Nuclear New York

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Dear Chairperson Harris, Chairperson Seggos, and Climate Action Council members,

We appreciate NYSERDA's recognition of reliable, carbon-free nuclear power as part of a credible plan for meeting the CLCPA's climate and community production goals at the November 7th Climate Action Council (CAC) meeting. To this end, we encourage you to support the language on Advanced Nuclear Power proposed by NYSERDA staff. As NYSERDA, NYISO, and members of the Climate Action Council have acknowledged on many occasions, achieving the ambitious goals of New York's Climate Leadership and Community Protection Act (CLCPA) will require reliance on emerging technologies. Advanced nuclear power exists today and will become prevalent in the 2030s. Therefore, it belongs in a reliable, responsible, and cost-effective climate plan for New York. Excluding advanced nuclear will increase system-level costs, disproportionately harm vulnerable communities, deprive New Yorkers of family-sustaining clean energy jobs, and induce avoidable ecosystem damages.

During the November 21th CAC meeting, clarity was sought on the definition of "advanced nuclear." Please find below the definition from 42 U.S. Code § 16271.

The term "advanced nuclear reactor" means—

A) *a nuclear fission reactor, including a prototype plant (as defined in sections 50.2 and 52.1 of title 10, Code of Federal Regulations (or successor regulations), with significant improvements compared to reactors operating on December 27, 2020, including improvements such as—*
   - i. *additional inherent safety features;*
   - ii. *lower waste yields;*
   - iii. *improved fuel and material performance;*
   - iv. *increased tolerance to loss of fuel cooling;*
   - v. *enhanced reliability or improved resilience;*
   - vi. *increased proliferation resistance;*
   - vii. *increased thermal efficiency;*
   - viii. *reduced consumption of cooling water and other environmental impacts;*
   - ix. *the ability to integrate into electric applications and nonelectric applications;*
   - x. *modular sizes to allow for deployment that corresponds with the demand for electricity or process heat; and*
   - xi. *operational flexibility to respond to changes in demand for electricity or process heat and to complement integration with intermittent renewable energy or energy storage;*

B) *a fusion reactor; and*

C) *a radioisotope power system that utilizes heat from radioactive decay to generate energy.*

Advanced nuclear reactors already exist in the U.S., Europe, and Asia. The 1,100 MW Westinghouse AP1000 is one such state-of-the-art advanced reactor incorporating passively-safe design features. Four reactors currently operational in China demonstrate exceptional performance. The first of two in the

U.S. are to enter service in the first quarter of 2023. Poland recently chose AP1000 as the first reactor (operational by 2033) in a bid to build 6-9 gigawatts of large reactors by 2040. Further, Westinghouse has signed an agreement supporting the construction of nine AP1000 reactors in Ukraine. Another example is the 1650 MW European Pressurized Water Reactor (EPR) developed by the French company EDF. EPR reactors are currently operating in Finland and China. Others are under construction in France and the U.K., with additional sites planned in France, India, and Czechia.

Beyond large-scale advanced reactors already available today, several Small Modular Reactors (SMRs) will be on the market in the next few years. Typically 350 MW or smaller, the major components of SMRs are built in a factory, reducing construction time and cost. SMRs incorporate inherently-safe and passively-safe design as well. Some also offer flexibility for load-following and fast-ramping, a particularly useful trait in a grid with significant amounts of intermittent renewable capacity.

While the technology options are diverse, each of the following are scheduled to have projects deployed in this decade, with plans for widespread deployment in the 2030s. NuScale, Natrium, and X-Energy have received joint funding from the U.S. Department of Energy, requiring the completion of demonstration projects by 2029.

- NuScale – The first SMR design to receive approval from US Nuclear Regulatory Commission, this modular design consists of multiple self-contained 77 MW pressurized water reactors. Natural convection-based circulation is used instead of pumps for simplicity and safety, and all modules are located within an in-ground pool designed to absorb heat indefinitely. NuScale will install its first set of reactors at Idaho National Labs with full plant operation expected by 2030.
- BWRX-300 – Developed by GE-Hitachi, this 300 MW boiling water reactor showcases safety, simplicity, and the use of proven technology. GE-Hitachi plans to build its first BWRX-300 reactor by 2028 as part of the Ontario's Darlington New Nuclear Project on the north shore of Lake Ontario in Canada. The company is also pursuing projects in the United States and Europe. Recently the Tennessee Valley Authority (TVA) entered into an agreement with GE-Hitachi to support planning and preliminary licensing of a BWRX-300 at its Clinch River facility near Oak Ridge. Already authorized for 800 MW of advanced nuclear. A specific proposal is expected in 2023 or 2024.
- Natrium – This nominal 345 MW reactor is a joint venture of TerraPower and GE-Hitachi. Instead of water, Natrium uses liquid sodium as a coolant, which allows for higher temperatures. This improves thermal efficiency and allows the plant to operate at atmosphere pressure, improving safety. The Natrium design reduces the volume and toxicity of spent fuel. Another breakthrough aspect of this design is using liquid sodium thermal storage to allow the electricity output to ramp up by 45% on demand. The first Natrium reactor is scheduled for completion in 2028 at the site of a retiring coal plant in Wyoming, thus protecting jobs while replacing a polluting facility with zero-emission electricity. Additional sites are also being considered.
- X-Energy – Unlike reactors that use uranium pellets as fuels, this SMR is a helium-cooled "pebble-bed" design that derives heat from tri-structural isotropic (TRISO) fuel. Each TRISO "pebble" contains thousands of tiny fuel particles individually encapsulated in carbon. Meltdown is essentially impossible because each pebble functions as its own containment vessel. Each Xe-100 SMR will produce 80 MW with up to four reactors in a set. X-Energy plans to build its first reactor at the site of an existing nuclear plant in Washington State by 2029. Beyond power generation, Dow Chemical Company is exploring the potential for a Xe-100 reactor at one of its Gulf Coast facilities to produce carbon-free industrial heat.

Perhaps the greatest testimony to the value of advanced nuclear power is evident in the sea-change of public awareness and policy that has occurred since initial passage of the CLCPA. The Inflation Reduction Act of 2022 includes important provisions to support both existing and new nuclear plants. Production Tax Credits and Investment Tax Credits, enjoyed by solar and wind developers for years, are now available for nuclear energy. At the state level, Illinois and California have taken action recently to protect their existing nuclear plants. Meanwhile, West Virginia and Montana have repealed prior restrictions on nuclear. Likewise, agencies in states like Michigan, New Hampshire and Virginia are pursuing initiatives to determine how nuclear power can be expanded. Indeed, advanced Western democracies like Canada, France, the U.K., Finland, and the Netherlands have all committed to the development of new nuclear plants. After careful evaluation, Japan and South Korea are also pursuing the restoration and expansion of its nuclear capacity. Nuclear power was openly welcomed at this year's COP27 climate conference at Sharm El-Sheikh, Egypt, indicating the profoundly changed landscape from the 2017 COP23 in Bonn, Germany.

Equally telling is enthusiasm within the financial sector. This year the EU included nuclear within its taxonomy of sustainable activities, thereby encouraging capital investment. Recently, Canada Investment Bank committed a billion Canadian dollars to the development of SMR technology in Ontario. Furthermore, at Ontario's Bruce Power, the first sale of a green bond for nuclear power was six-times oversubscribed. The growing public awareness of the environmental and developmental benefits of nuclear power has given rise to a greater inclusion of nuclear in Environmental-Social-Governance (ESG) investment portfolios. Notably, one of the world's most serious clean energy developers, Brookfield Renewable, recently purchased Westinghouse Electric Company, citing exciting growth prospects.

Around the country and the world, people are realizing that nuclear power is essential to a sustainable and prosperous future. **With proper planning this decade and deployment in the 2030s, New York can exceed the initial four-gigawatts of nuclear capacity identified by NYSERDA staff before 2040.** Doing so will give the state a chance of achieving the CLCPA's mandate of carbon-free electricity while ensuring a reliable grid vital to a thriving economy. As Germany is demonstrating to the world, climate plans that exclude nuclear are expensive and ineffective.

New York has the acumen, resources, and spirit of innovation to become a leader in this essential technology. Rather than presupposing limits on how or when advanced nuclear power may contribute to meeting the state's goals, we encourage the Council to retain flexibility and explore all options for cost-effective decarbonization.

Thank you.

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