



2019 Master Plan

Wholesale Markets for the Grid of the Future

*A Report by the
New York Independent System Operator*

April 2019 Draft

Table of Contents

INTRODUCTION	4
2019 UPDATE.....	4
PROJECT INITIATIVES	5
Grid Reliability and Resilience	6
Efficient Markets for a Grid in Transition	6
New Resource Integration.....	7
STRATEGIC MARKET DESIGN CONCEPTS AND PLANS	8
Proposed Project Timelines.....	8
Anticipated Project Benefits and Effort	9
<i>Benefits.....</i>	<i>10</i>
<i>Effort</i>	<i>10</i>
<i>Matrix.....</i>	<i>10</i>
2019 MASTER PLAN MARKET STRATEGY.....	12
GRID RELIABILITY AND RESILIENCE	13
Reliability and Market Considerations for a Grid in Transition	13
Enhancing Grid Resilience	13
<i>Enhancing Fuel and Energy Security.....</i>	<i>13</i>
<i>Reserves for Resource Flexibility</i>	<i>14</i>
<i>Large Scale Solar on Dispatch</i>	<i>16</i>
EFFICIENT MARKETS FOR A GRID IN TRANSITION	18
Carbon Pricing.....	18
Evolution of Ancillary Services	19
<i>Ancillary Services Shortage Pricing.....</i>	<i>19</i>
<i>Dynamic Reserve Requirements</i>	<i>21</i>
More Granular Operating Reserves	23
<i>Zone J Reserve Requirement.....</i>	<i>23</i>
<i>Load Pocket Reserve Requirements.....</i>	<i>24</i>
Enhancing Locational Price Formation.....	26
<i>Constraint Specific Transmission Shortage Pricing.....</i>	<i>26</i>
<i>Enhanced Fast Start Pricing.....</i>	<i>28</i>
Reliability Value of Resources.....	30
<i>Demand Curve Reset</i>	<i>30</i>
<i>Expanding Capacity Eligibility/Capacity Values.....</i>	<i>31</i>
<i>Tailored Availability Metric</i>	<i>33</i>
Capacity Market Fundamentals.....	34

<i>Improving Capacity Price Formation</i>	34
<i>Capacity Zone Evaluation</i>	35
<i>Comprehensive Mitigation Overview</i>	37
NEW RESOURCE INTEGRATION	38
New Resource Participation Models	38
<i>Energy Storage Resource Participation Model</i>	38
<i>Hybrid Storage Model</i>	40
Distributed Energy Resource Integration	41
<i>DER Participation Model</i>	41
<i>NYISO Pilot Framework</i>	43
<i>Meter Services Entity for DER</i>	44
<i>Dual Participation</i>	46
CONCLUSION	47

DRAFT

Introduction

Wholesale energy markets reflect the confluence of economics, technology, and public policy. Markets have successfully facilitated efficiency gains on the grid and cleaner energy production in the state since their inception. Those gains and improvements have been gradual as price signals have worked over time to influence more efficient (and often cleaner) generation, and investments in the grid that have further enabled energy production from cleaner resources. The NYISO views its markets as an effective platform for reflecting public policy and technological influences in an economically efficient manner to reliably meet consumers' energy needs.

The NYISO continues to be proactive in its efforts to harmonize wholesale markets and state policies while using markets to drive resource performance. The challenge for the NYISO will be to examine its market structures to develop incentives for investment in, and maintenance of, the types of resources needed to sustain reliability. The NYISO's Master Plan (Master Plan) for the wholesale markets details the plans to examine these market structures and develop enhancements over the next five years that will help ensure the reliability and economic efficiency of the grid.

In producing this document, the NYISO aims to achieve three concurrent goals: establish a clear framework for achieving the NYISO's vision of the future wholesale markets; align the objectives for the next five years with the most recent [Strategic Plan](#) (2019-2023); and support annual stakeholder-driven project prioritization efforts. Together, these goals will help to synthesize a clear and direct path forward as we engage in transforming the grid and markets.

2019 Update

In previous years, the NYISO has examined "what" the future grid and corresponding wholesale markets may look like considering the opportunities and challenges in front of us. As part of the NYISO's commitment to the success of wholesale markets supporting the delivery of reliable electricity at the lowest cost to the consumers of New York, the NYISO is collaborating with its stakeholders to sharpen its focus on *Reliability and Market Considerations for a Grid in Transition*. This effort is designed to raise awareness of the operational and market challenges that New York's wholesale market may face as the State transitions to a cleaner and more decentralized grid with more uncertainty of supply and demand, due to the weather dependent nature of large-scale wind and rooftop solar, respectively. The first deliverable of this effort is a May 2019 whitepaper that discusses the challenges, identifies "no regrets" actions that should be taken now, and establishes some tough questions that will take more time to analyze and consider in collaboration with stakeholders.

The goal of this year's Master Plan is to establish the framework for continuing the work that the NYISO and its stakeholders believe will bring high value to the wholesale markets, while reconsidering some of the previous efforts that may no longer be as critical to pursue at this time given the shifts in public policies and technologies over the last year. Many of the projects included in this Master Plan are large efforts that were based on previous work that the NYISO and its stakeholders undertook to holistically examine whether the current constructs are effective in a future with significantly more renewable, distributed and demand-side resources. These projects include exploring ways for the markets to provide clear signals that support the reliability needs of the grid in a future with more weather-dependent intermittent resources, how to integrate resources based on new technologies, and make considerations for fuel security of a fleet increasingly dependent on natural gas.

The Master Plan ties these initiatives into a cohesive market design strategy for the next five years. With the help and input of our market participants, this document discusses the NYISO's recommendations for evolving the wholesale markets that the NYISO administers. Market design concepts discussed include those developed or suggested in one or more of the following publications or projects:

- [Carbon Pricing Proposal](#), (NYISO, December 2018)
- [Capacity Resource Performance in NYISO Markets](#) (The Analysis Group, November 6, 2017)
- [NYISO Management Response to Capacity Resource Performance](#) (NYISO, February 21, 2018)
- [Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets](#) (NYISO, December 2017)
- [Wholesale Market Assessment of the Impact of 50% Renewable Generation](#), "2017 Market Assessment" (NYISO, December, 2017),
- [Constraint Specific Transmission Shortage Pricing](#) (NYISO, September 27, 2018)
- [State of Storage](#) (NYISO, December 2017)

The Master Plan establishes a strategic set of market reforms that when executed effectively places the New York's wholesale electricity markets in the best position to attract and retain the needed resources to reliably operate the grid.

Project Initiatives

This Master Plan will continue to harmonize the NYISO's annual Strategic Plan with initiatives that improve New York's wholesale market design. The Strategic Plan is an important document that guides the

NYISO's overall direction and establishes priorities and initiatives for the next several years; it should be considered in parallel to this document, which dives deeper into market design goals.

Each project included in this year's Master Plan was considered for how it advances one or more of the following three initiatives included in the Strategic Plan: Grid Reliability and Resilience, Efficient Markets for a Grid in Transition, and New Resource Integration. Many projects serve to advance more than one initiative, but for the purposes of this document, have been organized into one of the three categories.

Grid Reliability and Resilience

Maintaining power system reliability is the NYISO's primary responsibility in which wholesale markets play a critical role. Wholesale energy and capacity market products form price signals that indicate both current and future reliability needs, incentivizing both real-time performance and long-term investment. The changing portfolio of resources serving the electric needs of New York requires an ongoing review of the NYISO's existing market products to ensure the continued ability to efficiently and reliably serve New York's electricity requirements. Projects categorized under this initiative serve to maintain reliability and efficient operation of the grid under normal, stressed and extreme conditions.

The NYISO is currently conducting a wide-ranging study to examine what market changes should be made to address potential operational gaps as New York State transitions to the grid of the future. This report, titled *Reliability and Market Considerations for a Grid in Transition* (Grid in Transition report), will include suggestions for operating and market design changes that will better prepare the NYISO to maintain and enhance grid reliability and resilience as we transition to a future with increasing numbers of renewable resources, energy storage resources, distributed energy resources (DER), and changing load profiles. This report builds on the idea that price signals have to reflect the operational need.

The NYISO believes the Grid in Transition report and the Master Plan are intricately linked in that findings from the Grid in Transition report will inform Master Plan projects, while the Master Plan will reflect the overall market design trends and goals over the next several years. Some of the recommendations from the Grid in Transition report may become projects in the Master Plan going forward, or will lend support to existing projects within the Master Plan. The Grid in Transition report is currently being drafted, and will be updated periodically as more information becomes available; the first release of a draft is anticipated in mid-May.

Efficient Markets for a Grid in Transition

The addition of renewable resources, energy storage resources, and DER expected as a result of New York's Clean Energy Standard and other policy initiatives will create a more dynamic grid. Many of the

projects discussed in the 2019 Master Plan are expected to improve market efficiency as we move towards this new, more dynamic paradigm. Some of the projects in this section are holistic evaluations of governing principles and frameworks of existing market constructs. *Improving Capacity Price Formation*, for example, includes exploring alternative slopes and shapes of the ICAP Demand Curves that may help stabilize capacity market pricing outcomes and improve the predictability of future market revenues as large quantities of new resources are deployed across New York State over the coming years. Other projects will evaluate and adjust today's market products to represent the challenges and opportunities presented by a changing grid, such as the *Tailored Availability Metric* which seeks to better incent performance during peak load hours through enhanced capacity payments.

In a future where energy prices may often be low or negative, more granular ancillary services price signals will be required to promote real-time performance. Some initiatives in this category will examine whether existing ancillary services products should be disaggregated or decoupled, such as *More Granular Operating Reserves*, which seeks to improve reserve procurement and price formation in constrained regions of the NYCA. *Ancillary Services Shortage Pricing* will consider whether current pricing levels are adequate to incent investment in and/or retention of needed performance capabilities and promote real-time responsiveness.

Several proposed products and initiatives in this category will help support a changing grid by adding more flexibility to the Energy Markets. As suppliers become increasingly comprised of weather-dependent renewable resources, flexible resources will be needed to balance intermittent generation. Incenting resource flexibility, which includes the ability to respond rapidly to dynamic system conditions, provide controllable ramp with fast response rates, and provide frequent startup/shutdown capability, will be key to future market enhancements at the NYISO. For example, *Reserves for Resource Flexibility* proposes to address this need through expanding the procurement of operating reserves that would support resources that can provide additional upward ramping flexibility.

New Resource Integration

Technological advancements and public policies, particularly Reforming the Energy Vision (REV) and the State's storage initiative, are encouraging greater adoption of DER, energy storage resources, and other new resource types to meet consumer energy needs. DER and energy storage resources offer the potential to make load and supply resources more dynamic and responsive to wholesale market price signals and system needs, potentially improving overall system efficiencies. Developing projects that capture the unique operating characteristics of these new resources will allow DER, energy storage resources, and aggregations to maximize wholesale market participation and improve the reliability and efficiency of New York's electric

grid. This category of projects consists primarily of designing the obligations and requirements for how these new resources will participate in the NYISO markets.

Strategic Market Design Concepts and Plans

Proposed Project Timelines

Finally, this document also serves to support the annual stakeholder-driven project prioritization effort. The project prioritization process engages stakeholders to collaboratively determine which projects the NYISO will devote its resources to in the next year. While the process is effective and useful in receiving input from stakeholders, it can be difficult to develop a larger, multi-year plan from the process. This document aims to fill that gap by providing a snapshot of what the NYISO sees as the most important projects over the next several years. The Master Plan is in no way meant to replace, circumvent, or reduce the project prioritization effort in anyway.

This document suggests timelines for product development and identifies target dates for key milestones. These standard definitions for typical NYISO project milestones directly correspond to those used in the project prioritization process and are provided below for the reader's convenience.¹ Some project phases may require more time to complete than others, depending on the nature of the topic and complexity of the solution.

Study Defined: The scope of work for the study has been presented to stakeholders, including a discussion on the necessary input(s), assumption(s) and objective(s) of the study.

Study Complete: Scope of work to be performed has been completed; results and recommendations have been presented to the appropriate Business Owners and stakeholders.

Market Design Concept Proposed: NYISO has initiated or furthered discussions with stakeholders that explore potential concepts to address opportunities for market efficiency or administration improvements.

Market Design Complete: NYISO has developed with stakeholders a market design concept such that the proposal can be presented for a vote at the BIC or MC to define further action on the proposal.

Functional Requirements: NYISO has completed documentation of the functional requirements (FRS) and the Business Owner has approved.

Development Complete: Software development has been completed, packaged and approved by the

¹ These milestone definitions are consistent with those used by the NYISO's Budget and Priorities Working Group (BPWG).

Supervisor.

Deployment: Required software changes to support commitment have been integrated into the production environment.

The Master Plan provides project timelines for information, with several important caveats. First, the project milestones are recommendations only and will assist with longer term planning. Projects will be selected through the stakeholder prioritization process, which takes place annually in the NYISO's Budget and Priorities Working Group (BPWG).

Second, as part of market design development, extensive analysis is conducted to determine whether each product is needed and what value it would have for the markets and consumers, so that the NYISO can make an informed recommendation to stakeholders prior to a Business Issues Committee (BIC) vote. As a result of such analysis, the NYISO may recommend that certain designs not move forward to implementation. This document should not be viewed as a commitment to complete any of the projects discussed herein.

The Master Plan attempts to strike a balance between aggressive pursuit of market evolutions to meet the needs of the grid of the future, and the time necessary to thoroughly develop and evaluate the market designs. The NYISO understands the stakeholders' expectations to allocate sufficient time to develop a market design, evaluate its effectiveness, and analyze any other implications.

After careful examination of each project's intended benefits and potential impact to the market, there are some projects that were in the 2018 Master Plan but are excluded from this year's plan. Some of these projects no longer help drive toward the improvements that the NYISO is targeting or were excluded due to resource constraints imposed by other, more impactful projects.

Anticipated Project Benefits and Effort

Along with the project timeline, the NYISO is including a discussion of each project's projected benefits and level of effort to drive to completion. The intention in describing both the benefit to the NYISO market and effort to achieve stated goals for each project is to better communicate the level of internal resources needed to achieve each project's stated goals, and how impactful those goals are to the overall market. Each project will be rated as Low, Medium or High for both "benefits" and "effort", based on the criteria discussed below. Two projects, *Reliability and Market Considerations for a Grid in Transition* and *Enhancing Fuel and Energy Security* have not been scored for their benefits and effort, as they represent ongoing studies that may result in market design or operational recommendations. Without knowing what those recommendations will be, if any, it is difficult to anticipate the benefits or effort of projects that may arise from those studies.

Benefits

Some of the projects in which the NYISO engages focus on enhancing a specific segment of the market while others are wide-ranging revisions that broadly impact market participants. Each project included in this Master Plan, with the exception of the two noted above, has been rated either Low, Medium or High to convey how much impact the NYISO believes each individual effort will have on the market. Projects with a High level of benefit are broad efforts that have the potential to impact a wide-range of price outcomes, grid reliability, and revenue opportunities for new and existing resources; examples of High benefit projects include the *Energy Storage Participation Model* and *Carbon Pricing*. Projects with a Medium benefit are typically more focused enhancements that improve specific operating areas and products, such as *Dynamic Reserve Requirements*. Considering the strategic nature of this plan, no Low benefit projects are included in the Master Plan.

Effort

Along with the benefits of each project, the NYISO also included a discussion on the level of effort required to achieve the stated goals of each project. Effort can vary not only from project to project, but within the different parts of each project. For example, some projects have lengthy market design phases with little to no implementation time required, such as the *Comprehensive Mitigation Review*. By contrast, other projects may require more stakeholder discussions of the market design issues and have complex implementation considerations, such as the *DER Participation Model*. These projects affect many different markets, such as capacity, energy and ancillary services, and systems, from bidding and scheduling to settlements, that require significant software development, and quality assurance testing before they are deployed for use in a zero downtime environment.

A High level of effort typically requires a large amount of NYISO and/or stakeholder resources over a period of four or more years; a Medium level of effort can typically be focused on a specific team or department within the NYISO or be taken from design through implementation in two to three years; a Low level effort may already be underway with only a few steps required to complete the effort, and typically can be completed within two years. The number of years anticipated for a project is not expected to be the sole determinant of effort, but meant to help guide the expectation of how much effort a specific project will take. Other factors, such as the number of people working on and amount of resources dedicated to a specific project will also impact the effort rating.

Matrix

To better visualize the interplay of benefits and effort for each project, the NYISO has included a matrix along with each project timeline. This matrix captures the designation of High, Medium and Low for both

benefits and efforts: benefits are depicted on the horizontal axis and effort is depicted on the vertical axis. The “X” designates where on this matrix the specific project falls, benefits increase as the “X” moves right, and effort increases as the “X” moves down, following the gradient to show more benefits and effort.



This project has high benefits requiring high effort

DRAFT

2019 Master Plan Market Strategy

Market Strategy - 2019 Master Plan						
Grid Reliability and Resilience	2019	2020	2021	2022	2023	2024
Reliability and Market Considerations for a Grid in Transition						
Further Discussions on Concepts Proposed in Grid in Transition Report						
Development of Potential Projects Resulting from Concepts Proposed						
Enhancing Grid Resilience						
Enhancing Fuel and Energy Security						
Reserves for Resource Flexibility						
Large-Scale Solar On Dispatch						
Efficient Markets for a Grid in Transition	2019	2020	2021	2022	2023	2024
Carbon Pricing						
Evolution of Ancillary Services						
Ancillary Services Shortage Pricing (SOM)						
Dynamic Reserve Requirements (SOM)						
More Granular Operating Reserves						
Zone J Reserve Requirement						
Load Pocket Reserve Requirements						
Enhancing Locational Price Formation						
Constraint Specific Transmission Shortage Pricing (SOM)						
Enhanced Fast Start Pricing						
Reliability Value of Resources						
Demand Curve Reset						
Expanding Capacity Eligibility/Capacity Value Study						
Tailored Availability Metric						
Capacity Market Fundamentals						
Improving Capacity Price Formation						
Capacity Zone Evaluation						
Comprehensive Mitigation Review						
New Resource Integration	2019	2020	2021	2022	2023	2024
New Resource Participation Models						
Energy Storage Resource Participation Model (SOM)						
Hybrid Storage Model						
DER Integration						
DER Participation Model						
NYISO Pilot Framework						
Meter Service Entity for DER						
Dual Participation						

Grid Reliability and Resilience

Reliability and Market Considerations for a Grid in Transition

As discussed above, the *Reliability and Market Considerations for a Grid in Transition* study is an ongoing effort from which we expect to have several project recommendations that will be included in the Master Plan. The goals of this study are to identify what market changes might be prudent in order to support reliability, efficient markets, and investment given the expected future resource mix. With the integration of more intermittent resources, reliability risks may no longer be concentrated in peak load hours, but rather shifted to periods with low wind and solar generation, or rapid or unexpected ramps in load. This study aims to shape how the NYISO should structure markets in the future to support the entire fleet and maintain reliability, given expected shifts in market revenues and the evolving value of various resource attributes.

Project Scope

2019	2020	2021	2022	2023	2024
Study Complete	Ongoing				

The NYISO expects this study to be completed during 2019, at which point discussions will begin with stakeholders about the concepts proposed in the study. It is likely that projects, which may be included in future Master Plans, will develop as a result of this report and subsequent discussions; however, it is difficult to anticipate what those projects, and respective milestones, would be at this time. Therefore, the NYISO has designated the period through 2023 as “Ongoing” to reflect that additional work resulting from this study will be performed, without being able to clearly articulate the specific project work. As projects that result from the report’s recommendations crystallize, will be updated.

Enhancing Grid Resilience

Enhancing Fuel and Energy Security

This project seeks to enhance NYISO markets to provide for NY’s anticipated generating fuel needs, which will support grid reliability.

Problem Statement

New York’s power grid is anticipated to face increased challenges associated with the generating fleet transitioning towards more renewable and natural gas resources. Increased dependency on natural gas and intermittent technologies creates an elevated risk to system reliability if those fuel supplies were to be

interrupted. The 2019 Analysis Group (AG) Study on Fuel and Energy Security will help inform these concerns by examining various scenarios that could put strain on fuel and energy security in New York.

Background

The objectives of this project are to explore and develop any market design enhancements that may be prudent in response to conclusions from the 2019 AG Study on Fuel and Energy Security assessment. These efforts would examine potential adjustments to market structures and/or operational practices that could enhance incentives for maintaining system security given the possibility of fuel supply deficiencies.

Work under this project would be necessary to complete a market design that encompasses any recommendations from the 2019 AG Study on Fuel and Energy Security aimed at promoting grid reliability. Market design efforts in this project would seek to bolster New York’s preparedness for an altered resource portfolio by elevating the markets to embrace future challenges that could arise with respect to fuel supply security.

Project Scope

2019	2020	2021	2022	2023	2024

The 2019 AG Study on Fuel and Energy Security is planned to be completed in 2019. Timeline and scope for this project are speculative until the conclusion of the study, which is expected to occur near the end of Q2 2019 or early Q3 2019. If additional project work is deemed necessary, it will likely take a few years to complete.

Reserves for Resource Flexibility

This project seeks to encourage flexible resources to provide additional upward ramping capability, which will improve grid reliability and flexibility.

Problem Statement

The 2017 Market Assessment demonstrated that the volatility of the net NYCA load may increase significantly from one 5-minute real-time market interval to the next as more weather-dependent renewable resources are added to the grid. As load forecast uncertainty increases, it will become more important to maintain adequate load-following capability to instantaneously balance load and generation. The NYISO anticipates that intermittent generators will be able provide adequate downward ramping capability when needed, because both wind and solar units will be dispatchable in the future. However, a product that

procures more upward ramping capability could confer significant operational benefits.

Background

The NYISO currently procures the minimum amount of operating reserve required to meet applicable reliability requirements. With this project, the NYISO proposes to examine the potential to increase the quantity of reserves procured, thus encouraging resource flexibility to support grid reliability and improve grid resilience. Procuring additional reserves will yield more efficient market outcomes by enabling the NYISO’s energy markets to respond quickly to the volatility introduced by additional intermittent resources.

The 2018 Master Plan proposed further investigation into a “Flexible Ramping Product,” as well as the procurement of additional reserves, under the project titled “Reserve Procurement for Resilience.” Subsequent research into the flexible ramping products offered by other control areas and discussion with stakeholders led NYISO staff to conclude that these two project descriptions ultimately offered different ways of addressing the same market need for more upward ramping capability, which NYISO staff believes can best be achieved in the near-term by modifying the NYISO’s reserve procurement requirements. The Flexible Ramping product that was discussed in the 2018 stakeholder process would procure additional up-ramp on a longer time horizon than 10- and 30-minute reserves, and could be introduced in the future as the need arises.

This project will help the NYISO integrate large amounts of renewable generation and continue to meet stringent reliability standards economically.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits
						Effort 

The NYISO is developing a Market Design Concept Proposal for this project in 2019. It is expected that, pending stakeholder approvals, this project could be accelerated for deployment in 2020. In order to achieve this milestone, the following deliverables will need to be completed prior to deployment:

- Market Design Complete presentation to MIWG, BIC, and MC to include consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

It is expected that these deliverables will require low effort to complete as a result of the proposed accelerated timeline. Although the software changes anticipated are small, the remaining market design tasks will require significant effort in order to meet the proposed accelerated timeline. Project benefits are expected to be high, because additional upward ramping capability will confer significant improvements to the NYISO's ability to balance real-time volatility as intermittent renewable penetration increases. This initiative is not dependent on other projects for completion, but NYISO staff recommend that it be deployed in parallel with the *Ancillary Services Shortage Pricing* effort.

Large Scale Solar on Dispatch

This project seeks to place front-of-the-meter solar resources on dispatch in the NYISO's energy markets, so that they can provide downward ramping capability when necessary and improve operational flexibility.

Problem Statement

The participation of front-of-the-meter solar installations in the NYISO's wholesale markets is expected to grow significantly in the coming years; there are currently more than 75 large solar projects in the NYISO's interconnection queue, totaling more than 4,000 MW.² While solar technology can offer many benefits, it can also pose challenges to reliable grid operation due to its variable nature. Indeed, the NYISO already contracts with solar forecasting entities to provide predictions of output from such resources. As higher levels of intermittent resources like solar connect to the grid, it will be important to have appropriate market mechanisms to manage this variability with flexible resources that can follow a dispatch signal.

Background

In preparation for this shift in the resource mix, the NYISO implemented tariff revisions in 2018 to better accommodate front-of-the-meter solar generators.³ As a result of those efforts, front-of-the-meter solar plants are now required to provide meteorological data and pay a forecasting fee to cover the NYISO's costs to procure a unit-specific forecast. Similar requirements also exist for wind generators today.

Solar resources have a demonstrated ability to reduce their output in response to a dispatch signal, and the NYISO seeks to implement this capability within its energy markets. The NYISO recommends that front-of-the-meter solar resources be treated on an equivalent basis to wind resources in NYISO-administered markets. This would require solar plants to submit flexible offers that indicate their willingness to generate

² For more information, see *Power Trends, New York's Dynamic Power Grid*, NYISO (April 2018), available at this link: <https://www.nyiso.com/documents/20142/2223020/2018-Power-Trends.pdf/4cd3a2a6-838a-bb54-f631-8982a7bdfa7a>

³ See FERC approval of NYISO filing of Services Tariff revisions addressing forecasting data requirements and service costs for solar resources in the New York Control Area, FERC Docket No. ER18-1408-000

at various price levels, and to receive and respond to economic dispatch instructions to curtail output. Like wind plants, the NYISO proposes that solar plants meeting these requirements retain eligibility for Compensable Overgeneration payments and be exempt from Persistent Undergeneration charges.

Some of the expected benefits of placing solar on dispatch include minimizing less efficient out of market actions, enabling solar plants to indicate their economic willingness to generate, better identifying the most efficient resources to limit during overgeneration events, minimizing the duration of necessary energy limitations, and incorporating NYISO dispatch instructions into market clearing prices. This project is expected to positively influence both price formation and resource flexibility. The ability to send an economic market basepoint to a solar resource to reduce its output in response to system needs increases reliability while decreasing total production cost. It will also increase system ramp capability by enabling solar suppliers to provide down ramp.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	✘

This project will develop detailed requirements for treating solar resources as dispatchable in the NYISO energy markets, similar to the model currently in place for wind resources. Adding dispatch capability to solar resources is expected to produce high benefits for the market. A completed market design will be presented to stakeholders and the Board, along with tariff revisions, approximately 6 months prior to deployment. Deliverables to be completed prior to deployment will include:

- Market Design Complete presentations to MIWG, BIC, and MC to include consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

Because this project requires limited software changes, its completion is expected to require low effort. The NYISO recommends implementing the market rule changes needed to place solar on dispatch in a few years, subject to the necessary stakeholder, NYISO Board, and regulatory approvals. The necessary tariff and software changes can be prioritized beyond the immediate short term because the impact of large-scale solar

installations will be minimal for the next several years as proposed projects begin construction.

Efficient Markets for a Grid in Transition

Carbon Pricing

The NYISO's Carbon Pricing proposal seeks to harmonize New York State (NYS) public policy and the NYISO's wholesale markets by incorporating the social cost of carbon dioxide ("carbon") emissions when scheduling resources through the energy markets.

Problem Statement

New York State (NYS) public policy in recent years has been to promote carbon-free resources through the Clean Energy Standard.⁴ However, the wholesale electricity markets operated by the NYISO do not fully align with these policy objectives. As a result, the wholesale markets are restricted in their ability to signal cost-effective carbon abatement options and send effective price signals to retain needed units to sustain the reliable operation of the grid.

Background

In 2017, the Brattle Group published a report detailing how pricing carbon into the NYISO's wholesale markets could help to harmonize wholesale markets with New York State's public policies. After the report was published, a NYISO, NYSERDA, and DPS team worked with the Integrating Public Policy Task Force (IPPTF) to analyze the mechanics and benefits of incorporating carbon into NYISO's wholesale markets. These efforts culminated in the NYISO's publication of a Carbon Pricing Proposal at the end of 2018, which outlines a potential approach to capture the social costs of carbon emissions in the wholesale electricity markets to provide a market-oriented, cost effective approach to harmonize state policy and the NYISO markets.

Carbon pricing will charge generators for their carbon emissions, while allowing these generators to include the carbon charge within their offers. Under the proposal, the NYISO would continue to commit and dispatch resources to meet load; however, the resulting energy prices would be higher as a result of incorporating the price of carbon emissions. The carbon charge collected from generators would ultimately be returned to Load Serving Entities (LSEs).

⁴ New York Public Service Commission, *Order Adopting a Clean Energy Standard*, Issued and Effective August 1, 2016. Available at <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B44C5D5B8-14C3-4E32-8399-F5487D6D8FE8%7D>.

Harmonizing state policies and wholesale market design will provide consumers with more efficient ways to achieve New York State public policy goals at the lowest possible cost. Currently, the social cost of carbon is not reflected within the NYISO markets, thus resources compete mainly on fuel cost. Implementation of the NYISO’s carbon pricing proposal will allow resources to compete on fuel cost, as well as emissions cost.

The carbon pricing proposal functions well within the NYISO’s existing market structure.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

In 2019, the carbon pricing proposal is being vetted through the NYISO’s working group process, targeting a goal of market design complete. The NYISO will be looking for agreement from New York State, followed by approval from stakeholders, the NYISO Board, and FERC on the NYISO carbon pricing proposal. In addition to all necessary approvals, the following deliverables will need to be completed prior to deployment:

- Market Design Complete presentations to MIWG, BIC, and MC to include consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

It is expected that these deliverables will require high effort to complete, and will generate high benefits. Market design effort remains ongoing in 2019, followed by software development tasks before implementation.

Evolution of Ancillary Services

Ancillary Services Shortage Pricing

The purpose of this project is to evaluate the NYISO's Ancillary Services shortage pricing values, considering the implications of the grid of the future and the payment incentives in neighboring ISOs, including pay-for-performance capacity market designs.

Problem Statement

The 2017 Market Assessment demonstrated increased system volatility as output from intermittent generators changes and the power system has to respond quickly to un-forecasted changes in generation. Resource flexibility and responsiveness are increasingly important to maintain system reliability in a future of increased system volatility. Higher Ancillary Services shortage pricing values will incentivize resource flexibility, support grid reliability during critical operating periods and appropriately reflect the incremental value of Ancillary Services. Therefore, the NYISO is considering re-evaluation of its Ancillary Services shortage pricing values for each product relative to other products.

Background

Performance incentives in neighboring ISO/RTO regions indicate that a review of the NYISO’s current Ancillary Services shortage pricing values could offer significant value. For example, neighboring ISOs/RTOs have introduced capacity market performance incentives that are expected to financially reward resource performance during critical operating periods. Shortage pricing for Ancillary Services performs a similar function in the NYISO markets.

The relative value of Ancillary Service shortage prices from one product to another should be reassessed as the NYISO moves towards a future with high penetration of intermittent generation.

As part of this project, the NYISO is considering the interaction of the Operating Reserve, Regulation Service and Transmission Shortage Cost pricing levels, to ensure that they appropriately reflect tradeoffs between market products under various grid conditions.

This project will help to prepare for a future where a significant number of generation assets are intermittent and weather-dependent. The Market Monitoring Unit, the NYISO’s Management response to Analysis Group’s Capacity Resource Performance report, and the 2017 Market Assessment all identify appropriate Ancillary Services shortage pricing values as beneficial to efficient market outcomes.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits
						Effort 

In 2019, the NYISO is conducting a study of Ancillary Services shortage pricing. As part of that effort, NYISO staff intends to propose revisions to the current pricing values and develop corresponding market rule changes. It is expected that, pending stakeholder, NYISO Board, and regulatory approvals, this market design project could be accelerated for deployment in 2020. The following deliverables will need to be completed prior to deployment:

- Revision of market design to reflect any changes resulting from the dependent Ancillary Services projects.
- Market Design Complete presentation to MIWG, BIC, and MC to include consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

The effort to complete this project is low. The benefits are also expected to be high for efficient price formation. The NYISO recommends that final market designs for *Constraint Specific Transmission Shortage Pricing*, *More Granular Operating Reserves*, and *Reserves for Resource Flexibility* projects be coordinated as all of these projects will affect the efficiency of wholesale energy price formation. Please see the discussions of those projects for more information about their dependencies.

Dynamic Reserve Requirements

This project seeks to dynamically procure operating reserves based on system needs and transmission capabilities.

Problem Statement

The NYISO procures fixed quantities of operating reserves across the state. Under this structure, the procurement of reserves does not reflect the ability of the grid to respond to system needs by utilizing the transmission system to import capacity into a generation-constrained region. Establishing dynamic reserve requirements would better reflect lower cost options that may be available to import power into a constrained region rather than hold reserves within such location. By procuring reserves dynamically, based on real-time conditions, reserves could be shifted to resources in lower cost regions as transmission capacity is available.⁵ Dynamic reserves provides the opportunity to produce price signals that would be better aligned with the precise locations where operating reserves would provide the most value.

Background

⁵ For example, the amount of operating reserves that must be held within the East or SENY reserve regions could be reduced when there is unused transmission import capability into eastern New York or into SENY, as it may be less costly to reduce flows across the applicable interface rather than hold reserves on internal units in East or SENY. See recommendation 2015-16 in *2017 State of the Market Report for the New York ISO Markets* (May 2018) p. 100, available at this link: <https://www.nyiso.com/documents/20142/2223763/2017-State-Of-The-Market-Report.pdf/cd4ee8a0-1989-dfa0-b53e-2d642c65e46d>.

The NYISO procures fixed quantities of operating reserves across various locational reserve regions reflected in the market software. In each region, NYISO has defined locational requirements (in MW) for its three Operating Reserve products: Spinning Reserve, 10-Minute Non-Synchronous Reserve, and 30-Minute Reserve.⁶ The NYISO procures fixed quantities of various reserve types within each reserve region, which are determined by reliability requirements set by NYSRC, North American Electric Reliability Corporation (NERC), and Northeast Power Coordinating Council (NPCC). To qualify for providing locational reserves, a Supplier must be physically located within the applicable reserve region⁷

In its 2016 State of the Market Report, the Market Monitoring Unit recommended that the NYISO “[d]ynamically adjust operating reserve requirements to account for factors that increase or decrease the amount of reserves that must be held on internal resources.”⁸ In some instances, the reserve requirement for a local area can be met more efficiently through the utilization of the transfer capability provided by the transmission system (*i.e.*, importing energy for reserves), rather than scheduling reserves within a particular region.

This effort would propose changes to NYISO’s market software such that the optimization would respond to system constraints dynamically by scheduling reserves where they are most needed and most cost effective in consideration of system conditions.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits		
						<table border="1"> <tr> <td>Effort</td> <td>X</td> </tr> </table>	Effort	X
Effort	X							

The NYISO expects to develop a Market Design Concept Proposal for this project. In order to further develop and ultimately implement the design, the following deliverables will need to be completed prior to

⁶ Further information on the Operating Reserve locational reserve requirements are available in NYISO’s *Ancillary Services Manual* (<https://www.nyiso.com/documents/20142/2923301/ancserv.pdf/df83ac75-c616-8c89-c664-99dfea06fe2f>) and in the following document: https://www.nyiso.com/documents/20142/3694424/nyiso_locational_reserve_reqmts.pdf/ab6e7fb9-od5b-a565-bf3e-a3af59004672.

⁷ For example, a resource located in Zone G in Southeastern New York would contribute the reserve requirement for the SENY, East, and NYCA regions. A resource located in Zone C would contribute to the reserve requirement for NYCA.

⁸ See recommendation 2015-16 in *2017 State of the Market Report for the New York ISO Markets* (May 2018) p. 99, available at this link: <https://www.nyiso.com/documents/20142/2223763/2017-State-Of-The-Market-Report.pdf/cd4ee8a0-1989-dfa0-b53e-2d642c65e46d>.

deployment:

- Market Design Concept Proposed presentation to MIWG
- Market Design Complete presentation to MIWG, BIC, and MC to include consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

Software development and testing will require high effort due to the impacts to several different NYISO software applications, including the market optimization. Project benefits are expected to be high, because dynamically procuring resources provides a cost-effective approach to securing reserves across the NYCA. Due to the expected complexity of this effort, the NYISO currently envisions deployment after large projects such as Carbon Pricing, DER integration, and the ESR participation model have been completed. This project should be considered in tandem with the Load Pocket Reserves portion of the *More Granular Operating Reserves* project.

More Granular Operating Reserves

Zone J Reserve Requirement

This project seeks to establish an operating reserve region in Load Zone J (NYC).

Problem Statement

New York State Reliability Council (NYSRC) reliability rules require that certain quantities of reserved be held within New York City.⁹ The NYC load zone (Zone J) is not currently modeled as an independent reserve region in the NYISO's market software. The existing practice is to review market results and if the reserve requirements for Zone J have not been satisfied, the NYISO coordinates with the local transmission owner to take manual actions to procure additional reserves in Zone J. With this project, the NYISO proposes to implement a locational reserve region for Zone J together with the associated 10-minute and 30-minute reserve requirement, thus incentivizing resource flexibility, supporting grid reliability, and providing location specific market signals.

⁹ See New York State Reliability Council, Reliability Rules and Compliance Manual, September 8, 2017, version 41, rules G.1 B.R3, available at the following link:
<http://www.nysrc.org/pdf/Reliability%20Rules%20Manuals/RRC%20Manual%20V41.pdf>

Background

The 2018 NYISO Management Response to Capacity Resource Performance and the 2017 State of the Market report recommend that the NYISO consider establishing and securing a separate 10-minute reserve requirement for New York City.^{10, 11} In Q1 2019, the NYISO proposed a market design to establish a Zone J Operating Reserve region. This effort received stakeholder support at the March 2019 BIC and MC meetings.¹² Pending FERC approval, the NYISO plans to introduce a new Zone J reserve region with 10 and 30-minute reserve requirements in June 2019. The requirements will establish procurement targets for 1,000 MW of 30-minute reserves and 500 MW of 10-minute total reserves within New York City. This effort will enhance the location-specific value of maintaining short notice responsive resources in desirable locations, and incent improved performance by providing resources with schedules for the reserves in response to the in-city requirements.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits
						Effort <input checked="" type="checkbox"/>

As part of the June 2019 implementation, operating reserve demand curves that assign a \$25/MWh value to each Zone J reserve product will be established. As part of ongoing 2019 efforts related to the “More Granular Operating Reserves” project, NYISO staff and stakeholders will assess potential further enhancements to the proposed Zone J reserves implementation, including potential changes to the operating reserve demand curve value assigned to these reserves and the quantity of Zone J reserves procured in real-time during Thunderstorm Alerts (TSAs).

Load Pocket Reserve Requirements

¹⁰ See Management Response to the Analysis Group’s Report Capacity Resource Performance in NYISO Markets: An Assessment of Wholesale Market Options, NYISO (February 2018) p. 2, available at this link: <https://www.nyiso.com/documents/20142/1395217/Performance%20Assurance%20Management%20Response%20Feb%2021%20%20MIWG%20FINAL.PDF/67b61532-490d-5562-a493-c32dc3514004>

¹¹ See Recommendation 2017-1 in 2017 State of the Market Report for the New York ISO Markets, Potomac Economics (May 2018) p. 97, available at this link: <https://www.nyiso.com/documents/20142/2223763/2017-State-Of-The-Market-Report.pdf/cd4ee8a0-1989-dfao-b53e2d642c65e46d>

¹² See *Establishing More Granular Operating Reserves*, NYISO (Management Committee, March 27, 2019), available at this link: <https://www.nyiso.com/documents/20142/1403334/More%20Granular%20Operating%20Reserves%20June%202018%20MIWG%20FINAL.pdf/e2d1b1e5-c5c6-b9a8-73fe-13bcfccac7ee>

This project seeks to improve price signals for reserve procurement in constrained load pockets of New York City (NYC).

Problem Statement

The NYISO is required to satisfy reliability criteria in NYC to meet NYSRC reliability requirements for local areas under certain conditions.^{13,14} These local requirements are not expressly modeled in the market software, and can, therefore, require the need for out-of-market commitments. In the absence of a market mechanism, economic incentives for investment in resources in load pockets capable of providing the required reserves are limited. As the grid evolves, this could eventually lead to insufficient availability of reserve capability in constrained load pockets of NYC.

Background

The 2017 State of the Market report recommends that the NYISO model local reserve requirements in NYC load pockets.¹⁵ This project would explore development of more granular reserve requirements for load pockets within NYC and incorporate these requirements into the market software. Exploring load pocket reserve requirements builds upon the development of Zone J Operating Reserve requirements by enhancing the location-specific value of maintaining short notice responsive resources in constrained load pockets in NYC. This effort was also identified as beneficial in both the 2018 NYISO Management Response to Capacity Resource Performance and the 2017 Market Assessment.

The Market Monitoring Unit has also expressed concern that some reserve providers may routinely underperform. As part of this project, NYISO and stakeholders will review existing practices and resource performance to confirm that operating reserve resources are provided appropriate incentive to perform.¹⁶

Project Scope

¹³ See *More Granular Operating Reserves*, NYISO (MIWG, June 13, 2018), available at this link: <https://www.nyiso.com/documents/20142/1403334/More%20Granular%20Operating%20Reserves%20June%202018%20MIWG%20FINAL.pdf/e2d1b1e5-c5c6-b9a8-73fe-13bcfccac7ee>

¹⁴ See *TO Applications of NYSRC Reliability Rules*, available at this link: https://www.nyiso.com/documents/20142/1406014/reliability_rules_2_2003.pdf/d2d643c8-18a6-3565-50c7-d8965b62ffd1

¹⁵ See Recommendation 2017-1 in *2017 State of the Market Report for the New York ISO Markets*, Potomac Economics (May 2018) p. 97, available at this link: <https://www.nyiso.com/documents/20142/2223763/2017-State-Of-The-Market-Report.pdf/cd4ee8a0-1989-dfa0-b53e2d642c65e46d>

¹⁶ See Recommendation 2016-2 in *2017 State of the Market Report for the New York ISO Markets*, Potomac Economics (May 2018) p. 74, available at this link: <https://www.nyiso.com/documents/20142/2223763/2017-State-Of-The-Market-Report.pdf/cd4ee8a0-1989-dfa0-b53e2d642c65e46d>

2019	2020	2021	2022	2023	2024	Benefits		
						<table border="1"> <tr> <td>Effort</td> <td>X</td> </tr> </table>	Effort	X
Effort	X							

The NYISO is expecting to complete the market design for Load Pocket Reserves in 2019. It is expected that, pending stakeholder and regulatory approvals, this market design project could take several years to be deployed. In order to achieve this milestone, the following deliverables will need to be completed prior to deployment:

- Market Design Complete presentation to MIWG, BIC, and MC to include consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

It is expected that these deliverables will require medium effort to complete due to the impacts to several different NYISO software applications. Project benefits are expected to be high, because effective price signals would be established for more granular reserve procurements in load pockets within NYC. The market design will likely result in changes to reserve pricing, and therefore may benefit from being deployed in parallel with *Ancillary Services Shortage Pricing* and *Reserve for Resource Flexibility*, which are also expected to change reserve pricing. Further, load pocket reserves could benefit from *Dynamic Reserve Requirements*, as utilization of transmission capabilities could assist in meeting load pocket reliability requirements in NYC. It may be beneficial to deploy Load Pocket Reserves in phases, by first implementing fixed requirements, consistent with other current reserve procurements, and then, in coordination with the *Dynamic Reserve Requirements* project, implementing a dynamic product.

Enhancing Locational Price Formation

Constraint Specific Transmission Shortage Pricing

This project seeks to improve resource scheduling efficiency and investment signals by enhancing the way that constraints on the transmission system are priced in the NYISO’s energy markets.

Problem Statement

Transmission facility and line ratings limit the amount of energy that can flow from one location to the next on the bulk electric system. As transmission constraints arise, the NYISO’s energy market software prices the quantity of energy that would be necessary to alleviate them. The existing transmission constraint

pricing logic excludes certain conditions, and may over or under-value constraints in other instances, which leads to market inefficiencies and adversely impacts long-term investment signals.

Background

Transmission constraint pricing logic enables the NYISO’s market software to re-dispatch efficiently to alleviate constraints, and incentivizes long-term investment in locations where resources could provide the greatest benefits. The existing transmission constraint pricing logic applies a single graduated transmission pricing mechanism to all transmission facilities assigned a non-zero constraint reliability margin (CRM) and does not utilize the graduated mechanism to price constraints in all instances. Some transmission constraints are relaxed without being resolved by the graduated mechanism.

The Market Monitoring Unit, the 2017 Securing 100+ kV Facilities whitepaper, and the 2017 Market Assessment all recommended that the existing transmission constraint pricing logic be revised. A 2018 NYISO study concluded certain enhancements to the current transmission constraint pricing logic should be further explored with stakeholders¹⁷. Based on that study, the NYISO proposes to utilize more refined demand curves that better account for the various non-zero CRM values assigned to facilities. Using more refined demand curves to establish pricing levels will enable the NYISO’s market software to reflect the severity of transmission constraints with better precision.

The NYISO also proposes to eliminate most occurrences of constraint relaxation, by instead seeking to utilize demand curve mechanisms to value all shortages for internal facilities. Appropriately pricing transmission violations should lead to more efficient resource scheduling in the short term, and more rational investment and retirement decisions in the long term.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

This project is expected to require medium effort to implement, due to its impact on several NYISO systems and processes, including the NYISO’s market software and price validation procedures. The benefits are expected to be medium as well, because the project will promote incremental improvements in price formation and investment signals compared to the current transmission constraint pricing logic.

¹⁷ See Constraint Specific Transmission Shortage Pricing report, [https://www.nyiso.com/documents/20142/2549789/Constraint%20Specific%20Transmission%20Shortage%20Pricing%20-%20Paper Final.pdf/7f69227a-7ca8-656e-b895-of8147635319](https://www.nyiso.com/documents/20142/2549789/Constraint%20Specific%20Transmission%20Shortage%20Pricing%20-%20Paper%20Final.pdf/7f69227a-7ca8-656e-b895-of8147635319) .

The NYISO's energy market software uses factors such as resource costs and facility ratings to evaluate tradeoffs between transmission constraints and procurement of other required products and services, such as reserves. If transmission constraint prices intersect with reserve prices incorrectly, they might drive non-intuitive or inefficient market outcomes. Because operating reserve prices must be considered in parallel with transmission constraint prices, this project is dependent on the completion of both *Ancillary Services Shortage Pricing* and *Reserve for Resource Flexibility*, which are expected to change reserve pricing.

Deployment timeline is currently being considered for this and other competing projects. As the designs for this and other dependent projects evolve, the NYISO will consider whether an earlier deployment may be possible.

The following deliverables will need to be completed prior to deployment.

- Revision of market design concept to reflect any changes resulting from the dependent ancillary services projects.
- Market Design Complete presentations to MIWG, BIC, and MC to include consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

Enhanced Fast Start Pricing

This project seeks to revise pricing logic for resources that can start up in 30 minutes or less, to improve price formation and incentivize new investment.

Problem Statement

Start up and minimum-generation (no load) costs are not included in supplier energy market offers today, because they are not considered marginal costs. Not enabling fast start resources to include these costs in their economic offers may undervalue their contributions to managing an increasingly volatile grid.

Background

On December 21, 2017, the FERC issued an order to the NYISO related to fast-start pricing in the NYISO-administered markets. Consistent with the Commission's instructions, the NYISO filed an Initial Brief on February 12, 2018 outlining the NYISO's proposed approach to amend its tariffs and revise its market software to:

- (1) Modify pricing logic to allow fast-start resources' commitment costs (i.e., start-up costs and minimum

generation (no-load) costs) to be reflected in prices; and

(2) Allow the relaxation of all dispatchable fast-start resources’ economic minimum operating limits by up to 100 percent for the purpose of setting prices.”^{18,19}

The NYISO’s MMU has previously recommended that the startup costs of gas turbines be included in LBMPs to allow the NYISO’s real-time energy prices to “reflect the full costs of the resources needed to satisfy the system’s demands.”²⁰

The Order does not propose to change NYISO’s start-up time requirement or other price setting eligibility criteria for fast-start resources. The NYISO expects that it will continue to require fast-start resources to be able to start, synchronize to the grid and inject Energy in 30 minutes or less. The NYISO will also continue to require fast-start resources to have a minimum run time of one hour or less and to submit economic energy offers (*i.e.*, not self-schedule offers) into the market for evaluation. NYISO intends to exclude Generator offers to self-schedule Energy from the resource offers used to establish prices. In New York, all resources must submit flexible, economic energy offers to have their offers considered during price setting in the NYISO-administered markets.

Project Scope

2019	2020	2021	2022	2023	2024	Effort	Benefits

In its Initial Brief, the NYISO requested an implementation date of Q4 2020. The NYISO expects to complete the fast-start pricing market design in 2019, with implementation to follow quickly afterwards. Project efforts will be dependent on the timeline set by the FERC. The following deliverables will be in scope once a response is received from the FERC, prior to deployment.

- Revision of market design to reflect any changes mandated by the FERC’s response to NYISO’s initial brief.
- Market design discussions with stakeholders as time allows
- Consumer impact analysis

¹⁸ See FERC Docket No. EL18-33-000, available at this link: <https://www.ferc.gov/whats-new/comm-meet/2017/122117/E-3.pdf>

¹⁹ See NYISO Initial Brief, FERC Docket No. EL18-33-000, NYISO (February 12, 2018), available at this link: https://nyisoviewer.etariff.biz/ViewerDocLibrary//Filing/Filing1351/Attachments/20180212_NYISOInitialBrief_FastStart206.pdf

²⁰ See Recommendation 2014-10 in 2016 *State of the Market Report for the New York ISO Markets*, Potomac Economics (May 2017), p 96, available at this link: <https://www.nyiso.com/documents/20142/2223763/2016-State-Of-The-Market-Report.pdf/2feb2a59-df4c-e967-0a53-6818458a3138>

- Software development
- Testing

Because the market design as filed is well understood, and the NYISO does not expect to receive significant revisions from the FERC, the remainder of the market design effort is expected to be low. Software development and testing will require medium effort due to the impact to several different NYISO software applications, including the market and settlements software. Due to the focused nature of this project, it is expected to produce medium benefits.

The proposed pricing logic will influence price formation in the NYISO-administered Day-Ahead and Real-Time markets, and should be considered in conjunction with other projects such as the development of ESR and DER participation models.

Reliability Value of Resources

Demand Curve Reset

The demand curve reset (DCR) is a quadrennial study required by the NYISO Services Tariff of the various parameters used to set the Installed Capacity (ICAP) Demand Curves that seeks to align the capacity market with the expected costs of adding new capacity in New York State.

Problem Statement

Every four years, the NYISO and its stakeholder community engage in a study, referred to as the DCR, to examine the various parameters used to set the ICAP Demand Curves. Per the NYISO Services Tariff, the study includes an examination of potential peaking unit technologies and the financial parameters assumed in the construction and operation of that unit, along with an estimate of the projected profit earned in the Energy and Ancillary Service markets, to determine the unit with the “lowest fixed costs and highest variable costs among all other units’ technology that are economically viable”.

Background

This periodic review of the ICAP Demand Curves is done to analyze whether the capacity market continues to efficiently support reliability and send accurate, transparent price signals. The frequent, 4-year assessment also enables the NYISO to create new capacity zones when established criteria are met. NYISO is required by its Services Tariff to hire an independent consultant every four years to assist with completion of the DCR and to provide recommendations for updating the demand curves. The consultant performs the demand curve study and support tasks, which require assistance from the NYISO staff. Recommendations regarding the parameters and assumptions used to establish the demand curves are subject to stakeholder

comment and review and approval by the NYISO Board.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

The review is performed by engaging an independent consultant to lead stakeholders through the DCR process. The consultant’s efforts extend beyond examining demand curve inputs and parameters to include supporting evaluation of alternative demand curve shapes and zero crossing point methodologies that may achieve enhanced market performance. The DCR is a two-year long effort that begins two years prior to when the new ICAP Demand Curves become effective; the current DCR will determine how to set the ICAP Demand Curves for the four Capability Years covered by the periodic review (2021-2025) beginning with the Summer 2021 Capability Period. This project reflects the second year of work that began in 2019, and the 2020 milestone for this project is Study Complete. The deliverables for this project include:

- A [report by the DCR consultant](#) and the [NYISO recommendations](#) on the parameters and inputs for the ICAP Demand Curves.
- A NYISO filing submitted to the FERC

The DCR process culminates in a filing submitted to the FERC on or before November 30, 2020 of the proposed curves for the first year of the reset period (the 2021/2022 Capability Year) along with the assumptions and methodology to be used to set demand curves for the subsequent three Capability Years of the reset period; pursuant to the tariff-prescribed annual update process (the 2022/2023, 2023/2024, and 2024/2025 Capability Years). A ruling from FERC with respect to the NYISO’s filing is anticipated to be issued in early 2021. The DCR is a resource intensive process for both the NYISO and stakeholders that has a significant impact on the market as a whole; as a result, this project is considered to have high benefit for a high effort.

Expanding Capacity Eligibility/Capacity Values

Every four years, the NYISO will select a consultant to reassess the reliability benefit of short duration resources in the NYISO markets and provide the right investment signals to developers.

Problem Statement

The NYISO recognizes that resources of various durations provide different reliability benefit to the grid. As the NYISO anticipated that shorter duration resources will increasingly enter the markets in the upcoming years, the NYISO conducted a review of the Capacity Values and subsequently proposed rules to allow shorter

duration resources to participate in the markets and to value these resources based on the reliability benefit that the resources provide to the system. Through the stakeholder process for the DER project, the NYISO proposed to re-evaluate the Capacity Values periodically to accurately reflect the reliability benefit of short duration resources in the As-Found System over time and send appropriate investment signals to developers. The implementation of the capacity values requires software changes to the NYISO systems to allow shorter duration resources into the markets.

Background

The NYISO has been engaged in a multi-year effort to allow shorter duration resources to be eligible to participate in the NYISO markets. The market design for the DER project proposes revisions to the NYISO Services Tariff to require a periodic review of the Capacity Values. The goal of the periodic review is to assess the changes to the reliability benefit of resources in the grid through time to continue to support reliable grid operations. Additionally, implementing software for this project will promote overall market efficiency.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

The successful implementation of these market changes is dependent on developing software to account for short duration resources and their corresponding capacity values. The NYISO will begin its deployment phase of this project in 2020 and intends to implement the capacity values from its first study for the 2021-2022 Capability Year. This project has high benefits as the NYISO is expecting that a large number of short duration resources will enter the market in the coming years. This project seeks to improve the efficient operation of the grid with respect to these new resources. Implementing this software change, along with revisiting capacity values on a recurring basis, represents a high effort.

In 2022, the NYISO will begin its periodic review process to evaluate the reliability benefit of Resources with Energy Duration Limitations. The NYISO will select a consultant to evaluate the durations, capacity values, and Peak Load Windows associated with Resources with Energy Duration Limitations participating in the NYISO Installed Capacity Market. The consultant will discuss the review process and present results to stakeholders throughout the review years. As prescribed in the proposed revisions to the Market Services Tariff, the review will be completed in 2023 and the results associated with the review are intended to be implemented in the 2025-2026 Capability Year. Modifications of the program will be subject to the NYISO's standard stakeholder process and, if changes are warranted, the determinations will be submitted with a

205 filing.

The deliverables for this project include:

- FRS
- Software Development
- Testing
- Discussions with stakeholders at MIWG/ICAPWG to define the scope of the review
- Hiring and assisting a consultant to perform the review as defined by stakeholders and the NYISO
- A report by the consultant and NYISO recommendations for the durations, capacity values, and Peak Load Windows associated with Resources with Energy Duration Limitations
- Presentations to the BIC and MC
- FERC tariff filing under FPA Section 205

Tailored Availability Metric

This project looks to incentivize capacity resources to be available and perform during peak hours of operation.

Problem Statement

One of the issues identified in the Performance Assurance initiative in 2017 included maintaining the availability and incentivizing performance of capacity suppliers during peak operating hours. The Tailored Availability Metric project addresses this by incentivizing resources to be available and perform during these critical operating periods.

Background

The Tailored Availability Metric project is a result of the ongoing Performance Assurance effort, which was prompted by a report by the Analysis Group in 2017. The report identified areas where the NYISO could improve its market design to better incent performance and reliability of all capacity suppliers. The objective for this project is to implement a market design that reflects higher value to resources that are available and can perform during peak operating hours. For the current derating factors, all hours of operation are weighted equally, following the belief that outages occur randomly. A tailored metric could weight critical operating periods higher than others, under the assumption that these stressed conditions occur during peak hours. Weighting these peak hours reflects the concept that availability and performance during these hours has higher significance to the reliability of the system. Through reevaluating the current structure of how availability and performance of capacity suppliers is measured, tailored metrics will better

indicate how much capacity these resources will be allowed to sell in the market. Through a series of analysis, different weighting factors could be applied to peak hours and months, incenting resources to better perform during these critical time periods. The 2020 deliverable is a complete market design by the third quarter.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits
						Effort

Analysis for this project will reassess the current metrics of the derating factors of all capacity resources in order to more accurately reflect performance or availability. The completed market design for the Tailored Availability Metric project is important to maintaining reliability and transparency by enhancing accountability of capacity suppliers. From the Market Design Concept Proposed to Implementation, this project is expected to be a medium effort with medium benefits to the reliability and efficiency of the grid. The project will reach the implementation stage through a series of deliverables including:

- Discussions with stakeholders at MIWG/ICAPWG to define the scope
- Market Design proposals presented to stakeholders at MIWG/ICAPWG
- Market Design Complete presentations to MIWG and BIC
- Changes to the NYISO ICAP Manual

Capacity Market Fundamentals

Improving Capacity Price Formation

The Improving Capacity Price Formation project aims to examine the effects of using different slopes and shapes for the ICAP Demand Curves.

Problem Statement

The NYISO is aware of potential volatility that occurs as a result from the current slope and shape of its ICAP Demand Curves. The current structure of the ICAP Demand Curves incents resources to remain in the Installed Capacity Market and deters resources from leaving the Installed Capacity Market due to price spikes that occur when resources enter and leave the market. It is anticipated that this problem will expand as new resource types enter the market at a fast rate in the upcoming years.

Background

The NYISO establishes its ICAP demand curves every 4 years for the upcoming years, which are used to set prices and send market signals in the capacity market for a four-year period. In recent years, the NYISO

has discussed the possibility of re-evaluating the slope and shape of the demand curves with stakeholders. It is important that the NYISO re-assess the slope and shape of the demand curves to provide the appropriate price signals for the market.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits
						<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Effort</div> <div style="background-color: #cccccc; padding: 5px; text-align: center; margin-left: 10px;">X</div> </div>

For the Improving Capacity Price Formation project, the NYISO will hire a consultant to conduct a study in 2021 to assess the impacts on capacity prices of various slopes and shapes of demand curves. It is essential that significant analysis is conducted and that discussions with stakeholders occur during the study process to foster sufficient stakeholder engagement regarding this potential market change. Any changes would be considered for implementation for the ICAP Demand Curves beginning with the Summer 2025 Capability Period. The deliverables for this project include:

- Discussions with stakeholders at MIWG/ICAPWG to define the scope of a study
- Hiring and assisting a consultant to perform the study as defined by stakeholders and the NYISO
- Market Design proposals presented to stakeholders at MIWG/ICAPWG
- Market Design Complete presentation to MIWG, BIC, and MC, to including tariff revisions
- FERC tariff filing under FPA Section 205
- FRS
- Software Development
- Testing

The NYISO anticipates that this project will take a total of three years from the initial study to deployment, and considers this to be a medium effort project. This is a complex topic that will require analysis and stakeholder discussion to determine what the appropriate demand curve slope and shape should be for the ICAP Demand Curves; due to the complexity and potential to impact a wide-range of capacity price outcomes, this is considered a high benefit project. This project must occur during the interim period between the NYISO’s study periods for the Demand Curve Reset.

Capacity Zone Evaluation

The Capacity Zone Evaluation project will review the existing rules that govern how, when and why Capacity Zones are established, changed or eliminated, and evaluate if additional rules or modifications to the existing rules are needed.

Problem Statement

The NYISO currently only has rules for the evaluation of whether to create, and if appropriate, to create Capacity Zones (i.e., Localities) on a time line that coincides with the demand curve reset. The rules are based upon a generator deliverability test. A more holistic model governing a larger scope of Capacity Zone processes and issues, and potentially including a process to eliminate zones, may be warranted.

Background

The rules surrounding Localities have been a focus of stakeholders, the NYISO, and the external Market Monitoring Unit for a number of years. Efforts to revise the rules initiated in 2017 and 2018 were not fruitful. Localities recognize the need for capacity additions in different areas of the NYCA when there are transmission constraints between the Load Zones that prevent installed capacity from one area from meeting capacity needs in another area. Localities provide a mechanism to send proper price signals for locational capacity needs beyond state wide resource adequacy, attract new resources to enter the market and to retain existing resources in order to maintain system reliability.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

The NYISO is proposing to evaluate changes to the methodology for evaluating the creation of Localities, rules for the elimination of Localities, adjusting the frequency of establishing Localities, separating import and export constrained zones, and Dynamic Capacity Zones. This project will improve market efficiency and the reliable operations of the grid by setting up Localities that are efficient at sending price signals for resource adequacy needs; as such, we anticipate this project to produce high benefits for the capacity market. Due to the complexity and previous experiences addressing this topic, the NYISO considers this to be a high effort project.

This project is expected to start with a study in 2021, evaluating the various options available for Capacity Zone designs. From that study, a Market Design will be developed and presented to stakeholders for review and approval, with any revisions that are approved in time for the 2023-2024 Demand Curve Reset process used to establish Demand Curves for the 2025-2028 Capability Years. The deliverables for this project include:

- Discussions with stakeholders at MIWG/ICAPWG to define the scope of a study
- Hiring and assisting a consultant to perform the study as defined by stakeholders and the NYISO

- Market Design proposals presented to stakeholders at MIWG/ICAPWG
- Market Design Complete presentations to MIWG, BIC, and MC, including tariff revisions
- FERC tariff filing under FPA Section 205
- FRS
- Software Development
- Testing

Comprehensive Mitigation Overview

While there have been many incremental changes to align mitigation measures with changes in the market, there has not been a holistic evaluation of the Buyer-side Market Power Mitigation (“BSM”) rules and methodology to evaluate whether the current framework will be adequate in a future with significant renewable resources and ambitious policy objectives.

Problem Statement

The capacity market has undergone significant changes in both design and resource mix since the BSM measures were first implemented in May of 2008. The BSM rules were originally developed to evaluate traditional generators funded primarily by privately owned capital, but new resource types, such as battery storage, renewable generation and DER, are fundamentally different in design and operation. Additionally, these resources are more likely than traditional generator technologies to be partially funded by governmental entities to meet policy goals or promote environmental attributes. New rule sets and tests may provide a better evaluation of these resources for instances of buyer-side market power and thus result in more accurate BSM determinations.

Background

In its most recent Strategic Plan (2019-2023), the NYISO identified the “comprehensive review of the NYISO’s existing market products and operational and planning practices” as a key strategic initiative. Evaluating the mitigation framework is an essential part to maintaining efficient resource entry and exit as the generation mix rapidly changes in the coming years. As this project may result in a redesign of the BSM framework and two economic entry exemption tests (“Mitigation Exemption Test”), it is considered to have a high benefit with a medium level of anticipated effort.

Project Scope

2019	2020	2021	2022	2023	2024

The NYISO will perform a comprehensive review to examine the current BSM framework and principles to determine whether the rules efficiently mitigate concerns of buyer-side market power for both traditional and new resource types with both private and public funding considerations. As part of the review, alternative methods to perform the Mitigation Exemption Test for new resources and Additional CRIS projects will be considered. The 2020 goal for this project is to discuss with stakeholders the scope of a study, to be performed in 2021, along with a schedule for the work to be performed and the selection of a consultant to perform the study. If changes are deemed to be warranted, proposed market design changes will subsequently be completed and deployed, subject to stakeholder, NYISO Board, and acceptance by FERC. The deliverables for this project include:

- Discussions with stakeholders at MIWG/ICAPWG to define the scope of a study
- Hiring and assisting a consultant to perform the study as defined by stakeholders and the NYISO
- Market Design proposals presented to stakeholders at MIWG/ICAPWG
- Market Design Complete presentation to MIWG, BIC, and MC, including tariff revisions
- FERC tariff filing under FPA section 205
- Implementation

It is not anticipated that this project will require significant software development. With an anticipated timeline of approximately four years, this project is anticipated to require medium effort.

New Resource Integration

New Resource Participation Models

Energy Storage Resource Participation Model

This project aims to deploy a participation model for Energy Storage Resources (“ESRs”) with a minimum size of 100kW to effectively participate in the NYISO’s energy, capacity and ancillary services markets.

Problem Statement

Currently, the NYISO does not have a market participation model for ESRs that recognizes their unique physical and operational characteristics to both inject and withdraw energy. ESRs ability to shift load as a consumer when load is low and as a supplier when load is peaking, can help grid operators handle peak demand, manage the variability of intermittent resources, provide quick responding standby service, such as synchronous operating reserves and could significantly increase both resource flexibility and grid resilience. Although certain types of ESRs can participate in the NYISO markets today, the existing market products offer

limited opportunities to provide Energy and Ancillary Services. Recognizing these limitations, this project is to implement a participation model for ESRs that provides increased resource flexibility and reliable market operations while preparing for a future where a significant number of generation assets are intermittent and weather-dependent.

Background

In December 2017, the NYISO published a “State of Storage” report that outlined the Market Design Concept Proposal for Energy Storage Integration including minimum eligibility requirements, aggregation eligibility requirements, registration and offer parameters, scheduling logic, settlements logic and mitigation framework based on the NOPR market rule requirements.

On February 15, 2018, FERC issued a final rule on the Electric Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators by issuing Order 841 on Electric Storage Participation in Markets Operated by RTO/ISO’s. The order includes a set of requirements that will help facilitate the participation of ESRs in the RTO/ISO markets as the ISOs current tariff does not recognize the operational characteristics of ESRs and limits the participation of ESR in the markets. On December 3, 2018, NYISO submitted its compliance filing in response to FERC’s Order No. 841 directives. The NYISO’s ESR participation model, recognizing the physical and operational characteristics, will allow storage resources to set wholesale clearing prices when both injecting and withdrawing from the grid and enable suppliers with a minimum offer size of 100kW to participate in the energy, capacity and ancillary services markets.

New York State’s initiatives such as the goal to install 1,500 MW of storage capacity by 2025, and 3,000 MW of storage capacity by 2030, provide incentives for developers to invest in storage technologies. Given the state and federal goals, it is imperative for the NYISO to develop a participation model to leverage the benefit storage resources provide.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

This project is a continuation of the implementation project started in 2019. This project will develop the software code and implement the ESR participation model to enable storage resources to participate in NYISO’s Energy, Capacity, and Ancillary Services markets. The objective of the project in 2020 is Deployment.

The NYISO’s market software is undergoing a significant upgrade as part of the EMS/BMS project. The EMS/BMS Upgrade project is currently slated to be deployed in October, 2019. Because the ESR participation

model has to be tested and deployed on the new software platform, this project is dependent on the timely deployment of the EMS/BMS project. In its compliance filing with FERC Order No. 841, the NYISO requested an implementation date of no earlier than May 2020.

The following deliverables will be in scope once dependent projects are completed, and prior to deployment.

- Updating Manuals and Guides
- Software development
- Testing

Hybrid Storage Model

This project seeks to develop market participation rules for front-of-the-meter generators collocated with energy storage resources.

Problem Statement

The NYISO's market rules do not offer a participation model for co-located front-of-the-meter generators and energy storage resources today. Instead, where two or more resource types are collocated behind the same point of interconnection, each resource type must be separately metered and have its own point identifier (PTID).

Background

Federal tax credits provide incentives for developers to couple storage and intermittent renewable assets. Such programs are aimed at reducing the volatility and improving the availability of intermittent resources. In order to improve flexibility and availability while reducing emissions, some developers are also considering coupling ESRs with gas turbines. This project will build on work completed as part of the Energy Storage Resource and Distributed Energy Resource Integration initiatives to develop market rules that better integrate generators and energy storage resources co-located behind a single interconnection point.

Developing a method for hybrid generation plus storage participation in the wholesale markets will support policy efforts to integrate more clean energy into the grid.

This project is distinct from the Distributed Energy Resource (DER) Integration initiative which has developed aggregation rules for smaller resources that are generally distributed behind multiple interconnection points. In the 2018 Master Plan, the NYISO proposed to consider participation rules for front-of-the-meter intermittent renewables collocated with ESRs. This project would accomplish the same goals with a slightly expanded scope by including other generator types.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

NYISO staff plan to develop a market design for hybrid storage installations beginning in 2020. The full scope of such a participation model and the software changes it would require are unknown at this time, but it would affect multiple NYISO systems and processes, such as credit requirements, settlements, market software, and mitigation. It is expected that the extensive design work that has already been completed for both the ESR and DER initiatives will provide a foundation for this market design. With limited foresight, NYISO staff anticipate that the market design phase will require medium effort, while the development will be medium to high, ultimately depending on its complexity and interaction with existing participation models. Because there are not a large number of such projects currently in the NYISO’s interconnection queue, the benefits of implementation are currently estimated to be medium. Deliverables to be completed prior to deployment will include:

- Market Design Complete presentations to MIWG, BIC, and MC, including a consumer impact analysis and tariff revisions
- Tariff filing with FERC under FPA Section 205
- FRS
- Software development
- Testing

Distributed Energy Resource Integration

DER Participation Model

This effort will position the NYISO for future trends in electric grid advancements and allow for aggregations, including DER to participate in the wholesale electricity markets as well as more closely align those resources with limited duration capability to their respective Capacity payments.

Problem Statement

Technological advancements and public policy support are encouraging greater adoption of DER to meet consumer energy needs as well as system needs. DER offer the potential to make load more dynamic and responsive to wholesale market price signals, potentially improving overall system efficiencies.

Background

Throughout 2018 & 2019 the NYISO will have worked through concepts, proposals and Tariff edits for the Distributed Energy Resource (DER) Market Design Concept Proposal to enhance its market rules for DER to participate in NYISO’s capacity, Day-Ahead and real-time Energy and Ancillary Services Markets. The NYISO has also evaluated potential modifications to its existing Demand Response programs in order to enable this effort. Operational & performance changes to existing demand response programs are not required at this time but net payments to these resources will be impacted by the outcome of the proposed capacity market rule changes which are to be filed with this project.

This project will have many facets that ultimately support New York’s REV goals and compliance with FERC Order 719, 745 and 841, while simplifying the operational matrix of rule sets for product offerings of both demand response and distributed resources, for all stakeholders involved. These changes more closely align the bidding and performance measurements for those resources mentioned with the rule sets for Generators. By doing this, the NYISO hopes to create a rule set that is more universally applicable to all resources.

This project will use the rules created in the 2018 & 2019 Market Design effort to develop the Functional Requirements Specification (FRS) that will drive the software development effort in 2020.

The software development required to support the FRS will include new software and/or modifications to existing software that supports DER eligibility and registration, aggregations, bidding and scheduling, performance obligations, metering and telemetry requirements, measurement and verification of baselines and performance, modeling, settlements, capacity market participation, interconnection, CRIS, incorporation into planning studies, market mitigation, simultaneous participation of DER in retails/distribution-level programs as well as the NYISO’s wholesale program, and changes to the payment structure of existing demand response Capacity suppliers (SCRs) to enable this effort.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits	
						Effort	X

The 2019 deliverable for this project includes Functional Requirements. In 2020, Development complete will allow for Deployment in 2021 upon approval from stakeholders and the Board, as well as FERC acceptance of tariff revisions. In order to meet the 2021 deployment timeline milestone, the following deliverables will need to be completed:

- Market Design Complete Presentations to MIWG, BIC, Board and MC, including tariff revisions
- Tariff filing with FERC under FPA Section
- FRS
- Software development
- Testing

Development complete for new software and/or modifications to existing software that supports the business approved FRS implement dispatchable distributed energy resource participation in the wholesale markets which includes:

- Eligibility and registration
- Aggregations and Modeling
- Bidding and scheduling
- Performance obligations
- Metering and telemetry requirements
- Measurement and verification
- Settlements and cost allocation
- Capacity market participation
- Interconnection, CRIS, and incorporation into planning studies
- Market mitigation
- Dual participation in retail/distribution programs
- Changes to existing demand response programs to enable this effort

The NYISO expects the above deliverables and overall initiative to require ongoing high effort, given the extent of software development and market design necessary for effective and timely implementation. This project is expected to have high benefits, by allowing the NYISO to cultivate a market that is accessible and competitive for DER, in line with REV state policy goals.

NYISO Pilot Framework

This effort would allow NYISO staff to engage and learn about nascent technologies and their applications on the electric power system which would allow staff to prepare for future market design changes.

Problem Statement

Technological advancements and evolutions in DER market design drive a desire for the NYISO to understand distributed resource aggregation and dispatch in a test environment before DER developers commit to wholesale market participation. The NYISO and Market Participants can share knowledge on DER coordination efforts and aggregation configurations without risking the economic welfare of consumers and

the broader market. Before DER can further define the electrical landscape of the NYISO market, a Pilot Program presents an opportunity for the NYISO and Market Participants to learn and best prepare for a distributed grid.

Background

In conjunction with the development of the Distributed Energy Resource Participation Model, the NYISO will leverage Pilot projects to test new energy technologies. This project will use the Pilot Test Environment and framework that will allow developers of new or emergent technologies and the NYISO to gain knowledge about the technology’s capabilities and uses as well as supporting REV demonstration efforts. This will ultimately inform the NYISO of possible changes to market rules to appropriately incorporate new technology capabilities and meet grid needs. This pilot framework concept will not pay resources while the resource is within the pilot phase.

This project helps to position the NYISO for future trends in electric generation, storage and price responsive dynamic loads that will change the landscape of the current electrical grid. Technological advancements and public policy support are encouraging greater adoption of Distributed Energy Resources (DER) to meet consumer energy needs as well as system needs. DER offer the potential to make load more dynamic and responsive to wholesale market price signals, potentially improving overall system efficiencies.

Project Scope

2019	2020	2021	2022	2023	2024	Effort	Benefits

The NYISO expects this effort to span two years, with the anticipated Study Complete in 2020. This is a medium effort project that involves a number of stakeholders in testing, and requires continuous development of operating procedures to accompany new methodologies. The project will have medium benefits, as the results of the study will ultimately allow the NYISO to develop market rules that appropriately incorporate new technological capabilities and meet grid needs. In order to effectively execute this study, the following deliverables will need to be completed:

- Share the learnings of the completed pilot projects assessed with internal and external stakeholders
- Create a final report of the cumulative findings and performance of all pilot projects

Meter Services Entity for DER

This project seeks to create a third party metering construct providing additional flexibility, optionality,

and a modern approach to data services currently unavailable to Market Participants.

Problem Statement

The NYISO relies on accurate and timely information to efficiently and reliably run the grid of today and the grid of tomorrow. The changing landscape of New York’s existing metering constructs provides the opportunity for the NYISO to deploy a new metering construct that is equipped to meet the requirements of a dynamic transitioning grid where Distributed Energy Resources play an increasingly larger role in meeting system needs.

Background

The proliferation of Distributed Energy Resource participation in NYISO markets presents a challenge to existing metering constructs in New York with potentially thousands of resources needing meters to be installed, certified, and maintained, along with all the data services associated with meter data submissions.

Throughout 2017, 2018, and 2019 the NYISO will have worked on a comprehensive review of metering constructs throughout North American wholesale markets, culminating with Tariff amendments creating the Meter Services Entity (MSE) construct. The MSE construct is a replacement and enhancement of the previous Meter Data Service Provider construct. The MSE construct provides the opportunity for Market Participants to procure metering and meter data services from third party entities while maintaining a reliable and economically efficient grid.

This project helps to position the NYISO to respond to future changes in the rapidly changing world of data services and allow third parties to provide meter services delivering increased optionality and opportunities for Market Participants.

Project Scope

2019	2020	2021	2022	2023	2024	Benefits
						<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Effort</div> <div style="background-color: #cccccc; padding: 10px; text-align: center; margin-left: 10px;">×</div> </div>

The NYISO has been developing a Market Design for this effort as part of the DER Participation Model throughout 2018 and 2019. It is expected that, pending stakeholder, NYISO Board and regulatory approvals, this project will be deployed in 2020. In order to achieve this milestone, the following deliverables will need to be completed prior to deployment:

- Market Design Complete presentations to MIWG, BIC, and MC, including tariff revisions
- FERC tariff filing under FPA Section 205

- FRS
- Software development
- Testing

It is expected that these deliverables will require a medium effort to complete. Despite the limited years until deployment remaining, the creation of a new metering construct is an area the NYISO has limited subject matter expertise. Project benefits are expected to be medium as well, as a third party metering construct has the potential to reduce barriers to entry for DER in wholesale markets.

Dual Participation

The NYISO’s proposed DER market design will allow resources that provide wholesale market services to also provide services to entities outside of the NYISO wholesale markets (e.g., the utility or a host facility).

Problem Statement

Current NYISO wholesale market rules do not outline avenues for injection type resources to contribute both wholesale and retail services, restricting the potential net benefit to the electrical grid. From a reliability, resiliency and economic standpoint, disallowing wholesale resources from accessing the retail market hinders growth in the grid and an overall transition to a more dynamic operation. The NYISO believes that providing resources with the flexibility to meet wholesale and distribution system needs will deliver the maximum benefit to New York electricity consumers.

Background

Technological advancements and public policy support are encouraging greater adoption of DER to meet consumer energy needs as well as system needs. DER offer the potential to make load more dynamic and responsive to both wholesale and retail market price signals, potentially improving overall system efficiencies. Resources participating in the wholesale markets will continue to be obligated to follow all applicable NYISO market rules and utilize good utility practices.

Project Scope

2019	2020	2021	2022	2023	2024	Effort	Benefits

The rules proposed in the DER market design allow for the flexibility of all resources in the NYISO markets to also offer services in the retail markets. Dual participating resources will be required to comply with all NYISO market rules for services offered to the wholesale market, and non-compliance may result in

financial penalty. It will be required that resources appropriately reflect any non-wholesale (*e.g.*, retail) obligations when bidding into wholesale markets. Resources will still be required to follow NYISO dispatch instructions at all times, and will submit offers to NYISO when providing non-wholesale service regardless. Resources will receive payments for Energy or Ancillary Services through wholesale offers properly reflecting all obligations.

The 2019 deliverable for this project includes Functional Requirements, and in 2020, Development complete and Deployment upon approval from stakeholders and the NYISO Board, as well as FERC acceptance of proposed tariff edits. The NYISO will continue to work with utilities to support operational coordination framework for DSP development, which is an ongoing effort in enabling dual participation for DER and Aggregators. The NYISO anticipates a medium effort for this project, considering the software developments and market design specifications ongoing in the DER Participation Model. The project will have high benefits, enabling resources to access both retail and wholesale market opportunities for maximized economic and grid benefits. In order to meet the 2020 deployment timeline milestone, the following deliverables will need to be completed:

- Market Design Complete Presentations to BIC, Board and MC, including tariff revisions
- FERC tariff filing under FPA Section 205
- FRS
- Software development
- Testing

Conclusion

NYISO is currently developing many of the projects discussed in this document, and nearly half are in the conceptual design phase. While all of the initiatives described herein may offer value to the wholesale markets, the NYISO does not have the resources to complete the detailed design and implementation of all of them simultaneously. Unplanned work may also result from future FERC orders and stakeholder input, causing the proposed timelines to require revision. In light of these and other unknowns, this document lays out what the NYISO believes to be an efficient path toward market reform, in preparation for anticipated changes to the bulk power system as a result of state policies, FERC compliance directives, and evolving technology.