June 22, 2022

Climate Action Council
625 Broadway
Albany, New York 12233-0001

Re: NYSRC Comments on CAC's Draft Scoping Plan

These comments are submitted on behalf of the New York State Reliability Council ("NYSRC") as requested by the Climate Action Council (CAC) and regarding the CAC's Draft Scoping Plan.

Summary of NYSRC's Comments & Recommendations

The reliability and resilience of New York's power system is critically important today and in the transition to an emissions free grid.

The success of CAC's Draft Scoping Plan strategy in preserving the safety, reliability and resilience of the electric grid, while meeting CLCPA's Greenhouse Gas (GHG) reduction goals is dependent upon the unprecedented deployment of new zero emission firm resources and long-duration (multi-day availability) battery storage resources, as well as significant development of new wind and solar resources starting in 2025.

Therefore, it is recommended that the proposed CAC strategy be reviewed for its practical application in the period 2025 to 2030.

NYSRC Background

The NYSRC was approved by FERC in 1998 as part of the comprehensive restructuring of the wholesale electricity market in New York State[1]. Under the restructuring, the New York Power Pool ("NYPP") was replaced by the New York System Independent System Operator ("NYISO") as the entity with the primary responsibility for the reliable operation of the state's bulk power system. The NYISO also assumed responsibility for administration of the newly established competitive wholesale electricity markets.

The NYSRC was established to promote and preserve the reliability of the New York State Power System by developing, maintaining and, from time to time, updating the reliability rules ("Reliability Rules")[2] that govern the NYISO's operation of the state's bulk power system. The NYSRC develops Reliability Rules in accordance with standards, criteria and regulations of North American Reliability Corporation ("NERC"), Northeast Power Coordinating Council ("NPCC"), FERC, the Commission, and the Nuclear Regulatory Commission[3]. The NYISO/NYSRC Agreement provides that the NYISO and all entities engaged in transactions on the New York State power system must comply with the Reliability Rules adopted by the NYSRC[4]. The NYSRC Reliability Rules have been adopted by the New York State's Public Service Commission under its Public Service Law authority prescribing reliability rules necessary to ensure safe and adequate service[5].

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1 Central Hudson Gas & Electric Corp., *et al.*, 83 FERC ¶ 61,352 (1998).

2 The NYSRC Reliability Rules are available on the NYSRC website, www.NYSRC.org, under Documents/Reliability Rules Compliance Monitoring.

3 NYISO/NYSRC Agreement, Section 4.1. The NYISO/NYSRC Agreement is available on the NYSRC website, www.NYSRC.org, under Documents/Agreements.

4 NYISO/NYSRC Agreement, Section 2.1, 3.1.

5 Case 05-E-1180, supra, Order Adopting New York State Reliability Rules (issued February 9, 2006).

One of the major responsibilities of the NYSRC is to set the annual Installed Reserve Margin (IRM) for the New York Power System[6]. The IRM is the reserve resource capacity over and above that required to meet peak load and is needed to maintain minimum levels of reliability in New York. This is necessary based on the recognition that the availability of generation resources may be limited by forced outages or loss of fuel supply, including periods with little to no sun or wind. Typical unavailability figures for fossil fueled generation in New York is in the order of ~15% (~85% availability) largely based on forced outage performance.

NYSRC determined that the IRM for the 2022 - 2023 capability year is 19.6% and that IRM was adopted by the New York Public Service Commission for the New York Control Area on March 16, 2022 (Case 07-E-0088).

Comments on the Climate Action Committee's Draft Scoping Plan

The Climate Action Council recognizes the challenges in meeting the Climate Leadership and Community Protection Act (CLCPA) targets of 70% renewable energy for electricity production by 2030 and 100% zero emission resources for electricity production by 2040, as outlined in the CAC Draft Scoping Plan. NYSRC notes that it is essential that the transition to a clean energy grid be measured and sequenced to ensure that standards for reliability and resiliency are maintained or improved. Ultimately, these standards have a direct and significant impact on New York State's public health and safety.

The CAC Draft Scoping Plan is comprehensive in outlining the strategies for achieving the CLCPA goals. It recognizes that the intermittent nature of wind and solar resources present new resource and transmission requirements for maintaining New York's Power System

[6] New York Control Area Installed Capacity Requirement for the Period May 2022 through April 2023 is contained in two documents: Final Report Body 2022 IRM Report Body Final and 2022 Appendices

standards of reliability and resilience. Renewable resources have low availability factors (~10% to ~25%) when compared to fossil fueled plants (~85%). Thus, the Draft Scoping Plan recognizes that, to maintain the reliability of the New York State Power System, an unprecedented deployment of new zero emission firm and dispatchable resources and long-duration (multi-day availability) battery storage resources is required, as well as a significant development of new wind and solar resources, along with existing zero emission resources.

Intermittent resources have different performance characteristics on a seasonal basis and New York State is predicted to change from a summer peaking to a winter peaking power grid in the mid-2030s. As we make this transition to renewable energy, the overarching need to balance energy demand and supply in all seasons and under all weather conditions, including extreme weather conditions, will be critical. To address this issue, NYSRC and NERC are considering, in addition to the adequacy of generation capacity, the ability to provide adequate energy in all hours and seasons, and not only at peak, as an extremely important measure of reliability. This new measure reinforces the need the careful timing and sequencing of this 25+ year plan.

CAC Draft Scoping Plan's Observations

The CAC Draft Scoping Plan makes important observations[7] with respect to the reliability of the New York State Power System and are summarized below:

- The Climate Act must support New York State's high reliability standards.
- Recognition that must-run fossil fuel resources may be required until suitable zero carbon resources are commercially available.

[7] These observations from the CAC Draft Scoping Plan are referenced in detail in the Appendix to these comments

- Newer, long-duration storage will be needed to maintain reliability. This technology is still under development.
- The State should expand electricity transmission and distribution systems due to the expected electric load requirements from transportation and building electrification, coupled with reduced utilization of natural gas over time.
- Significant amounts of Dispatchable Emissions Free Resources (DEFR) will be required. These potential technologies are still under development.
- It is anticipated that demand response resources will play a more critical reliability role in the future.
- Focus on identifying and developing solutions for dispatchable technologies including new long-duration storage technology, Renewable Natural Gas (RNG), green hydrogen, nuclear, or other new technologies.
- The role of nuclear power should consider its ability to contribute to baseload and meet reliability requirements, as well as the cost, health, safety, community impact and environmental concerns of nuclear power generation.
- The increasing frequency of severe climatic events has exposed vulnerabilities in the State's energy system and the need exists to improve the reliability and resilience of the energy system under these conditions.

As noted, the CAC Draft Scoping Plan recognizes the challenges to grid reliability and resilience that will be presented in the transition to zero carbon electricity production. In particular, the need for significant amounts of new DEFR and energy storage resources, along with the need to develop utility scale deployment of new long duration storage technology, RNG, green hydrogen, or other new technologies and a reconsideration of the benefits of nuclear power.

The critical need to maintain reliability in the transition to meeting CLCPA requirements was recognized by the New York Public Service Commission when it recently stated[8]:

"Recognizing the Commission's responsibility to ensure safe and reliable service during the State's transition to a decarbonized electric sector, the CLCPA is clear that the Commission's evaluation under CLCPA §7(2) and (3) will be made in that context. *Indeed, the Commission firmly believes that the transition to an emissions-free grid will occur only if the electric system remains reliable throughout the transition*." (emphasis added)

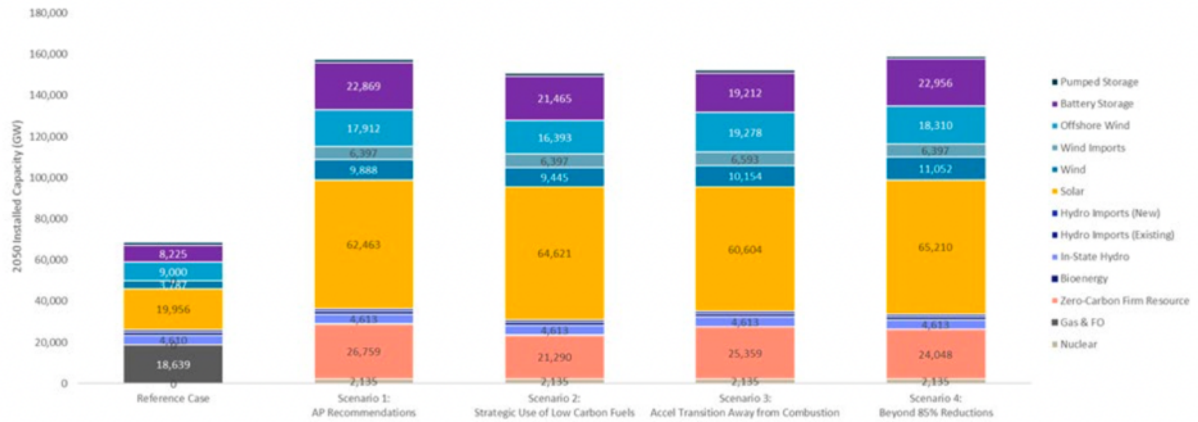
NYSRC Analysis of CAC's Draft Scoping Plan

Appendix G[9] of CAC's Draft Scoping Plan examines various scenarios for meeting CLCPA goals while maintaining the reliability of the New York Power System. The Electric Sector Framework section of Appendix G indicates "that the portfolios met or exceeded statewide reliability standards (i.e., with LOLE at or below 1-day-in-10-years)". Figure 30 below, taken from Appendix G, shows that the study Scenarios 2 - 5 have broadly similar requirements for firm, variable and storage resource capacity to meet the 1-day-in-10-years resource adequacy criterion.

[8] Case 22-M-0149: Order On Implementation Of The Climate Leadership And Community Protection Act, Issued and Effective May 12, 2022)

[9] CAC Draft Scoping Plan, Appendix G - Integration Analysis Technical Supplement

Figure 30. Installed Capacity in 2050, All Scenarios[31]



It is noted that the CAC's Draft Scoping Plan uses NYSRC's resource adequacy criterion but employs an alternate methodology and data to determine the amount of installed capacity and IRM necessary for reliable operation. At this point NYSRC cannot confirm the future resource requirements in CAC's Draft Scoping Plan. However, scenario studies performed by the NYISO under NYSRC direction for the study period up to 2030 have indicated a similar increase in the capacity needed to comply with reliability criterion (the probability of the loss of load no more than in 1-day-in-10-years) as a function of increased penetration of intermittent resources.

An illustration of the magnitude of future resource requirements based on CAC's Draft Scoping Plan for Scenario 3, Annex 2[10] is shown in the table reproduced below. The table shows the amount and type of installed capacity required to meet CLCPA goals and meet NYSRC's resource adequacy reliability criterion of 1-day-in-10-years. The text in red was added to demonstrate the total installed capacity, the peak load, the required reserve capacity and the IRM for the years 2025 through 2050.

[10] CAC Draft Scoping Plan, Appendix G - Integration Analysis Technical Supplement, Annex 2: Key Drivers and Outputs

Capacity and Generation Results: Scenario 3

Note: 2020 is a modeled year, reflecting historical trends.

Note: "Bioenergy" category includes existing facilities combusting landfill gas or waste products.

Note: In Scenario 3, existing fossil fuel resources are retired by 2040 and no new combustion-based (CCGT or CT) capacity is permitted. New firm capacity is provided by a combustion-free resource (e.g. hydrogen fuel cells).

Fuel Mix (Capacity)	Unit		2020	2025	2030	2035	2040	2045	2050
Nuclear	MW		4,860	3,355	3,355	3,355	3,355	3,355	2,135
Gas & FO	MW		26,388	25,775	22,398	14,292	-	-	-
Zero-Carbon Firm Resource	MW		-	-	-	5,489	23,522	25,230	25,359
Bioenergy	MW		327	327	327	327	327	275	178
In-State Hydro	MW		4,269	4,269	4,610	4,613	4,613	4,613	4,613
Hydro Imports (Existing)	MW		1,485	1,485	1,485	1,485	1,485	1,485	1,485
Hydro Imports (New)	MW		-	-	1,250	1,250	1,250	1,250	1,250
Wind	MW		1,917	3,292	4,600	5,220	6,126	8,250	10,154
Wind Imports	MW		-	-	2,421	5,448	6,397	6,593	6,593
Wind_Offshore	MW		-	1,826	6,600	10,423	16,756	19,278	19,278
Solar	MW		2,592	8,201	16,762	28,625	41,420	49,042	60,604
Battery Storage	MW		750	1,500	3,000	8,090	12,207	16,383	19,212
Pumped Storage	MW		1,435	1,435	1,435	1,435	1,435	1,435	1,435
Installed Capacity (MW)		A		51,467	68,244	90,054	118,894	137,190	152,297
Peak Load (MW)		B		28,890	29,640	37,430	44,440	48,630	49,780
Installed Capacity - Peak Load (MW		C=A-B		22,577	38,604	52,624	74,454	88,560	102,517
Installed Reserve Margin (%)		D=C/B		78.15%	130.24%	140.59%	167.54%	182.11%	205.94%

The table shows the increase in required reserve capacity from 22,577 MW (78.15% IRM) in 2025 to 102,517 MW (205.94% IRM) in 2050. These numbers need to be pondered in perspective. To supply a forecasted peak load of 49,780 MW in 2050, 152,297 MW of capacity will be needed, roughly 3 times the peak load at that time. The corresponding numbers for 2030 are that for a peak load of 29,640 MW, a capacity of 68,244 MW is needed, more than twice as much. Given that the 2020 installed capacity is 44,023 MW, around 22,000 MW of additional capacity must be built in the next 7-8 years.

The table assumes that intermittent generation capacity from wind and solar resources increases from 13,319 MW in 2025 to 96,629 MW in 2050.

The table also assumes that the magnitude of new technology requirements for Zero-Carbon Firm Resource (RNG, green hydrogen or other) increases from 5,489 MW in 2035 to 25,359 MW in 2050. Long-Term Battery Storage or other increases from 1,500 MW in 2025 to 19,212 MW in 2050. None of these technologies presently exist commercially for utility scale application.

Some of the new renewable resources will be located behind the meter at retail levels (i.e. solar PV, batteries, and EV charging). This will also require investment in distribution system automation to protect reliability, cyber-security and public safety. The role of the Distribution System Operator will become even more critical in this complex operating environment.

The amount of new generation that needs to be built to maintain system reliability in a zero-carbon environment is sobering. This change represents an unprecedented increase in capital investment in resource capacity along with a corresponding increase in transmission and distribution capacity. Further, this transition must be managed during a time of high inflation, and supply chain delays, permitting challenges, and high demand for renewable resource equipment, not just in New York, but around the globe.

One other aspect that must be kept in mind is that renewables and storage devices work internally with direct current (DC) and must ultimately be interconnected to a grid that works with alternating current (AC). To accomplish this, devices called inverters that transform DC into AC and vice versa are used. These inverter-based resources (IBR) are starting to be used in increasing numbers in the USA and it is becoming clear through actual reliability impact events that more work is still necessary with respect to the reliability of IBRs, and standards need to be adopted for a reliable transition.

Furthermore, even if we build all this capacity on time, operating a system largely based on renewable resources is not the same as operating the system of today. The performance and responsiveness of existing generation must be emulated to keep the lights on. We have no experience in operating a bulk power system that we will need to operate by 2030 and beyond.

NYSRC Conclusions and Recommendations

NYSRC believes that the success of the CAC Draft Scoping Plan strategies depends upon:

- Deployment of significant amounts of intermittent generation based on existing wind and solar technologies starting in 2025 and rapidly increasing in magnitude through 2050.
- Deployment of unprecedented amounts of new Long-Term Battery Storage firm resources and Zero-Carbon firm resources and starting in 2025 and 2035 respectively, and rapidly increasing in magnitude to a total in excess of 44,000 MW through 2050. Much of this technology is still in the development or demonstration phases.
- The timeliness of deployment of intermittent and new firm technology resources in the amounts and locations needed to meet CLCPA's goals. Failure to achieve these deployments will require delays in the retirement of existing generation to prevent a degradation in the current reliability and resilience of the electric power system.
- The reliability of new wind, solar, zero-carbon firm resources and long-term battery devices must be demonstrated. Recent outages of intermittent resources in California[11,12] and Texas[13] after routine transmission system disturbances have shown the importance of standards for the interconnection, protection and operation of these devices.

[11] Multiple Solar PV Disturbances in CAISO - April 2022

[12] San Fernando Disturbance - November 2020

[13] Odessa (TX) Disturbance - September 2021

- Recognition of the impact of extreme weather on resource requirements with a power system based upon intermittent resources. The National Regulatory Research Institute (NRRI) recently published a paper stressing the importance of resource adequacy modeling with more frequent extreme weather events in systems with high penetration of renewables[14]. It is unclear how the CAC Draft Scoping Plan incorporated extreme events due to climate change in its strategy. More information would be desirable.

Therefore, considering the above requirements for success, it is recommended that the proposed CAC strategy be reviewed for application in the short-term based upon practical considerations for the period 2025 to 2030.

Practical considerations affecting the availability, schedule and operability for new interconnections include: interconnection standards; site availability; permitting; resource equipment availability; regulatory approval; large volume of projects in NYISO queue and study process; scalability of long-term battery storage and other technologies; operational control; impact of extreme weather; consideration of a must-run reliability need for legacy resources. In addition, the pace of transportation and building electrification, the timing of any natural gas phase-out and their impact on the electric T&D system must also be carefully studied from technical, economic and environmental perspectives. Together, these practical considerations require the development of reliable zero emission resources to be conscientiously sequenced and timed in the near term (through 2030) to ensure broader GHG reductions in all sectors beyond 2030.

[14] Resource Adequacy Modeling for a High Renewable Future, June 2022. NRRI Insights: https://pubs.naruc.org/pub/DC366C78-1866-DAAC-99FB-4C0759DB57C5

It is noted that delaying or changing a CLCPA goal would be preferable to the risk of a wide scale blackout and associated public safety concerns if it should ever appear that the implementation of the CLCPA's goals may pose a significant risk to electric system reliability, including the potential risk of a system-wide blackout,

In conclusion, there are many unknowns in the transition to CLCPA's goals. The risks of not reaching a goal in the time required is real. The CAC and all participants in the transition to an emissions free grid need to stay alert to the critical importance of keeping the system functioning within reliability criteria. Each time that an existing unit must retire or stop operating through some regulatory action, there is a need to confirm that reliability criteria will still be met without that unit.

Your consideration of these comments is appreciated.

Any questions regarding these comments should be provided to Paul L. Gioia, Counsel to the NYSRC at pgioia@outlook.com or (518) 795-5766.

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NYSRC

Appendix - Climate Action Committee's References to Reliability in the Draft Scoping Plan (Bold emphasis added)

- **Reliability**: *Reliability and resiliency of energy systems is critical to providing robust systems that respond to changing demand in real-time and withstand unexpected events. The strategies to implement and achieve* ***the goals of the Climate Act must support the high reliability standards in place*** *in the State by implementing improvements and enhancements where needed and sustaining the practices that provide high quality electric service (p41).*
- **Must-Run fossil fuel resources**: *If a reliability need or risk is identified, emissions-free solutions should be fully explored, such as storage, transmission upgrades or construction, energy efficiency, demand response, or another zero-emissions resource.* ***Only after these alternatives are fully analyzed and determined to not be able to reasonably solve the identified grid reliability need shall new or repowered fossil fuel-fired generation facilities be considered.*** *These should only be considered if the NYISO and local transmission operators confirm that the fossil fuel fired facility is required to maintain system reliability and that need cannot reasonably be met with the alternatives listed above. (p165).*
- **Long duration storage**: *A portfolio of energy storage technologies will be needed as intermittent renewable energy generation penetration increases. Existing and* ***newer, long-duration, storage will be needed to maintain reliability*** *as the State approaches 2040 (p176).*
- **Transmission & Distribution expansion:** ***The State should expand electricity transmission and distribution systems*** *to support energy delivery, and, building on the Power Grid Study, continue RD&D and rapid deployment of advanced grid technology (p168).*

- **Significant amounts of Dispatchable Emissions Free Resources (DEFR):** *With an increasing supply mix comprised of intermittent generation resources, the grid will face unprecedented challenges to remain resilient to weather events regardless of the supply resources' location. The current system is heavily dependent on existing fossil fueled resources to maintain reliability. To ensure reliability and that generation is available when needed, dual fuel capability currently provides oil back up during periods of high gas and electric demand.* ***To replace these units, dispatchable and emissions-free resources will be needed to balance the system and must be significant in capacity, be able to come on-line quickly, and be flexible enough to meet rapid, steep ramping needs****. The importance of developing large amounts of dispatchable generation is echoed in the Power Grid Study, Pathways Study, and NYISO Grid-in Transition and Climate Change Study.* ***Energy storage is one such resource that can provide benefits on the supply side*** *at the generation level by providing dispatchable, flexible capacity which results in lower generation costs and increased system reliability.* ***Energy storage can also provide benefits on the demand side*** *at the customer level by providing flexibility and resiliency benefits for consumers through demand response and backup power supply (p 180).*

- **Demand side management**: *The State should expand demand-side opportunities and opportunities for flexible resources.* ***It is anticipated that demand response resources will play a more critical reliability role in the future*** *as the grid becomes more electrified and the load shape shifts. Demand response can also supply some amount of needed system flexibility without emitting carbon which is consistent with the 2040 Climate Act requirement (p186).*

- **Investment in new technologies**: *To achieve the 70x30 requirement, the focus should be on energy delivery, energy efficiency, and aggressive deployment of existing renewable energy and energy* *storage technologies. However,* ***the 100x40 goal presents significant challenges that cannot currently be met by the deployment of these existing technologies. Current studies identify that even after full deployment of available clean energy technologies, there is a remaining need for 15 GW to 25 GW of electricity generation in 2040 to meet demand and maintain reliability,*** *although that gap may change over time. This calls for a focus on identifying and developing solutions for dispatchable technologies that can be called on as needed to balance supply and demand (p186).*

- **Cost of new technologies**: ***Whether the answer is new long duration storage technology, RNG, green hydrogen, nuclear, or other new technologies that may emerge due to RD&D efforts over the next two decades, the costs are likely to be high and aggressive action and smart planning will be necessary*** *to make these fundamental shifts in our energy systems in the next two decades. While these actions will be costly, the health, societal, and economic benefits of the transition to clean zero-emitting technologies will be significant and the cost of inaction or insufficient action will far outweigh the costs of action (p186).*

- **Role of nuclear:** *Nuclear power generation is a complex technology with potential impacts on host communities as well as questions relating to the impacts of nuclear waste on health and the environment. Yet at the same time, nuclear generation provides a significant amount of baseload resources and is carbon-free, providing a complement to the increasing amount of variable generation renewables being added to the grid. Analysis should occur prior to the end of the Zero Emissions Credit program in 2029 to determine whether subsidizing any of the State's remaining nuclear reactors will be necessary for meeting the 2040 emissions mandate and/or whether more cost effective and environmentally friendly alternatives are available.* ***The analysis should consider the ability of***

nuclear to contribute to baseload and meet reliability requirements, as well as cost, health, safety, community impact and environmental concerns of nuclear power generation *(p187)***.**

- **Research and Development**: ***Determine technologies, Modeling, Support innovation and demonstration projects, Federal resources, Market enhancements, Long-duration energy storage, Advanced Fuels, Prioritization, Define emissions free, Analysis of impact*** *(p188).*
- **Extreme weather:** ***The increasing frequency of severe climatic events has exposed vulnerabilities in the State's energy system and the need to improve the reliability and resilience of the energy system****, as well as the resilience of those who depend on that energy system in buildings and for transportation (p 327).*