

**From:** [Caitlin Ferrante](#)  
**To:** [erda.sm.DraftBlueprint](#); [REDACTED]  
**Subject:** Sierra Club Comments Draft Blueprint for Consideration of Advanced Nuclear Technologies  
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Good morning -  
Please find attached the Sierra Club Atlantic Chapter's comments on the Draft Blueprint for Consideration of Advanced Nuclear Technologies.  
Thank you for the opportunity to submit comment and please reach out with any questions/concerns.

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# SIERRA CLUB

ATLANTIC CHAPTER

744 Broadway  
Albany, NY 12207

November 7th, 2024

President and CEO Doreen Harris, NYSERDA  
17 Columbia Circle  
Albany, NY 12203-6399

CC: Governor Kathy Hochul and Interim NYS DEC Commissioner Sean Mahar

Dear NYSERDA President and CEO Harris;

These comments are submitted on behalf of Sierra Club Atlantic Chapter, in response to NYSERDA's ***Draft Blueprint for Consideration of Advanced Nuclear Technologies***, which was the focus of the afternoon session of the 'Future Energy Economy Summit' on September 5, 2024.

The Sierra Club Atlantic Chapter, in accord with National Sierra Club Nuclear Policy, is firmly opposed to New York State pursuing nuclear power as a solution to meeting the mandated targets of the Climate Leadership and Community Protection Act (CLCPA). New York needs to focus on proven renewable energy technology that works now, and should not waste resources, time, and money chasing solutions which will not be ready in the timeframe of the Climate Leadership and Community Protection Act (CLCPA). Nuclear power has long been proven to be too toxic, too dangerous, too expensive, and too slow to build to be a climate solution. In addition, extraction of nuclear fuels and siting of facilities have long been a source of social and environmental injustice among indigenous and disadvantaged communities.

Founded in 1892, Sierra Club is the most historic grassroots environmental organization in the country. The Atlantic Chapter of Sierra Club includes more than 46,000 members throughout New York State. Part of its mission statement is to Explore, Enjoy and Protect the Planet. The Chapter takes this mission seriously and is deeply committed to

saving a habitable climate. For that reason, a team of volunteers have spent many hours of time taking a fresh look at nuclear power. They have reviewed articles, technical papers, books, and data on the history of nuclear power and new technologies, including small modular reactors (SMRs). The Chapter's reasoned, thoughtful conclusion is that nuclear power should **not** be pursued as a climate solution, based on ample evidence, science and consideration of risks and uncertainties. Instead, we advocate for accelerating efforts to deploy proven renewable energy solutions, backed up by energy storage, and efficiency measures, in order to meet necessary climate targets and reduce greenhouse gas emissions quickly enough to save a habitable climate.

### **Nuclear Power Comes with Irreconcilable Environmental and Social Injustices**

The production of nuclear energy is an environmental injustice. The issue employs less than 272 words of the draft blueprint, yet it may be the most important consideration of whether we use the technology. The "Environmental and Climate Justice" section completely fails to acknowledge the real, deadly harms faced by the Onondaga Nation, the Seneca Nation, the Ramapough Munsee Lenape Nation, and other environmental justice communities along the entire fuel chain of nuclear energy, including those who live close to existing reactors, uranium mines, enrichment sites, and nuclear waste dumps. The Atlantic Chapter insists that NYSERDA staff read the Red Paper by the Onondaga Nation, Haudenosaunee Environmental Task Force, and American Indian Law Alliance

(<https://drive.google.com/file/d/1WxZiW8Kgv4n15m4zGHmwC2oKSO2NSDXe/view?usp=drivesdk>). The Red Paper provides one of the best compilations of environmental injustices experienced by Indigenous peoples in New York and across the U.S., perpetrated by the nuclear industry and the governments that support it.

### **Nuclear Power is Prohibitively Expensive**

Finding practical zero emissions solutions to energy production is often predicated on cost. While public safety and reliability are key components to NY's energy decisions - affordability may be the biggest factor in determining which technologies we will choose to decarbonize our grid.

The levelized cost of energy (costs over a project's lifetime) generated by various sources has been calculated and tabulated in a June 2024 Lazard report, published at this link: <https://www.lazard.com/media/xemfey0k/lazards-lcoeplus-june-2024-vf.pdf>

The report reveals that Onshore Wind, with Energy Storage, is least expensive per unit of energy measured in dollars per megawatt hour (\$/MWh), with a range of \$45 to \$133 /MWh. Utility scale solar, backed up by energy storage is next in cost with a range of \$60 to \$210 /MWh.

The report also details that **Conventional Nuclear energy is most expensive**, ranging from \$142 to \$222 /MWh. The U.S.'s latest nuclear project, Vogtle in Georgia, costs

\$190 /MWh. The Vogtle nuclear expansion project has two reactors of 1.1 GW each and started delivering electricity to the grid in March 2024, 7 years behind schedule. The project took 15 years to construct and cost \$34 billion, more than double the initial \$14 billion cost estimate.

Small Modular Reactor (SMR) designs are also prohibitively expensive and in fact are so new there is no way to adequately predict their practical cost in New York applications, beyond the few national examples. The canceled NuScale Small Modular Reactors project cost \$119/MWh in 2022 dollars, based on the article linked below from IEEFA dated Jan 11, 2023: [Eye-popping new cost estimates released for NuScale small modular reactor](#)

The price for such power is likely to go up, especially if you factor in fuel material cost increases, unforeseen adjustments to an unproven technology and the costs of handling and safely storing nuclear waste for hundreds of thousands of years. The estimated construction cost for NuScale's six reactor "Carbon Free Power Project" ballooned from \$5.3 billion to \$9.3 billion during the multi year permitting process before the project was canceled. While the Sierra Club is certainly not advocating for gas-fired power plants, for comparison purposes, one of the newest, modern combined-cycle gas-fired power plants, the Valley Energy Center plant built by CPV in Wawayanda in Orange County, NY, is estimated to have a total construction cost of \$900 million and is rated at a 680 MW power output. The NuScale project was only going to produce 462 MW of total power, and was estimated to cost more than \$9 billion (if you believe the latest estimate), producing just 2/3 of the power while costing 10 times as much to build.

In addition, 'according to the [National Renewable Energy Laboratory](#) (NREL), solar farms cost \$1.06 per watt, whereas residential solar systems cost \$3.16 per watt. In other words, a 1 megawatt (MW) solar farm can cost upwards of \$1 million.'

<https://www.marketwatch.com/guides/solar/solar-farm-cost/>

Based on \$1.06/watt for a fixed-tilt utility scale solar farm, a 462 MW solar farm would cost \$490 million. For utility scale solar in New York State, there is a capacity factor of 17% to account for nighttime and cloudy days.

[https://emp.lbl.gov/sites/default/files/utility\\_scale\\_solar\\_2023\\_edition\\_slides.pdf](https://emp.lbl.gov/sites/default/files/utility_scale_solar_2023_edition_slides.pdf)

Adjusting for needing to build more solar to get full capacity factor output on average:  $462\text{MW}/0.17 = 2718\text{MW}$  would be the roughly estimated needed solar farm nameplate capacity. Cost of this is  $\$1.06/\text{W} \times 2718\text{MW} = \$2881$  million, or \$2.9 billion. This still represents about 1/3 of the cost to build the NuScale project, without the radioactive waste, long construction time frames, excessive water withdrawals and other environmental injustices.

### **Scaling Up Nuclear Power is too Slow to Meet Our Climate Goals**

Conventional large scale nuclear could easily take 15 years from proposal to delivering power. As noted above, the Vogtle nuclear expansion project in Georgia, which has two

reactors of 1.1 GW each and started delivering electricity to the grid in March 2024, was completed 7 years behind schedule. The project took 15 years to get built. No new large scale nuclear plant planned in New York now will help us meet our 2030 goals , much less help us achieve an emissions free grid by 2040.

<https://www.eenews.net/articles/after-vogtle-whats-next-for-nuclear/>

**Small Modular Reactors may take a decade or more from proposal to completion of construction.** New design Small Modular Reactors (SMR) are being proposed, but there is no commercial scale working project yet approved by the NRC, so this is unproven technology. The experience of the first attempt to build a nuclear power plant with Small Modular Reactors in USA, failed after 9 years of effort and over \$600 million in subsidies. The project was canceled before construction could begin.

[https://www.reuters.com/business/energy/nuscale-power-uamps-agree-terminate-nuclear-project-2023-11-08/?fbclid=IwY2xjawFMLjRleHRuA2FibQIxMAABHfNGGVvEPHbzV4UjuCNBcl3yvcz9YYSIsdPS5wumytHVMiHyhqFqr87Nug\\_aem\\_SZrRIFMRXyk6STQQE D23MQ](https://www.reuters.com/business/energy/nuscale-power-uamps-agree-terminate-nuclear-project-2023-11-08/?fbclid=IwY2xjawFMLjRleHRuA2FibQIxMAABHfNGGVvEPHbzV4UjuCNBcl3yvcz9YYSIsdPS5wumytHVMiHyhqFqr87Nug_aem_SZrRIFMRXyk6STQQE D23MQ)

With timelines of a decade to one and a half decades, or longer, nuclear power would probably not help New York meet its 2030 goals for reduction of Greenhouse Gas (GHG) emissions, which are mandated to be reduced by 40% from 1990 levels for NY State per the Climate Leadership and Community Protection Act (CLCPA).

### **Nuclear comes with too many risks: safety, health, environmental, security**

Uncontrolled releases and/or intentional releases from nuclear power plants could result in radioactive contamination of air, soils, and water both locally and over a long-range. Airborne releases can easily spread over long distances and contaminate a large area downwind. This may require mass evacuations and could render water sources and agricultural soils unusable. The following excerpt is from US Energy Information Administration (EIA): “An uncontrolled nuclear reaction in a nuclear reactor could result in widespread contamination of air and water. The risk of this happening at nuclear power plants in the United States is small because of the diverse and redundant barriers and safety systems in place at nuclear power plants, the training and skills of the reactor operators, testing and maintenance activities, and the regulatory requirements and oversight of the U.S. Nuclear Regulatory Commission. A large area surrounding a nuclear power plant is restricted and guarded by armed security teams. U.S. reactors also have containment vessels that are designed to withstand extreme weather events and earthquakes.”

<https://www.eia.gov/energyexplained/nuclear/nuclear-power-and-the-environment.php>

The safety concerns expressed by knowledgeable critics of the nuclear power industry are actually much worse than what is revealed in the relatively dry language of the

excerpt above. Thomas Wellock's "[Safe Enough? A History of Nuclear Power and Accident Risk](#)" documents how the US government, from the nineteen-forties onward, took for granted that "catastrophic accidents" were possible; when in fact nobody really knew how statistically safe the technology was, much less prove it scientifically. Even as plants were being built, the numbers used by officials to describe the likelihood of an accident were based on "expert guesswork or calculations that often produced absurd results," according to Wellock.

Daniel Ford, former executive director of the Union of Concerned Scientists, published an article in *The New Yorker* (8/13/2022) titled "How Safe are Nuclear Power Plants?" (<https://www.newyorker.com/science/elements/how-safe-are-nuclear-power-plants>). In it he writes:

*'The "guesswork" nature of such analysis was never candidly acknowledged to either the public or the agency's licensing boards, ... ' ... 'Around the world, more than four hundred reactors are in operation, most of them using U.S. designs, or similar ones, from the sixties and seventies, which have documented flaws that are not easily correctable. The [nuclear reactors at Fukushima Daiichi](#), Japan, for example, where meltdowns occurred in 2011, were designed by General Electric; there are thirty-one plants of the same basic G.E. vintage currently operating in the U.S.' ...*

*'In principle, nuclear energy remains an appealing technology, assuming that the problem of long-term radioactive-waste disposal can be solved. And yet my own studies on reactor safety—which include papers co-authored with the late M.I.T. physicist and Nobel laureate Henry Kendall, and several books based on extensive reporting for this magazine—have concluded that nuclear power's potential contribution to clean energy has been compromised by safety shortcuts taken by the industry, and by lax government regulation of day-to-day safety practices at the plants.'*

Worse yet, similar to the fossil fuel industry, the cost of risks and harms is largely externalized from the nuclear power industry, and is left mainly to be paid for by government, and therefore, the taxpayers!

Returning to excerpts from *The New Yorker* article: *'Shrewdly, the industry sought to protect itself from the risks it might be imposing on others: it refused to consider building large numbers of plants until 1957, when Congress passed the Price-Anderson Act, which effectively granted it blanket protection from paying the full cost of potential liabilities should accidents occur.' ... "Although government experts couldn't nail down the probability of an accident, they could use straightforward arithmetic to predict the damage that might result. The results were presented in a 1957 study by the A.E.C.'s*

*Brookhaven National Laboratory. The study, which drew on research on the impact of ionizing radiation, conducted after the bombings of Hiroshima and Nagasaki, indicated that a worst-case scenario for a major accident at what was then considered a large nuclear plant could cause thirty-four hundred deaths and seven billion dollars in property damage—about seventy-four billion dollars in today’s money. Eight years later, in 1965, Brookhaven updated its analysis of a worst-case scenario. Nuclear plants had grown in scale, and the implications were devastating: a meltdown could cause forty-five thousand deaths, with radioactive contamination creating a potential “area of disaster the size of the State of Pennsylvania.”*

### **Small Modular Reactors may not be as safe as claimed**

The Environmental Working Group (EWG) discusses in their July 2023 article the risks of NuScale's new SMR design and questionable oversight by NRC: *“Unlike any nuclear power plant that’s already online, NuScale would house the reactor core – the nuclear fuel – and steam generator in the same vessel. This would be a departure from the traditional design, in which the steam generator is separated from the fuel, outside the reactor vessel but inside the secondary containment.”*

The NRC has preliminarily approved NuScale’s design, despite serious questions about the steam generator. And NuScale still hasn’t produced the necessary analysis of all the accidents that could occur.

As EWG writes:

*“[T]he NRC staff stated that further analysis or testing results to ‘demonstrate the design and performance of the steam generators’ could be included as part of the application for the license to construct and operate the reactor, even though ‘[s]ome uncertainty will remain until a NuScale Power Module is built and operated.’*

*A major accident is a little late to determine whether the reactor and its steam generator will operate safely.”*

Source of above excerpt:

<https://www.ewg.org/news-insights/news/2023/07/small-size-big-problems-nuscale-s-troublesome-small-modular-nuclear>

### **Spent fuel pools may be targets for terrorist attacks.**

According to the National Academies of Sciences, Engineering, and Medicine (2007): *“Spent-fuel pools may be more vulnerable than the reactors with which they are associated. The spent fuel in such pools can catch fire if the water is removed. Such fires can be difficult to extinguish and could release large quantities of cesium-137 and other radionuclides. An analysis published in 2003 found that spent-fuel pools in the*

*United States currently hold an average of 400 tons of spent fuel each, containing 35 megacuries (MCi) of cesium-137. A 1997 Brookhaven National Laboratory study concluded that a fire at such a spent-fuel pool could release between 10 and 100 percent of the cesium-137 inventory. Hence, in an average case, between 3.5 and 35 MCi would be released. This amount can be compared to the approximately 2 MCi of cesium-137 that was released in the Chernobyl accident.”*

see: <https://nap.nationalacademies.org/read/11848/chapter/8>

Spent fuel pools are a necessity for the industry to store waste on site for at least a decade while the waste becomes less radioactive and thermally cooler. Loss of power to maintain cooling, such as occurred at the [nuclear reactors at Fukushima Daiichi](#) nuclear plant in 2011, can lead to major releases of radioactivity. Moreover, these pools are vulnerable to intentional sabotage and terrorist attacks.

### **There is no permanent repository for spent fuel in the United States**

The Nuclear Blueprint correctly identifies the as-yet unsolved problem of the “disposal” of highly radioactive nuclear waste (p.22):

“Currently, nearly all nuclear waste is managed on-site at the generation facility in the form of solid spent fuel rods stored in deep pools of water for approximately 10 years after generation, and then placed in steel-lined concrete casks on the reactor site. While on-site storage is intended to be temporary ...there are no available permanent disposal sites in the U.S., and virtually all nuclear fuel used for electricity generation still sits at the facilities where it was generated. While this approach has been successful in preventing waste leakage, as dry casks approach their maximum licensing period, the risks of their failure increase.” All nuclear fission reactors produce highly radioactive waste; SMRs produce more waste due to inefficiencies inherent to the process.

### **Nuclear Power’s Uncertain Labor Market**

Among the most important questions is one of labor and scalable expertise in the nuclear labor sector. Does the U.S. currently have the trained, experienced workforce to build new nuclear plants effectively in the timeframe needed to address the most immediate impacts of the climate crisis? Will the 13,000 workers who assembled the Vogtle plant in Georgia be available to relocate to another part of the country for the next few decades to assemble the next nuclear facility?

John Quiggin, an economist at the University of Queensland, claims “The trained workforce is a rapidly depreciating asset for the nuclear industry. Once the job is finished, workers move on or retire, subcontractors go out of business, the engineering and design groups are broken up and their tacit knowledge is lost. If a new project is started in, say, five years, it will have to do most of its recruiting from scratch.”

see: <https://grist.org/energy/plant-vogtle-georgia-nuclear/>

### **The risks of Liquid Sodium Metal coolant in SMR reactors**

The proposed use of liquid sodium metal as a coolant in SMR reactors presents concerning risks that require a deeper examination of safety protocols. Sodium is highly reactive with air and water. Specifically, a sodium leak in air could lead to the production of toxic sodium-oxide aerosols caused by sodium fires. In addition, sodium's fast and highly exothermic reaction with water produces hydrogen gas that is flammable and explosive.

Excerpt: 'To meet fire protection regulatory objectives, adequate evaluation and verification must be performed. This ensures that fires and explosions that may be associated with sodium's reactivity are prevented or adequately controlled so as not to compromise nuclear safety, damage safety related structures, systems and components and put personnel at risk.'

This is not an inconsequential risk to be considered and warrants much greater study and analysis before any further contemplation of SMR development be pursued. See: <https://www.cnsccsn.gc.ca/eng/resources/research/technical-papers-and-articles/2019/overview-of-liquid-sodium-fires/>

### **Nuclear fuel is a limited resource that will run out well before 2050 if the world decides to build huge numbers of reactors for power.**

If New York decides to pave the way for construction of substantial numbers of new reactors in order to power its future energy needs, then other states and countries may also decide to follow this risky path and try to build thousands of reactors around the world, which could cause known uranium reserves to be used up in just a few decades.

In his book, [\*No Miracles Needed, How Today's Technology Can Save Our Climate and Clean Our Air\*](#) (2023) Mark Z. Jacobson writes: "If the world's all-purpose energy were converted to electricity and electrolytic hydrogen by 2050, the 9 trillion watts (TW) in resulting annual average end-use electric power demand would require about 12,500 850-megawatt nuclear reactors (31 times the number of active reactors today), or one installed every day for 34 years. Not only is this construction timeline impossible given the long planning operation times of nuclear power plants, but it would also result in all known reserves of uranium worldwide for once-through reactors running out in about 3 years."

The International Atomic Energy Administration's (IAEA) 2021 report stated that, as of 2019, about 8.1 million tons of uranium reserves are available in deposits that are practical to extract. Even if only one tenth of the world's forecasted electrical energy needs were to be met with nuclear power, the world would then run out of known reserves of uranium, the primary nuclear fuel, in about 30 years. This means that pursuing nuclear power, with uranium as its base fuel, is basically a risky dead end. Nuclear power should thus neither be considered a form of renewable energy nor as a

viable climate solution because of this supply scarcity.

### **Nuclear Power Presents Steep Opportunity Costs in Other Sectors**

Diverting attention, effort and money to nuclear power risks delaying the implementation of proven, quicker solutions for meeting CLCPA mandates, such as solar power, wind energy generation and battery-based storage. Worse yet, delaying the complete decarbonization of NY's electric grid by waiting for nuclear energy infrastructure, has the compounding effect of losing reductions in other sectors. NYS intends to achieve maximum Greenhouse Gas (GHG) emission reductions in the building sector (via heat pumps and thermal energy networks), and the transportation sector (via Electric Vehicles) using innovative all- electric technologies. That conversion will have less impact if the electricity still comes from fossil fuels, while we await nuclear's long construction times and exorbitant costs. SMRs also can be expected to take much longer to build than proponents claim. Instead of waiting a decade or longer for SMRs, we should add all of the wind, solar, [geothermal](#) and storage capacity that we can, as quickly as we can. Greenhouse gas emission reductions achieved in the near term have a bigger impact than ones that might be obtained a decade or more in the future.

### **California is showing the way on how renewable energy, backed up by adequate energy storage, enabled by grid upgrades can transform the electric grid to be 100% based on renewable energy. NY should learn from this example.**

45% of California's electric grid generation comes from renewable energy, backed up by over 10 GW of energy storage, with 38% from fossil fuels (gas and oil), and just 9% from nuclear energy. Excerpt: 'California has given America a glimpse at what running one of the world's largest economies on renewable energy might look like. The state recently hit a milestone: 100 days this year with 100% carbon-free, renewable electricity for at least a part of each day, [as tracked](#) by Stanford University engineering Professor Mark Z. Jacobson. The state notched the milestone while — so far — avoiding blackouts and emergency power reductions this year, even with the [hottest July on record](#). That progress is largely due to the substantial public and private investments in renewable energy — particularly batteries storing solar power to use when the sun isn't shining, according to energy experts.' See:

<https://calmatters.org/environment/climate-change/2024/08/california-clean-power-progress-grid/>

California plans to shut down its last nuclear power plant, Diablo Canyon, at the end of 2030. <https://fortune.com/2023/12/15/california-diablo-canyon-nuclear-power-plan-extended-operations-2030/>

## Conclusion

Achieving NY's ambitious climate goals under the CLCPA will be difficult enough without distracting our primary energy and environmental agencies with expensive, false solutions. We know that there is a pathway forward if we accelerate the buildout of solar and wind energy infrastructure, maximize energy storage facilities and pursue energy efficiency programs. All of this will take decisive political leadership and bold investments of public dollars in technologies we know will work. Siphoning off those precious funds to subsidize new nuclear power facilities in New York will prolong efforts to achieve our climate goals and at *many* times the cost. Pursuing nuclear technologies will slow the growth of safe renewable energy projects and commit New York to centuries of environmental risk as we will be forced to safeguard thousands of tons of radioactive waste. New York is already burdened by the environmental and economic costs of misadventure with the nuclear industry. The leaking nuclear disposal site in West Valley, NY comes with a \$10 Billion price tag for clean up and remediation. Long Island ratepayers are still financing the \$6 billion Shoreham Nuclear powerplant, whose construction began in 1973, but closed in 1989 without ever producing significant power, due to safety concerns. And cost overruns on the \$6.4 billion Nine Mile Point 2 reactor caused electricity prices to spike, tanked Niagara Mohawk's stock value, and eventually led to the utility's near-bankruptcy. New York cannot afford another multi-billion debacle that does nothing to support our electrical grid or advance our climate goals.

The Sierra Club encourages NYSERDA to look beyond the allure of federal subsidies for unproven technologies and remain steadfast to the renewable energy path we have undertaken. Nuclear power is a dangerous dead end and we urge you to stop pursuing the technology as a viable climate solution.

Thank you for your consideration of these comments.

Sincerely,

A handwritten signature in cursive script, reading "Kate Barholomew".

Kate Barholomew, Chair

Sierra Club Atlantic Chapter