

TO: U.S. Senate Committee on Energy and Natural Resources
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DATE: October 28th, 2024
SUBJECT: Reprocessing Nuclear Waste From Small Modular Reactors (SMRs)

I. OVERVIEW

AI's growing energy demands, projected to reach 10% of U.S. electricity consumption by 2030, have prompted industry leaders like Amazon, Microsoft, and OpenAI to invest more than \$12 billion in small modular reactors (SMRs) to power data centers.^{1,2,3,4} While current AI policy proposals regulate upstream impacts like model development and safety, this policy addresses downstream impacts from heightened AI energy demand. This policy targets SMRs, which offer clean, efficient, and reliable power, but can also generate up to 30 times more nuclear waste than traditional nuclear reactors.⁵ Current U.S. regulation prohibits the reprocessing of nuclear waste into fuel.⁶ This policy aims to change this paradigm.

II. BACKGROUND

Generative AI (GenAI) is transforming the way that we create, interact, and innovate across different fields. However, these advancements come with serious environmental and resource costs. For instance, a query on ChatGPT costs more than 10x the power of a traditional web search.⁷ To meet this computational demand, AI companies are building massive data centers which use large amounts of power. As AI increases its demand on an already strained and aging power grid, tech companies are exploring alternative solutions to generate more power.

In 2022, data centers consumed 1.65 billion gigajoules of electricity, which accounts for 2% of global demand of electricity according to conservative estimates by the International Energy Agency (IEA).⁸ In 2030, it is estimated that data centers will grow to account for 8% of total electricity use in the United States.⁹ This increase shows that the demand for electricity and the expansion of data centers is expected to accelerate over time to meet the rising needs of an increasingly digital world.

Partnerships have been announced between tech companies such as Microsoft and OpenAI as well as energy providers to reopen dormant nuclear power infrastructure to power data centers.¹⁰ These partnerships, like Microsoft's recent agreement in September 2024 with Constellation Energy to restart a unit of the Three Mile Island nuclear plant, indicate an industry trend toward partnerships between tech giants and energy providers.

Nuclear power is far less expensive than coal, or any other fossil fuel alternative. It is also more reliable than other renewable sources of energy like solar and wind once the nuclear reactors are operational.

¹ [Amazon's Investments in Nuclear Power](#)

² [Microsoft Signs Deal Investing 10B on Renewable Energy](#)

³ [OpenAI Buys Vast Quantities of Fusion Power](#)

⁴ [World Nuclear Foundation Radioactive Waste Management Guidelines](#)

⁵ [Stanford Sustainability Lab: SMRs Produce More Waste Than Traditional Reactors](#)

⁶ [US takes another look at recycling nuclear fuel](#)

⁷ [AI Poised to Drive Massive Power Demand](#)

⁸ [International Energy Agency 2024 Electric Market Report](#)

⁹ [AI is Exhausting the Power Grid](#)

¹⁰ [Big Tech's Nuclear Gamble Could Transform the Energy Industry](#)

These benefits make nuclear the ideal candidate to meet the massive electric demands of AI data centers.¹¹ As the demand for sustainable and reliable energy sources grows, SMRs offer a promising pathway to meet this nuclear demand. SMRs are advanced nuclear reactors designed to produce lower electrical output compared to traditional large reactors. Tech companies have collectively invested over \$12 billion in SMR research to power data centers, favoring their modular design which allows for factory production on a massive scale and easy transport to remote locations.¹²

However, SMRs can produce up to 30 times more nuclear waste compared to traditional reactors.¹³ In other OECD countries, the industry standard for minimizing this high-level nuclear waste is reprocessing rather than long-term storage. However, current federal regulations do not allow the reprocessing of nuclear waste. In 1977, President Jimmy Carter announced an indefinite ban on the commercial reprocessing and recycling of plutonium produced in U.S. nuclear power programs¹⁴. Current Department of Energy (DOE) policy continues to enforce a moratorium on commercial nuclear reprocessing, hampering implementation of the technology.¹⁵

Despite these restrictions, the field of nuclear waste repurposing holds significant potential for managing substantial U.S. stockpiles of spent nuclear fuel. Technological advancements and a growing emphasis on clean energy have driven renewed interest with readily available methods to efficiently separate and recycle valuable materials from spent fuel. Other countries have already implemented such processes; France is able to reclaim 96% of the reusable material in spent fuel via safe, clean nuclear reprocessing technologies.¹⁶

III. RECOMMENDATION

Congress should pass a law directing the DOE to implement policies addressing growing AI energy demands by:

- a. **Legalizing Nuclear Waste Reprocessing:** Authorizing and facilitating the reprocessing of spent nuclear fuel by commercial and government actors, which would reduce waste volume and recover valuable materials, thereby minimizing the need for long-term storage solutions.
- b. **Providing Tax Benefits for R&D:** Offering tax incentives to entities engaged in the research and development of nuclear reprocessing technologies, specifically
 - i. Facilitating the development of a startup ecosystem dedicated to decreasing costs and increasing yield of nuclear waste reprocessing technology
 - ii. Stimulating innovation and investment from legacy power providers and private sector companies
- c. **Establishing a Task Force for Reprocessing Initiatives:** Convening a task force of private sector companies, public or private utilities, trade associations, federal agencies (e.g., NRC, EPA, DOE, NIST), and other relevant stakeholders. This task force should be responsible for:
 - i. Developing standards and metrics for effectiveness and safety of waste reprocessing

¹¹ [International Day of Clean Energy: Why Nuclear Power?](#)

¹² [What Are Small Modular Reactors \(SMRs\)?](#)

¹³ [Stanford Sustainability Lab: SMRs Produce More Waste Than Traditional Reactors](#)

¹⁴ [Nuclear Fuel Reprocessing: U.S. Policy Development](#)

¹⁵ [US takes another look at recycling nuclear fuel | Physics Today | AIP Publishing](#)

¹⁶ [France's Efficiency in the Nuclear Fuel Cycle: What Can 'Oui' Learn?](#)

- ii. Determining types of waste that can be most effectively reprocessed
- iii. Incentivizing public-private partnerships on research, development, and construction of waste reprocessing facilities
- iv. Training new and existing professionals to build, maintain, and advance nuclear power infrastructure
- v. Identifying and mitigating potential proliferation or national security concerns

IV. VIABILITY AND FEASIBILITY

Powering AI infrastructure at scale with SMRs will require massive amounts of power, and produce large amounts of nuclear waste—reprocessing nuclear waste offers a more viable and sustainable solution than expanding storage for three reasons:

- U.S. storage infrastructure is severely constrained—Yucca Mountain's 70,000-metric-ton capacity falls short of current needs, which exceed 88,000 metric tons.¹⁷
- Decommissioning bonds, and other financial regulations, already guarantee the safe storage of existing nuclear waste.
- Local opposition consistently blocks new storage site development, as demonstrated by decades of resistance to proposed nuclear facilities; however, nuclear reprocessing does not raise many of the concerns regarding constant expansion¹⁸

This storage deficit, combined with SMRs' higher waste generation, makes reprocessing particularly appealing, especially as the AI industry looks to adopt SMRs as the most viable alternative to power its data centers.

This policy is also constitutionally feasible, given the regulatory authority of the DOE and the NRC to regulate nuclear materials. Both agencies have statutory frameworks in place to manage nuclear waste and ensure safety, including the development of eventual reprocessing facilities. The efficient development of nuclear waste reprocessing will involve private research interests and government agencies such as the DOE or NRC to mitigate non-proliferation risks. Our proposal would create jobs in nuclear research and could improve equitable access to clean energy sources.

This policy supports the energy demands of AI infrastructure while addressing the downstream impacts by ensuring reliable, low-carbon energy sources for AI data centers. Integrating SMRs by expanding nuclear capacity into the aging power grid would enhance reliability, stabilize electricity prices, and protect consumers from projected price increases of 20% over the next five years without major grid upgrades.^{19,20}

¹⁷ [NRC Policy Issue Reprocessing](#)

¹⁸ [NIMBY, CLAMP, and the location of new nuclear-related facilities - PubMed](#)

¹⁹ [Power Gets Pricier as Electric Grid Costs Rise](#)

²⁰ [Forbes Monthly Utility Costs by State](#)