

-Via Electronic Filing-
November 8, 2024

New York State Energy Research & Development Authority
17 Columbia Circle
Albany, New York 12203-6399

RE: Comments on Draft Blueprint for Consideration of Advanced Nuclear Technologies

Dear NYSERDA staff,

Please accept the following comments on the Draft Blueprint for Consideration of Advanced Nuclear Technology (“Draft Blueprint”). I support the comments submitted on behalf of Nuclear New York (NNY), New York Energy and Climate Advocates, and Mothers for Nuclear (“NNY comments”). This comment letter explains why I support their comments.

Responsiveness of Comments

A primary reason that I support the NNY comments is the quality and responsiveness. The comments make a persuasive case for the use of advanced nuclear energy in New York’s future. I think the profile of advanced nuclear technologies clearly documents why nuclear has advantages over the proposed wind, solar, and energy storage approach espoused in the Climate Leadership & Community Protection Act Scoping Plan. I do not have the background in nuclear technology to provide meaningful comments on the capabilities of advanced nuclear technologies but the NNY comments strengthen the Draft Blueprint. Finally, I think the response to the questions raised in the Draft Blueprint address your concerns.

The remainder of my comments support the main point of the NNY comments that nuclear power should be the backbone of the zero-emissions electric grid. I am an air pollution meteorologist with decades of experience in the electric sector. I support nuclear power because it addresses an intractable problem with an electric system that relies on wind and solar – weather variability.

Time to Acknowledge Reality

The Climate Action Council [statement of Robert W. Howarth](#), Ph.D., the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University characterized the position of the Climate Leadership & Community Protection Act authors. They believed that New York could “rapidly move away from fossil fuels and instead be fueled completely by the power of the wind, the sun, and hydro.” They also believed that “it could be done completely with

technologies available at that time (a decade ago) and that it could be cost effective". This formed the basis for their belief that implementation of the Climate Act was only a matter of political will.

Reality is different and the time has come to acknowledge that fact. The Scoping Plan, NYSERDA's Integration Analysis, New York Independent System Operator (NYISO), and the New York Department of Public Service all have noted that a new category of generating resources called Dispatchable Emissions-Free Resources (DEFR) is necessary to keep the lights on during periods of extended low wind and solar resource availability. The [DPS staff proposal concerning definitions for key terms](#) sums up the current position of New York's electric resource planning community on DEFR:

The Coordinated Grid Planning Process (CGPP) presently being undertaken by Staff, NYSERDA, the Joint Utilities, the NYISO, and members of the Energy Policy Planning Advisory Council (EPPAC) in accordance with the Accelerated Renewable Energy Growth and Community Benefit Act is examining, among other things, what scale of resources New York needs to deploy in order to avert a gap between power sector supply and demand after 2040. That process recently estimated that 17 GW of clean, firm generation capacity will be needed. This estimate, which is based on modeling conducted specifically to support the CGPP, largely confirms the conclusion of the NYISO and academic researchers regarding a looming need. Notably, the CGPP estimate is substantially below the 20-40+ GW range estimate published by NYISO in its 2023-2042 System and Resource Outlook. In any event, there is no consensus among CGPP participants about the technologies that could be deployed to meet the estimated 17 GW need.

It is inarguable that DEFR is needed for the future wind, solar, and energy storage dependent electric system. I support the Blueprint NNY comments because they make a persuasive argument for advanced nuclear technologies. These technologies must be employed if New York is going to proceed without compromising resource adequacy, reliability standards, and affordability for two reasons: technological availability and weather variability risks.

Technological Availability

The first reason is that using nuclear power for DEFR is the only technology option that can be expanded, and we know will work. The Blueprint NNY comments point out that "the availability of fission-based advanced nuclear reactors is a matter of "commercial" readiness, not "technological" readiness." All the other candidate technologies that can be expanded as needed are not technologically ready. Hydrogen was proposed as the placeholder DEFR

technology but there are so many physical limitations that any feasibility analysis is going to show that relying on hydrogen will never work.

There is one caveat on the use of advanced nuclear for DEFR support. Resource projections estimate that the DEFR technologies will not run much. Scenario 2 in the Integration Analysis projects a DEFR capacity factor of only 1.8%. I support the Blueprint NNY comments explanation why this calls for a shift in plans:

The first chapter of the draft Blueprint (Introduction) appears to describe the approach assumed by NYSERDA in the Climate Action Council's Scoping Plan from 2022. That approach, presented as four very similar scenarios, contemplated a maximum deployment of intermittent generation (solar and wind) along with large amounts of storage and transmission to meet most of the energy needs of the state, and it relegated additional "firm" Dispatchable Emission-Free Resources (DEFRs) to serve merely as "backup" for those intermittent sources. However, this paradigm represents the least efficient use of installed capacity and infrastructure, and is therefore likely to be the least feasible and most expensive. It also does not fully consider the more inclusive set of possibilities embraced by Governor Hochul in her words before the Future Energy Economy Summit.

A more effective system-level architecture will make use of high-capacity-factor "firm" generation like nuclear power not simply as **backup**, but as part of the **backbone** of a reliable system serving a sizable portion of total energy demand in a baseload or load-following configuration.⁸ Such an arrangement reduces the total amount of generation capacity and support infrastructure needed, thereby reducing land impacts and system-level costs that are ultimately borne by ratepayers and taxpayers. Indeed, this is how upstate New York, which relies largely on baseload hydropower and nuclear, has already achieved a 90% decarbonized grid while maintaining reliable and affordable electricity.

Weather Variability Risks

The second reason I support the use of advanced nuclear is that there is a huge unacknowledged risk related to an electric system that relies on weather-dependent resources. All of the analyses that showed the need for DEFR determined that there are extended periods with persistently low solar and wind generation that required additional firm zero-carbon resources beyond the contributions of expected zero-emissions resources when DEFR is required. I believe that characterizing these extended periods introduces an unacceptable risk for future electric resource planning.

The [DPS staff proposal concerning definitions for key terms](#) acknowledges the importance of the analysis to determine the size of the gap:

Comments filed since the December 2023 technical conference have highlighted the importance and analytical challenges of estimating the size of a potential reliability gap. Staff does not endorse a specific estimate of the potential 2040 gap, but it does take the view that the trends on the supply and demand sides of New York State power sector's make likely a gap that would require at least 10 to 20 GW of clean firm generating capacity to fill. This view is informed in part by the draft analysis, recently published by Staff and NYSERDA, of recent global disruptions and other factors' delaying effects on large-scale renewables deployment in New York. As for new technologies that could be deployed in the coming years to help New York hit the 2040 target, panelists at the December 2023 technical conference described how several show promise, but panelists and commenters also noted diverse factors that make deployment at the locations and scale required uncertain.

In my opinion, DPS Staff and NYSERDA have not yet come to grips with analytical challenges of estimating the size of the potential reliability gap. I outlined analyses of the gap in [comments](#) submitted on July 3, 2024 in response to [comments](#) submitted by Sierra Club and Earthjustice dated June 14, 2024 in the Case No. 15-E-0302 docket. I explained that all renewable resource projection analyses should use historical meteorological data to provide the basis for projections of future load and estimates of electric resource availability based on projected deployment of wind, solar, energy storage, and other technologies needed to supply the expected load. Hourly profiles of weather variables produced using current weather forecast modeling techniques yield hourly demand forecasts and energy output profiles for wind and solar resources for the periods being studied. I believe that the State must invest in a comprehensive analysis of these data for as long a period as possible.

There has been some analysis that shows the extent of the problem. The NYISO is working with its consultant DNV to assess New York [onshore wind, offshore wind, and solar resource availability](#). Their analysis uses a 23-year historical meteorological database for the New York State renewable resource areas. Similar analyses are underway in other regional transmission operator regions. It has also been recognized that larger areas need to be treated similarly. The Electric Power Research Institute has a [Low-Carbon Resources Initiative](#) that has been evaluating the North American continent. Researchers outside of the industry have also done analyses of [wind and solar power droughts](#) using the [ERA5 reanalysis data](#) from 1950 to the present. The reanalysis data analysis uses current weather forecast models and historical observations to provide hourly meteorological fields for input to the resource availability

models. The data can be further refined to finer scales to project refined wind and solar resource availability for New York State.

All of these analyses find there are frequent and extensive periods of low renewable resource availability. For example, the [New York State Reliability Council Extreme Weather Working Group](#) (EWWG) analyzed the high resolution [NY offshore wind data](#) provided by NYISO and its consultant DNV for offshore wind resources. The summary of the report stated:

The magnitude, duration, and widespread geographic impacts identified by this preliminary analysis are quite significant and will be compounded by load growth from electrification. This highlights the importance of reliability considerations associated with offshore wind and wind lulls be accounted for in upcoming reliability assessments, retirement studies, and system adequacy reviews to ensure sufficiency of system design to handle the large offshore wind volume expected to become operational in the next five to ten years.

That analysis used a 21-year database. I think the DPS staff proposal is using a shorter weather analysis database that results in the CGPP estimate being “substantially below the 20-40+ GW range estimate published by NYISO in its 2023-2042 System and Resource Outlook”.

The period of record makes a big difference. In a similar type of analysis, the Independent System Operator of New England (ISO-NE) [Operational Impact of Extreme Weather Events](#), the ERA5 data were used to prepare a database covering 1950 to 2021. The analysis evaluated 1, 5, and 21-day extreme cold and hot events. One of the important results presented in the ISO-NE analysis is a table of projected system risk for weather events over the 72-year data record. In the analysis, system risk was defined as the aggregated unavailable supply plus the exceptional demand during the 21-day event. Note that the analysis considered sliding windows for the 21-day events by shifting the 21-day window every seven days. The Important point to highlight is that the system risk increases as the lookback period increases. If the resource adequacy planning for New England had only looked at the last ten years, then the system risk would be 8,714 MW, but over the whole period the worst system risk was 9,160 MW and that represents a resource increase requirement of 5.1%.

**ISO-NE Operational Impact of Extreme Weather Events with % Differences
Top 10 Unique Events (of 1,470)**

| Rank | 21-Day Event Start Date | Avg. System Risk (MW) | % Difference to Max |
|------|-------------------------|-----------------------|---------------------|
| 1 | 1961-01-22 | 9,160 | |
| 2 | 1979-02-02 | 9,005 | 1.7% |
| 3 | 1961-01-15 | 8,899 | 2.9% |
| 4 | 1981-01-01 | 8,719 | 5.1% |
| 5 | 2015-02-14 | 8,714 | 5.1% |
| 6 | 2010-07-05 | 8,696 | 5.3% |
| 7 | 1979-07-13 | 8,685 | 5.5% |
| 8 | 1971-01-15 | 8,665 | 5.7% |
| 9 | 1994-01-11 | 8,660 | 5.8% |
| 10 | 1979-02-09 | 8,656 | 5.8% |

Source: ISO-NE Operational Impact of Extreme Weather Events, available [here](#)

Note that there was an EWWG analysis of [Historical Weather and Climate Extremes for New York](#) performed by Judith Curry and myself that identified the January 1961 event as the probable worst-case scenario in New York. We found that there was a 15-day period from January 20 until February 3, 1961, that will likely turn out to be the worst-case cold wave. This was a period when high-pressure systems dominated the weather in the Northeast and those conditions caused light wind speeds. I believe that New York agencies must do a similar analysis for the state and adjoining electric operating regions to get the best available estimate of potential resource gaps.

Even if the State uses a longer data period there is a major reliability risk that has not been acknowledged. Current resource assessments are based on observations of existing generating resources over many years that show that unplanned outages do not happen at the same time. There is no reason to expect, for example, that all the nuclear plants will be forced offline at the same time. This characteristic enables the resource planners to conservatively determine how much generating capacity is necessary to meet the probability of losing load not more than once in ten years loss of load expectation (LOLE) reliability criterion. Importantly, I believe that the lack of correlation also means that the capacity needed above firm system load would not change substantially if the LOLE planning horizon was shifted to a longer period.

Variations in weather affecting wind and solar resource availability will require changes to electric resource planning. Everyone has heard of a hundred-year flood which is the parameter used for watershed planning. This is the one in a hundred probability that the water level in a river or lake will exceed a certain level in a given year. Similar probability estimates of low wind

and solar resource availability must be developed and incorporated into electric resource planning.

Electric resource planning is complicated by the observation that the meteorological conditions that cause low wind and solar resource availability are so large that they can affect all of New York and adjacent areas at the same time. This means that wind and solar outages will be widespread, affecting many facilities at the same time. The unacknowledged issue is that the design of an affordable and practical system to meet the worst-case weather induced lull will always involve a tradeoff between practicality and affordability versus the probabilistic estimate of the worst-case lull.

An unresolved problem is what approach is acceptable for addressing these lulls. If the resource planning process does not provide sufficient backup resources to provide capacity for a peak load period, then reliability issues are inevitable. Two factors exacerbate the severity of this problem and the importance of the reliability criteria:

1. Periods of highest load are associated with the hottest and coldest times of the year and frequently correspond to the periods of lowest wind resource availability.
2. The decarbonization strategy is to electrify everything possible so the impacts of a peak load blackout during the coldest and hottest periods will be greater.

I think that the reliability planning process should use as much historical data as possible to define the worst case. Consider the ISO-NE analysis where it was found that the most recent 10-year planning lookback period consistent with current LOLE evaluations would plan for a system risk of 8,714 MW. If the planning horizon covered the period back to 1950, a worst-case situation in 1961 would be considered and an additional 446 MW would be required to meet system risk.

The unaddressed issue is the tradeoff between the planning horizon and the resources needed. I cannot imagine a business case for the deployment of 446 MW electric system resources that will only be needed once in 63 years. For one thing, the life expectancy of these technologies is much less than 63 years. Even over a shorter horizon such as the last ten years, how will a required facility be able to stay solvent when it runs so rarely? Any reliability mandate that requires consideration of the worst-case lull over an extended period of record like this example is going to be expensive. Consequently, there will be pressure to choose a less restrictive reliability standard even though that means that when the conditions that cause the worst-case lull inevitably occur there will be major problems.

This risk goes away if nuclear resources are used as the backbone of the future electric system. Given the magnitude of the potential problems when renewable resources are unable to provide reliable power for the extreme weather case, this is a major reason to rely on nuclear power for a zero-emissions electric grid. The Staff Proposal presumes that an electric system reliant on wind, solar, and energy storage will somehow work and ignores the reliability risk described here. DPS staff should address this feasibility issue as soon as possible.

Conclusion

I support the NNY comments because there are fundamental reliability risks of a wind, solar, and energy storage dependent electrical system that can be eliminated by making nuclear the primary source of electrical power. If New York wants to decarbonize without compromising resource adequacy, reliability standards, and affordability then the only feasible solution is to rely on advanced nuclear power as the primary provider of firm generation capacity and this should be reflected in the Draft Blueprint. At some point the electric energy experts responsible for the system must tell the politicians that the arbitrary schedule and unproven technologies of a wind, solar, and energy storage zero-emissions approach are too big a risk to reliability to continue down that path. The Blueprint document should make that case.

Personal Background

I have been following the [Climate Leadership & Community Protection Act](#) (Climate Act) since it was first proposed, submitted [comments](#) on the Climate Act implementation plan, and have [written](#) over 470 articles about New York's net-zero transition. I am a meteorologist with over 40 years' experience in the electric generating sector. I am on the New York State Reliability Council's Extreme Weather Working Group (EWWG). The opinions expressed in this comment do not reflect the position of any of my previous employers, the EWWG, or any other organization I have been associated with, these comments are mine alone.

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