

QUESTIONS FOR THE RECORD

**Submitted to Dr. John C. Wagner, Laboratory Director, Idaho National Laboratory
House Committee on Energy and Commerce, Subcommittee on Energy
Hearing: American Energy Dominance: Dawn of the New Nuclear Era**

Responses

January 7, 2026

THE HONORABLE GARY PALMER (R-AL)

Question 1:

Can you describe the laboratory's current efforts to advance nuclear waste recycling and reprocessing technologies—particularly those aimed at improving safety, proliferation resistance, and cost—and outline any future demonstration or scale-up activities the lab believes are necessary to move these technologies closer to commercial deployment?

Idaho National Laboratory's (INL's) Materials and Fuels Complex (MFC)¹ is the nation's premier center for used nuclear fuel research, and our work in recycling and reprocessing represents some of the most-important and underpublicized capabilities in the American nuclear enterprise.

INL performs research on multiple reprocessing technologies, including pyroprocessing, an electrochemical separation process that operates at high temperatures and recovers usable fissile material from used metallic fuel. INL has operated the Fuel Cycle Facility (FCF)² at MFC for decades, using pyroprocessing to recover high-assay, low-enriched uranium (HALEU) from used Experimental Breeder Reactor-II (EBR-II) fuel.³ That processed EBR-II material now provides a critical HALEU feedstock to meet advanced-reactor needs until commercial HALEU enrichment comes online, demonstrating that what was once considered a waste-management challenge can be converted into a fuel supply asset. This process has several important attributes from safety, proliferation-resistance, and cost perspectives. Unlike traditional aqueous reprocessing methods, pyroprocessing does not produce separated plutonium streams. Instead, it co-recovers transuranics together with uranium, making the resulting product highly radioactive and substantially less attractive for weapons proliferation. The process operates in a compact, modular footprint, reducing capital costs compared to large-scale aqueous reprocessing facilities. It is also well-suited to the metallic fuels used in advanced sodium-cooled fast reactors, creating

¹ Learn more at <https://inl.gov/mfc/>.

² Learn more at <https://inl.gov/document/fuel-conditioning-facility/>.

³ Donna Kemp Spangler, "Leading the Charge: INL's Role in Advancing HALEU Production. Nuclear News. October 24, 2025. <https://www.ans.org/news/2025-10-24/article-7387/leading-the-charge-inls-role-in-advancing-haleu-production/>.

a natural closed-fuel-cycle pathway for the growing fleet of advanced reactors under development.

INL is also developing the Zirconium Extraction (ZIRCEX) process, specifically to recover HEU from a range of used fuels, including zirconium-clad fuels. ZIRCEX uses a hybrid dry head-end process to remove cladding, followed by a compact solvent-extraction system. The recovered uranium is then downblended to HALEU levels using natural uranium, providing an important additional domestic feedstock source for advanced reactors. This process is particularly timely given the acute HALEU supply gap facing advanced-reactor developers through the 2028–2032 period.

The Hot Fuel Examination Facility (HFEF)⁴ at MFC provides unmatched capability for post-irradiation examination of used nuclear fuel that advances our understanding of exactly how fuel performs and fails under actual reactor conditions. These data directly inform both advanced fuel design and the safety case for recycling technologies, supporting qualification pathways that are essential for commercial deployment.

To move these technologies toward commercial demonstration and deployment, the following activities are most urgently needed. First, a pilot-scale recycling demonstration that scales pyroprocessing beyond current laboratory operations to process greater quantities of used fuel from both the existing light-water reactor (LWR) fleet and early advanced-reactor programs. Second, integrated testing of the ZIRCEX process at sufficient scale to validate its performance across a range of used fuel types and establish the technical basis for a commercial HALEU feedstock pathway. Third, the development of regulatory frameworks and waste-form qualification data for these byproducts of advanced recycling processes. Currently, the NRC's regulatory framework for recycled fuel is designed around aqueous reprocessing, and updating it for pyroprocessing-derived products requires a sustained data-generation program that only a national laboratory can support. Congress can support this work through sustained appropriations for MFC infrastructure and the Nuclear Launch Pad, which will provide industry with access to national-laboratory capabilities essential for demonstrating and deploying advanced fuel cycle technologies. This is consistent with the requirements of EO 14302.

⁴ Learn more at <https://inl.gov/document/hot-fuel-examination-facility/>.

Question 2:

As you know, China has successfully converted Thorium 232 into Uranium 233 in a molten-salt reactor. My state of Alabama passed a joint resolution in the state legislature last April, later signed by our governor, recognizing the value of uranium-233 and offering Alabama as a new home for that material. Furthermore, Redstone Arsenal is among nine installations chosen by the Army for its next generation nuclear power program, the Janus Program.

Question 2a:

What are your thoughts on expanding thorium reactors in the United States by utilizing the remaining U-233 we have for fuel?

I appreciate the Congressman's interest in this topic and the recognition of the potential value of the existing uranium-233 inventory. This is an area that merits thoughtful consideration as part of the broader landscape of advanced nuclear energy options.

By way of context, thorium-232 is not itself fissile, but can be converted into fissile U-233 through neutron capture in a reactor. While China has recently demonstrated this process in a molten-salt reactor, similar conversions have previously been achieved in the United States and internationally across a range of reactor types. The United States maintains a limited inventory of U-233, much of which originated from research programs conducted in the 1950s through 1970s. Portions of this material are currently being processed to recover thorium-229, which decays to actinium-225, a highly promising medical isotope used in targeted alpha cancer therapies—an important and beneficial use of this material.

With respect to using the remaining U-233 for reactor fuel, there are several practical considerations. U-233 is typically associated with gamma-emitting impurities that increase the complexity of handling, storage, and fuel fabrication, though these challenges can be managed with appropriate capabilities. The nuclear characteristics of U-233, including its ability to support breeding in thorium-based systems, are well established, and the United States has prior operational experience, including the Molten Salt Reactor Experiment.

Beyond its medical isotope value, the remaining material has been designated for disposition although the long-term pathway continues to be evaluated. There is awareness of private-sector interest in accessing U-233 for advanced-reactor applications; however, retaining and repurposing this material would involve tradeoffs with ongoing medical-isotope production and would likely require additional investment in infrastructure, handling capabilities, and long-term storage. These factors are important considerations in evaluating potential pathways for its use.

At the same time, the current U-233 inventory is limited and would not be sufficient to support multiple reactors at scale. As a result, many emerging reactor developers—including those in the private sector—are pursuing approaches that use uranium-235 or low-enriched uranium as an initial fuel, with thorium incorporated to enable the generation and reuse of U-233 within the system over time.

Overall, thorium-based systems and U-233 offer potential advantages, and growing industry interest underscores that promise while practical considerations related to material availability, handling, current beneficial uses, and implementation pathways help inform how these concepts are most effectively pursued. In any case, the supply of U-233 is limited, and to fully realize the benefits of a thorium fuel cycle, thorium-breeding reactors would have to be deployed using U-235 as the initial fissile driver.

THE HONORABLE TROY BALDERSON (R-OH)

Question 1:

We've seen several technology and data center companies make big bets on SMR technologies. These are companies with a history of investing in early-stage, innovative technologies that become commercialized and are widely used today. Why are these bets being made on SMR technology today?

Small modular reactors (SMRs) offer several advantages beyond nuclear's inherent strengths. Their modular design enables incremental capacity additions that match the pace of data-center buildout; a company can bring one module online, then add others over time, rather than committing upfront to a gigawatt-scale plant. Multiple units also provide redundancy that a single large plant cannot: if one SMR is taken offline, the others continue generating power, and refueling outages can be staggered across units to maintain continuous, highly reliable output. Finally, their smaller footprint enables siting flexibility, including placement at or adjacent to data-center campuses in off-grid configurations.

Question 1a:

How important is it for us to accelerate both permitting and technology development of SMRs to win the AI race with China?

Winning the artificial-intelligence (AI) race with China requires winning the energy race first. Large-scale data centers demand reliable power at a scale our current grid cannot deliver, and the nation that powers its data centers fastest will lead on AI. Accelerating nuclear permitting and technology development is not merely helpful—it is a prerequisite.

That imperative operates at two levels. At the infrastructure level, China is simultaneously building nuclear capacity at a pace that dwarfs ours and investing aggressively in AI-compute infrastructure. If American AI companies cannot access the reliable power they need

domestically, they will either build elsewhere or fall behind Chinese competitors backed by state-secured energy. Either outcome undermines American technological leadership. At the technology level, the race to establish global SMR standards is a strategic competition with direct national-security consequences. The countries that build and operate the world's reactor fleet set the nonproliferation norms, safety standards, and supply-chain dependencies that will shape global nuclear development for the next 60–80 years. If Chinese or Russian designs dominate global markets because American designs were delayed in licensing or lacked domestic operational experience, we cede influence over global nuclear architecture at precisely the moment proliferation stakes are highest.

The AI-nuclear relationship also runs in the other direction. DOE's Genesis Mission deploys AI across all 17 national laboratories as a force multiplier for scientific discovery, including nuclear technology development. At INL, this is directly informing PROMETHEUS, which is working toward an AI-driven autonomous pipeline for reactor design, safety analysis, manufacturing, and operations that could deliver up to fivefold schedule acceleration, and VULCAN, which applies AI-driven discovery and autonomous experimentation to compress decades-long materials qualification timelines to years. The relationship is bidirectional: AI accelerates how fast we can design, qualify, and deploy reactors, and nuclear provides the reliable power that AI infrastructure requires.

Question 1b:

Would the growth of SMRs as the next wave of carbon-free power technologies be possible without data center growth in the United States?

Possible but far less certain, and probably slower by a decade or more. The data-center demand signal has fundamentally changed the economics of advanced nuclear deployment in ways that no previous policy intervention fully achieved.

Before Microsoft's commitment to Three Mile Island, advanced nuclear developers faced a classic chicken-and-egg problem: investors would not commit capital without credible offtake agreements, and offtake customers would not commit without operational references demonstrating the technology's reliability and cost performance.

The technology sector's power purchase agreements have broken that cycle by providing the creditworthy, long-duration revenue commitments that project finance requires. They have also created a constituency for nuclear's success that extends far beyond the utility industry. The technology sector brings political capital, financial resources, and technical-partnership opportunities that the nuclear sector has not previously enjoyed. But the data-center industry's contribution goes beyond offtake agreements. Hyperscalers and other large data-center developers bring a fundamentally different risk tolerance to the table that could prove decisive in getting first-of-a-kind advanced-reactor deployments across the finish line. For a hyperscaler, the

premium paid to be among the first to bring a new reactor design online is a strategic investment in a long-term energy advantage that competitors may struggle to replicate. Speed to power is itself a form of return on investment.

This risk tolerance has consequences that extend well beyond the hyperscaler’s own balance sheet. First-of-a-kind deployments, even if more expensive and slower than projected, generate real-world operational data, demonstrated construction sequences, trained workforces, and qualified supply chains. Each of these outputs compresses the timeline and cost of every subsequent deployment. The nth-of-a-kind reactor that a regulated utility or industrial off-taker can one day procure with confidence only becomes available because someone was willing to absorb the steepest part of the learning curve first. Right now, that someone is the data-center industry.

Question 2:

How should the U.S. Department of Energy best allocate loan credit authority through the Office of Energy Dominance Financing to accelerate small modular reactor development?

DOE's loan and credit authority is a powerful tool⁵ that, used strategically, can catalyze private capital at a multiplier well beyond the direct federal investment. The allocation of loan credit authority is ultimately DOE’s decision to make, and I have full confidence in the Department's ability to direct these resources strategically. From INL’s perspective as a technical partner to the advanced-reactor ecosystem, I would simply observe that credit authority tends to be most impactful at the “first commercial” financing gap at the moment when a technology has been demonstrated but the market cannot yet price the risk at commercially viable interest rates. That is where federal support can change outcomes that private capital alone cannot achieve. It may also be worth considering whether a portfolio approach across multiple SMR technologies—rather than concentration in a single design—best serves the national interest by building a more-resilient domestic industry and positioning American companies to serve the diverse preferences of international customers. But these are the Department’s judgments to make, and INL stands ready to provide whatever technical analysis or programmatic support would be useful as DOE develops its strategy.

⁵ Learn more about the Office of Energy Dominance Financing here <https://www.energy.gov/EDF>.

Question 3:

Accelerating capacity in the near term is critical. While constructing new nuclear facilities is imperative, more needs to be done to improve the output of existing nuclear facilities. How can the U.S. Department of Energy and the Office of Energy Dominance Financing encourage investments that improve efficiencies from existing nuclear facilities through uprates to support meeting demand in the near term?

Power uprates at operating reactors are the fastest path to meaningful new nuclear generation because there is nothing faster than adding megawatts to plants that are already licensed, staffed, connected to the grid, and operating safely. The administration's goal of facilitating 5 GW of uprates across the existing 94-reactor fleet reflects an accurate assessment of where near-term nuclear growth is most achievable.

DOE took a significant and well-timed step to answer this question directly on March 12, 2026, with the launch of UPRISE, the Utility Power Reactor Incremental Scaling Effort⁶, an initiative managed by INL and designed to deliver 2.5 GW of additional nuclear capacity by the end of 2027 and 5 GW by 2029. INL is proud to be managing this initiative, and I want to briefly explain what it entails and why it is the right approach.

UPRISE is structured around a three-pronged near-term approach: establishing the business case by examining supply chain readiness, assessing plant equipment for increased power output or upgrades, and validating economic models to support project-investment decisions. Beyond that analytical foundation, the initiative encompasses power uprates at operating plants, license renewals to extend reactor lifespans, restarts of dormant facilities—including Palisades in Michigan, the Crane Clean Energy Center in Pennsylvania, and Duane Arnold in Iowa—and plant-efficiency optimization through advanced fuel technologies including accident-tolerant fuel.

The Office of Energy Dominance Financing (EDF) is a central partner in UPRISE. With more than \$289 billion in available loan authority and the ability to provide up to 80% financing for eligible uprate project costs at attractive interest rates, EDF can substantially de-risk the capital investment that uprates require. Later this year, the Office of Nuclear Energy and EDF plan to convene matchmaking workshops to facilitate collaborative agreements between plant owners and end users, including hyperscalers, industrial co-locators, and utilities recognizing that long-term offtake commitments from creditworthy customers are as important to project finance as the federal loan authority itself.

⁶ Learn more at <https://www.energy.gov/ne/articles/nations-nuclear-reactor-fleet-rise>.

On the regulatory side, INL’s January 2026 report, “Reassessing Double-Ended Guillotine Break Requirements,”⁷ identified a specific and significant opportunity: the design-basis assumption of a complete, instantaneous severance of primary coolant piping, called a double-ended guillotine break, or DEGB, has never occurred in more than 20,000 reactor-years of global commercial nuclear operation, yet it continues to drive sizing requirements that constrain the achievable power level at many plants. Current 10 Code of Federal Regulations 50.46 analyses show that DEGB scenarios typically consume the majority of available margin to the peak cladding-temperature limit, leaving only 200–350°F of remaining margin. This margin consumption directly restricts uprate feasibility. INL estimates that 40–50 of the currently operating 94 U.S. reactors could potentially pursue enhanced uprates if DEGB margin constraints were eliminated through formal NRC rulemaking. This would represent a potential cumulative fleet value of \$4–10 billion in net present value terms, realizable without physical plant modifications. DOE should support NRC’s rulemaking efforts in this area and provide technical resources to support the analytical work required.

The combination of regulatory reform potentially removing the DEGB constraint through rulemaking and targeted financial support could unlock meaningful near-term nuclear capacity growth from facilities that are already operating, already staffed, and already contributing to grid reliability.

THE HONORABLE DIANA HARSHBARGER (R-TN)

Question 1:

Following President Trump’s four executive orders, INL is leading the Reactor Pilot Program to help fast-track commercial licensing. Can you tell me a little more about the different awards and the value of supporting a diverse portfolio of American reactor technologies?

The Reactor Pilot Program, established by EO 14301, reflects a deliberate and strategically sound approach: rather than selecting a single technology to champion, the Administration has created a structured pathway that allows multiple reactor technologies to advance simultaneously, with the market and operational data ultimately determining which designs succeed at commercial scale.

⁷ Kevan Weaver, John Wagner, Timothy Stout, Svetlana Lawrence, and Scott Ferrara, "Reassessing Double-Ended Guillotine Break Requirements: Evidence-Based Analysis of Regulatory Assumptions After Five Decades of Nuclear Operation." Idaho National Laboratory. INL/RPT-26-90155. January 2026.
https://inl.gov/content/uploads/2026/02/INLRPT_26-90155_DEGB-Technical-Assessment.pdf.

As of December 2025, ten companies and eleven projects have been selected as participants. These include Aalo Atomics, Oklo, Radiant, Antares, Natura Resources, Deep Fission, Terrestrial Energy, Last Energy, Valar Atomics, and Atomic Alchemy. The designs span a remarkable range of technologies including liquid-metal-cooled reactors, gas-cooled reactors, molten-salt designs, and others at scales ranging from very small microreactors of a few kilowatts to designs approaching 20 megawatts thermal. Several are targeting the July 4, 2026, criticality deadline, and multiple reactors are receiving technical support from INL and other national laboratories.

The value of portfolio diversity cannot be overstated, and it operates at several levels. Different reactor technologies offer different advantages for different applications. A mobile microreactor suitable for a military forward operating base has fundamentally different requirements than an SMR designed to power an AI data center or a baseload reactor serving a city. A diverse technology portfolio ensures the United States has options across the full range of deployment contexts. At the industrial development level, a diverse set of technologies in development creates a broader and more-resilient supply chain, workforce, and regulatory knowledge base. If a single technology encounters an unexpected technical or commercial obstacle, the American nuclear program is not dependent on its success. At the international competitiveness level, we should not expect global nuclear markets to converge on a single design because different countries and different applications will demand different solutions. American companies competing across a technology portfolio are better positioned to capture global market share than a single-design approach.

THE HONORABLE LAURAL LEE (R-FL)

Question 1:

In your written testimony, you discuss President Trump’s four Executive Orders to reestablish American leadership on nuclear energy. One of these, “Reforming Nuclear Reactor Testing,” established the Reactor Pilot Program to help fast-track the testing of advanced reactor designs.

Question 1a:

Can you elaborate on what the Reactor Pilot Program will involve and what the 11 projects selected for it will be working on?

The Reactor Pilot Program was created by EO 14301 to establish a streamlined DOE-authorization pathway for private-sector reactor demonstrations, with the specific goal of achieving at least three reactor criticalities by July 4, 2026. The program operates under DOE’s research-reactor authority, which allows participating companies to access DOE sites, infrastructure, and technical support.

The eleven selected projects represent a cross-section of the American advanced reactor innovation ecosystem and are making significant progress towards the goal of at least three criticalities before July 4, 2026.⁸

Question 1b:

What will success look like for the program?

Success in the near term means achieving at least three reactor criticalities before July 4, 2026, demonstrating that the United States can move from policy directive to operational reactor in timeframes measured in months rather than decades. But criticality is the beginning of success, not the end. The reactors that achieve criticality in 2026 must also generate the operational performance data, including safety-system response, thermal efficiency, fuel performance, and materials behavior, that form the technical basis for subsequent NRC commercial licensing.

Success in the medium term means that at least several Reactor Pilot Program participants have used their DOE demonstration experience to advance toward commercial deployment. The demonstration-to-commercial transition pathway must work in practice, not just in theory. This requires close coordination between DOE and NRC during the demonstration period to ensure data collected under DOE authorization meets NRC evidentiary needs for subsequent licensing.

Long-term success means that the Reactor Pilot Program is recognized as the model for how the United States rapidly advances nuclear technologies from innovation to deployment and that its participants anchor a competitive American advanced-reactor industry capable of winning global-export markets.

Critically, long-term success also means that the Reactor Pilot Program does not remain a one-time government initiative; instead, it transitions into a permanent, self-sustaining demonstration ecosystem. That is precisely the role the Nuclear Energy Launch Pad is designed to play. Where the Reactor Pilot Program provides the initial streamlined DOE authorization pathway and federal support to get first-of-a-kind reactors to criticality, Launch Pad provides a long-term institutional home with Launch Pad INL and Launch Pad USA.⁹ The two initiatives are designed as sequential steps in the same journey: the Pilot Program proves that America can move at speed; Launch Pad ensures that speed becomes the new standard.

⁸ Neil Ford, "Nuclear Startups Bullish on Hitting US Pilot Program Deadlines." Reuters. February 24, 2026. <https://www.reuters.com/business/energy/nuclear-startups-bullish-hitting-us-pilot-program-deadline--reeii-2026-02-24/>.

⁹ Learn more here <https://nric.inl.gov/nuclear-energy-launch-pad-at-idaho-national-laboratory/>.

Question 1c:

How will INL be supporting the work of the Reactor Pilot Program?

INL's support to the Reactor Pilot Program is comprehensive and spans the full range of capabilities that the nation's nuclear energy laboratory can offer. At the infrastructure level, INL is completing test beds to support specific categories of participants. At the technical-support level, INL provides safety analysis support, helping companies develop the documented safety analyses required under DOE authorization frameworks. Our researchers work alongside company engineers on fuel qualification, materials testing, thermal-hydraulic analysis, and radiation protection.

Question 2:

You also mentioned that in addition to the Reactor Pilot Program, the Idaho National Laboratory (INL) has been working on other projects to support the development of nuclear energy resources.

Question 2a:

Recently, INL has announced the production of a new form of fuel for its Molten-Salt Reactor Experiment, under DOE's Advanced Reactor Demonstration Program (ARDP) Risk Reduction Project. This is an exciting and unique technology, demonstrating U.S. global leadership in nuclear technology. Would you please elaborate on the goals of this project and how Congress can support the momentum moving forward?

The Molten Chloride Reactor Experiment, or MCRE, represents a genuine first in nuclear history: when it operates at LOTUS in 2028, it will be the world's first fast-spectrum molten-salt reactor experiment.¹⁰ Molten-chloride fast reactors offer potential advantages in fuel-cycle flexibility, high-temperature heat delivery, and the ability to burn actinides from used nuclear fuel, reducing both the volume and the long-term radiotoxicity of nuclear waste.

Progress has been significant. The partnership completed the first-ever production of fuel for a fast-spectrum molten-salt reactor in 2024 and achieved the first full-scale production of enriched fuel salt in Fall 2025 via a newly installed Fuel Salt Synthesis Line at INL's MFC. Production of the required fuel-salt batches is ongoing.

Congress can support this momentum in several concrete ways. Sustained appropriations for LOTUS, the facility that will host MCRE, are essential, as is continued investment in the fuel-synthesis and handling infrastructure at MFC that supports molten-salt fuel production. Also vital is continued support for the Advanced Reactor Demonstration Pilot program that provides cost-shared funding for MCRE and several other reactor projects. Congress could support the

¹⁰ Donna Kemp Spangler, "Scientists Cook Up the Perfect Recipe to Feed an Energy Future." March 3, 2025. <https://inl.gov/feature-story/scientists-cook-up-the-perfect-recipe-to-feed-an-energy-future/>.

regulatory work needed to establish NRC's technical capability to review molten-salt reactor license applications because MCRE's purpose is not just to demonstrate the technology, but to begin to generate the safety case that enables subsequent commercial licensing and deployment.

THE HONORABLE DORIS MATSUI (D-CA)

Question 1:

During the hearing on January 7, you acknowledged that the Nuclear Waste Policy Act, as amended in 1987, does not meet the need for an effective comprehensive nuclear waste program. Can you please provide specific and detailed recommendations to this Committee for how the Nuclear Waste Policy Act should be amended to meet the nation's current and future needs regarding nuclear waste and used fuel?

I appreciate the Congresswoman's attention to this issue, which I characterized in my testimony as one of the most-consequential unresolved challenges in the entire nuclear enterprise. The Nuclear Waste Policy Act (NWPA) of 1982, as amended in 1987, was designed for a nuclear landscape that no longer exists. It assumed a fleet of large LWRs, a single repository at Yucca Mountain as the disposal pathway, and no role for recycling or reprocessing in the American fuel cycle. All three of those assumptions are now obsolete. The growing advanced-reactor fleet makes updating this framework increasingly urgent. I would also note that DOE's January 2026 initiative to establish Nuclear Lifecycle Innovation Campuses, regional federal-state partnerships designed to support the full nuclear fuel life cycle, including enrichment, fuel fabrication, reprocessing, and waste disposition, represents an important and timely signal that the administration understands this challenge as an integrated, end-to-end fuel-cycle problem rather than a waste-management problem in isolation. A modernized NWPA should be designed to enable exactly the kind of comprehensive, regionally distributed fuel-cycle infrastructure those campuses envision.

The 1987 amendments' exclusive focus on Yucca Mountain produced a political and legal impasse that has persisted for nearly 40 years. Whatever one's view of Yucca Mountain's technical suitability—and the technical case remains strong—the reality is that a workable disposal framework cannot depend on a single site. A revised NWPA should establish a collaboration-based siting process for deep geologic repositories that allows willing host communities and states to come forward, supported by defined federal benefits, clear legal authorities, access to required funding, and a timeline with enforceable milestones. This approach has worked in Finland, Sweden, and Canada, all of which are further advanced than the United States in repository development despite having smaller nuclear programs.

The current NWPA was designed for the used-fuel characteristics of large LWRs. Advanced reactors produce used fuel with different characteristics: different compositions, fuel geometries, levels of fuel utilization, chemical forms, decay-heat profiles, and long-term radiotoxicity. Some of these differences are favorable for disposal. TRISO fuel, for example, has outer coatings that serve as a self-contained waste form, providing improved performance in all disposal schemes compared to standard LWR fuel. Others may require processing prior to disposal to meet Environmental Protection Agency requirements under the Resource Conservation and Recovery Act. INL has substantial experience with this processing requirement from our EBR-II used-fuel treatment program, and that experience demonstrates that treatment requirements are manageable and can themselves generate value. A revised NWPA framework should explicitly account for advanced reactors' fuel diversity, establishing characterization requirements and disposal pathway analyses appropriate for each fuel type, rather than applying LWR-derived requirements wholesale. It should also anticipate that if nuclear fuel recycling is implemented, waste forms can be specifically engineered to improve repository performance and expand disposal options that would include alternative pathways, such as deep-borehole disposal, that may become more feasible for processed or repackaged waste forms.

While administration policy on commercial nuclear fuel recycling has evolved since the 1970's (see Figure 1 below), the current NWPA is effectively silent on recycling. EO 14302 requires DOE to produce a comprehensive used-fuel management and recycling report, and the expected recommendations include piloting a recycling demonstration. Congress should anticipate those recommendations and create the legal framework for recycling demonstrations that includes clarity on the regulatory pathway for recycled fuel under the NRC's licensing framework, liability delineation and financial assurance for recycling facilities, and an established the waste-classification framework for recycling byproducts that current NRC regulations do not adequately address. The Nuclear Lifecycle Innovation Campus initiative envisions regional sites hosting the full fuel cycle, including reprocessing and waste disposition, in partnership with willing states. A modernized NWPA should create the statutory authorization structure that makes those campuses viable, allowing co-located storage of used nuclear fuel in anticipation of recycling, reuse, and waste-management operations to function under a coherent legal framework rather than navigating a patchwork of statutory authorities designed for a different era.

U.S. Policy on Commercial Nuclear Fuel Recycling

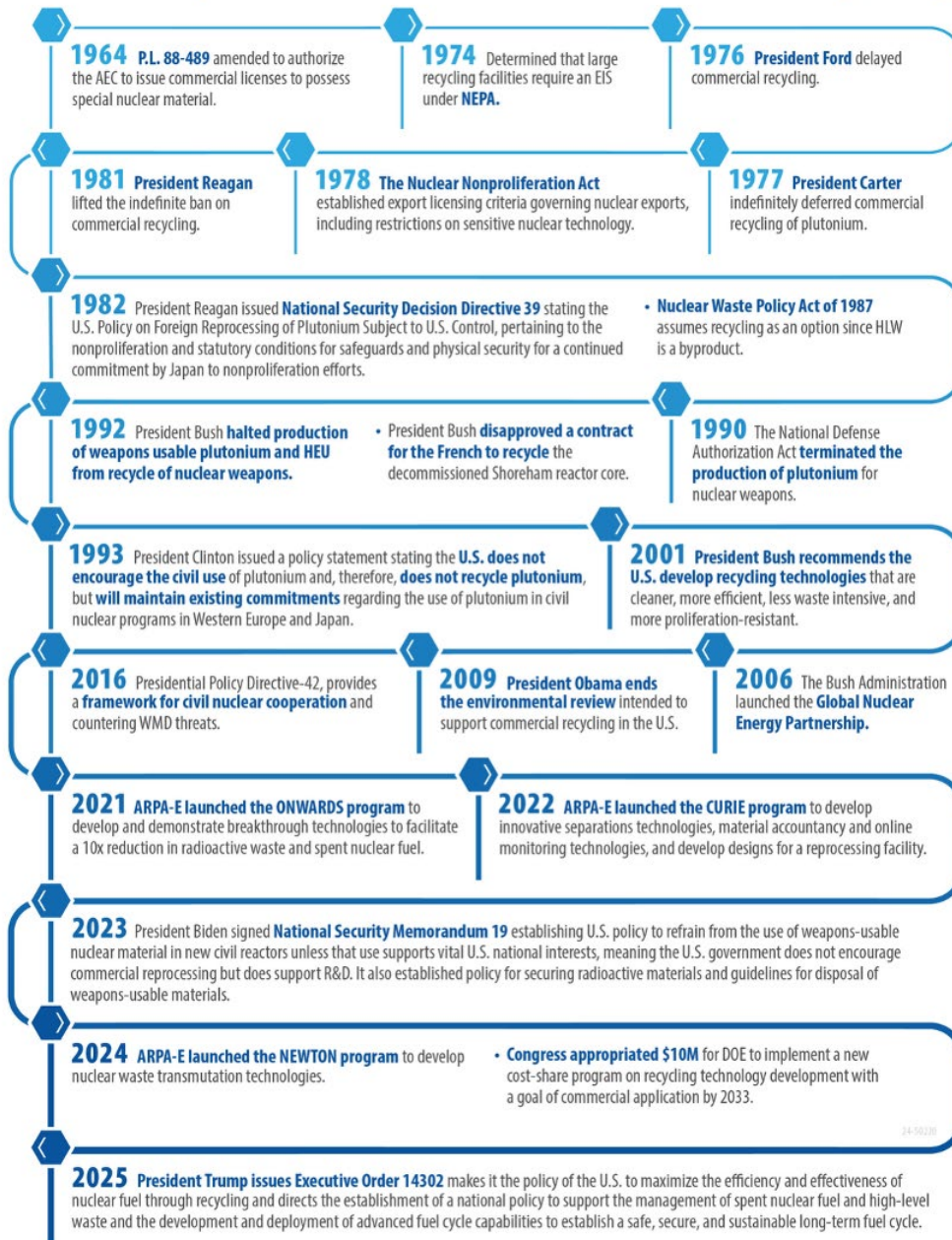


Figure 1 U.S. Policy on Commercial Nuclear fuel Recycling. Source: Idaho National Laboratory.

Utilities have contributed approximately \$22 billion in fees to the Nuclear Waste Fund¹¹—a fund that has grown to nearly \$50 billion, including accumulated interest—in exchange for DOE’s contractual obligation to accept their used fuel by 1998. DOE has never fulfilled that obligation, resulting in more than \$11 billion in damages¹² already paid to utilities from the Treasury’s Judgment Fund, with DOE’s estimated remaining liability ranging from \$37.6 to \$44.5 billion. The Fund currently sits largely unused while the government continues to incur liability. A revised framework should establish clear appropriations access to the Fund for its intended purposes and reform the collection mechanism to reflect the realities of today’s nuclear fleet, including advanced reactors which have fuel characteristics and waste volumes significantly different from those of LWRs.

The establishment of INL’s Center for Used Fuel Research in January 2026 positions the laboratory to provide the technical foundation for these policy reforms—characterizing advanced-reactor used fuels, developing and testing recycling processes, informing the regulatory frameworks for new disposal pathways, and supporting the safety case for consolidated interim storage. This is the technical work that makes sound policy possible. Congressional support for the Center’s research agenda, alongside legislative action to modernize the NWPFA, would represent a genuinely comprehensive approach to one of the most complex challenges in American energy policy.

¹¹ U.S. Department of Energy, *Nuclear Waste Fund (NWF) Annual Financial Report Summary, FY2024 and Cumulative*. December 2024. <https://www.energy.gov/sites/default/files/2024-12/FY24%20-%20NWF%20Annual%20Financial%20Report%20Summary.pdf>

¹² U.S. Department of Energy, *Agency Financial Report, Fiscal Year 2024* (DOE/CF-0211), Note 19, Contingencies and Commitments. December 2024. https://www.energy.gov/sites/default/files/2024-12/fy-2024-doe-agency-financial-report_0.pdf