Generation Atomic
1878 Pascal Street
Saint Paul, MN 55113

February 28th, 2025

FAQ on Nuclear

During the House Committee on Climate, Energy, and Environment hearing for House Bill 2410 on February 27th, committee members raised several questions about nuclear technology. This memo addresses these questions and provides clarity on topics discussed during the hearing. For additional information, please contact Madison Schroder at madison@generationatomic.org.

Existing SMRs operating globally

Currently, four operational SMRs exist globally: Russia's Akademik Lomonosov floating plant (two 35 MWe KLT-40S reactors operating since 2020) serving Pevek; China's HTR-PM at Shidaowan (200 MWe, operational December 2023); and two long-running high-temperature test reactors in Japan (HTTR) and China (HTR-10).

Four additional SMRs are under construction: Argentina's CAREM-25 (expected 2028), China's ACP100/Linglong One (expected 2026), Russia's BREST-OD-300 lead-cooled fast reactor (started 2021), and the Kairos Hermes test reactor in Tennessee, which received the first non-light water reactor construction license in the US in over 50 years.

Investment in nuclear and "how things pencil"

Nuclear energy offers compelling long-term financial returns despite significant upfront capital costs. The economics are driven by several key factors: capital efficiency improves dramatically after first-of-kind builds (30% cost reduction potential from Vogtle Units 3-4); operational lifespans of 60-80+ years spread investment costs over decades; and innovative financing approaches including private sector consortiums, clean transition tariffs, and integrated project delivery models that align incentives between owners and contractors.

Financial institutions are recognizing this value proposition, with 14 major banks recently pledging support for nuclear expansion. Multiple companies are forming consortiums to pool resources, share risks, and aggregate demand for standardized designs—enabling sufficient scale to justify

investments. Major corporations like Duke Energy, Amazon, Google, Microsoft, and Nucor have developed innovative power purchasing agreements that support clean firm generation while securing reliable electricity. The investment impact extends beyond power generation to include substantial job creation (9,000 construction and 900 permanent positions at Vogtle) and catalytic effects throughout regional economies, driving further private investment in supporting industries and infrastructure.

Opportunities for recycling and how it works

Nuclear fuel recycling, also known as reprocessing, is a technology that extracts reusable uranium and plutonium from spent nuclear fuel. Spent nuclear fuel still contains approximately 95% of its potential to produce electricity after use in conventional reactors. When recycled, this fuel could power advanced reactors and significantly reduce waste volume requiring long-term storage.

Currently, several countries operate nuclear fuel recycling programs, including Russia, China, India, and France. The United States does not currently recycle its spent nuclear fuel, instead storing it safely at reactor sites in either cooling pools or dry cask storage. This approach is considered sufficiently safe, as nuclear power generates relatively small volumes of waste compared to other energy sources. The decision not to recycle is primarily economic rather than technical - the current abundance and relatively low cost of uranium makes recycling less economically compelling in the U.S. context. The U.S. may reconsider recycling as part of a broader sustainable nuclear energy strategy as the industry evolves.

Stanford Study (2-30x the waste for SMRs)

The Stanford University-led study on small modular reactor waste has been met with substantial criticism from nuclear industry experts and developers. While the researchers concluded that SMRs would increase waste volumes "by factors of 2 to 30" compared to conventional reactors, numerous stakeholders have challenged both the methodology and conclusions.

NuScale Power formally contested the findings in a letter to the journal's editor, pointing to what they describe as outdated design information and incorrect assumptions about their reactor design. A blog article by Neutron Bytes also includes specific criticism from Terrestrial Energy, whose CEO Simon Irish stated that their "IMSR Generation IV fission plant generates electric power at nearly 50 percent higher thermal efficiency than a conventional reactor, so clearly it produces less radioactive waste or

activity per unit power." Terrestrial Energy later submitted a more detailed response calling the article's quality "poor" with "numerous and significant factual errors."

For more context, a study by researchers from Argonne National Laboratory and Idaho National Laboratory offers a different perspective. This research assessed the nuclear waste attributes of three near-term deployable SMRs (VOYGR, Natrium, and Xe-100) using established nuclear waste metrics. The researchers found that SMR nuclear waste attributes show both similarities to conventional PWRs and differences based on reactor-specific design features. They concluded that "given the analysis results in this study and assuming appropriate waste management system and operational optimization, there appear to be no major challenges to managing SMR nuclear wastes compared to the reference PWR" (1107).

Weather-related shutdowns

Data from the Energy Information Administration demonstrates that nuclear power consistently outperforms all other energy sources in terms of reliability.

Nuclear power maintained an average capacity factor of 92-93% from 2014 through 2024, meaning nuclear plants produced electricity at nearly their full potential more than 90% of the time. This is substantially higher than weather-dependent renewables like wind (33-36% capacity factor) and solar photovoltaic (23-25% capacity factor). Even during months with extreme weather conditions, the industry-wide nuclear capacity factor rarely drops below 80%, with most reductions representing planned refueling outages rather than weather-related shutdowns.

While wind and solar show dramatic seasonal fluctuations (solar capacity factors can vary from 13% in winter to 30% in summer), nuclear power maintains high reliability year-round. This data refutes claims about nuclear's weather susceptibility - in fact, it demonstrates that nuclear is the most weather-resilient electricity source in our generation portfolio.

Centralized Repository for Spent Nuclear Fuel

While many express concern about the lack of a central repository for spent nuclear fuel, it's important to recognize that countries worldwide employ diverse strategies for nuclear waste management rather than relying on a single centralized solution. Nuclear waste management is

handled through various complementary approaches tailored to each nation's specific circumstances, geological conditions, and regulatory frameworks.