UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

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

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

In accordance with the *Supplemental Notice of Technical Conference Inviting Comments* issued by the Federal Energy Regulatory Commission ("Commission" or "FERC") on March 15, 2021 in the above referenced proceeding ("Supplemental 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 shares the Commission's desire to understand the near, medium, and long-term challenges presented by climate change and extreme weather events.[2] The NYISO has already undertaken a series of studies to better understand these challenges, and appreciates the opportunity to share its experience with the Commission. Commission guidance will help industry stakeholders prepare for, and develop responses to, the threats posed by climate change and extreme weather.

I. Background

The NYISO is actively engaged in extensive system planning efforts that help inform a continuous, comprehensive approach to enhancing market designs that will incent the kinds of

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

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

grid services needed as system conditions change, and has undertaken a three-phase Climate Change Impact and Resilience Study ("Climate Study"). Phase 1 of the study, released in 2019, focused on developing long-term energy, peak, and hourly load projections that capture the impacts of increasing temperatures and state policies designed to improve energy efficiency and address climate change.[3] The Phase 1 study prepared load forecasts for the period 2020 through 2040 for the entire New York Control Area ("NYCA") system and for each of the NYISO's eleven load zones. Among other things, the Phase 1 study identified that, on an annual basis, increasing temperatures will have minimal impact on total system energy requirements as increasing cooling needs are largely mitigated by decreasing heating-related needs. The NYISO expects that the system load profile will evolve over time, with the strongest load growth occurring in shoulder months (April, May, September, and October).[4] State policies designed to counter the impact of climate change will also affect load levels, potentially having a greater impact than rising temperatures.[5]

The NYISO completed the second phase of its Climate Study in 2020.[6] The Phase 2 study reviewed the potential impacts on power system reliability from (i) the electric load projections identified in the Phase 1 study, and (ii) system load and resource availability associated with the impact of climate change, such as severe storms, extended extreme temperatures, and other meteorological events, on New York's power system. The Phase 2 study

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[3] Itron, Inc., *New York ISO Climate Change Impact Study Phase 1: Long-Term Load Impact* (Dec. 2019), *available at* https://www.nyiso.com/documents/20142/16884550/NYISO-Climate-Impact-Study-Phase1-Report.pdf/ at 1 ("Phase 1 Report").

[4] *Id.* at 3.

[5] *Id.*

[6] Analysis Group, *Climate Change Impact and Resilience Study – Phase II: An Assessment of Climate Change Impacts on Power System Reliability in New York State* (Sept. 2020), *available at* https://www.nyiso.com/documents/20142/16884550/NYISO-Climate-Impact-Study-Phase-2-Report.pdf/ ("Phase 2 Report").

simulated the potential impacts of climate change and climate policy on the reliable operation of the New York power system to assist the NYISO, its market participants, policy makers and other stakeholders in considering whether those potential impacts warrant changes to the NYISO's planning, operational practices, and/or market designs.[7]

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. 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.

II. COMMUNICATIONS AND COORESPONDENCE

All communications and correspondence concerning these Comments should be served as follows:

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[7] For example, the NYISO modeled and evaluated inland and coastal storms, extended wind lulls, heat and cold spells, and drought and icing events using historical experience with similar events to assess their effects on power system infrastructure and operations.

III. COMMENTS

a. Near-, Medium-, and Long-Term Challenges of Climate Change and Extreme Weather

Climate change and extreme weather events already affect New York's electric system, and those impacts are expected to continue. Extreme weather conditions occurring in the summer months include more and longer-duration hot weather conditions, high winds and periods of no wind (wind "lulls") lasting several days, and increased risk of hurricanes or other severe storms. Winter conditions are expected to include more frequent sustained cold weather conditions, high winds, deep snowpack, sustained icing of waterways used for hydroelectric generation, ice storms, and, in the spring, increased risk of floods resulting from snowmelt.

These conditions can create challenges for New York's electric system. For example, periods of strong winds may result in transmission outages and wind generator "cut-outs."[8] Alternatively, sustained periods of hot and humid weather, which often include wind lulls, compromise the availability of wind generation across the state. In the winter season, sustained cold weather conditions impact fuel availability, particularly to Generators down-state, where generation is predominantly powered by fossil fuels. For example, generators in and around New York City that use natural gas as their primary fuel typically have interruptible natural gas contracts that are subject to curtailment when firm gas customers require greater pipeline capacity (*e.g.*, during periods of increased home heating need). Many downstate units that are primarily fueled by gas have dual fuel capability, and receive oil supplies from barges on the Hudson River and in New York Harbor. Those deliveries, however, can be hindered by storms, strong winds, and ice on the waterways.

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[8] Each wind turbine is designed to have a maximum wind speed beyond which it automatically shuts down to protect equipment. The maximum winds speed at which a wind turbine can operate is its "cut-out" speed.

The NYISO expects these types of challenges, as well as other challenges identified in the remainder of these comments, to continue for the foreseeable future. Some challenges, such as wind lulls, may be exacerbated by an evolving resource mix that includes increased penetration of renewable resources dependent on particular weather conditions to generate electricity.

b. Effect of Climate Change and Extreme Weather Events on the New York State Electric System

New York has experienced hurricanes, ice storms, floods, extreme heatwave conditions, and extreme cold weather conditions throughout its history. It is difficult to say with precision that extreme weather events have become more common in the last decade, but there have been several extreme weather events that significantly impacted New York during that period.

In 1985 Hurricane Gloria, a Category 3 storm, directly hit Long Beach, Long Island, resulting in severe damage to Long Island, New York City, and Connecticut, including significant damage to electric generators and the transmission and distribution systems. After a period of relatively low tropical storm activity, Hurricane Irene hit New York City in 2011 and traveled inland up the Hudson Valley and north into New England, resulting in significant electric infrastructure damage. The storm caused 500-year-flood conditions in two central New York counties, disabling local and regional electric systems far from the coast.[9] The following year Superstorm Sandy hit New Jersey, New York City, Long Island, and Connecticut. Reports indicate that Sandy left approximately 1,000,000 Long Island residents[10] and more than

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[9] United States Geological Survey, *Floods of 2011 in New York*, *available at:* https://www.usgs.gov/centers/ny-water/science/floods-2011-new-york?qt-science_center_objects=0#qt-science_center_objects (citing severe damage occurring in Greene and Schoharie counties).

[10] Scott DiSavino, *LIPA restores power to most Sandy outages on Long Island, NY*, Reuters (Nov. 12, 2012), https://www.reuters.com/article/us-storm-sandy-lipa/lipa-restores-power-to-most-sandy-outages-on-long-island-ny-idUSBRE8AD0VI20121114.

1,000,000 Con Edison customers[11] without power for up to two weeks. On Long Island, utility work included replacement of 4,500 power poles, 2,100 transformers, and repairs to 44 substations, at a cost of over $800 million according to post-storm reporting.[12] Most recently, Tropical Storm Isaias battered New York, New Jersey and Connecticut, resulting in approximately 267,000 customers in the New York City area, and more than 300,000 on Long Island, without power.[13]

Drought conditions also affect New York's electric system. Importantly, water levels on the Niagara and St. Lawrence Rivers may drop in response to drought conditions in the Great Lakes drainage basin (including the U.S. Midwest and Manitoba and Ontario in Canada). Therefore, it is not just local drought conditions that impact hydroelectric generation in New York. Extreme weather and fire conditions in Canada also affect imported hydroelectric power from Quebec that the NYISO relies upon.

Prolonged heatwaves strain generation, transmission, and distribution facilities, and may affect electric system reliability. In July 2013, New York and neighboring states were in the grip of a six-day heatwave that saw New York State hit its all-time peak electric demand.[14] Although the NYISO did not need to shed Load during the heatwave, weather conditions created significant levels of transmission congestion in the lower Hudson Valley and Western New York

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[11] Con Edison, *Super Storm Sandy: 2013 State of the Company, available at*: https://www.conedison.com/ehs/2012-sustainability-report/engaging-stakeholders/reliability/superstorm-sandy/index.html ("Sandy caused five times as many outages as the next-largest storm, Hurricane Irene, which hit in August 2011. In Sandy's immediate aftermath, more than a million customers were without power.").

[12] Roger Riddell, *The 10 longest power outages of 2012*, Utility Dive (Jan. 23, 2013), https://www.utilitydive.com/news/the-10-longest-power-outages-of-2012/92756/.

[13] Mihir Zaveri & Ed Shanahan, *2.5 Million Lose Power and One Is Killed as Isaias Batters N.Y. Area*, N.Y. Times (Aug. 4, 2020), https://www.nytimes.com/2020/08/04/nyregion/isaias-ny.html.

[14] Press Release, New York Indep. Sys. Operator, Inc., NYISO Meets Record Demand with Balanced Array of Resources (Jul. 22, 2013), *available at*: https://www.nyiso.com/documents/20142/3064623/NYISO%20Meets%20Record%20Demand%20with%20Balanced%20Array%20of%20Resources%20-%2007_22_13%20-%20FINAL.pdf/.

regions, and identified the need for targeted transmission system upgrades.[15] Electric system reliability is enhanced by inter-regional coordination during times of peak demand, and the NYISO was able to meet demand in the areas most affected by the heatwave with internal generation, along with imports from PJM Interconnection, ISO New England, Hydro Quebec, and Ontario.

In the past decade, New York has experienced two winters with sustained cold weather conditions lasting several consecutive days. Gas fired generation is primarily served with interruptible gas pipeline service, making Dual Fuel capability crucial for electric reliability during these extreme, sustained cold weather events. However, in times of sustained extreme cold, oil burn rates can exceed fuel replacement rates, creating challenges for maintaining electric reliability.

New York State's location and topography expose different regions to different challenges. It is difficult to quantify whether extreme weather events have occurred more frequently throughout the state in the past decade, as compared to previous decades. However, certain data deserve to be highlighted. Superstorm Sandy and Tropical Storm Isaias, which both occurred within the last ten years, represent the two most impactful storms (by number of customers without electricity) in the history of New York City and Long Island. The July 2013 heatwave, as well as the desire to maximize the output of Upstate renewable resources, underscored the benefits of constructing new transmission facilities linking Upstate New York to New York City. New transmission facilities will address transmission congestion between generation located in upstate and western New York and the downstate load pockets. Moreover, the recent sustained cold weather conditions in New York reinforce the need for fuel diversity

[15] *Id.*

throughout the generation fleet to support reliability when the interstate and local natural gas systems become constrained.

The NYISO expects climate change and extreme weather events to be an increasingly important consideration in the development and operation of electric generation, transmission, and other facilities moving forward. Increased incidences of extreme weather are expected to require enhanced planning and operation criteria, increased purchases of ancillary services, and additional hardening of energy infrastructure assets.

For example, sustained hot weather and other summer extreme weather conditions are likely to contribute to fuel unavailability (*e.g.,* drought conditions affecting hydroelectric facilities) and derates (*e.g.,* high temperature derates for thermal units) that reduce the capability of generators to produce to their rated capabilities. Weather conditions may also contribute to a reduction in the output capability of intermittent resources such as wind and solar. To the extent that weather-affected changes in generator performance can be captured in reliability studies, they may lead to the need for more installed capacity to be available to the system, and increased operating reserve requirements to serve real-time load. Greater reliance on weather-dependent generation sources (*e.g.*, wind, solar, hydroelectric) in New York will likely result in the need to add a significant amount of dispatchable, fast-response resources to address these real-time operating reserve needs.

Facility Owners will also need to evaluate the resiliency of the complete system. Facility Owners and developers may need to consider hardening generation, transmission, substations, and other facilities to mitigate the impacts of extreme weather and climate change, and to enable efficient recovery from any weather-related events.

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

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 New York State Reliability Council ("NYSRC"), Con Edison and the Long Island Power Authority annually determine the load levels at which generation must switch from natural gas to oil. Known as the "Loss of Gas 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.[16]

In the future, new common mode failures are likely to arise as more intermittent resources are added to electric systems. As discussed above in Section III.a, future, more volatile weather conditions could produce wind lulls lasting several days, resulting in limited or no wind output to the power system. 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. As described below in Section III.e, the NYISO conducted modeling of a

[16] *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.

possible resource set comprised of wind, solar, and storage with certain other resources (nuclear and hydro) under forecasted 2040 loads in its Phase II Climate Change 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.

d. Coordinated Operations and Planning of Natural Gas and Electric Power Systems

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").[17]

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

The NYISO also has a Gas Pipeline Communications Protocol pursuant to FERC Order No. 698[18] that provides for emergency coordination among the NYISO, gas pipeline operators and LDCs.

e. Regulator, Utility, and the ISO Coordination to Address Climate Change

The NYISO performs winter Seasonal Readiness Assessments, including conducting on-site visits of generating stations, to discuss prior winter season operations and preparations for upcoming winter operations, including generator testing, cold-weather preventive maintenance, and fuel issues (*e.g.*, types, inventory, and switching capability). The NYISO performs an annual transmission security analysis to understand system impacts due to loss of gas supply for generation facilities in the winter, and a transmission security analysis for a high peak summer forecast. The transmission security studies are informational only, and used to provide an understanding of what the system could experience during these types of extreme events. As penetration of land-based and off-shore wind increases, loss of fuel (*i.e.*, wind) will need to be examined in these studies. The NYISO's analysis of extreme contingencies evaluates the loss of one entire facility (*e.g.*, a substation), but does not evaluate the loss of multiple facilities due to extreme weather (*e.g.*, a hurricane) at this time.

The NYISO's resource adequacy studies (discussed in more detail below in section III.g) 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 determines the amount of capacity

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[18] *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).

needed to meet load in each hour, and calculates an average loss of load expectation for a Capability Year at each of the seven load levels. This information is used to develop a probability weighted-average Loss of Load Expectation. The NYISO also uses historical information in its evaluation of generation facilities. While it will be important to incorporate the impacts of climate change and extreme weather in these analyses, at least equally important will be the need to evaluate increases in demand driven by policies that encourage electrification (*e.g.*, electric heating and electric vehicles). Electrification has the potential to be the most significant driver of electric demand in long-term planning studies.

The NYISO also completed Phase 1 and Phase 2 of its Climate Study in 2019 and 2020, respectively, evaluating planning considerations through 2040. The two reports (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 included developing a detailed hourly forecast across each year that incorporated climate change impacts such as rising temperatures. Phase 2 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 (including off-shore wind) and solar. Planning for significant penetration of these resources becomes challenging when forecasting the potential for derates due to environmental impacts 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, threatening the grid operator's ability to serve load. The Climate Change 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.

f. Grid Operation Changes to Address Climate Change and Extreme Weather Events

The NYISO has undertaken a series of market rule changes in recent years in an effort to adapt to changing grid conditions. The two-pronged approach (i) updates NYISO operations to enhance reliability, and (ii) modifies generator financial incentives to improve resource availability in times of tight supply.

The NYISO did not intend these recent rule updates to directly address climate change and extreme weather events, but rather to enhance electric system reliability generally. Nonetheless, modifications to the NYISO's Operating Reserve Requirements, dual fuel testing requirements, and Day-Ahead Market schedule will assist grid operators and generators responding to climate change and extreme weather. For example, in 2015 the NYISO increased its Total Operating Reserve Requirement from 1,965 MW to 2,620 MW, and implemented a new 30-Minute reserve requirement for Southeastern New York. These enhancements provide grid operators with greater access to generation capability in times of tight supply, such as sustained hot weather conditions.

The NYISO also updated its dual fuel testing rules in 2017 to reflect a NYSRC reliability rule requiring combined cycle generators located in New York City that have the ability to automatically switch from natural gas to a liquid fuel, to demonstrate that capability at least once each Capability Period.[19] These testing requirements enhance reliability of the bulk power system by maintaining reliable operation of auto-switching capability of dual fuel units in New

[19] New York Indep. Sys. Operator, Inc. August 11, 2017 Filing, Docket No. ER17-2286-000.

York City and preparing for winter weather conditions. The NYISO also modified its Day-Ahead Market offer window, consistent with Order No. 809, to provide generators additional time to procure gas before the close of the gas day market. The NYISO's Day-Ahead Market now closes at 5:00 a.m. local time, and Day-Ahead Market schedules are posted around 9:30 a.m. local time.

Modifying generator compensation opportunities also represent an effort to incent resource availability in times of tight supply. For example, the NYISO implemented changes to its shortage pricing rules in an effort to incent generators to secure sufficient fuel to meet Day-Ahead Market schedules, and modified its generator reference level rules to allow resources to reflect expected fuel costs in their reference levels. More recently, the NYISO implemented scarcity pricing rules that apply when demand side resources are deployed for reliability purposes. The rules provide that real-time Operating Reserves prices reflect the value reliability-based demand side resources provide the system. Without the scarcity pricing rules, dispatching reliability-based demand side resources during tight supply conditions could depress real-time prices, sending inefficient price signals to generators.

In addition to these market rule enhancements, the NYISO has modified its control room and software capabilities to enhance grid operator situational awareness of the natural gas system. In addition to employing new ISO staff to support gas-electric system coordination, the NYISO updated its control room video displays to include northeast interstate gas pipeline critical notices, and established a new web-based fuel survey application to monitor generator capability and fuel inventories. These enhancements reflect the need for close coordination between the electric and gas systems, particularly during cold weather operations and other weather events. The NYISO continuously reviews and, when necessary, updates its operating practices to reflect changing system conditions. In the third phase of its Climate Study, the NYISO will consider whether Phase 2 results lead it to modify existing, or create new operating practices to address climate change and extreme weather events.

g. Evaluation of Resource Adequacy

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. The NYISO conducts an annual study of the NYCA system to determine resource adequacy needs in support of the NYSRC. The NYSRC evaluates the NYISO's recommendations and determines the applicable Installed Reserve Margin ("IRM") necessary to maintain system reliability.[20]

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 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 (which are influenced by summer weather events such as heatwaves). The IRM study also evaluates transmission capability models that influence the amount of capacity needed in particular locations to maintain system reliability (known as "Locational Capacity Requirements," or

[20] *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.

"LCRs"). Resources eligible to meet these needs may include generators, demand side resources, and energy imported from neighboring control areas.

The Installed Capacity Subcommittee ("ICS") of the NYSRC is responsible for administering and enhancing the IRM and LCR determination processes, and comprises representatives and consultants from the NYSRC Executive Committee, NYISO staff, and a diverse group of NYISO stakeholders. Each year, the ICS working group facilitates a review of the ICS and LCR processes by evaluating lessons learned from prior processes, directives from the NYSRC Executive Committee, and emerging reliability needs. The review assesses the relative value and priorities of the Resource Adequacy models and processes used to determine the IRM and LCRs. For example, for the 2021-2022 Capability Year, the ICS debated twenty-five potential process improvements, before prioritizing initiatives to: (i) study the impact of extreme weather on peak load forecasts, including how to account for increasing levels of load forecast uncertainty (the level of coincidence between expected and actual peak loads with available resources), validating existing models and modeling techniques, and providing recommendations for forecasting improvements, (ii) continue improving the representation of energy duration limited resources (*e.g.*, limited duration energy storage resources), (iii) assess and improve the modeling of certain demand side resources, (iv) study and provide recommendations to expand the IRM process to capture the effects of transmission security requirements, and (v) initiate a study of the load shapes represented in the IRM and LCR models to capture the impacts of behind-the-meter solar resources, and to prepare for the potential impacts of electrification (*e.g.*, the impacts of significant electric vehicle charging).

h. Outage Planning Processes

The NYISO's Outage Scheduling Manual describes the outage scheduling processes and rules. These processes result in scheduling most generation and transmission system maintenance during off-peak (shoulder) seasons. Increasing penetration of renewable generation and energy storage, and future changes to load patterns and capacity requirements in New York State may also require modifications to the NYISO's outage scheduling processes. The NYISO continues to evaluate how changing system characteristics affect its outage scheduling processes.

i. Blackstart Capability

New York has a statewide blackstart plan under which three large hydroelectric facilities and associated transmission switching plans energize a synchronized backbone transmission system that runs from Niagara to New York City. As part of the NYISO's restoration plan, the New York Transmission Owners each have individual restoration plans that will connect generation without blackstart capability and connect a balanced amount of electric load at the NYISO's direction. The NYSRC also requires a New York City-specific blackstart restoration plan, which includes blackstart capability from certain in-City generators.

The blackstart plans are designed with a certain level of flexibility addressing the actual electric system infrastructure and topology available to be restored. If parts of the transmission system are unavailable, or if certain generation is unavailable, the restoration plans include alternative switching schemes and generation schemes that can be utilized. However, high levels of transmission or generation unavailability in a geographic location can impede restoration efforts.

Electric system infrastructure should continue to be improved over time to reflect system conditions and potential threats. As additional renewable resources and electric storage (inverter-based resources) are added to the system, and as extreme weather events increase the probability of contingencies that can result in system outages, the NYISO and other stakeholders in New York will explore modifications to the blackstart plans to complement those resources and system conditions.

IV. 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 the markets they administer.

Respectfully submitted,

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Dated: April 15, 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 15th day of April 2021.

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