UNITED STATES OF AMERICA

BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

Climate Change, Extreme Weather, and Electric System Reliability	**)** **)**	**Docket No. AD21-13-000**

POST-TECHNICAL CONFERENCE COMMENTS OF THE NEW YORK INDEPENDENT SYSTEM OPERATOR, INC.

In accordance with the *Notice Inviting Post-Technical Conference Comments* issued by the Federal Energy Regulatory Commission ("Commission" or "FERC") on August 11, 2021, in the above referenced proceeding ("Notice"),[1] the New York Independent System Operator, Inc. ("NYISO") hereby submits comments on the Commission's efforts to examine the impacts of climate change and extreme weather events on electric system reliability. The NYISO continues to share the Commission's desire to evaluate the near, medium, and long-term challenges presented by climate change and extreme weather events.[2] As discussed during the June 1 and 2, 2021 technical conference ("Technical Conference"), the NYISO has undertaken a series of studies to better understand and prepare for these challenges. The Technical Conference provided a valuable discussion of experiences and potential impacts from climate change and extreme weather. The NYISO looks forward to continuing its work with the Commission, market participants, policy makers, and other stakeholders to develop forward-looking solutions to the challenges posed by climate change. Further Commission guidance will help industry

[1] Climate Change, Extreme Weather, and Electric Reliability, *Notice Inviting Post-Technical Conference Comments*, Docket No. AD21-13-000 (Aug. 11, 2021).

[2] Notice of Technical Conference, AD21-13-000 (Mar. 5, 2021) at 2.

stakeholders prepare for, and develop responses to, the threats posed by climate change and extreme weather.

The NYISO appreciates the opportunity to provide its perspective on the impact climate change and extreme weather events will have on New York State's electric system.

I. COMMUNICATIONS AND CORRESPONDENCE

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II. COMMENTS

a. Probabilistic Assessment of Climate Change Risks through Long-Term Planning and Load Forecasting

The NYISO is actively engaged in extensive system planning efforts to analyze potential risks to reliability and resilience stemming from extreme weather and climate change. Planning efforts guide market reforms designed to incent the kinds of grid services needed as system conditions are expected to evolve in response to climate change risks. The NYISO encourages the Commission, utilities, and other industry participants to continuously assess climate change risks. However, as our understanding of these risks continues to evolve, and the impacts of extreme weather and climate change risks vary significantly by region of the country, the NYISO

encourages the Commission to avoid imposing one-size-fits-all planning study directives to evaluate these risks.

Various load forecast scenarios allow the NYISO to reflect increasing uncertainty in its studies when modeling future energy usage across New York State. NYISO's load forecasts typically include a baseline expected load, a high load scenario, and a low load scenario. Each forecast incorporates historical data on annual energy and seasonal peak demand levels in the New York Control Area ("NYCA"). The high load scenario forecast reflects faster adoption of electric vehicles and other programs and policies designed to support electrification, and slower adoption of behind-the-meter solar photovoltaic (PV) and energy efficiency measures. The low load scenario forecast reflects full adoption of behind-the-meter ("BTM") solar PV and energy efficiency policy measures in accordance with state mandates, and slower adoption of electric vehicles and other electrification. The baseline forecast reflects the expected implementation rates of these programs and technologies.

In addition to the scenario forecasts, the NYISO regularly assesses the relationship between climate and both regional and statewide demand levels. These assessments examine how the electric system and regional demand levels are impacted by changes in the climate (*i.e.*, the interannual variability in the weather). These analyses aid the NYISO in quantifying the long-term uncertainty of load forecasts attributable to the year-over-year weather changes and are used to create probabilistic forecasts of load under both expected weather conditions and extreme weather conditions.

Baseline and scenario forecasts are based on information obtained from the New York State Department of Public Service ("DPS"), the New York State Energy Research and Development Authority ("NYSERDA"), state power authorities, Transmission Owners ("TO"),

the U.S. Census Bureau, and the U.S. Energy Information Administration, and other sources. The baseline and scenario forecasts reflect a combination of information provided by Transmission Owners for their respective service territories, and other forecasts prepared by the NYISO. The baseline forecasts, which report the expected NYCA load, include the projected impacts on expected demand from public policy energy efficiency programs, building codes and appliance standards, distributed energy resources, BTM energy storage, BTM solar PV power production, electric vehicle usage, and electrification of space heating and other end uses. Zonal forecasts extend through 2051 for studies that evaluate longer time horizons. Over a 30-year horizon, the NYCA baseline energy forecast growth rate has slightly increased compared to the forecast developed in 2020, while the NYCA baseline summer peak demand forecast growth rate has slightly decreased compared to the forecasts developed last year.

As discussed in the NYISO's Pre-Technical Conference comments, the NYISO has also undertaken a three-phase Climate Change Impact and Resilience Study ("Climate Study") to evaluate planning considerations through 2040.[3] Phase 1 and Phase 2 of its Climate Study, completed in 2019 and 2020, respectively, (i) examined the impacts of climate change and system loads, and (ii) evaluated potential reliability concerns that may arise due to climate change and extreme weather events. The study evaluated impacts out to the year 2040, which is when New York State policies require electric generation to be zero-emission.

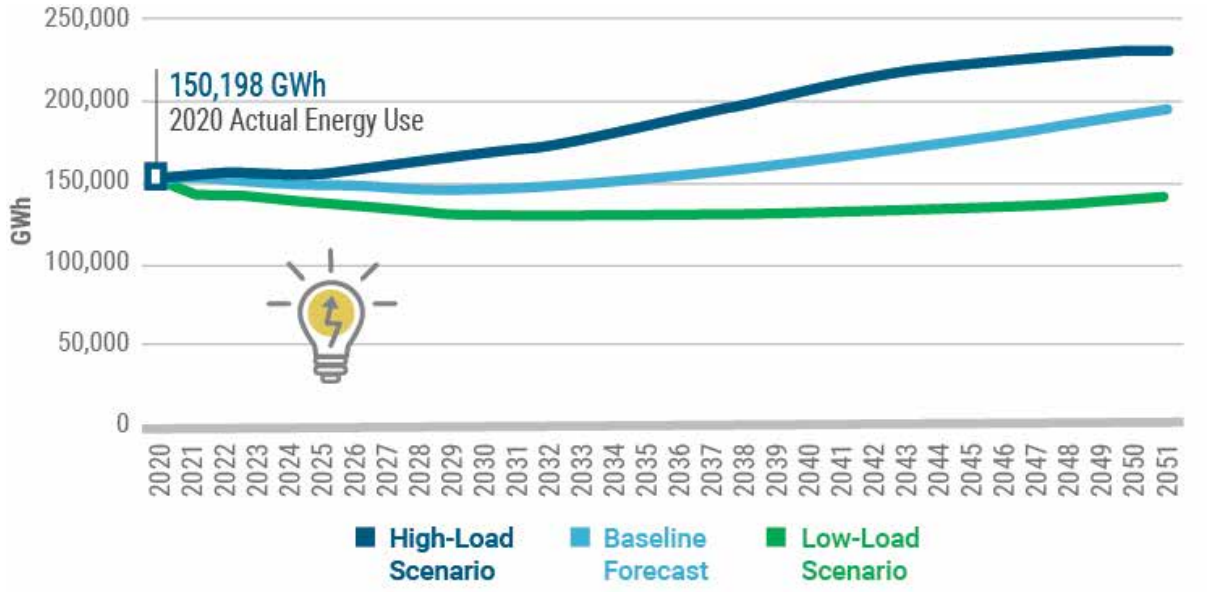
The load forecast from Phase 1 of the Climate Study included developing a detailed hourly forecast across each year that incorporated climate change impacts such as rising temperatures. As part of the forecast development, past temperature trends were analyzed and

[3] *Pre-Technical Conference Comments of the New York Independent System Operator, Inc.*, AD21-13-000 (April 15, 2021).

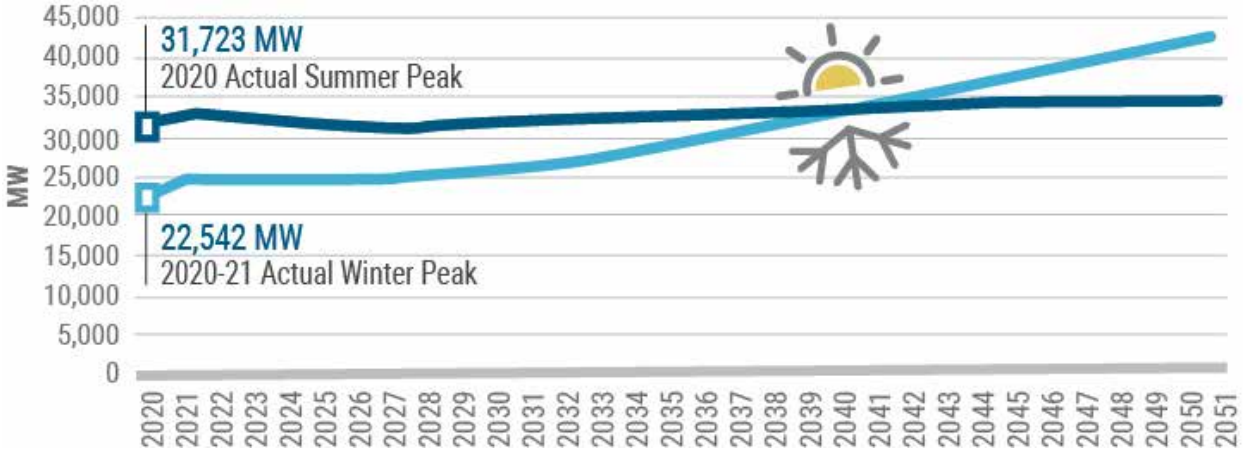
compared to the anticipated future temperature trends. The study included an expected trend in temperature through 2050 and its corresponding impacts on system demand. From an overall annual energy usage perspective, increasing temperatures were found to produce small incremental impacts on system energy requirements, as increasing cooling loads were largely offset by decreasing heating loads.

In parallel with the annual energy usage analysis, the Climate Study considered summer and winter peak demand, which will also be noticeably impacted by climate change. By 2050, increasing temperatures will potentially add between 1,600 MW to 3,800 MW to expected system demand, or approximately 4% to 9% (depending on the assumed temperature warming scenario). The NYISO now includes an expected climate trend in its annual baseline load forecast scenario to continue to assess the impacts of climate change and temperature trends on future system load conditions.

The Climate Study included an analysis of state policies designed to counter the impact of climate change. This analysis revealed that public policy related changes may have an even larger impact on demand levels in New York than increasing temperatures. The figure below represents three energy forecasts through 2051 developed by the NYISO, as discussed above. While near-term load is expected to decline, the figure points to longer-term load growth that will be driven largely by electrification. The high-load scenario evaluated conditions with higher rates of electrification and reduced adoption of energy efficiency measures and BTM solar. The low-load scenario models increased adoption of energy efficiency measures, which have the effect of reducing demand on the transmission system.



Over time, the electrification of heating, transportation and other functions currently driven by fossil fuels is expected to shift New York State from a summer peaking system to a winter peaking system, as illustrated in the figure below. The extent to which this trend takes hold will depend, in part, on both the development of heat pump technology, and the rate of electric vehicle adoption. Electrification has the potential to be the most significant driver of electric demand in long-term planning studies.



Phase 2 of the Climate Study evaluated the impacts of transitioning to a generation resource mix that is 100% emission free. An emission-free resource mix will include significant

amounts of intermittent resources such as wind (on-shore and off-shore) and solar PV. Planning for significant penetration levels of these resources becomes challenging when forecasting the potential for derates due to extreme environmental conditions such as drought, sustained wind lulls, and other factors outside of system operator and generator operator control. These environmental impacts can cause significant decreases in generation capability over short and long periods of time, thus threatening the grid operator's ability to maintain system reliability. The Climate Study identified the need to add significant amounts of emission-free dispatchable resources to the system that have the ability to ramp quickly and run for extended periods of time. Such technologies are not in commercial operation at this time.

b. Accounting for Extreme Weather in NYISO's Reliability Planning

The NYISO relies on the use of probabilistic methods to account for weather uncertainty in planning studies and its annual study of the NYCA system to determine resource adequacy needs for the next Capability Year.

The NYISO's resource adequacy studies, as a component of the reliability planning process, utilize a load forecast uncertainty model that captures the impacts of various weather conditions on future load. The load forecast uncertainty model evaluates seven load levels—three low load cases, a median peak case, and three high load cases—and includes the probability of occurrence for each case. The NYISO's resource adequacy evaluation then determines the amount of capacity needed to satisfy the various load scenarios in each hour of a given Capability Year and calculates an average loss of load expectation for the Capability Year at each of the seven load levels. This information is used to develop a probability weighted-average loss of load expectation ("LOLE").[4] The NYISO also uses historical information in its

[4] The NYISO utilizes resource adequacy criteria established by the New York State Reliability Council and the Northeast Power Coordinating Council. Those criteria provide that the probability of an unplanned loss of firm load

evaluation of expected performance by generation facilities, which can vary dramatically from region to region. While it will be important to incorporate these impacts of climate change and extreme weather in reliability planning analyses, the NYISO focuses significant effort on the need to evaluate increases in demand, driven by public policies that encourage electrification as discussed above (*e.g.*, electric heating and electric vehicles).

In New York, stringent reliability rules require that there be enough generating capacity available to maintain resource adequacy, which is the level of installed capacity needed to meet peak electric demand. In support of the New York State Reliability Council ("NYSRC"), the NYISO conducts an annual study of the NYCA system to determine resource adequacy needs for the next Capability Year (*i.e.*, May 1 through April 30). The NYSRC evaluates the NYISO's recommendations and determines the applicable Installed Reserve Margin ("IRM") necessary to maintain system reliability.[5]

The IRM identifies the amount of capacity that must be available to maintain reliable system operations, which is in excess of the forecasted peak demand. The NYISO, NYSRC, and other stakeholders develop the IRM through an extensive study process starting with an annual analysis of updated load projections and the potential uncertainty that can result from extreme weather conditions. Revisions to resource availability calculations capture recent generation asset performance as well as resources entering and exiting the market. The IRM study evaluates a baseline case and a number of scenarios that include low and high system loads. These load levels are influenced by summer weather events such as heatwaves.

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should not exceed one day in ten years, expressed as a loss of load expectation ("LOLE") of no greater than 0.1 days per year.

[5] *See* New York State Reliability Council, L.L.C., *Policy No. 5-15: Procedure for Establishing New York Control Area Installed Capacity Requirements and the Installed Reserve Margin* (Jun. 3, 2020), *available at:* http://www.nysrc.org/PDF/Policies/Policy%205-15.pdf.

The IRM study also evaluates transmission capability models that influence the amount of capacity needed in particular locations to maintain system reliability. These areas are known as "Locational Minimum Installed Capacity Requirements" or "LCRs". The NYISO uses the IRM established by the NYSRC to set LCRs for New York City (Load Zone J), Long Island (Load Zone K) and the lower Hudson Valley (Load Zones G-J). Resources eligible to meet these needs may include generators, energy storage resources, demand side resources, and firm capacity imported from neighboring control areas.

c. Interregional Planning to Prepare for Extreme Weather Events

Under FERC Order No. 1000, and in collaboration with its New England (ISO-NE) and Mid-Atlantic (PJM) neighbors, the NYISO expanded its pre-existing interregional planning process based upon the Northeastern ISO/RTO Planning Coordination Protocol that had been in place for more than a decade. The NYISO, PJM, and ISO-NE have implemented the Northeastern ISO/RTO Planning Coordination Protocol and other joint agreements to facilitate joint planning and coordination. The protocol supports: (i) exchanging data and information between the regions; (ii) coordinating interconnection requests and transmission requests with cross-border impact; (iii) developing a Northeastern Coordinated System Plan that includes a roll-up case evaluating potential reliability issues; (iv) performing planning studies through an open stakeholder process; and (v) allocating the costs associated with any interregional projects that are included in the regional plans of at least two of the regions participating in the protocol. The three regions hold regular biannual meetings to share information on their regional plans and potential cross-border projects. These meetings are open to participation by all interested parties. In 2020, the three regions published an updated Northeastern Coordinated System Plan, which

covers the period of 2020-2028. The report did not identify any need for new interregional transmission projects.

As a member of the Eastern Interconnection Planning Collaborative ("EIPC"), the NYISO also conducts joint evaluations with planning authorities across the entire Eastern Interconnection, a region that includes 40 states and several Canadian provinces from the Rocky Mountains to the Atlantic Ocean, and from Canada south to the Gulf of Mexico. The EIPC is made up of 19 electric system planning authorities and was the first organization to conduct interconnection-wide planning analysis across the eastern portion of North America. In 2020, the EIPC completed a study on changing system frequency response capabilities resulting from the shift towards electric generation by wind and solar resources. The study found that maintaining system frequency is a concern and warrants continued study.

d. New York State Electric Reliability Challenges Associated with Common-Mode Failures

Currently, in New York, the single most significant common-mode failure would be loss of natural gas for electric generation. Loss of gas could be the result of low gas inventories and/or deliveries, or generation assets being unable to procure gas deliveries under their interruptible contracts due to firm gas contract needs (*e.g.*, 100% utilization of a pipeline for firm gas deliveries to retail customers during extreme cold weather events). Under rules established by the NYSRC, Con Edison and the Long Island Power Authority annually determine the load levels at which certain generation must switch from natural gas to oil. Known as the "Loss of Gas Supply" or "Minimum Oil Burn" rules, these criteria avoid generation losses that can result

from the common-mode failure of the loss of a major gas pipeline or operational flow order that interrupt gas service to a series of generators, if those generators did not switch to oil.[6]

In the future, new common-mode failures are likely to arise, as more intermittent resources are added to electric systems and weather patterns become more extreme. More volatile weather conditions could produce wind lulls lasting several days, resulting in limited or no wind output to the power system.[7] Simultaneously, behind-the-meter and front-of-the meter solar generation becomes unavailable during night-time hours, and may provide little or no output under snow cover and on very cloudy days. With current technologies, battery storage lasts only a limited number of hours before needing to be recharged. In periods when the wind is not blowing, there is limited solar, and storage is depleted, the power system would experience a common-mode failure. The NYISO conducted modeling of a possible resource set comprised of wind, solar, and storage with certain other resources (nuclear and hydro) under forecasted 2040 loads in Phase 2 of its Climate Study. That study identified "gap" periods that will have to be filled by some type of non-emitting dispatchable resource, the technology for which does not exist yet. Moreover, the conditions giving rise to such common-mode failures may occur simultaneously in neighboring regions, limiting the regions' ability to provide capacity or emergency assistance to each other. These potential common-mode failures may need to be further investigated and addressed on a region-specific basis.

[6] *See* New York State Reliability Council Rules, G.2: *Loss of Gas Supply – New York City*, G.3 *Loss of Gas Supply – Long Island*, *available at*:
https://www.nysrc.org/PDF/Reliability%20Rules%20Manuals/RRC%20Manual%20V45%20Final.pdf.

[7] In the NYISO's Comprehensive Reliability Plan that is currently under development, the NYISO is evaluating the nature and scope of reliability issues that would be presented by a multi-day wind lull.

e. NYISO's Existing Interregional Practices Efficiently Support Reliable Operation

The New York Control Area depends on External Transactions with neighboring areas to operate competitive and efficient markets and, if necessary, emergency assistance from neighboring areas to protect electric system reliability under certain alert conditions. The NYISO facilitates 15-minute scheduling of External Transactions over numerous interfaces with neighboring control areas to allow transaction schedules to address system conditions more accurately, including congestion signals. In addition to 15-minute scheduling, the NYISO utilizes Coordinated Transaction Scheduling ("CTS") with ISO-NE and PJM to allow Market Participants to offer transactions based on the price differences or "price spreads" between regions instead of offering a more traditional supply curve. If necessary, under extreme system conditions, the NYISO can also request emergency assistance or invoke Emergency Transfer Criteria ("ETC") to deliver reserves and/or energy by relaxing Normal Transfer Capabilities.

The NYISO's Real-Time Scheduling ("RTS") process, comprised of the Real-Time Commitment ("RTC") and Real-Time Dispatch ("RTD"), performs a unique *ex ante*, co-optimized, multi-period commitment, scheduling and dispatch process that simultaneously evaluates bids and offers submitted by External Transactions (*i.e.*, intertie transactions) and internal resources to produce a least production cost solution to meet demand requirements. External Transaction offers and bids (Imports, Exports and Wheels-Through) compete directly with internal NYCA resources, and with other External Transactions to be economically awarded an Energy schedule. RTS incorporates expected transmission congestion and permits the NYISO to meet its load obligations at the lowest production cost. The NYISO awards all necessary transmission service to economically committed resources, including External Transactions.

Coordinated Transaction Scheduling, or CTS, is a set of Real-Time Market rules that allows Imports and Exports to be scheduled based on a bidder's willingness to purchase and sell energy if the forecasted price spread is greater than or equal to the dollar value specified in the CTS Interface Bid. The NYISO permits CTS Interface Bids at all four of the PJM interfaces and requires CTS Interface Bids at the ISO-NE interface.

Transmission Customers using CTS submit a single CTS Interface Bid to indicate their desire to simultaneously buy Energy in one Control Area and sell Energy into the other Control Area based on the forecasted price difference between the two relevant markets at the identified location. CTS Interface Bids allow schedules to be based on the price differences projected by PJM or ISO-NE and the NYISO. Every 15 minutes, the NYISO incorporates forecasted prices from PJM and ISO-NE into the NYISO's RTC optimization and will economically evaluate CTS Interface Bids, along with other offers to sell and purchase energy, to determine cross-border Transaction schedules.

CTS improved scheduling efficiency by reducing counter-intuitive regional schedules by explicitly incorporating projected price differences between Control Areas into scheduling decisions and establishing intra-hour schedules closer to actual, real-time operations. The scheduling process, repeated every 15 minutes, efficiently utilizes a CTS Enabled Interface whenever economic Transactions are proposed to move power from the low-cost Control Area to the high-cost Control Area. Establishing intra-hour schedules closer to the actual 15-minute scheduling interval improved the accuracy of cross-border scheduling decisions because those decisions reflect updated system conditions. CTS Interface Bids also protect a Transmission Customer from the financial risk of obtaining inconsistent transmission schedules in the NYISO

and PJM/ISO-NE because CTS Interface Bids are jointly scheduled and coordinated between the ISOs.

In the event of a system reliability need, such as a shortage of thirty-minute or ten-minute operating reserves, the NYISO has authority to declare an alert state and potentially request emergency assistance from neighboring regions. Consistent with its obligation to maintain sufficient operating reserves, in the event of a deficiency the NYISO has authority to direct all Market Participants to convert reserves to energy, to direct resources to emergency upper operating limits, to curtail exports, and to purchase emergency energy from sources outside the NYCA. This protocol provides a valuable safety net to maintain reliable operation of the of the bulk power system.

Lastly, New York and its neighbors in the Northeast participate in natural gas and electric industry coordination groups that discuss, and endeavor to improve, gas-electric coordination in the areas of infrastructure maintenance outages, communication, and emergency protocols. The NYISO also has a specific New York State Gas-Electric Coordination Protocol under which specific emergency communications are initiated between state agencies, the NYISO, and a generator when (i) the generator has a derate or outage arising from an emissions limitation, and (ii) the derate would require potential electric load shedding. During an event that could cause a loss of gas supply, including the declaration of an operational flow order, the NYISO or the local utility can determine that the loss of gas would likely lead to the loss of firm electric load. The protocol provides for mutual assistance to identify a critical generator, and to determine whether gas can be made available to that generator to remain in service through coordination among the

NYISO, the local utilities, the New York State Department of Public Service, interstate gas pipelines and gas Local Distribution Companies ("LDCs").[8]

The NYISO also has a Gas Pipeline Communications Protocol pursuant to FERC Order No. 698[9] that provides for emergency coordination among the NYISO, gas pipeline operators and LDCs.

f. NYISO's Existing Transmission Line Rating Practices Support Reliable System Operation

Each RTO/ISO employs different power system modeling techniques, has different approaches to scheduling transmission service, employs different pricing methods, has different market rules, relies on a different mix of transmission and generation resources, and uses different software to implement its markets. In particular, the NYISO uses a financial reservation transmission model for Market Participants to schedule energy market transactions.

The NYISO utilizes two sets of seasonal transmission line ratings, provided by Transmission Owners, in numerous settings across its planning, operations, and market-administration functions. Transmission line ratings affect reliability, economic, and public policy planning studies, reliability studies that inform the NYSRC IRM evaluation process, Installed Capacity Auctions, Centralized Transmission Congestion Contract ("TCC") Auctions, Day-Ahead Energy scheduling, and real-time system operations. Summer seasonal ratings are in place from May 1 through October 31, while Winter seasonal ratings are in place from November 1 through April 30. The equipment ratings that Transmission Owners rely on to develop seasonal ratings are publicly available through the summer and winter operating studies

[8] *See* NYISO Open Access Transmission Tariff Attachment BB.

[9] *Standards for Business Practices for Interstate Natural Gas Pipelines; Standards for Business Practices for Public Utilities*, Order No. 698, FERC Stats. & Regs. ¶ 41,251 (2007), *order on clarification and reh'g*, Order No. 698-A, 121 FERC ¶ 61,264 (2007).

performed and discussed with stakeholders.[10] The applicable pre- and post-contingency seasonal ratings in effect and utilized in the Day-Ahead Market ("DAM"), Real-Time Market, and the TCC market solutions are available to NYISO stakeholders, upon request, on a secure basis.

In the NYCA, the Transmission Owners own the physical transmission assets and are responsible for developing the ratings.[11] These asset owners provide the element ratings directly to the NYISO and the NYISO determines the most limiting element, which becomes the applicable transmission facility limit. For example, a breaker disconnect in series with a transmission line may be the limiting element of the path and, therefore, will be used to set the limit for the transmission line.[12] The NYISO assigns each facility a rating authority for real-time operations to avoid potential disagreements over the rating in effect. The NYISO Operating Committee then reviews and approves the transfer limits developed by the NYISO through the seasonal study process.

The NYISO has Dynamic Line Ratings ("DLRs") functionality in place today for the Transmission Owners to increase transmission line ratings in real time, when appropriate. The functionality does not differentiate between ambient-adjusted ratings ("AARs") on transmission lines and DLRs. Asset owners may increase or decrease real-time line ratings for any reason, including ambient temperature, using the DLR functionality. These real time adjustments historically have been made to increase the ratings used in real time based on ambient conditions. A majority of the Bulk Electric System equipment in New York is able to be rated using DLRs

[10] *See*, https://www.nyiso.com/documents/20142/3691300/Winter2020-21-Operating-Study-Appendicies-Final.pdf/0bed36d6-8060-67ab-4a07-bcf23e5d7816.

[11] The NYISO does not own any transmission equipment; it relies on the asset owners to provide transmission line ratings.

[12] Pursuant to NERC standards, the most limiting rating should be used until a disagreement can be resolved.

(or AARs). Transmission Owners submit the updated ratings to the NYISO via the Inter-control Center Communications Protocol secure communications tool.

The NYISO encourages the Commission to carefully consider all of the potential consequences of a general requirement to implement more granular transmission line ratings (*e.g.*, ratings that vary hourly) beyond those ratings already employed by the RTOs/ISOs. Utilizing AARs or DLRs in the NYISO's DAM, or for any day within the following ten days, would introduce significant market inefficiencies to the existing NYISO market structure and increases the potential for real-time reliability issues. The NYISO DAM incorporates both financial and reliability passes to present a secure day ahead plan to the operators. This plan may be augmented as needed to address reliability concerns identified after the DAM, but the DAM is the starting point for addressing these concerns. To avoid the risk of an unanticipated reduction in transmission capability, and potential reliability concerns, the NYISO uses seasonal ratings in the DAM. If transmission line ratings are reduced in real-time, compared to the values relied on in the Day-Ahead Market solution, the NYISO may be required to rapidly reduce the schedules of certain Generators while quickly ramping up other generation resources. Given the limited amount of system flexibility in real-time due to the reduced lead-time to bring on additional resources, this situation could present reliability issues if sufficient generation is not available to serve load, after certain transmission line ratings are reduced. Even when sufficient resources are available to protect electric system reliability, the revised market solutions could frequently result in significant cost increases to customers as Generators are asked to ramp up and down. On the other hand, when DLRs and AARs make additional transmission capability available in the Real-Time Market relative to the DAM, the increased system flexibility allows efficient online fast-ramping generation to be dispatched in real-time and may result in a reduction of

Real-Time Market congestion costs for NYISO Load Serving Entities, thereby directly providing a cost benefit to consumers.

In addition to these Energy market and reliability concerns, transmission line ratings play a significant role in the NYISO's electric system planning function. As part of its economic planning process, the NYISO regularly evaluates the electric system both with and without any transmission constraints to understand the impact of existing transmission limits on the delivery of Energy.[13] This approach is the equivalent of having infinite transmission capability across the New York grid, which provides an understanding of "ideal" system behavior. In order to compare the ideal system to the existing physical limitations, the NYISO evaluates electric system congestion with the New York transmission limits reset to their actual values. The difference in annual generation (or hourly generation, depending on the study) by resource type and location informs an estimate of the resources that cannot deliver Energy at times due to existing transmission limits and constraints. These studies rely on seasonal transmission line ratings to provide information about the future of the entire electric system to Transmission Owners, Generator developers, Load Serving Entities, customers, and regulators. Significant deviations between the transmission line ratings used in these studies and those used in real-time operations increase the risk of misguided investment decisions and, in the worst case, real-time reliability issues.

The currently effective seasonal transmission line ratings and DLR functionality support effective system planning, efficient markets, reliable system operation, and the flexibility needed for NYISO and TO operators to respond to real-time system conditions. Any regular deviations

[13] A number of transmission development projects are underway in New York that will facilitate more transmission capability throughout the state and reduce congestion constraints. For example, the Western New York and AC Transmission Public Policy Transmission Projects are planned to enter into service on June 1, 2022, and December 31, 2023, respectively.

from the seasonal ratings in effect, especially downward deviations, would require significant changes to the NYISO's planning studies, operational studies, market administration, and operation of the New York State Power System. More granular transmission line ratings (*e.g.*, three-month seasonal ratings, monthly ratings, or hourly ratings) would require numerous projects to develop the necessary market and operational rules to avoid the cost increases and potential reliability issues discussed throughout these comments, as well as software to implement the suite of new rules.

g. NYISO's Outage Scheduling Practices Support Reliable Operation

The NYISO coordinates all requests for transmission and generation outages based on their potential impact on power system reliability.[14] The New York Transmission Owners must schedule maintenance outages in accordance with outage schedules approved by the NYISO.[15] The NYISO's Outage Scheduling Manual describes the process to determine whether system reliability and power transfer requirements will be met during scheduled outages. The NYISO will determine if reliability criteria violations will occur based on the requested transmission outages. The NYISO will also determine if projected Operating Reserves will be adequate during requested generator outages. These processes allow the NYISO to coordinate and execute outages in a manner that robustly protects electric system reliability. As a result, most generation and transmission system maintenance is scheduled during off-peak (shoulder) seasons. In addition, the NYISO has authority to defer, postpone, or cancel scheduled

[14] *See* Outage Scheduling Manual at pp. 12 and 28-29.

[15] *See* Section 2.08 of the Agreement between the NYISO and the Transmission Owners, available on the Foundation Agreements page of the NYISO website, https://www.nyiso.com/regulatory-viewer.

transmission outages of facilities under NYISO operational control to maintain electric system reliability.[16]

As Mr. Yeomans described during the Technical Conference, the NYISO already has the authority to recall Transmission facilities from outage. During times where reliable operation of the grid is at increased risk, the NYISO may issue a Hands-Off directive.[17] Hands-Off means the NYISO may cancel or recall all or some transmission facility outages and recommend that Transmission Owners cancel In-Service Relay work and Hot Line work on their facilities for the specified period. Increased risk to the electric grid may arise from, but is not limited to, periods of forecasted extreme weather conditions.

Transmission facility outages can have an impact on congestion settlements related to the Day-Ahead Market and TCC Auction settlements, as described in Attachment N of the NYISO Open Access Transmission Tariff ("OATT"). This section of the NYISO OATT describes how congestion settlements are allocated to Transmission Owners based on transmission facility outages and a facility's return-to-service. Coordinating outages based on reliability as the primary criterion, while assigning the cost of the outage to the responsible party, allows for critical outages to occur and requires the asset owner to evaluate the impact of an outage. The NYISO-Transmission Operator agreements allow for the operation of the New York State Power System in the most reliable, economic, and transparent fashion.

Increasing penetration of renewable generation and energy storage, and future changes to load patterns and capacity requirements in New York State may require modifications to the NYISO's outage scheduling processes. The NYISO continues to evaluate how changing system

[16] *See* Outage Scheduling Manual at p. 12.

[17] *See* Outage Scheduling Manual at p. 38.

characteristics affect its outage scheduling processes and will develop any necessary changes through its collaborative stakeholder governance process.

h. Loss of Load Expectation Enhancements

An electric system is adequate if the probability of having insufficient transmission and generation to meet expected demand is equal to or less than the system's standard, which is expressed as an LOLE. The New York State Power System is planned to meet an LOLE that is less than or equal to an involuntary load disconnection that is not more frequent than one day in every ten years or 0.1 days per year. This requirement forms the basis of New York's installed capacity or resource adequacy requirement.

Resource adequacy is measured using a probability-based index, *i.e.*, LOLE. Resource adequacy analysis calculates the LOLE for the specified bulk power system conditions based on modelling assumptions. The primary tool used for resource adequacy analysis is General Electric's MARS program. MARS computes the reliability of a system comprised of any number of interconnected areas or zones, including the impacts of the transfer capability of the transmission system. Each study case system is developed by modeling the existing system, including expected generation and transmission system additions and upgrades, and a set of assumptions based on the preceding Reliability Planning Process study's matrix. The NYISO regularly adjusts the assumptions to conform to the rules and procedures for conducting its Reliability Needs Assessment ("RNA"). Given that the transmission topology utilized in the MARS analysis is a transportation algorithm, rather than being based upon network flow, many assumptions have to be made in translating network-based transfer limits into the interface transfer limits utilized by MARS. These assumptions involve the construction of interface groupings and nomograms to capture the important effects and conclusions that may be derivable

from the analysis of a network flow-based model. The construction complexity and implementation are impacted by other assumptions made in the MARS model.

LOLE continues to be a valuable probabilistic metric for expected electric system performance. However, since the LOLE calculation depends exclusively on modeling assumptions, the NYISO believes that continuous review and enhancement of models and input assumptions is necessary to maintain a robust approach to resource adequacy planning. Similar to the NYISO's outage scheduling procedures, increasing penetration of renewable generation and energy storage, and future changes to load patterns and capacity requirements in New York State may require modifications to the NYISO's LOLE calculations and resource adequacy planning. The NYISO continually evaluates how changing system characteristics affect its planning processes and may propose necessary changes through its collaborative stakeholder governance process.

III. CONCLUSION

WHEREFORE, for the foregoing reasons, the NYISO respectfully requests that the Commission (i) consider these comments, including the description of the NYISO's ongoing efforts to evaluate the potential challenges brought about by climate change and extreme weather events, and (ii) provide ISOs/RTOs with the flexibility necessary to appropriately implement any future Commission directives on these issues in a manner that is appropriate and tailored to account for existing regional differences and the markets they administer.

Respectfully submitted,

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Dated: September 27, 2021

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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 27th day of September 2021.

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