UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Transmission System Planning Performance Requirements for Extreme Weather	**)** **)**	**Docket No. RM22-10-000**

COMMENTS OF THE NEW YORK INDEPENDENT SYSTEM OPERATOR, INC.

The New York Independent System Operator, Inc. ("NYISO") respectfully submits its comments in response to the *Notice of Proposed Rulemaking* in the above-captioned proceeding issued by the Federal Energy Regulatory Commission ("Commission") on June 16, 2022 ("Notice").[1] The NYISO shares the Commission's desire to "address reliability concerns pertaining to transmission system planning for extreme heat or cold weather events that impact the Reliable Operation of the Bulk-Power System"[2] and supports Commission guidance to the North American Electric Reliability Corporation ("NERC") and the industry at large that will help stakeholders plan for, and develop responses to, impacts from extreme heat and cold weather on the reliable operation of the Bulk-Power System.[3]

The NYISO encourages the Commission to direct NERC to develop modifications to Reliability Standard TPL-001-5.1 to require planning for extreme heat and cold events using transmission security analyses expanded to cover a range of defined extreme weather conditions, including availability of the expected resource mix, and use of corrective action plans to mitigate

[1] Transmission System Planning Performance Requirements for Extreme Weather, *Notice of Proposed Rulemaking*, Docket No. RM22-10-000 (June 16, 2022).

[2] *Id*. at P 1.

[3] Capitalized terms that are not otherwise defined in this filing shall have the meaning specified in the NOPR or the NYISO Market Administration and Control Area Services Tariff.

instances where performance requirements are not met for certain defined extreme heat and cold conditions. At the same time, the Commission should encourage NERC to avoid imposing one-size-fits-all planning study directives to evaluate these risks. As described herein, the NYISO has already implemented processes to examine the impact of climate change and regionally appropriate potential extreme weather. Revisions to TPL-001-5.1 should be mindful of regional differences and existing long-term planning efforts already underway.

I. Existing NYISO Planning Processes and Study Work to Address Climate Change and Potential Extreme Weather

a. Probabilistic Assessment of Extreme Weather through Long-Term Planning and Load Forecasting

The NYISO is already engaged in system planning efforts to analyze potential risks to reliability and resilience stemming from extreme weather and climate change. This is critical to protect electric system reliability and guide market reforms in response to evolving system conditions.

For instance, various load forecast scenarios allow the NYISO to reflect increasing uncertainty in its studies when modeling future energy usage in the New York Control Area ("NYCA"). Baseline and scenario forecasts are based on information from NYISO stakeholders, and numerous New York and federal sources. The baseline forecasts include the projected impact on expected demand from public policy energy efficiency programs, building codes and appliance standards, distributed energy resources, behind-the-meter energy storage and 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. A 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 and energy efficiency measures. A low load scenario forecast reflects full adoption of behind-the-meter solar 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, 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). Such efforts 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. The NYISO currently plans for statewide summer peak load under baseline normal weather conditions (maximum temperature of 91 degrees Fahrenheit). The NYISO also evaluates a 95-degree Fahrenheit heatwave expected once every ten years (90/10) and an extreme 1-in-100 year heatwave with a maximum temperature of 98 degrees Fahrenheit to quantify potential risks to reliability, but does not currently seek corrective action plans as part of these evaluations.

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

Grid reliability is measured by assessing transmission security and resource adequacy criteria established by NERC, Northeast Power Coordinating Council ("NPCC") and the New York State Reliability Council ("NYSRC"). Transmission security is the ability of the electric system to withstand disturbances such as electric short circuits or unanticipated loss of system elements without involuntarily disconnecting firm load. Resource adequacy is the ability of the electric system to supply the aggregate electrical demand and energy requirements of their

customers, taking into account scheduled and reasonably expected unscheduled outages of system elements. The NYISO relies on the use of probabilistic methods to account for weather uncertainty in these key reliability planning studies.

The NYISO assesses grid reliability with metrics including transmission security margins, loss of load expectation, zonal resource adequacy margins, and binding interfaces. The most recent study in the NYISO's reliability planning process, the Comprehensive Reliability Plan ("CRP") published in 2021,[4] found that the New York State bulk power transmission system meets all applicable reliability criteria. However, in the CRP the NYISO also recognized risk factors that could adversely affect system reliability over the ten-year planning horizon, including extreme weather.

In the CRP, the NYISO evaluated the impact of extreme weather through transmission security margin calculations (or "tipping point") analysis. As the margins to achieve reliability under baseline conditions were extremely narrow, the NYISO observed that several conditions, including extreme weather, could "tip" the system into a reliability issue. New York is not immune from such extreme weather, which could lead to greater electrical demand and more forced outages of resources than currently accounted for in the baseline forecasts underpinning the CRP. In consideration of these climate-related risk factors, the New York grid may cross a "tipping point" in future years such that the transmission system and resources may not fully serve the demand. Together with stakeholders, the NYISO monitors and tracks these potential impacts in its reliability planning processes.

[4] The Comprehensive Reliability Plan specifically included a section "Beyond the CRP – Road to 2040". https://www.nyiso.com/documents/20142/2248481/2021-2030-Comprehensive-Reliability-Plan.pdf/99a4a589-7a80-13f6-1864-d5a4b698b916. *See also*, https://www.nyiso.com/documents/20142/26735166/CRP-Study-Examines-Power-Grid-Reliability-Risks.pdf/b34771e4-7f34-aea5-d277-52e9a5966adc.

In response to the risk factors identified in the CRP, the NYISO implemented several enhancements to rules and procedures to maintain reliability and resiliency. Starting with the 2022 reliability planning process, the NYISO is planning the transmission security of the grid for (1) expected availability of intermittent generation, and (2) increased unavailability of thermal generation in the future due to forced outages and permit-driven operational limitations using the baseline forecast.

Establishing clear reliability criteria in TPL-001 for planning to extreme weather conditions will aid in developing plans to maintain reliability in the future.

c. NYISO's Climate Change Study on the Impact of Increasing Temperatures and State Policies on Power System Reliability

The NYISO has also completed a multi-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.[5] 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).[6] State policies designed to counter the

[5] 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").

[6] *Id.* at 3.

impact of climate change will also affect load levels, potentially having a greater impact than rising temperatures.[7]

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 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.

The NYISO completed the second phase of its Climate Study in 2020.[8] Phase 2 of the study reviewed the potential impacts on power system reliability from (i) the electric load projections identified in Phase 1, 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. 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

[7] *Id.*

[8] 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").

generator operator control.[9] 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.

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% of peak system demand (depending on the assumed temperature warming scenario).

The Climate Study identified new load forecasting methods to account for rising temperatures in long-term forecasts. The study noted a statistically significant increase in average temperatures of 0.5 to 1.1 degree per decade. This trend is expected to contribute to an increase in the number of summer days with high demand. These findings were incorporated into NYISO long-term load forecasts beginning in 2020. 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.

II. Climate Change and Extreme Weather Impacts on the New York Electric System

Climate change and extreme weather already affect New York's electric system, and those impacts are expected to continue. Extreme weather conditions occurring in the summer

[9] 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.

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

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.

Figure 1 below shows diminishing reliability margins in New York City for a variety of conditions.[10] The baseline analysis of normal weather and limited generation outages shows positive but narrowing reliability margins across the ten-year period. However, heatwave conditions combined with the impact of additional forced generation outages would result in deficiencies to serve demand in New York City in many of the years studied. A heatwave with a statewide average maximum temperature of 95 degrees Fahrenheit may result in very thin margins in 2023 and significant deficiencies beginning in 2025, while an extreme 98-degree Fahrenheit sustained heatwave would test the system limits today and exceed grid capabilities beginning in 2023.

[10] NYISO 2021-2030 Comprehensive Reliability Plan, based on 2021 Gold Book data 99a4a589-7a80-13f6-1864-d5a4b698b916 (nyiso.com).

Figure 1: New York City Transmission Security Margins

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.[11] Although the NYISO did not need to shed Load during the heatwave, weather conditions created

[11] 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/.

significant levels of transmission congestion in the lower Hudson Valley and Western New York regions, and it identified the need for targeted transmission system upgrades.[12]

In the winter season, sustained cold weather conditions impact fuel availability, again particularly to Generators in and around New York City, where generation is predominantly powered by fossil fuels. These generators generally use natural gas as their primary fuel but have the capability to run on liquid fuel (*e.g.*, No. 2 fuel oil). Natural gas deliveries can be interrupted during cold weather when firm gas customers require greater pipeline capacity (*e.g.,* during periods of increased home heating need). Oil supplies can also be at risk during cold weather conditions when ice on the waterways, storms, or strong winds hinder barge deliveries on local waterways.

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.

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.

[12] *Id.*

The NYISO expects these types of climate and weather challenges to continue for the foreseeable future. However, all weather challenges cannot be studied and addressed with a single approach. The NYISO supports this NOPR's focus on extreme heat and cold weather.[13] A NERC Transmission System Planning Performance Requirement will provide helpful guidance and consistent requirements for Transmission Planners and Planning Coordinators to model and study the potential impacts of extreme heat or cold weather events. The NYISO looks forward to working with NERC and other stakeholders through the Reliability Standards development process to further evaluate and refine the planning performance requirements.

III. NYISO Recommends that the Commission and NERC Maintain Current TPL-001 Practices

The NYISO encourages the Commission and NERC to modify TPL-001-5.1 to include extreme heat and cold weather conditions in a manner that is consistent with the current overall requirements of the TPL standard. Today, detailed NERC Standards, NPCC Criteria, and NYSRC Rules[14] specify the analyses to be performed and the contingency events to be evaluated under TPL-001. TPL-001 studies are appropriately limited to deterministic transmission security analyses.[15] While the inputs, such as the potential weather conditions or the dispatch of weather dependent generation may be based on probabilistic models, once the inputs are set, the transmission security study is deterministic. After incorporating the assumed weather conditions

[13] Storms, such as hurricanes and tornadoes, should be approached differently than temperature considerations like extreme heat and cold weather.

[14] *See* NERC Standard TPL-001, available at https://www.nerc.com/pa/Stand/Pages/USRelStand.aspx, NPCC Regional Reliability Reference Directory #1, available at https://www.npcc.org/content/docs/public/program-areas/standards-and-criteria/regional-criteria/directories/directory-01-design-and-operation-of-the-bulk-power-system.pdf, and NYSRC Reliability Rules B Transmission Planning, available at https://www.nysrc.org/PDF/Reliability%20Rules%20Manuals/RRC%20Manual%20V46%20final.pdf.

[15] TPL-001 requires an annual assessment and currently studies a 10-year period. The NYISO encourages the Commission to maintain this frequency and duration as it aligns effectively with other reliability planning processes. While it may be feasible to identify reliability risks beyond the 10-year horizon, there is far less certainty in all elements of the analysis beyond the 10-year horizon.

and generation mix availability, current planning practices used to comply with TPL-001 should be maintained under the expanded requirements where feasible.

Extreme events in TPL-001 are analogous to extreme contingencies rather than extreme system conditions such as heatwaves, cold snaps, droughts, etc. The NYISO understands heatwaves and cold snaps to be the extreme weather circumstances contemplated in this NOPR and encourages the Commission to clarify that extreme heat and cold weather should continue to be studied as system conditions, as opposed to events or contingencies. Extreme heat, or heatwaves, is currently evaluated as a sensitivity case in TPL-001 as well as an extreme system condition in NPCC/NYSRC compliance studies. Cold weather, or the loss of natural gas fuel under expected winter peak conditions, is also a sensitivity evaluated as a system condition in NPCC/NYSRC compliance studies. Corrective Action Plans ("CAPs") are not required at this time for these extreme system conditions. Rather, evaluation of extreme system conditions is typically provided for information under existing criteria. However, depending on the sensitivities selected for compliance with TPL-001 if reliability issues are observed in more than one sensitivity, a CAP is required. The NYISO encourages the Commission and NERC to clarify when CAPs should be required in response to extreme heat and cold weather conditions.

Since it is infeasible to assess all possible system conditions in transmission security analyses, the NYISO encourages the Commission and NERC to allow each Planning Coordinator and Transmission Planner to determine the credible combinations of system conditions that need to be evaluated to identify reliability issues on the electric system. Consistent with the discussion of New York's weather conditions above, the weather conditions faced by each area will vary so the NYISO recommends each area document the justification for the credible combinations of system conditions evaluated in assessing transmission security

rather than requiring all areas to study specific conditions. A key component of allowing each area to identify the weather conditions it will face is to allow each Planning Coordinator and Transmission Planner to develop forward-looking weather and load forecasts. As entities learn more about extreme weather conditions, benchmarking based on history may not be the best approach to forecasting future weather conditions. Meteorological projections are likely to be more appropriate to establish the study inputs. Conditions are changing too rapidly to rely on historical events. In New York, we already consider the impact of climate change as well as state policies that are driving more significant and dramatic change to the generation mix.

TPL-001 is currently limited to a transmission planner or planning coordinator's planning areas. Maintaining the same boundaries would be the best way to expand the TPL-001 Reliability Standard without imposing overly burdensome obligations on planning coordinators and transmission planners that could jeopardize timely completion of studies. NERC MOD-032 R4 requires Planning Coordinators to make the models for its planning area available to NERC, or is designee, to support developing and maintaining interconnection wide transmission system databases. If the Commission, or NERC, determine that coordinated analysis of extreme heat and cold weather conditions across Planning Coordinator Areas is necessary, the NYISO encourages the Commission, and NERC, to consider utilizing the MOD-032 process to facilitate coordinated analysis.

TPL-001 planning events are currently limited to the occurrence of electrical faults. However, the NYISO also recognizes that extreme weather also suddenly impacts the availability of weather dependent generation. To enhance the resiliency of the system, the NYISO recommends the expansion of NERC planning events to include the weather-related loss of generation across areas of the system in the design-basis contingencies rather than as an

extreme contingency. Weather-related loss of generation may result from wind lulls, cloud cover, or freezing temperatures, among other reasons.

IV. Planning Studies Must Consider Regional Variation in Weather Conditions

The NYISO encourages the Commission, NERC, utilities, and other industry participants to continuously assess climate change risks. However, as our understanding of these risks evolves, and the impacts of extreme weather 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.

Given the NYISO-specific weather concerns and the efforts underway, the NYISO encourages the Commission and NERC to allow transmission planners and reliability coordinators to build on existing processes to meet the objectives outlined by the Commission. The Commission should not impose a uniform planning study directive on all applicable parties.[16] The Commission has previously recognized that ISOs and RTOs do not (and need not) have identical software or market rules for their markets and power systems to produce compatible results.[17] Likewise, each Planning Coordinator already employs studies and processes to comply with Reliability Standard TPL-001 consistent with their existing electric system, expected system changes, and regional characteristics. If NERC chooses to expand TPL-001 to include requirements to plan for extreme heat and cold conditions, transmission

[16] *See, e.g.*, *New York Indep. Sys. Operator, Inc*., Order on Tariff Revisions, 135 FERC ¶ 61,014 (2011) (The NYISO generally follows the Commission's *pro forma* OATT, but the NYISO's tariff has long included numerous independent entity variations. Such Commission-accepted variations are specifically tailored to New York's unique circumstances, and the existence of previously accepted variations has prompted the NYISO to obtain additional independent entity variations in response to prior modifications to the *pro forma* OATT.); *See also*, *New York Indep. Sys. Operator, Inc*., Order Accepting and Rejecting Tariff Revisions, 124 FERC ¶ 61,238 (2008).

[17] *See, e.g., New York Independent System Operator, Inc*., 142 FERC ¶ 61,202 at PP 24-26 (2013) ("NYISO's compliance obligation does not require NYISO to redesign its market. [footnote omitted] This would be particularly unnecessary here where, as NYISO points out, it would be costly and economically inefficient to do so.")

planners and reliability coordinators should be permitted to expand existing study work to include additional system conditions for evaluation.

V. COMMUNICATIONS AND COORESPONDENCE

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

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VI. 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 extreme weather conditions and climate change and, and (ii) direct NERC to develop modifications to Reliability Standard TPL-001-5.1 to require planning for extreme heat and cold conditions consistent with the overall approach currently required by Reliability Standard TPL-001.

Respectfully submitted,

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Dated: August 26, 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 26th day of August, 2022.

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