2025

Power Trends

THE NEW YORK ISO ANNUAL GRID AND MARKETS REPORT

New York ISO

New York ISO

THE NEW YORK INDEPENDENT SYSTEM OPERATOR, INC. (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.

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ON THE COVER

This image is a snapshot of the real-time fuel mix captured on April 22, 2025.

To learn more, read the "A diverse resource mix supports grid reliability" in the Overview section or view the Figure 22: Summer 2025 Installed Capacity and Figure 23: Energy Production by Fuel Source pie charts in the Appendix section of this report.

A letter From the CEO

On behalf of our team at the New York Independent System Operator (NYISO), welcome to the 2025 edition of *Power Trends*. Our flagship report explores the issues and challenges shaping the grid of the future based on the latest facts and data, information and figures.

The electric system is the backbone of our economy. It is essential to the health and safety of all New Yorkers. Since the NYISO's inception in 1999, protecting electric system reliability and evolving competitive markets has been our top priority in the face of great change, whether it be societal, public policy, or extreme weather. As older resources retire and new resources transform the way the system performs, this commitment remains.

The electric system is undergoing rapid and instrumental change on a scale not experienced since 1882 when Thomas Edison first electrified the Pearl Street station in lower Manhattan.

The influx of intermittent, renewable resources, and the advance of storage technology is changing the supply side. The building and transportation sectors continue the march toward electrification. The swift development of energy-intensive economic development projects like semiconductors, data centers, and hyperscale computing promises to change not just the electric system but society as a whole. It is imperative during this period of transition that we maintain an adequate supply of resources with the right performance characteristics to meet growing consumer demand for electricity.

This year's *Power Trends* spotlights the uncertainty inherent in forecasting the adoption of emerging technologies like electric vehicles and electric heating equipment. Equally challenging is predicting the pace of development with regard to energy-intensive data centers and manufacturing facilities seeking to connect to the grid.

To keep the system reliable during this period of uncertainty means our planning engineers are running multiple models, with scenarios that provide outlooks for a range of possible outcomes. Subsequently our planning and forecasting work at the NYISO has become more complex, but we embrace this challenge to serve our mission and support consumers, investors, and policymakers.

What we do know with certainty is that as public policies drive more fossil generators into retirement to meet decarbonization goals and tighter emissions restrictions, new carbon-free resources are not being added to the grid fast enough to keep pace with expected demand growth. Meanwhile, the traditional fossil-fueled generation fleet is aging, increasing concerns for their ongoing ability to provide essential reliability services to the grid at a time when reliability margins are shrinking.

Strong reliability margins enable the grid to meet peak demand and respond to sudden disturbances and avoid outages. As these margins narrow, consumers face greater risks of outages if the resources needed for reliability are forced out of service by policy mandates or failures associated with aging equipment.

How do we address these risks in the short-term? As *Power Trends* highlights, we've recently made enhancements to the interconnection process, the system by which the NYISO is required to study the reliability impacts of new generation and large loads seeking to connect to the grid. Hundreds of wind, solar, and battery storage projects are currently being evaluated under the NYISO's new streamlined process. New resources have been applied to improve the experience and make progress faster. We are committed to moving these projects as swiftly through the process as possible while also evaluating and identifying any reliability impacts to keep the future grid safe for consumers.

Power Trends also demonstrates how competitive electricity markets continue to provide the most powerful vehicle available to align investments in the grid with reliability needs. During a time of changing policy mandates, supply chain constraints, and economic uncertainty, competitive wholesale electricity markets administered by the NYISO continue to provide superior cost efficiency and strong investment signals for innovation while shifting that investment risk away from consumers. At the same time, we recognize that the changing nature of the grid requires continuous enhancements to our markets to ensure that the market signals drive the most reliable service and performance to benefit New Yorkers.

As residents and businesses across New York become more dependent on electricity to power their lives and livelihoods, the expectation for reliable electricity grows. A careful and collaborative approach by all stakeholders is required for success across the broad range of economic and environmental policies. To that end, we must consider all options for investing in the grid to provide for reliability and certainty at the most efficient cost.

The addition of new dispatchable generation needs to be considered in the near term to mitigate the dual risks of accelerated load growth and aging infrastructure. In addition to new conventional supply, the repowering of aging, inefficient and higher emitting assets should be evaluated as a bridge to a lower carbon future while delivering a more reliable electric system to support new economic development projects. Repowering older, renewable facilities may also hold promise for needed capacity.

In short, every plausible option and opportunity to bolster both reliability and resource needs should be on the table. All of us at the NYISO are committed to a continued strong partnership with policymakers, market participants, and industry stakeholders to address these priorities and challenges. Our promise at the NYISO is to always provide our independent, fact-based perspective and expertise to assist in a reliable transition of the electric system. We are proud of that work and the role we play in serving New York. We are excited for the future.

Sincerely,

Rich Dewey

Rich Dewey
President and CEO

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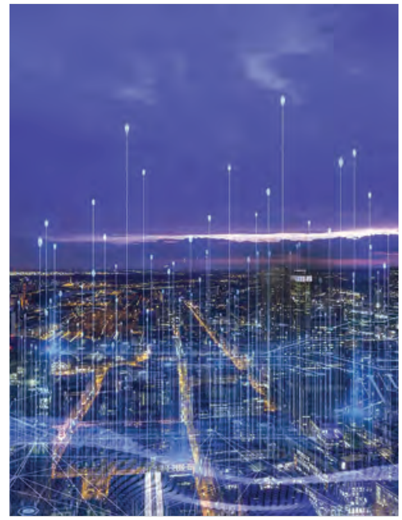

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New York's grid of the future

Overview

The creation of New York City's electric system began in 1882 with the activation of Thomas Edison's Pearl Street station. The invention marked the beginning of what would eventually become our grid-based electric system, transforming the city and state with great speed.

Innovation and economic growth followed, bringing electricity for the first time to homes and businesses, eventually leading to the construction of public transportation, high rise buildings, and manufacturing.

Power Trends Key Messages

> Generator deactivations are outpacing new supply additions. Electrification programs and new large-load customers associated with economic development initiatives are pushing projected demand higher. Together, these forces are also narrowing reliability margins across New York and increasing the risk of future reliability needs.

> As public policy goals seek to decarbonize the grid, fossil-fired generation will be needed for reliable power system operations until the capabilities it offers can be supplied by other resources. Energy efficiency and Demand-Side Management (DSM) will continue to play a key role in reducing energy consumption, lowering costs, and mitigating environmental impacts.

> Repowering aging power plants can lower emissions, meet rising consumer demand, and provide reliability benefits to the grid that are needed to integrate additional clean energy resources.

> New York is projected to become a winter-peaking electric system by the 2040s, driven primarily by electrification of space heating and transportation. On the coldest days, the availability of natural gas for power generation can be limited, and interruptions to natural gas supply will introduce further challenges for reliable electric grid operations.

> Driven by public policies, new supply, load, and transmission projects are seeking to interconnect to the grid at record levels. NYISO's interconnection processes continue to evolve to balance developer flexibility with the need to manage the process to more stringent timeframes. New processes have been implemented to accelerate the process while protecting grid reliability.

> The competitive wholesale electricity markets administered by the NYISO support reliability while minimizing costs to consumers. Competitive wholesale markets are essential to a reliable, affordable and cleaner grid of the future.

Today, the electric grid in New York is undergoing a transformation. Driven by changes in public policy, technological advances and economic development, the electric grid is in the midst of a monumental change that promises a new set of challenges and opportunities.

Data centers, fueled by the rise of generative Artificial Intelligence (AI), machine learning, and cryptocurrency mining activities, are becoming major electricity consumers. Electrification continues to expand across transportation, industrial processes, and buildings and homes. The NYISO's forecast scenarios indicate that by 2030 demand could increase by an additional 1,600 megawatts (MW) to nearly 4,000 MW due primarily to the combination of new large loads and building electrification.

With a robust resource mix, New York is home to more than 450 generating stations and 11,000 miles of transmission lines. The grid's central function is to safely and reliably deliver electricity to homes and businesses across the state. The electric grid powers our society, our economy, and supports the health, safety and welfare of nearly 20 million residents. However, the forecasted growth in consumer and industrial demand will need to be met with a similar growth in supply.

While stricter state emissions regulations have resulted in the exit of fossil fuel generation, and the state continues to pursue efforts to comply with the state's Climate Leadership and Community Protection Act (CLCPA), forecasts for electricity demand are increasing. So too are expectations for a more reliable grid.

High-tech manufacturing is expanding in New York. Several projects are underway or on the horizon, promising to create thousands of jobs for New Yorkers while also highlighting the need for large investments in energy infrastructure.

The challenge for policymakers and industry stakeholders is how to continue to power our society and economy in a way that is reliable, affordable, and sustainable — even while much of the clean generation technologies mandated by state policies are weather-dependent and thus variable in nature.

The transition of the electric system presents a set of challenges that can only be solved through a coordinated effort of industry, government, and stakeholders. Together, we must keep a careful watch on how the electric system itself reacts and responds to this change. The reliability of the system is showing strains under a mix of changing conditions and new pressures. Balancing the needs of grid reliability with the growing amount of weather-dependent generation and increasing demand requires careful attention to system data and information.

NYISO Independence and Transparency

Regulatory and reliability organization oversight

> The NYISO serves New Yorkers under the oversight of the **Federal Energy Regulatory Commission,** the **New York Public Service Commission,** the **North American Electric Reliability Corp.,** the **Northeast Power Coordinating Council,** and the **New York State Reliability Council.**

Shared governance

> This process **engages suppliers, transmission owners, consumers, environmental and environmental justice interests, and state organizations** to facilitate the development of the rules and processes for a reliable and economically-efficient grid in New York.

Independence

> **The NYISO is transparent, open, and independent of its stakeholders.** We are a registered 501(c)3 not-for-profit corporation. NYISO and its directors, executives, and employees are prohibited from having financial interests in any company participating in New York wholesale competitive electricity markets.

The NYISO's mission is to ensure power system reliability and competitive markets in a clean energy future. A core activity through which we serve that mission is to perform in-depth analyses of power system data and then provide information on the changing electric system to all stakeholders.

This information is intended to help policymakers, developers, market participants, and stakeholders make the most informed decisions possible. With a focus on system and resource planning, efficient, competitive markets and grid operations, *Power Trends* captures much of the recent work the NYISO has performed in fulfilling that role and responsibility.

NYISO's Powerful Purpose

MISSION	VISION
Ensure power system reliability and competitive markets for New York in a clean energy future	**Working together with stakeholders to build the cleanest, most reliable electric system in the nation**

Maintaining and enhancing regional reliability

Planning the bulk power system for the future

Operating open and fair wholesale electricity markets

Providing factual information to policymakers, stakeholders and investors

Large energy-intensive economic development projects

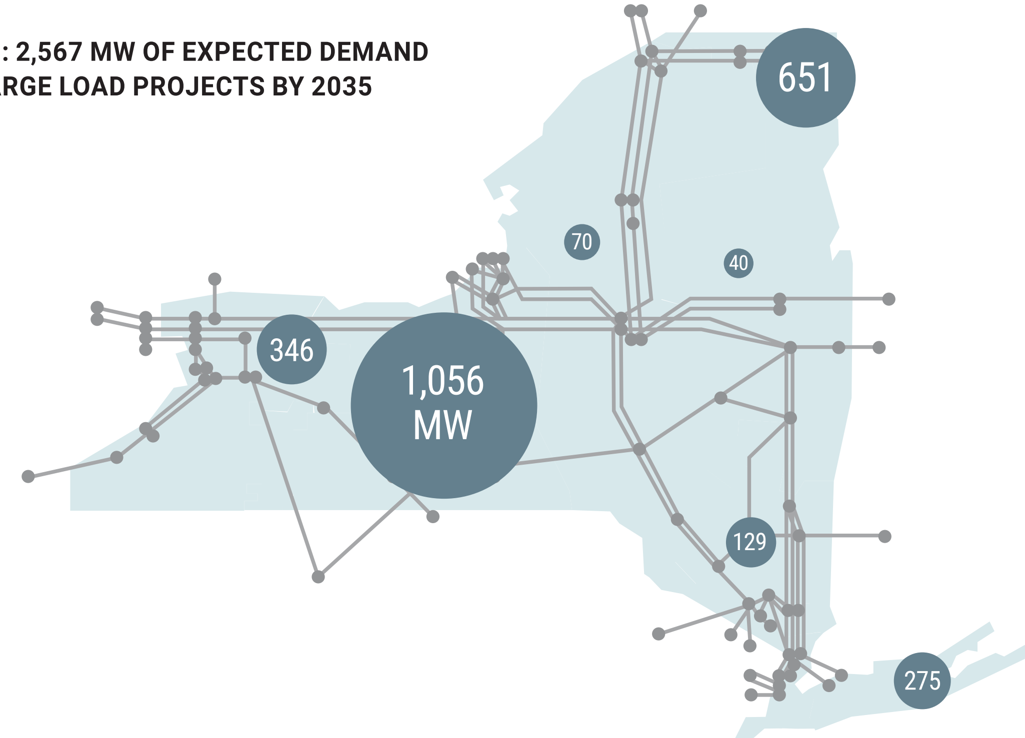
Large energy-intensive economic development projects are driving up demand for electricity.

Over the last decade, demand for electricity in New York has been relatively flat as energy efficiency programs counterbalanced an increase in demand from homes and businesses across the state.

While recent demand forecasts have lowered expectations of how quickly electrification measures are being adopted, the building and transportation sectors are expected to increase demand on the system. Even as the expected adoption of electrification slows, economic development projects like microchip fabrication and data centers are projected to be major drivers of load growth.

The number of new interconnection requests from large loads has grown dramatically in just a few years. In 2022, six large load projects in the interconnection queue accounted for 1,045 MW. As of April 2025, there are 20 large load projects in the queue which would collectively add nearly 4,400 MW of load to the grid. Load forecasters anticipate that as much as roughly 2,500 MW of that new demand will be on the system by 2035. The increase in forecasted demand poses a major challenge to grid reliability in New York.

FIGURE 1: 2,567 MW OF EXPECTED DEMAND FROM LARGE LOAD PROJECTS BY 2035



As initially highlighted in our *2024 Reliability Needs Assessment* (RNA), some large load projects are expected to have flexibility in the amount of power they need from the grid. More specifically, the *2024 RNA* assumed that approximately 1,200 MW of demand from large loads can be reduced during peak periods, which can provide an important reliability benefit.

The ability to shift load from times of greater system demand to times with lower demand or higher renewable energy production could significantly reduce the amount of generation capacity buildout required to serve demand. As discussed further, the NYISO's wholesale electricity market design includes demand-side programs which empower consumers to compete with suppliers to provide reliability services to the grid, supporting reliability, affordability, and a clean energy future.

Reliability margins are declining

As traditional fossil-fueled generation deactivates in response to decarbonization goals and tighter emissions regulations, reliability margins on the grid are eroding. Further, the remaining fossil-fueled generation fleet, which provides many of the essential reliability services to the grid, is increasingly made up of aging resources, raising further concerns about grid reliability.

Strong reliability margins enable the grid to meet peak demand, respond to sudden disturbances, and avoid outages. They also support the grid's ability to respond to risks associated with extreme weather conditions. As these margins narrow, consumers face greater risk of outages if the resources needed for reliability are unavailable due to policy mandates or failures associated with aging equipment.

The benefits of repowering

A change as monumental as decarbonizing our electric system can be challenging and unpredictable.

For instance, to achieve the mandates of the state's Climate Leadership and Community Protection Act, new, emission-free generating technologies must replace retiring fossil fuel-based generation. However, these new technologies are not yet available on a commercial scale.

In addition, economic development investments, the likes of which haven't been seen in New York in decades, are driving a need for additional power. New data centers, chip fabrication facilities, and even traditional manufacturing projects are arriving at a quickening pace.

So, what options exist in the short-term to transition the electric system, support economic development, and achieve deep emissions reductions? One idea is the repowering of existing, older fossil fuel power plants, or upgrading existing renewable generating facilities with new technologies.

Repowering can offer a bridge between old and new, the past and the future. It involves replacing or upgrading existing components with new equipment that can increase power output, improve efficiency, and aid the transition to cleaner energy sources.

Repowering is especially important to consider as we rely more on an aging generation fleet. With many power plants in New York already beyond industry standards for their expected useful life, the NYISO has raised concerns with future reliability. Upgrading our existing fleet not only can help with a stepped approach to carbon reductions by replacing older, dirtier turbines with new, cleaner cutting-edge technology, it also holds the potential for helping avoid future generator breakdowns, therefore bolstering grid reliability.

Here's a more detailed examination of the benefits of repowering:

What it is

Repowering is the process of retrofitting and modernizing existing power plants, often focusing on replacing older components with cleaner, more efficient, and powerful equipment that can provide more energy and lower emissions.

Why it's done

- **Increased efficiency:** Newer technologies can generate more power with the same or even less resources.
- **Reduced environmental impact:** Repowering can allow for a transition to cleaner energy sources, reducing carbon emissions.
- **Extended lifespan:** By upgrading components, the overall lifespan of a power plant can be extended, bolstering reliability.
- **Cost savings:** Repowering can be a more cost-effective solution than building a new plant, especially when existing infrastructure can be utilized.

Examples of repowering

- **Fossil plants:** Replacing older boilers or turbines with newer, cleaner, more efficient, cutting-edge technology.
- **Hydro power:** This process often includes replacing turbines, generators, automation systems, and hydraulic components to enhance the plant's performance,
- **Solar power:** Replacing older photovoltaic equipment and inverters with newer, more efficient generating equipment.
- **Wind power:** Replacing turbines with greater capacity or upgrading older blades with more efficient technology can improve energy yield.

The benefits

- **Increased power generation:** Repowering can lead to a material increase in the total capacity of a power plant, something increasingly important as we observe declining reliability margins across the state.
- **Improved grid stability:** Newer, thermal-based generating technologies can provide what's known as "voltage support," which bolsters grid reliability and keeps the flow of electricity steady along transmission infrastructure over great distances.
- **Reduced environmental impact:** Building large generating facilities on new sites can impact existing ecosystems, infrastructure or even residential areas. Power plant repowering is a tool in the energy toolbox that goes beyond emissions reductions, avoiding costly and possibly disruptive new construction.

From extending the lifespan of existing infrastructure to enhancing grid stability and supporting economic growth, repowering can provide a practical pathway or bridge for achieving lower emissions profiles, and a more resilient energy future.

DSM, Energy efficiency

> Energy efficiency and Demand-Side Management (DSM) play a key role in reducing energy consumption, lowering costs, and mitigating environmental impacts.

> Energy efficiency programs offer customers incentives to decrease overall electricity demand. DSM focuses on managing energy use through various strategies to optimize grid operations during times of peak demand. By promoting energy-efficient technologies and behaviors, DSM initiatives help reduce overall energy consumption, which in turn lowers electricity demand.

> Energy efficiency measures and demand response programs can help individuals and businesses save money on energy bills. Reducing energy demand can lead to lower emissions.

> DSM also helps manage the flow of electricity on the grid, ensuring a stable and efficient power supply, especially with the increasing integration of renewable energy sources. By proactively managing demand, DSM can also minimize the need for costly infrastructure upgrades and promote a more efficient and sustainable energy system.

Since 2021 NYISO reliability reports have noted that reliability margins are declining. In July 2023, the NYISO issued a *Quarterly Short-Term Assessment of Reliability* (STAR) report that identified a reliability violation in New York City beginning in the summer of 2025, when several generation facilities (commonly referred to as "peaker plants") were slated to exit the market due to stricter emissions requirements imposed by the state Department of Environmental Conservation (DEC). After soliciting solutions, the NYISO received none that could be installed in time or were sufficient to fully address the identified deficiency. As a result, the NYISO identified the need to retain certain dual-fuel generators as the temporary solution for New York City's Reliability need until the Champlain Hudson Power Express (CHPE) transmission line from Quebec to New York City is completed. CHPE is expected to enter service in the spring of 2026 and, as the STAR report and other NYISO planning reports have highlighted, delays in that project could prolong the need to retain the peaker plants.

More recently, the *2024 RNA* identified another Reliability need in New York City beginning in summer 2033. The need was driven by a combination of the legislatively mandated deactivation of generating units owned by the New York Power Authority (NYPA) by the end of 2030, forecasted increases in peak demand, and limited new supply. To underscore how narrow reliability margins create uncertainty, the NYISO's most recent annual forecast update projects roughly 200 MW less demand in New York City by 2035. The reduction reflects slower adoption rates for electrification technologies and is enough to eliminate the Reliability need identified in the *2024 RNA*. But while the Reliability need no longer exists, significant uncertainties associated with future demand growth and the changing supply mix could result in the identification of reliability needs in the future.

Electric system reliability in winter is an increasing concern

Issues associated with maintaining grid reliability during the winter months are expected to become more acute in the coming years. As severe winter weather events, such as Winter Storm Elliott, demonstrated, the connection between fuel security and grid reliability is an important topic that requires more attention and discussion.

While New York's electric grid is still currently a summer-peaking system, the state will in the coming years see electricity demand reach its highest points in colder months. Winter demand is expected to grow by approximately 14,000 MW by the year 2040.

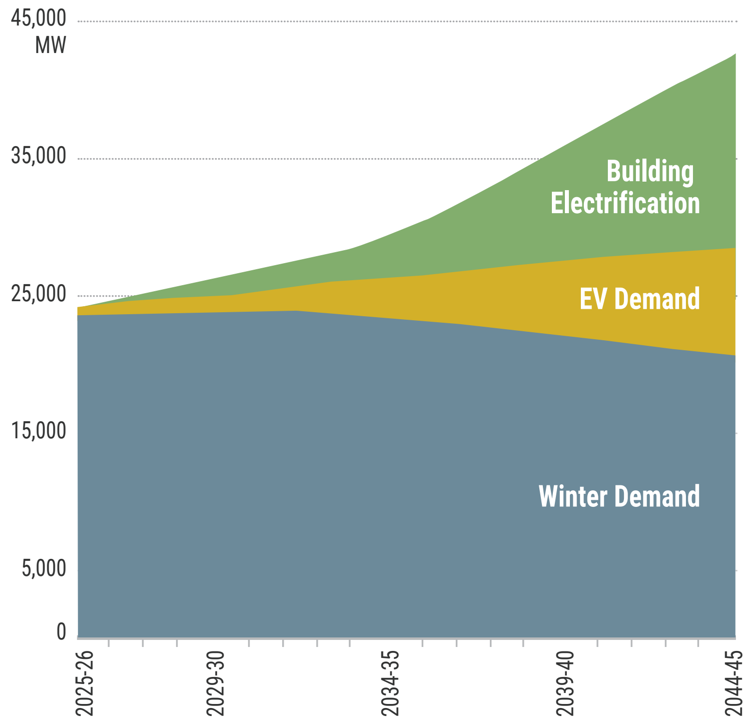
Historically, investments have been made to meet high summer demand, which is driven primarily by air conditioning use, especially during prolonged heat. As more consumers rely on the electric system to meet space heating needs, however, the NYISO must ensure the grid is prepared to supply winter peak periods reliably under various conditions.

Current statewide reliability margins in winter are sufficient. However, if gas-fired generators cannot secure fuel during peak winter demand periods, statewide deficiencies could arise as soon as winter 2029-2030 under normal weather conditions. Considering higher demand growth or extreme winter weather conditions, deficiencies may happen years earlier.

For health and safety reasons, natural gas is prioritized for residential consumers to heat their homes in the winter. As a result, winter-time gas constraints affect all generators that rely on natural gas. The impact is mitigated for dual-fuel units, which can switch to oil as a backup fuel when gas demand is high or gas supply is otherwise constrained.

With natural gas serving as the primary fuel for more than 60% of the generating capacity in the state, potential fuel constraints can have serious consequences for grid reliability. Most of the gas-powered generation located downstate is dual-fuel. This flexibility supports system reliability during extreme weather events like the recent polar vortex.

FIGURE 2: EXPECTED IMPACT OF ELECTRIFICATION ON STATEWIDE WINTER PEAK DEMAND



The state's clean energy goals seek to decarbonize the electric grid by 2040, and natural gas will continue to be necessary to maintain grid reliability during the transition period. Fuel security is also critical for the ongoing electrification of housing and transportation, as gas-based generation helps power heat pumps and electric vehicles.

With winter peak demand approaching summer peak demand levels within the next 10-15 years, the winter reliability margin is shrinking, underscoring the need to more accurately account for winter operating conditions in reliability planning models.

The New York State Reliability Council (NYSRC), which establishes rules used to assess grid reliability, identified the need to model winter operations under conditions in which generators have limited access to natural gas. A new rule, adopted in May 2024, seeks to model future winter system operations under gas supply constraint conditions.

The rule is reflected in the findings of the NYISO's *2024 RNA.* In that report, NYISO planners modeled the system with the assumption that 6,400 MW of gas-only generation will be unavailable during winter peak conditions due to gas system constraints. This assumption contributes to the forecasted narrowing of reliability margins across the RNA's study horizon.

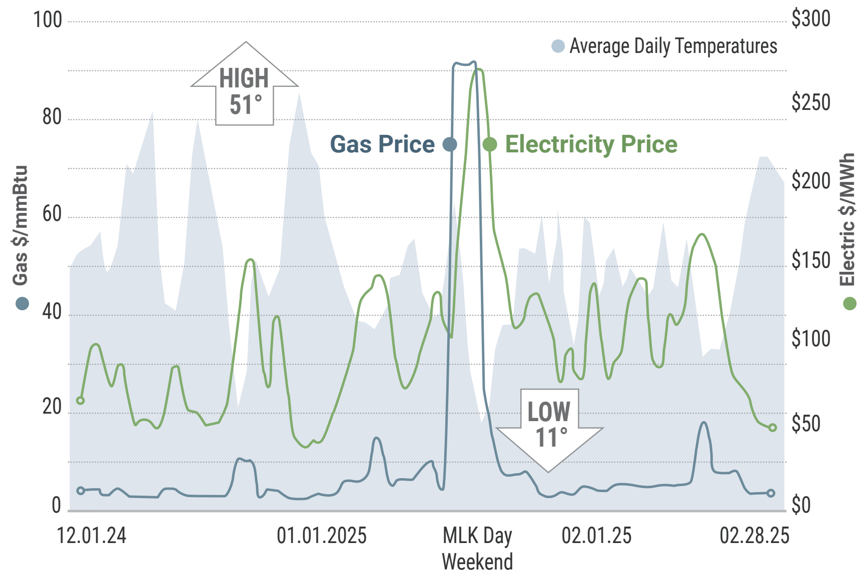
Demand for natural gas drove electricity prices during 2024/2025 winter season

As winter weather impacted much of the nation, demand for natural gas increased, leading to higher electricity costs for New York consumers.

That's because generators that use natural gas in the production of electricity experienced price spikes in fuel supply and factored those increases into their production costs.

The NYISO administers the state's competitive markets where the price of electricity is established. The wholesale price of electricity can fluctuate month-to-month, influenced by several factors including market forces, weather, and operating conditions.

FIGURE 3: WINTER 2024/25 DAILY TEMPERATURE AND ENERGY PRICES



The country's pipeline network is a highly integrated system that moves natural gas throughout the continental United States, with millions of miles of pipelines that link natural gas production and storage facilities with New York consumers and power plants. The NYISO does not oversee the natural gas system.

According to the U.S. Energy Information Administration (EIA), demand by residential and commercial customers using natural gas for space heating rose significantly in January and February as severe cold weather swept the nation.

As reported in the EIA's *Natural Gas Weekly Report,* released February 12, 2025, the January polar vortex caused natural gas prices in New York to increase nine-fold. "Colder-than-normal temperatures across much of the United States in mid-January increased natural gas consumption, resulting in the fourth-largest reported weekly withdrawal from natural gas storage in the lower 48 states," according to the EIA analysis.

Other elements that factor into electricity costs include the increased expense of maintaining aging power plants, investments in much-needed transmission and distribution equipment, and investments in renewable energy to support the state's climate policies. Inflation has also contributed to higher electricity prices as the cost of materials and labor has risen across industries.

While the NYISO cannot control these costs, we monitor market participants' buying and selling behavior to keep the electric system reliable and as cost-efficient as possible for consumers. The NYISO's role is to oversee the wholesale markets and ensure that buyers and sellers operate within the markets according to regulations determined by the Federal Energy Regulatory Commission, other regulatory bodies, and state and regional reliability organizations.

The NYISO's market mitigation and analysis team examines data on market transactions and operating behaviors of generating assets to verify that consumer prices reflect competitive market circumstances. If they detect anomalies or a trend that raises questions, they can investigate and request additional information from market participants.

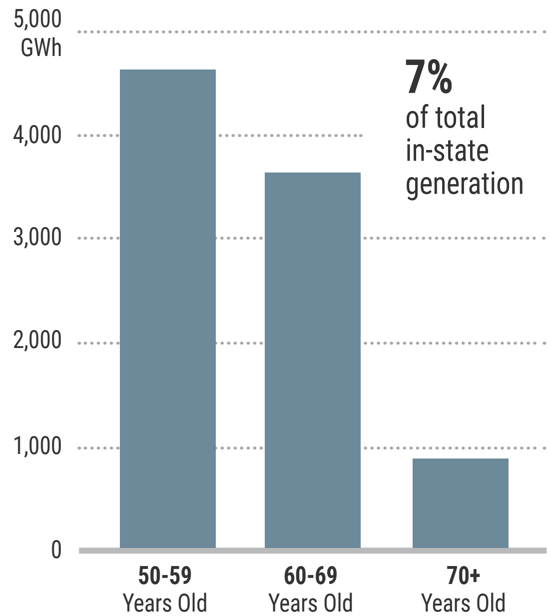
New York's generation fleet is aging

A growing number of fossil-fuel generators in New York are reaching an age at which similar units across the country have been deactivated. New York's fleet of fossil-fuel-based generation includes more than 10,000 MW, roughly 25% of the state's total generating capacity, that has been in operation for more than 50 years.

As these fossil-fuel generators age, they are experiencing more frequent and longer outages. Greater difficulties in maintaining older equipment, combined with the impact of policies to restrict or eliminate emissions may drive aging generators to deactivate, which would exacerbate declining reliability margins. Reliability concerns associated with the age and condition of New York's fossil fleet were underscored this past winter by the outages of three units.

In addition to the concerning issue of deteriorating performance of aging fossil-fuel generators, the pace of generator deactivations is exceeding the development of new generating resources. Since the passage of the state's 2019 CLCPA, 4,315 MW have left the system while only 2,274 MW have been added. This net loss of more than 2,000 MW represents enough capacity to power roughly 2 million homes.

FIGURE 4: ENERGY PRODUCTION FROM AGING FOSSIL-FUEL-BASED GENERATION: 2024



A diverse resource mix supports grid reliability

The most basic measure of grid reliability is resource adequacy, which measures if there is sufficient generating capacity available to meet expected peak demand on the grid. But resource adequacy is only one test of reliability. More than megawatts, resources powering the grid must deliver certain capabilities to maintain reliability under dynamic conditions.

These critical capabilities include:

- **Dispatchability:** Resources that provide the real-time ability to turn on, off, increase, or decrease output in response to changing conditions. Dispatchable resources offer highly controllable, reliable, and predictable electricity supply.
- **Flexibility:** Resources that can be dispatched through a wide operating range with a low minimum output.
- **Multi-start:** Resources that can be brought online or switched off multiple times throughout the day.
- **Dependable fuel source:** Resources that have secure, reliable sources of fuel that can be brought online across a range of operating conditions.
- **Non-energy limited:** Resources that can provide energy for multiple hours and days regardless of weather conditions.

Most of these capabilities can be supplied by existing fossil-fired resources and certain hydropower assets, which can respond quickly to changing conditions. While all resources supplying the grid offer some of these capabilities, only New York's existing fossil resources and certain hydro generators deliver the full array of services needed to balance a dynamic grid. Despite the need to reduce fossil fuel use to meet the state's emissions reduction targets, some level of fossil-fired generation will be needed for reliable power system operations until the capabilities they offer can be provided by other resources.

Existing nuclear energy, in addition to being emissions-free, provides reliable, continuous, predictable supply. Wind and solar resources lack dispatchability (producing electricity only when wind and sun are present) and are considered energy-limited because they rely on fluctuating weather conditions for their fuel. Battery storage, while offering dispatchability and dependability, is also considered energy-limited because batteries can typically only supply the grid for limited durations before needing to be recharged. Emerging nuclear technologies hold promise for added flexibility and dispatchability, but the commercial availability of advanced nuclear designs is uncertain.

Even the capabilities of fossil-fired generators can vary. Generators fueled solely by natural gas are subject to potential fuel disruptions due to pipeline constraints in the winter months. On the other hand, dual-fuel generators that are capable of operating on natural gas or oil are less susceptible to fuel disruptions and offer greater support to power system reliability in cold winter conditions.

In New York City and Long Island, most generators are required to maintain dual-fuel capability and supply. Dual-fuel generation is particularly important for meeting downstate energy needs, where it accounts for 74% of the region's capacity. The availability and consistent contributions of dual-fuel resources are necessary to maintain power system reliability in cold winter conditions throughout the transition toward a zero-emission system.

Simply put, as New York seeks to retire more fossil fuel units in the coming years it will be essential to deploy new energy resources with the same reliability attributes to maintain grid reliability. Until new, non-emitting alternatives like hydrogen or advanced nuclear generation are developed and commercialized, fossil resources are needed to fill an essential role in preserving reliable grid operations.

Enhancing the interconnection process

The NYISO recently unveiled a new-and-improved interconnection process to accommodate the large volume of renewable energy resources seeking to connect to the grid.

The NYISO is tasked with evaluating proposals in our interconnection queue to ensure projects can connect to the grid without harming the system or imposing undue costs on consumers.

In August 2024, the NYISO launched a streamlined "Cluster Study" process for developers consistent with regulatory reforms in FERC Order No. 2023. Under the new process, NYISO's interconnection team evaluates a large group of interconnection requests collectively rather than individually, saving time and workload for the NYISO, utilities, and developers.

Key aspects of the new cluster study process:

- Expedites the interconnection process significantly.
- Provides more information to prospective developers, including a pre-application process and physical infeasibility screens.

- Emphasizes commercial readiness and incentivizes uncertain projects to exit the queue early.
- Establishes firm study deadlines for work performed by the NYISO and transmission owners with consequences for missed deadlines.
- Integrates requests from facilities that are 20 MW or smaller into the single, standardized process.

In addition to these process enhancements, NYISO's interconnection team upgraded the online portal through which developers and utilities submit and access information on pending interconnection proposals. This enhancement makes it easier to access project status information and connect to NYISO staff.

In June 2025, nearly 240 project proposals were under evaluation in the NYISO's initial cluster study comprised almost entirely of wind, solar, and energy storage resources. Collectively, the capacity of those projects totaled approximately 35,000 MW.

NYISO continues to engage with interconnection customer focus groups and other stakeholders to develop additional interconnection process enhancements. These steps demonstrate NYISO's deep commitment to improving the efficient integration of new generation projects onto the grid.

The power of competitive electric markets to support investment in the grid and state

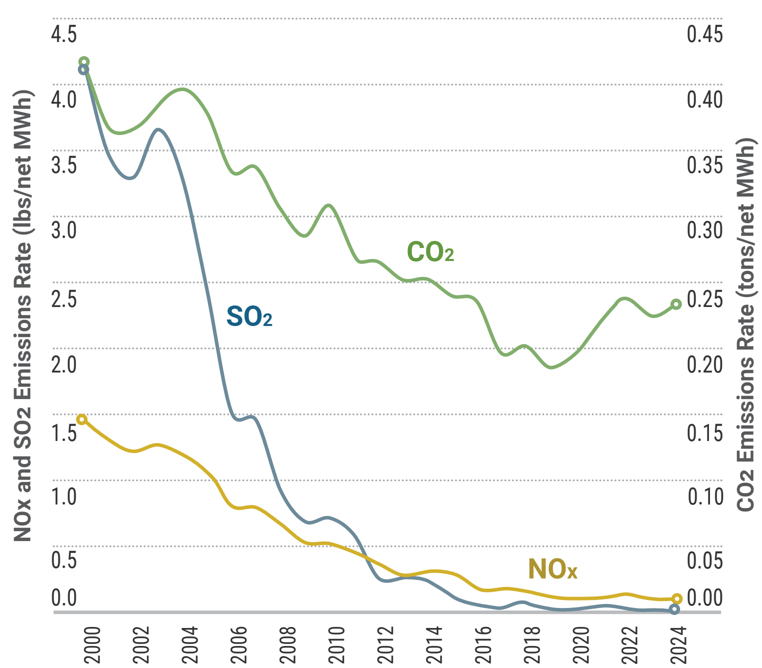
Managing wholesale electric markets is a core responsibility for the NYISO. We are committed to administering and overseeing the competitive electricity markets as the most cost-effective way to attract and retain new resources to meet our reliability needs as we transition to a decarbonized grid.

For 25 years, competitive electricity markets have provided New Yorkers with reliable, least-cost power. Since 2000, the CO_2 emissions rate in the power sector decreased by nearly 45%.

Competitive markets produce real-time price signals that allow power suppliers and flexible loads to respond to the grid's changing needs. With ever-increasing intermittency, extreme weather, and demand from electrification and economic development, the balancing force of markets is essential.

Our market design team is hard at work developing new tools and programs to encourage investment in resources that are fast-ramping,

FIGURE 5: EMISSIONS RATES FROM ELECTRIC GENERATION IN NEW YORK: 2000-2024



Sources: U.S. EPA, U.S. EIA, RGGI

flexible, dispatchable, and emissions-free — resource characteristics that are becoming increasingly important for grid reliability.

NYISO market design innovations underway include winter reliability capacity improvements; dynamic reserves to balance intermittency; advanced battery storage modeling; and a review and analysis of the current Capacity Market structure. Each of these is discussed in detail under the Markets section of *Power Trends*.

Economic development investment, the likes of which haven't been seen in New York in decades, is driving a need for additional power supply. New data centers, AI technology, chip fabrication facilities and even traditional manufacturing projects are arriving at a quickening pace.

Wholesale electricity markets in New York send strong price signals to guide new market entry and retain existing resources necessary for maintaining reliability. Wholesale electricity markets also provide strong economic signals to attract generation that possess the specific characteristics necessary for a more reliable, flexible, distributed, and dispatchable grid. In this era of rising costs and supply chain challenges, competitive electric markets also provide the valuable benefit of shifting investment risks away from the consumer and onto financiers and developers.

Repowering existing generation can help meet rising consumer demand, lower emissions, and provide reliability benefits to the grid. Without investment in new dispatchable resources, grid operators are increasingly relying on an aging fleet of fossil generation.

Achieving the state's climate goals in an orderly fashion is a challenge given ever-changing market conditions. A careful and collaborative approach is important as we strive to meet the goals of the CLCPA and maintain a reliable grid. As residents and businesses across New York become more dependent on electricity to power our lives and livelihoods, the expectation for reliable electricity will also continue to grow.

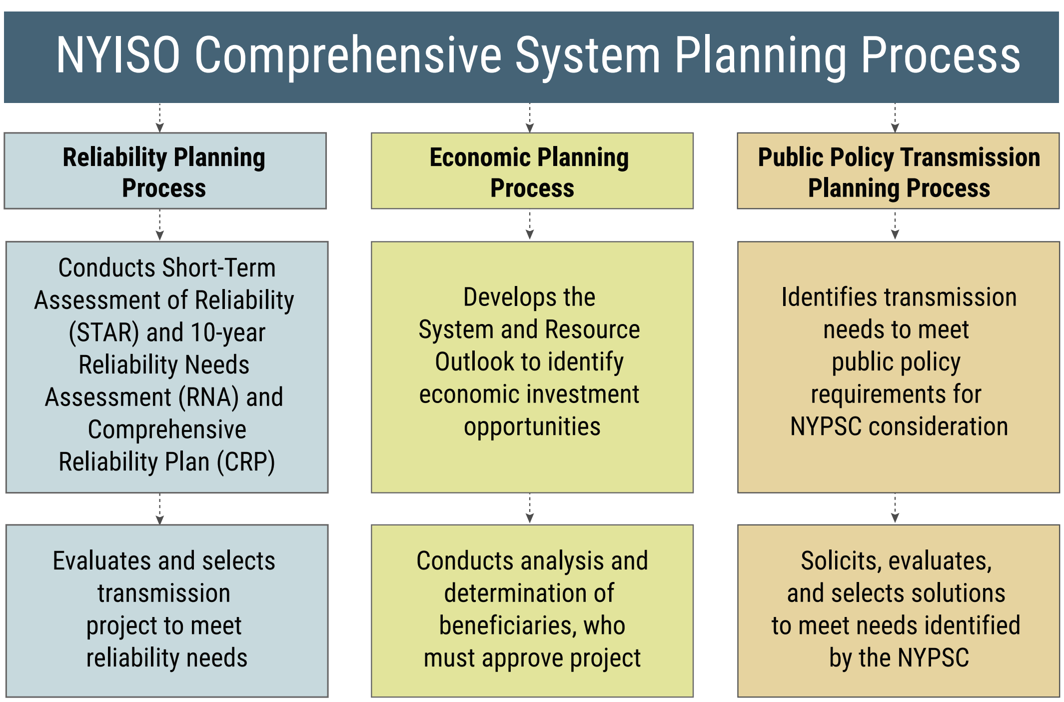
Planning

for a reliable future grid

Reliability planning process

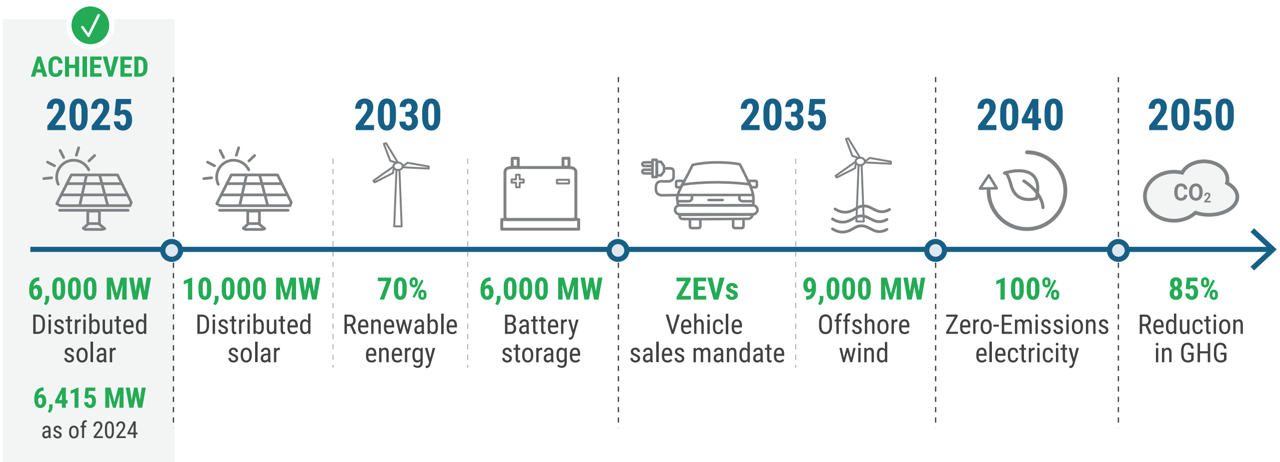
The electric system planning process is crucial for ensuring a reliable, safe, and affordable electricity supply. It involves forecasting future demand, planning new generation, transmission, and distribution infrastructure, and coordinating these plans to meet economic, reliability, and environmental objectives. This process is essential for adapting to changes in energy sources, technologies, and consumer needs.

The NYISO's Comprehensive System Planning Process (CSPP) focuses on the impacts of forecasted changes in supply, identifying future system needs before a possible impact to reliability occurs. It has taken on even greater importance and complexity in recent years as the grid is impacted by a confluence of public policy mandates, advancing technology and more frequent extreme weather.



NYISO planners continuously study the electric system to identify and address changes that pose a risk to reliability. Planners conduct short-term and long-term assessments of reliability. They evaluate the system from an economic perspective, identifying investment opportunities that can support policy goals and improve the efficiency of the grid. Further, NYISO planners evaluate transmission expansion needs driven by public policies.

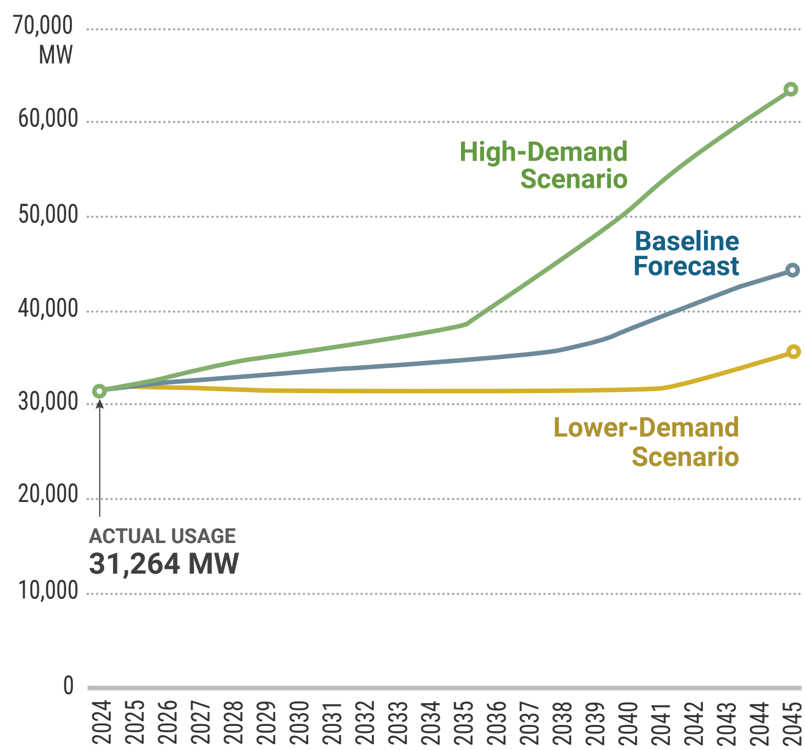
FIGURE 6: NEW YORK STATE CLEAN ENERGY POLICIES



The NYISO's planning process functions in compliance with FERC-regulated tariffs and reliability standards established by NERC, NPCC, and the NYSRC. The NYISO's Reliability Planning Process includes biennial reliability planning reports focused on identifying and resolving reliability needs over a ten-year time horizon through the RNA and the CRP.

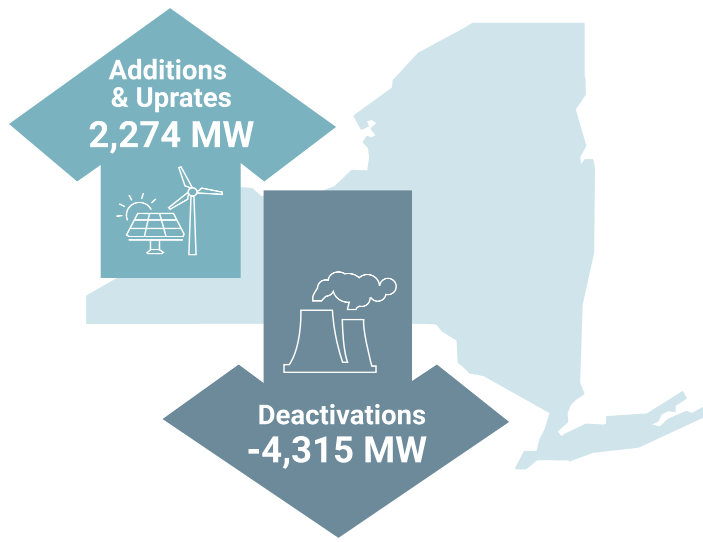
The biennial long-term reliability planning process is performed in two steps, where the even-year *Reliability Needs Assessment* (RNA) identifies any reliability needs and the subsequent odd-year *Comprehensive Reliability Plan* (CRP) identifies the plan for the planning horizon, including appropriate solutions to needs.

FIGURE 7: ACTUAL AND FORECAST ANNUAL PEAK DEMAND: 2024-2045



Both planning processes evaluate the New York transmission system's ability to meet established transmission security and resource adequacy criteria and have procedures for identifying solutions in their respective timeframes. As described below, transmission-security driven reliability needs were identified in New York City in the short-term and long-term reliability planning processes.

FIGURE 8: ADDITIONS AND DEACTIVATIONS SINCE 2019



In 2019, anticipating that the pace of change on the grid was increasing, the NYISO established a Short-Term Reliability Process in its federally regulated tariffs. Through this process, each quarter the NYISO issues a *Short-Term Assessment of Reliability* (STAR) report to identify reliability needs that may arise over the next five years due to various changes to the grid such as generator deactivations, revised transmission plans, or updated electricity demand forecasts. Should a reliability need be identified in a STAR, the NYISO solicits for and selects solutions to address the need. This approach provides the opportunity to proactively identify reliability needs that may arise due to changes to the grid from generator deactivations, transmission availability, and updated electric demand forecasts.

Short-Term Assessment of Reliability (STAR)

The *2023 Quarter 2 STAR* (Q2) and the *2025 Q1 STAR* are particularly notable because they address specific reliability impacts and expected changes to future demand forecasts.

In 2019, the New York State DEC took steps to limit Nitrogen Oxide (NOx) emissions and adopted what has become known as the "Peaker Rule." This resulted in 1,027 MW of affected fossil-fired generators being deactivated or limited as of May 1, 2023, and an additional 590 MW expected to become unavailable by May of 2025.

The *2023 Q2 STAR*, issued July 14, 2023, found a reliability need due to a deficiency of up to 446 MW within New York City beginning in summer 2025. The need was 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."

The report identified the need based on a deficient "transmission security margin." A transmission security analysis tests the grid's ability to withstand disturbances, such as electric short-circuits or unanticipated loss of system elements (such as a generator or a transmission line) that can risk the grid's ability to safely and reliably deliver electricity from where it is produced to where it is consumed.

Per regulatory oversight by the Federal Energy Regulatory Commission (FERC), the finding of a reliability need initiates a process administered by the NYISO to bring reliability margins back to acceptable operating levels.

The DEC Peaker Rule

> In 2019, New York took a bold step towards cleaner air and public health with the introduction of the "Peaker Rule" by the New York State Department of Environmental Conservation (DEC). This regulation targets the state's oldest, most inefficient power plants, requiring that they meet stringent emissions standards. These plants generally provide electricity during peak demand times — think sweltering summer days or frigid winter nights. The DEC rule mandated that these units make a choice: invest in cleaner technologies, cease operations for certain times, or shut down.

> **Cost challenges:** As power plants navigate stricter emissions standards, the transition is steering New York towards a cleaner energy future but also bringing its share of cost challenges. Since the rule went into effect and affected units have shut down, noticeable increases in capacity charges have been observed, particularly during the peak demand periods of winter and summer. These charges ensure power availability when it's needed most, bolstering system reliability. Yet, amidst this shift, the energy sector's adaptation to a cleaner mix of generation sources is introducing a period of market volatility, characterized by fluctuating or increased prices, as we move towards sustainability.

To resolve the reliability need, the NYISO determined that the Gowanus 2 & 3 and Narrows 1 & 2 generation units, which provide 508 MW toward meeting the identified deficit, are necessary to maintain reliability of the system. The NYISO's designation of these plants as necessary for reliability allows for their continued operation beyond May 2025 consistent with provisions in the DEC's "Peaker Rule." The continued operation of the Gowanus and Narrows units was described in the STAR as a temporary solution until the CHPE transmission project enters service and fully addresses the need for the remainder of the STAR's five-year outlook.

The NYISO continues to evaluate the reliability of the system in each quarterly STAR study to confirm if system changes mitigate the New York City deficiency or require extending the permits for the designated units to address such deficiency an additional two-year period beyond 2027.

For the *2025 Q1 STAR*, the NYISO evaluated the impact of updated forecasts and uncertainties in potential system changes or study assumptions. The following factors were evaluated in the sensitivity analyses: updated New York City demand forecasts, CHPE unavailability, heatwave conditions, accelerated deactivations of the certain NYPA fossil-fired plants, unplanned failures or outages of aging fossil fuel generators, and different methods for determining the expected availability (or "derating factors") of thermal generation units.

Some of the sensitivities showed improved reliability margins while others showed even further risks. Considering the baseline results in the *2025 Q1 STAR* and the heightened uncertainty of future system conditions, the NYISO's designation of the Gowanus 2 & 3 and Narrows 1 & 2 generators to allow their continued operation beyond May 2025 continues to be necessary to address the reliability need identified in the *2023 Q2 STAR*.

Through the quarterly STAR studies, the NYISO continues to work closely with the DEC, the New York State Public Service Commission (NYPSC), stakeholders, and the New York State Energy Research and Development Authority (NYSERDA) to evaluate the reliability of the electric system, assess the continued need for the peaker plants, and monitor progress by CHPE.

2024 Reliability Needs Assessment (RNA)

The RNA, issued biennially, evaluates the future reliability of the New York electric grid considering forecasts of power demand, planned upgrades to the transmission system, public policy and changes to the generation mix over a ten-year period. The RNA assesses an actionable "base case" set of assumptions, referred to as "baseline assessment," as well as various scenarios that are provided for information.

The *2024 RNA* closely evaluated risk factors, such as winter system conditions, the impact of large industrial and other energy-intensive loads, and anticipated generator deactivations that could potentially lead to deficiencies in reliable electric service over the planning horizon.

A key finding of the *2024 RNA* was the increasing uncertainty about important system trends over the next ten years. Primarily among these trends are the development and flexibility of large loads and the impact of electrification and electric vehicle adoption on the demand forecast. The RNA provides a variety of plausible, if not probable, scenarios of generation development over the next ten years that would result in positive margins, while also noting scenarios in which reliability margins are degraded.

The *2024 RNA* continued to observe a declining statewide system margin due to increased demand, anticipated generation retirements without adequate new generation addition, and the potential unavailability of natural gas during winter peak conditions. A negative statewide system margin on its own is not a criteria violation, but it is a leading indicator of the system's inability to securely serve demand under normal operations while fully maintaining operating reserves.

Planning Reports and Studies

> **Short-Term Assessment of Reliability (STAR):** Conducted every quarter to assess reliability needs within a five-year horizon to determine whether the grid will be able to supply enough power to meet demand.

> **Reliability Needs Assessment (RNA):** Evaluates the reliability of the New York bulk electric system considering forecasts of peak power demand, planned upgrades to the transmission system, and changes to the generation mix over the next ten years.

> **Comprehensive Reliability Plan (CRP):** Integrates STAR reports and the most recent RNA, resolves any identified reliability needs and develops a ten-year reliability plan.

> **System and Resource Outlook (Outlook):** The Outlook will provide a comprehensive overview of system resources and transmission constraints throughout New York, highlighting opportunities for transmission investment driven by economics and public policy over a 20- year period.

Additionally, state legislation enacted in 2023 requires the New York Power Authority (NYPA) to deactivate certain of its natural gas plants located in New York City and Long Island. These retirements would result in a loss of 517 MW. The new law authorizes NYPA to confer with the NYISO to determine if the plants are necessary for electric system reliability.

The *2024 RNA* identified a reliability need beginning in summer 2033 within New York City driven primarily by a combination of forecasted increases in peak demand and the assumed retirement of the affected NYPA plants. Accounting for these factors, the bulk power transmission system was not expected to be able to securely and reliability serve the forecasted demand starting in summer 2033 by as much as 17 MW for 1 hour and increasing to 97 MW for 3 hours in summer 2034 on the peak day during expected weather conditions. However, updated forecasts resulted in a decrease in New York City peak demand. Forecasted peak demand in New York City is now anticipated to be roughly 200 MW lower than previous forecasts. While demand is still forecasted to grow year-over-year in New York City driven by building and transportation electrification, increasing by 500 MW over the 10-year planning period, the NYISO determined that the updated forecasts eliminated the reliability need identified in the *2024 RNA.*

While the reliability need no longer exists at present, the *2024 RNA* noted uncertainties that could affect the findings in future reliability studies. For instance, statewide reliability margins continue to shrink over the next ten years, due to forecasted growth in demand coupled with retirements of conventional generation that are outpacing renewable generation additions.

The *2024 RNA* also continued to underscore the importance of the timely completion of planned transmission projects — primarily CHPE — to maintain system reliability. The *2024 RNA* highlights that without the CHPE project in service by May 2026 or other offsetting solutions, reliability margins within New York City may be deficient beginning in summer 2026.

The forecasted transition from a summer-peaking system to a winter-peaking system also poses challenges to grid reliability. This shift, driven by the electrification of the building and transportation sectors, is expected to accelerate over the next 10-15 years. Increased winter demand introduces new reliability concerns, particularly around fuel availability for gas-fired generators. On the coldest days, natural gas distribution companies prioritize residential heating and limit the fuel available to generators without firm contracts. These coldest days also correspond to peak winter electric demand periods when the gas-fired generation fleet is needed most.

As New York becomes a winter-peaking system, the gas supply to electric generation plants is expected to be strained. On the coldest days, the natural gas distribution companies must serve residential heating first and, when there is insufficient gas supply, limit the fuel available to generators without firm contracts. These coldest days also correspond to peak winter demand periods when the gas generation fleet is needed the most. As described elsewhere in *Power Trends,* the NYSRC in 2024 revised its reliability rules to require the NYISO to plan for credible system conditions that model anticipated winter peak load and the unavailability of generation with non-firm gas contracts. Accounting for this new reliability rule in the RNA results in the assumed unavailability of approximately 6,400 MW. The *2024 RNA* is the first NYISO study to apply the new NYSRC reliability rule. The specific modeling of gas unavailability is expected to be refined in future STAR reports and the *2025-2034 Comprehensive Reliability Plan.*

Longer-term potential risks identified in the RNA may be resolved by new capacity resources coming into service, construction of additional transmission facilities, increased energy efficiency, integration of distributed energy resources and/or growth in demand response participation.

2025-2034 Comprehensive Reliability Plan (CRP)

The NYISO is expected to release the *2025-2034 CRP* in November 2025. The CRP, issued biennially, sets forth a plan to maintain a reliable bulk electric grid based on expected changes and forecasted conditions over a ten-year planning period.

The CRP will review the reliability margins forecasted from previous CRPs to identify the historical trends and further investigate a variety of risk factors and plausible ways the system could change over the next ten years. In consideration of increasing uncertainty about key system trends over the next ten years, the CRP will also consider and analyze the following uncertainty factors:

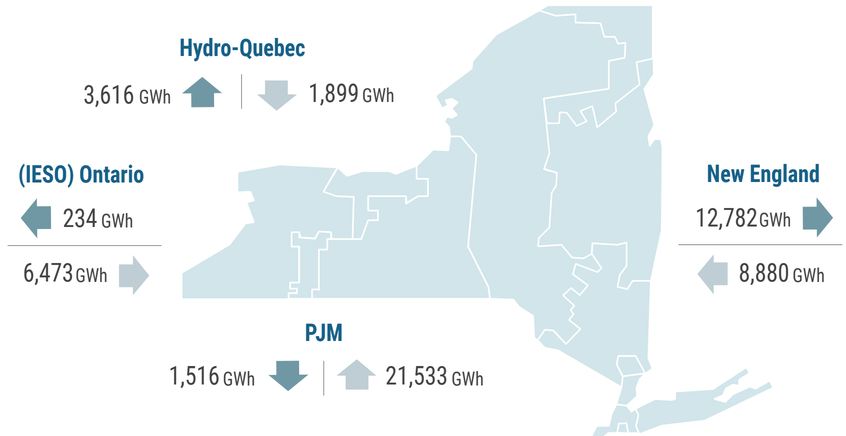
- **Aging generation:** A growing amount of New York's fossil-fired capacity is reaching an age at which, nationally, the majority of similar capacity has been deactivated. By 2028, more than 6,500 MW of existing gas-turbine and steam-turbine based capacity in New York will reach an age beyond which 95% of these types of generators have deactivated. The CRP will consider the potential for additional generation retirements due to asset age and if resulting reliability concerns can be mitigated by new renewable and other clean energy additions.
- **Large loads:** There is significant uncertainty about the recent trend of large loads seeking to connect to the NYISO. This is a trend that system operators around the country are grappling with, and the NYISO is actively coordinating with its peers to best capture the reliability impacts of different types of large loads. For example, data centers potentially have very different operating characteristics depending on whether they are used for cloud computing, AI, or crypto mining.
- **Winter and extreme weather reliability risks:** The CRP will continue to evaluate the evolving winter reliability risks and extreme weather resiliency.
- **Reliance on imports:** Past studies have shown that future system reliability in New York is, in part, dependent on scheduled imports and emergency assistance from neighboring control areas. However, these neighbors are experiencing tighter margins for many of the same reasons as New York. Consequently, there is a growing concern whether the NYISO can depend on these imports when most needed.
- **Delays in transmission:** The NYISO will conduct analysis to highlight the reliability benefits of certain transmission upgrades and risks posed by potential delays to the completion of such upgrades.

Interregional imports and exports support reliability

New York is at the center of a strong and expansive electrical hub, with transmission pathways interconnecting our grid to those in New England, Quebec, Ontario, and the Mid-Atlantic.

These connections across state and national boundaries provide valuable flexibility and reliability to the greater electric system, allowing New York to rely on neighboring power systems, if necessary, when our grid is stressed, and demand is high.

FIGURE 9: INTERREGIONAL IMPORTS AND EXPORTS: 2024



Source: 2025 NYISO Gold Book

The U.S. electric system has a long tradition of coordinating operations to enhance reliability and lower costs across regional boundaries. While energy can be traded across regions, the bulk of electricity wheeled through New York is from transactions between Canada and New England.

Historically, New York and Canadian provinces have relied on each other to supplement their power generation because demand tends to peak in the winter in Quebec, while the New York electric grid sees the highest electricity use in the summertime. That dynamic flipped this past summer, however, when Canada's drier-than-usual season reduced its hydroelectricity production.

In addition to reliability benefits, economics plays a significant role in the amount of electricity traded between regions. NYISO's wholesale Energy Markets involve a competitive bidding process designed to ensure that there is a sufficient flow of electricity at the least possible cost to consumers. Canadian hydroelectric power can be less expensive to produce than electricity generated from other sources, making it a cost-effective option at times for New York.

In recent years, regional power grid operators have worked together to expand access to resources and provide electricity at an efficient price to consumers. For instance, New York's Empire State Line project, a 345-kilovolt transmission line serving Western New York, has facilitated greater utilization of electricity imports from Ontario, while the CHPE project, which is in development, will deliver up to 1,250 MW of renewable hydro power to New York City from Quebec.

FIGURE 10: SNAPSHOT OF NEW YORK'S ELECTRICITY IMPORTS AND EXPORTS: 2024

New York's transactions with neighboring control areas can be tracked on the NYISO's Real-Time Data Dashboard on our webpage and annual import-export figures provided in the *2025 Load & Capacity Data Report* (Gold Book). In 2024, New York relied on roughly 38,785 GWh of energy imports to meet its needs and exported 18,148 GWh.

Neighboring Region	Imports	Wheels-In	Exports	Wheels-Out	Net Imports
Hydro-Quebec	1,899	350	3,616	0	-1,367
IESO (Ontario)	6,473	46	234	16	6,269
New England	8,880	10	12,782	350	-4,242
PJM	21,533	16	1,516	56	19,977
Total (GWh)	**38,785**	**422**	**18,148**	**422**	**20,637**

System and Resource Outlook (The Outlook)

The *System and Resource Outlook* is the NYISO's primary economic planning report that analyzes how changes in supply and demand will affect the grid of the future. The Outlook provides a wide-ranging assessment of future transmission and generation investment opportunities driven by economics and public policy.

The Outlook is not intended to fully assess reliability like the RNA but instead identify potential future operational needs to facilitate a more reliable and decarbonized system in New York. It also differs from the STAR, RNA, and CRP reports in that the Outlook evaluates the New York power system over a 20-year period.

The latest Outlook, released July 2024, forecasts electricity demand to increase by 50% - 90% over the study horizon driven by electrification of housing and transportation sectors, and energy-intensive economic development projects. The Outlook found that between 100 and 130 gigawatts (GW) of installed capacity will be needed to reliably meet forecasted increases in demand while also meeting the state's energy policy mandates. Of that total, at least 20 GW of Dispatchable Emission-Free Resource (DEFR) capacity will be needed by 2040 to replace the current 25.3 GW of conventional fossil-based generation.

The Outlook notes that future DEFR technologies could include (but are not limited to), long-duration batteries, small modular nuclear reactors, hydrogen-powered generators, and fuel cells. No DEFR technology is currently available at a commercial scale. The Outlook notes that research, development, and construction lead times of DEFR technologies may extend beyond the state policy timelines, requiring existing generation to remain in operation to maintain system reliability until adequate replacement options are available.

What is a DEFR?

> DEFR stands for Dispatchable Emission-Free Resource. In the context of energy and climate change, DEFRs are emission-free resources that can be reliably dispatched to provide both energy and capacity over long durations. They are crucial for meeting energy demands when intermittent renewable sources like solar and wind are unavailable.

Here's a more detailed explanation:

- **Dispatchable:** DEFRs can be turned on or off as needed to match energy demand, unlike some renewable sources that are inherently intermittent.
- **Emission-free:** They produce no greenhouse gas emissions, making them important for decarbonizing the energy sector.
- **Long-duration:** They can provide power and capacity for extended periods, unlike some short-duration energy storage options.
- **Reliability:** DEFRs can offer the same reliability attributes as traditional synchronous generation, which is important for grid stability. Examples of DEFRs may include advanced nuclear power, long-duration energy storage, and certain forms of renewable energy coupled with long-duration storage capabilities.

Finally, the Outlook highlighted that while historic levels of investment in the transmission system have been made over the last decade, more is necessary to achieve public policy mandates and avoid future possible transmission congestion. The Outlook shows that completed transmission projects advanced through the NYISO's Public Policy Transmission Planning Process and other state initiatives have delivered significant benefits to the high voltage system and toward the achievement of state policies. For example, the upgrades in response to the Western New York and AC Transmission Public policy transmission needs have increased the ability to deliver power across the state, reducing congestion at critical times of demand.

Maximizing transmission

> To fully leverage the transmission system's capability as fossil generation retires, additional dynamic reactive power must be added to the grid.

> Dynamic reactive power will improve the delivery of electricity from renewable resources and help alleviate congestion.

> Potential technology options include various Grid-Enhancing Technologies (GETs), including power flow control devices, static synchronous compensators, and synchronous condensers.

> This is especially important to the Central East Interface which plays a key role in moving energy from upstate generation pockets to downstate communities.

The report also concluded that additional voltage support facilities must be added to the grid in upstate New York to fully utilize the transmission capability already in place.

Interconnecting new resources

There has been an unprecedented increase in the number of projects seeking to connect to the bulk power system since the passage of the state's 2019 CLCPA. Through the NYISO's interconnection process, major generation, transmission, and load projects are studied to assess the reliability impact they may have on the electric system. The interconnection process is coordinated by the NYISO but requires significant involvement by both the electric utilities and developers. Each party has an important role to play, and success of the process depends on coordination and timely delivery of information by all participants. Through the interconnection process, as required by FERC, the NYISO seeks to balance the demands of open access to the electric system with grid reliability while protecting customers from undue costs.

Transparent and robust rules for reliably connecting to the grid provide essential information for developers. Working closely with developers and affected utilities, studies identify necessary system upgrades and estimated costs to allow new resource developers to make informed investment decisions. Costs identified as necessary to maintain reliability are borne by developers and not consumers under the NYISO's interconnection process. If electric system upgrades are found to be necessary to maintain reliability, project developers, not consumers, are required to pay for investments identified through the process.

In August 2018, the NYISO's interconnection queue hosted 174 proposals. The queue at that time included 26 proposals representing more than 8,400 MW of fossil fuel-based generation. In 2025, the queue contains nearly 350 proposals, with nearly 50,000 MW of proposed clean energy supply resources.

The NYISO must also perform a rigorous analysis of large load projects, like major manufacturing facilities, data centers, and chip fabrication, that plan to draw substantial amounts of power from the grid. Since 2018, the number of load-related interconnection requests have grown from just one project with a proposed 500 MW load to more than 20 requests by spring of 2025, totaling nearly 4,200 MW.

It is important to note that, for various reasons, not all proposals in the interconnection queue are destined to enter commercial operations. Multiple factors outside the scope of the NYISO's control can impact whether a project elects to move forward with the interconnection process, including the status of siting and other regulatory matters, investment risks, and supply-chain concerns. These factors can result in developers electing to defer or drop out of the process, even after the final interconnection studies have been completed and interconnection costs have been allocated and accepted.

New, improved interconnection process

In May 2024, the NYISO implemented new procedures to improve the efficiency and transparency of its interconnection process. The inaugural cluster study commenced in August 2024, and more than 240 generation projects are currently advancing through the first phase of the cluster study — a crucial step and significant milestone toward integrating new generation facilities onto the grid.

The new process, which expedites the interconnection study process for developers, was developed in response to the regulatory reforms required by FERC Order No. 2023.

The interconnection process requires significant coordination between utilities, developers, and state and local governments. NYISO leads this process, ensuring that projects can connect to the grid without harming the system or imposing undue costs on consumers to upgrade the electric system.

Overall, key improvements include:

Feasibility screen

The new study process includes a customer engagement window that includes a "physical infeasibility screen" to determine early on whether there are any known issues preventing a project from feasibly connected to the grid at its desired location.

Interconnection Queue

> **What is it?:** A queue of transmission and generation projects that have submitted an interconnection request to the NYISO to be interconnected to the state's electric system. Depending on the level of proposed capacity, most projects must undergo three studies before interconnecting to the grid.

> **174 proposals,** 26 of which represented more than 8,400 MW of fossil fuel-based generation, were in the queue in August 2018.

> **350 proposals,** with nearly 50,000 MW of proposed clean energy supply resources, were in the queue in 2025.

> Since 2018, the number of load-related interconnection requests have grown from just one project with a proposed 500 MW load to more than 20 requests by spring of 2025, totaling nearly 4,200 MW.

Two-phase cluster study approach

The NYISO has transformed its study process into a two-phase "cluster approach" to evaluate a large group of interconnection requests collectively rather than individually, saving time and workload for developers, utilities, and NYISO staff. The timeframes set by the new cluster study process represent a significant reduction from prior interconnection procedures.

Process changes to speed study time

The cluster study approach limits the number of "mid-stream" project modifications during the interconnection process to help speed timelines and avoid the possibility of one project creating delays for other projects looking to move forward within the cluster.

- The two-phase study includes several decision periods with commercial readiness deposits and withdrawal penalties, to incentivize uncertain projects to exit the queue early.
- The study process includes firm tariff-mandated study deadlines for work performed by the NYISO and utilities and tariff consequences for missed deadlines.

- The two-phase study aligns the treatment of generating facilities 20 MW or smaller with the overall process, incorporating all generation facilities into a single, standardized process.
- The new rules provide for additional pro forma documents and agreements to expedite the interconnection process, the negotiation of required agreements, and the construction of required upgrades.

A new interconnection portal

The interconnection portal is a digital platform where developers and utilities submit and gain information on pending interconnection proposals and applications. The NYISO has made several improvements to the interconnection portal to enhance the user experience and streamline the process.

These improvements include:

- **Streamlined inquiry submissions:** The portal now offers a more streamlined process for submitting inquiries, making it easier for users to request information and assistance.
- **Enhanced transparency:** The portal provides improved transparency of project progress and status, which helps parties stay informed about developments during the study process.
- **On-demand access:** Users have on-demand access to common interconnection questions, which provide immediate answers to frequently asked questions.
- **Ongoing technology improvements:** NYISO has held numerous focus groups with developers since 2023 to identify areas for improvement with the portal. NYISO continues to engage with customer focus groups and other stakeholders to discuss and develop additional portal functionality.

These steps demonstrate NYISO's deep commitment to improving the efficient integration of new generation projects onto the grid.

Wholesale Electricity Markets

Competitive electric markets: 25 years of reliability and economic efficiency

For a quarter century, competitive wholesale electricity markets in New York have provided the foundation for grid reliability at the least cost to consumers. Several advantages derive from the strength of competitive electric markets that may go unrecognized amidst the consistent benefit they provide.

New York operates the high voltage electric system to the strictest reliability standards in the nation. Competitive markets provide the underpinnings for reliability, attracting resources to areas of the grid where they can provide the most economic advantage.

Competition between generators incentivizes technological innovation, economic efficiency and new, cleaner resources. As developers consider investment opportunities in the resources needed to supply rising consumer demand, competitive electricity markets ensure the financial risks remain with the investor, rather than on consumers and taxpayers.

And through extreme weather, public policy changes, geo-political events, and a shifting economy, competitive electric markets seek the lowest cost solution to meet consumer demand, smooth price spikes, and provide certainty.

Supporting economic development and technological innovation

A robust electric grid is fundamental to any modern economy. New York's economy is the eighth largest in the world, requiring a continuous balance of reliable power for manufacturing, farming, technology, public transportation, and the health and safety of residents.

Protecting consumers

> The NYISO has a team of engineers and economists that review market performance to make sure that prices reflect market conditions, such as fuel costs to produce energy. The NYISO can modify market participant offers if they do not meet competitive market rules that require that offers appropriately reflect supplier's costs.

> An independent market monitor evaluates the performance of the NYISO's markets each day to make sure market outcomes reflect strict market rules driving competition to serve customers. The market rules and how they are administered are also subject to review by the independent market monitor to make sure our market design is as efficient as possible.

> FERC's Office of Enforcement and the New York State Department of Public Service are active in evaluating markets and how they are administered. FERC can issue penalties to entities that violate wholesale market rules.

The expert design of New York's competitive electricity markets plays a crucial role in a more robust and sustainable economy by providing strong economic incentives to attract cleaner and more efficient generation that serves reliability and drives down costs.

To this end, the NYISO is developing new market designs to incentivize technological innovation, investment, and lower costs.

Through the NYISO's robust grid planning process we identify the developing and shifting characteristics of the future grid. From these studies we modify electricity markets to ensure they are well positioned to retain and attract the resources necessary to serve future demand and support a growing economy and modern society.

We know from our planning studies that transitioning to a cleaner grid will require unprecedented investment in new supply resources and infrastructure. We also know that technological innovation is driving changes in generation resources and consumer demand.

Competition in established wholesale markets drives power producers to become more efficient, thus lowering prices. And transparent market-based price signals stimulate necessary infrastructure investment to meet reliability, the modernization of our grid and our state's economy.

Competitive electric markets benefit consumers and system reliability

An instrumental component in developing transparent, market-based price signals is Locational Based Marginal Pricing (LBMP).

LBMP is the price of electricity calculated at a specific location on the grid. It is determined by various conditions such as supply, demand, transmission congestion, and weather. LBMP offers several benefits to the grid and consumers in the form of accurate prices and grid investments that support reliability.

As power prices fluctuate with several factors, LBMP ensures that electricity is priced efficiently, taking into account local consumer demand, future reliability needs, and energy supply costs. Locational-based marginal prices also work to attract and retain enough supply in the most beneficial locations on the system at the most efficient cost to serve consumers reliably.

LBMP sends clear signals to generators and consumers about the true value of electricity at different locations in the state and at different times on the grid. Upstate cities like Albany, Syracuse, and Buffalo, for instance, experience unique weather patterns and have different local economies. The Hudson Valley is distinct from the dense urban environment of New York City and suburban Long Island. LBMP accounts for these regional differences and leads to accurate prices, better grid planning and informed investment decisions.

LBMP also helps market participants make informed decisions about where to locate new generation, storage, and demand response, maximizing overall system benefits. LBMP can minimize financial risk and optimize site selection for generators looking to build and connect to the grid. It provides accurate and transparent price signals, fostering innovation in the energy sector.

Understanding the Difference Between Wholesale and Retail Electricity Costs

FIGURE 11: AVERAGE ANNUAL NATURAL GAS AND WHOLESALE ELECTRICITY PRICES IN NEW YORK: 2000-2024

Wholesale electricity pricing

In New York, wholesale electricity prices are determined through an open, competitive marketplace, where electricity is bought and sold between suppliers and utilities.

Demand for electricity contributes to the cost of electricity. Electricity demand is usually highest in the afternoon and early evening, so costs are usually higher at these times. The rules under which the markets operate are set through an open and transparent governance process. State regulators play an important role in this process, and all wholesale market rules are subject to oversight by federal regulators.

The wholesale price of electricity reflects several external factors:

- **Fuel costs:** The cost of fuels used in electricity generation, such as natural gas, directly impacts wholesale electricity prices. An increase in fuel costs can lead to higher wholesale electricity prices, as experienced during the 2025 winter heating season.
- **Supply and demand dynamics:** As noted above, during periods of high demand or limited supply, prices can surge. Lower demand can lead to lower prices.
- **Transmission constraints:** Limitations in the transmission network can cause price variations across different locations, especially during times of high consumer demand.

Retail electricity pricing

Retail prices are the rates charged to end-use consumers by the utility delivering electricity to one's business or home. These rates are set at a level to recover the utilities' costs of doing business, including the cost to purchase or generate the electricity to serve consumers, the cost of delivering the power, and administrative costs. Retail electricity rates are approved by the PSC and include several components beyond the wholesale cost of electricity:

- **Supply charges:** In New York, each utility procures electricity to serve consumers through purchases from the wholesale electricity markets and direct purchases from suppliers. How each utility procures electricity supply is subject to oversight by the NYPSC.
- **Transmission and distribution costs:** Expenses related to delivering electricity to consumers, including maintenance of power lines and supporting equipment and infrastructure.
- **Administrative and operational costs:** Costs associated with billing, customer service, and other operational activities of the utility or retail provider.
- **Taxes and regulatory fees:** Government-imposed taxes and fees that support state-sponsored energy programs, resource development, and other regulatory requirements.
- **Profit margins:** Utilities include a profit margin to cover business risks, investment costs for new infrastructure, and costs for maintaining aging infrastructure.

Here's a closer look at the benefits of LBMP:

Fostering innovation and competition

Market participants use LBMP data to make informed decisions about where on the grid to invest, leading to a more competitive, efficient market for power generation. LBMP provides a transparent and competitive market environment, encouraging innovation in areas like Distributed Energy Resources (DER) and demand response, which can lower costs and support reliability.

Improved grid stability

LBMP helps determine which generators should run to meet regional demand and reliable operating requirements but also considers transmission grid constraints to avoid overloads or instability. This can lead to a more reliable and resilient grid, especially during times of high demand or grid stress.

To meet the complex needs of managing the grid, the NYISO also operates multiple wholesale competitive electricity markets that work together to achieve a reliable and efficient system. Each of the NYISO-administered markets is interdependent, and supports system reliability in real-time:

The Energy Market secures electricity production to meet demand in real-time.

The Capacity Market secures commitments from suppliers to be available to meet seasonal and annual resource adequacy requirements.

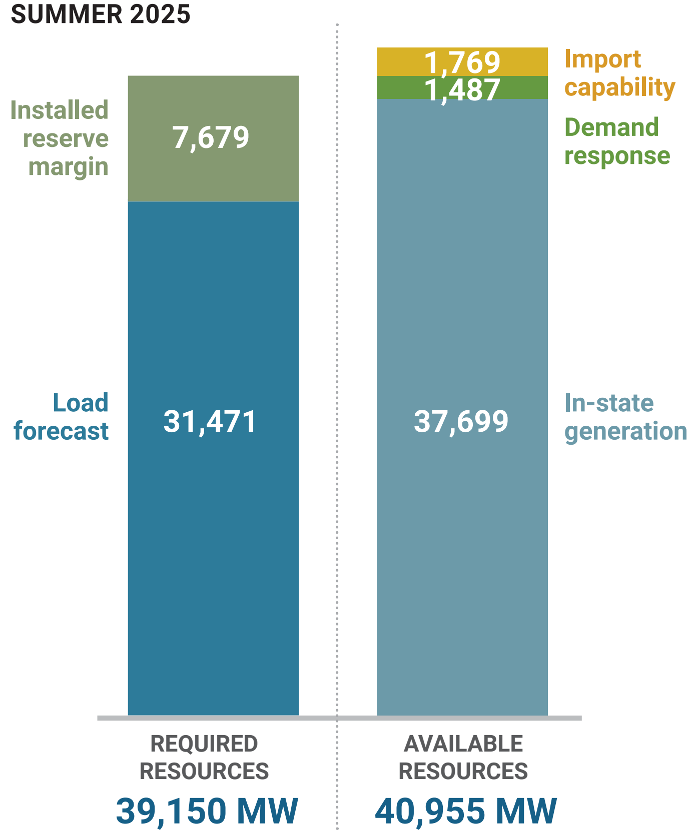
The Ancillary Services Market secures flexibility services from suppliers to maintain balance in response to changing conditions on the electrical grid.

Energy Market

The Energy Market provides a fundamental platform for utilities, large consumers, retail energy providers, and other load serving entities to purchase electricity in the NYISO marketplace. Put simply, the Energy Market provides a means for load serving entities to satisfy the immediate power needs of the customers they serve.

While some electricity is bought and sold directly between suppliers, much of the electricity consumed in New York is procured through the wholesale electricity markets. In these markets, suppliers compete to offer electric supply and Ancillary Services necessary to maintain reliability.

FIGURE 12: STATEWIDE RESOURCE AVAILABILITY: SUMMER 2025



Every five minutes, every day, these markets select the least-cost mix of supply to meet changing electricity demand across the state, all while adhering to strict reliability standards. After being selected in these auctions, suppliers deliver their services to the marketplace. Several factors influence which suppliers are selected for their services, including location, cost, and the amount of electricity flowing across the grid.

Capacity Market

Our highest priority is to maintain reliability of the electric system, and in keeping with our mission, we operate the Capacity Market to meet resource adequacy requirements. The Capacity Market acts as a transparent and cost-effective mechanism to avoid the danger of service interruptions and outages.

Strict reliability rules require extra capacity to be available in excess of expected peak demand, so demand can be met reliably when unforeseen events occur like transmission or generation outages, or additional demand from extreme weather conditions. This requirement to maintain extra supply among the pool of resources interconnected to the grid is called the Installed Reserve Margin (IRM). The IRM is set annually by the NYSRC, with approval by FERC and the NYPSC, based on reliability rules, annual peak demand projections, grid constraints, and the makeup of the supply mix anticipated to meet demand. Developing the IRM is an extensive study process that unfolds over much of the year to align requirements with reliability needs.

The IRM is based on updated load, resource, and transmission models. It is derived by engineers, meteorologists, and economists, using strict reliability rules, engagement with industry stakeholders, and oversight from regulators. Inputs include information from NYISO such as changes in forecasted demand, supply performance capabilities, and transmission system constraints.

Not every region in the U.S. uses this mechanism to support reliability for customers. For example, Texas and California do not operate Capacity Markets. Due to a multitude of factors including the challenges of coordinating the pace of renewable energy integration with the retirement of fossil resources, both states are beginning to consider Capacity Market-like structures to address reliability going forward. In 2022, the grid operator in California, CAISO, extended special contracts through the end of 2023 with a handful of fossil-fuel power plants that were scheduled to retire. This type of contract is only utilized in scenarios where concerns about availability of supply are very high, and the risk of capacity shortages is significant.

Key benefits of the IRM

> **Grid reliability:** The IRM can provide enough capacity to meet peak consumer demand, preventing disruptions on the high voltage electric system.

> **Resilience:** The IRM provides a buffer against variations in demand, unexpected weather events, or loss of generation capacity, ensuring a stable power supply.

> **Improved system planning:** The IRM helps system planners determine the appropriate amount of capacity needed to meet future demand and ensure long-term grid reliability.

> **Incentives for investment:** The IRM can provide a clear, efficient price signal to investors to build new resources and maintain existing generation to meet rising demand.

> **Support for renewable integration:** A robust IRM allows for the integration of intermittent solar and wind energy, by providing an incentive for backup power to fill in gaps when renewable generation is low or unable to produce power.

The NYISO's Capacity Market provides built-in security to the marketplace for energy. The NYISO's Capacity Market ensures that supply is not only available, but also that the cost of that supply is as competitive as possible for the benefit of consumers.

Ancillary Services Market

Ancillary Services refer to functions that help grid operators maintain reliability and the proper flow and direction of electricity. These increasingly essential grid services address imbalances between supply and demand, help avoid power system interruptions, and support recovery after a power system event.

Ancillary Services are crucial for supporting grid strength by ensuring a stable electricity supply. Electricity demand is highly dynamic, varying throughout the day and across seasons. They also help manage these fluctuations by adjusting supply or demand in real-time, ensuring uninterrupted electricity delivery. The critical services also maintain grid frequency and voltage, can provide backup power in case of unexpected events, and act as the backbone of the grid, responding to fluctuations and supporting power delivery.

Proposed improvements in the Ancillary Services Market include:

- The NYISO is working with stakeholders via our transparent shared governance process to expand Ancillary Services products to better support reliable grid operations and help to balance the intermittent nature of the anticipated renewable generation fleet. These products will help procure necessary reliability attributes, at the lowest cost to consumers, balancing weather-dependent resources to achieve a reliable future grid.
- In a clean energy grid of the future, a premium attribute of energy supply will be its flexibility. We are working on several market innovations that will attract flexible resources that perform when needed and reward those resources that can support balancing grid supply and demand. With ever-increasing intermittency, extreme weather, and demand from electrification and economic development, the economic force of markets is essential for maintaining reliability.

Grid Strength

> The ability of an electrical power system to maintain stable voltages and frequencies during disturbances or changes in load. A strong grid can handle larger fluctuations and disturbances without significant voltage drops or frequency deviations.

Market enhancements currently underway

The NYISO's wholesale electricity markets continuously evolve to address changing system needs and capture the benefits of new technologies entering the grid, all while supporting reliability. Through ongoing, effective engagement with stakeholders and policymakers, the NYISO continues to prepare the wholesale electricity markets of today for the needs of consumers tomorrow.

Review and analysis of current Capacity Market structure

Early in 2025, the NYISO launched a complete review of the Capacity Market structure to determine if alternatives or enhancements to the existing structure might better facilitate growing demand for electricity while also meeting the NYISO's regulatory mandate for maintaining reliability.

For over 20 years, the current Capacity Market design has served system reliability well, driving cost efficiencies, achieving emissions reductions, while retaining existing resources and supporting additional supply. A review of the Capacity Market framework will help determine what, if any, changes might be necessary moving forward. This review is timely in consideration of forecasted increases in load, projected shifts in hourly peak demand, and new, large-scale, energy-intensive microchip fabrication and data centers seeking to locate in New York.

In addition to the review, ongoing Capacity Market analysis includes a sharp focus on the future performance of the electric system under winter conditions. More than half of New York's current generating capacity relies on fossil fuels to produce electricity. The prospect of a future winter-peaking system introduces new reliability challenges. It is critical to understand the risks these shifts present for generators to procure adequate and secure fuel supplies on the coldest days.

Proper price signals must be designed to encourage participation from supply resources with firm fuel supply arrangements. We are working with stakeholders to identify the emerging winter risks and determine what market changes may be needed to compensate suppliers for meeting these needs. We will determine how best to incorporate changes into the Capacity Market structure so that the market properly signals the times of year that resources are needed most and properly values resources that can contribute the most to reliability.

Any proposed changes in the Capacity Market must ensure resources are valued accurately for contributions to reliability. Furthermore, the Capacity Market must continue to deliver transparent, appropriate price signals to new and existing resources while achieving predictable outcomes to maintain future reliability while driving value for consumers.

NYISO Shared Governance

> The NYISO and its stakeholders utilize a shared governance process to establish wholesale market rules and processes associated with grid planning and operations.

> This process engages suppliers, transmission owners, consumers, environmental and environmental justice interests, and state organizations to facilitate the development of the rules and processes for a reliable and economically efficient grid in New York.

Dynamic reserves to balance intermittency

Renewable energy sources that are dependent on changing weather patterns present uncertainty in forecasting the needs of the electric grid. The dynamic reserves framework the NYISO is pioneering aims to address that, by strengthening grid reliability and ensuring a more efficient, responsive electricity market.

Currently, the grid relies on fixed amounts of backup power to cover potential issues like a generator failure or a transmission outage. However, as renewable energy sources like wind and solar become more common, their output can fluctuate rapidly due to changing weather conditions.

These variables make it harder to predict exactly how much reserve power is needed.

The dynamic reserves approach attempts to address this problem by continuously monitoring the grid in real-time and adjusting the amount of reserved production capability purchased based on the most significant risks at any given moment. This seeks to ensure that there is always enough backup power to keep the system stable, even if renewable energy production drops suddenly.

Another key benefit of this new system is that it gives energy suppliers stronger incentives to be flexible and respond quickly to changing conditions. It also sends price signals to suppliers that better align with the true cost of maintaining grid reliability, and results in less volatility for consumers.

NYISO's dynamic reserves proposal has already received strong support from stakeholders and will be submitted to federal regulators later this year. Pending acceptance, the NYISO anticipates implementing the first-of-its-kind dynamic reserve framework in 2027.

Advanced storage modeling

Coordinating the growing fleet of energy storage resources requires advanced modeling techniques in day-ahead and real-time markets, and improved tools for grid operators to manage capabilities so that these resources are deployed at the most effective times to meet New York's reliability needs. Efforts are underway to develop these capabilities so that energy storage resources, which act as both load and supply and have limited-duration capabilities, are utilized in an optimal manner.

We anticipate deployment of enhanced tools in 2027, in advance of the state's 2030 goals calling for 6,000 MW of energy storage capacity.

Balancing intermittency

The operating characteristics of the power system are changing with the introduction of large quantities of renewable and duration-limited resources. The sudden loss of large amounts of energy due to rapid changes in weather conditions and the uncertainty surrounding predicting how much energy will be produced from these resources introduces operational challenges. These challenges will require having resources on standby to provide energy when the availability of the renewable fleet diminishes.

With new duration-limited resource technologies, it is important to define the duration needs of standby resources, not just how quickly a resource could start. The balancing intermittency efforts seek to expand ancillary service products to better account for resource and net load uncertainty in reliability operating the changing power system. The project uses NYISO and relevant external studies on the ramp and flexibility needs of the future to assess current and future standby resource needs (operating reserves).

The current project will better define the standby resource needs of the system and establish incremental procurement requirements. These enhancements are anticipated to be in place in 2026. Additional phases will focus on identifying and developing new ancillary service products to maintain reliability in a cost-effective manner.

What are capacity factors and why are they important?

A generator's capacity factor refers to how often a plant runs at maximum output. In theory, a plant with a capacity factor of 100% runs at full power, full time.

However, no generating type operates at full power, full time. In reality, capacity factors vary for several reasons, including weather, operating conditions, fuel costs, and necessary maintenance. The relative capacity factors of different types of generation are critical considerations in reliability planning and operations for the NYISO. Understanding the impact of capacity factors helps determine future grid investment needs.

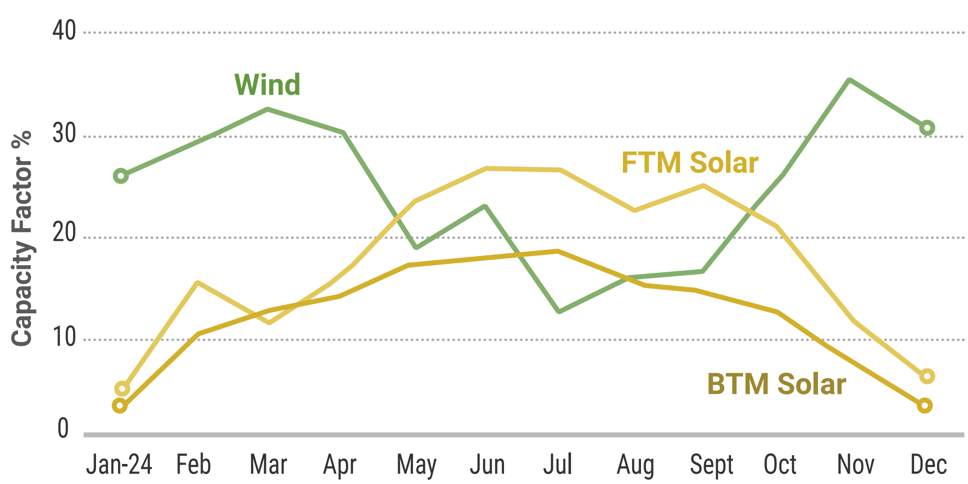
Lower capacity factors can be due to the intermittent availability of a resource's fuel supply, such as solar, and wind energy. Nuclear or hydro resources possess high-capacity factors, producing great amounts of power most of the time. These resources provide predictability for NYISO grid operators who must balance load with supply to meet demand as it fluctuates. The contributions of wind and solar to the supply-mix changes with the weather, time of day, and the time of year.

A NYISO report on the state's renewable resource fleet evaluated the growth and performance of wind and solar resources over the last year to determine the average capacity factor for future grid planning purposes. The inability to precisely predict energy output from these resources requires other, controllable resources to be available to grid operators.

From an operational perspective, each resource has its own benefits and limitations. While wind and solar resources cannot be dispatched like other generators on the system, they do produce low-cost, emissions-free energy on the grid. This is an important issue to consider as the state advances the goal of decarbonizing the grid by 2040 while striving to keep the system reliable for all New Yorkers.

The following figure from the NYISO's *2024 Renewables Report* reflects the variability of capacity factors of wind and solar resources throughout the year.

FIGURE 13: MONTHLY WIND AND SOLAR CAPACITY FACTORS



On the Horizon

next steps for the grid in transition

For twenty-five years, the NYISO has proudly served as the independent administrator of the competitive electric markets and operator of the grid. 2025 marked an important milestone, providing a moment to reflect on a quarter century of success and dedication.

The future provides a different opportunity. And as the entity responsible for wholesale electric system and resource planning it is more our nature to look forward, determining the most reliable path possible for the grid.

New York State's economy is dynamic. Significant investments from a range of manufacturing and high-tech commercial interests provides for an exciting set of possibilities. Likewise, are the possibilities for innovation of the electric system. To accommodate much of the new, energy-intensive development we see on the horizon we will need the grid to be more flexible yet maintain a strong diverse fuel and resource mix to accommodate for uncertainty in the demand forecast.

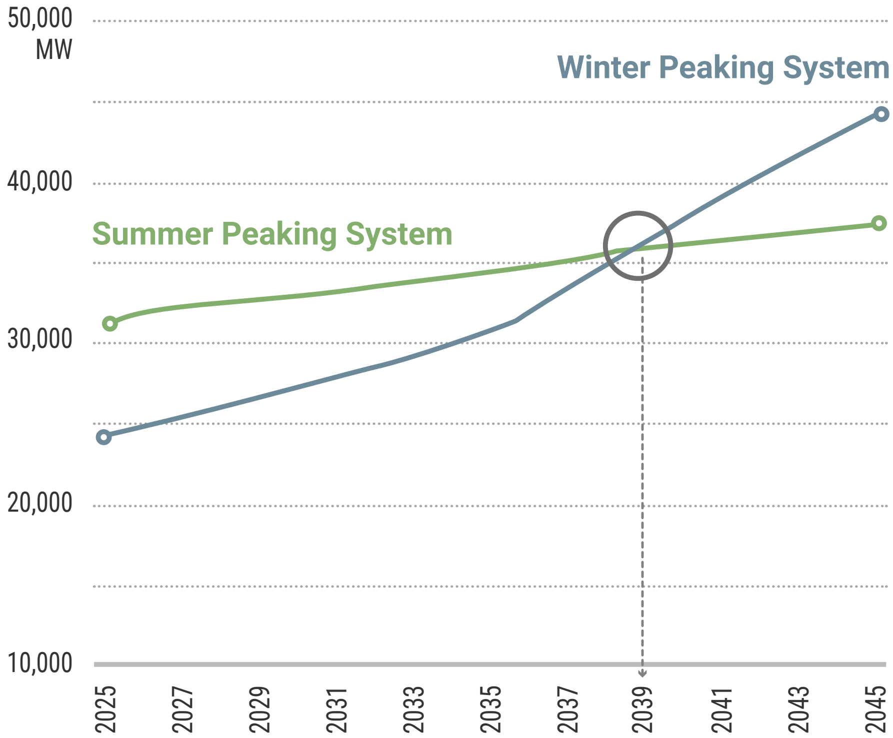
The NYISO's more than 600 employees share a common mission: maintain grid reliability, deliver electricity at the least cost through our wholesale markets, plan for an effective and efficient transition to a cleaner grid, and serve as an independent and authoritative source of information for policymakers, regulators, investors, stakeholders, market participants, and the public.

In that regard, the following are key, near-term planning objectives which will both influence and reflect public policy decisions and the changing economy:

- **July 2025:** NYISO issues second quarter *Short-Term Assessment of Reliability* (STAR)
- **October 2025:** NYISO issues third quarter *Short-Term Assessment of Reliability* (STAR)
- **November 2025:** NYISO publishes its *2025-2026 Winter Assessment*
- **December 2025:** NYISO publishes the *2025-2034 Comprehensive Reliability Plan* (CRP)

Demand Trends

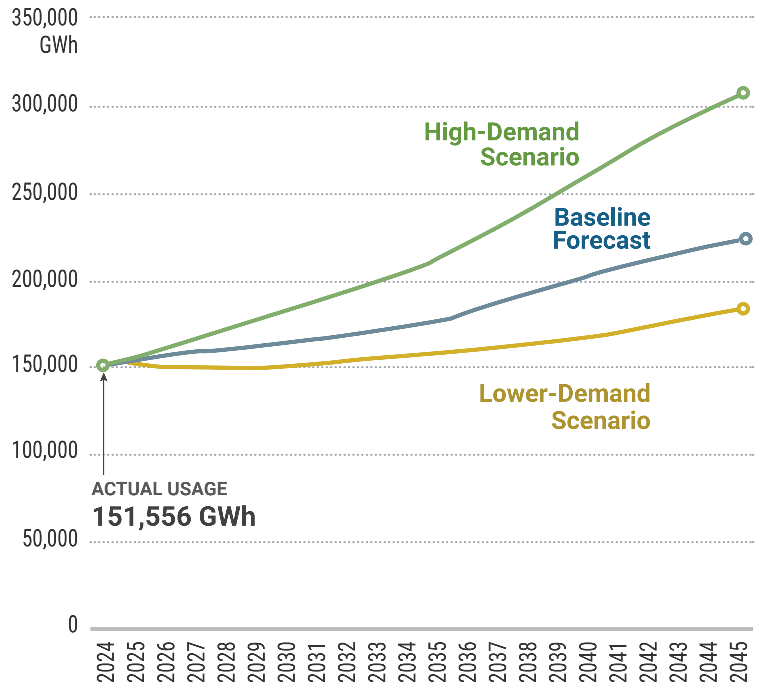
FIGURE 14: SUMMER AND WINTER PEAK DEMAND FORECASTS



> While electrification will drive growth in winter peak demand, summer peak demand is not expected to grow as significantly, due largely to the saturation of electric-based air conditioning for cooling needs. The impact of large loads is expected to drive near-term demand increases while electrification measures will have more impact on longer-range forecasts.

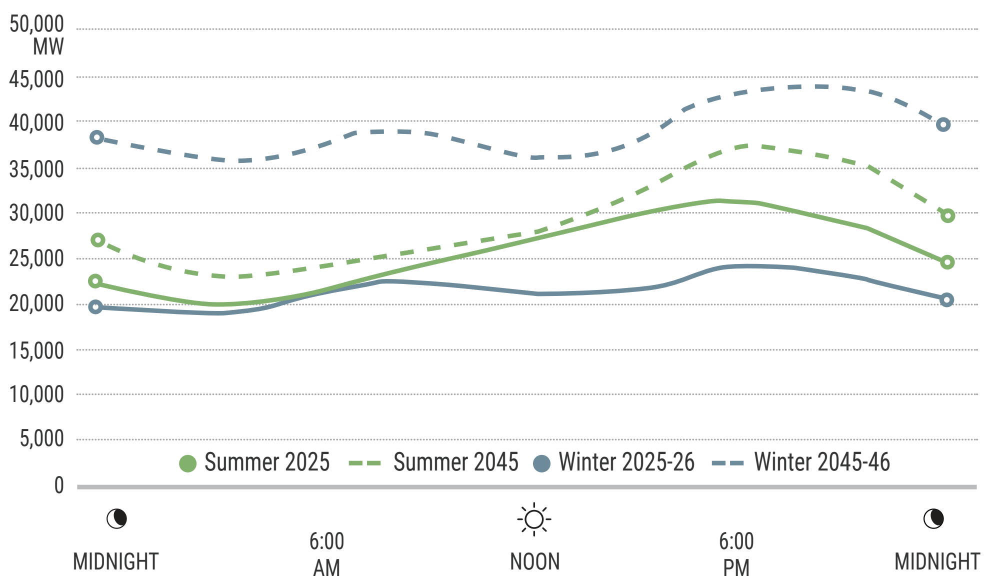
Demand Trends

FIGURE 15: ACTUAL AND FORECAST LOAD: 2024-2045



> This figure presents three scenario forecasts: a baseline forecast that the NYISO assumes is the most likely outcome based on current observations and assumptions, and two scenarios that include differing assumptions about key inputs in the forecast, including economic activity and the adoption of electrification. These High-Demand and Low-Demand scenarios provide bounds around the baseline forecast.

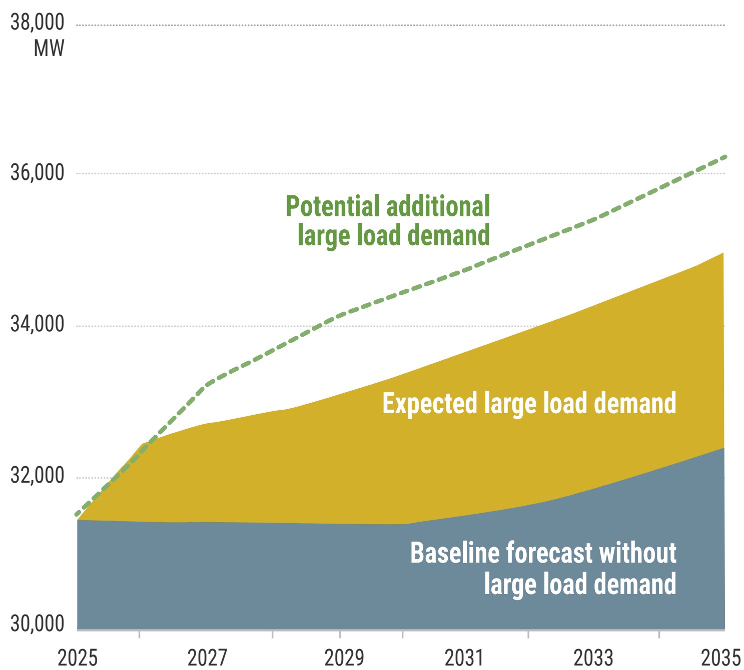
FIGURE 16: CURRENT HOURLY DEMAND VS. HOURLY FUTURE DEMAND FORECAST



> This figure shows the average hourly demand for peak days in the summer and winter 2024-25 as well as projected high-demand days 20 years in the future. Electrification will contribute to increased demand, with winter demand expected to roughly double. Summer demand will also grow, but to a lesser degree. Summer peaks are expected to occur later in the day with the continued growth of behind-the-meter solar resources.

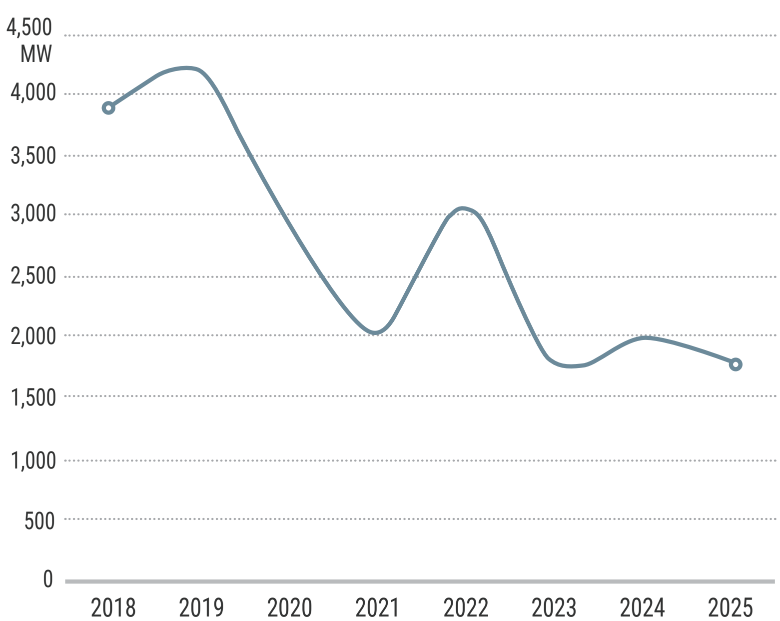
Demand Trends

FIGURE 17: LARGE LOAD SUMMER DEMAND UNCERTAINTY



> There is significant uncertainty about large loads seeking to connect to the grid, including the timing and operational characteristics of the new load. The NYISO base case forecasts include large loads that are expected to connect to the grid. However, numerous additional large load proposals could quickly advance and come online within the next ten years, creating uncertainty about their impact on demand.

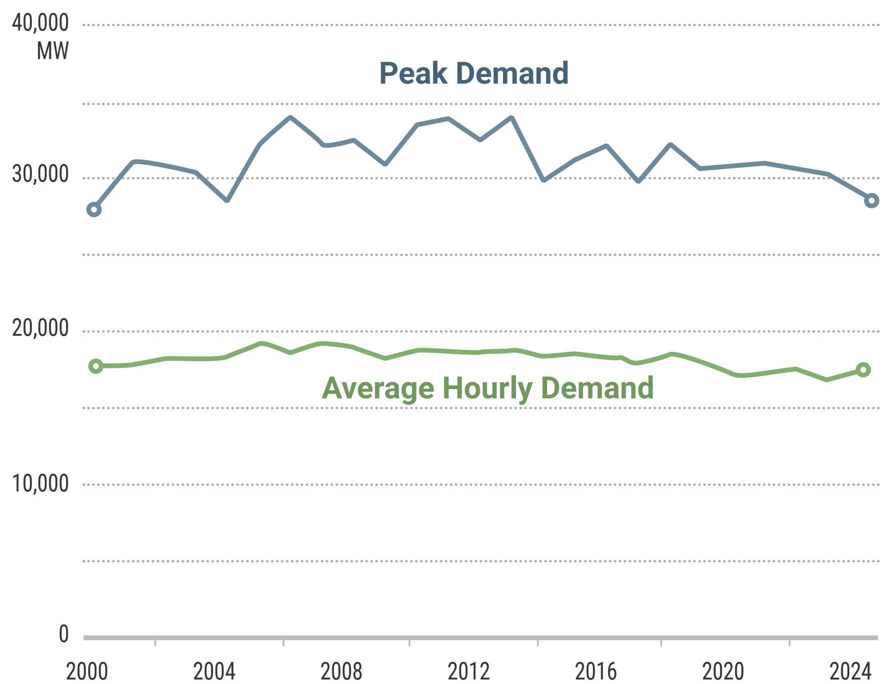
FIGURE 18: THINNING MARGIN BETWEEN AVAILABLE AND REQUIRED RESOURCES



> The Installed Reserve Margin establishes minimum requirements for installed capacity on New York's grid. Historically, New York has enjoyed robust margins between the capacity available to the system and what's required by the IRM. With generator deactivations and higher IRM requirements due to growing intermittent supply, the margin between available and required resources has narrowed to roughly half of what it was in 2018. Wider margins enable a more flexible grid, where operators have more options to address unexpected conditions.

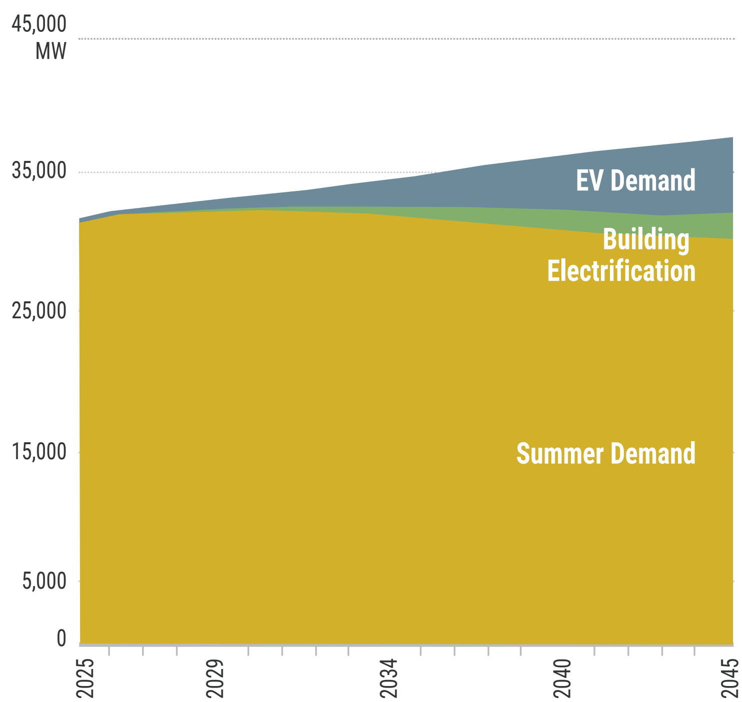
Demand Trends

FIGURE 19: PEAK VS. AVERAGE HOURLY DEMAND



> The NYISO's Capacity Market supports reliability by ensuring that sufficient resource capability is available to meet expected maximum energy needs.

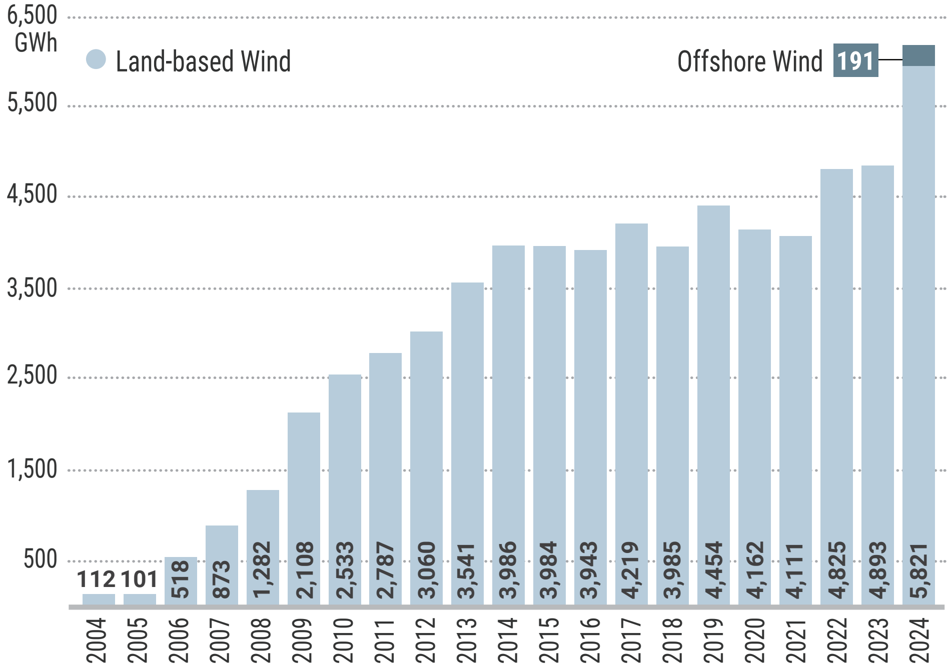
FIGURE 20: EXPECTED IMPACT OF ELECTRIFICATION ON STATEWIDE SUMMER PEAK DEMAND



> While electrification will drive growth in winter peak demand, summer peak demand is not expected to grow as significantly, due largely to the saturation of electric-based air conditioning for cooling needs. The impact of large loads is expected to drive near-term demand increases while electrification measures will have more impact on longer-range forecasts.

Supply Trends

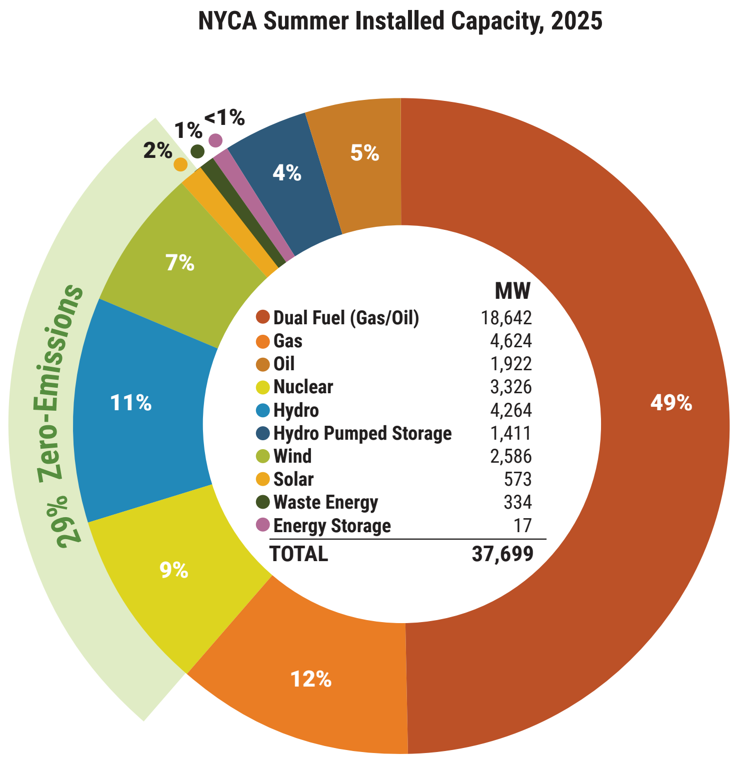
FIGURE 21: NEW YORK STATE WIND GENERATION: 2004-2024

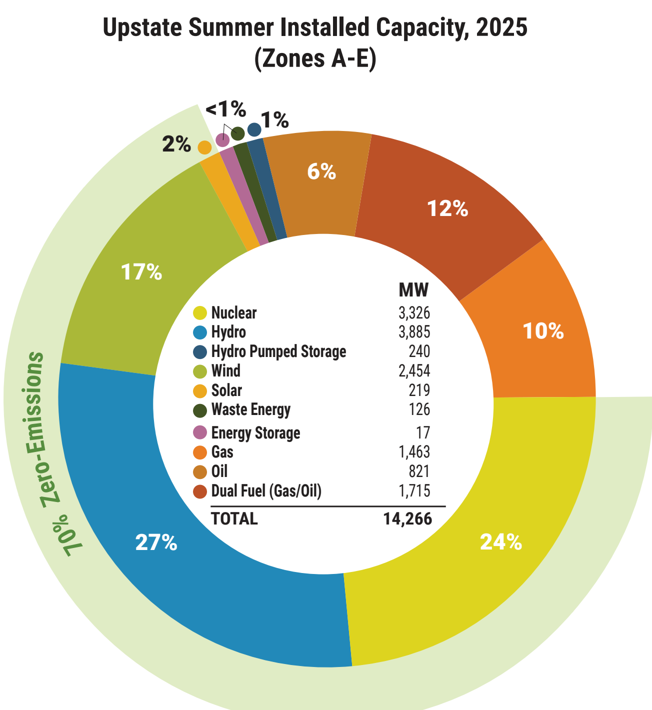


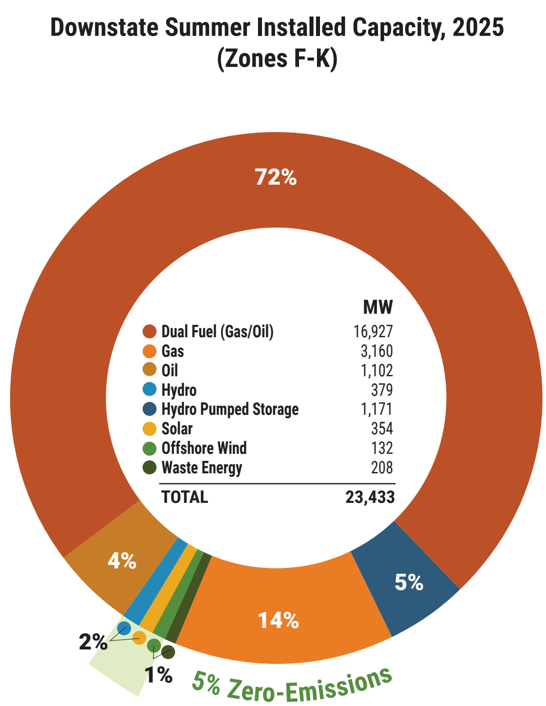
> 2024 marked the inaugural year for offshore wind energy production in New York State, with the integration of the 132 MW South Fork Wind project off the coast of Long Island.

Supply Trends

FIGURE 22: SUMMER 2025 INSTALLED CAPACITY BY FUEL SOURCE



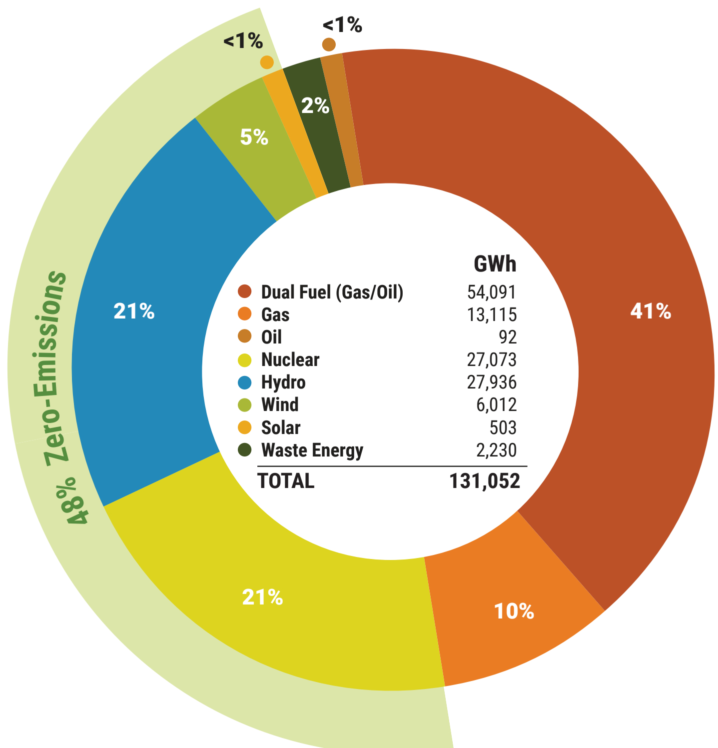




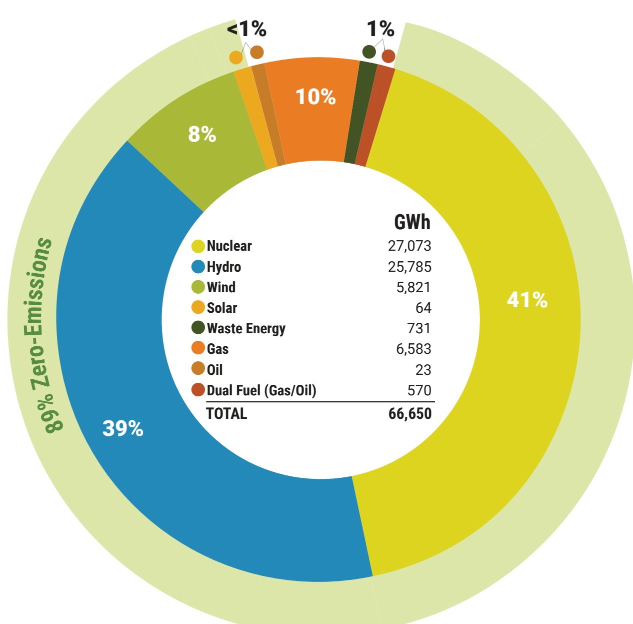
Supply Trends

FIGURE 23: 2024 ENERGY PRODUCTION BY FUEL SOURCE

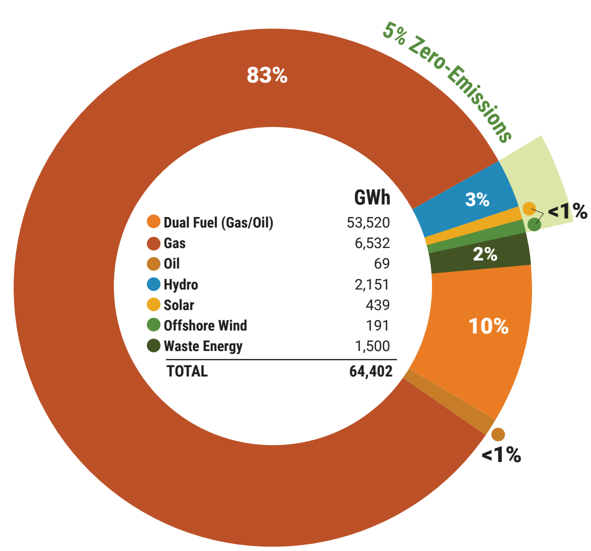
NYCA Energy Production, 2024



Upstate Energy, 2024 (Zones A-E)

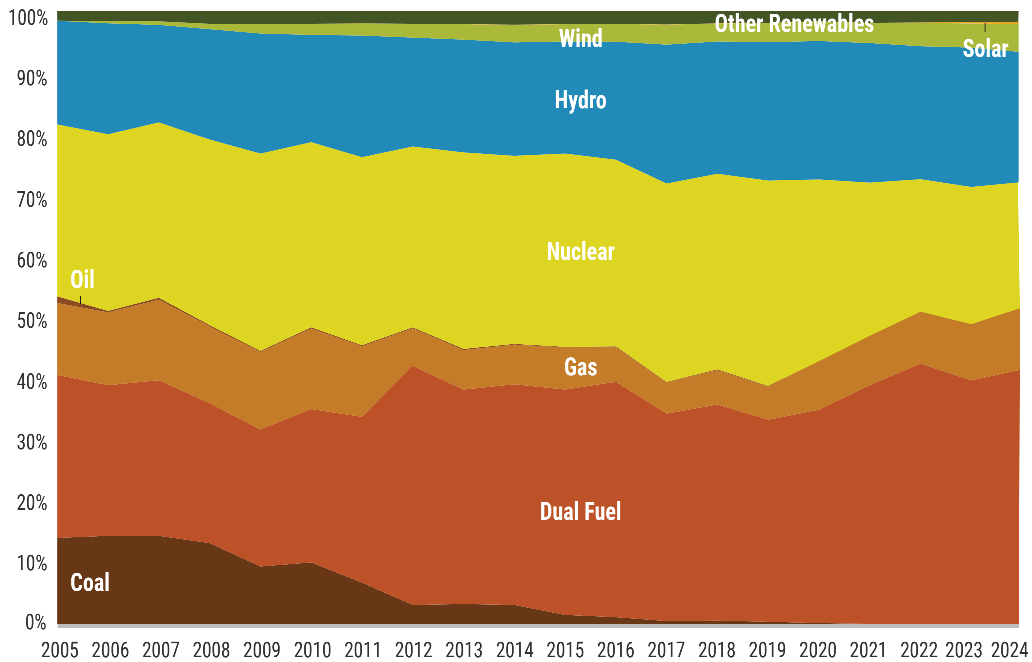


Downstate Energy, 2024 (Zones F-K)



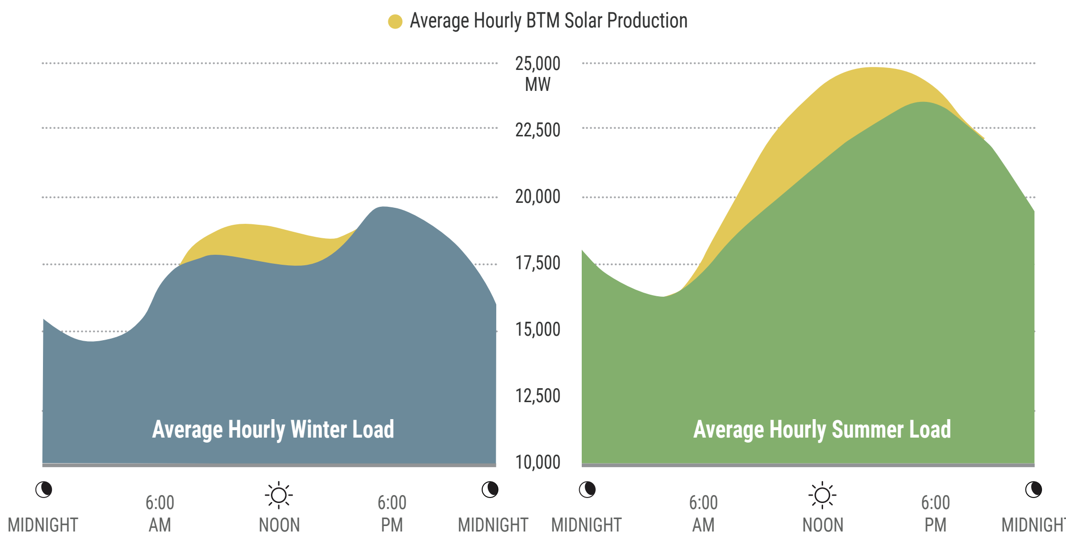
Supply Trends

FIGURE 24: HISTORICAL FUEL MIX FOR ENERGY PRODUCTION IN NEW YORK STATE



> The fuel mix of the resources powering New York's grid has become cleaner over time, including the elimination of coal-fired power plants, the growth of wind, and the emergence of solar.

FIGURE 25: SUMMER AND WINTER BTM SOLAR PERFORMANCE



> New York's policy incentives have driven significant investment in Behind-the-Meter (BTM) solar resources. By the end of 2024 there were more than 6,400 MW of BTM solar capacity supplying customers. BTM solar energy production reduces the amount of energy the NYISO must dispatch to supply the grid. More recently, the NYISO is seeing growth in grid-connected solar that the NYISO dispatches to supply the grid whenever the resource is available.

Glossary

Definitions and explanations of terms and phrases

Ancillary Services: Services that support the reliable operation of the power system, which can include voltage support, frequency regulation, operating reserves, and black start capabilities.

Behind-the-Meter Generation: A generation unit that supplies electric energy to an end user on site. An example is a rooftop solar photovoltaic system that primarily supplies electricity to the facility on which it is located.

Bulk Power System: The transmission network over which electricity flows from suppliers to local distribution systems that serve end-users. New York's bulk power system includes electricity-generating plants, high-voltage transmission lines, and interconnections with neighboring electric systems located in the New York Control Area (NYCA). Also referred to as "bulk electric system," "grid," or "power grid."

Capability Period: Lasting six months, the Summer Capability Period runs from May 1 through October 31. The Winter Capability Period runs November 1 through April 30 of the following year. A Capability Year begins May 1 and runs through April 30 of the following year.

Capacity: Capacity is the electric output that a generator can produce. It is measured in megawatts (MW).

Climate Leadership and Community Protection Act (CLCPA): A law that requires New York to reduce economy-wide greenhouse gas emissions 40% by 2030 and no less than 85% by 2050 from 1990 levels. The law establishes technology-specific mandates for deploying clean energy technologies as well as a Climate Action Council charged with developing a scoping plan of recommendations to meet these requirements.

Cluster Study: is a streamlined approach to evaluating interconnection requests for new generation projects. Instead of assessing each project individually, it groups multiple requests into clusters, allowing for collective evaluation. This method improves efficiency, reduces study timelines, and ensures better coordination among developers, utilities, and stakeholders.

Dispatchable Emissions-Free Resource (DEFR): A resource designed to provide reliable, on-demand electricity without emitting carbon. Unlike intermittent renewable sources like wind and solar, DEFRs can be dispatched as needed to meet demand. Many of the potential technologies are still in development and may face challenges in terms of economic viability and scalability.

Distributed Energy Resource (DER): A broad category of resources that includes distributed generation, energy storage technologies, combined heat and power systems, and microgrids. A DER is generally customer-sited to serve the customer's power needs, but may, in some instances, sell excess energy production, capacity and/or Ancillary Services to the power system.

Electrification: Adopting technologies that support the transition of fossil-fuel-intensive sectors of the economy to electricity. Sometimes referred to as "beneficial electrification" due to its underlying goals of promoting societal benefits through emissions reductions.

Energy: Energy is the amount of electricity a generator produces over a specific period of time. It is measured in megawatt-hours (MWh). For example, a generating unit with a 1-megawatt capacity operating at full capacity for one hour will produce 1 megawatt-hour of electricity.

Energy Storage Resources (ESRs): Energy storage resources are devices used to capture energy produced at one time for use at a later time. ESRs include technologies like batteries and pumped hydro storage.

Federal Energy Regulatory Commission (FERC): The federal agency responsible for regulatory oversight of the NYISO's operation of the bulk power system, wholesale electricity markets, and planning and interconnection processes. The NYISO's tariffs and foundational agreements are overseen and approved by FERC.

Gigawatt (GW): A unit of power or capacity equal to one billion watts.

Gigawatt-Hour (GWh): A gigawatt-hour is equal to one gigawatt of energy produced or consumed continuously for one hour.

Installed Capacity (ICAP): the capability of a qualifying generator or load facility to supply and/or reduce demand when directed by the NYISO.

Installed Reserve Margin (IRM): The level of capacity that must be secured, above projected system peak demand, to maintain reliability after accounting for unplanned and scheduled outages as well as transmission capability limitations. The IRM requirement can be met through a combination of installed generation, import capabilities, and demand response. The IRM is established by the New York State Reliability Council (NYSRC).

Interconnection Queue: A queue of load, transmission, and generation projects that have submitted an Interconnection Request to the NYISO to be interconnected to the state's electric system.

Intermittent Resource: An electric energy source whose output varies due to the fluctuating nature of its fuel source. Examples include solar energy which is dependent upon sunlight intensity, or wind turbines where output is dependent on wind speeds.

Load: A consumer of energy, or the amount of energy consumed. Load can also be referred to as demand.

Megawatt (MW): A measure of electricity that is the equivalent of 1 million watts. It is generally estimated that one megawatt provides enough electricity to supply the power needs of 800 to 1,000 homes.

Megawatt-Hour (MWh): A megawatt-hour is equal to one megawatt of energy produced or consumed continuously for one hour.

New York Control Area (NYCA): The area under the electrical control of the NYISO. It includes the entire state of New York, divided into 11 load zones.

New York State Reliability Council (NYSRC): The council promotes and preserves the reliability of electric service on the New York State power system by developing, maintaining, and, from time-to-time, updating the reliability rules which shall be complied with by the NYISO and all entities engaging in electric transmission, Ancillary Services, energy and power transactions on the grid.

North American Electric Reliability Corporation (NERC): The not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid. NERC is the Electric Reliability Organization for North America, subject to oversight by FERC and governmental authorities in Canada. NERC's jurisdiction includes users, owners, and operators of the bulk power system.

Peak Load: The maximum power demand on the electric grid measured in megawatts (MW). Peak load, also known as peak demand, reflects the highest average hourly demand experienced on the system.

Peakers: Fossil-fired power plants, also known as peaker plants or just "peakers," that generally run only during periods of high demand — known as peak demand — for electricity.

Public Policy Transmission Planning: Part of the NYISO's Comprehensive System Planning Process. Public Policy Transmission Planning consists of two steps: (1) identification of transmission needs driven by Public Policy Requirements that should be evaluated by the NYISO; and (2) requests for specific proposed transmission solutions to address those needs, and the evaluation of those specific solutions. The NYPSC identifies transmission needs driven by Public Policy Requirements and warranting evaluation, and the NYISO requests and evaluates specific proposed transmission solutions to address such needs.

Resource Adequacy: The ability of the electric system to supply electrical demand and energy requirements at all times, taking into account scheduled and unscheduled outages of system elements. A system is considered adequate if the probability of having sufficient resources to meet expected demand is greater than the minimum standard.

Transmission Constraints: Limitations on the ability of a transmission facility to transfer electricity.

Transmission Security: The ability of the electric system to withstand disturbances, such as electric short-circuits or unanticipated loss of system elements.

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About the ISO

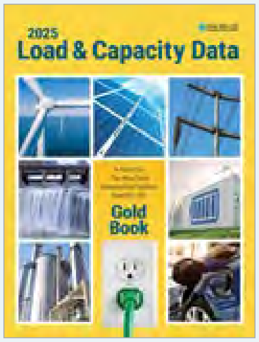
The NYISO is subject to the oversight of the Federal Energy Regulatory Commission and regulated in certain aspects by the New York State Public Service Commission. NYISO operations are also overseen by electric system reliability regulators, including the North American Electric Reliability Corporation, Northeast Power Coordinating Council, and the New York State Reliability Council.

The NYISO is governed by an independent 10-member Board of Directors. The members of the NYISO's Board of Directors have backgrounds in electricity systems, finance, information technology, communications, and public service. The NYISO is unaffiliated with any market participant or government entity. The members of the Board, as well as all employees, have no business, financial, operating, or other direct relationship to any market participant. The NYISO does not own power plants or transmission lines.

The NYISO engages stakeholders in a robust and transparent shared governance process that involves representation from a variety of interests, including transmission owners, generator owners, public authorities and municipal utilities, large and small consumers, and environmental advocates. Through open engagement and consensus building with stakeholders, rules and procedures address our wholesale electricity markets, system planning, and grid operations are developed.

POWER TRENDS 2025 is the NYISO's annual analysis of factors influencing New York State's power grid and wholesale electricity markets. Begun in 2001 as *Power Alert,* the report provides a yearly review of key developments and emerging issues.

POWER TRENDS 2025 DATA is from the *2025 Load & Capacity Data Report* (also known as the Gold Book), unless otherwise noted.



Published annually by the NYISO, the *Gold Book* presents New York Control Area system, transmission and generation data and NYISO load forecasts of peak demand, energy requirements, energy efficiency, and emergency demand response; existing and proposed resource capability; and existing and proposed transmission facilities.

The *Gold Book* and other NYISO publications are available on the NYISO website, visit www.nyiso.com

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Learn more: www.nyiso.com/power-trends