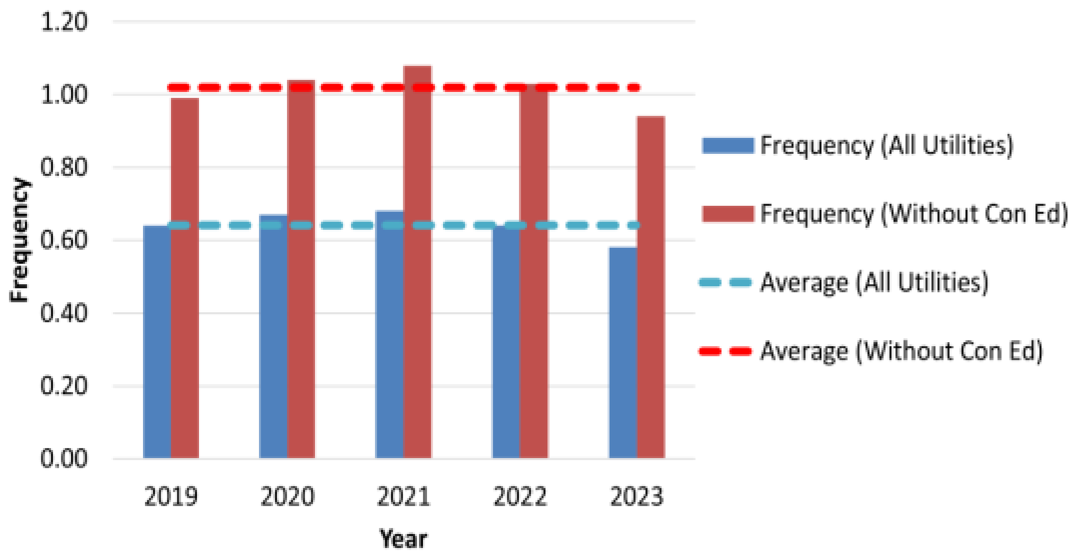
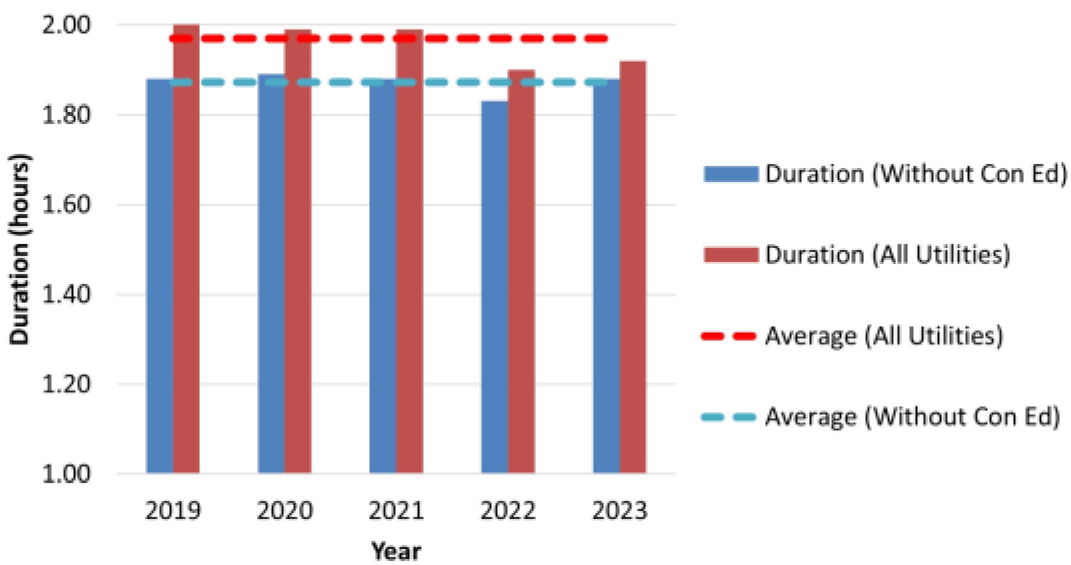


Figure D-2 below summarizes the statewide five-year outage duration history (excluding major storms). The statewide interruption duration performance for 2023 was 1.92 hours.[111] This metric was worse than the previous year's duration metric by approximately 1.2 minutes, but an improvement on the five-year average by a total of 3.0 minutes. Only Orange & Rockland's and Con Edison's Network duration performance improved year over year from 2022.

Figure D-2: Statewide Five-Year Outage Duration History (Excluding Major Storms)



Central Hudson, Con Edison, National Grid, Orange & Rockland, PSEG-LI, and RG&E all met their reliability targets in 2023. NYSEG failed its target for frequency for the fifth consecutive year, incurring a negative revenue adjustment of $3.5 million. NYSEG's frequency was 1.29, higher than the

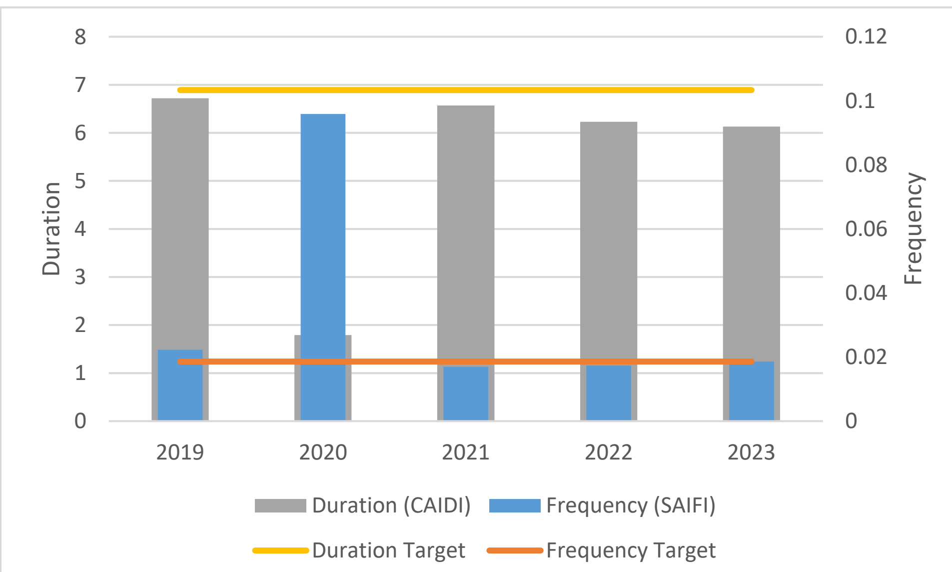
[111] NYS Department of Public Service, 2023 Electric Reliability Performance Report: https://dps.ny.gov/system/files/documents/2024/09/70923690-0000-c613-bf9e-41b85aab90b2.pdf

performance target of 1.20. Tree contacts were the single largest contributor to system interruptions for NYSEG in 2023. As a result, the Commission authorized an expanded distribution vegetation management budget for NYSEG to continue its Reclamation and Danger Tree programs and perform system-wide routine trimming. When including sever weather/major storms to reliability assessment figures, the statewide interruption frequency index and statewide interruption duration index, excluding Con Edison, improved year over year. This is largely due to fewer major storms occurring in 2023 than in 2022. In fact, 2023 was one of the state's best years since 2016.

D.2.3. Con Edison 2023 Reliability Summary

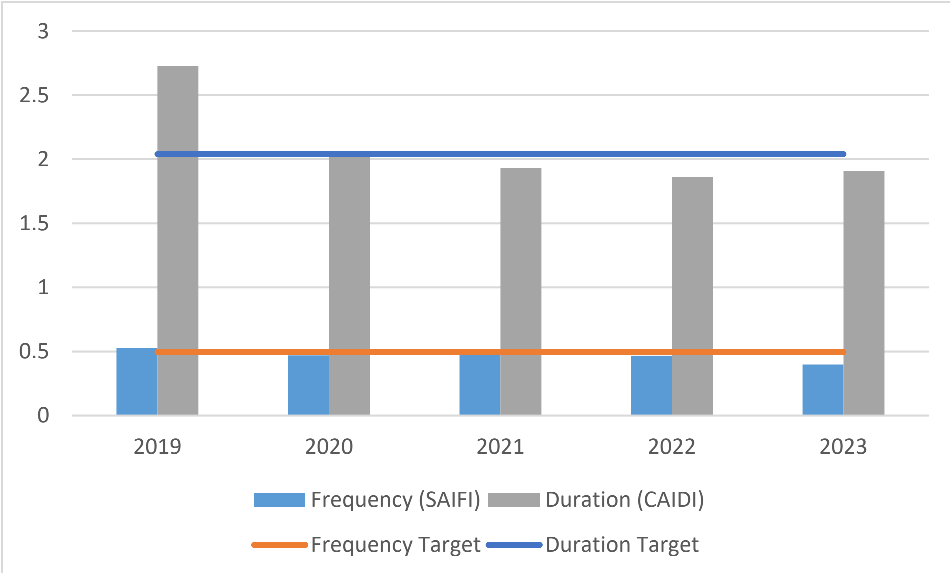
As stated earlier, Con Edison services approximately 3.7 million customers between New York City and Westchester County, New York. Approximately 2.7 million of those customers are supplied electricity via Con Edison's network system, and the remaining customers are supplied electricity via Con Edison's radial system. Con Edison's network system mostly serves the boroughs of Bronx, Brooklyn, Queens, and Manhattan, and consists of mostly underground wires encased in conduit, whereas its radial system also serves Queens and Brooklyn, and other regions such as Staten Island and Westchester County and is likened to the typical overhead wire configuration.

Figure D-3: Con Edison – Network System CAIDI and SAIFI Metrics



Within its network system, Con Edison achieved a system-wide frequency value of 0.0117 hours and system-wide duration value of 6.13 hours – both metrics within the system's frequency target of 0.0186 hours and duration target of 6.89 hours were improvements from 2022 and better than the system's five-year average. The most significant challenge facing Con Edison's network performance is the failure of underground equipment in manholes during the winter, and cable burnouts during the summer. The company works to improve the reliability of its underground network distribution system through its network relief and reliability programs – programs that utilize capital outlays focused on proactively replacing poorly performing, old and/or obsolete equipment.

Figure D-4: Con Edison – Radial System CAIDI and SAIFI Metrics

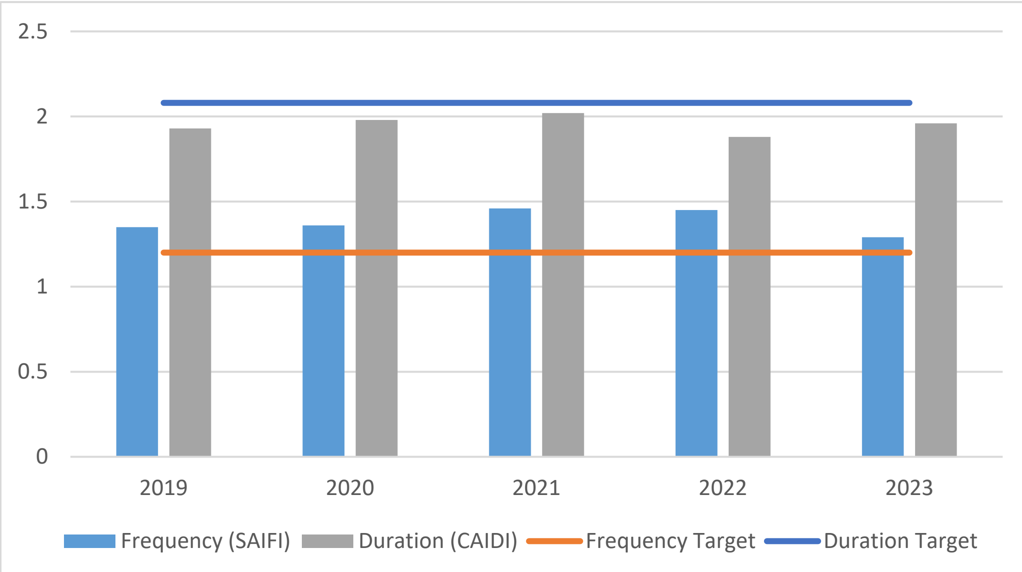


Within Con Edison's radial (overhead) system, the company achieved a frequency value of 0.398 and a duration of 1.91 hours, again both figures within their target frequency range of 0.495 and duration range of 2.04 hours. Compared to 2022, the radial network improved its frequency performance but worsened in its duration performance by several minutes. Both metrics were better than their five-year average. The leading causes of interruptions on Con Edison's radial system were equipment failures, followed by tree contracts and prearranged outages. Con Edison manages several capital programs supporting preventive maintenance of the radial system that both reinforce the system and prevent outages from occurring. These include vegetation management programs and installation of new or replacement reclosers and other switches on circuits.

D.2.4. NYSEG 2023 Reliability Summary

NYSEG serves a primarily rural area that covers approximately 40% of New York state by square mileage. NYSEG has failed to meet its 1.20 frequency target for the last five years, with an outage frequency metric of 1.29 in 2023 (its best result in the last five years.) NYSEG has consistently met its duration target every year over the last five years, however, with a 1.96-hour duration metric in 2023 as compared to a 2.08-hour target metric.

Figure D-5: NYSEG CAIDI and SAIFI Metrics

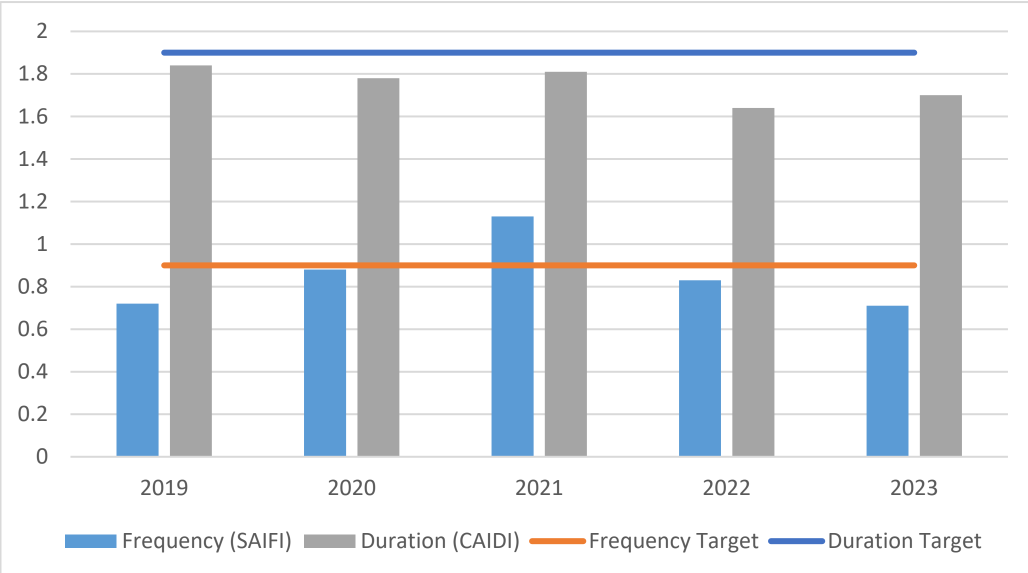


Tree contacts provide the most significant contribution to NYSEG's system interruptions at approximately 37% of interruptions in 2023. As part of NYSEG's 2023 Rate Order, the Commission authorized an expanded distribution vegetation management budget so that NYSEG could continue its expanded tree trimming programs. NYSEG additionally has investment in a Resiliency Plan since 2018 focusing on severe weather and storm hardening efforts – in the form of more robust construction practices and changes to circuit design, among others, to isolate outages and restore power quickly.

D.2.5. RG&E 2023 Reliability Summary

RG&E provides service to customers across its Rochester, New York-area territory. RG&E has historically had consistently high levels of electric service reliability for both outage frequency and duration metrics. In 2023, RG&E earned a 0.71 frequency performance against a 0.90 target, and a 1.7 duration performance against a 1.90 target. Both of its 2023 performance metrics were improvements on their respective five-year averages as well.

Figure D-6: RG&E CAIDI and SAIFI Metrics

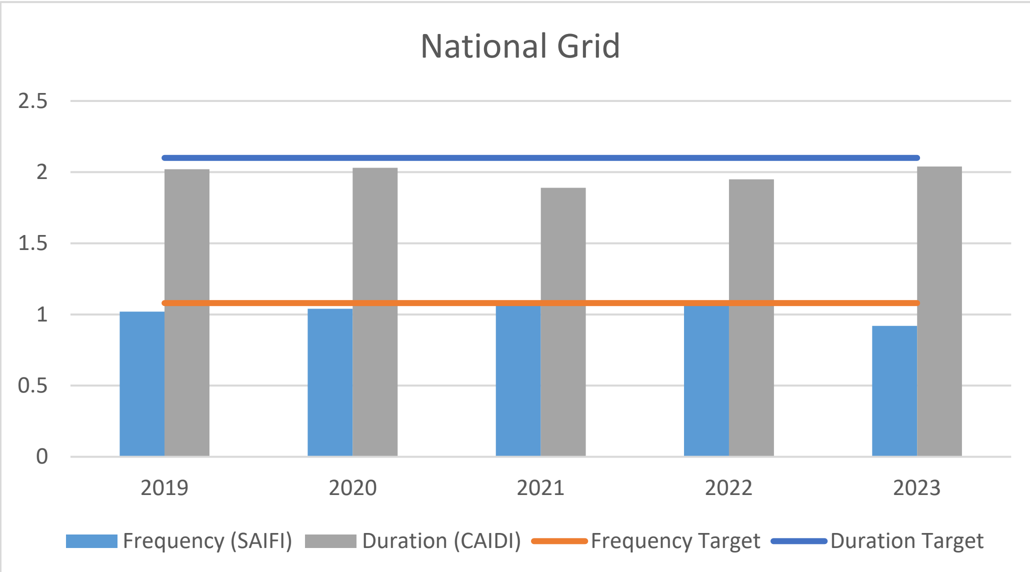


RG&E's major causes for interruptions in 2023 were pre-arranged outages (32.1%), tree contacts (23.7%), and equipment failures (20.5%). RG&E invests significantly in several programs to reduce its number of interruptions, overall outage duration times, and improve reliability. These programs include a robust vegetation management initiative, a circuit breaker replacement program, and distribution circuit resiliency and hardening program, among others. Much like NYSEG, RG&E maintains its own Resiliency Plan focused on the hardening of its infrastructure, removal of hazard trees, and changes to its circuit design to better withstand extreme weather.

D.2.6. National Grid 2023 Reliability Summary

National Grid services customers across a vast, approximately 25,000 square mile territory of upstate New York and in multiple metropolitan areas, including Albany, Buffalo, and Syracuse, as well as many rural areas including northern New York and the Adirondacks. In 2023, National Grid achieved a frequency metric of 0.92 hours, an improvement versus 2022 and better than both its target and the five-year average; and a duration metric 2.04 hours, slightly worse than 2022 but better than both its target and five-year average.

Figure D-7: National Grid CAIDI and SAIFI Metrics



The majority of interruptions on National Grid's system were largely due in part of three different causes: Tree contacts (33%), equipment failures (27%), and accidents (16%). In response, the company invests significantly in its Reliability Program, which is designed to significantly improve and maintain reliability through five key initiatives:112

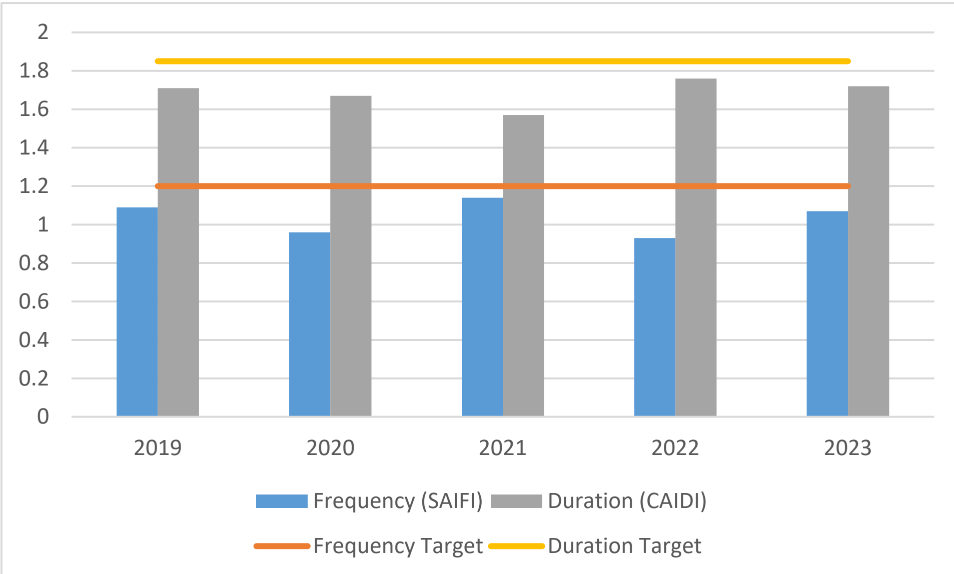
1) Engineering Reliability Reviews, or ERRs
2) Sub-Transmission Automation & Fault Location, Isolation, & service Restoration ("FLISR")
3) Vegetation Management – Enhanced right-of-way clearing and treatment and Enhanced Hazard Tree Maintenance ("EHTM") removal of danger trees on critical sections of the distribution system.
4) Inspection and Maintenance Program (”I&M")
5) Trip Saver Installation Program – Single-phase cutout mounted recloser installations

D.2.7. Orange & Rockland Utility 2023 Reliability Summary

Orange & Rockland provides service to customers in the Orange, Rockland, and Sullivan Counties in southern New York State. In 2023, O&R achieved a frequency metric of 1.07, just above its five-year average but still well below its current target. The company also achieved a duration metric of 1.72, again above its five-year average, but still under its current target. O&R has consistently achieved SAIFI and CAIDI scores under its target levels, indicating that its reliability initiatives are having the anticipated positive effect on reliability performance.

112 National Grid, 2022 Reliability Report: https://jointutilitiesofny.org/sites/default/files/National%20Grid_Reliability%20Report%202022_0.pdf

Figure D-8: Orange & Rockland CAIDI and SAIDI Metrics

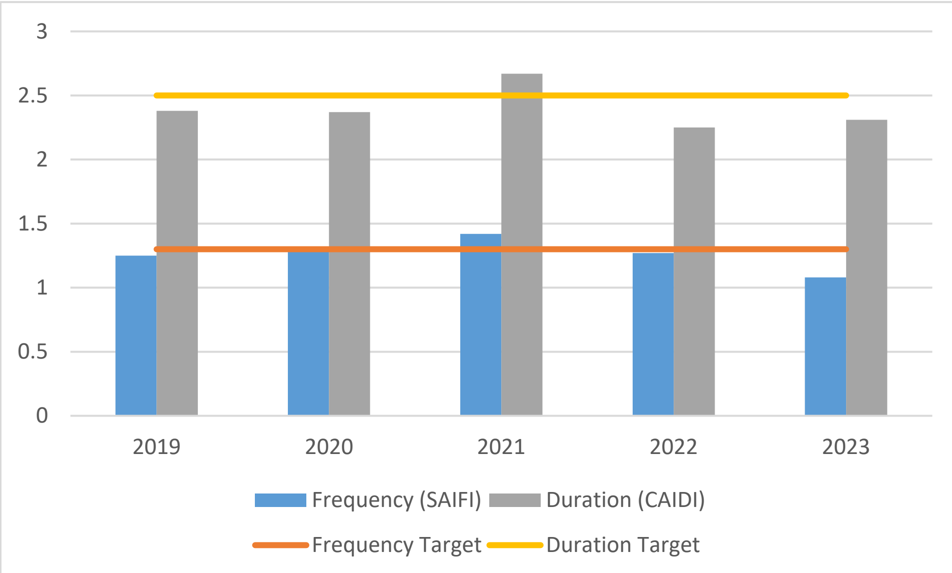


Equipment failures and tree contacts were the most significant sources of interruptions for Orange & Rockland in 2023. Combined, the two categories totaled approximately 60% of all interruptions. O&R is utilizing capital to complete several projects to improve the reliability of its distribution system, specifically with regard to vegetation management (tree contacts). The utility has reconductored certain circuits on its system to a spacer cable system to reduce exposure to vegetation hazards. O&R has additionally commissioned new circuits and distribution ties which provide for additional supply feeds to support customers during outage situations. Lastly, the company installed new equipment across its system to help sectionalize circuits to limit customer impacts when a fault on a given circuit happens upstream.

D.2.8. Central Hudson Utility 2023 Reliability Summary

Central Hudson serves New York State customers in the Mid-Hudson River Valley region. In 2023, Central Hudson met its frequency target of 1.3 with a 1.08 SAIFI score, and its duration target of 2.5 with a 2.31 CAIDI score. The utility performed better in both performance metrics than its five-year average as well.

Figure D-9: Central Hudson Utility CAIDI and SAIFI Metrics



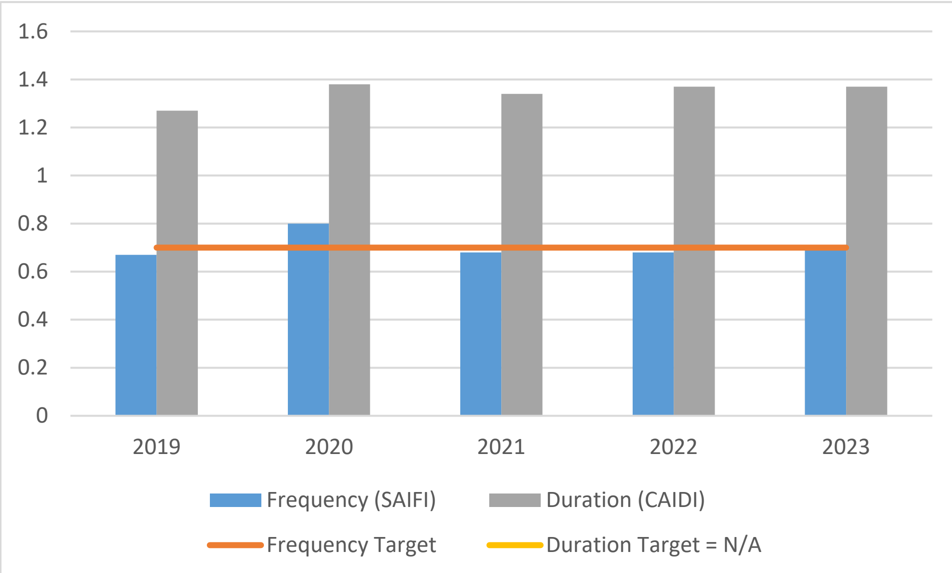
The most significant source of outages for Central Hudson in 2023 were tree contacts at about 50%. Within this category, 82% of tree contact interruptions were caused by limbs and trees from outside of the designated clearance zone. To remedy this, Central Hudson has focused its investments in the space on enhanced vegetation management programs, using new prioritization methodologies, prioritizing circuits based on SAIFI score per mile versus total SAIFI score.

D.2.9. Long Island Power Authority / PSEG-LI 2023 Reliability Summary

PSEG-LI, acting as Long Island Power's system manager, oversees the operation and maintenance of LIPA's Long Island territory, which includes Nassau County, Suffolk Country, and the Rockaway Peninsula in Queens County. System interruption performance metrics for PSEG-LI as part of their Amended Operating Service Agreement (OSA) with LIPA. In 2023, PSEG-LI achieved a 0.69 SAIFI scope, just under their current Frequency Target (and five-year average) of 0.70. As of 2022, PSEG-LI does not utilize CAIDI as its OSA target for duration as part of its performance metrics, instead using alternative metrics to measure duration performance.[113] Still, the DPS tracks PSEG-LI's outage duration performance to compare against other utilities in the state, and in 2023 they achieved a 1.37, just above their five-year average of 1.35.

[113] LIPA, Second Amended and Restated Operations Services Agreement between LIPA and PSEG Long Island: https://www.lipower.org/wp-content/uploads/2022/04/2nd-AR-OSA-in-effect-on-4-1-2022.pdf

Figure D-10: PSEG-LI (LIPA) CAIDI and SAIFI Metrics



The three main sources of system interruptions in 2023, accounting for approximately 85% of all interruptions, were equipment failures (48.7%), tree contacts (16.8%), and prearranged outages (19.7%). PSEG-LI invests capital to remedy these trouble areas. For equipment failures, their most notable program is their Circuit Improvement Program, where they repair hundreds of miles of distribution lines annually to maintain properly functioning equipment. The company also invests in its Enhanced Vegetation Management Program, which trims trees under an increased distribution line clearance specification to ensure a net positive effect on reliability.

D.2.10. Electric Utility Emergency Response Plans

Public Service Law, Section 66(21) and 16 NYCRR 105 require each electric power corporation in New York to file with the PSC an electric emergency response plan describing on or before December 15 of each year.[114] The emergency response plan establishes the steps to be taken in anticipation of an emergency event, defines roles and responsibilities of personnel for each activity, contains strategic contact information in the event the emergency response plan is activated, and sets forth communication protocols. Some aspects of the plans have application to virtually all electric emergencies (e.g., customer contacts, communication with the media and government officials). 16 NYCRR Chapter 2, Part 105 requires investor-owned electric utilities to have formal electric emergency plans. The emergency plans are approved by the Commission annually. The emergency plans are also reviewed annually by DPS staff for conformance to the rules and to evaluate any enhancements made because of any emergency restoration in the preceding year. The rules include but are not limited to the following minimum components of an emergency plan:

- An annual storm drill (or equivalent);
- Validation of personnel contacts;

[114] "New York State, 16 CRR-NY 105.3 NY-CRR Electric Utility Emergency Plans: https://govt.westlaw.com/nycrr/Document/I5059fee6cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

- Emergency criteria definitions for varying severities;
- Training for workers performing out-of-title duties during restoration;
- Updated contact list for all utility personnel, mutual aid and contractors, life support and special needs customers, human services agencies, media outlets, motels and restaurants, local government officials including emergency and police, medical facilities, and vendors;
- Emergency anticipation;
- Service restoration procedures, including damage assessment, crew use, and coordination with state and local government;
- Organization chart and descriptions of personnel responsibilities;
- Customer contacts, addressing large call volumes, special needs and life support customers, and dry ice distribution;
- Outside aid, describing criteria and procedures for obtaining extra-company assistance;
- Support services, including logistics required to feed and house a large temporary work force, as well as supplying the material and required fuel; and
- Performance assessment reports following any emergency restoration period of more than three days. Reports are due 60 days after completion of restoration.

The following sections further detail the typical components of an emergency (or restoration) plan, as well as a program to storm-harden the system to limit damage during major storm events. There can be other programs that are designed to accomplish similar types of improvements as a single "ideal" plan or strategy is not appropriate for every locality. Plans may vary significantly with geographic location, population make-up and dispersal, form of government, intergovernmental relationships among localities, as well as the degree of local concern and support for the concept. Furthermore, since storms come in all degrees of severity, restoration activities would vary accordingly. In general, an emergency restoration plan is broken into several areas of responsibility. Those areas consist of operations, communications, and media information, as briefly discussed.

An operations group within the plan would be responsible for restoring electric service during emergencies. This includes mobilization and direction of an emergency restoration organization that surveys damage and makes repairs to transmission and distribution systems. External utility crews and contractor crews also can be used depending on the extent of damage and in consideration of agreements with other utilities such as the Edison Electric Institute Mutual Assistance Agreements, to augment the affected area's repair forces. The operations group is expected to maintain contact with the PSC during emergencies.

A communications group would be responsible for taking customer calls and communicating with special customers, municipal agencies, and government officials through customer call centers, local offices, and local emergency command centers. Communications would be coordinated through a coordination center.

A third group would be the interface with the general media as well as company employees working on the restoration. Regular communications, including news briefings and releases, would be conducted by this group to keep all parties informed.

The first priority in any restoration effort is to make conditions safe. After that, priority is given to restoring the most customers the quickest, such as the substation, then the feeder (e.g., lock outs), then the three-phase main, followed in progression to single customers, with priority consideration given to customers such as hospitals and other critical facilities. In general, following a major storm, the first few days often see restoration of major groups of customers as locked-out circuits and three-phase mains are restored. As larger jobs are completed, localized damage to single and small groups of customers would be addressed.

After customers are restored, it is often necessary to resurvey the system for damage that may not have been identified or occurred after the initial review. This survey can identify outstanding repairs e.g., final repairs to temporary fixes, and non-critical conditions.

D.3. Reliability and Resiliency Improvements

Utilities implement programs to maintain and improve the reliability of their distribution feeders. These programs also speed restoration of service after an outage. This section describes several types of programs that might be used. Each utility typically has its own specific programs to address pressing issues related to its region and issues that are causing reliability problems in the form of service interruptions. The programs listed below are examples of common programs utilized by all New York electric utilities with the effort of enhancing system reliability.

D.3.1. Storm Hardening / Tree Trimming & Removal / General Vegetation Management Programs

Electric system reliability is of primary concern to the NY PSC and statewide energy consumers. System outages can impact the reliability of New York's electric power grid. These outages can be triggered by individual component failures resulting in potential serious consequences in terms of economic, personal, and societal losses that may be suffered by the public and communities affected in a blackout or extended power outage.

Major disturbances in electric service can result from fallen tree limbs and overgrown vegetation coming in contact with electric transmission and distribution lines. In New York, reliable power delivery depends upon the competent maintenance and operation by utilities of over 15,000 miles of electric transmission facilities within the state. Under state law, the PSC is charged with ensuring safe and reliable operation of the state's electric grid.

In order to help ensure the highest degree of electric system reliability for the benefit of New York State's residents, electric utilities are required to file with the PSC long-range vegetation management plans to effectively manage transmission facility right-of-way corridors they rent or own in order to minimize power outages due to encroaching tree limbs or overgrown vegetation on utility right-of-ways. The PSC requirements for vegetation management extend only to property controlled by the utility via fee or easement.[115]

[115] NY PSC, Tree Trimming and Vegetation Management – NY PSC: https://dps.ny.gov/tree-trimming-and-vegetation-management

D.3.2. Circuit Improvement Programs

When customer complaints or analysis of interruptions causes on distribution feeders fall below average reliability levels, those affected feeder circuits can be selected for improvement. This involves a detailed field inspection of the entire circuit to identify corrective actions and all substandard conditions that are likely to be causing the interruptions. The field survey enables development of customized improvements that may not have been apparent from an office analysis of interruption data. In addition to identifying substandard conditions, other reliability improvement programs such as tree trimming, installation of lightning arrestors, and replacement of armless insulators, hot-line clamps, and automatic-style wire splices are applied to the affected circuits as appropriate to enhance reliability. The reliability performance of circuits targeted under these programs experience a significant improvement compared to untargeted circuits.

D.3.3. Sectionalizing Programs

Sectionalizing distribution feeders allow an electric utility to more easily isolate faults on its feeders and thus speed restoration of customers. These devices can be field operated, e.g., fuses on taps, load-break disconnects, and switches, as well as automatic or centrally controlled devices such as automatic circuit reclosers and automatic sectionalizing units.

Automatic Sectionalizing Unit (ASU) program involves the installation of supervisory controlled auto-sectionalizing switches at or near the mid-point and end-point (tie-point) of distribution circuits that provide automatic sectionalizing of downstream faults and operator-controlled switching to sectionalize and restore portions of faulted circuits. This process limits the number of customers interrupted when a main-line fault occurs. On select circuits with above average numbers of connected customers, additional ASUs are installed in series, breaking up large load centers into smaller components. This protocol results in an increase in overall circuit reliability due to a smaller number of customers experiencing a sustained interruption during a mainline fault, and increased flexibility in operating the electric distribution system.

D.3.4. Cable Replacement Programs

Based on aged and poor performance of distribution equipment, i.e., failures of same or similar equipment, proactive replacement programs of equipment prior to failure can be implemented. One such program is a cable replacement program to replace existing three-phase underground main-line exit cables and main-line underground dips. Locations would be prioritized for replacement based on their field condition and historical risk factor, such as recent failure history. Programs such as this can use failure data to determine which underground cables have higher historical risk factors and are thus eligible for testing. Exit cables with no known failures can be proactively tested as to their field condition. Considering the potentially large quantity of aging exit-cables and the fact that an exit-cable failure typically interrupts an entire circuit, exit cables can be a high priority.

Cable test results can be analyzed in conjunction with historical data to better manage cable assets, which will reduce outages while improving the program cost effectiveness.

D.3.5. Resiliency Planning Law (Public Service Law 66(29))

Signed into law on February 24, 2022, Subsection 29 of Section 66, "General Powers of commission in respect to gas and electricity", of the New York Public Service Law (PSL) requires electric utilities to submit a climate change vulnerability study to the Public Services Commission, evaluating the utility's infrastructure, design specification, and procedures with respect to climate change vulnerability and adaptation.[116] [117] Utilities are then required to submit climate resiliency plans to the commission outlining:

- Proposed storm hardening and resiliency measures for the next 10 and 20 years
- Details on incorporating climate change into planning, design, operations, and emergency response
- Incorporate climate change into existing processes and practices to manage risks and build resilience
- Propose adjustments to how the utility plans and designs infrastructure in response to climate change impacts

Utilities submitted their initial plans in November 2023 and must submit updated plans to the commission every 5 years. This affects all New York gas and electric utilities.

[116] NY Senate, PBS Chapter 48, Article 4, Section 66: https://www.nysenate.gov/legislation/laws/PBS/66
[117]

E. Investment and Expenditure Issues

This section reviews utility investment and expenditures as they relate to transmission and distribution system reliability. Utilities and regulators must balance multiple objectives when examining investments and expenditures in the transmission and distribution systems to maintain reliability while ensuring just and reasonable rates for utility customers. Even when investments are necessary to comply with specified reliability criteria, those criteria are implicitly designed under the presumption that the costs of compliance will be outweighed by the societal and economic benefits of avoiding disruptions to reliability.

Utility investments and expenditures can impact reliability in a variety of ways. Capital investments to replace old equipment, maintain or improve reliability, or fix specific system issues can improve system reliability. Operations and maintenance expenses, to clear trees near transmission lines can also improve electric reliability. Both types of expenditures are likely to have long-term rather than short-term effects.

While detailed examinations of utility spending occur during a rate case, the typical three-year rate agreement warrants additional attention during the "out" years. Balancing utility spending on reliability with affordability concerns is the reason that the DPS staff has put the capital and operations and maintenance expenses reporting requirements into the utilities' annual reliability report. In addition, quarterly meetings help with information gathering between rate cases.

Transmission planners invest in new infrastructure and allocate expenditures to meet transmission and distribution reliability objectives. They must weigh multiple priorities to maintain system reliability while ensuring just and reasonable rates for customers. Even when investments are made to meet established reliability criteria, those criteria assume that the societal and economic benefits of avoiding service disruptions outweigh the costs. This section details the processes and considerations utilities use to pursue these goals efficiently.

The first section discusses how system planning serves as a precursor to investment and expenditure outlay. These planning efforts, captured by each utility's Distributed System Implementation Plan filed with the New York Public Services Commission, ensure that utility spending is aligned with consumer interests and grid reliability objectives.

The second section outlines the reliability and cost considerations informing these plans. Balancing these factors is a key purpose of the system planning process; increasing reliability can increase the financial burden on ratepayers, but lowering rates may expose the system to reliability risks by foregoing critical investments. Given the importance of achieving this balance, these calculations are typically subject to review and approval by the Public Service Commission.

The last section discusses the 5-year capital investment plans of the different major New York utilities. Distinct from the Distributed System Implementation Plans, these 5-year plans outline the long-term utility plans for capital expenditures and their goals for reliability and resiliency.

E.1. System Planning as a Pre-Cursor to Investment and Expenditure Outlay

On February 26, 2015, as part of the REV initiative, the Public Service Commission (PSC) issued its Track I Order, which requires each utility, as a Distribution System Platform (DSP) Provider, to file a Distributed System Implementation Plan (DSIP). At the core of the Commission's vision for the DSIP is greater transparency and visibility for how utilities operate the grid and plan for system needs. They provide information on the utilities' recent progress, current activities, and future plans to continue the transition towards a clean, resilient, distributed, modernized and customer-centric electric power system. The DSIPs are a source of public information and are updated every two years. The intention of the DSIPs is to provide a comprehensive and holistic view of utilities' statuses and their plans to improve their processes and decision-making. The DSIP process does not include the approval of projects, rate design, or cost recovery mechanisms. The Commission has explicitly affirmed that these issues will be dealt with through utility rate cases and other REV-related proceedings.

On April 20, 2016, the PSC issued guidance which:

i. required each utility to file by June 30, 2016, an Initial DSIP to provide specific information about the utility's unique characteristics and initial plans for DSP implementation;

ii. required the utilities to jointly prepare and file by November 1, 2016, a Supplemental DSIP to provide specific information and plans applicable to all the utilities; and

iii. required the utilities to file biennial DSIP updates beginning in 2018 to "include increased detail, such as developments in markets and technology capabilities as well as lessons learned and improvement opportunities."

The utilities individually filed their Initial DSIPs on June 30, 2016 and jointly filed their Supplemental DSIP on November 1, 2016. Most recently, the utilities each individually filed their 2023 DSIP updates.

E.1.1. Distributed System Implementation Plans ("DSIPs")

DSIP documents provide extensive and holistic views around distribution utility system planning, and their efforts to improve their processes and decision-making. They focus on each utility's recent progress, current activities, and future plans as the companies continue to transition toward a more distributed, integrated, and customer—centric electricity system. It is important to note that DSIPs do not contain information regarding the approval of projects, rate design, or cost recovery mechanisms. Instead, they wholly focus on how each utility will go about assessing, planning for, facilitating, integrating, and generally managing a variety of critical issues they face.

Some core areas the joint utilities are focusing on presently include the following:

- Addressing the significance of Distributed Energy Resources ("DER"), including:
  - Becoming "distribution system platforms" or "DSPs"
  - Fostering DER growth and adopting and incorporating into distribution planning
  - Evaluating and implementing DER as "Non-Wires Alternatives" solutions to offset transmission and distribution infrastructure project needs
  - Incorporating new methods of DER control and automation

- Efforts to sustaining growth of energy efficiency as a means of reducing energy usage and decarbonization of the electrical grid
- Providing necessary support to electric vehicle growth and adoption in the form of infrastructure development and stakeholder outreach
- Developing climate vulnerability plans, by incorporating potential risks from excessive heat, flooding, and extreme and multi-hazard events, and proposing operation, planning, and design mitigation actions
- Continued planning for and documentation of broad, large-scale decarbonization across the state

As with all planning activities, there are significant costs associated with putting plans into action. Sometimes, utilities will file rate cases with New York Department of Public Services to request consumer rate increases as a way of raising additional funding for new or expanding service needs. Additionally, the joint utilities file 5-year capital investment plans as a projection of anticipated spending related to various operating activities. The remainder of this chapter will focus on these cost- and investment-related topics and look at each of the state's utilities planned capital investment outlays over the next five years.

E.2. Reliability and Cost Considerations

Costs to comply with transmission and distribution reliability rules or criteria are reflected in utility rates. There are generally incremental costs associated with compliance. Costs may include additional capital investments, changes to operations, and incremental operation and maintenance expenses.

As an example, in Consolidated Edison's currently pending Rate Case (Case 25-E-0072) filed on January 31st, 2025, the utility has requested an increase in annual electric delivery revenues by approximately 11.4% in total revenues. There are several factors underlying the requested revenue hike, but the additional need for investments in reliability and resiliency measures plays a big role. ConEd cited specifically additional investments in feeder replacements, as well as enhancing system reliability due to more frequent and severe storms and warming temperatures as a rationale for the request.[118]

Additionally, Orange and Rockland Utilities has a pending rate case (Case 24-E-0060) filed on January 26th, 2024, where the utility is requesting an increase in their annual revenues as well. As rationale for the increase, O&R has cited the need for investments designed to improve the utility's ability to provide safe and reliable service, increase its resiliency and storm hardening efforts in anticipation of extreme weather events, and expand grid modernization efforts, among others.[119]

E.2.1. Transmission

When new standards or changes to existing standards are proposed, it is becoming increasingly common for the sponsoring entity to perform an analysis of the cost of compliance. For example, NERC and

[118] Consolidated Edison, Consolidated Edison Pending Cases: Case 25-E-0072: https://dps.ny.gov/pending-and-recent-electric-rate-cases

[119] NY DPS, Orange & Rockland rate case request: https://dps.ny.gov/system/files/documents/2024/01/orange-and-rockland-broadcast-memo-for-web.pdf

NPCC have begun to consider both the benefits and costs to implement reliability standards. NERC launched the Compliance Assurance, Compliance Analysis, Organization Registration and Certification, and Compliance Enforcement programs to promote a culture of reliability excellence through risk-informed compliance monitoring, mitigation, enforcement, and registration. Key efforts underway include NERC's oversight of risk-based compliance monitoring, CIP compliance, Compliance Monitoring and Enforcement Program (CMEP) technology project, regional entity training, and emerging technology roundtables. Similarly, the NPCC launched a Compliance Monitoring and Enforcement and Organization Registration and Certification Program.

E.2.2. Distribution

The balancing of reliability and costs is an ongoing challenge for electric distribution systems. For example, Con Edison's network system[120] (network systems also exist to a limited extent in some of the major upstate cities[121]), is inherently much more reliable in terms of interruption frequency. While theoretically possible, it would, however, be cost prohibitive to put such a network in place throughout the State. Similar although less extreme comparisons could be made between more densely populated areas and the more rural areas of the State. Another challenge is the call for widespread undergrounding of existing overhead facilities in the aftermath of a major storm(s). Again, however, the cost to do so would be extremely high. For example, a study performed in 2013 estimated the cost to convert Con Edison's existing overhead electric distribution system in Westchester County, Bronx, Brooklyn, Queens and Staten Island to an underground distribution grid at $42.9 billion. To provide a frame of reference, Con Edison's entire capital expenditures for 2024 totaled approximately $4.8 billion.

In determining "safe and adequate service" at "just and reasonable rates," the PSC tries to maintain a balance between what is acceptable reliability versus what is an acceptable rate impact to utility customers.

E.2.3. Transmission & Distribution Supply Chain

The transformer manufacturing industry has experienced significant supply chain disruptions over the past years since the COVID-19 pandemic. Currently, an electric utility or project developer that orders a transformer may have to wait 2 to 4 years for it to be delivered, compared to a wait of just months as recently as 2020. This is compounded with the increase in demand of transformers with forecasted load increases across the country.[122] Transformer supply chain challenges are generally representative of extended procurement timelines for other critical transmission, distribution, and supply equipment necessary for maintaining reliability. This includes semiconductor equipment, HVDC equipment to support offshore wind, circuit breakers, switchgear, and more.

---

[120] A Network System is a highly interconnected or webbed electric distribution system, typically found in dense urban areas, that provides redundancy and higher reliability by allowing multiple power sources to supply customers, reducing the likelihood of outages.

[121] For example, networks also exist in Albany, Troy, Syracuse, and Buffalo. These networks serve a portion of the downtown business district in each of these cities and are relatively small.

[122] CISA, DRAFT NIAC Addressing the Critical Shortage of Power Transformers to Ensure Reliability of the U.S. Grid: https://www.cisa.gov/sites/default/files/2024-06/DRAFT_NIAC_Addressing%20the%20Critical%20Shortage%20of%20Power%20Transformers%20to%20Ensure%20Reliability%20of%20the%20U.S.%20Grid_Report_06052024_508c.pdf

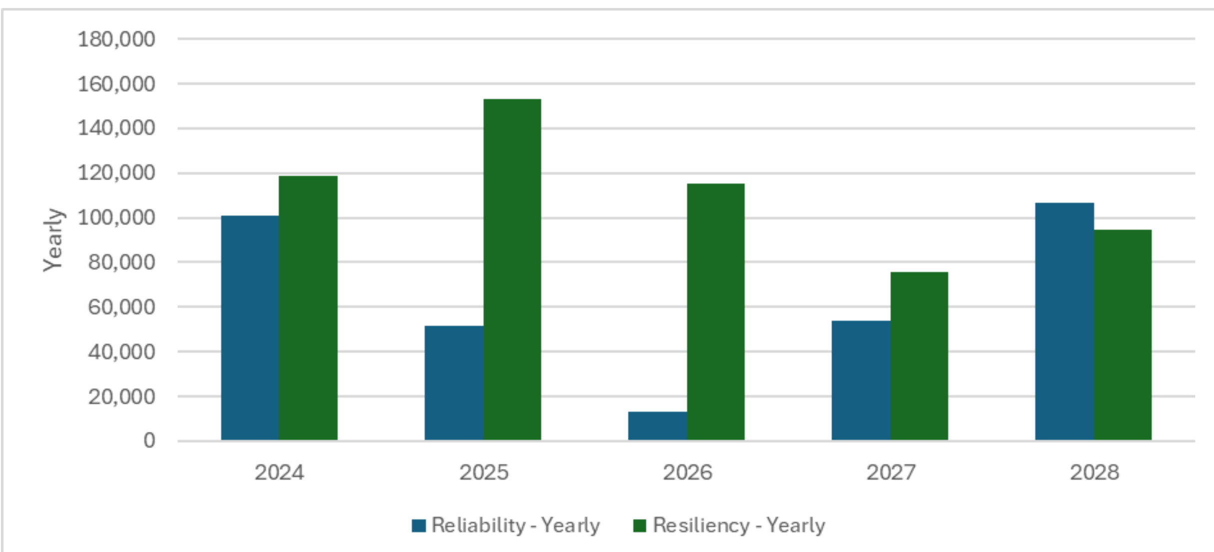
E.3. 5-Year Capital Investment Plans

In addition to the DSIPs, the utilities also required to file annual Capital Investment Plans with the DPS, which look at projected capital expenditures for the utility over the next five-year period.[123] A summary of the 5-year capital investment plans by utility, highlighting yearly and aggregated capital outlays related to reliability and resiliency programs, can be found in the following subsections.

E.3.1. NYSEG 2024-2028 Capital Investment Forecast

NYSEG provided a detailed summary of its Five-Year Capital Investment Plan with a forward-looking view from 2024-2028.[124] The report details all major planned projects and investments and provides subtotals for the Reliability and Resiliency sub-categories. NYSEG has detailed these planned investments under its "Electric Projects – Reliability and Resiliency" plan. The annual estimated expenditures can be seen in Figure E-1 below.

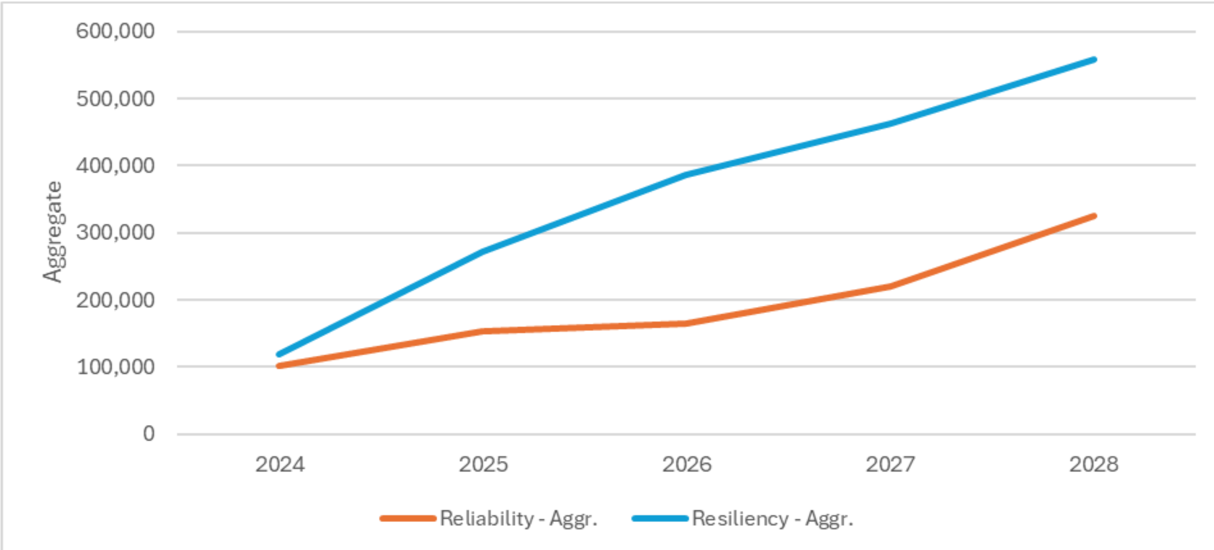
Figure E-1: NYSEG 2024-2028 Reliability and Resiliency CapEx Forecast ($000s)



[123] Joint Utilities of New York, Joint Utilities of New York Capital Investment Plans: https://jointutilitiesofny.org/utility-specific-pages/system-data/capital-investment-plans

[124] NYSEG, NYSEG and RG&E Five-Year Capital Investment Plan (2024-2028): https://www.nyseg.com/documents/40132/5899056/2024-2028+NYSEG+%26+RGE+5-Year+Capital+Investment+Plan+04.12.24.pdf/174fb7ca-3840-6735-3042-2c826d94648f?t=1712937869928

Figure E-2: NYSEG 2024-2028 Reliability and Resiliency CapEx Forecast, Aggregated ($000s)



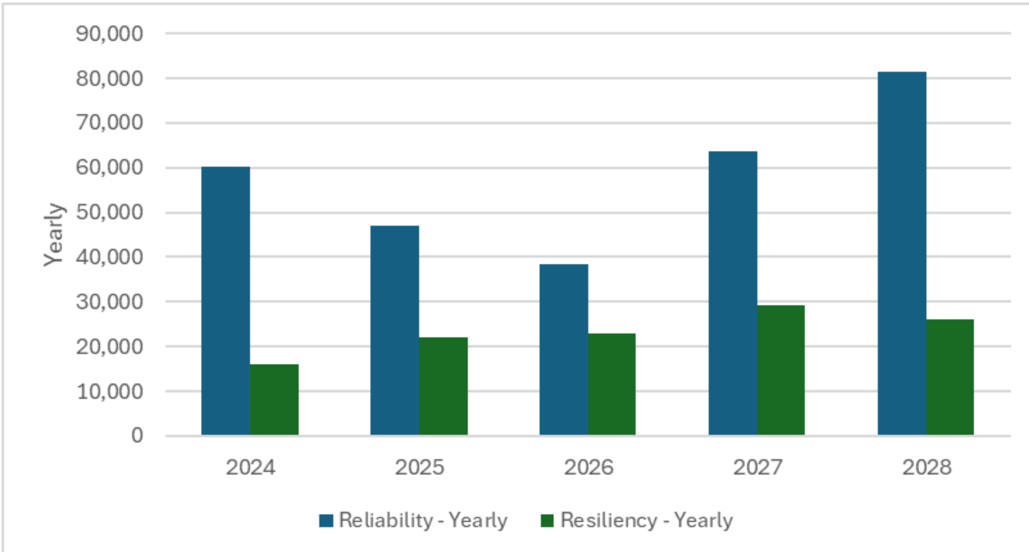
Within the context of its Reliability subtotal, NYSEG includes such programs as its Breaker Replacement Program, which prioritizes the substation circuit breakers in need of upgrades based on the latest health and risk assessment conducted by utility staff; Distribution Load Relief Program, a program that conducts a system-wide facility analyses on substations and distribution circuits that are overloaded and/or start to exceed 90% capacity, and then develop a mitigation strategy to enhance the condition of those assets so they do not exceed their associated system normal thermal ratings; and several substation and transformer replacements and reinforcements, which specifically addresses needed reinforcement of system elements in violation of load, thermal, and/or voltage criteria that directly affect NYSEG's customer base.

Examples of projects under its Resiliency subtotal include Grid Automation projects, which is intended to provide smart devices on all parts of the electric distribution system; New York 21st Century Grid Plan project, which is a special project that resulted from an integrated T&D planning study where NYSEG is piloting an all-in-one study approach to include all area needs and propose a cost effective solution alternatives to mitigate existing and future needs; Resiliency Automation, Hardening and Topology, which includes NYSEG's focused improvement of its worst performing circuits utilizing enhanced vegetation management, enhanced storm hardening efforts, and distribution automation and smart grid efforts; and lastly, SCADA Automation projects, which includes installation of remote terminal units (TRU) in all substations that do have currently have an RTU, as well as integration of all the bays into NYSEG's master supervisory control and data acquisition (SCADA) system of stations which ultimately allows for quicker response and improved CAIDI and SAFI performance. Grid Modernization and Clean Energy Transformation projects are not included in the above subtotals.

E.3.2. RG&E 2024-2028 Capital Investment Forecast

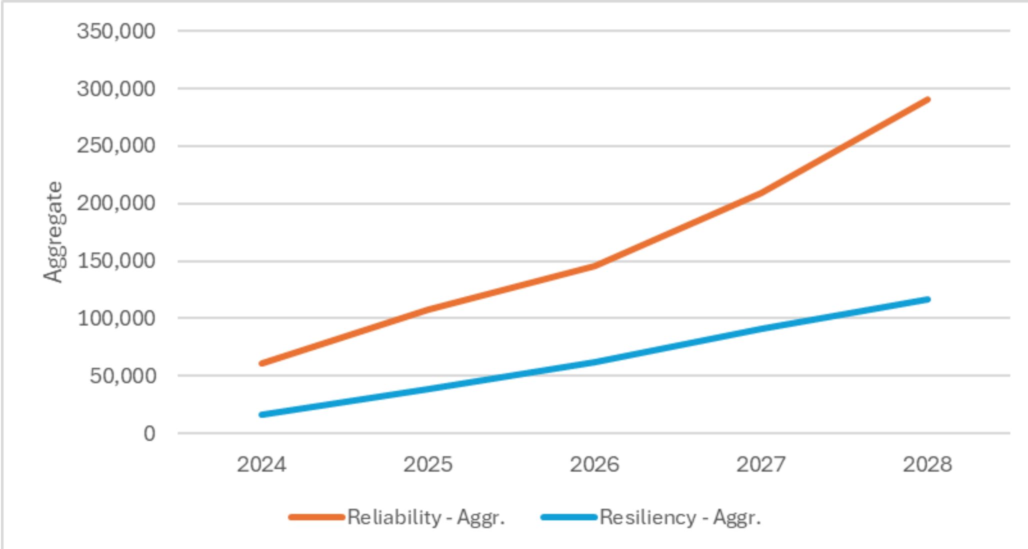
RG&E submitted a Five-Year Capital Investment Plan with the same type of breakout as NYSEG for the years 2024 through 2028.[125] The Resiliency and Reliability subtotals can be seen in Figure E-3 below.

Figure E-3: RG&E 2024-2028 Reliability and Resiliency CapEx Forecast, Yearly ($000s)



[125] "NYSEG, NYSEG and RG&E, 5-Year Capital Investment Plan (2024–2028): https://www.nyseg.com/documents/40132/5899056/2024-2028+NYSEG+%26+RGE+5-Year+Capital+Investment+Plan+04.12.24.pdf/174fb7ca-3840-6735-3042-2c826d94648f?t=1712937869928

Figure E-4: RG&E 2024-2028 Reliability and Resiliency CapEx Forecast, Yearly ($000s)



RG&E's programs and projects within the Reliability subtotal are like those detailed in the preceding NYSEG section, and include a Breaker Replacement Program, various service area reinforcements, and circuit and/or substation upgrades.

Examples of projects under the Resiliency subtotal are additionally like those detailed in the preceding NYSEG section, and include Grid Automation expenditures and Resiliency Automation, Hardening and Topology, and SCADA Automation.

E.3.3. Central Hudson Gas & Electric 2025-2029 Capital Investment Forecast

Central Hudson Gas & Electric also has a Five-Year Capital Investment Plan ranging from years 2025 through 2029.[126] This plan details investments differently than NYSEG and RG&E. Instead of aggregating investments under Reliability and/or Resiliency-centric buckets, Central Hudson aggregates based on what part of its system is being affected, e.g., Distribution improvement, Electric Transmission, and Electric Substation. Central Hudson additionally depicts a separate, single line item for Storm Hardening efforts. The results of Central Hudson's Capital Investment Plan can be seen below in Figure E-5.

[126] NY DPS, Central Hudson Gas and Electric 2025-2029 Corporate Capital Forecast: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjUqIbPio-NAxXDK1kFHTCGIgEQFnoECAwQAQ&url=https%3A%2F%2Fdocuments.dps.ny.gov%2Fpublic%2FCommon%2FViewDoc.aspx%3FDocRefId%3D%257B40E16F90-0000-CC11-84EF-185FD0BC1752%257D&usg=AOvVaw3ouKIa5g5lVAq2KsetajRp&opi=89978449

Figure E-5: Central Hudson Gas & Electric 2025-2029 CapEx Forecast, Yearly ($000s)

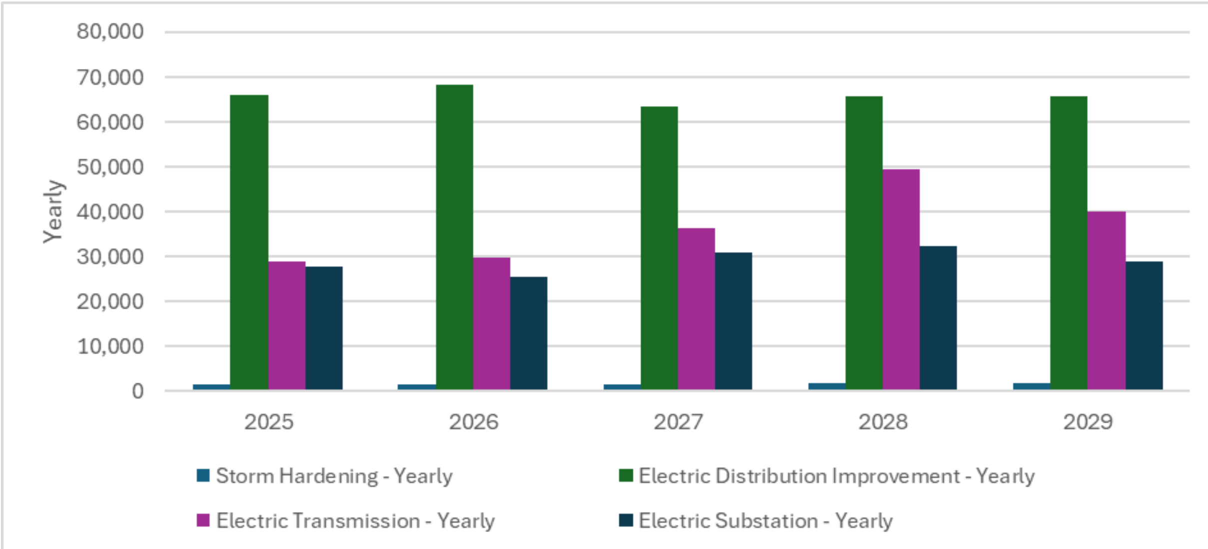
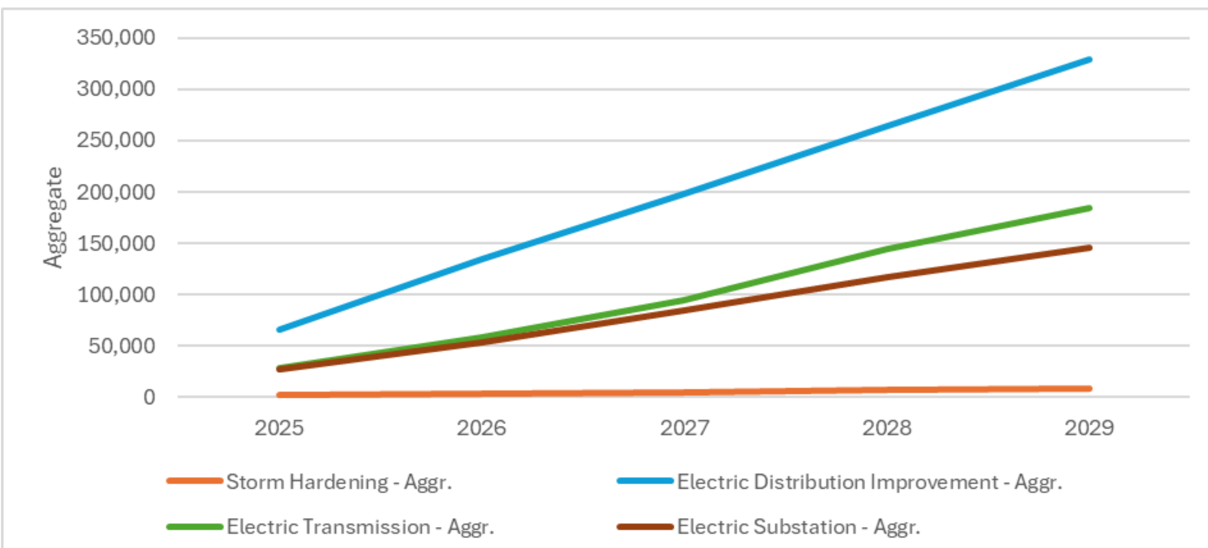


Figure E-6: Central Hudson Gas & Electric 2025-2029 CapEx Forecast, Aggregate ($000s)



Within the Electric Transmission investment category, the purpose is to serve the expected system load by developing a rational program to maintain reliability, avoid unacceptable risks, and strive for the most economical reinforcements, and allow for equipment maintenance. The significant projects in this category include the rebuild of several transmission lines and account for 74% of planned expenditures. The remainder of the budget in this category is set aside for replacement and improvement work associated with other transmission lines in Central Hudson's system.

The Electric Substation capital program is developed based on current planning criteria and address load serving capability, infrastructure, compliance, and reliability/operating issues. Given this, projects in this category include substation upgrades, equipment replacement programs and projects establishing new substations or the addition of circuits and transformers in existing substations.

The Electric Distribution Improvement program focuses on addressing condition-based infrastructure replacements, expenditures related to day-to-day capital requirements for distribution facilities, and projects necessary to maintain current levels of reliability performance. This includes conversion from 4kV to 13.2 kV operation due to low or errant voltage or and overladed step-down transformer; distribution pole replacement; road/bridge rebuild/relocation projects, and "worst circuit" projects attending to areas where customers are experience multiple interruptions over a 12-month period.

Lastly, the Strom Hardening capital budget program includes numerous items to improve system reliability that also have resiliency benefits. Projects within this program include circuit hardening projects, which focus on rebuilding mainline zones of protection that impact large numbers of customers, and strategic undergrounding work, which will focus on undergrounding 1.5 miles of mainline that is prone to outages.

E.3.4. National Grid 2025-2029 Capital Investment Forecast

National Grid NY, like Central Hudson G&E, has provided a five-year capital investment plan spanning from fiscal years 2025 through 2029, and provides multiple classifications of spending within its project expenditure categorization efforts.[127] Much like NYSEG and RG&E, National Grid includes categories where the primary investment driver of the respective set of projects is Reliability and/or Resiliency. National Grid defines its Reliability category as projects that are required to improve power quality, storm hardening, and system performance. It defines its Resiliency category as projects that are intended to ensure the electric power system can recover quickly following a disaster or, more generally, the ability of anticipating extraordinary and high-impact, low-probability events and rapidly recovering from these disruptive events. National Grid NY's five-year capital investment outlay can be seen in Figure E-7 below.

[127] National Grid, Transmission and Distribution Capital Investment Plan: https://systemdataportal.nationalgrid.com/NY/documents/NMPC_5_Year_Capital_Investment_Plan.pdf

Figure E-7: National Grid 2024-2028 Reliability and Resiliency CapEx Forecast, Yearly ($000s)

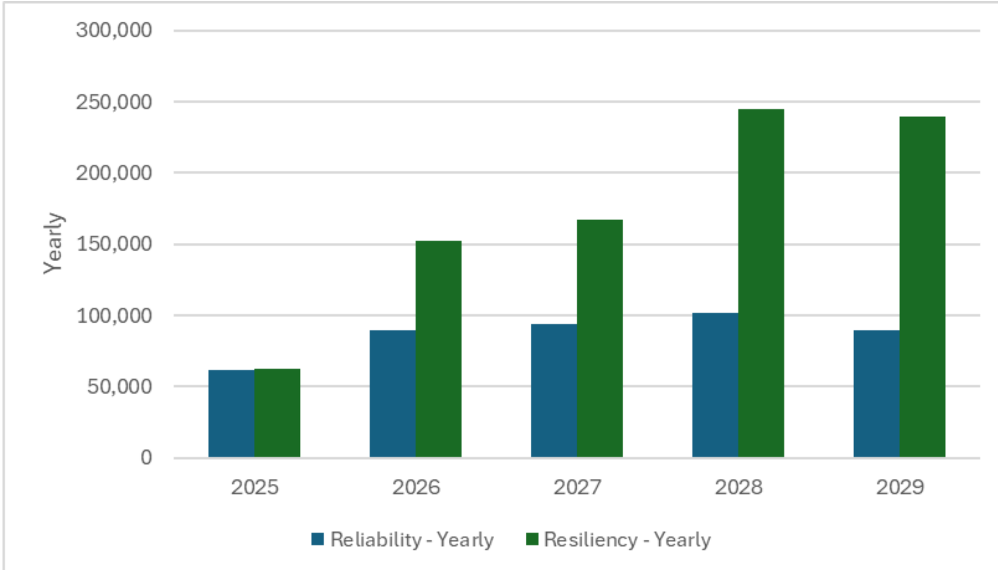
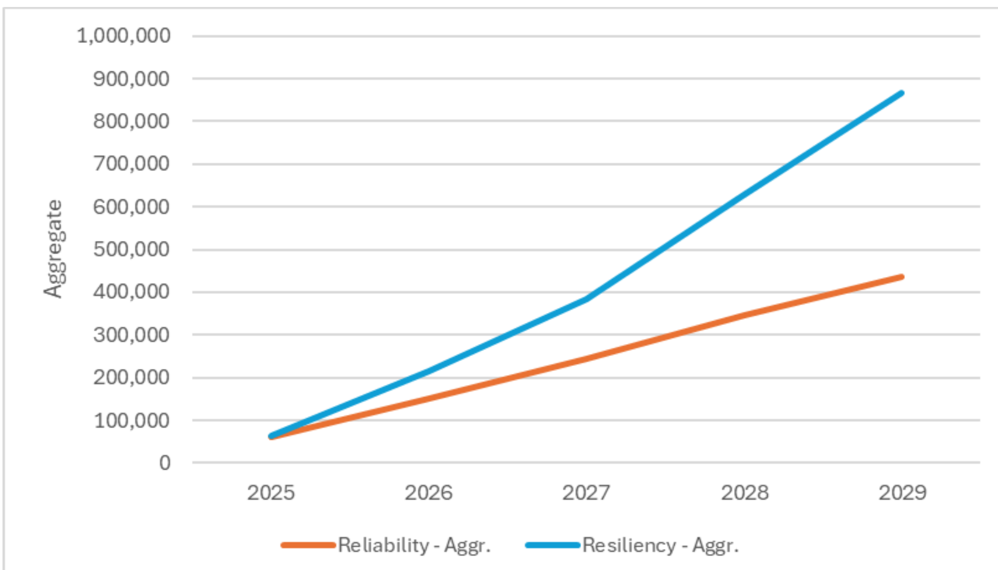


Figure E-8: National Grid 2024-2028 Reliability and Resiliency CapEx Forecast, Aggregate ($000s)



National Grid's reliability investments target projects that improve power quality and reliability performance. One of these projects is the Conductor Clearance Program, which increases the clearance of certain overhead conductors to meet industry standards and lower the risk of safety events. Another one of National Grid's reliability projects is the Smart Fault Indicator Program, which installs smart fault indicators on NG's 115kV transmission system, which helps to reduce outage times. Other projects include the replacement of old equipment caused by deterioration and/or old age.

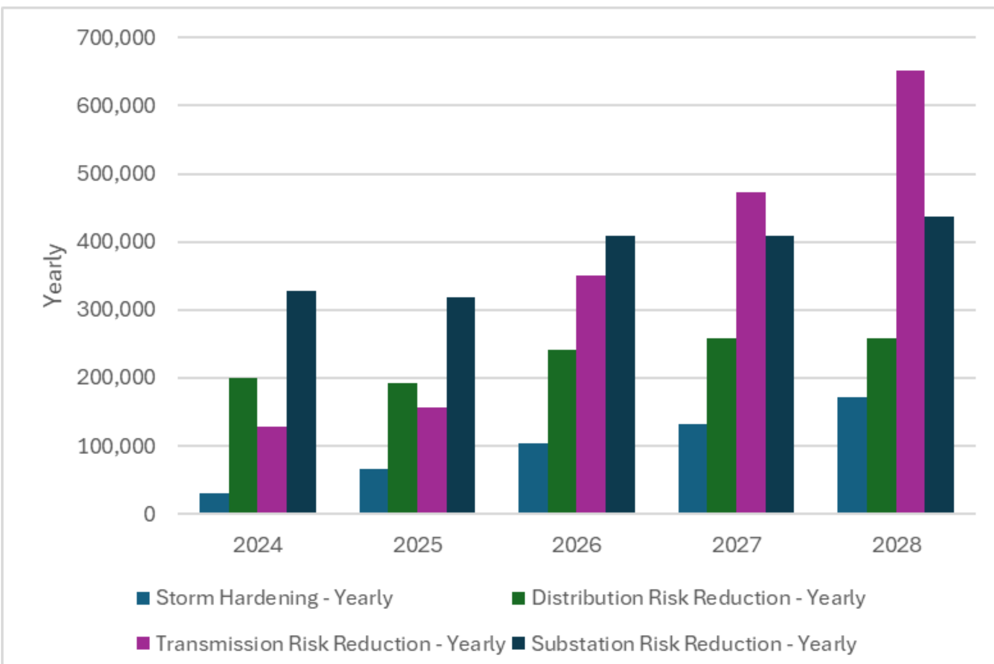
National Grid's resiliency investments target projects that give the utility the ability to recover quickly following a large-scale interruption. These projects involve increasing the flexibility of the grid utilizing feeder ties, as well as "smartening" the grid by installing fault location, isolation and service restoration (FLISR) schemes and distribution line sensors. Other projects include standard upgrades to transmission, sub-transmission and distribution lines, undergrounding of lines due to wind and icing risks, installation of substation flood walls, and more.

National Grid runs a storm hardening program that increases the reliability and resiliency of its system in areas that have experienced repeated outages during adverse weather. Efforts here include moving pole lines to the road, review of pole size, class, and use, additional sectionalizing points, enhanced lighting protection, and enhanced vegetation management.

E.3.5. Consolidated Edison Company of New York 2024-2028 Capital Investment Forecast

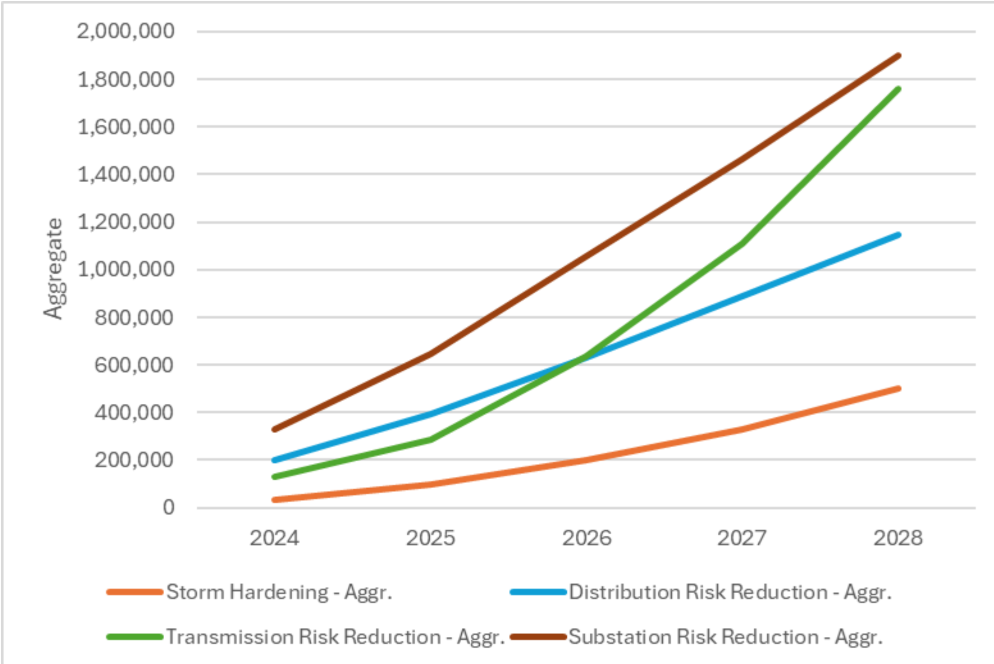
Consolidated Edison (CECONY) qualifies its 5-year capital investment plans somewhat differently than the other utilities in-state.[128] The company splits its capital forecast between Electric T&D (via System and Transmission, Substations, and Distribution), Electric Production, and Shared Services. Within the T&D capital outlay forecast for Transmission, Substations and Distribution, CECONY lists a number of programs within each "sub-category", such as Environmental Programs, Replacements, System Expansion, Risk Reductions, and Safety/Security. None of the categories are explicitly dedicated to system reliability and/or resiliency, though Risk Reductions appears to be the best example. Only the Distribution sub-category includes an additional Project/Program Type for Storm Hardening. For the purposes of summarizing estimated five-year capital expenditures on Reliability/Resiliency, we have utilized the Risk Reduction category for Transmission, Substations, and Distribution, and included an additional, separate budget line for Storm Hardening. Figure E-9 below details the proposed spending.

Figure E-9: CECONY 2024-2028 Risk Reduction and Storm Hardening CapEx Forecast, Yearly ($000s)



[128] Consolidated Edison Company, Report on 2023 Capital Expenditures and 2024-2028 Electric Capital Forecast: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi4uouIi4-NAxWhGFkFHXQDJ5UQFnoECBgQAQ&url=https%3A%2F%2Fdocuments.dps.ny.gov%2Fpublic%2FMatterManagement%2FCaseMaster.aspx%3FMatterCaseNo%3D22-E-0064&usg=AOvVaw0USJg6flayCqZrM-4nLzbB&opi=89978449

Figure E-10: CECONY 2024-2028 Risk Reduction and Storm Hardening CapEx Forecast, Aggregate ($000s)



CECONY's transmission risk reduction category sharply increases over the period due to several total or partial feeder replacement projects breaking ground. For the Substation category, the most significant expenses come from substation replacement or enhancement programs, as well as other various equipment upgrade projects. On the Distribution side, the most significant expense comes from projects to modernize transformer vault and structures, replace switchgear, provide underground secondary reliability, and provide enhanced primary feeder reliability. For storm hardening, projects ranged from selective undergrounding of lines to enhancement of substation and other critical facility resiliency.

F. Environmental Regulations

This chapter outlines the major *environmental regulations* that impact the electric sector. Electricity generation has major impacts on the natural and human environments, from the emissions of fossil-fuel plants to the land-use impacts of wind and solar farms, and each major echelon of government has an interest in prescribing how and when such impacts occur.

The first section outlines the major *federal regulations* that impact electricity generation in New York state. These regulations, which apply to multiple states, set broad standards and limits on the emissions of fossil fuel plants, and are the origin of many major state-level regulations.

The second section outlines the *state environmental regulations, policies and guidance* that impact electricity generation. While the federal environmental regulations are generally broad standard-setting measures, state-level regulations, policies, and guidance can prescribe specific methods, metrics, and actions taken by generators. They are typically derived from the Environmental Conservation Law (ECL) and promulgated or issued by the New York State Department of Environmental Conservation (NYSDEC).

The last section outlines the *local regulations* passed by sub-state governments (e.g. New York City). Local governments can have individual emissions or environmental targets pertaining to electricity generators, and they are sometimes permitted to craft their own additive standards to apply to generators.

Regulations covered in this chapter include:

- Federal Regulations
- Cross-State Air Pollution Rule (CSAPR)
- National Emission Standards for Hazardous Air Pollutants (NESHAP) and New Source Performance Standards (NSPS) for Stationary Internal Combustion Engines
- Mercury and Air Toxics Standards (MATS)
- Clean Air Action Section 111 Carbon Emissions Update
- State Regulations, Policies and Guidance
- Best Technology Available (BTA) for Cooling Water Intake Structures
- 6 NYCRR Part 201 Permits & Registrations
- Emissions Verification Regulation
- Distributed Generation Sources Regulation
- Stationary Combustion Installations Regulation
- Reasonably Available Control Technology Regulation
- Peaking Units Regulation
- New Source Review Regulation
- Best Available Retrofit Technology Regulation
- CO2 Performance Standards Regulation
- Sulfur Hexafluoride Standards Regulation

- Climate Act Policies
- Resiliency Planning Law
- Local Regulations
- NY City Council Residual Oil and Fuel Oil No. 4 Elimination

F.1. Federal Regulations

The following list of regulations are promulgated by the EPA and impact the New York generation, transmission and distribution systems.[129] Most apply to generators and their emissions, which have follow-on effects on the bulk electricity system.

F.1.1. Cross-State Air Pollution Rule (CSAPR)

The CSAPR, initially published on January 1, 2015, with updates on September 6, 2016, and March 15, 2023, is a regional sulfur dioxide (SO_2) and nitrogen oxides (NO_X) emissions cap-and-trade program that requires 27 states in the eastern half of the U.S—including New York State—to reduce power plant emissions that cross state lines and contribute to fine particle (soot) pollution and ground-level ozone (smog) formation in downwind states. The program helps downwind areas achieve and maintain the National Ambient Air Quality Standards (NAAQS), the federal standards for air pollution of carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), and particulate matter (PM). The CSAPR replaced the Clean Air Interstate Rule (CAIR), EPA's previous emission allowance rule. The 2016 CSAPR Update Rule and the 2023 update titled the Good Neighbor Plan successively further restricted NO_x emissions from 25 states including New York.[130] In New York State, the CSAPR allowance allocations are administered through 6 NYCRR Parts 243, 244 and 245, affecting EGUs of >25 MW capacity. This currently affects an estimated 14,550 MW of capacity from 62 units as estimated based on Form EIA-860 Generator Inventory data.[131]

F.1.2. NESHAP and NSPS for Stationary Internal Combustion Engines

The EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP) and New Source Performance Standards (NSPS) were finalized in January 2013.[132] The two rules apply to generators

[129] In addition to the authorities discussed here, other federal statutes may also apply to New York generation, transmission and distribution systems. Sections 402 (pollutants, NPDES/SPDES) and 404 (dredged or fill materials) of the Clean Water Act require water quality permits for any discharges into the waters of the United States. Environmental reviews for T&D projects under the National Environmental Policy Act (42 U.S. Code 4321 *et seq.*) may include analyses required by Section 106 of the National Historic Preservation Act or its State counterpart, the New York State Historic Preservation Act. Additionally, if projects may affect protected species, they could also require compliance with the Endangered Species Act (16 USC 1531 *et seq.*), Bald and Golden Eagle Protection Act (16 USC 668-668d), Migratory Bird Treaty Act (16 USC 703-712), or other laws.
[130] EPA, Good Neighbor Plan for 2015 Ozone NAAQS. https://www.epa.gov/Cross-State-Air-Pollution/good-neighbor-plan-2015-ozone-naaqs
[131] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/
[132] EPA, Regulatory Actions for Stationary Engines: https://www.epa.gov/stationary-engines/regulatory-actions-stationary-engines

powered by reciprocating internal combustion engines (RICE) often used for demand response: the National Emission Standards for Hazardous Air Pollutants (NESHAP) and the New Source Performance Standards (NSPS) for Stationary Internal Combustion Engines. Compliance with these rules is required for the operation of stationary RICE in demand response programs. Prior to these rules becoming effective, some of the affected engine powered generators had participated in the NYISO's demand response programs, such as the Installed Capacity – Special Case Resource (ICAP-SCR) or the Day Ahead Demand Response Program (DADRP).

F.1.3. Mercury and Air Toxics Standards (MATS)

On December 16, 2011, the EPA finalized the Mercury and Air Toxics Standards (MATS) rule establishing the Maximum Achievable Control Technology (MACT) emission rate standards for hazardous air pollutants from coal- and oil-fired steam generators with a nameplate capacity equal or greater than 25 MW.

Heavy oil-fired units affected by the MATS rule are anticipated to continue to implement a cleaner fuel mix strategy to comply with the rule by using natural gas to maintain fuel ratios specified by the regulation. In New York, MATS is administered through 6 NYCRR Part 246. The EPA issued more stringent MATS in 2020 and 2024, but the revisions only applied to coal-fired units.[133] Cayuga Power Station, the last coal-fired power plant in New York State, completed its deactivation process on April 8, 2020.[134]

F.1.4. Clean Air Act Section 111 Carbon Emissions Updates

Effective July 8th, 2024, the EPA issued a rule under Section 111 of the Clean Air Act, restricting greenhouse gas emissions from fossil fuel-fired electric generating units.[135] The new requirements are as follows:

[133] EPA, Mercury and Air Toxics Standards: https://www.epa.gov/stationary-sources-air-pollution/mercury-and-air-toxics-standards

[134] NYISO, Cayuga 1 and 2 Generation Deactivation Assessment: https://www.nyiso.com/documents/20142/1396324/Cayuga1and2-Generation-Deactivation-Assessment-vFinal.pdf/9328ed90-41aa-da58-354f-d02fa755f260

[135] EPA, Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power: https://www.epa.gov/stationary-sources-air-pollution/greenhouse-gas-standards-and-guidelines-fossil-fuel-fired-power

Figure F-1: CAA Section 111 Requirements

FINAL CARBON POLLUTION STANDRADS FOR NEW AND EXISTING FOSSIL-FUEL FIRED ELEECTRICITY GENERATORS			
Existing 111(d) Steam Generators		**New Source and Reconstructed 111(b) Stationary Combustion Turbines**	
Coal-Fired Boilers	**Natural Gas and Oil-Fired Boilers**	**Phase I** Date of promulgation or initial startup	**Phase II** Beginning in Jan 1, 2032
Long-term subcategory: For units operating on or after January 1, 2039 **BSER**: CCS with 90 percent capture of CO_2 (88.4% reduction in emission rate lb/MWh-gross) by January 1, 2032	**BSER:** routine methods of operation and maintenance with associated degree of emission limitation: **Base load unit standard:** (annual capacity factors greater than 45%) 1,400 lb CO_2/MWh-gross **Intermediate load unit standard:** (annual capacity factors greater than 8% and less than or equal to 45%) 1,600 lb CO_2/MWh-gross. **Low load units:** (annual capacity factors less than 8%) a uniform fuels BSER and a presumptive input-based standard of 170 lb CO_2/MMBtu for oil-fired sources and a presumptive standard of 130 lb CO_2/MMBtu for natural gas-fired sources. Compliance date of January 1, 2030	**Low Load Subcategory (Capacity Factor <20%)**	
		<u>BSER</u>: Use of lower emitting fuels (*e.g.*, hydrogen, natural gas and distillate oil) **<u>Standard</u>**: less than 160 lb CO_2/MMBtu	EPA is not finalizing a Phase II BSER for low load units
Medium-term subcategory: For units operating on or after Jan. 1, 2032, and demonstrating that they plan to permanently cease operating before January 1, 2039 **BSER**: co-firing 40% (by heat input) natural gas with emission limitation of a 16% reduction in emission rate (lb CO_2/MWh-gross basis) by January 1, 2030		**Intermediate Load Subcategory (Capacity Factor 20% to 40%*)** *Source-specific upper bound threshold based on EGU design efficiency	
		<u>BSER</u>: Highly efficient simple cycle technology with best operating and maintenance practices **<u>Standard</u>**: 1,170 lb CO_2/MWh-gross	EPA is not finalizing a Phase II BSER for intermediate load units
For units demonstrating that they plan to permanently cease operating before January 1, 2032 Units are exempt from the rule. Cease operations dates finalized in state plans for exemption purposes are federally enforceable.		**Base Load Subcategory (Capacity Factor >40%*)** *Operation above upper-bound threshold for Intermediate Subcategory	
		<u>BSER</u>: Highly efficient combined cycle generation with the best operating and maintenance practices **<u>Standard</u>**: 800 lb CO_2/MWh-gross (EGUs with a base load rating of 2,000 MMBtu/h or more) **<u>Standard</u>**: 800 to 900 lb CO_2/MWh-gross (EGUs with a base load rating of less than 2,000 MMBtu/h)	**<u>BSER</u>**: Continued highly efficient combined cycle generation with 90% CCS by Jan 1, 2032 **<u>Standard</u>**: 100 lb CO_2/MWh-gross EPA's standard of performance is technology neutral, affected sources may comply with it by co-firing hydrogen.
For new and existing units installing control technologies, a 1-year extension is available in situations in which implementation delays are due to factors beyond the EGU owner/operator's control. For existing units with cease operations dates, a 1-year extension is available in situations in which the unit is needed for reliability through a reliability assurance mechanism, provided appropriate documentation is submitted.			
Major Modifications 111(b) Coal-fired Steam Generators: Standards of performance for coal-fired units that undertake a large modification (*i.e.*, increases hourly emission rate by more than 10%) mirror the emission guidelines for existing coal-fired steam generators.			

This may only affect one planned unit: the RED-Rochester LLC Industrial combined heat and power plant, with 42 MW of natural gas-fired generation expected to come online in 2025.[136]

F.2. State Regulations, Policies, and Guidance

The following list of state environmental regulations, policies, and guidance that impact the New York generation, transmission, and distribution systems. Most apply to generators and their emissions which has secondary effects on the transmission system's Best Technology Available (BTA) for Cooling Water Intake Structures

In October 2014, the EPA established cooling system requirements under section 316(b) of the Clean Water Act to protect aquatic life from harm caused by water withdrawals, applying to facilities withdrawing over 2 million gallons daily for cooling, with compliance standards.

New York State's regulation 6 NYCRR 704.5 states that facilities using cooling water intake structures and having associated point source thermal discharges must have the BTA to minimize impingement and entrainment. [137] On July 10, 2011, the Department of Environmental Conservation issued NYSDEC

[136] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/
[137] NYDEC, Regulations – Chapter X: https://dec.ny.gov/regulatory/regulations/chapter-x

Commissioner Policy- 52 to explain the process used to make a BTA determination at a facility, and to set minimum requirements for reducing impingement and entrainment. The policy applies to all industrial and commercial facilities that withdraw 20 million gallons per day or more of water and use 25% of that water for cooling. Facilities using less than 20 million gallons per day are subject to 6 NYCRR 704.5.

F.2.1. Permits and Registrations Regulation (6 NYCRR Part 201)

The NYSDEC amended 6 NYCRR Part 201 on February 24, 2021, describing the permitting requirements and processes for owners and operators of air contamination sources to obtain a permit for the construction and operation of such sources. [138] Stationary combustion installations with more than 10million BTU/h heat outputs, including fossil fuel fired steam electric plants, are covered under this regulation. Stationary internal combustion engines used for emergency power (i.e. when the usual supply of power is not available) and operated for less than 500 hours per year are exempt from registration unless they are enrolled in a peak shaving or demand response program. This likely affects 14,091 MW of generation as estimated based on Form EIA-860 Generator Inventory data.[139]

F.2.2. Emissions Verification Regulation (6 NYCRR Part 202)

6 NYCRR Part 202 prescribes, among other things, the emissions test requirements for sources of air contamination for the purpose of ascertaining compliance or noncompliance with any air pollution control code – rule or regulation.[140] Source operators must notify the NYSDEC 30 days prior to any periodically required test, and NYSDEC may request additional tests at its discretion. If the source is a major source (as defined in Subpart 201-2 or is a NOx / VOC emitter of 25+ tons located in an ozone non-attainment area) its annual emissions of regulated air contaminants must be reported to the NYSDEC each year. Ozone non-attainment areas are areas that are in violation of the national ambient air quality standards established by the Clean Air Act for ozone. This likely impacts an estimated 3,275 MW of generation, as estimated based on Form EIA-860 Generator Inventory data, with the ozone non-attainment zones concentrated around New York City.[141]

F.2.3. Distributed Generation Sources Regulation (6 NYCRR Part 222)

6 NYCRR Part 222 prescribes the emissions control, emissions testing, and recordkeeping requirements pertaining to owners and operators of distributed generation sources classified as economic dispatch sources located in the New York City metropolitan area with a maximum mechanical output rating of 200 horsepower or greater where the potential to emit oxides of nitrogen (NOx) at a facility is less than

---

[138] NYSC, 6 CRR-NY 200.1:
https://govt.westlaw.com/nycrr/Document/I4e8c1ca4cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
[139] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/
[140] NYSC, 6 CRR-NY 202-1.1:
https://govt.westlaw.com/nycrr/Document/I4e8cdff4cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
[141] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/

25 tons per year.[142] It requires such sources to meet certain NOx emission restrictions for each generation technology; for example, by natural gas combustion turbines must have an emissions rate of no more than 2.96 pounds per MWh by May 1 2021, and 25 parts per million (dry) by May 1 2025. This currently affects approximately 513 MW of generation as estimated based on Form EIA-860 Generator Inventory data.[143]

F.2.4. Stationary Combustion Installations Regulation (6 NYCRR Part 227-1)

This regulation, last revised in 2021, sets emissions limits and reporting requirements on particulate emissions from stationary combustion installations.[144] The limit is 0.1 pounds emitted per million BTU of heat input and applies to installations with a maximum heat input capacity of 1 million BTU per hour of solid fuel or 50 million BTU per hour of oil or oil-mix fuels.[145] This affects approximately 4,110 MW of generation as estimated based on Form EIA-860 Generator Inventory data.[146]

F.2.5. Reasonably Available Control Technology Regulation (6 NYCRR Part 227-2)

This regulation, last revised in 2019, restricts NO_x emission from facilities containing a boiler, combustion turbine, stationary internal combustion engine, or other combustion engine.[147] The regulation sets NOx emissions limits for 20 different types of generating units with either emissions limits per unit heat generated, maintenance requirements, or case-by-case analysis.[148] This currently affects all of New York's fossil fuel resources estimated at approximately 28,277 MW as estimated based on Form EIA-860 Generator Inventory data.[149]

[142] NYSC, 6 CRR-NY 222.1: https://govt.westlaw.com/nycrr/Document/I234b42ced26a11e69accf5455470d933?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
[143] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/
[144] EPA, Approval and Promulgation of Implementation Plans – New York Particulate Matter Control Strategy: https://www.federalregister.gov/documents/2022/09/20/2022-20243/approval-and-promulgation-of-implementation-plans-new-york-particulate-matter-control-strategy
[145] NYSC, 6 CRR-NY 227-1.3: https://govt.westlaw.com/nycrr/Document/I4e976756cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
[146] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/
[147] EPA, Approval and Promulgation of Implementation Plans – New York Particulate Matter Control Strategy: https://www.federalregister.gov/documents/2022/09/20/2022-20243/approval-and-promulgation-of-implementation-plans-new-york-particulate-matter-control-strategy
[148] NYSC, 6 CRR-NY III A 227-2: https://govt.westlaw.com/nycrr/Browse/Home/NewYork/UnofficialNewYorkCodesRulesandRegulations?guid=Ib82d1520b5a011dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)
[149] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/

F.2.6. Peaking Units Regulation (6 NYCRR Subpart 227-3)

This was a new regulation adopted in December 2019 and sets NO_x emission limits for simple cycle combustion turbines (SSCT).[150] Emission limits were phased in beginning in May 2023 with NOx emissions limits of 100 parts per million dry volume basis (ppmvd). The second phase began May 2025 with 25 ppmvd for those burning gaseous fuels and 42 ppmvd for those burning liquid fuels by.[151] The regulation contains a reliability provision. This affects approximately 4,472 MW of generation, as estimated based on Form EIA-860 Generator Inventory data, although 446 MW of peaking units are exempt and retained to meet New York City's 2025 reliability needs.[152] [153]

F.2.7. New Source Review Regulation (6 NYCRR Part 231)

Amended in 2021, NYSDEC Part 231 establishes the new source review (NSR) preconstruction, construction and operation requirements for new and modified facilities to further article 19 of the Environmental Conservation Law. These requirements are intended to bring Clean Air Act nonattainment areas into compliance and prevent the degradation of air quality for areas already in compliance. Nonattainment areas are areas that fail to keep ambient concentrations of certain pollutants below the prescribed maximum established by the Clean Air Act standards. These standards are called the National Ambient Air Quality Standards, and they apply to emissions of the "criteria pollutants" Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone, Particle Pollution PM 2.5 and PM 10, and Sulfur Dioxide. The regulations do so by establishing emission control requirements for the construction of new sources of criteria pollutants and establishing associated mitigation measures. This affects any new or modified fossil fuel-fired power plant anticipated to emit more than the threshold values for the criteria pollutants (unique to each pollutant and attainment / nonattainment zone).

F.2.8. Best Available Retrofit Technology Regulation (6 NYCRR Part 249)

This regulation, created to fulfill the mandates of the federal Clean Air Visibility Rule first published in 1999 and amended in 2005, restricts the emissions of visibility-impairing pollutants by requiring the installation of Best Available Retrofit Technology (BART) on a BART-eligible stationary source to reduce regional haze and restore natural visibility conditions to Federal Class I Areas (national parks > 6,000 acres and national wilderness areas > 5,000 acres in 1977) [154]. BART is determined by measuring the emissions reductions achievable by the best technology system able to continually reduce emissions.

---

[150] EPA, Approval and Promulgation of Implementation Plans – New York Particulate Matter Control Strategy: https://www.federalregister.gov/documents/2022/09/20/2022-20243/approval-and-promulgation-of-implementation-plans-new-york-particulate-matter-control-strategy

[151] NYSC, 6 CRR-NY 227-3.4: https://govt.westlaw.com/nycrr/Document/I23afb5c062d711ea8777f1e457ab6add?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

[152] EIA, Generator Inventory: https://www.eia.gov/electricity/data/eia860m/

[153] NYISO, NYC Reliability Solution Fact Sheet: https://www.nyiso.com/documents/20142/39103148/NYC-Reliability-Solution-Fact-Sheet.pdf/169f336c-730f-6bd3-67c2-22037fcee56f?t=1700503745709

[154] NYSC, 6 CRR-NY 249-1 Purpose and Applicability: https://casetext.com/regulation/new-york-codes-rules-and-regulations/title-6-department-of-environmental-conservation/chapter-iii-air-resources/subchapter-a-prevention-and-control-of-air-contamination-and-air-pollution/part-249-best-available-retrofit-technology-bart/section-2491-purpose-and-applicability

BART determinations are passed through New York to the EPA for final approval. Emissions testing for BART sources quantify the emissions of visibility-impairing pollutants, including PM10 and PM2.5. This does not currently affect any generation units in New York, as the state does not have any Federal Class I Areas.

F.2.9. CO2 Performance Standards Regulation (6 NYCRR Part 251)

6 NYCRR Part 251 limits the amount of carbon dioxide emitted from certain generation facilities.[155] This rule applies to new electric generating facilities that commenced construction after July 12, 2012 and existing facilities that provide more than 10 percent of their annual electric output to the electric grid.

For new sources: boilers that are permitted to fire greater than 70 percent fossil fuel, combined cycle combustion turbines, and stationary internal combustion engines that fire only gaseous fuel are required to meet output or input emission rates of 925 lbs CO2/MWh or 120 lbs CO2/mmBtu. While simple cycle combustion turbines and stationary internal combustion engines that fire either liquid fuel or liquid and gaseous fuel simultaneously must meet output or input emission rates of 1450 lb CO2/MWh or 160 lb CO2/mmBtu.

Existing sources: Non-modified existing sources are required to meet output or input emission rates of 1800 lbs CO2/MWh or 160 lbs CO2/mmBtu. This rule currently affects approximately 25,667 MW of generation as estimated based on Form EIA-860 Generator Inventory data.

F.2.10. Sulfur Hexafluoride Standards and Reporting (6 NYCRR Part 495)

Passed in January of 2024, 6 NYCRR Part 495 implements requirements for phasing out and reporting sulfur hexafluoride (SF6) emissions in the electric power sector.[156] [157] This regulation will affect utilities and transmission owners operating gas-insulated equipment utilizing SF6 or other greenhouse gasses; such equipment includes switchgears and other medium- and high-voltage equipment used where space is limited.[158]

The requirements apply to equipment utilizing SF6 (or other covered gasses) as an insulating gas, as well as firms with gas-insulated equipment emissions of greater than 7,500 metric tons of carbon dioxide-equivalent per year. Implementation is executed using a series of SF6 phase-out dates (varying by equipment type); the earliest dates is 1 January 2027 and the latest is 1 January 2033. The law

---

155 NYSC, 6 CRR-NY 251 CO2 Performance Standards for Major Electric Generating Facilities: https://casetext.com/regulation/new-york-codes-rules-and-regulations/title-6-department-of-environmental-conservation/chapter-iii-air-resources/subchapter-a-prevention-and-control-of-air-contamination-and-air-pollution/part-251-co2-performance-standards-for-major-electric-generating-facilities

156 Trinity Consultants, New York Finalizes New and Amended SF6 and HFC Rules: https://www.trinityconsultants.com/news/new-york-finalizes-new-and-amended-sf6-and-hfc-rules

157 NYSDEC, Express Terms of Part 495: https://dec.ny.gov/sites/default/files/2024-12/part495expresstermsofficial.pdf

158 Siemens Energy, Gas-Insulated Switchgear: https://www.siemens-energy.com/us/en/home/products-services/product-offerings/gas-insulated-switchgear.html

establishes a gradually declining cap on other gas-insulated equipment emissions beginning in 2030 (at 1% of baseline CO2-equipvalent), then declining at 5% per year starting in 2035.

F.2.11. NYSDEC Climate Act Policies

F.2.11.1. Climate Change and DEC Action (NYSDEC CP-49)

NYSDEC Commissioner's Policy 49 (CP-49) establishes NYSDEC's responsibility to incorporate climate change considerations into aspects of its activities and comply with the specific requirements of the Climate Act and the Community Risk and Resiliency Act of 2014 as amended by the Climate Act.[159] This responsibility includes but is not limited to establishing a value of carbon for use by state agencies, considering emissions limits when issuing permits and licenses, and ensuring at least 35% of clean energy benefit funds are spent in disadvantaged communities.

F.2.11.2. Climate Act and Air Permit Applications (NYSDEC DAR-21)

Adopted on December 14, 2022, NYSDEC's Division of Air Program Policy 21 (DAR-21) outlines the requirements for analyses developed pursuant to Section 7(2) of the Climate Act in support of air pollution control permit applications.[160] This applies to new, modified, and renewals of Title V, Title IV (i.e. subject to federal acid rain requirements) and Air State Facility permits. DAR-21 outlines-the required content of Climate Act analyses submitted in support of air permit applications, including direct, upstream, downstream, and indirect greenhouse gas emissions associated with the proposed project. Applicants are also required to discuss potential alternatives and mitigation measures for projects that would result in an increase in greenhouse gas emissions.

F.2.11.3. Permitting and Disadvantaged Communities Under the Climate Act (DEP 24-1)

NYSDEC's Division of Environmental Permits Program Policy DEP 24-1 was issued on May 8, 2024. DEP 24-1outlines the requirements for analysis development pursuant to Section 7(3) of the Climate Act and applies to permit applications subject to the Uniform Procedures Act (UPA).[161] The Climate Act states that "All state agencies, offices, authorities, and divisions shall… prioritize reductions of greenhouse gas emissions and co-pollutants in disadvantaged communities". Analytical requirements in DEP 24-1 include identifying the scope of permits affected (including all major permit applications made pursuant to Article 19 of the Environmental Conservation Law: Air Pollution Control, process requirements, and specific analytical considerations to be included in the permit evaluation.

[159] NYSDEC, Commissioner Policy 49: Climate Change and DEC Action: https://extapps.dec.ny.gov/docs/administration_pdf/cp492022.pdf
[160] NYSDEC, DAR-21: The Climate Leadership and Community Protection Act: https://extapps.dec.ny.gov/docs/air_pdf/dar21.pdf
[161] NY DEP, Draft DEP-23-1 Policy for Environmental Justice Permitting: https://extapps.dec.ny.gov/docs/permits_ej_operations_pdf/draftdep23dash1policy.pdf

F.3. Local Regulations

The following regulation is promulgated by a sub-state government echelon and significantly impacts the New York transmission and distribution systems.

F.3.1. New York City Council Residual Oil and Fuel Oil No. 4 Elimination

In January 2018 the New York City Council passed legislation to accelerate the phasing out the combustion of fuel oil grade No. 4 and No. 6 in heat and hot water boilers and burners. Operators had the option to either:

i. Switch from No. 6 fuel oil to ultra-low sulfur No. 2 fuel oil - or an alternative fuel - by 2022
ii. Switch from No. 4 fuel oil to No. 2 fuel oil - or an alternative fuel - by 2025.

The purpose of the rule is to improve City air quality by reducing emissions of particulate matter (PM) and NOx associated with the operation of boilers and burners. These boilers and burners are required by reliability rules (e.g. NYSRC Loss of Gas Supply Reliability Rule) to maintain dual-fuel capability with natural gas and oil.

NYISO expected about 3,000 MW of installed capacity to be impacted by the initial rule with compliance ongoing.[162]

G. Energy Policy Initiatives

This chapter outlines the major *energy policy initiatives* that impact the electric sector. As the foundation of our modern society, energy markets, subsidies, and operating requirements have been extensively shaped and regulated by policy efforts at all levels of government.

The first section outlines the intended *effects of public policy* on the grid. Public policy is shaping the transmission and distribution systems, from economic development initiatives driving increases in large loads to climate goals leading to shifts in the generation mix.

The second section outlines the *federal* policy initiatives that impact the New York transmission system. These multi-state initiatives tend to broadly distribute funds for projects that meet federal policy goals without prescribing the details of their execution.

The third section outlines *regional* policy initiatives. These are voluntary efforts by multi-state coalitions to both coordinate their transmission planning efforts for greater efficiency and reliability effects and overcome coordination problems inherent to many energy and environmental challenges.

The last section outlines the energy policies initiated by *New York State.* These tend to be more detailed than federal or regional policy programs and target specific sectors. These initiatives are intended to

[162] NYISO. "2016 Reliability Assessment Needs." Oct. 18, 2016.

shape the New York energy landscape to fit the state's vision for itself as a net-zero energy emissions state by 2040.

G.1. Public Policy Effect on the Grid

Public policies at the federal, state, and local levels are reshaping New York's electricity demand, generation, and grid infrastructure, driving significant changes in both load and transmission requirements. Federal initiatives like the IRA, the IIJA, and the CHIPS Act have incentivized electrification and manufacturing, resulting in increased electricity demand forecasts across the state, with many new large loads projected to be located in upstate New York, though federal energy policy is currently uncertain. Simultaneously, state and local policies, including the Climate Act and the AEBA are accelerating the decarbonization of the electrical grid and the electrification of sectors such as transportation and buildings through mandates and incentives. These measures are critical for achieving decarbonization goals but also place growing pressure on the state's electric grid.

Even as the electric sector is seeing increased stresses from aging infrastructure and climate change, it also faces a two-pronged policy-driven challenge over the coming decades as well:

1. Expanding generation and transmission infrastructure to keep pace with growing demand driven by electrification as well as new large loads.
2. Transforming its generation mix to one powered primarily by zero-emission technologies.

Public policy is also directly shaping the transmission landscape. New transmission buildout will be needed to transport the increased penetration of energy from renewable projects from upstate and offshore to increasing demand in load centers. Policies described in this section such as funding opportunities present in the IIJA (G.2.2) and transmission siting reforms present in the New York's RAPID Act (G.4.3) are targeting electric transmission development to address the dual demands of increased load and renewable integration. In response to the Accelerated Renewable Energy Growth and Community Benefits Act (AREGCB), the NYPSC has issued a series of implementing orders. Among these is the directive for Joint Utilities to establish a Coordinated Grid Planning Process (CGPP). The CGPP is designed to facilitate comprehensive and collaborative planning among utilities, ensuring that transmission development aligns with policy objectives and system needs. Additionally, the Public Policy Transmission Planning Process (PPTPP) (further developed in section C.2.4) serves as a mechanism by which the New York Independent System Operator (NYISO) evaluates transmission needs driven by public policy requirements, ensuring that the state's transmission infrastructure evolves in accordance with legislative and regulatory mandates.

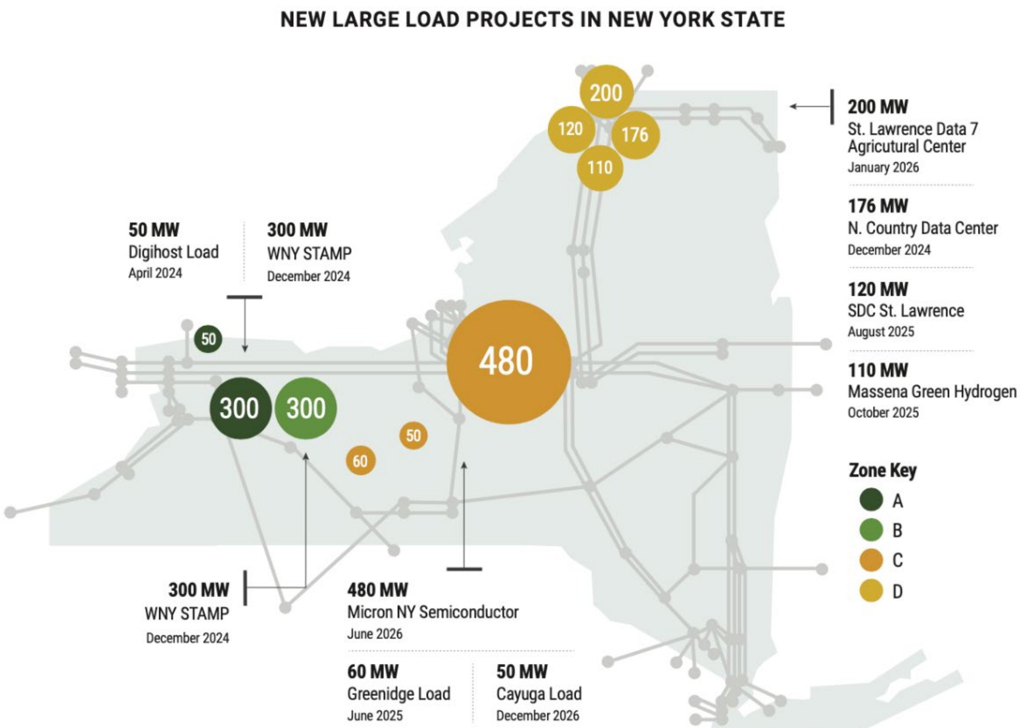


Figure G-1: New Large Projects in New York State

G.2. Federal

This section covers federal policy initiatives relevant to the New York transmission system.

G.2.1. The Context of the Presidential Administration Transition

All the federal policies discussed in this section were enacted during President Biden's term of office, which ended on 20 January 2025. The incoming administration, led by President Trump, has expressed a strong intent to reverse many of President Biden's environmental and energy-related policies. Since these reversals have not yet been implemented at the time of this writing, this section serves to document policies that are on the books and their corresponding impacts on New York State, acknowledging that many of these policies face an uncertain future.

G.2.2. Infrastructure Investment and Jobs Act (IIJA)

The federal Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), was enacted in November 2021 to modernize the nation's infrastructure, enhance economic competitiveness, and address environmental and energy challenges.[163] The total funding package is approximately $1.2 trillion, including $550 billion in new spending over five years. One of the core investment areas in the legislation is Clean Energy and Grid Modernization which receives approximately $65 billion from which approximately $22 billion is allocated for transmission and distribution investments including:

- $11 billion for grid resilience and modernization.
- $3 billion for the Smart Grid Investment Matching Grant Program.
- $8 billion for regional and interregional transmission lines through the established Transmission Facilitation Program.

Under the IIJA, the Grid Deployment Office (GDO) is overseeing the $10.5 billion Grid Resilience and Innovation Partnerships (GRIP) Program. This initiative aims to enhance grid flexibility and strengthen the resilience of the power system in response to increasing risks from extreme weather events and climate change. In October 2024, the U.S. Department of Energy (DOE) announced $4.2 billion in federal investments through the second round of GRIP funding for 46 projects.[164] Included were the following New York-impacting projects:

- A $49.6 million award to National Grid for their "Future Grid Project" which aims to accelerate and enhance the effectiveness of new renewable resources in New York and Massachusetts;[165]
- A $27 million award for upstate NY's Delaware County Electric Cooperative to increase grid resilience against outages caused by weather events and tree damage caused by invasive species;[166]
- A $10.9 million grant to enable Scaling Vehicle-to-Grid Integration through a partnership with Highland Electric Fleets, the leading provider of school bus fleet electrification-as-a-

---

[163] US Congress, Infrastructure Investment and Jobs Act (H.R.3684): https://www.congress.gov/bill/117th-congress/house-bill/3684

[164] US DOE, Grid Resilience and Innovation Partnerships (GRIP) Program Projects: https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program-projects#:~:text=As%20of%20October%2018%2C%202024,weather%2C%20lower%20costs%20for%20communities%2C

[165] National Grid, $50 Million Federal Infrastructure Grant: https://www.nationalgridus.com/News/2023/10/National-Grid-Awarded-50-Million-Federal-Infrastructure-Grant-to-Integrate-More-Clean-Energy-on-the-Grid-/

[166] Senator Kirsten Gillibrand, $27 Million for Delaware County Electric Cooperative: https://www.gillibrand.senate.gov/news/press/release/gillibrand-announces-27-million-in-federal-funding-for-delaware-county-electric-cooperative-as-part-of-the-department-of-energys-grid-resilience-and-innovation-partnerships-grip-program/#:~:text=The%20requested%20funding%20will%20be,(202)%20224%2D4451

service, and 12 utility providers and educational institutions with impacts across multiple states including New York;[167]

- A $17.4 million grant to the Jamestown Board of Public Utilities to deploy a microgrid near the city's downtown.[168]

G.2.3. Inflation Reduction Act (IRA)

The Inflation Reduction Act (IRA) was enacted by the U.S. Congress in August of 2022, and contains **three** transmission provisions in Part 5 Subtitle A of Title V providing approximately $2.9 billion in funding:[169]

- Section 50151 (Transmission Facility Financing) provides $2 billion, available until September 30, 2030, for direct loans to support 10 potential transmission projects within National Interest Electric Transmission Corridors (NIETCs) that were established by the DOE in May of 2024. One of these 10 potential transmission projects is a New York-New England 60-mile corridor connecting Massachusetts and New York which includes sections of existing state highway and high-voltage transmission right-of-way.[170] While this corridor was ultimately not selected as a final NEITC, it does indicate a potential for future expansion if subsequent funding becomes available.
- Section 50152 (Grants to Facilitate the Siting of Interstate Electricity Transmission Lines) allocates $760 million, available until September 30, 2029, for grants to support the siting of onshore and offshore electricity transmission lines. These grants can be used by state and local siting authorities for activities such as project studies, exploring alternative corridors, facilitating stakeholder negotiations, engaging in regulatory proceedings, and fostering economic development in affected areas. To receive funding, siting authorities must agree to issue a final decision on the project within two years, though the act does not outline penalties for missing this deadline. In July 2024, the New York Power Authority was awarded $43,538,714 by the U.S. Department of Energy to support the Propel NY transmission project, a 90-mile initiative designed to enhance electric grid reliability, resiliency, and the integration of clean energy resources, including offshore wind, in Long Island, New York City, and Westchester County. The project includes collaboration with local schools, housing authorities, and community service organizations to advance clean energy education and workforce development opportunities for residents of disadvantaged communities impacted by the line.
- Section 50153 (Interregional and Offshore Wind Electricity Transmission Planning, Modeling, and Analysis) allocates $100 million, available until September 30, 2031, for stakeholder engagement and analysis to support interregional and offshore wind transmission development. The U.S. transmission system consists of three main interconnections—

---

[167] PR Newswire, US DOE Awards Highland Electric Fleets $10.9 Million for V2G Services: https://www.prnewswire.com/news-releases/us-department-of-energy-awards-highland-electric-fleets-project-approximately-10-9-million-in-cost-share-funding-to-accelerate-vehicle-to-grid-services-302279920.html

Jamestown Board of Public Utilities, Jamestown Community Microgrid: https://www.jamestownbpu.com/414/Jamestown-Community-Microgrid#:~:text=The%20DOE%20GRIP%20funding%20will,cabling%20in%20the%20downtown%20area .

[169] US Congress, Inflation Reduction Act (H.R.5376): https://www.congress.gov/bill/117th-congress/house-bill/5376

[170] DOE, National Interest Electric Transmission Corridor Designation Process: https://www.energy.gov/gdo/national-interest-electric-transmission-corridor-designation-process

Eastern, Western, and ERCOT—with limited connectivity between them. Interregional transmission projects are rare but could enhance renewable energy integration and reduce consumer costs. The Federal Energy Regulatory Commission (FERC) is actively reviewing interregional transmission planning, including through its Joint Federal-State Task Force on Electric Transmission and ongoing rulemakings on transmission planning and cost allocation

The IRA also deployed both direct clean energy investments and production + investment tax credits for eligible green electricity generators.[171] These incentives have furthered New York's clean energy goals by increasing the economic competitiveness of carbon-free generators.

G.2.4. The CHIPS and Science Act

The Creating Helpful Incentives to Produce Semiconductors and Science Act (CHIPS Act) was enacted by the U.S. Congress in August 2022 and authorizes roughly $280 billion in fundings to support domestic research and manufacturing of semiconductors in the United States. One of the main aims of the Act is to revitalize and secure the U.S. semiconductor industry by onshoring supply chains and manufacturing. For this purpose, the Act provides a 25% investment tax credits and $54.2 billion in subsidies for microprocessor facilities. The Act also sets aside $170 billion for R&D initiatives across multiple federal agencies, including the NSF, DOE, NIST, and others.[172]

To enhance its competitiveness, in 2022 New York State also enacted its own semiconductor manufacturing incentive legislation known as the Green CHIPS Legislation (S.9467/ A.10507).[173] The legislation offers at least $3 billion in qualified investments for semiconductor manufacturers that consider GHG emissions and environmental impacts, invest in workforce and community development, support local STEM education, and offer prevailing wages. The incentives work on a pay-for-performance mechanism and are an amendment to the Excelsior Tax Credit Program.

As of August 2024, over $112 billion in planned capital investments in microprocessor manufacturing facilities have been announced in New York state in response to these policies:

- Micron Technology was awarded $6.1 billion preliminary memorandum that includes the development of a $100 billion chip manufacturing campus in in Central NY.
- GlobalFoundries was awarded over $1.5 billion in federal grants which it will use to expand its Fab 8 campus in Saratoga County.
- New York State was also awarded $40 million from the Department of Defense's Microelectronic Commons Program to develop Northeast Regional Defense Technology Hub which is a consortium that aims to bring together academia, industry and government organizations to help New York's chips industry with innovation, attract new companies, strengthen the workforce and bolster the industry.

These advanced manufacturing facilities are expected to consume large amounts of energy and lead to load growth highlighting the need for the expansion of robust generation and transmission and

---

[171] US Treasury, IRA Tax Credits and Related Guidance: https://home.treasury.gov/policy-issues/inflation-reduction-act/ira-related-tax-guidance
[172] Congressional Research Service, Frequently Asked Questions: CHIPS Act of 2022: https://crsreports.congress.gov/product/pdf/R/R47523
[173] NY State Senate, Bill S9467 – Green CHIPS Projects in Excelsior Program: https://www.nysenate.gov/legislation/bills/2021/S9467

distribution infrastructure. They also are particularly sensitive to grid reliability since minor system disturbances can create costly damages in production. Therefore, the resurging New York semiconductor industry is a major economic driver for the expansion of a clean and stable grid.

G.3. Regional

G.3.1. Regional Greenhouse Gas Initiative (RGGI)

The Regional Greenhouse Gas Initiative (RGGI) is a multi-state program to reduce CO2 emissions from the power sector by implementing a regional emissions cap. The participating states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.[174]

RGGI applies to fossil-fuel-powered electric generators with a capacity of 25 megawatts or more. New York State expanded the program to cover fossil fuel-fired electric generating units equal to or greater than 15 MW located at an existing RGGI facility, or where there are two or more units at a non-RGGI affected facility with a combined generating capacity greater than 15 MW.[175]

The Regional Greenhouse Gas Initiative (RGGI) sets the number of CO2 allowances available across participating states, including New York, based on each state's emissions reduction goals and Budget Trading Programs. These allowances are allocated to covered facilities according to the RGGI Model Rules, with additional allowances auctioned regionally to ensure compliance with emissions obligations. The total number of allowances decreases over time to meet decarbonization targets, requiring covered entities to either reduce their emissions, use banked allowances, or purchase additional allowances on the secondary trading markets. Auction proceeds are redistributed to participating states for programs that benefit consumers, improve energy efficiency, and support renewable energy deployment. In New York, the Climate Act mandates that disadvantaged communities receive at least 35%, with a goal of 40%, of the overall benefits of spending on clean energy and energy efficiency programs, projects or investments.

In New York State, RGGI is implemented by NYSDEC through 6 NYCRR Part 242, CO_2 Budget Trading Program. The administration and implementation of CO_2 allowance auctions and programs provided for in 6 NYCRR Part 242 is implemented by the New York State Energy Research and Development Authority through 21 NYCRR Part 507, CO_2 Allowance Auction Program.

The participating RGGI states periodically review their CO2 budget trading programs. The First Program Review and Second Program Review were completed in February 2013 and December 2017. The Third Program Review was announced in February 2021 and the latest updated modeling results were published in September of 2024.[176]

[174] RGGI, Third Program Review Update: https://www.rggi.org/sites/default/files/Uploads/Program-Review/2024/Third_Program_Review_Update_9-23-2024.pdf
[175] S&P Global, NY RGGI Expansion and Stricter Cap: https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/new-york-adopts-stricter-rggi-cap-extends-requirement-to-smaller-units-61580266
[176] RGGI, Program Review Update September 23rd, 2024: https://www.rggi.org/sites/default/files/Uploads/Program-Review/2024/Third_Program_Review_Update_9-23-2024.pdf

G.3.2. Northeast States Collaborative on Interregional Transmission

Initiated in June 2023, the Northeast States Collaborative on Interregional Transmission is a collaboration of representatives from 10 states intended to coordinate on interregional transmission planning to lower costs for ratepayers, improve system reliability, and advance state energy policies.[177] A memorandum of understanding was signed by the member states on July 9, 2024. [178]

On October 1st, 2024, the Collaborative published a white paper on HVDC Equipment Standardization and Supply Chain Considerations for Offshore Wind Transmission.[179] The paper describes four key benefits for standardizing HVDC equipment:

- Minimizing supply chain challenges by permitting equipment manufacturers to focus on a single standard.
- Maximizing forward compatibility between systems for the future possibility of networking HVDC offshore wind lines.
- Accelerating investment in domestic supply chains by clarifying state interest in HVDC transmission.
- Encouraging adoption of global HVDC standards to allow for larger, more cost-effective projects.

G.4. New York State

G.4.1. Climate Leadership and Community Protection Act

New York's Climate Leadership and Community Protection Act [180] (The Climate Act) was enacted in July 2019. The Climate Act sets forth the following goals and requirements:

- Statewide greenhouse gas (GHG) emissions reductions of 40 percent by 2030 and 85 percent by 2050 compared to 1990 levels;
- Regulations to achieve the statewide GHG emissions reductions targets;
- 70 percent renewable electricity by 2030;
- 100 percent zero emission electricity by 2040;
- 9 GW offshore wind installed by 2035;

[177] Johns Hopkins University Energy Institute, Northeast States Collaborative on Interregional Transmission: https://energyinstitute.jhu.edu/northeast-states-collaborative-on-interregional-transmission/

[178] The member states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

[179] Johns Hopkins University Energy Institute, 2024 Whitepaper on Transmission Standards – NE States Collaborative: https://energyinstitute.jhu.edu/wp-content/uploads/2024/10/2024-Whitepaper-on-Transmission-Standards-NE-States-Collaborative-Oct-1-2024.pdf

[180] NY State Senate, Bill S6599 – Climate Leadership and Community Protection Act: https://www.nysenate.gov/legislation/bills/2019/s6599

- 6 GW distributed solar installed by 2025 and 10 GW by 2030;
- 3 GW energy storage installed by 2030, which was increased to a 6 GW target by the PSC;[181]
- A statewide goal of reducing energy consumption by 185 trillion BTUs from the state's 2025 forecast through energy efficiency improvements; and
- Disadvantaged communities receive a minimum of 35 percent, with a goal of 40%, of the overall benefits of spending on clean energy and energy efficiency programs, projects or investments.

In the electricity sector, the Climate Act expanded upon the goals of the State's Clean Energy Standard (CES) which was established in 2016, superseding the state's Renewable Portfolio Standard.[182] Under the CES, NYSERDA procures Renewable Energy Certificates (RECs) and Zero Emissions Credits (ZECs) from renewable and zero-emission (nuclear) electricity generation facilities. RECs and ZECs represent the environmental attributes of one MWh of energy. The CES program mandates that the LSEs procure RECs and ZECs from NYSERDA in proportion to their load share. NYSERDA centrally procures RECs and ZECs, offering long-term purchase agreements with clean energy generators. To achieve the 70% goal, the PSC determined that renewable electricity generation from all sources will need to be approximately 115,437 GWh.[183] One major infrastructure effort to meet this goal is the Champlain Hudson Power Express (CHPE), an under-construction transmission line to deliver power from Quebec into Queens, New York.[184] The power delivered over CHPE is eligible for RECs under Tier 4 Program of the CES, which was created to drive reductions in fossil generation in New York City.[185] When complete in 2026, this line aims to deliver up to 1,250 MW of clean power from Hydro Quebec's hydroelectric generators into New York City.

G.4.1.1. Climate Act Phase 1 and Phase 2 Transmission Projects

Published by the PSC and NYSERDA in 2021, the Power Grid Study identifies necessary upgrades and investments in New York State's power grid to support the goals of the Climate Act.[186] The study is comprised of three components: the Utility Transmission & Distribution Investment Working Group Study, the Zero-Emissions Electric Grid in New York by 2040, and the Offshore Wind Integration Study. The study's findings have informed the Public Service Commission's planning for investments in New York's electric system.

The study found that New York's current transmission system is generally capable of supporting the state's 2030 target of 70% renewable electricity. The study also found that meeting the longer-term of the Climate Act past the 2030 mark will require additional transmission investments and proactive

---

[181] PSC, Order Establishing Updated Energy Storage Goal and Deployment Policy. June 20, 2024. https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Energy-Storage/2024-06-6GW-Energy-Storage-Order.pdf
[182] PSC, Order Adopting a Clean Energy Standard, 2016. https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={44C5D5B8-14C3-4F32-8399-F5487D6D8FE8}.
[183] NYSERDA, CES Biennial Review: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Clean-Energy-Standard/A00194900000C313A126877CFFAA2B0C.pdf
[184] CHPE, Champlain Hudson Power Express: https://chpexpress.com/
[185] NYSERDA, Tier 4 Program: https://www.nyserda.ny.gov/All-Programs/Large-Scale-Renewables/Tier-Four/About-Tier-4
[186] NYSERDA, New York Power Grid Study: https://www.nyserda.ny.gov/About/Publications/Energy-Analysis-Reports-and-Studies/Electric-Power-Transmission-and-Distribution-Reports/Electric-Power-Transmission-and-Distribution-Reports---Archive/New-York-Power-Grid-Study#:~:text=In%20March%202021%2C%20the%20PSC,York%20Independent%20System%20Operator%20(NYISO)

system planning. The Department of Public Service (DPS) has established a two-phase approach ensure the transmission system can accommodate the changes necessary to advance the Climate Act goals:

- Phase 1 projects include near-term upgrades that are already underway or planned over the next few years. These upgrades are focused on maintaining reliability, improving resilience, and enabling the level of renewable energy growth expected by 2030.
- Phase 2 projects are oriented toward the longer-term needs of the Climate Act, particularly after 2030. These projects are designed to integrate larger volumes of new generation, especially offshore wind, and ensure the grid can support deeper decarbonization.

G.4.2. Zero by 2040 Initiative

The Climate Act sets a target of a zero-emissions electricity sector by 2040.[187] On May 18, 2024, The PSC issued an Order that initiates a process to identify technologies that can help achieve the 2040 goal while maintaining reliability standards.[188] This Order led to two main workstreams:

- **Defining Key Zero by 2040 Terminology**: The Climate Act's text reads "by the year [2040] the statewide electrical demand system will be zero emissions." The PSC Order directed DPS to define the key terms – "zero emissions" and "statewide electrical demand system" – that are critical to determining how the Zero by 2040 goal will be reached. On November 4th, 2024, DPS released a whitepaper proposing definitions of both terms.[189]
- **2040 Reliability Gap Analysis**: The Order acknowledges the possibility of a gap between the capabilities of existing zero-emissions technology and expected future system reliability requirements.[190] In response, the PSC is currently in the process of identifying and analyzing possible technologies that can close this gap and has solicited the input of stakeholders in this process. The results of this analysis have yet to be published.

G.4.3. Siting Law

The siting process for generation facilities allows a regulatory agency to determine whether a generation facility can be located and operated at a specific site. While historically much of the authority over siting decisions rested with local municipalities and planners, in recent years, state governments like Massachusetts, Michigan, Illinois, and New York have increasingly centralized this authority through legislation.[191]

---

[187] NY State Senate, Bill S6599 – Climate Leadership and Community Protection Act: https://www.nysenate.gov/legislation/bills/2019/s6599

[188] New York PSC, Case 15-E-0302 – Clean Energy Standard Proceeding: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B00E12F88-0000-C914-BA3F-E14BF4BA3762%7D

[189] New York DPS, Proposed Definitions of Key Terms in PSL §66-p: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={F09DF892-0000-CE4F-ACD5-E3FCF99B210B}

[190] New York PSC, Case 15-E-0302 – Clean Energy Standard Proceeding: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B00E12F88-0000-C914-BA3F-E14BF4BA3762%7D

[191] US DOE, Siting of Large-Scale Renewable Energy Projects: https://www.energy.gov/eere/siting-large-scale-renewable-energy-projects#map

In 2011, New York enacted Article 10 of the New York State Public Service Law.[192] Article 10 re-authorized the State-level siting law for major electric generation facilities originally enacted in 1972 as Public Service Law Article VIII and, in 1992, as Article X. Article 10 re-established the Board on Electric Generation Siting and the Environment (Article 10 Siting Board) to oversee the siting review of new and modified major electric generating facilities, streamlining the application process for developers of facilities larger than 25MW. The law required new projects to conduct environmental justice analyses and established CO2 emissions standards.

Article VII, originally enacted in 1970, provided a review process under the jurisdiction of the New York State Public Service Commission to determine the need for and environmental impact of siting, design, construction, and operation of any major electric and fuel gas transmission facility.

In April 2020, the New York State legislature passed the Accelerated Renewable Energy Growth and Community Benefit Act, including the new Executive Law § 94-c, and established the Office of Renewable Energy Siting (ORES) within the Department of State.[193] This new office, which replaced the Article 10 Siting Board for major renewable energy facilities, was designed to create a central forum for siting renewable energy generators, facilitating the siting and construction of large-scale renewable energy projects while considering their environmental impacts. In March of 2021, ORES implemented regulations and uniform standards and conditions (USCs) for the permitting of large-scale renewable energy projects. These permit USCs were informed via collaboration with relevant State agencies, and a series of public hearings, allowing local governments, stakeholders, and private individuals to provide formal input and reducing the need for lengthy iterative exchanges in between these parties during the application review window.

ORES has between six months and one year to make a determination on a complete permit application or any draft permit issued for public comment will be deemed approved and a permit granted.[194] During the application review, ORES has the authority to review and potentially waive local siting laws the applicant demonstrates are "unreasonably burdensome" in light of New York's Climate Leadership and Community Protection Act (Climate Act) goals and the environmental benefits of the project.[195]

In April 2024, the Renewable Action through Project Interconnection and Deployment (RAPID) Act was enacted (new Article VIII of the Public Service Law).[196] This legislation sought to accelerate the siting and deployment of transmission projects in line with generation to advance the emission cuts and carbon neutrality goals outlined in the Climate Act. The RAPID Act renamed ORES as the Office of Renewable Energy Siting and Electric Transmission and transferred ORES from the Department of State to the Department of Public Service. The RAPID Act continued all of ORES's existing functions, powers, duties, and obligations with respect to renewable energy generation siting, and granted ORES new additional functions, powers, duties, and obligations with respect to major electric transmission facility siting. ORES replaced the Public Service Commission for the permitting of such facilities.

The RAPID Act establishes a single, State-level permit requirement for major renewable energy facilities with a nameplate generating capacity of 25 MW or greater. The Act also establishes a permit

[192] NY State Senate, Public Service Law: https://www.nysenate.gov/legislation/laws/PBS
[193] ORES, About ORES: https://dps.ny.gov/about-ores
[194] NYSDERDA, Accelerated Renewable Energy Growth and Community Benefit Act Fact Sheet: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Fact-Sheets/Accelerated-Renewables-Fact-Sheet.pdf
[195] New York State Bar Association, Preempting Local Zoning Codes Fuels Opposition to Renewable Energy in New York: https://nysba.org/preempting-local-zoning-codes-fuels-opposition-to-renewable-energy-in-new-york/#_ednref10
[196] New York State Senate, Assembly Bill A8808A: https://legislation.nysenate.gov/pdf/bills/2023/A8808A

requirement for major electric transmission facilities with a design capacity of (i) 150 kV or more extending a distance of one mile or more, or 100 kV or more, including associated equipment, and (ii) less than 125 kV, extending a distance of ten miles or more, including associated equipment. The RAPID Act pre-empts other State and local permitting approvals for projects that meet the major facilities criteria. Projects that fall below the RAPID Act thresholds are subject to local and State permitting and are regulated under the Environmental Conservation Law.

The RAPID Act mandates that ORES develop regulations and establish uniform standards and conditions for the permitting of major renewable energy and electric transmission facilities in consultation with NYSERDA, NYSDEC, the New York State Department of Agriculture and Markets, and other relevant State agencies. Additionally, the Act codifies local outreach requirements, including proof of pre-application coordination with affected municipalities. ORES is authorized to include in its regulations a framework that relieves transmission projects that utilize existing rights-of-way from certain requirements of the RAPID Act.

The RAPID Act also reinforces existing farmland protections, requiring generation and transmission facilities to avoid, minimize, or mitigate "potential significant adverse impacts to land used in agricultural production, with additional consideration for land within agricultural districts or land that contains mineral soil groups 1-4" (soil optimal for crops). It also continues the Farmland Protection Working Group to recommend additional mitigation measures.

G.4.4. Grid of the Future Initiative

In April 2024, the New York State Public Service Commission (PSC) initiated a proceeding to develop a comprehensive "New York Grid of the Future Plan". Through this process, the Department of Public Service (DPS) staff will work with stakeholders to craft a forward-looking roadmap for the deployment of flexible resources such as distributed energy resources (DERs) and virtual power plants (VPPs). These flexible resources have the potential to provide flexibility services that can address system and reliability needs and benefit both the bulk and distribution levels of the electric system.

The Plan builds on existing PSC programs aligned with New York's ambitious clean energy targets, such as NY-Sun, energy storage, energy efficiency, clean heat, and electric vehicle (EV) programs, as well as compensation frameworks like the value stack methodology for DERs.

The proceeding involves three phases:

1. Grid Flexibility Potential Study (January 2025): a quantitative assessment of cost-effective, achievable potential for grid flexibility and identification of barriers to deploying that flexibility.
2. Distributed System Investment Plan Review (March 2025): an evaluation of utilities' distribution system investment plans (DSIP) and updated guidance for utilities.
3. Grid of the Future Plan (anticipated December 2025): a comprehensive plan and framework for achieving long-term vision for grid flexibility in New York, to be updated over time.

The Grid of the Future Plan has nine required elements:

1. Identify resource deployment goals
2. Determine distributed system platform (DSP) elements that are needed to support grid flexibility
3. Identify new forms of compensation for customers who provide flexibility services
4. Identify potential customer savings and benefits
5. Identify roles and responsibilities for market participants

6. Account for changing technology and information asymmetries
7. Identify Physical and Cyber Security Protocols
8. Address the need for operational flexibility and intelligent deployment of resources
9. Consider equitable allocation of costs and benefits among customers and possible funding sources not provided directly from utility customers[197]

G.4.5. Proactive Planning Initiative

On August 15, 2024, the New York State Public Service Commission commenced a proceeding which directs New York's investor-owned utilities to develop a framework for proactively planning for transportation and building electrification-driven distribution system needs.[198] The objective of this proceeding is to proactively identify and develop grid infrastructure to meet new energy loads, shifting away from a traditionally-reactive approach to distribution planning in which individual utilities identify and respond to potential needs as they arise in their territory. The pace and scale at which new electrification loads and other new large loads can come online (months) exceeds the speed of building traditional grid infrastructure (years). This new proactive approach will enable utilities to anticipate and begin construction for new loads before they seek connections, model policy-driven electrification using scenario-based planning approaches, and feed granular load forecast information into the newly established Coordinated Grid Planning Process.

G.4.6. Building Electrification and Decarbonization

In May 2023, the New York State Legislature passed the All-Electric Buildings Act (AEBA), aimed at reducing reliance on fossil fuels in new buildings. The AEBA prohibits municipalities from issuing building permits for new buildings that are not all-electric, with phased implementation deadlines:

- Buildings under seven stories: All-electric compliance required for permits submitted after December 31, 2025
- Buildings over seven stories: All-electric compliance required for permits submitted after December 31, 2028

This rule aligns with similar measures in New York City, where fossil fuel bans in new buildings were adopted in 2021, taking effect in 2024 for buildings under seven stories and July 2027 for taller buildings.

The AEBA applies broadly to fossil fuels, including natural gas, heating oil, and propane. However, certain exemptions are allowed for facilities such as manufacturing plants, hospitals, restaurants, and car washes, as well as for projects in regions where electrification is deemed infeasible. The law does not apply to existing buildings or renovations.[199]

A precursor to the AEBA was NYC's Local Law 97 (LL97). Enacted in 2019, LL97 sets specific GHG emission limits for buildings over 25,000 square feet, with initial thresholds taking effect in 2024 and becoming progressively stricter in subsequent years. The ultimate objective is to achieve a 40%

[197] Office of the Governor, Grid of the Future Study: https://www.governor.ny.gov/news/governor-hochul-launches-grid-future-study-build-clean-and-resilient-electric-grid
[198] New York State Department of Public Service, Proactive Grid Planning Proceeding: https://dps.ny.gov/news/commission-announces-new-proactive-grid-planning-proceeding-prepare-new-yorks-electric-grid
[199] New York State Senate, Senate Bill S6843: https://www.nysenate.gov/legislation/bills/2021/S6843

reduction in emissions by 2030 and an 80% reduction by 2050, relative to 2005 levels**.** Building owners are mandated to monitor and report their annual emissions. Non-compliance can result in substantial financial penalties, calculated based on the extent to which emissions exceed the established caps. The law provides various pathways for compliance, including energy efficiency upgrades, on-site renewable energy installations, and the purchase of renewable energy credits (RECs). Recent updates have introduced provisions such as the "good faith" effort clause, allowing buildings to avoid fines by demonstrating committed efforts toward decarbonization. Recognizing the unique challenges faced by affordable housing providers, LL97 includes specific provisions and support mechanisms to facilitate compliance without imposing undue financial burdens. This includes the creation of an Affordable Housing Reinvestment Fund to assist with necessary retrofits.[200]

G.4.7. Nuclear Power

In previous years, nuclear power plants had been facing several economic pressures caused by more stringent safety and security requirements, federal and state mandates for renewable generation, net decrease in electricity demand, sustained low natural gas prices that have augmented the competition from natural gas power plants, and the increasing cost of nuclear fuel and plant operations. However, some of these trends have begun to reverse. According to the Nuclear Energy Institute, between 2002 and 2016, nuclear energy fuel costs increased by 16 percent, capital expenditures by nearly 70 percent and operating costs by more than 8 percent (in 2022 dollars per MW). Total generating costs increased by more than 18 percent.[201] Recently, however, costs have begun to decrease. From 2017 – 2022, fuel costs decreased 29 percent, capital costs decreased 12 percent, and operating costs decreased by 23 percent. Altogether, total nuclear generating costs decreased by 22 percent over the same time period.[202] This may enable nuclear power to be more competitive with historically cheaper natural gas generation and renewable energy.

In 2017, recognizing the value that nuclear power can provide to help the State meet its emissions reductions goals and to maintain grid reliability, the PSC initiated a Zero Emission Credit (ZEC) program within the CES mandate to provide monetary value for the non-emitting attribute of nuclear energy. It is scheduled to run through 2029 with the multi-year ZEC contracts undergoing price revisions every two years.[203]

Several nuclear generation units in the State previously announced risk of closure due to economic reasons, including FitzPatrick Nuclear Plant in upstate New York that was expected to close by January 2017. After the ZEC requirement mandate was proposed, Exelon announced a $200 million investment in the Ginna and Nine Mile Point Nuclear Plants and investment of hundreds of millions of dollars in Fitzpatrick Nuclear Plant, which Exelon bought from Entergy in anticipation of the CES proposal being implemented, to refuel the plant and upgrade systems.

In 2024, New York began exploring the potential for advanced nuclear technologies to contribute zero-emissions electricity as a complement to New York's continued buildout of renewable energy resources

[200] NYC Department of Buildings, Local Law 97 – Greenhouse Gas Emissions Reductions: https://www.nyc.gov/site/buildings/codes/ll97-greenhouse-gas-emissions-reductions.page
[201] Nuclear Energy Institute, Nuclear Costs in Context (2018): https://www.nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/nuclear-costs-context-201810.pdf
[202] Nuclear Energy Institute, 2023 Nuclear Costs in Context: https://www.nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/2023-Costs-in-Context_r1.pdf
[203] DSIRE, NY Renewable Portfolio Standard: https://programs.dsireusa.org/system/program/detail/5883

and to support the growing power needs associated with economic development. At the September 2024 Future Energy Economic Summit, NYSERDA published a draft Blueprint for Consideration of Advanced Nuclear Technologies, soliciting public and stakeholder comment. In January 2025, Governor Hochul announced the start of a process to develop a Master Plan for Responsible Advanced Nuclear Development in New York. The development of the Master Plan will provide a framework for in-depth examination with stakeholders into the key issues raised by the Blueprint to develop recommendations for implementation of advanced nuclear technologies in New York State. The Master Plan development process is expected to conclude with publication by the end of 2026.

As part of this process, New York will also help lead a multi-state initiative on nuclear energy. Known as the First Mover Initiative, it is facilitated by the National Association of State Energy Officials (NASEO) and the US DOE's Gateway for Accelerated Innovation in Nuclear (GAIN) and is a group of leadership states committed to accelerating advanced nuclear project and focused on driving down costs and risk-sharing.

G.4.8. Offshore Wind

New York's Climate Act set an offshore wind (OSW) target of 9 GW by 2035. Supporting this target will require extensive coordination among all governmental echelons to address OSW's regulatory, environmental, and logistical complexities. Authorities in New York have conducted a series of studies, special planning activities, and procurement processes to identify and address the unique challenges posed by attaining its lofty OSW target.

In 2018, NYSERDA released the Offshore Wind Master Plan 1.0 which comprehensively discussed the challenges and opportunities of offshore wind energy development in the State to reach the target that at the time was 2.4 GW of OSW development by 2030. Some of these discussions included topics such as siting of the facilities and procurement options for offshore wind energy at the lowest cost for ratepayers. This Master Plan is supported by a suite of 20 detailed studies with information and analysis concerning a variety of environmental, social, economic, regulatory, and infrastructure-related issues implicated in planning for future OSW energy development in the state.

An update to the Offshore Wind Master Plan 1.0, the "New York State Offshore Wind Master Plan 2.0: Deep Water" is in development and is working with stakeholders to consider and analyze the economic, environmental, siting, transmission, supply chain, and workforce advantages and concerns as they pertain to floating and deepwater OSW facilities. OSW facilities are considered "deepwater" if they are at least 60 meters deep in the New York Bight. The Master Plan 2.0 is still ongoing at the time of the writing of this report.[204]

The 2021 Power Grid Offshore Wind Integration Study assessed possible grid interconnection points, offshore transmission configurations, and onshore bulk transmission needs. The study's three objectives were:

1) An onshore grid assessment
2) An offshore transmission assessment, and

[204] NYSERDA, New York State Offshore Wind Master Plan 2.0 (In progress): https://www.nyserda.ny.gov/All-Programs/Offshore-Wind/About-Offshore-Wind/Master-Plan

3) An environmental constraint analysis.

The study identified that 6 GW delivered into New York City and 3 GW into Long Island minimized onshore transmission system upgrades with very limited OSW curtailment. The study also identified that offshore radial and meshed connection concepts had lower costs compared to the backbone connection concept and the meshed connection concept had the greatest availability and operational benefits. Significant environmental constraints on identified route segments were mitigated through planning and outreach efforts.[205]

In response to the Power Grid Study Recommendations, in April of 2024 NYSERDA published the Meshed Offshore Wind Transmission Study (NYC PPTN) which assessed the advantages, costs, and challenges of various offshore transmission expansion pathways including comparing meshed transmission and interregional network configurations with radial transmission setups. The results of the study indicate that, across all pathways, meshed configurations yield benefit/cost ratios higher than 1.5 compared to radial configurations. Additional benefits include reduced curtailment during onshore and offshore grid events and reducing the stress on existing onshore infrastructure by creating alternative paths for OSW to directly reach the load centers. The study also identifies areas for further investigation: NYISO market and operations issues, interregional market and operations issue, network-ready equipment standardization and high-voltage direct current (HVDC) technical issues, reliability criteria, and other regulatory issues.[206]

In March of 2024, the DOE published the final version of the Offshore Wind Transmission Development in the U.S. Atlantic Region Study. The study also found that meshed transmission topologies provide substantial added value compared to radial configurations, delivering at least twice the return per additional dollar invested when expanding from a radial setup. The study proposes an action plan to address near-, medium-, and long-term offshore wind transmission challenges for the Atlantic Coast of the United States.[207]

In October of 2024, NYISO published the New York City Offshore Wind PPTN: Viability & Sufficiency Assessment report to implement FERC Order No. 1000 directives which mandates that public utility transmission providers consider transmission needs driven by public policy requirements in their planning processes. This assessment ensures that proposed projects are capable of effectively delivering offshore wind energy to New York City, thereby supporting the state's renewable energy goals. In this context, the New York City Offshore Wind Public Policy Transmission Need (NYC PPTN) was established to facilitate the integration of offshore wind energy into New York City's electrical grid[208].

---

[205] NYSERDA, Power Grid Study: Offshore Wind Integration Study (2021) Appendix D: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/NY-Power-Grid/Appendix-D.pdf

[206] NYSERDA, Meshed Offshore Wind Transmission Study: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Offshore-Wind/24-23-Meshed-Offshore-Wind-Transmission-Study-acc.pdf

[207]U.S. Department of Energy, Offshore Wind Transmission Development in the U.S. Atlantic Region Study (2024): https://www.energy.gov/sites/default/files/2024-04/Atlantic_Offshore_Wind_Transmission_Plan_Report_v16_RELEASE_508C.pdf

[208] NYISO, New York City Offshore Wind Public Policy Transmission Need: Viability & Sufficiency Assessment (October 2024): https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b00E0DD92-0000-C815-9AEF-911396313693%7d

NYSERDA issues competitive solicitations for offshore wind energy and contracts with offshore wind developers to purchase offshore wind renewable energy certificates (ORECs). NYSERDA has contracts for ORECs with two projects: Empire Wind 1 and Sunrise Wind, and LIPA has contracted with the South Fork Wind Farm which is now operating.

In December of 2024, NYSERDA issued a Request for Information to solicit industry feedback to inform the development of the State's sixth Offshore Wind Renewable Energy Certificate (OREC) solicitation. This solicitation will focus on optimizing coordination between offshore wind generation and transmission projects, supporting the integration of an additional 4,770 MW of offshore wind into New York City.

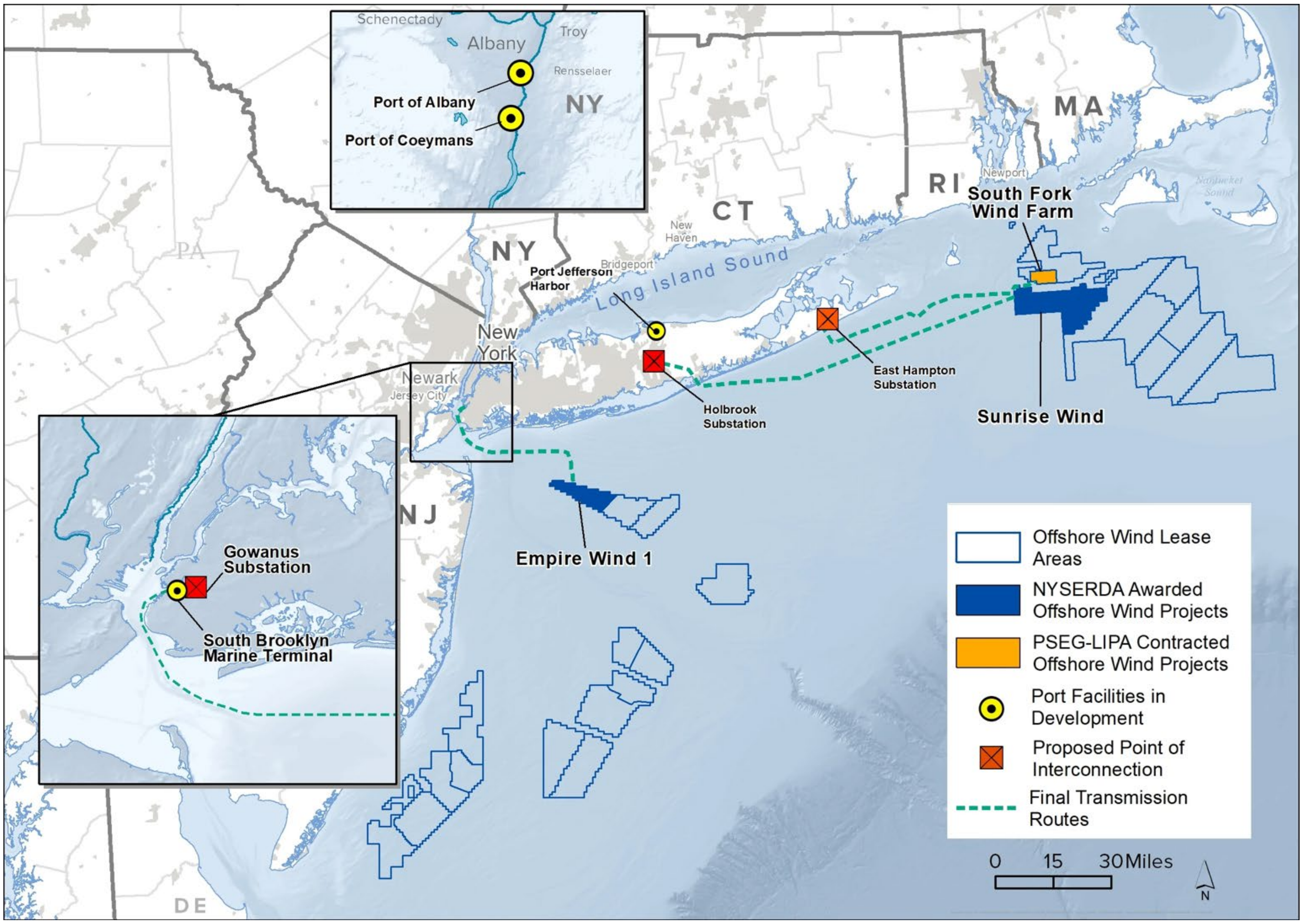


Figure G-2: Map of New York's offshore wind projects and interconnection points (October 2023)[209]

G.4.9. Energy Storage

Energy storage has the potential to help integrate variable renewable resources into the grid and provide new tools to enhance system reliability. In June 2024 the Public Service Commission approved an

[209] NYSERDA, Offshore Wind Projects: https://www.nyserda.ny.gov/All-Programs/Offshore-Wind/Focus-Areas/NY-Offshore-Wind-Projects

updated Storage Roadmap which set a storage deployment target of 6 GW by 2030. This expands on the previous goal, announced in 2019, of 3 GW of deployed storage by 2030, and requires adding 4.7 GW of storage in the next five years.[210] The Energy Storage Roadmap proposed meeting this requirement with 3 GW of utility storage, 1.5 GW of retail storage, and 200 MW of residential storage.

New York created additional incentives to support the expanded storage goal.[211] Retail and residential storage incentives are allocated $675 million and $100 million in funding, respectively, on a per-kWh capacity-based methodology. Incentives for retail projects are capped at 5 MW for 4-hour storage. Wholesale utility bulk storage incentives are estimated to total $701million - $1.42 billion, and are based on a novel index storage credit incentive structure which takes into account NYISO market conditions to close the gap between storage operators' revenue requirements and actual market revenues. These incentives also require 35% of residential and retail projects be located in disadvantaged communities, and 30% of bulk storage be located in NYISO Zone J (NYC) in order to ensure the benefits offset city peaker plant emissions. The deadline for NYSERDA to issue the first annual bulk storage RFP is June 30, 2025.

An area of potential innovation is Storage as a Transmission Only Asset (SATOA) / Storage as a Transmission Asset (SATA). Under SATOA, the grid operator operates storage resources to perform certain transmission functions like congestion relief, curtailment reduction, voltage control, thermal overload protection, and N-1-1 contingency response.[212] SATAs performs similarly to SATOAs but add the ability to earn revenues in energy markets. FERC has approved SATOA tariffs for MISO, SPP, and ISO-NE. NYISO is currently exploring options for their own SATA / SATOA tariff, and current planning documents suggest the following approach:[213] [214]

- SATOA may be proposed as a regulated transmission resource in response to an identified transmission need that is eligible for cost-of-service rate recovery
- SATOA will operate in wholesale markets only to the extent necessary to act as a transmission resource
- Market-based solutions to an identified transmission need will be considered prior to SATOA
- SATOA may only meet a transmission need arising from an N-1-1 contingency event, and will be dispatched manually by NYISO
- SATOA deployments are limited to 20MW at any one substation and 200 MW across NYISO

---

[210] Energy and Environmental Economics Inc, New York State Energy Storage Roadmap. June 21, 2018. https://www.ethree.com/wp-content/uploads/2018/06/NYS-Energy-Storage-Roadmap-6.21.2018.pdf

[211] NYSERDA, New York State Energy Storage Program, Order Overview: https://www.nyserda.ny.gov/All-Programs/Energy-Storage-Program

[212] FERC, Policy Statement on Cost Recovery for Electric Storage Resources: https://www.ferc.gov/news-events/news/ferc-issues-policy-statement-cost-recovery-electric-storage-resources

[213] NYISO, Storage as Transmission – Introduction: https://www.nyiso.com/documents/20142/38699263/Storage%20as%20Transmission%20-%20Introduction.pdf/c5458a07-4be6-fe57-bef6-514abdcb725c

[214] NYISO, Storage as Transmission Concept Proposal: https://www.nyiso.com/documents/20142/48151567/Storage%20as%20Transmission%20Concept%20Proposal.pdf/7d2bd637-cdf1-48ae-404e-f5c8b7f2c46d

In June of 2024, the New York State Public Service Commission approved a storage deployment target of 6 GWs statewide by 2030 in an effort to help advance the Climate Act's 2040 zero-emissions electricity system target.[215] As part of the order, the PSC recognized the value of storage as a transmission asset but also acknowledged that utility-ownership of this type of energy storage is not currently permitted in the State. The Order directed JUs to study the non-market T&D services that energy storage projects can provide and include an in-depth engineering and economic review of the use cases of energy storage can provide to maintaining reliability.

G.4.10. Distributed Solar

Distributed solar refers to solar energy generated on a small scale, either near or at the location where electricity is consumed. The most common forms of distributed solar include community solar projects, which produce renewable energy for multiple customers who receive credits on their monthly electric bills for their share of the clean energy generated, and rooftop solar installations. Distributed solar can also provide a non-wires alternative, helping mitigate the need for traditional infrastructure investments in areas where distribution capacity may not meet future demand. Additionally, it enhances local energy resilience and delivers economic benefits to the communities it serves. In July of 2021, NYSERDA and the DPS released New York's 10-Gigawatt Distributed Solar Roadmap which proposed a pathway to an expanded target of 10 GW dc of distributed solar by 2030 as part of the Climate Act targets. The state has already achieved its goal of 6 GW of installed distributed solar by late 2024 a year ahead of schedule, and 3.4 GW out of the remaining targeted 4 GW already in development. The roadmap recommended:

- Extending the NY-Sun Megawatt Block Program incentive structure because it was determined to be efficient, transparent, flexible, and successful.
- Leveraging dedicated funds to target a minimum of 40% of the proposed new capacity towards low to moderate income residents, regulated affordable housing, and disadvantaged communities through an expanded Solar Energy Equity Framework.
- Phasing in requirements for prevailing wages or project labor agreements for projects between 1 and 5 MW ac.
- Improving interconnection policies through modifications to the utility planning process, the inclusion and consideration of distribution system investments, and the expansion of the Cost-Sharing framework 2.0.

In April of 2024, NYISO launched the US' first program to integrate aggregations of 10 kW or greater distributed energy resources (DERs) to participate in wholesale markets. This program was approved by FERC as meeting requirements issued in Order 2222. Distributed solar will likely benefit from this lower barrier of entry into markets.[216]

[215] State of New York Public Service Commission: Order Establishing Updated Energy Storage Goal And Deployment Policy: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Energy-Storage/2024-06-6GW-Energy-Storage-Order.pdf

[216] NYSERDA, New York's 10-Gigawatt Distributed Solar Roadmap (2021): https://www.nyserda.ny.gov/-/media/email/nysun/informational-roadmap.pdf

G.4.11. Energy Efficiency

Energy efficiency policy and programs aim to reduce or minimize energy usage in the various economic sectors through different means including establishment of energy performance requirements or standards, and financial incentives. Well-structured energy efficiency programs provide a cost-effective reduction in energy consumed and reduce the need for infrastructure upgrades.

New York State announced a 2025 Energy Efficiency Target of 185 trillion BTUs of cumulative annual site energy savings (2015-2025) relative to forecasted energy consumption in 2025.[217] The target is set on an all-fuel basis, addressing energy savings in buildings and the industrial sector across all fuel sources (electricity, natural gas, heating oil, propane, and delivered steam). By the end of 2024, approximately 151 trillion of the targeted 185 trillion BTUs of energy savings are being achieved annually.[218]

The 2025 Energy Efficiency Target calls for scaling up energy efficiency programs that support building retrofits and industrial process efficiency, dedicated financial support for low-to-moderate income households and affordable housing, the advancement of appliance standards, and the advancement of building energy codes and standards for high-performance new construction. Additional strategies include the support of heat pump adoption to decarbonize heating and cooling, technology transfer and innovation to expand attractive options for decarbonization and leading by example in State facilities. Transportation is beyond the scope of the 2025 Energy Efficiency Target and thus electricity consumed by electric vehicles (EVs) will be net out from end-use energy consumption tracked for target achievement.

New York invests over $1 billion in public funds annually for State- and utility-administered grant and market development programs focused on energy-efficient buildings. New York works to leverage funding from ratepayer, State, and federal sources. For example, New York has been allocated $317.4 million in federal funding, divided between the Home Efficiency Rebates (HOMES) Program ($159 million) and the Home Electrification and Appliance Rebate (HEAR) Program ($158.4 million).[219]

G.4.12. Demand Response Programs

FERC defines Demand Response (DR) as "Changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized."[220] Demand response programs offer costumers financial benefits for reducing electricity usage when net demand is highest, lowering energy and capacity costs, reducing necessary infrastructure spending, and enhancing reliability. These actions can also help reduce harmful emissions, since peaking plants used during critical hours are often dirtier and less efficient than

[217] NYSERDA, New Efficiency: New York: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/New-Efficiency-New-York.pdf

[218] NYSERDA, Clean Energy Dashboard (December 2024): https://www.nyserda.ny.gov/About/Tracking-Progress/Clean-Energy-Dashboard/View-the-Dashboard

[219] NYSERDA, 2024-11-21 Announcement: Saving Families Money - Governor Hochul Announces Retail Rebates: https://www.nyserda.ny.gov/About/Newsroom/2024-Announcements/2024-11-21-Saving-Families-Money-Governor-Hochul-Announces-Retail-Rebates

[220] FERC, Assessment of Demand Response and Advanced Metering: Staff Report (December 2017): https://www.ferc.gov/sites/default/files/2020-05/DR-AM-Report2017.pdf

base load power plants. These programs exist both at the wholesale (transmission) and retail (distribution) levels. In New York State, the wholesale demand response programs are administered by NYISO, while retail demand response programs are administered by each utility.

G.4.12.1. Transmission-Level Reliability-Focused Demand Response Programs

The NYISO has two reliability demand response programs that provide peak shaving to support reliability of the bulk-power grid operations by providing compensation for retail loads (*i.e.* electricity consumers, either individual, aggregated, or LSEs such as utilities) to participate in the wholesale market. The first is the Special Case Resource (SCR) program, which is part of the Installed Capacity (ICAP) market, and the second is the Emergency Demand Response Program (EDRP). In addition, the NYISO facilitates the Targeted Demand Response Program of Zone J (NYC). SCR and EDRP resources are deployed for forecasted or actual operating reserve shortages or other emergency reliability needs (*e.g.*, heat waves, polar vortexes). Demand response resources may enroll as EDRP or SCR but cannot participate in both programs.

SCRs are end-use loads capable of being interrupted when called upon, and/or shifting the end-use load to on-site distributed generators. These distributed generators can supply some or all the facility's load and thus reduce the energy supplied by the electric grid to the facility. They enroll in the ICAP market through Responsible Interface Parties (RIPs). To participate in the ICAP market, resources must be rated at 100 kW or higher, which can be achieved by aggregating SCRs, if they are in the same NYISO load zone. RIPs are responsible for all forms of communication to and from the NYISO, including enrollment, offering into auctions, certification, notification of events, and dispatch of SCRs. They also are responsible for determining the amount of load reduction provided by the SCRs, submitting load-reduction data to the NYISO, and distributing program payments from the NYISO to the SCRs. SCRs participate in ICAP auctions in the same manner as other ICAP suppliers. The amount of capacity an SCR is qualified to sell in the ICAP auction is based on the SCR's pledged load reduction and its performance factor. The performance factor reflects the historical performance of the SCR, which is determined from actual performance data. Once during each Capability Period, SCRs are required to perform a test of their pledged reduction. Each SCR's performance factor is based on the load reduction achieved during tests as well as any events during the capability period.

When possible, RIPs are given at least 21 hours advance notice (24 hours if notified after 3 p.m.) that SCRs may be required the following day and a second notice two hour in advance of an event. The EDRP program allows participants to be paid for reducing their energy consumption upon notice from the NYISO that an operating reserves deficiency or other emergency exists.

EDRP are also end-use interruptible loads or loads with a qualified behind-the-meter local generator. To participate in the EDRP program, a minimum of 100 kW load reduction capability is required. Curtailment Service Providers (CSP) serve as the interface between the NYISO and the resource. The same series of notifications by NYISO applies to the EDRP program; however, load curtailment by EDRP resources during NYISO-called events is voluntary.

The Targeted Demand Response Program (TDRP), introduced in 2007 in response to a request for assistance from the TO for Zone J, is a program that deploys SCRs and EDRP resources in targeted sub-load pockets to solve local reliability problems at the request of the TO. To date, the TDRP program is only available in Load Zone J (New York City). Participation in the TDRP is voluntary for both SCR and EDRP.

In 2023, a total of 7,981 resources were enrolled in NYISO's Emergency Demand Response Program (EDRP) and Installed Capacity Special Case Resources (ICAP/SCR) program, contributing 1,294.5 MW of demand response—an increase of 4.78% compared to 2022. This represented 4.5% of the 2023 Summer Capability Period peak demand of 28,735 MW. Of these enrolled resources:

- 3,114 participated in the ICAP/SCR program by successfully selling their capacity in the ICAP auction.
- 770 voluntarily participated in the EDRP program from the start.
- 4,097 were automatically enrolled in EDRP because they did not sell their capacity in the ICAP auction.

Under NYISO's market rules, any ICAP/SCR resource that does not sell its load reduction capacity in the auction is automatically enrolled in EDRP for that period. This ensures that unsold capacity remains available for emergency events, though with a different compensation structure. Unlike ICAP/SCR participants, who receive payments for availability, EDRP participants are only compensated for actual load reductions during grid emergencies—at rates of up to $500/MWh.

G.4.12.2. Transmission-Level Market-Participation Demand Response Program

In addition to the two reliability demand response programs mentioned above, in April of 2024 the NYISO launched the DER & Aggregation Participation Model which allows DERs to participate in the NYISO's wholesale energy, ancillary services, and capacity markets and provide transmission security. According to the program, an Aggregation refers to a group of two or more Distributed Energy Resources (DERs) or Demand Side Resources (DSRs) that are combined and operated as a single resource within NYISO's wholesale electricity markets. These resources can be interconnected to either the transmission or distribution systems but must be electrically connected to the same transmission node within the New York Control Area (NYCA). This new program retired the previously used Demand Side Ancillary Services Program (DSASP) and the Day-Ahead Demand Response Program (DADRP).

Some of the current requirements for participation in the Aggregation Participation Model are:

- A minimum capacity requirement of 10 kW for each individual DER and 100 kW for minimum for an Aggregations
- Capability of responding to NYISO dispatch instructions in real-time
- Capability to provide six second telemetry and hourly revenue quality meter data to the NYISO.[221]

In its 2025 Project Update, NYISO stated that that priority should be given to developing market designs that substantially enhance or increase Demand Side Resource participation. The project update also highlights potential areas of focus to enhance the DER & Aggregation Participation Model:

- Bidding obligations: Enhancing bidding obligations could allow DSRs to provide more precise and flexible offers, improving market efficiency and resource utilization.
- Commitment parameters: Such as start-up and minimum run times for large Industrial Loads

[221] https://www.nyiso.com/der-aggregations

Metering and telemetry requirements: Stringent requirements can pose challenges for DSR participation. Reevaluating these requirements to balance accuracy with feasibility could lower barriers to entry, encouraging more DSRs to participate in the market. [222]NYISO plans to continue to work with Market Participants and key stakeholders to pursue these potential improvements to the DER & Aggregation Participation Model through 2025.

G.4.12.3. Distribution-Level Demand Response Programs

On July 2015, the PSC issued the Dynamic Load Management (DLM) Order instituting the implementation of distribution-level demand response programs across all service territories with the goal of improving electric system reliability and resiliency. DLM programs offer customers financial payments to reduce the amount of electricity used during periods of high demand or system stress such as hot summer days. These utility demand response programs were developed in conjunction with the REV initiative and mirror programs that had been in place at Con Edison service territory since year 2000.

Three demand response programs were established in the DLM Order: Distribution Load Relief Program (DLRP), Commercial System Relief Program (CSRP), and the Direct Load Control Program (DLC) for residential participants. The DLRP and CSRP are primarily designed for industrial and commercial customers, while the DLC program is focused on residential and small commercial customers.

The DLRP provides compensation for load reduction during distribution system load-relief periods in specific defined electrical or geographic areas designated by the utility for its system reliability. The DLRP includes both a mandatory and a voluntary option. Both curtailable load and on-site generation are allowed, and the program has a two-tiered reservation payment, with higher payments being paid to participants in higher priority electrical distribution networks designated by the utility. In this program, participants are notified up to 2 hours prior to the event. DLRP helps increase electric service reliability by reducing load to prevent demand from exceeding grid capacity.

The CSRP is a load-reduction program that provides monthly reservation payments and performance payments for load reductions made by the customer during planned event hours. A Planned Event refers to the utility's request for Load Relief when the day-ahead forecasted load level approaches the forecasted summer system peak. This program is activated by the utility during summer-peak days or system-critical situations. Participants in the CSRP are notified 21 hours in advance of an event and a second time up to 2 hours prior the start of the event. This program helps prevent increased energy cost for customers by reducing peak demand growth to defer investment in grid infrastructure.

The DLC program is a thermostat- or smart control device-controlled program remotely operated by the utility through a telecommunications device, that reduces energy demand from air conditioning units at times of critical system need. Customers are awarded an upfront incentive to sign up to participate on a voluntary basis and can override the thermostat and smart control device with no penalty.

The programs established in the DLM Order have been implemented by utilities in high-value areas including Central Hudson Gas & Electric Corporation, New York State Electric & Gas Corporation

[222] https://www.nyiso.com/documents/20142/50614388/ETDS%202025%20Project%20Update_Final%20(1).pdf/5d4f2eed-4b51-4ab6-1bfd-6528e69f1f42

(NYSEG), National Grid, Rochester Gas and Electric Corporation (RG&E), Orange and Rockland Utilities, Inc (O&R).

In March of 2024, the PSC directed the largest electric utilities to file proposals outlining alternative procurement mechanisms that they are seeking to deploy in the dynamic load management (DLM) program.

G.4.13. Energy Market Reforms

As New York State's grid transitions to align with the Climate Act goals, wholesale electricity markets must adapt to meet shifting system demands and integrate emerging technologies, ensuring both efficiency and grid reliability. Some of the market reforms being considered by the NYISO are:

- Balancing Intermittency: Developing a new ancillary service called "Uncertainty Reserves" to address forecast uncertainties driven by BTM solar, FTM solar, land-based wind, and offshore wind.
- Dynamic Reserves: Transitioning the current static reserve operating reserve requirements to dynamic reserve requirements that reflect current market and grid conditions.
- Operating Reserve Performance: Reviewing performance of operating reserve providers and considering penalties or implications for non-performance.
- Firm Fuel Requirements: Tying accreditation to demonstrated fuel availability—such as on-site storage or secure contracts—and introducing audits and penalties/implications for non-performance.

H. Future Transmission and Distribution Reliability Issues and Next Steps

This concluding section summarizes the key reliability issues that have emerged on the New York transmission and distribution systems. These are issues that stakeholders and decision makers in New York are grappling with in efforts to maintain reliability while adapting to changing grid conditions and working to achieve environmental and economic goals.

H.1. Enabling and Adapting to Rapid Load Growth

Accelerating load growth and higher levels of uncertainty create a wide spectrum of potential future reliability needs that can be difficult to anticipate and plan for. With increasing electrification and large load additions, ensuring grid reliability requires proactive and flexible planning approaches. Below is a summary of key issues as well as areas for continued exploration:

- **Electrification of end uses in buildings, transportation, and industry, coupled with the addition of new large loads such as manufacturing facilities and data centers, are expected to drive significant and rapid load growth.** The forecasted rapid expansion of beneficial electrification and large industrial loads—such as data centers and microchip manufacturing—is already materializing in the large load interconnection queue which has nearly tripled since 2022. These trends are expected to drive a significant increase in peak demand over the coming decade, with the 2024 RNA projecting summer peak demand rising by 2,300 MW and winter peak demand increasing by 7,300 MW. These trends are driven by economic conditions as well as federal and state policies, including the IRA, IIJA, Climate Act, AEBA, and LL97, though federal energy policy is currently uncertain.

- **Rapid load growth is projected to introduce new challenges for system reliability, and system planning approaches also must evolve to respond to significant uncertainty associated with load projections.** The Outlook and 2024 RNA indicate that the large levels of expected load growth could require rapid changes to maintain reliability. Under high-demand scenarios or conditions where large loads do not exhibit flexibility, the 2024 RNA identifies that statewide capacity shortfalls may occur as early as 2032 with the New York City Locality deficient as early as 2029. The RNA, the Outlook, and the Gold Book also underscore the wide range of possible load growth scenarios, reflecting significant uncertainty in future electricity demand. The Gold Book load forecasts studied in RNA scenarios range by 17 GW when extended out to 2050 which corresponds to roughly 50% of 2024 peak load.[223] High-growth cases project a rapid acceleration driven by large-scale electrification and economic expansion, while lower-growth scenarios assume more gradual adoption rates and higher demand-side efficiency measures. The actual levels of load growth that materialize in New York will be highly dependent on factors such as economic trends, policy shifts, technology adoption rates, and consumer behavior. With demand uncertainty spanning over ten gigawatts over the coming decades, traditional planning approaches that rely on a single forecast or incremental adjustments may be insufficient. Instead, system operators must develop strategies that remain adaptable across a broad set of potential futures, ensuring resilience without committing to infrastructure that may become unnecessary or inadequate. Employing a scenario matrix approach—rather than modifying individual assumptions in isolation—can provide a more comprehensive understanding of potential outcomes, as exemplified in NYISO's 2024 RNA and the CGPP. Expanding portfolios studied in planning processes and reliability assessments will help capture the full range of uncertainties and guide the development of adaptive strategies. An example of another source of mid and long-term load growth uncertainty that may warrant scenario exploration could include the impacts of future climate change on heating and cooling demand.

H.2. Accessing the Full Value of Demand-Side Resources

Demand-side resources (DSRs) in New York operate mostly on the distribution system, though more are likely to be connected to the higher voltage systems as large loads proliferate. The NYISO has been investigating ways to enhance DSR participation in wholesale markets. This requires careful coordination, telemetry, and market design to ensure that DSRs contribute to system reliability in an

[223] Note that the 2024 RNA only looks out to 2034, but the 2024 Gold Book forecasts past 2050.

economically efficient manner. Below is a summary of key issues as well as areas for continued exploration:

- **DSRs have the potential to reduce system reliability requirements by providing flexible, responsive capacity; New York should incorporate targeted solutions to improve aggregation and wholesale market participation.** Unlocking the full value of DSRs requires thoughtful planning to balance fairness, efficiency, reliability, and cyber security. Several programs, proceedings, and policies have been enacted across New York to enable and optimize the use of DSRs. The Reforming the Energy Vision (REV) proceeding, launched in 2014, included the development of a new policy framework to facilitate utilities' integration of DERs through the creation of Distributed System Platforms (DSPs). The Grid of the Future initiative expands upon the DSP framework and focuses on modernizing grid operations and integrating distributed energy resources (DERs) into wholesale markets. Recent and ongoing efforts to improve the DER & Aggregation Participation Model aim to enhance DSRs' ability to participate in wholesale markets, enabling them to better access opportunities to best provide value to grid systems. The Grid of the Future initiative is also assessing the potential of demand flexibility on the New York power system as loads continue to grow.
- **System operators should continue to remove barriers to enhance the ability of DSRs to efficiently provide their full range of potential benefits to the grid.** Challenges remain in aligning market rules, compensation structures, and operational coordination to fully integrate DSRs into the power system. A key challenge is ensuring that DSRs are appropriately compensated for their reliability contributions while maintaining overall market efficiency and cyber security. Market designs must prevent distortions while allowing DSRs to provide meaningful capacity, energy, and ancillary services. The variability of DSRs also introduces uncertainty, requiring robust verification mechanisms, predictability assessments, and equitable participation models to ensure all resource types and customer classes can effectively contribute. One example is NYISO's effort to improve the DER & Aggregation Participation Model that may continue into 2026. Specific areas of focus for this initiative could include:
    - Enhancing bidding obligations could allow DSRs to provide more precise and flexible offers, improving market efficiency and resource utilization
    - Evaluating potential approaches to overcoming barriers for DSR participation including commitment parameters such as startup and minimum run times for industrial loads
    - Reevaluating telemetry requirements to refine the balance of accuracy and feasibility could lower barriers to entry, encouraging more DSRs to participate in the market.
- **New large loads should be encouraged/enabled to provide flexibility to reduce reliability risks.** The RNA findings indicate that demand-side flexibility can help mitigate reliability risks, particularly as new large loads are added to the system, reaffirming that policies and programs supporting flexible loads should remain an area of active exploration. It is important to note that while flexibility is valuable for reliability, demand flexibility may be challenging particularly for new large industrial loads depending on their operational needs. By integrating load flexibility considerations directly into planning efforts and compensation mechanisms, stakeholders and market participants can better anticipate and respond to evolving reliability needs in an era of rapid electrification and economic growth.

H.3. Delivering Timely and Cost-Effective Solutions to Meet Reliability Needs

Aging infrastructure and growing demand are creating an expanding reliability need that is compounded by supply chain challenges, workforce development needs, siting and permitting barriers, interconnection bottlenecks, and an unclear path to the commercial deployment of firm resources that are compliant with policy requirements by 2040. Below is a summary of key issues and areas for continued exploration:

- **Expanding the grid fast enough to maintain reliability will require streamlining processes and accelerating the pace at which infrastructure can be built.** As highlighted in Section H.1, the RNA and Outlook illustrate the speed at which resource and transmission expansion must take place to maintain reliability. However, efforts to meet growing demand are constrained by several key bottlenecks, including permitting challenges and interconnection processes. Addressing these bottlenecks will be critical to ensuring that the grid can expand and modernize in a timely and efficient manner. Policymakers should monitor the effects of FERC Order 2023 compliance and the RAPID Act in improving the ability for new infrastructure expansion to meet growing reliability and policy needs. Efforts to improve NYISO's interconnection processes and streamline siting and permitting will be critical to addressing these challenges. FERC Order 2023 instructs RTO/ISOs to undertake reforms to reduce interconnection backlog and improve interconnection best practices by May 16th, 2025. These reforms include transitioning to a first-ready, first-served queue process, implementing cluster studies, increasing site control requirements for projects, implementing stiffer requirements for meeting interconnection study deadlines, and incorporating alternative transmission technologies into their processes. Separately, the RAPID Act offers potential solutions to siting and permitting challenges by streamlining regulatory requirements for certain types of interconnections and centralizing the generation and transmission approval process under the Office of Renewable Energy Siting (ORES) within the Department of Public Service (DPS). Both Order 2023 and the RAPID Act aim to accelerate the process of bringing new projects online and enhance efficiencies, ensuring that grid expansion keeps pace with demand growth.
- **Severe delays in transformer procurement and other supply chain issues are stalling grid upgrades and raising reliability risks.** Modernizing the grid requires addressing a range of structural and logistical barriers. Supply chain challenges, particularly for critical equipment such as transformers, have extended procurement timelines significantly. Transformer delivery times have increased from a few months in 2020 to 3-6 years, delaying necessary upgrades and increasing system vulnerability. Transformer procurement delays are representative of similar delays experienced for other critical transmission and distribution equipment. Planners and stakeholders should monitor these supply chain challenges when considering the pace at which New York can expand and modernize its grid to keep up with load growth.

- **Workforce development will be essential to sustaining long-term reliability as the grid evolves and becomes increasingly more complex.**. Utilities and system operators are signaling that a key risk amid increasing reliability challenges is that growing demand for skilled workers is outpacing supply, compounded by workforce turnover and potential loss of technical expertise. This trend poses a long-term risk to maintaining system reliability and implementing necessary grid upgrades. Outlined in its ERO Reliability Risk Priorities Report, NERC's workforce development recommendations to expand educational pathways and mid-career transition opportunities and offering specialized trainings could provide a framework for increasing the supply of skilled electrical engineers and technicians needed to maintain and upgrade T&D infrastructure. By implementing these measures, policymakers and system operators can support the workforce growth needed to keep up with the expansion and modernization of New York's electricity system.
- **Capacity additions will need to outpace load growth and resource retirements to ensure that resource adequacy is maintained.** In roughly the last 6 years, more capacity has been deactivated than has been added, which is an unsustainable trend as reliability margins across the state are tightening. The pace of resource deployment will need to accelerate to both replace retiring capacity and meet growing demand, and careful coordination of retirements and additions will be essential to avoid resource adequacy gaps. The interconnection reforms discussed above should be closely tracked to assess their effectiveness in improving the pace at which new generation can be brought online. Further complicating the need for rapid generation deployment is the need for large quantities of Dispatchable Emissions-Free Resources (DEFRs) that can support reliable advancement toward the State's 2040 zero-carbon electricity target , discussed in more detail in H.4 below.

H.4. Advancement of a High-Renewable Grid will Require Aligning Markets and Planning Processes to Maintain Reliability

Pursuing a high renewable, zero-emission grid will necessitate reliably integrating significant quantities of variable energy, which will require balancing across multiple timescales. Below is a summary of key issues and areas for continued exploration:

- **Integrating large quantities of renewable energy will require balancing across multiple timescales, ensuring that electricity supply is always adequate to meet demand despite increased variability of generation.** Balancing refers to the ability to dispatch generation, storage, and demand flexibility in response to fluctuations in renewable output and consumption patterns. Different timescales present distinct challenges: sub-hourly balancing involves maintaining grid frequency and stability as renewable generation fluctuates in real time, hourly and inter-day balancing ensures that storage and flexible resources can shift energy between peak and off-peak periods, and intraday to seasonal balancing addresses the need for sustained energy availability over longer durations, particularly during prolonged periods of low renewable generation.
- **As the generation mix increasingly consists of inverter-based resources, it will be important to ensure that the grid retains sufficient sub-hourly balancing capabilities. Market operators should refine compensation mechanisms and market rules to enhance sub-hourly flexibility as reliance on inverter-based resources grows.** The EIPC State of the Grid Report 2021 identified increasing concerns over maintaining frequency stability in

the Eastern Interconnection as more inverter-based resources (IBRs) are added to the system. Unlike conventional generators, wind and solar do not inherently provide system inertia, making frequency regulation more challenging; however, grid-forming inverters, if integrated into new IBR installations, can potentially address this issue. New mechanisms for procuring and compensating resources that can provide fast-response frequency support will be essential. The Dynamic Reserves project has begun exploring compensation mechanisms for fast-responding reliability services. The NYISO's Balancing Intermittency project is also exploring how to ensure sufficient reserves are always maintained to handle unanticipated unavailability from weather-dependent resources. Continuing efforts to refine market rules for ancillary services such as fast-ramping capabilities and frequency response will be critical for ensuring grid stability as reliance on inverter-based resources increases.

- **Dispatchable storage and demand resources are valuable for intra-day balancing and as their contributions grow, it will become increasingly important to accurately represent these resources in reliability planning efforts. Planners and regulators should support hourly and intra-day balancing solutions by improving forecasting, strengthening price signals, and expanding demand-side participation.** While short-duration battery storage and flexible demand resources can help smooth variations in renewable generation over several hours, accurately incorporating these resources into market structures and planning models remains a key challenge. Ensuring that dispatchable demand-side flexibility is effectively integrated into market structures will be crucial for maintaining reliability during daily fluctuations in renewable output. While demand flexibility and short-duration storage are expected to play a key role in managing daily fluctuations in renewable generation, further work is needed to establish market mechanisms and operational frameworks that enable full participation of these resources.
- **A new class of zero emissions resources will need to be deployed to provide interday and seasonal balancing**. In a deeply decarbonized electricity system, multiple analyses have found that there will be a reliability need for resources that can provide energy over multiple days, or Dispatchable Emission-Free Resources (DEFRs). By 2040, as winter demand continues to grow as a result of building electrification, there will be challenging multi-day periods in which renewable output is low (e.g. due to cloudy winter days with wind lulls) and short-duration storage is quickly depleted, and significant amounts of DEFR capacity are needed to maintain reliability. However, the technologies capable of delivering these long-duration and seasonal balancing services—such as green hydrogen, advanced energy storage, next-generation nuclear, or other emerging technologies—are not yet commercially available at scale. This uncertainty presents a significant challenge for system planners and market operators to meet system reliability needs over the 15-year horizon through the Zero by 2040 target. New York should continue to investigate the availability of DEFRs that can be used to advance interday and seasonal reliability solutions, including through the Public Service Commission's Zero by 2040 proceeding currently underway, which is investigating pathways for deploying and integrating emerging technologies that can meet multi-day reliability needs in a fully decarbonized electric system. Continued engagement with industry stakeholders, research institutions, and technology developers will be essential to accelerating the deployment of scalable solutions.

H.5. Evolution of Planning Practices

Transmission planning processes need to both address heightened uncertainty and enable a more diverse set of transmission and generation technologies to compete to meet system needs on a level playing field. Below is a summary of key issues and areas for continued exploration:

- **New transmission technologies have the potential to provide alternatives to traditional transmission solutions, providing unique benefits. Planning processes should take careful measure to assess advanced transmission technologies (ATTs) on equal footing with traditional transmission solutions.** ATTs offer innovative solutions that can optimize the use of existing infrastructure and defer or reduce the need for major transmission expansion. These include Grid Enhancing Technologies (GETs) that help optimize the capacity, efficiency, and visibility of the existing transmission system, such as DLRs, power flow control devices, and topology optimization.[224] It also includes physical infrastructure technologies including high-voltage direct current (HVDC) lines and advanced conductors. These technologies can play a crucial role in addressing emerging system needs and certain developments are underway to ensure they can fulfill their potential. Order 881 requires transmission operators to implement AARs and enable DLRs. Order 1920 more broadly requires ATTs and right-sizing to be studied in future planning processes. The NYISO must comply with FERC Order 881 by January 2028 and Order 1920 by July 2026. The Advanced Technology Working Group, as part of the Coordinated Grid Planning Process (CGPP), has been tasked with identifying and assessing ATTs to ensure that emerging solutions are fully considered.
- **ATTs can potentially be used to right-size solutions to transmission needs and provide stability services.** The ability of ATTs to maximize existing infrastructure and right-size new investments is particularly beneficial given the rapid rate of load growth and resource expansion projected in the RNA and Outlook, in addition to the fact that many transmission assets are nearing end of useful life. Traditional large-scale transmission projects often face long permitting timelines and siting challenges, whereas many ATTs can be deployed more quickly, providing a near-term means to enhance system reliability while longer-term solutions are developed. Higher shares of inverter-based resources (IBRs) will be required to advance the clean energy targets set out in the Climate Act, increasing the need for transmission solutions that can support system stability. Certain ATTs, such as grid-forming inverters and advanced power flow control devices, can help mitigate stability challenges that arise as conventional synchronous generation retires. Ensuring that these technologies are adequately studied and incorporated into planning frameworks will be critical to maintaining system reliability as the resource mix shifts.
- **Interregional coordination will become increasingly important for maintaining reliability.** This trend was specifically identified as a future issue to monitor in the 2023 Outlook. Coordinating across neighboring regions to identify, build, and cost-allocate transmission infrastructure, as well as optimize its operation for both reliability and economic

[224] While ATTs may be considered on equal footing with traditional transmission infrastructure, there may be cases in which certain technologies are not compatible with specific needs. For example, some older transmission infrastructure may not be compatible with certain GETs.

value, is complex. While existing interregional planning frameworks have supported communication and data sharing, additional processes may be needed to more effectively facilitate large-scale projects. Enhanced interregional collaboration on both onshore transmission and offshore infrastructure to support offshore wind projects will be required to ensure efficient resource development and system balancing across jurisdictions. Additional collaborative efforts should continue to investigate improved interregional coordination. The Northeast States Collaborative is working to improve coordination across state and regional boundaries, aligning planning efforts to facilitate efficient infrastructure development and cross-border energy exchanges.

- **Planning processes should continue to evaluate battery storage as a transmission asset, which could expand the range of solutions available to address New York's transmission needs.** Through its recent order updating its energy storage goals and deployment policies, the PSC has collected reports from the New York joint utilities studying the engineering and economic applications of storage as a resource for providing transmission and distribution reliability. This could be a foundation for enabling storage to be deployed as an alternative to traditional transmission solutions in New York in the future. NYISO is also soliciting feedback on its market design proposal for storage-as-transmission to provide an alternative to traditional transmission solutions that is more rapidly deployable and can be more easily right-sized and flexibly dispatched to meet transmission needs.
- **As New York transitions toward a winter-peaking grid, winter electricity demand will increasingly strain fuel supply systems.** NYISO and others have begun studying the implications of New York's transition toward a winter-peaking grid in recent years. The 2020 Comprehensive Area Transmission Review focused on extreme system conditions like loss of natural gas fuel supply in its 4th of 5 bulk power system assessments. The 2023 Comprehensive Reliability Plan (CRP) evaluated the effects of deactivations of dual-fuel generation beyond what is planned that could exacerbate winter reliability risk during gas supply shortages during winter peak. And lastly, the 2024 RNA factored in a new NYSRC rule requiring the evaluation of future winter system operations under conditions in which generators have limited access to natural gas due to supply constraints. The electricity sector's transition toward higher winter peak demand will coincide with already high natural gas demand from other commercial and industrial sectors, underscoring the need for reliable and resilient fuel supplies. Electric and gas system planners should continue evaluating whether additional coordination measures are needed to ensure fuel adequacy and maintain reliability as system conditions evolve.

H.6. Increasing System Resilience to Extreme Weather Events

Planning for and operating the system reliably will become more challenging as the intensity and frequency of extreme weather events increases. Below is a summary of key issues and areas for continued exploration:

- **Extreme weather events pose a significant threat to system reliability; stakeholders should continue to work to enhance capacity accreditation, and other operational requirements to ensure preparedness for extreme events.** In its review of extreme weather events, the 2023 CRP highlights that the risk of potential systemwide reliability deficiencies is particularly extreme in areas like New York City where grid infrastructure is highly concentrated and space-constrained. NYSERDA's Climate Impacts Assessment adds further urgency by projecting more frequent high-temperature days, increased precipitation, and more frequent severe storms in New York. These changes increase the likelihood of equipment failure, fuel supply constraints, and sudden spikes in electricity demand that challenge real-time system operations. Recent and ongoing efforts include PSL 66(29) plans for storm hardening and NYISO's updated capacity accreditation for firm fuel resources ensuring system performance during winter peak periods, even when fuel supplies are constrained.

- **Interregional coordination will become a critical tool to responding to catastrophic weather events.** The 2024 Reliability Needs Assessment (RNA) forecasted that, under certain extreme or unexpected events, the state may have to depend on emergency assistance from neighboring regions to meet local demand. This highlights the importance of regional coordination and infrastructure resilience, especially in areas with limited in-state redundancy.
- **Planning processes should explore supplemental methods and metrics as the nature and timing of reliability risks change over time.** Ongoing efforts should explore the adoption of supplemental analyses and criteria that address resource adequacy and transmission security considerations under evolving weather-based challenges. Improving system resilience under more frequent and intense weather events may require planning frameworks that go beyond traditional adequacy criteria, such as LOLE. The adoption of supplemental probabilistic resource adequacy criteria may help system planners better anticipate and prepare for a wider range of weather outcomes as New York's electricity system becomes more reliant on weather-dependent renewable resources. It is important that organizations such as RTOs, utilities, NERC, NYSRC, and State Energy Offices, for example, coordinate on the identification and development of potential new criteria as system needs evolve. The supplemental metrics discussed in B.4.7.1.2 include Loss of Load Hours (LOLH), Loss of Load Events (LOLEV), Loss of Load Probability (LOLP), Expected Unserved Energy (EUE), and Normalized EUE. Additionally, the NYSRC recently proposed a new reliability rule, PRR 153, that would require the examination of potential design criteria contingencies to reflect the loss of generation due to changes in weather as compared to electric fault-based events in existing criteria. Supplemental methods and criteria can enable a more comprehensive view of reliability and resiliency risks and trade-offs, supporting system planning and investment strategies that enhance the grid's ability to respond to and recover from weather-based reliability challenges, including future rare but severe events.