STATE OF NEW YORK
New York State Energy Research and Development Authority

Draft Blueprint for Consideration of Advanced Nuclear Technologies

Comments of the New York Independent System Operator on the New York State Energy Research and Development Authority's Draft Blueprint for Consideration of Advanced Nuclear Technologies

The New York Independent System Operator, Inc. ("NYISO") hereby submits written comments to the New York State Energy Research and Development Authority ("NYSERDA") on the Draft Blueprint for Consideration of Advanced Nuclear Technologies (the "Blueprint"). The NYISO values the opportunity to provide feedback to NYSERDA on the Blueprint, the need for Dispatchable Emission-Free Resources ("DEFRs"), and the potential role of advanced nuclear technologies to support fuel diversity and a reliable electric system. The NYISO urges NYSERDA to consider these comments and the need to prioritize electric system reliability as we all work to achieve the Climate Leadership and Community Protection Act ("CLCPA") mandates, including the directive that the statewide electrical demand system is zero emissions by 2040.

The CLCPA is transforming New York's economy and driving profound changes in the electricity sector. Through our expertise in grid operations, system planning, and wholesale market design, the NYISO is taking important steps to inform and support this transformation. At the same time, the NYISO is committed to reliable operation of the electric system 24 hours a day, 365 days a year, to administer wholesale electricity markets that reflect grid reliability conditions, and to plan for a reliable electric system for the future. New York currently relies on a diverse resource mix that integrates sufficient levels of predictable, reliable, and dispatchable

generators from various fuel sources to maintain system reliability, promote grid resilience, and minimize the risk of power disruptions. Wind generation, solar generation, hydroelectric generation, other renewables, nuclear generation, and fossil fuel-fired generation supplies the day-to-day energy demands of New Yorkers. Within the existing resource mix, a robust fleet of natural gas-, oil-fired, and dual fuel generation provides much of the flexible, dispatchable supply that is necessary to meet demand and provide the service attributes that are necessary to maintain reliability.

The future non-emitting supply mix must also include sufficient predictable, reliable, and dispatchable supply resources to maintain the level of service New Yorkers expect as a greater share of electricity is supplied by intermittent resources and more electricity is demanded by multiple sectors of the economy, such as buildings and transportation. New flexible zero-emission technologies, or what the NYISO generally refers to as DEFRs,[1] will be critical to reliably support continuous electric system operation. A sufficiently diverse fleet of zero-emission technology resources will be essential to maintaining reliable electric service as we transition to an emission-free grid.

The NYISO offers these comments to further highlight the importance of developing sufficient DEFRs, such as advanced nuclear technologies. The NYISO encourages NYSERDA to discuss the timely development of generation resource types, including advanced nuclear technologies, that satisfy the CLCPA targets, support fuel diversity, and possess the service attributes critical to maintaining electric system reliability.

[1] *See* 2023-2032 Comprehensive Reliability Plan ("CRP"), A Report of the New York Independent System Operator, November 28, 2023, at pp. 75-79. *See also*, Blueprint at p. 1.

I. Advanced Nuclear Energy Technologies Could Contribute to the Reliable Operation of the Electric System with Zero-Emissions Power.[2]

New Yorkers have long enjoyed reliable electric service and will expect the same, or better, service to continue as societal preferences and public policies drive greater usage of electricity to heat our homes, to power our vehicles, and to protect our health, safety, and welfare. Predictable, reliable, and dispatchable electric generation supports every aspect of New Yorkers' daily lives, is vital to the state's economy, and is critical to achieving the electrification contemplated in the CLCPA. A diverse resource mix promotes grid resilience by minimizing the risk of power disruptions. The resources supporting this diverse mix rely on various fuels and integrate sufficient levels of dispatchable, reliable generators, with capabilities to provide the energy and reliability attributes the electric system requires. The resilience stemming from a diverse resource mix is increasingly important as winter load increases and extreme weather conditions place power systems across the nation at risk of not reliably serving electricity customers. Particularly in a highly electrified economy, any blackouts, or electric service interruptions, would upend normal life and could have a devastating impact on public health, welfare, and safety.

Electric energy consumption is projected to increase significantly in response to the economic development and economy-wide decarbonization policies. The generation resources and transmission system necessary to meet the changing energy demand across sectors needs to evolve accordingly. DEFRs will be critical to maintaining electric system reliability as other zero-emission, intermittent resources, such as wind and solar, continue to become more prevalent on the electric grid. Zero-emission resources, such as advanced nuclear technologies, that can

[2] *See* Blueprint at p. 1 ("The Commission has not adopted a definition of "zero emissions," but, in the 2016 order through which it established the Zero Emission Credit (ZEC) program, the Commission characterized existing nuclear generation as a zero-emission technology.").

be dispatched to provide both energy and capacity over long durations and provide the reliability attributes of synchronous generation will regularly be called upon to balance and supplement intermittent resources and other existing generation, such as the state's existing hydroelectric generators and existing nuclear generators, to serve load and protect electric system reliability.[3] DEFRs may need to operate for extended periods of time (several days) during extended weather conditions, such as prolonged wind lulls, extreme cold snaps, heatwaves, and/or storms. As the grid transitions to greater levels of resources that are dependent upon wind and solar availability, DEFRs must have secure fuel availability and the capability to operate continuously under all conditions, *e.g.*, at times when wind and solar resources are not available due to weather conditions. Potential DEFR technologies include long-duration storage, advanced nuclear technologies, and hydrogen-powered generators and fuel cells. Continuous operation of DEFRs could be required to completely replace the energy lost from intermittent sources or depleted storage resources.

The NYISO's 2023-2042 System & Resource Outlook ("the Outlook") shows an increased reliance on dispatchable resources (*e.g.*, fossil fuel or DEFR) to provide both peak capacity and hourly energy to support a highly renewable system.[4] This reliance on dispatchable resources is driven by the expected forecasted hourly profile of demand, hourly output of renewable generation sources, the limitations on the duration of battery energy storage

[3] The NYISO's analysis and generation resource projections assume that the existing Nine Mile Point 1, R.E. Ginna, James A. FitzPatrick, and Nine Mile Point 2 nuclear generators remain in operation past their current permit expiration dates in August 2029, September 2029, October 2034, and October 2046, respectively. The R.E. Ginna and Nine Mile Point 1 generators must commence their respective renewal processes in less than two years. *See* Plant Applications for License Renewals, Future Submittals of Applications, available at: https://www.nrc.gov/reactors/operating/licensing/renewal/subsequent-license-renewal.html.

[4] *See* 2023-2042 System & Resource Outlook ("The Outlook"), A Report of the New York Independent System Operator, July 23, 2024, at p. 9.

resources,[5] and the reliability attributes discussed below. New York is projected to increase electric energy consumption by roughly 50% - 90% over the next 20 years and to become a winter-peaking system in the mid to late 2030s. This drastic change is largely driven by the electrification of essential energy-consuming systems, primarily building heating and electric vehicle charging, and by the interconnection of large loads (*e.g.*, manufacturing facilities and data centers).

NYISO has stated in the past that DEFRs will also have to possess particular attributes to support system reliability.[6] All attributes do not have to be provided by a single technology type. The electric generation fleet must collectively maintain a balance of the attributes listed below:[7]

1. **Zero-emission/carbon free** (*i.e.*, the qualification criteria for the Zero-Emissions by 2040 Target);
2. **Dependable Fuel Sources** that allow these resources to be brought online when required and to operate based on system needs;
3. **Non-Energy Limited** and capable of providing energy for multiple hours and days regardless of weather, storage, or fuel constraints;
4. **Dispatchable** to follow instructions to increase or decrease output on a minute-to-minute basis;
5. **Quick-Start** to come online within 15 minutes;
6. **Flexibility** to be dispatched through a wide operating range with a low minimum output;
7. **Fast Ramping** to increase or reduce energy injections based on changes to net load which may be driven by changes to load or intermittent generation output;
8. **Multiple starts** so resources can be brought online or switched off multiple times through the day as required based on changes to the generation profile and load;
9. **Inertial Response** and frequency control to maintain power system stability and arrest frequency decline post-fault;
10. **Dynamic Reactive Control** to support grid voltage; and
11. **High Short Circuit Current** contribution to ensure appropriate fault detection and clearance.

[5] This Outlook considered 4- and 8-hour battery storage resources as potential future technologies in its evaluation.

[6] *See* The Outlook at p. 8.

[7] *See* CRP at pp. 52 and 75-79. *See also*, NYISO's August 16, 2023, Comments in this proceeding, Case 15-E-0302, at pp. 7-11.

In the Outlook, DEFRs were added to the postulated future resource mix to supply essential characteristics, such as dispatchability and flexibility capabilities to support a high renewable system. The Outlook projects that at least 20 GW of DEFR capacity would be needed by 2040 to replace the current 25.3 GW of fossil generation to support the achievement of CLCPA mandates, and, under certain scenarios, the need could surpass 40 GW of DEFR capacity.[8] High operating cost DEFRs, such as hydrogen-powered generators or fuel cells,[9] are generally included to provide firm peak capacity and, therefore, only produce energy for a few hours, while lower operating cost DEFRs, such as advanced nuclear facilities, generally provide needed energy and other attributes throughout the year.

While essential to the grid of the future, DEFR technologies with these attributes do not exist as a single specific commercially technology today at the necessary scale. Even assuming that some resource types may be commercially viable, there remains significant work in implementation and logistics to transition the dispatchable fleet to some combination of new technologies in the next 15 years. The research, development, and construction lead times necessary for these technologies may extend beyond the policy mandate timeline, in which case other existing generation technologies may be required to remain in operation to continue to maintain a reliable system. The time is right for NYSERDA and others to be considering the role of all potential DEFR options, including advanced nuclear technologies, to fill the gap remaining between demand and renewable supply, to support fuel diversity, and to support the availability of operating reserves and other service attributes necessary for a reliable and resilient

[8] *See* The Outlook at p. 48.

[9] Hydrogen-powered generators typically incur, or require, additional electrolysis load on the system to generate the clean hydrogen fuel. The pathway from electricity to hydrogen and back to electricity is expected to have a MWh-to-MWh round trip efficiency below 33%.

grid. NYSERDA and New York State should evaluate advanced nuclear technologies now and, if these resources are deemed options to move New York towards the mandates of the CLCPA, the state should develop a realistic strategy to advance these technologies. As discussed in the Blueprint, the lead time to permit, develop, and commercialize advanced nuclear technologies is uncertain but likely to exceed 10 years.[10]

II. Conclusion

The NYISO appreciates NYSERDA's consideration of these comments and looks forward to continuing work with NYSERDA and other state agencies to meet the CLCPA requirements while maintaining electric system reliability for all New Yorkers.

Sincerely,

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[10] *See* Blueprint at p. 9 ("The timelines for commercializing these technologies are uncertain. X-Energy plans to deliver a commercial four-unit generation facility using its Xe-100 reactor by the "early 2030s".").