

# Executive Summary

To the whitepaper  
**Reliability and  
Market Considerations  
For A Grid In Transition**

**February 2020**

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## Executive Summary

### Introduction

In a time of unprecedented change in the electricity sector, New York's competitive electricity markets are positioned to unleash the innovation and flexible energy solutions necessary for a reliable transformation towards a zero-emissions power grid. A rapid transition is underway in New York State from a power grid where energy is largely produced by central-station fossil fuel generation, towards a grid with increased renewable intermittent resources and distributed generation.

The pace of this transition is driven primarily by state policy, notably New York's Climate Leadership and Community Protection Act (CLCPA). In addition, technological advancements are expanding the capabilities of new resources and lowering their costs, further driving broader industry changes. In order to achieve the transformation anticipated, the NYISO, together with stakeholders, must provide the leadership to develop innovative products that allow wholesale markets, including energy, ancillary services and capacity, to serve the reliability requirements of New Yorkers while maximizing efficiency through this transition.

The central question arising for the NYISO is how the wholesale markets in New York can continue to provide the pricing and investment signals necessary to reflect system needs and to incent resources capable of resolving those needs. The key is to anticipate the needs for existing and new grid reliability services and proactively evolve the wholesale market design to balance the electric system to achieve reliability. To maximize the benefits of the new types of resources expected, the NYISO will leverage its expertise in developing and operating best-in-class wholesale markets, to enhance its market structure to facilitate the reliable transition towards a renewable resource base.

The NYISO is actively working on market enhancements to meet these future challenges. A grid characterized by high levels of intermittent renewable resources and distributed generation will require new thinking. We approach this work with two guiding principles: (1) all aspects of grid reliability must be maintained; and (2) competitive markets should continue to maximize economic efficiency and minimize the cost of maintaining reliability while supporting the achievement of New York's climate policy codified in the CLCPA.

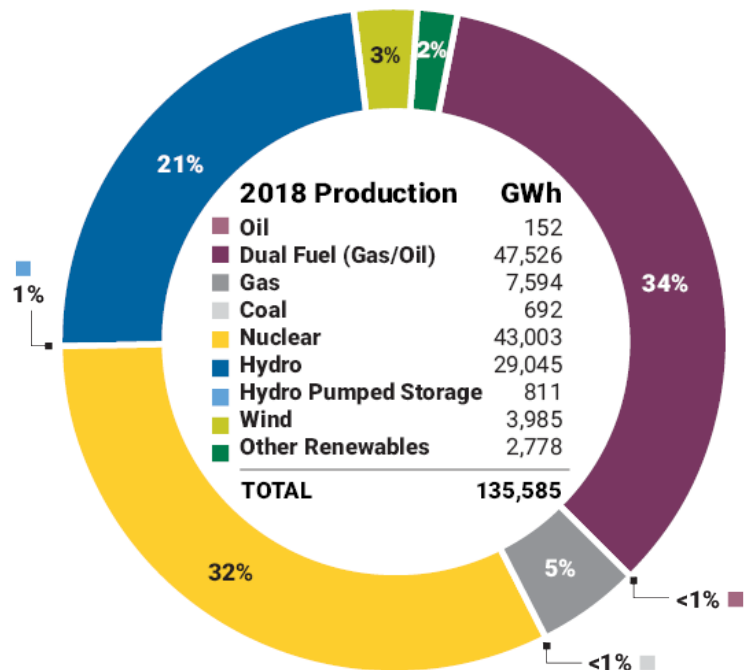
This white paper is intended to facilitate a thorough review of a recommended set of market enhancements to ensure that the market signals provided through the energy, ancillary services and capacity markets are aligned with system reliability needs in order to attract investment and retain competitive suppliers through the transition to 70% renewable energy by 2030. We need to take the

necessary steps to prepare and further shape the competitive markets, and identify strategic transmission investment opportunities for the change that is underway and then continue to evolve our markets as a better understanding of the long term challenges is developed.

In order to further that objective this whitepaper: 1) describes the emerging reliability and economic challenges; 2) presents our initial identification of gaps to address; and 3) proposes next steps. We focus on market design improvements, but also identify the required operations and planning studies that will inform the trajectory of how to meet reliability as we transition to a carbon free future.

### Public Policies and Clean Energy Technologies Are Reshaping the Grid

New York’s electricity industry is transforming from a grid that is powered by traditional central-station, controllable fossil fuel generation to non-emitting, weather-dependent intermittent resources and distributed generation. Since their inception, NYISO’s markets have a proven history of evolving to facilitate the integration of new technologies while continuing to meet reliability requirements in an economically efficient manner. These markets can be leveraged to support the transition to the grid envisioned by the CLCPA, including the integration of storage and renewable technologies. It is important to consider the current sources of energy within New York relative to the mandates established by the CLCPA in order to frame the magnitude of the change that must be achieved. In 2018, 27% of the energy production within New York was derived from renewable resources like hydro, wind and centralized solar, 32% from nuclear and 41% was provided by fossil based resources. For context, in 2018 New York’s bulk power system operated only 1,985 MW of land-based wind, 32 MW of utility-scale solar (much of the solar installed to date is located behind-the-meter).

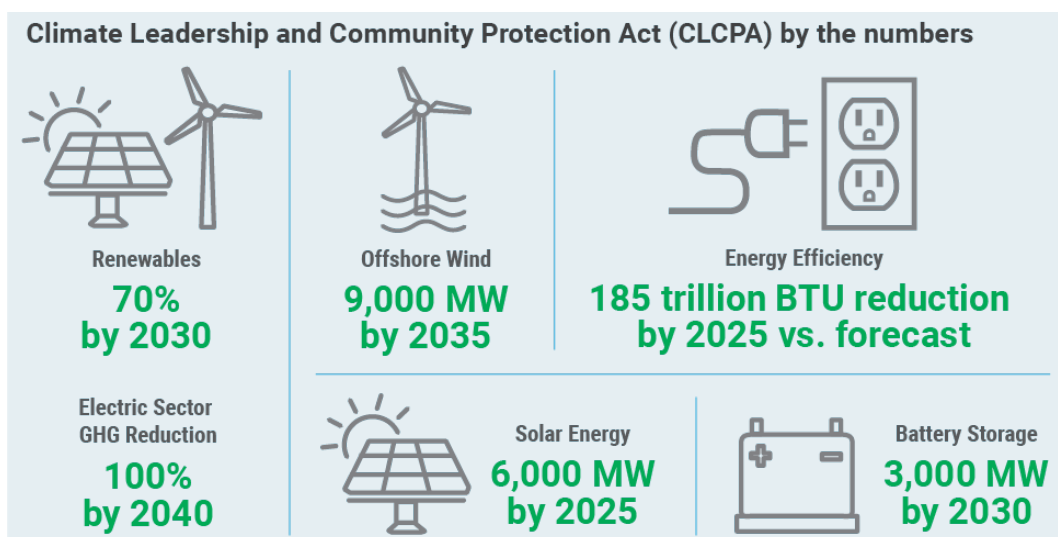


The CLCPA establishes that 70% of load will be served by energy generated from renewables by 2030 while requiring that 100% of the energy serving load be zero emission by 2040. The legislation specifies

deployment of 9,000 MW of offshore wind, 6,000 MW of solar, and 3,000 MW of energy storage. A significant transformation in the mix of system resources is needed to reach these goals and markets can help.

Additionally, New York’s economy-wide Greenhouse Gas (GHG) emissions goals and clean energy mandates stand out as having clear and substantial impacts on the NYISO wholesale markets and will be the major driver for the individual policies that can affect the NYISO wholesale markets going forward. GHG emission reductions will likely require even more changes including substantial electrification for heating, transportation, heavy industry, and other direct uses of fossil fuels that contribute to in-state greenhouse gas emissions. The NYISO recently developed enhanced load modelling techniques to incorporate future impact on load forecasts driven by climate change policies.

Wholesale markets are designed to attract and retain enough resources in the right locations to provide the needed reliability attributes; in the simplest terms to balance the supply and demand on the electric system. Within today’s system there is a predominance of large-scale controllable resources that can be dispatched by operators to respond to system needs. In the grid of the future, where more intermittent resources are expected to interconnect to the grid, markets must incent sufficient resources to meet consumer demand, and also must attract controllable resources that will be necessary to balance varying supply from wind and solar. Furthermore, it is necessary to consider how markets can more explicitly recognize environmental attributes. Properly enhancing market designs to reflect this paradigm shift in how the grid is to be operated will ensure consumers continue to benefit from competitive markets that deliver economically efficient energy supplies to reliably serve demand while also supporting achievement of policy goals.

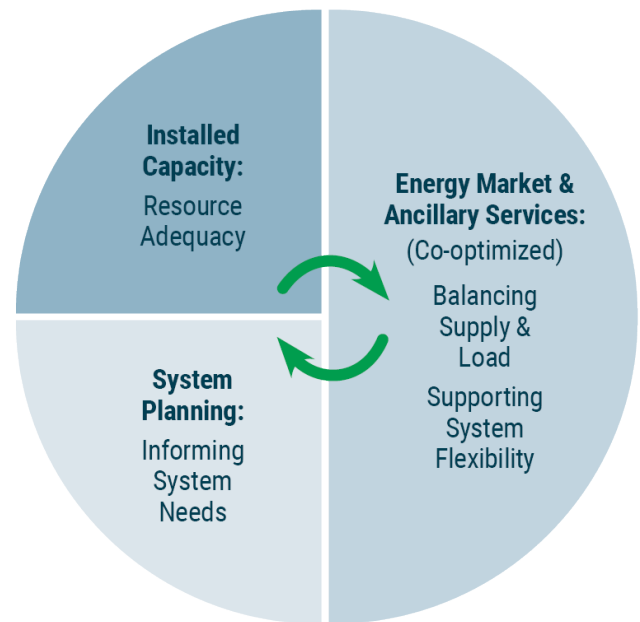


## NYISO Markets Provide a Framework for Integrating New Technologies and Achieving Policy Objectives

Wholesale markets harness competitive forces to improve the economic efficiency of operations and investment and encourage innovation. Asset owners who are most efficient will thrive in the market while lowering the costs of providing resources to consumers; those asset owners who have inefficient resources or make poor investment decisions bear the consequences and exit the market without placing additional cost burden on consumers.

The NYISO supports reliability primarily through three complementary markets for energy, ancillary services, and capacity. Each addresses distinct reliability needs, and each provides competitive market pricing designed to meet reliability needs at an overall least-cost to consumers. NYISO’s markets are designed to provide pricing on a locational level in order to reflect the reliability needs of specific areas of the state. This locational pricing model minimizes overall costs to the state while serving as an important investment signal for investors.

Together, energy, ancillary services, and capacity revenues, provide economic signals for new investment, retirement decisions, and participation by demand response providers. When the energy and ancillary services components decrease, the capacity market prices increase to allow for sufficient revenues for needed resources (new or existing). Thus, our current market design is structured to allow resources to compete to provide reliability services while maintaining revenue adequacy for needed resources (i.e., retain resources that are providing reliability value and incent entry of new resources to maintain specified reliability levels – Loss of Load Expectation of 1 event in 10 years). While the capacity market is designed to meet resource adequacy, the energy and ancillary services markets provide the primary incentive for units to perform in real time and respond to rapidly changing system conditions. Well-functioning markets create opportunities for all resources, new and existing, to compete.



Competitive markets provide a framework for change in the power system. By way of example, it is helpful to note that the wholesale markets have played a significant part in meeting New York’s environmental goals since the inception of the NYISO.

Since 1999, New York’s generation fleet has evolved to become markedly cleaner and more efficient. 11,335 MW of new generation has been developed in optimal locations due to locational energy and capacity price signals. Competitive market pricing has contributed to 7,343 MW of older facilities retiring or suspending operations and being replaced by cleaner fuel types and more efficient technologies. More recently, the NYISO developed comprehensive market rules for the integration of Energy Storage and Distributed Energy Resources (DER) into the wholesale markets.

Currently pending FERC approval, the NYISO’s proposed implementation of these market frameworks will provide increased opportunities for renewables and storage.

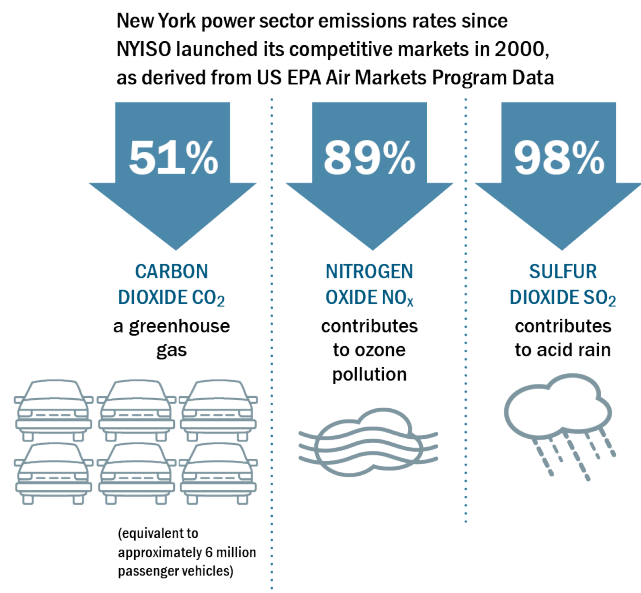
There is clearly more to do, but the NYISO’s existing market structure is readily adaptable to changing system needs and public policy priorities. Going forward, the competitive market framework will serve as a platform to facilitate expanded policy goals and integrate advanced clean energy resources.

### How to Evolve the Markets to Meet Changing Needs

The NYISO’s wholesale markets can continue to successfully fulfill the mission and goals of reliability and economic efficiency while also serving as an effective platform for achieving New York State environmental objectives. As such, the NYISO is actively engaging stakeholders and policymakers in developing plans to meet the future challenges expected to arise from a grid characterized with high levels of energy supply from intermittent renewable and DER.

We have identified several recommended market design enhancements. While each of these efforts addresses the concerns and follows the principles outlined above, they must fit together coherently and efficiently satisfy New York’s grid reliability needs. As technologies change and the asset mix evolves, continued assessment and on-going market improvements will need to occur.

The energy and ancillary services design enhancements will provide appropriate pricing signals for generating resources that are responsive to real time changes in system conditions. Quick start capability, ramping and load following are needed for a system comprised of a large percentage of intermittent



resources. An approach that emphasizes energy and ancillary services products and market pricing that are reflective of system conditions and operational requirements is important for incenting those needed attributes.

The NYISO continues to see the implementation of carbon pricing as the most effective means to directly reflect the public policy goals with respect to evolving to a zero carbon future into the markets. Shortage pricing for energy and ancillary services is particularly important to provide incentives for generating units to respond to real-time needs and to signal investment. There is a need to create more granular operating reserve areas to provide targeted price signals by location for ancillary services (e.g., within New York City to provide more accurate price signals for units to carry reserves).

As highlighted by the New York Public Service Commission (PSC) in the Resource Adequacy proceeding, steps also need to be taken to enhance the capacity market. It is important to improve the resource adequacy models used to set the Installed Reserve Margin and Locational Capacity Requirements and better align compensation with performance given the changing power grid.

Notably, the NYISO’s existing capacity market Buyer Side Mitigation (BSM) rules require review in order to preserve competitive price signals and economically efficient market outcomes required to maintain system reliability and support the achievement of New York’s climate policy codified in the CLCPA. To achieve this, the NYISO plans to engage with stakeholders to conduct a comprehensive review of the BSM rules aimed at modifying NYISO market structures in a balanced manner that support the transitioning grid.

This transformational shift in resources and potential for significant electrification of heating, transportation, and heavy industry necessitates addressing the impacts on the NYISO market design today. The projects presented below require immediate attention and are recommended for implementation in the next five years, through 2024.

**Table 1: Recommended Enhancements Requiring Immediate Attention**

Market Enhancement Opportunity	Description
<b>Energy &amp; Ancillary Service Market Opportunities</b>	
Carbon Pricing	Internalize the societal cost of carbon dioxide emissions via a \$/ton charge to participants in the energy and ancillary services markets. Implementation requires state support.



Market Enhancement Opportunity	Description
Enhance Energy and Shortage Pricing	<p>Enhance energy and shortage pricing such that prices are consistent with customers' value of lost load and probability of outage as supply conditions tighten and with smoother demand curves. Ongoing efforts include:</p> <ul style="list-style-type: none"> <li>▪ Ancillary Services Shortage Pricing</li> <li>▪ Constraint Specific Transmission Shortage Pricing</li> <li>▪ Enhanced Fast Start Pricing</li> </ul>
Review Energy and Ancillary Services (E&AS) Product Design	<p>Further analysis to evaluate whether today's ancillary services products will continue to support reliable operations and investment signals as the system evolves. Ongoing efforts include:</p> <ul style="list-style-type: none"> <li>▪ More Granular Operating Reserves</li> <li>▪ Reserve Enhancements for Constrained Areas</li> <li>▪ Reserves for Resource Flexibility</li> </ul>
Distributed Energy Resources	<p>In 2019, NYISO worked with its stakeholders to develop a comprehensive set of rules to integrate Distributed Energy Resources into wholesale markets. These rules are awaiting FERC approval and scheduled to go into effect in 2021.</p>
Energy Storage Resources	<p>In 2018, the NYISO developed market rules for integration of Energy Storage in wholesale markets. These rules are awaiting FERC approval and are scheduled to be implemented in 2020.</p>

<b>Capacity Market Opportunities</b>	
Comprehensive Mitigation Review	<p>A holistic evaluation of the BSM rules and methodology to evaluate how to modify NYISO market structures in a balanced manner that preserves competitive price signals and economically efficient market outcomes required to maintain system reliability and supports the Climate Leadership and Community Protection Act (CLCPA) goals.</p>
Enhancements to Resource Adequacy Models	<p>Evaluate the robustness of NYISO's resource adequacy models and make updates as needed to reflect emerging technologies and changing system dynamics.</p> <ul style="list-style-type: none"> <li>▪ Modeling of storage and other duration limited resources</li> <li>▪ Modeling of intermittent renewable resources</li> <li>▪ Modeling of demand response</li> <li>▪ Modeling of the dynamic and variable behavior of behind-the-meter solar and load modifiers</li> </ul>

Revise Resource Capacity Ratings to Reflect Reliability Contribution	Develop enhanced capacity ratings for all supply resources that reflect the marginal contribution to meeting resource adequacy criterion, accounting for system dynamics, resource availability and performance (including the impact of outage correlations). Ongoing efforts include: <ul style="list-style-type: none"> <li>▪ Expanding Capacity Eligibility</li> <li>▪ Tailored Availability Metric</li> <li>▪ Recurring study building upon the above initiatives</li> </ul>
Capacity Demand Curve Adjustments	Incremental adjustments to the capacity demand curve, including the shape and slope, to ensure resource adequacy and price stability as system conditions evolve.

It is the NYISO’s belief that twenty years of wholesale markets in New York have provided substantial benefits to New Yorkers. Leveraging this success, engagement with policymakers and stakeholders to address the challenges and potential solutions identified in this report will play an important role in achieving the environmental objectives of the state while maximizing the benefits of wholesale markets to New York’s energy consumers.