UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Modernizing Electricity Market Design Docket No. AD21-10-000

Initial Post-Technical Conference Comments of the New York Independent System Operator, Inc.

The New York Independent System Operator, Inc. ("NYISO") provides these Initial Comments in response to the Commission's December 6, 2021 Notice Inviting Post-Technical Conference Comments ("Notice"). The NYISO's Initial Comments address topics raised at the September 14, 2021 and October 12, 2021 technical conferences the Federal Energy Regulation Commission ("Commission" or "FERC") convened to discuss energy and ancillary services markets in the evolving electricity sector.

I. Introduction—Transformation of the Electric Grid in New York

Technological developments, economic and environmental considerations, and public policies are transforming the electric grid and resource mix in New York. The New York State Climate Leadership and Community Protection Act ("CLCPA") mandates that 70% of the State's load be served by energy generated from renewable resources by 2030, and that 100% of the energy serving load be zero emission by 2040. The CLCPA also requires the installation of 6,000 MW of distributed solar resources by 2025, 3,000 MW of storage resources by 2030, and 9,000 MW of offshore wind resources by 2035. It also requires an 85% reduction in economy-wide greenhouse gas emissions by 2050. New York Governor Kathy Hochul recently announced an expansion of the distributed solar goal to 10,000 MW by 2025.

Since the CLCPA was enacted in 2019, the NYISO has taken steps to better understand the reliability, operational, and market implications of such a transformation in the resource mix operating within the state. In late 2019, the NYISO released a report outlining *Reliability and*

Market Considerations for a Grid in Transition,[1] its "Grid in Transition report" and a look at the anticipated long-term load impact.[2] In 2020, based on the considerations described in its Grid in Transition report, the NYISO released two important studies, *New York's Evolution to a Zero Emission Power System*[3] and *Climate Change Impact and Resilience Study*.[4] These studies helped inform the NYISO and its stakeholders about the operational, reliability and investment implications of transitioning to a carbon free grid by 2040. The Grid in Transition report and following studies continue to frame the NYISO's approach to evolving its market design, including the NYISO's consideration of enhancements to the energy and ancillary services markets.

The three reports highlight potential issues that, if not addressed early, could lead to poor investment decisions or, worse, reliability issues. Some of the potential issues identified by the reports include:

- The variability of output from wind and solar resources presents a fundamental challenge to balancing supply with electricity demand, while the growth of behind-the-meter supply will increase the variability of demand on the system, making load more dynamic than it is today;

[1] Grid in Transition report - https://www.nyiso.com/documents/20142/2224547/Reliability-and-Market-Considerations-for-a-Grid-in-Transition-20191220%20Final.pdf.

[2] *New York ISO Climate Change Impact Study: Phase 1: Long-Term Load Impact* https://www.nyiso.com/documents/20142/16884550/NYISO-Climate-Impact-Study-Phase1-Report.pdf

[3] *Evolution to a Zero Emission Power System* study - https://www.nyiso.com/documents/20142/13245925/Brattle%20New%20York%20Electric%20Grid%20Evolution%20Study%20-%20June%202020.pdf.

[4] *Climate Change Impact and Resilience Study* Official Phase 2 report - https://www.nyiso.com/documents/20142/16884550/NYISO-Climate-Impact-Study-Phase-2-Report.pdf.

- Battery storage resources help to fill-in short term reductions in renewable resources output, but extended periods of low- or zero-renewable output rapidly deplete the short duration storage capabilities of existing battery technologies;
- Dispatchable, emission-free resources with longer duration energy output capabilities are needed to balance renewable intermittency on the system; and
- Climate change will impact meteorological conditions and cause events that introduce additional reliability risks.

The power system will become more complex to operate reliably under these expected conditions, and the probability of reliability risks will grow due to uncertainties in demand, supply, and available infrastructure. The NYISO believes these risks can generally be described as risks to energy security. That is, risks to ensuring enough energy is available where needed for all New Yorkers continue to enjoy safe and reliable electric service.

The NYISO's responses to the Commission's questions incorporate its expectation that risks to energy security will increase in both the near-term as New York transitions to increased reliance on variable energy resources, and in the long-term. The NYISO must be able to provide reliable service even when actual resource output is less than anticipated, load is greater than expected, or when both conditions occur simultaneously.

II. Comments on Topics Addressed at September 14, 2021 Technical Conference

Panel 1: Understanding the Need for Additional Operational Flexibility in RTO/ISO Energy and Ancillary Services Markets

1. RTOs/ISOs and other industry experts generally agree that power systems will require greater flexibility from system resources in the future.[5] What operational capabilities or services will be most valuable to RTO/ISO operators in the future as the resource mix

[5] *See, e.g.*, CAISO, *Day-Ahead Market Enhancements Revised Straw Proposal*, at 7 (June 2020); SPP, *Uncertainty Product Whitepaper*, at 6 (Mar. 2020); NYISO, *Reliability and Market Considerations For A Grid in Transition*, at 8-9 (Dec. 2019).

and net load profile changes and why? Is there a desirable reaction time, sustained performance duration, etc. expected from a resource?

2. To what extent will the "traditional ancillary services" defined in Order No. 888[6] and existing energy market designs continue to ensure reliability as the resource mix changes in RTO/ISO markets in the future?

    a. Will traditional ancillary services provide the appropriate types and adequate quantities of operational flexibility RTOs/ISOs need to manage both expected (e.g., reasonably predictable) and unexpected (e.g., inherently uncertain and captured in forecast errors) variability in net load?

    b. Will existing RTO/ISO energy and ancillary services market designs that generally compensate certain traditional ancillary services resources based on the opportunity cost of foregone energy sales – for example, spinning and non-spinning reserves - give resources a sufficient economic incentive to offer their flexible capabilities to the RTO/ISO?

3. How should RTOs/ISOs define the system's need for operational flexibility, now and in the future?

    a. To what extent is operational flexibility needed on a bi-directional basis (i.e., both up and down) versus a unidirectional basis (i.e., only up or down)?

    b. How do these needs compare to the services provided by traditional ancillary service products?

NYISO Response

The NYISO currently manages energy security through its day-ahead and real-time energy and ancillary services markets. In these markets energy, regulation, 10-minute synchronous operating reserves, 10-minute non-synchronous operating reserves, and 30-minute operating reserves are simultaneously co-optimized by the NYISO's day-ahead security constrained unit commitment ("SCUC"), real-time commitment ("RTC"), and real-time dispatch

[6] Order No. 888 required the following six ancillary services be offered in an open access transmission tariff: (1) Scheduling, System Control and Dispatch Service; (2) Reactive Supply and Voltage Control from Generation Sources Service; (3) Regulation and Frequency Response Service; (4) Energy Imbalance Service; (5) Operating Reserve - Spinning Reserve Service; and (6) Operating Reserve - Supplemental Reserve Service. Order No. 888, FERC Stats. and Regs. ¶ 31,036, at 31,703 (1996).

("RTD") software.[7] However, considering emerging risks due to uncertainties, the NYISO believes changes to its energy and ancillary services markets will be necessary for the wholesale electricity markets to continue to support safe, reliable delivery of electricity to New Yorkers. Such uncertainties include weather, net load forecasts, actual available energy from intermittent wind and solar resources, available energy from limited energy resources, and higher probabilities of correlated resource or infrastructure failures.

Existing ancillary services products, such as regulation service, 10-minute synchronous operating reserves, 10-minute non-synchronous operating reserves, and 30-minute operating reserves, continue to provide value and support management of Area Control Error, secondary frequency response, contingency management, transmission security requirements, and load balancing. However, changes in the resource mix are leading to operational challenges including larger loss of supply contingencies in parts of New York, more variability in net load due to the addition of active resources behind the meter (both renewable and non-renewable) that the NYISO does not have direct line of sight to, and increased risk for and probability of correlated reductions in energy output from renewable resources that are clustered, such as offshore wind and behind-the-meter solar resources. These and other operational challenges related to simultaneously balancing consumer demand and intermittent supply are expected to increase over time.

Today, reliability rules require that operating reserve providers respond in 10 or 30 minutes, with an expectation that the energy output after the reserves are converted to energy can be sustained for at least one hour. The NYISO believes that additional ancillary service products

[7] Capitalized terms not otherwise defined herein have the meaning specified in the NYISO's Market Administration and Control Area Services Tariff and Open Access Transmission Tariff.

or modifications to existing ancillary service products will be required, that response times from resources will need to be quicker, and the duration of sustained energy output, once activated, will need to be longer than is typically needed today in order to address the operational challenges that managing large quantities of (i) limited energy/duration resources, (ii) intermittent renewable resources, and (iii) combinations of intermittent and duration-limited resources (*e.g.*, hybrid aggregations) present.

The NYISO expects that dynamically determining reserve requirements based on projected near-term resource commitments and dispatch, and changes to real-time look ahead capabilities to better manage limited energy/duration resources, will be necessary to ensure the markets procure sufficient ancillary services and efficiently utilize dispatchable resources to address operational risks.

Several of the NYISO studies mentioned in the introduction to the NYISO's Initial Comments, and the recently issued 2021-2030 Comprehensive Reliability Plan,[8] concluded that resource flexibility and availability will be key for managing the future grid.[9] New York suppliers will need to provide additional energy (to ramp-up energy output) when renewable availability is uncertain, or to manage more extreme correlated supply contingencies.[10] The NYISO has taken steps to place large-scale renewables on dispatch, which has provided an important tool to the operation of the grid and allows the NYISO to curtail (or ramp down) these

[8] 2021-2030 Comprehensive Reliability Report - https://www.nyiso.com/documents/20142/2248481/2021-2030-Comprehensive-Reliability-Plan.pdf.

[9] The 2021-2030 Comprehensive Reliability Plan also evaluates other reliability needs including system strength and inertial response needs. To date, the NYISO has not identified issues with inertial response and continues to monitor system strength.

[10] An example of an extreme correlated supply contingency might be loss of or reduced wind across several clustered land-based or offshore wind plants where the combined reduction in energy output far exceeds the largest single source contingency such as the loss of a nuclear plant.

resources to manage transmission constraints or over-generation issues. The NYISO is less concerned about the ability to ramp resources down and is more focused on having resources available to ramp-up when needed.

A study released by the NYISO in August 2021, *Grid Services for Renewables,*[11] concluded that separating regulation service into separate regulation-up and regulation-down products could allow the NYISO to better utilize existing resources[12] and provide new opportunities for renewables resources to provide ancillary services. However, the study noted that out-of-market payments to renewable resources for providing energy[13] make it unlikely for these resources to opt to provide regulation-down services unless regulation clearing prices increase significantly.

For example, a qualifying renewable resource might receive a Production Tax Credit ("PTC")[14] of $20/MWh, plus the locational-based marginal price ("LBMP") at its location for each MWh of energy it produces. Therefore, it would need to recover at least the same amount to make providing regulation service economic. In 2019 and 2020, Regulation Capacity prices in New York averaged $7/MWh and exceeded $20/MWh in less than 5% of intervals. Historic regulation service prices provide some indication that a renewable resource reflecting the opportunity cost of not providing energy in its regulation offer would rarely receive a regulation

[11] Grid Services for Renewables Report, August 2021 - https://www.nyiso.com/documents/20142/24130223/Grid%20Services%20from%20Renewable%20Generators%20Study.pdf.

[12] Separating regulation service into separate up and down products could also allow existing resources that are scheduled near their lower operating limit to provide the NYISO with additional upward ramp capability. This would provide access to additional resource capability to help the NYISO address some of its emerging operational challenges.

[13] Examples include production tax credits, renewable energy credits and investment tax credits.

[14] The PTC compensates qualified renewable facilities per kWh produced: https://www.epa.gov/lmop/renewable-electricity-production-tax-credit-information.

schedule. In addition, the NYISO's optimization generally seeks to maximize energy output from renewable resources because their energy offers are very economic (often negative values). Thus, the optimization would rarely schedule renewable generators to provide regulation service, and renewable resources may lack adequate incentive to become regulation service suppliers.

The NYISO's Grid in Transition Initiative Will Help it Identify Necessary Market Improvements

Meeting New York's CLCPA objectives and effectively addressing climate change will require electrification of various sectors of New York's economy, such as transportation and heating. With the expected increase in behind-the-meter solar and energy storage resources and the loss of fossil fueled dispatchable generation, predicting the load-shape and managing multiple load peaks throughout the day will become increasingly complex.

As part of its multi-year Grid in Transition initiative, the NYISO is continuing to work with its stakeholders to better define the operational risks and potential flexibility needs in a future of greater reliance on intermittent resources, higher load forecast uncertainty, and impacts of climate change.[15] The Grid in Transition review will evaluate whether changes to existing ancillary service products or new ancillary service products will be needed to incent the entry or continued operation of flexible resources, and to procure the desired operational responses from those resources.

[15] The current work builds on the NYISOs past work, including (1) the Grid in Transition report which describes emerging reliability and economic challenges facing New York's electricity sector, identifies gaps to address and proposes a path forward (*see* n.1 above); (2) Appendix B to the Reliability Gap Assessment included as part of the Grid in Transition report that identifies the upcoming reliability challenges and how they will be monitored and addressed (*see* n.1 above); two Climate Change studies, (3) the first focused on how load will change over time (see n.2 above) and (4) the second simulating the potential impacts of climate change and climate policy on the reliable operation of the New York power system (*see* n.4 above); and, finally (4) the NYISO's Comprehensive System Planning Process reports (available at https://www.nyiso.com/cspp) which assess risks to the grid on a going-forward basis.

Additionally, the NYISO will consider the efficacy of its existing market structures, and whether changes such as modifying the current structure and optimization horizons of its day-ahead SCUC, or its real-time RTC and RTD, are needed to manage the challenges of the future grid. The look-ahead capabilities of RTC and RTD do an excellent job of addressing short-term ramping needs that are forecasted an hour or so into the future. However, the limited look-ahead capability of these tools (one hour for RTD, 2.5 hours for RTC) means they do not have visibility into potential systems conditions several hours ahead, and could miss the opportunity to start a slower start resource or make other scheduling decisions to address an anticipated system condition. Instead, the NYISO might be forced to deploy a fast-start limited energy/duration resource, which would deplete its available energy and makes the resource unavailable for managing grid needs until it is able to recharge. Expanding the time horizons that RTC and RTD consider may help the NYISO make more efficient real-time scheduling decisions.

4. Could variable energy resources or new resource types (e.g., storage, hybrid, and co-located resources) be operated or dispatched differently from the status quo to provide greater operational flexibility to the RTO/ISO, if so, how? Given the evolving resource mix, are the current eligibility requirements for each resource type to provide ancillary services appropriate?

NYISO Response

Efficient Dispatch of Intermittent Renewable and Hybrid Resources

Part of the rationale for creating ISOs and RTOs was to improve efficiency in scheduling resources, resulting in reduced production costs for consumers. The ISOs and RTOs can do this because they have information about the power grid and interconnected resources that market participants cannot have due to confidentiality concerns and the potential for the exercise of market power. This information asymmetry places the ISOs and RTOs in the best position to determine the most efficient and effective resources to schedule to meet all of the needs of the grid and serve all consumers. Consumers will receive necessary reliability services at the lowest

cost available if the ISOs and RTOs continue their focus on the products and characteristics that are needed, and if the rules for new resource types allow them to participate in the markets where they provide reliability benefits.

The tools that ISOs and RTOs rely on to make scheduling decisions are extremely sophisticated and optimize the schedules of hundreds of resources considering thousands of constraints over multiple time periods. The NYISO's tools are designed to capture the operating characteristics of each resource and resource type to the fullest extent practical, while ensuring market solutions meet stringent reliability criteria established by the North American Electric Reliability Corporation ("NERC"), Northeast Power Coordinating Council ("NPCC"), and New York State Reliability Council ("NYSRC"). The NYISO's markets are necessarily robust; they are expected to be available 24 hours a day, every day.

The NYISO is working with its stakeholders to incorporate new resource capabilities, including integrated hybrid storage resources. The NYISO believes that dispatchable resources, including Energy Storage Resources ("ESRs"), can best be leveraged to provide flexibility to the system by being made available directly to the ISO/RTO for dispatch.[16] The NYISO's existing rules and market solutions are designed to accommodate renewable resource output without penalty, and to provide ESRs (including aggregations of ESRs) access to revenues from the energy, ancillary service and capacity markets.

The NYISO continues to be concerned about market participants independently determining how best to operate an aggregation, especially aggregations that include large-scale resources, without full understanding of actions the NYISO is taking to preserve grid reliability,

[16] The NYISO's ESR, Co-located Storage Resource ("CSR") and accepted, but not yet effective, single resource type DER aggregation rules all enable ESRs and ESR-only aggregations to be dispatched directly by the NYISO.

or how other market participants have been instructed to respond. Self-optimization of co-located resources by resource owners, which lack the NYISO's access to grid data and to the market offers submitted by other resources, is likely to result in inefficient scheduling of resources. The impacts of inefficient scheduling may include increased consumer costs, or even reliability issues if sub-optimal scheduling decisions result in resources not being available to address recognized, upcoming grid issues, such as forecasted storm watches (which require significant re-dispatch of generation when the transmission lines to New York City are at risk). To prevent inefficient scheduling, the Commission's policies must support and enhance ISO and RTO access to dispatchable resources, such as ESRs, that will be needed to balance intermittent resource output.[17]

Panel 2: Revising Existing Operating Reserve Demand Curves (ORDCs) to Address Operational Flexibility Needs in RTOs/ISOs

1. Contingency reserves are provided by existing 10- and 30-minute reserve products and are designed to ensure the system can recover from a contingency (e.g., a generator or transmission outage). How will the procurement of additional contingency reserves help RTO/ISO operators manage routine operational flexibility needs (e.g. needs driven by net load variability and uncertainty)?

2. What are the benefits of procuring contingency reserves beyond the minimum reserve requirement through a given ancillary service product?

    a. If employing such a method, how should RTOs/ISOs determine the market's demand for contingency reserves (both the quantity and willingness to pay) beyond the minimum reserve requirement of a given contingency reserve product?

    b. What principles should RTOs/ISOs follow if they consider revising the shape of the ORDC for a given contingency reserve product (e.g., introducing additional

[17] If an ESR participates in the energy and ancillary services markets as part of an integrated "black box" hybrid aggregation that includes wind or solar intermittent power resources ("IPRs"), then the ISO's or RTO's dispatch will not directly incorporate (i) the current output of the IPRs, or (ii) the state of charge of the ESR (which determines the ESR's ability to inject or withdraw energy). ISOs and RTOs can most efficiently utilize ESRs to balance intermittent output when they know the state of charge and can directly dispatch the ESR to inject or withdraw energy, or schedule the ESR to provide ancillary services consistent with its capabilities.

> steps or graduation to the ORDC curve)? For example, should the willingness to pay for such additional reserves be based on the Value of Lost Load times the loss of load probability with a given quantity of the reserve product associated with the ORDC, the cost of actions operators would take to procure additional reserves, or some other valuation method? How should customer willingness to pay be incorporated?

NYISO Response

The evolution of New York's electric grid to a carbon-free energy system, with increasing reliance on weather-dependent generation sources, introduces the potential for additional system volatility. Access to sufficient flexible resources is of paramount importance as New York's level of reliance on weather-dependent renewable generation increases over time. In 2021, the NYISO commenced discussions with its stakeholders regarding the development of a process to facilitate reserve procurements in excess of minimum reliability requirements. The NYISO referred to such additional reserves procurements as "supplemental reserves." Supplemental reserves are intended to help maintain system reliability as the transition of New York's energy system continues to rapidly unfold over the coming years.

The proposal the NYISO discussed with its stakeholders was designed to primarily address potential needs that could arise quickly if (for example) the NYISO's forecast simultaneously underestimates real-time load and overestimates real-time production from weather-dependent renewable generation resources. The proposal sought to leverage metrics based on actual operating data to identify the potential need to procure supplemental reserves. The NYISO proposed to utilize its observed under-forecast net load as a key metric for evaluating the need to procure supplemental reserves. The NYISO uses this metric to measure the observed increase in un-forecasted system volatility and variability arising from increasing penetration levels of weather-dependent renewable resources and the potential for more dynamic load.

The NYISO's supplemental reserves proposal would have also revised the NYISO's existing reserve demand curves to include new, predefined shortage pricing values for any future supplemental reserves. In comparison to the shortage pricing values for currently existing reserve requirements, the NYISO contemplated assigning lower values to any future supplemental reserve requirements. The assignment of lower shortage pricing values to supplemental reserves would: (1) provide appropriate priority for the procurement of the reserve quantities necessary to comply with minimum reliability requirements prior to procurement of incremental reserve quantities; and (2) establish efficient pricing levels to facilitate the procurement of supplemental reserves when reserve capability is available from resources at a relatively low cost.

The NYISO believes that establishing procedures to procure supplemental reserves is a prudent, proactive measure to facilitate maintaining reliability in response to the rapidly transforming electric grid in New York State. However, in 2021, the Commission rejected a supplemental reserves proposal submitted by the NYISO, without prejudice, because the proposed revisions lacked sufficient specificity. In doing so, the Commission indicated the proposal would require additional tariff provisions to provide further details about triggering metrics for determining whether to purchase supplemental reserves and the quantity of supplemental reserves that would be procured.[18]

The NYISO is currently focused on including the ability to dynamically determine reserve requirements within its market software. There are two primary benefits that could be gained by employing dynamic reserves. First, dynamic reserves tailor the reserve requirement and the reserves procured to cover the largest contingency that could potentially occur under the

[18] *See New York Independent System Operator, Inc.*, 175 FERC ¶ 61,241 at PP39-43 (2021).

current system conditions. Second, dynamic reserves permit locational reserve requirements to be met more efficiently by allowing resources located outside a locational reserve region to provide reserves to the extent there is unused interface capability into the reserve region, rather than always scheduling reserves on resources located within the reserve region.[19]

Dynamic determination of reserve requirements has the potential to support the CLCPA by allowing more economic clean energy to be imported into the New York Control Area ("NYCA") from external control areas such as Hydro Quebec. Employing dynamic reserves may also permit the NYISO to effectively account for and secure the significant quantity of offshore wind generation that is expected to be interconnected to Long Island and New York City. The NYISO plans to revive discussions with its stakeholders to refine and finalize a proposal to establish appropriate procedures for implementing supplemental reserve procurements after the capabilities of the dynamic reserves process are better understood.

Finally, as part of its ongoing Grid in Transition effort, in 2022 the NYISO will continue to investigate the need to make market structure changes, including the procurement of additional ancillary service products. The NYISO's investigation may include evaluation of a longer-duration operating reserve product if data indicates that adding such a product would be beneficial.

3. Reserve shortage prices are administratively determined penalty factors invoked when the system falls below the minimum requirement of one or more reserve products. To what extent can higher reserve shortage prices inform investment decisions and reflect the value of flexible resource capabilities?

    a. What principles should RTOs/ISOs follow if they consider revising the shortage price associated with the ORDC of a given contingency reserve?

[19] The optimization would consider the cost of procuring reserves in the reserve region, the cost of procuring reserves outside the reserve region, and the cost of redispatch to relieve the tie lines into the reserve region.

b. How should the shortage prices of individual contingency reserve products be determined? For example, should the shortage prices reflect the marginal reliability value of each individual reserve product? How should customer willingness to pay be incorporated?

c. How should shortage pricing be implemented when the system is short both 10- and 30-minute reserves? Does establishing shortage prices based on the marginal reliability value of each contingency reserve product that is in shortage ensure that adding the shortage prices reflects the combined reliability impact of being short of those reserve products?

d. Do differences in shortage prices across regions present operational challenges today? Is there an expectation that such differences could present operational challenges in the future as the resource mix and load profiles change? Is there a need to better align shortage pricing across RTOs/ISOs, and if so, what principles should be considered in doing so?

4. To what extent do RTOs/ISOs use contingency reserves to manage non-contingency related operational uncertainties (e.g., expected and unexpected net load variability)? If such reserves are used for this purpose, should this alter an RTO/ISO's approach to establishing the maximum height and shape of the ORDC? Under such approaches, how do prices in the ORDC appropriately reflect the marginal reliability value contingency reserves provide?

5. Is there a particular point at which procuring reserves beyond the minimum reserve requirement can reduce or conflict with the objectives of shortage prices? What is an appropriate balance between raising shortage prices and procuring reserves beyond the minimum reserve requirement given that procuring additional reserves can reduce the probability of the RTO/ISO experiencing a shortage?

NYISO Response

Shortage Pricing, Scarcity Pricing and Operating Reserve Demand Curves

The NYISO uses "shortage pricing" to reflect the gradually increasing value of reserves, regulation, and transmission security as the system becomes more constrained. "Scarcity pricing" refers to the manner in which the NYISO seeks to ensure that real-time prices reflect the value of demand response resources enrolled in certain NYISO-administered programs when called upon to help maintain reliability.[20] Consistency needs to be maintained between the

[20] *See* Docket No. ER16-425-000, *New York Independent System Operator, Inc.*, Proposed Revisions to Services Tariff and OATT to Implement Improved Scarcity Pricing (November 30, 2015);

NYISO's shortage and scarcity pricing mechanisms to ensure that shortage pricing accurately accounts for the scarcity pricing levels that result from utilizing demand response resources to maintain reserves.

The NYISO implements shortage pricing in both its Day-Ahead and Real-Time Markets utilizing various demand curves for reserves (*i.e.*, Operating Reserve Demand Curves), regulation (*i.e.*, Regulation Service Demand Curve), and transmission security (*i.e.*, Transmission Shortage Cost mechanisms). These demand curves represent the escalating value of each product as the level of any shortage thereof increases. The NYISO has utilized demand curves for shortage pricing since 2005.[21]

Shortage pricing levels should be based on the expected costs associated with operator actions that could be taken after the Day-Ahead Market to maintain reliability and avoid shortage conditions. Shortage pricing levels should also consider the offer prices of resources that may be committed to resolve shortage conditions (including fast-start resources and demand response). Shortage pricing design should further include escalating prices as the level of a given shortage increases. Escalating prices allow the NYISO's commitment and dispatch software to determine the most economic solutions to resolve different levels of product shortages. Escalating values also provide signals to incent greater flexibility on the system by rewarding resources for their capability to respond to real-time system conditions.

Docket No. ER16-425-000, *supra*, Compliance Filing (March 25, 2016); Docket No. ER16-425-000, *supra*, Response to Data Request (May 26, 2016); and *New York Independent System Operator, Inc.*, 154 FERC ¶ 61,152 (2016).

[21] *See* Docket No. ER04-230-000, *New York Independent System Operator, Inc.*, Tariff Revisions Reflecting Implementation of Enhanced Real-Time Scheduling Software (November 26, 2003); and *New York State Independent System Operator, Inc.*, 106 FERC ¶ 61,111 (2004).

In recent years, the NYISO has implemented several enhancements to its reserve procurement practices in response to the ongoing transformation of New York's electric grid. For example, in 2019 the NYISO implemented a new reserve region and associated reserve requirements for New York City.[22] Last year the NYISO implemented additional enhancements to further improve its reserve procurement practices. In June 2021 the NYISO increased the quantity of 30-minute reserves it procures during on-peak hours within the downstate region of New York (*i.e.*, the Southeastern New York reserve region encompassing the lower Hudson Valley, New York City, and Long Island).[23] These additional reserves are intended to provide ready access to sufficient resource capability to return transmission facilities to normal transfer criteria following a contingency. Additionally, in July 2021 the NYISO implemented revisions to its current reserve demand curves to improve market efficiency and maintain alignment of shortage pricing values with the cost of various operating actions that may be taken to maintain reliability.[24]

Pricing Ancillary Services and Providing Incentives for Flexibility

The NYISO uses nested operating reserves demand curves ("ORDCs") when determining shortage pricing. The ORDCs cascade by both location and product. For example, if there are simultaneous shortages of both 10-minute synchronous operating reserves and 30-minute

[22] *See* Docket No. ER19-1678-000, *New York Independent System Operator, Inc.*, Proposed Tariff Revisions to Implement a New York City Operating Reserves Region (April 26, 2019); and Docket No. ER19-1678-000, *supra*, Letter Order (June 21, 2019).

[23] *See* Docket No. ER21-625-000, *New York Independent System Operator, Inc.*, Proposed Tariff Revisions to Implement Southeastern New York Reserve Enhancements (December 11, 2020); and Docket No. ER21-625-000, *supra*, Letter Order (January 28, 2021).

[24] *See* Docket No. ER21-1018-000, *New York Independent System Operator, Inc.*, Proposed Tariff Amendments to Revise the Operating Reserves Demand Curves and to Establish the Process to Procure Supplemental Reserves (February 2, 2021); and *New York Independent System Operator, Inc.*, 175 FERC ¶ 61,241 (2021).

operating reserves, then the shadow price of the 10-minute synchronous operating reserves would be the sum of the shadow prices for both the 10-minute synchronous operating reserves and 30-minute operating reserves. In this case, the 30-minute operating reserves shadow price would be solely from the shadow price determined by the 30-minute operating reserves demand curve.

There can also be cases where there are operating reserves shortages in separate reserve regions. In these cases, the NYISO cascades the shadow prices from the largest region to the smallest region. For example, if there are operating reserve shortages in eastern New York, and operating reserve shortages in southeastern New York, then the southeastern New York shadow price would be the sum of the shortage prices for eastern New York and southeastern New York, and would also account for the cascading of the particular operating reserve product that was short, as described above.

The NYISO believes that this cascading of shadow prices across regions and products is necessary for market efficiency and the proper alignment of market prices with reliability conditions. This practice captures the operational and practical realities that higher quality ancillary service products, such as 10-minute synchronous operating reserves, can be dispatched as a substitute for lower quality products, such as 30-minute operating reserves. This structure also makes it clear that procuring operating reserves in more constrained regions, such as southeastern New York where supply is constrained and limited, is more valuable to grid reliability and operation than procuring operating reserves in upstate New York where supply is more available.

In 2019, the NYISO completed an *Ancillary Services Shortage Pricing*[25] study to consider factors that would inform efficient setting of ORDCs. The NYISO evaluated methodologies such as relying on value of lost load ("VOLL") estimates, which the NYISO does not believe are robust enough to use in establishing market clearing prices at this time, and loss-of-load probabilities, to develop sample ORDCs that were useful in shaping the updated ORDCs that were implemented by the NYISO in July 2021.

The study evaluated other ISO/RTO ORDC implementations and specifically looked to determine how well the NYISO's ORDC levels coordinated with its neighboring ISO/RTO ORDC levels. The study found that, generally, the Northeast ISOs'/RTOs' ORDCs were fairly well coordinated, but also concluded that the NYISO should make some adjustments to its ORDCs, mainly at the lower priced "steps."

In response to the study and the ongoing transformation of New York's electric grid, the NYISO proposed enhancements to its reserve procurement processes and procedures.[26] The updated ORDC values and steps facilitate continued compliance with applicable reliability requirements and provide targeted market signals that align with actual reliability needs at the times when actions would be required to maintain reliability, including manual operator actions. In July 2021, following stakeholder discussions and the Commission's acceptance of the NYISO's proposal, the NYISO implemented updated ORDCs.[27]

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[25] Ancillary Services Shortage Pricing study - https://www.nyiso.com/documents/20142/9622070/Ancillary%20Services%20Shortage%20Pricing_study%20report.pdf.

[26] *See* Docket No. ER21-1018-000, *New York Independent System Operator, Inc.*, Proposed Tariff Amendments to Revise the Operating Reserves Demand Curves and to Establish the Process to Procure Supplemental Reserves (February 2, 2021) at pp. 4-8.

[27] *See New York Independent System Operator, Inc.*, 175 FERC ¶ 61,241 at P 38 and Ordering Paragraph (A) (2021).

The NYISO believes that its current practices of co-optimizing its procurement of operating reserves, regulation service and energy and establishing ancillary service clearing prices based on lost opportunity costs for the marginal resource to provide other services, or the shortage price if the NYISO is short supply to meet the particular ancillary service requirement, are still appropriate and will remain appropriate going forward. The NYISO's transparent and robust price formation is a key factor to ensuring resource developers can understand market incentives and make investments that will lead to added flexibility for the system.

To the extent products and services are needed to support reliable grid operations, these products and services are best procured through transparent market clearing mechanisms rather than relying on grid operators to make out-of-market decisions to commit or instruct resources manually. Manual commitments or instructions by grid operators leads to additional supply on the system that is required for grid reliability, but can create downward pressure on market clearing prices, increase make whole payments to suppliers, and reduce the incentives to improve flexibility or make investments that improve flexibility.

III. Comments on Supplemental Notice for October 12, 2021 Technical Conference

Panel 1: Incenting Resources to Reflect Their Full Operational Flexibility in Energy and Ancillary Services Offers

1. Do any existing RTO/ISO energy and ancillary services market participation rules, supply offer rules, eligibility requirements, and relevant procedures encourage certain resources to offer into the market inflexibly (i.e., without reflecting the full range of their physical operating capabilities)? For example, are any changes to resource supply offer rules or uplift eligibility requirements needed to ensure resources submit physical offer parameters (e.g., notification time, minimum run time, ramp rates) that reflect their flexible capabilities? To what extent do RTOs/ISOs account for existing fuel limitations, like natural gas supplies, that have the potential to impact resource flexibility?

NYISO Response

The NYISO's focus has been on the wholesale energy products that are needed for reliability in the face of an evolving resource mix and, at the same time, ensuring that the

broadest set of resources possible can participate in those markets. The NYISO's market rules are designed to increase the financial returns for resources that perform flexibly and reliably in the real-time markets, and to reduce the compensation paid to inflexible units.

The NYISO co-optimizes its procurement of energy, operating reserves and regulation service. Co-optimizing these products in both the day-ahead and real-time markets causes the prices of energy to reflect the costs to the system of providing operating reserves and regulation service from resources that would otherwise be scheduled to provide energy.

The opportunity to sell different ancillary service products may encourage resources to make investments or modify their operating practices to expand the range of products they can provide. Investments to enhance a resource's capabilities can be costly; this is why focusing on reliability and the products needed to maintain reliability is so important.

The NYISO's responses to the October 12 Panel 1, Question 2 and October 12 Panel 2 (all questions) address new and emerging resource types and what the NYISO is doing to accommodate their participation in its energy and ancillary services markets. With regard to existing resource types, the NYISO's current rules are not completely able to reflect the ability of combined cycle generators to participate in the energy, regulation service and operating reserves markets. The NYISO has an improved duct-firing cycle modeling project in 2022 that is exploring ways to better reflect the operating capability of combined cycle generators.

The NYISO accounts for fuel limitations that have the potential to impact resource flexibility (such as operational flow orders or ratable take requirements that limit natural gas use) by (i) permitting generators to shape their day-ahead and real-time offers consistent with demonstrated natural gas use restrictions and the gas they are able to procure, and

(ii) incorporating the costs incurred to comply with gas system requirements into generator reference levels.[28]

The NYISO does not permit generators to include the cost of consuming "unauthorized" penalty gas in their reference levels.[29] The NYISO made that decision in response to requests from pipelines and local distribution companies ("LDCs") that serve New York, after considering the impacts that disruptions to natural gas supply could have on electric generation.

2. Do any existing RTO/ISO energy and ancillary services market rules exhibit an undue preference for certain resource types over other resource types? If so, please explain how and provide examples.

NYISO Response

The NYISO's energy and ancillary services markets do not incorporate any preference for specific technologies or resource types. The NYISO's market rules are designed to compensate resources based on the provision of products or services that address reliability needs – both the immediate, real-time needs of the NYISO's operators and the reliability requirements set by reliability oversight organizations – in particular NERC, NPCC and the NYSRC.

With regard to new and emerging resources, the NYISO looks for opportunities to increase market participation. When the NYISO does not have sufficient parameters modeled to adequately reflect a technology's capabilities, the NYISO works on improving or evolving its participation models so the new technology can participate. Examples of market improvements the NYISO made to allow new resources to participate in its energy and ancillary services markets include its implementation of ESRs in August 2020 and of CSRs in December 2021.

[28] See NYISO Market Services Tariff Sections 23.3.1.4.6, 23.3.1.4.6.2; User's Guide 19, *NYISO Expectation of Generator Operation During a Gas Restriction or Interruption.*

[29] *See* NYISO Market Services Tariff Sections 23.3.1.4.6.2.1 and 23.3.1.4.6.2.1.1.

Both of these participation models are designed to maximize the ability of the participating resources to provide energy and ancillary services consistent with the NYISO's market rules.

The NYISO is working diligently toward implementing distributed energy resources ("DER") in its markets by the end of this year.[30] Although the NYISO's current DER rules impose some limitations on the ability of heterogeneous DER aggregations to provide operating reserves and regulation service, the NYISO intends to improve those rules as part of its effort to develop participation rules for integrated hybrid resources.[31]

3. To what extent do existing self-scheduling or self-commitment rules in RTO/ISO markets reduce the amount of operational flexibility available to the RTO/ISO in real time and the system's need for operational flexibility? Are options for self-scheduling and self-commitment needed to allow resource owners to make the best use of their assets over time?

NYISO Response

To answer the Commission's question it is necessary to distinguish between self-scheduling and self-commitment. Self-scheduling a resource at a specific level of output (without the ability for the ISO or RTO to increase or reduce the output) reduces the amount of operational flexibility available to an ISO or RTO in real-time to the extent it denies the ISO or RTO access to the self-scheduled resource's flexible operating range.

In New York, self-scheduling appears to be used primarily to accommodate inflexible contracts (*e.g.*, natural gas contracts or legacy physical electricity supply contracts), or to reflect operational limitations of either the self-scheduled resource or its fuel source (*e.g.*, a ratable take

[30] Additional changes to its accepted DER design to accommodate Order No. 2222 requirements may delay the NYISO's efforts to implement DER in its markets.

[31] Please see the NYISO's response to October 12 Panel 2, Question 1 for more information about the NYISO's plans to develop a participation model for integrated hybrid resources in 2022 and apply the operating reserve and regulation service improvements it develops for integrated hybrid resources to heterogeneous DERs.

requirement for natural gas). In order to reduce self-scheduling, ISOs and RTOs should incentivize flexibility, which is already a recognized goal of the NYISO's energy and ancillary services markets.

The NYISO expects it may see more use of self-scheduling when DER and integrated hybrid resources that include intermittent resources enter the market because (i) time may be required for new market participants to learn how to develop economic offers that accurately represents their resources' costs and operating capabilities, and (ii) a portion of these resources' output will be eligible to receive Renewable Energy Credits ("REC") or other extra-market subsidies for the energy they produce. However, in the long run self-scheduling is not profit maximizing for suppliers. Because self-scheduling is not price-sensitive, it results in inefficient over- or under-commitments, which leaves money on the table.

Self-commitment may be achieved using economic offers, resource operating parameters, or a combination thereof. It is less clear that self-commitment reduces the amount of operational flexibility available in real-time. In many cases, self-committed resources are made available to be flexibly dispatched above the self-commitment level by the ISO or RTO.

Self-commitment is used to addresses the NYISO's day-ahead and real-time commitment horizons. The NYISO's horizon for committing units in the day-ahead market is 24 hours. In real-time, the commitment horizon is approximately 2 hours.[32] Resources that expect to operate over a longer time horizon may choose to assume the commitment risk and use self-commitment to start-up and indicate to the NYISO when they are available. There are, and will continue to be, valid reasons for resources to use self-commitment.

[32] RTC's look-ahead covers 2.5 hours.

4. Do current RTO/ISO offer rules, market power mitigation practices, and reference levels prevent or discourage resources from including in their offers the additional costs, if any, that resources incur from being more flexible (e.g., longer-term wear and tear on natural gas resources due to increased cycling, battery warranty considerations, etc.)? Are such costs difficult to quantify? If so, please explain why. How should RTOs/ISOs review such costs to ensure that resources' energy and ancillary services supply offers are competitive?

NYISO Response

The NYISO encourages resources to accurately reflect their marginal costs (including opportunity costs) in their energy, operating reserve and regulation service offers. The NYISO's market power rules, mitigation practices and reference levels do not prevent or discourage resources from including incremental costs they incur to be more flexible, such as increased maintenance costs, or degradation due to wear and tear. The NYISO allows resource reference levels to reflect these costs.

Although incremental wear-and-tear costs are permitted to be included in reference levels for gas turbines and ESRs, the NYISO's reference levels do not include fixed costs. Depending on the terms and conditions, a gas turbine's maintenance agreement, or a battery warranty, could include both fixed and incremental components.[33] Additional information about reference levels can be found in the NYISO's Reference Level Manual.[34]

[33] For example, a maintenance cost that is incurred after every 5 start-ups, or after every 1000 run hours is considered an incremental cost. A one-time fee that is paid when the maintenance contract or warranty is first executed is likely to be a fixed cost.

[34] Link to NYISO Reference Level Manual: https://www.nyiso.com/documents/20142/2923301/rl_mnl.pdf.

Panel 2: Maximizing the Operational Flexibility Available from New and Emerging Resource Types

1. Do existing RTO/ISO energy and ancillary services market rules, practices, or procedures prevent or otherwise obstruct relatively new and emerging resource types from fully participating in RTO/ISO markets and offering the operational flexibility they are technically capable of providing?

4. To what extent are emerging resource types, such as hybrids, storage resources, and distributed energy resource aggregations technically capable of providing existing ancillary service products or other reliability services? Acknowledging that some market rules are evolving due to Order Nos. 841[35] and 2222,[36] do current RTO/ISO market rules for ancillary services and other reliability services, such as eligibility requirements, align with these emerging resource types' capabilities?

NYISO Response

NYISO's Energy and Ancillary Service Rules Permit Broad Participation,

As the NYISO explained in its response to October 12 Panel 1, Question 1, New York's market design is structured to promote flexible resource operation. From the beginning, the NYISO set out to develop features and advancements to enable new technologies, like Limited Energy Storage Resources and intermittent renewable resources, to participate in meaningful ways. The structure is designed to reward resources that can change output levels quickly, follow dispatch instructions closely, and be responsive to emerging grid needs.

New York's energy and ancillary services markets are open to all resources that satisfy minimum eligibility requirements. There is no prohibition that prevents an existing, new or emerging resource from participating. However, sometimes the operating characteristics of

[35] *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 841, 83 FR 9580, 162 FERC ¶ 61.127

[36] *Participation of Distributed Energy Resource Aggregations in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 2222, 85 FR 67094, 172 FERC ¶ 61,247

new/emerging resources require new functionality to be developed or new dispatch constraints to be modeled. These improvements can require some time to implement.

The NYISO continues to focus on improving its market models, and minimizing perceived barriers to participation by all resources in its wholesale market. The NYISO led the way with its implementation of a full ESR model in August 2020, and by implementing Co-located Storage Resources that allow an ESR and a wind or solar IPR to share a point of injection ("POI") in December 2021.

In 2022, the NYISO is working diligently to implement its Commission-accepted DER participation model, and to address the new requirements presented by Order No. 2222. The NYISO also continues to work with its stakeholders on developing an integrated hybrid aggregation model for larger (20 MW and above) sets of resources that include one or more ESRs and other resources. Finally, the NYISO is working to develop a model for new internal High Voltage, Direct Current lines that are planned to deliver clean energy into New York City. These efforts have broadened or will broaden the opportunities for various types of resources to participate in the wholesale markets that the NYISO administers.

To facilitate and be prepared for the clean energy transition and grid of the future, ISOs/RTOs and their stakeholders need to think more broadly than participation models. As the generating fleet transitions to one that is largely based on renewable resources and energy/duration limited resources, ISOs and RTOs also need to be thinking about how their market structure, look ahead capabilities, and settlement structures can work together to ensure that resources continue to respond to grid needs and operator instructions. The NYISO's Grid in Transition efforts are critically focused on evolving its market structure to help achieve the transition required by the CLCPA.

ISOs and RTOs Have the Information Necessary to Efficiently Dispatch Intermittent Power Resources and Energy Storage Resources to Maximize Consumer and Producer Surplus

Wholesale markets were created to maximize consumer and producer surplus, and ISOs/RTOs were given great responsibility to operate the grid as efficiently and reliably as possible. To do that, ISOs/RTOs have information that is critical to grid operations and confidential market information about each asset participating in the wholesale market. Although ISOs and RTOs make as much data available as possible to enhance competition, ISOs and RTOs necessarily have unique access to confidential data on ***all*** participating resources' Day-Ahead and real-time (1) availability (including information about outages and derates), (2) costs, (3) offers/bids, (4) current output levels, (5) response rates, and (6) expected future commitment and de-commitment. ISOs and RTOs also have unique access to information about import, export and wheel-through offers and schedules. ISOs and RTOs must have this information to develop a dispatch solution that minimizes total production cost and maximizes consumer and producer surplus.

Owners of hybrid resources and DERs have access to a more limited set of market information, and only have confidential information about the resources they own or offer into the markets. This information asymmetry places ISOs and RTOs in the best position to make dispatch decisions that maximize consumer surplus for all customers. Additional efficiencies can be achieved when the ISO or RTO has "line of sight" to schedule and settle each resource rather than aggregating a number of resources and leaving the optimization of that set of resources to a market participant.

Aggregations are important to manage sets of small resources, including dispatchable loads, that connect to the distribution system. The NYISO's DER rules were developed to help manage market participation by aggregations of resources that are collectively capable of

injecting 20 MW or less at any point of interconnection to the distribution system.

ISOs and RTOs are Uniquely Positioned to Evaluate the Need For and Anticipated Costs and Benefits of New Resource Participation Models

Further improvements to modeling of resources can be made, and the NYISO continues to work to identify, develop, and implement such improvements. However, there is a cost for these improvements, trade-offs that must also be part of the discussion. Each new participation model requires regular upkeep and education/training, adds risks to the timely development of market solutions, and overall requires more resources.

The Commission accepted the NYISO's DER participation model in 2020, and the NYISO submitted proposed Order No. 2222 compliance revisions in 2021, but the NYISO continues to look for ways to improve its DER participation model. For example, NYISO is currently working on a set of rules to permit integrated hybrid storage resources ("HSRs") to provide operating reserves and regulation service on a more flexible basis. The NYISO will propose to apply the new rules it is developing for HSRs to also allow heterogeneous DER aggregations to provide operating reserves and regulation service on a more flexible basis than the NYISO's current, accepted DER rules allow.

However, it is not reasonable to expect ISOs and RTOs to develop unique participation rules to optimize participation by each and every compilation of resources a market participant might develop or accrue. Expanding the range of available hybrid and DER participation options causes additional costs to the ISO or RTO and to market participants. Each new participation model includes unique capabilities and requirements, but it adds costs as well. There is the obvious cost to the ISO or RTO of developing and implementing the new rules and capabilities. There are less obvious costs that are also significant. The incremental utility provided by each new or additional participation model decreases, but the complexity of the ISO's or RTO's

software code increases and becomes more difficult to modify, update or repair with each unique participation model that is added. The time an ISO or RTO requires to issue its day-ahead and real-time market solutions also increases when new resource-specific constraints or unique capabilities are added to the optimization.

An ISO or RTO may need to add new staff to support expanded capabilities, or an entire new team to support a new category of resources.[37] As the range of participation options broadens, it will become more and more difficult for NYISO staff and market participants to gain expertise in and fully understand the functionality, capabilities and limitations that each participation model presents.

In developing participation models for hybrid resources and DERs, the Commission must permit each ISO or RTO to develop a mix of participation options that achieves an appropriate compromise between resource optimization and practical implementation, given that ISO's or RTO's market rules. ISOs and RTOs must be permitted to account for factors including implementation complexity, impacts to market solution time, the need for additional staffing and developing necessary expertise. Finally, the Commission must consider the costs and expected benefits to the entire market, not just to a specific resource type or to a specific configuration of aggregated resources that propose a new market participation model.[38]

[37] For example, on pages 48-52 of the NYISO's September 14, 2021, answer to comments on and protest of its Order No. 2222 compliance filing in Docket No. ER21-2460, the NYISO explained that it would need to add new staff to implement a new capacity market only participation program for energy efficiency resources that are not capable of responding to the NYISO's dispatch instructions. The NYISO does not have a program for energy efficiency resources that cannot respond to NYISO's dispatch instructions in its markets today. In order to administer participation in the program and verify reductions in energy use the NYISO would be required to add several new/additional positions and recruit employees with the necessary expertise.

[38] The cost of implementing and benefits derived from a new participation model or market enhancement will vary based on the unique market design of each ISO and RTO.

Out-of-Market Incentives May Prevent Energy Storage Resources from Operating Flexibly and Providing Maximum Reliability Benefits

ESRs that are paired with wind or solar IPRs and required to only receive their charging energy from intermittent renewable resources in order to remain eligible for a Federal Investment Tax Credit ("ITC") or to receive state renewable resource subsidies, are not incented to operate flexibly and may be prevented from engaging in optimal market behavior. For example, an ESR that can only charge from its co-located solar resource may be underutilized because it cannot receive additional charging energy from the grid. The ESR is forced to limit its operation and sacrifice revenues in the wholesale energy and ancillary services markets in order to benefit from the ITC. Because the ESR is not able to fully respond to economic market signals, the ISO or RTO is not able to fully optimize the ESR's market participation. This can increase the cost of the overall market solution the ISO or RTO develops.

There is little the Commission can do to change existing laws. Prospectively, the Commission should (a) encourage the development of tax credits and other investment incentives that will increase the availability of clean, flexible resources *without* imposing restrictions on how they operate, and (b) not require ISOs or RTOs to develop participation models that intentionally sacrifice market efficiency in order to maximize the benefits that participating resources can derive from the ITC or other out-of-market subsidies.

2. To what extent do existing RTO/ISO energy and ancillary services market rules require standalone variable energy resources to respond to dispatch instructions (e.g., curtailment)?

    a. To what extent are standalone variable energy resources technically capable of being "dispatchable?" Is there a distinction between being dispatched down and being curtailed?

    b. Under what circumstances can a standalone variable energy resource be dispatched up versus down?

3. To what extent do resource capabilities vary amongst different classes and vintages of variable energy resources (e.g., newer vs. older wind turbine models, onshore vs. offshore wind, fixed-tilt vs. tracking solar, etc.) and do offer rules currently reflect such differences, if any?

NYISO Response

In the NYISO market, the terms "dispatched down" and "curtailed" are often used synonymously. However, the term "curtailment" is a misnomer in the context of NYISO's market rules for wind and solar IPRs. It is more accurate to describe the economically-determined schedules that are sent to wind and solar resources as dispatch down instructions.

The NYISO schedules wind and solar IPRs at or below the MW value that NYISO has forecasted for their output.[39] RTC and RTD will only dispatch a wind or solar IPR down to operate below its forecast value based on the economic offer submitted for that wind or solar IPR. The offer indicates that IPR's economic willingness to generate at specific market prices. When a wind or solar IPR's schedule is below the NYISO's forecast, that could be thought of as a dispatch down instruction.

A wind or solar IPR will never be dispatched "up" by the NYISO above the MW level that NYISO's forecast indicates the wind or solar IPR is expected to attain. The dispatch

[39] Wind and solar resources are paid for their entire output, except when the NYISO issues a Wind and Solar Output Limit. When such an output limit is issued, the NYISO does not pay for output in excess of schedule and may impose penalties for overproduction.

schedule issued by the NYISO may increase from one dispatch interval to the next because the IPR's output forecast has increased, or because the previous interval reflected an economic dispatch down instruction that is no longer justified based on the wind or solar IPR's economic offer (because the offer has changed, or because the LBMP has changed at the IPR's location).

With regard to treatment of old versus new wind and solar IPRs, there is only one distinction that NYISO makes for older technology wind turbines. Specifically, the two oldest on-shore wind plants in New York are exempt from following dispatch down instructions. There are no other accommodations.

5. What RTO/ISO energy and ancillary services market reforms could be adopted, if any, to ensure that new and emerging resource types are able to offer their full operational capabilities into RTO/ISO energy and ancillary services markets to help operators manage changing system needs?

    a. Would shortening the day-ahead market interval length increase the operational flexibility available from resources? What considerations (e.g., computing time) are important to consider when establishing the length of energy and ancillary services market intervals?

NYISO Response

The NYISO has not identified an imminent need to implement additional day-ahead, sub-hourly intervals in New York at this time. However the NYISO continues to analyze its future net load forecasts to understand how net load varies across specifics hours.

The NYISO explains its Grid in Transition initiative in its response to September 14 Panel 1, Questions 1 through 3 above. The Grid in Transition effort may include analysis to better understand New York's future flexibility and ramping needs. The cited response also explains why real-time market enhancements are a high priority for the NYISO.

b. RTOs/ISOs often require resources that provide ancillary services to be capable of doing so for a duration of 60 minutes. Does this eligibility requirement limit the pool of resources available to offer ancillary services into RTO/ISO markets? Would reexamining the need for this particular eligibility requirement present reliability concerns or raise other issues for operators? If so, please explain.

NYISO Response

The fact that energy-limited and intermittent resources may not be able to satisfy currently applicable reliability standards is not a valid reason to determine the reliability standards are unnecessary, or should be relaxed. This is particularly true for the NPCC requirement that when providers of synchronous, 10-minute or 30-minute Operating Reserves are called on to perform and are converted to Energy, their Energy output must be sustainable for at least 60 minutes. The need for sustainable Operating Reserves is expected to increase, not decrease, as New York relies more and more heavily on IPRs like wind and solar plants to meet its demand for electricity.

A reserve provider is expected to respond with increased energy production in reaction to the loss of another resource's energy production. It needs to continue to operate until another resource is procured or committed (started-up) to backfill the need. Legacy expectations have been that the changeover can be accomplished within 60 minutes. However, as the portfolio of resources evolves, and especially when the system is operating at minimum reliability standards, the reserve provider may be the provider of last resort and needs to be able to sustain its output until the reliability need has subsided; possibly longer than the 60 minute duration NPCC currently requires.

New York's projected resource mix of the not-so-distant future will replace a significant quantity of dispatchable, conventional generation with thousands of MW of variable energy resources that could be affected by an extended wind lull or a deeply overcast day. As a result, New York needs to be *more* concerned about the possibility of sustained energy droughts. The

NYISO believes it may be prudent to develop longer duration requirements and/or longer duration reserve market products to ensure that reliable electricity is available for all New Yorkers. This is especially true because New York is working to move away from use of fossil fuels for heating and transportation, which will make New York even more dependent on electricity to provide critical services that are currently met by fossil fuels.

The NYISO's response to September 14 Panel 1, Questions 1 through 3 is also responsive to this question.

IV. Communications

Communications regarding the NYISO's Initial Comments and the above-captioned proceeding addressing energy and ancillary services markets in the evolving electricity sector should be directed to:

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V. Service

The NYISO will send an electronic copy of this filing to the official representative of each party to this proceeding, to the New York State Public Service Commission, and to the New Jersey Board of Public Utilities. In addition, a complete copy of this filing will be posted on the NYISO's website at www.nyiso.com, and the NYISO will send an electronic link to this filing to the official representative of each of its customers and to each participant on its stakeholder committees.

VI. Conclusion

While the grid of the future poses various challenges, the initiatives described above are an important aspect of preparing the NYISO's wholesale markets for the massive changes that are anticipated over the next two decades. The NYISO has many energy and ancillary service market initiatives planned and underway that are important for maintaining reliable electric service and supporting a smooth transition to meet New York's CLCPA and support related energy and environmental goals. Although some of the challenges the NYISO is facing might be similar to other regions, applicable reliability rules and specific challenges to operating New York's power system will require unique solutions tailored to the resource mix, transmission constraints, location and concentration of demand within regions of the state, and weather patterns of New York. Therefore, the NYISO requests that each region be given the flexibility to

devise modifications to its energy and ancillary service markets that best meet the regional operational needs. The NYISO does not support a "one size fits all" solution, or the imposition of a uniform set of requirements on all regions.

Respectfully submitted,

NEW YORK INDEPENDENT SYSTEM OPERATOR, INC.

By: */s/ Alex M. Schnell*
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February 4, 2022

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding in accordance with the requirements of Rule 2010 of the Rules of Practice and Procedure, 18 C.F.R. §385.2010.

Dated at Rensselaer, NY this 4th day of February 2022.

/s/ Mitchell W. Lucas

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