

U.S. House Committee on Energy and Commerce
Subcommittee on Energy
“Nuclear Spent Fuel Policy: Examining Nuclear Lifecycle Innovation Campuses.”
September 15, 2026
Documents for the Record

1. May 2019, A chart of “Nuclear Waste Fund Payment Information by State”, submitted by the Majority.
2. May 23, 2025, Executive Order 14302, submitted by the Majority.
3. December 2008, a Department of Energy report titled “Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites,” submitted by the Majority.
4. January 23, 2025, a Congressional Research Service report titled “Considerations for Reprocessing of Spent Nuclear Fuel,” submitted by the Majority.
5. December 2012, an Oak Ridge National Laboratory report titled “Categorization of Used Nuclear Fuel Inventory in Support of a Comprehensive National Nuclear Fuel Cycle Strategy,” submitted by the Majority.
6. September 15, 2026, a letter from the Western Governors’ Association, addressed to Chairman Latta and Ranking Member Castor, submitted by the Majority.
7. January 28, 2026, a Department of Energy Request for Information on Establishment of Nuclear Lifecycle Innovation Campuses, Submitted by the Majority.
8. July 24, 2026, A letter from the United States Nuclear Waste Technical Review Board, addressed to Assistant Secretary for Nuclear Energy Theodore J. Garrish, submitted by the Majority.
9. December 2008, a Department of Energy report titled “The Report to The President and The Congress by The Secretary of Energy on the Need for a Second Repository,” submitted by the Majority.
10. April 5, 2011, A letter from the Nye County, Nevada Nuclear Waste Repository Project Office, addressed to the Department of Energy with attention to Dr. Peter Lyons, submitted by the Majority.
11. September 12, 2026, An article from the LA Times titled “As the coast begins to crumble, the clock ticks on moving San Onofre’s radioactive waste,” submitted by the Majority.
12. September 15, 2026, A letter from Rep. Mike Levin, addressed to Chairman Latta and Ranking Member Castor, submitted by the Minority.



Nuclear Waste Fund Payment Information by State

THE CONTRIBUTIONS ARE AS OF SEPTEMBER 30, 2016.

STATE	TOTAL NWF CONTRIBUTIONS (\$M)	ONE-TIME FEE OUTSTANDING (\$M)	ALLOCATION OF INTEREST ON NWF (\$M)	TOTAL LIABILITIES (\$M)
Alabama	962.1	0.0	1,018.2	1,980.3
Arizona	697.2	0.0	737.9	1,435.1
Arkansas	375.0	181.3	396.8	953.1
California	977.0	0.7	1,034.0	2,011.7
Colorado	0.2	0.0	0.3	0.5
Connecticut	467.7	481.3	494.9	1,443.9
Florida	903.6	0.0	956.3	1,859.8
Georgia	862.2	0.0	912.5	1,774.7
Illinois	2,307.1	1,020.9	2,441.8	5,769.9
Iowa	141.2	0.0	149.4	290.6
Kansas	228.9	0.0	242.3	471.2
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LOCATED HERE (/legal)	411.9	0.0	435.9	847.8
Maine	69.1	185.9	73.1	328.1

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Maryland	432.9	0.0	458.2	891.1
Massachusetts	191.0	0.0	202.1	393.1
Michigan	844.1	265.5	893.3	2,002.9
Minnesota	456.7	0.0	483.4	940.1
Mississippi	253.5	0.0	268.3	521.7
Missouri	247.6	0.0	262.1	509.7
Nebraska	305.3	0.0	323.1	628.4
New Hampshire	201.8	0.0	213.5	415.3
New Jersey	782.5	174.9	828.2	1,785.6
New York	1,027.8	506.7	1,087.7	2,622.2
North Carolina	1,050.9	0.0	1,112.3	2,163.2
Ohio	386.0	32.7	408.5	827.3
Oregon	79.6	0.0	84.2	163.8
Pennsylvania	1,976.6	89.1	2,092.0	4,157.7
South Carolina	1,524.4	0.0	1,613.3	3,137.7
Tennessee	605.0	0.0	640.3	1,245.3
Texas	815.2	0.0	862.7	1,677.9
Vermont	121.3	144.9	128.4	394.7
Virginia	852.9	0.0	902.7	1,755.7
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Washington	201.5	0.0	213.3	414.8
Wisconsin	423.9	0.0	448.6	872.5

Other	7.6	0.0	8.0	15.6
Total	21,191.0	3,084.1	22,427.8	46,703.0

NOTES:

THE NUCLEAR WASTE FUND CONTRIBUTIONS IDENTIFIED ABOVE ARE AS OF SEPTEMBER 30, 2016.

NUCLEAR WASTE FUND CONTRIBUTIONS IDENTIFIED ABOVE FOR EACH STATE ARE ESTIMATED BASED ON THE GENERATION OF ELECTRICITY FROM THE NUCLEAR POWER PLANTS LOCATED IN THOSE STATES.

BECAUSE ELECTRICITY GENERATED BY THE NUCLEAR POWER PLANTS WAS TRANSMITTED ACROSS UTILITY SERVICE TERRITORIES THAT EXTEND BEYOND STATE BORDERS, ELECTRIC CUSTOMERS FROM SEVERAL STATES THAT DO NOT HAVE NUCLEAR POWER PLANTS LOCATED WITHIN THEIR BORDERS WERE REQUIRED TO CONTRIBUTE TO THE NUCLEAR WASTE FUND. THESE STATES INCLUDE DELAWARE, INDIANA, KENTUCKY, NORTH DAKOTA, NEW MEXICO, RHODE ISLAND, AND SOUTH DAKOTA. THE U.S. DEPARTMENT OF ENERGY HAS NOT SPECIFIED EXACT CONTRIBUTION AMOUNTS AT THIS TIME.

THE U.S. DEPARTMENT OF ENERGY SUSPENDED COLLECTION OF THE NUCLEAR WASTE FEE IN MAY 2014, AS MANDATED BY THE U.S. COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT.

SOURCE: U.S. DEPARTMENT OF ENERGY, GUTHERMAN TECHNICAL SERVICES

UPDATED: MAY 2019

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Presidential Documents

Executive Order 14302 of May 23, 2025

Reinvigorating the Nuclear Industrial Base

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered:

Section 1. Purpose. The United States originally pioneered nuclear energy technology during a time of great peril. We now face a new set of challenges, including a global race to dominate in artificial intelligence, a growing need for energy independence, and access to uninterrupted power supplies for national security.

It took nearly 40 years for the United States to add the same amount of nuclear capacity as another developed nation added in 10 years. Further, as American deployment of advanced reactor designs has waned, 87 percent of nuclear reactors installed worldwide since 2017 are based on designs from two foreign countries. At the same time, the Nation's nuclear fuel cycle infrastructure has severely atrophied, leaving the United States heavily dependent on foreign sources of uranium as well as uranium enrichment and conversion services. These trends cannot continue.

Swift and decisive action is required to jumpstart America's nuclear energy industrial base and ensure our national and economic security by increasing fuel availability and production, securing civil nuclear supply chains, improving the efficiency with which advanced nuclear reactors are licensed, and preparing our workforce to establish America's energy dominance and accelerate our path towards a more secure and independent energy future.

Sec. 2. Policy. It is the policy of the United States to expedite and promote to the fullest possible extent the production and operation of nuclear energy to provide affordable, reliable, safe, and secure energy to the American people, to power advanced nuclear reactor technologies, as defined in 42 U.S.C. 16271(b)(1)(A), and to build associated supply chains that secure our global industrial and digital dominance, achieve our energy independence, protect our national security, and maximize the efficiency and effectiveness of nuclear fuel through recycling, reprocessing, and reinvigorating the commercial sector.

Sec. 3. Strengthening the Domestic Nuclear Fuel Cycle. (a) Within 240 days of the date of this order, the Secretary of Energy, in coordination with the Secretary of Defense, the Secretary of Transportation, and the Director of the Office of Management and Budget (OMB), shall prepare and submit to the President, through the Chair of the National Energy Dominance Council and the Director of the Office of Science and Technology Policy, a report that includes:

- (i) a recommended national policy to support the management of spent nuclear fuel and high-level waste and the development and deployment of advanced fuel cycle capabilities to establish a safe, secure, and sustainable long-term fuel cycle;
- (ii) a review of relevant statutory authorities to identify any legislative changes necessary or desirable to achieve the national policy recommended under subsection (a)(i) of this section;
- (iii) an evaluation of the reprocessing and recycling of spent nuclear fuel from the operation of Department of Defense and Department of Energy reactors and other spent nuclear fuel managed by the Department of Energy, along with a discussion of steps the Department of Defense

and the Department of Energy are taking or must take to improve such reprocessing and recycling processes;

(iv) an analysis of legal, budgetary, and policy considerations relevant to efficiently transferring spent nuclear fuel from reactors to a government-owned, privately operated reprocessing and recycling facility;

(v) recommendations for the efficient use of the uranium, plutonium, and other products recovered through recycling and reprocessing;

(vi) recommendations for the efficient disposal of the wastes generated by recycling or reprocessing through a permanent disposal pathway;

(vii) a recommended process for evaluating, prior to disposal, nuclear waste materials for isotopes of value to national security, or medical, industrial, and scientific sectors;

(viii) a reevaluation of historic and current nuclear reprocessing, separation, and storage facilities slated for decommissioning and that are identified as having valuable materials, isotopes, equipment, licenses, operations, or experienced workers, and that may have potential fuel cycle or national security benefits if operations are continued or increased; and

(ix) a program to develop methods and technologies to transport, domestically and overseas, used and unused advanced nuclear fuels and advanced nuclear reactors containing such fuels in a safe, secure, and environmentally sound manner, including any legislation required to support this initiative.

(b) Within 120 days of the date of this order, the Secretary of Energy, in consultation with the Chair of the Nuclear Regulatory Commission and the Director of OMB, shall develop a plan to expand domestic uranium conversion capacity and expand enrichment capabilities sufficient to meet projected civilian and defense reactor needs for low enriched uranium (LEU), high enriched uranium (HEU) and high assay, low enriched uranium (HALEU), subject to retention of such stockpiles as are necessary for tritium production, naval propulsion, and nuclear weapons. The plan shall be implemented based on the timeframes set forth in the plan.

(c) The Secretary of Energy shall halt the surplus plutonium dilute and dispose program except with respect to the Department of Energy's legal obligations to the State of South Carolina. In place of this program, the Secretary of Energy shall establish a program to dispose of surplus plutonium by processing and making it available to industry in a form that can be utilized for the fabrication of fuel for advanced nuclear technologies.

(d) Within 90 days of the date of this order, the Secretary of Energy, in consultation with the Secretary of Defense as appropriate, shall update the Department of Energy's excess uranium management policy to align with the policy objectives of this order and the Nuclear Fuel Security Act, factoring in the national security need to modernize the United States nuclear weapon stockpile. The Secretary of Energy shall prioritize contracting for the development of fuel fabrication facilities that demonstrate the technical and financial feasibility to supply fuel to qualified test reactors or pilot program reactors within 3 years from the date of such applications.

(e) Within 30 days of the date of this order, the Secretary of Energy, in coordination with the Attorney General and the Chairman of the Federal Trade Commission, shall utilize the authority provided to the President in section 708(c)(1) of the Defense Production Act of 1950 (DPA) (50 U.S.C. 4558(c)(1)), which has been delegated to the Secretary of Energy pursuant to Executive Order 13603 of March 16, 2012 (National Defense Resources Preparedness), to seek voluntary agreements pursuant to section 708 of the DPA with domestic nuclear energy companies. The Secretary of Energy should prioritize agreements with those companies that have achieved objective milestones (e.g., Department of Energy-approved conceptual safety design reports, the ability to privately finance their fuel, or the demonstrated technology capability) for the cooperative procurement of LEU and HALEU,

including as needed by the Federal Government for tritium production, naval propulsion, and nuclear weapons.

(f) The Secretary of Energy, the Attorney General, and the Chairman of the Federal Trade Commission shall take all necessary and appropriate steps under sections 708(c), (d), (e), and (f)(1)(A) of the DPA (50 U.S.C. 4558(c), (d), (e), (f)(1)(A)), for the Secretary of Energy to form agreements pursuant to subsection (e) of this section.

(g) The Attorney General shall, after consultation with the Chairman of the Federal Trade Commission, consider whether to make the finding described in section 708(f)(1)(B) of the DPA (50 U.S.C. 4558(f)(1)(B)), with respect to any agreement and, no later than 30 days after any voluntary agreement is reached, shall publish such finding as appropriate.

(h) Such voluntary agreements shall further allow consultation with domestic nuclear energy companies to discuss and implement methods to enhance the capability to manage spent nuclear fuel, including the recycling and reprocessing of spent nuclear fuel, to ensure the continued reliable operation of the Nation's nuclear reactors. Such voluntary agreements shall also allow industry consultation to establish consortia and plans of action to ensure that the nuclear fuel supply chain capacity, including milling, conversion, enrichment, deconversion, fabrication, recycling, or reprocessing, is available to enable the continued reliable operation of the Nation's existing, and future, nuclear reactors. The Secretary of Energy, consistent with applicable law, is authorized to provide procurement support, forward contracts, or guarantees to such consortia as a means to ensure offtake for newly established domestic fuel supply, including conversion, enrichment, reprocessing, or fabrication capacity.

Sec. 4. *Funding for Restart, Completion, Uprate, or Construction of Nuclear Plants.* (a) To maximize the speed and scale of new nuclear capacity, the Department of Energy shall prioritize work with the nuclear energy industry to facilitate 5 gigawatt of power uprates to existing nuclear reactors and have 10 new large reactors with complete designs under construction by 2030. To help achieve these objectives, the Secretary of Energy, through the Department of Energy Loan Programs Office, shall, subject to the requirements of the Federal Credit Reform Act and other applicable law and OMB Circular A-11, prioritize activities that support nuclear energy, including actions to make available resources for restarting closed nuclear power plants, increasing power output of operating nuclear power plants, completing construction of nuclear reactors that was prematurely suspended, constructing new advanced nuclear reactors, and improving all associated aspects of the nuclear fuel supply chain.

(b) The Secretary of Energy shall also coordinate with the Secretary of Defense to assess the feasibility of restarting or repurposing closed nuclear power plants as energy hubs for military microgrid support, consistent with applicable law, focusing initially on installations with insufficient power resilience or grid fragility.

(c) Within 180 days of the date of this order, the Secretary of Energy, in coordination with the Administrator of the Small Business Administration, shall, subject to the availability of appropriations, prioritize funding for qualified advanced nuclear technologies through grants, loans, investment capital, funding opportunities, and other Federal support. Priority shall be given to those companies demonstrating the largest degrees of design and technological maturity, financial backing, and potential for near-term deployment of their technologies.

Sec. 5. *Expanding the Nuclear Energy Workforce.* (a) Nuclear engineering and other careers and education pathways that support the nuclear energy industry shall be considered areas of focus and priority pursuant to Executive Order 14278 of April 23, 2025 (Preparing Americans for High-Paying Skilled Trade Jobs of the Future).

(b) Within 120 days of the date of this order, the Secretary of Labor and the Secretary of Education shall seek to increase participation in nuclear

energy-related Registered Apprenticeships and Career and Technical Education programs by:

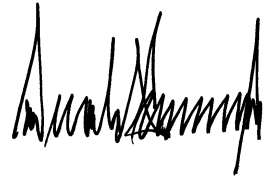
- (i) using apprenticeship intermediary contracts and allocating existing discretionary funds, as appropriate and consistent with applicable law, to engage industry organizations and employers to perform a gap analysis of apprenticeship programs, and facilitate the development of Registered Apprenticeship programs, in nuclear energy-related occupations that are underrepresented;
 - (ii) encouraging States and grantees to use funding provided under the Workforce Innovation and Opportunity Act (Public Law 113–128), as amended, to develop nuclear engineering and other nuclear energy-related skills and to support work-based learning opportunities, including issuing related guidance to State and local workforce development boards and others regarding use of such funds for such purposes; and
 - (iii) consistent with applicable law, establishing nuclear engineering and other nuclear energy-related skills training and work-based learning as a grant priority in Employment and Training Administration and Office of Career, Technical, and Adult Education discretionary grant programs.
- (c) Within 120 days of the date of this order, all executive departments and agencies that provide educational grants shall, as appropriate and consistent with applicable law, consider nuclear engineering and other nuclear energy-related careers as a priority area for investment.
- (d) Within 120 days of the date of this order, the Secretary of Energy shall take steps to increase access to research and development infrastructure, workforce, and expertise at Department of Energy National Laboratories for college and university students studying nuclear engineering and other nuclear energy-related fields, and Department of Defense personnel affiliated with nuclear energy programs.

Sec. 6. *Other Provisions.* Nothing in this order shall be construed to impair or otherwise affect OMB functions related to procurement actions and related policy. This order shall be carried out subject to the budgetary, legislative, and procurement processes and requirements established by the Director of OMB, and coordinated with OMB, as appropriate, prior to the initiation of any new program, obligation, or commitment of Federal funds, or submission of any legislative or procurement proposal arising from this order. This order shall be carried out in a manner which adheres to applicable legal requirements, conforms with nonproliferation obligations, and meets the highest safeguards, safety, and security standards.

Sec. 7. *General Provisions.* (a) Nothing in this order shall be construed to impair or otherwise affect:

- (i) the authority granted by law to an executive department or agency, or the head thereof; or
 - (ii) the functions of the Director of the Office of Management and Budget relating to budgetary, administrative, or legislative proposals.
- (b) This order shall be implemented consistent with applicable law and subject to the availability of appropriations.
- (c) This order is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.

(d) The Department of Energy shall provide funding for publication of this order in the *Federal Register*.

A handwritten signature in black ink, appearing to be "Donald Trump", located in the upper right quadrant of the page.

THE WHITE HOUSE,
May 23, 2025.

[FR Doc. 2025-09801
Filed 5-28-25; 8:45 am]
Billing code 6450-01-P

Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites

December 2008



**U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Washington, D.C.**



The picture on the cover is the Connecticut Yankee Independent Spent Fuel Storage Installation site in Haddam, Connecticut, with 43 dry storage NRC-licensed dual-purpose (storage and transport) casks.

EXECUTIVE SUMMARY

The House Appropriations Committee Print that accompanied the Consolidated Appropriations Act, 2008, requests that the U.S. Department of Energy (the Department):

...develop a plan to take custody of spent fuel currently stored at decommissioned reactor sites to both reduce costs that are ultimately borne by the taxpayer and demonstrate that DOE can move forward in the near-term with at least some element of nuclear waste policy. The Department should consider consolidation of the spent fuel from decommissioned reactors either at an existing federal site, at one or more existing operating reactor sites, or at a competitively-selected interim storage site. The Department should engage the 11 sites that volunteered to host Global Nuclear Energy Partnership facilities as part of this competitive process.

The Department has reviewed its authority to accept spent nuclear fuel from decommissioned commercial nuclear power reactor sites for interim storage and has concluded that it has no such currently exercisable authority. Legislation is required that would eliminate the limitations in the Nuclear Waste Policy Act of 1982, as amended, on taking commercial spent nuclear fuel for interim storage prior to the opening of the Yucca Mountain repository. In addition, in order to undertake interim storage in a timely manner, legislation would be needed: (1) to direct the Department to take spent nuclear fuel from decommissioned commercial nuclear power reactors as soon as possible; (2) to establish an expedited siting process; and (3) to authorize the Department to construct and operate the facility under its regulatory authority, or, if the facility were to be constructed and operated under a U.S. Nuclear Regulatory Commission license, to provide for an expedited siting and licensing process. Furthermore, such legislation should also provide for funding reform to ensure that the Department would have access each year to adequate funds from the Nuclear Waste Fund to carry out such activities. Reliable and sufficient funding is necessary for the simultaneous development of the Yucca Mountain repository, an interim storage facility, and transportation of spent nuclear fuel to both facilities.

The Department has concluded that, without legislation, a demonstration could not be completed in the near term and would not reduce taxpayer costs for waste disposal. Assuming expeditious resolution of a number of complex statutory, regulatory, siting, construction, and financial issues, if development were to begin in 2009, such a facility might begin operations in 2015 at the earliest and complete operations by shipping commercial spent nuclear fuel from the interim storage facility to Yucca Mountain between 2025 to 2028 at a cost of \$743 million. It would increase the total system life cycle costs of the repository program under the Nuclear Waste Policy Act of 1982, as amended.

The ongoing liability associated with the Department's delay in waste acceptance (currently \$11 billion, assuming that operation of the Yucca Mountain repository begins in 2020) would not be reduced in any significant way and could be increased if directing the priority acceptance of spent nuclear fuel from the ten decommissioned commercial nuclear power reactors resulted in additional litigation from contract holders with operating reactors. If Congress authorizes the Department to initiate interim storage for the consolidation of the spent nuclear fuel from decommissioned commercial nuclear power reactors and amends the interim storage siting provisions provided in the Nuclear Waste Policy Act of 1982, as amended, the Department

would consider either an existing federal site, one or more existing operating commercial nuclear power reactors, or a competitively selected interim storage site, engaging the sites that have volunteered to host Global Nuclear Energy Partnership facilities as part of the competitive process.

Authorization and funding by Congress to perform interim storage would provide the Department an option in addition to Yucca Mountain to allow the Department to begin to meet its contractual obligations with the owners of commercial spent nuclear fuel. This option could prove beneficial should Yucca Mountain experience delays due to licensing, litigation, lack of funding, or other causes, but only if the enabling legislation adequately addresses the issues discussed in this report.

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ACRONYMS

AEA	Atomic Energy Act
DOE	U.S. Department of Energy
GNEP	Global Nuclear Energy Partnership
HLW	high-level radioactive waste
MRS	monitored retrievable storage
MTHM	metric tons of heavy metal
NRC	U.S. Nuclear Regulatory Commission
NWF	Nuclear Waste Fund
NWPA	Nuclear Waste Policy Act
OFF	oldest fuel first
SNF	spent nuclear fuel

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1. INTRODUCTION

This report has been produced at the request of Congress. The House Appropriations Committee Print that accompanied the Consolidated Appropriations Act, 2008, requests that the U.S. Department of Energy (the Department):

...develop a plan to take custody of spent fuel currently stored at decommissioned reactor sites to both reduce costs that are ultimately borne by the taxpayer and demonstrate that DOE can move forward in the near term with at least some element of nuclear waste policy. The Department should consider consolidation of the spent fuel from decommissioned reactors either at an existing federal site, at one or more existing operating reactor sites, or at a competitively-selected interim storage site. The Department should engage the 11 sites that volunteered to host Global Nuclear Energy Partnership facilities as part of this competitive process.

This report discusses the status of the commercial spent nuclear fuel (SNF) inventory in the United States, at both decommissioned and operating commercial nuclear power reactor sites; summarizes the contractual arrangement the government and utilities have under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (10 CFR Part 961) (Standard Contract), related litigation, and the financial liabilities resulting from the Department's delay in performance under these contracts; provides a history of interim storage policy as it relates to commercial SNF in the United States; and identifies actions that would be necessary for the Department to develop an interim storage facility and demonstration program for commercial SNF from the decommissioned commercial nuclear power reactor sites.

2. CURRENT COMMERCIAL SNF STORAGE

There are currently 104 operating and 14 permanently shutdown commercial nuclear power reactors in the United States; four of these shutdown reactors are located at sites with other operating reactors. The other ten shutdown reactors are located at nine sites with no other nuclear operations.

For purposes of this report, the Department interprets the Congressional intent in the House Appropriations Committee Print to be the ten shutdown (decommissioned) commercial nuclear power reactors located at the nine sites with no other nuclear operations.

The SNF stored at the nine sites represents a small portion of the total SNF inventory currently stored at 72 commercial sites in the United States. An interim storage facility developed solely for the SNF from the nine sites would be significantly smaller than storage facilities previously considered as part of the federal waste management system.

2.1 COMMERCIAL SNF AT DECOMMISSIONED NUCLEAR POWER REACTOR SITES

There are currently ten decommissioned commercial nuclear power reactors located at nine sites with no other nuclear operations. Approximately 2,800 metric tons of heavy metal (MTHM) of SNF is stored on a temporary basis at these nine sites, awaiting removal by the Department for

permanent disposal. Until this SNF is removed from these nine sites, the sites cannot be fully decommissioned and made available for other purposes.

As of the end of 2007, six of the nine sites have developed independent spent fuel storage installations and placed all of their SNF into dual-purpose storage systems; one additional site is loading its SNF into dry storage during 2008. While the two remaining sites are planning for dry storage, the facilities have not yet been developed, and over 1,000 MTHM of SNF remains in pool storage at these two sites. Table 1 provides a summary of the nine sites, including the quantity and status of the SNF located at the sites. For the sites that have not yet implemented dry cask storage, one has already entered into a contract for dry storage, and for the other, the Department has estimated the number of storage casks.

As noted in Table 1, the Department estimates that all of the SNF currently located at the nine sites will be packaged in approximately 294 storage/transport cask systems. These systems utilize a sealed stainless steel canister to contain the SNF. The SNF canister and the required overpacks will be certified by the U.S. Nuclear Regulatory Commission (NRC) for storage (under 10 CFR Part 72) and transportation (under 10 CFR Part 71). These canisters, when placed in an approved transportation overpack, can be shipped directly from the utility site to an interim storage facility, where the canister would be taken from the transportation overpack and placed into a storage overpack for interim storage.

Table 1. Status of Decommissioned Commercial Nuclear Power Reactor Sites in the U.S.

Plant	State	MTHM Stored at Site	MTHM in Pool Storage	MTHM in Dry Storage	Number of Casks	DOE Estimated Casks	Total Casks (Actual Plus Estimated)	Average MTHM/Cask
Big Rock Point	Michigan	58	0	58	7	—	7	8.3
Haddam Neck	Connecticut	412	0	412	41	—	41	10.1
Humboldt Bay ^a	California	29	0	29	5	—	5	5.8
LaCrosse ^b	Wisconsin	38	38	0	5	—	5	7.6
Maine Yankee	Maine	542	0	542	60	—	60	9.0
Rancho Seco	California	228	0	228	21	—	21	10.9
Trojan	Oregon	359	0	359	34	—	34	10.6
Yankee Rowe	Massachusetts	127	0	127	15	—	15	8.5
Zion 1 & 2 ^c	Illinois	1,019	1,019	0	—	106	106	9.6
TOTALS		2,813*	1,057	1,756*	188	106	294	—

NOTE: ^aDry storage underway in 2008. Holtec canister has capacity of 80 assemblies (five canisters for the 390 assemblies).

^bDry storage contract entered with NAC for five NAC-MPC canisters. Dry storage schedule indicates target completion by the end of 2010.

^cDecommissioning contract entered with EnergySolutions. Canisters estimated using FuelSolutions W21 capacity. Target schedule for completion is 2013.

DOE = U.S. Department of Energy; MPC = multipurpose canister; NAC = Nuclear Assurance Corporation.

*Totals might differ from sums of values due to rounding.

3. STANDARD DISPOSAL CONTRACTS, LITIGATION, AND FINANCIAL LIABILITIES

The Standard Contract (10 CFR Part 961) defines the terms and conditions under which the government will accept commercial SNF for disposal in a geologic repository. The Department has taken the position that, as a general matter with respect to existing reactors, it will implement the Standard Contract by taking commercial SNF in the order it was generated. If Congress enacted legislation that directed the Department to take SNF from decommissioned reactors as a limited demonstration program, the Department would assign a priority to the acceptance of the SNF from these sites, pursuant to the provision in the Standard Contract that grants the Department the discretion to take SNF from decommissioned reactors on a priority basis. As discussed in the following sections, this situation would be a change from the current Department position stated previously.

3.1 STANDARD DISPOSAL CONTRACT

Section 302(a) of the Nuclear Waste Policy Act of 1982, as amended (NWPA), authorizes the Secretary of Energy to “enter into contracts with any person who generates or holds title to high-level radioactive waste, or spent nuclear fuel.” These contracts cover the acceptance of title, subsequent transportation, and disposal of such high-level radioactive waste (HLW) or SNF. The NWPA stipulates that the contracts provide for the payment of fees to the Secretary to offset the expenditures of providing these services, and specifically in Section 302(a)(5), it further requires that contracts entered into under this section provide that:

- A. **following commencement of operation of a repository** [emphasis added], the Secretary shall take title to the high-level radioactive waste or spent nuclear fuel involved as expeditiously as practicable upon the request of the generator or owner of such waste or spent fuel; and
- B. in return for the payment of fees established by this section, the Secretary, beginning not later than January 31, 1998, will dispose of the high-level radioactive waste or spent nuclear fuel involved as provided in this subtitle.

In 1983, the Department promulgated the provisions in a disposal contract through notice and comment rulemaking. The resulting contract, known as the Standard Contract, can be found at 10 CFR 961.11.

Priority for Waste Acceptance—In addition to the provisions required by the NWPA, the Standard Contract also contains provisions that establish the responsibilities of the parties, the terms for payment, and the processes and procedures for the transfer of title and physical possession of the HLW and SNF from the utility company to the federal government. In particular, the Standard Contract establishes the process for allocating the federal government’s finite waste acceptance capacity among the various utility purchasers.

This waste acceptance allocation, also known as the acceptance queue, is developed in accordance with the principle of “oldest fuel first” (OFF). Under the OFF methodology, the oldest SNF, as measured from the date of permanent discharge from the reactor, is given the highest priority in the acceptance queue. This approach ensures that all SNF, regardless of

location or ownership, is afforded equal treatment in establishing waste acceptance priority. Using the OFF methodology to allocate the Department's planned waste acceptance capacity, the last SNF shipment from the ten decommissioned commercial nuclear power reactors considered in this report would be 15 years after the repository begins operations.

The contract allows the OFF queue to be altered under certain conditions with Department consent. For instance, utility companies may, subject to Department approval, exchange places in the waste acceptance queue. Additionally, the Department may alter the queue by granting priority acceptance in cases of emergencies or by permitting priority acceptance of the SNF from reactors that have permanently ceased operations (decommissioned reactors).

The Department has been asked, on numerous occasions, to exercise its discretion under the Standard Contract to allow for the priority acceptance of SNF from decommissioned reactors. In all instances, the Department has declined to grant this priority, noting that doing so would, because of the finite nature of the federal government's planned waste acceptance capacity, adversely affect the timely removal of SNF from operating reactor sites. In other words, acceleration in waste acceptance from a decommissioned reactor site would result in a corresponding delay in removing SNF from an operating reactor site. Because of issues of equity that may result from this reallocation of waste acceptance capacity, the government has consistently advised the parties seeking such priority treatment to avail themselves of the exchange provisions of the Standard Contract that allow the utilities to exchange approved delivery commitments subject to the Department's approval.

3.2 CURRENT LITIGATION RELATED TO THE STANDARD CONTRACT

Because the Department has had no facility available to receive SNF under the NWPA, it has been unable to begin accepting SNF as required by the Standard Contracts. Significant litigation has ensued as a result of this delay. The Federal Circuit Court in the cases Northern States Power Co. v. U.S., 224 F.3d 1361 (Fed. Cir. 2000) and Maine Yankee Atomic Power Company v. United States, 225 F.3d 1336 (Fed. Cir. 2000) found the Department to be in partial breach of its contracts and found that utilities are entitled to recover damages for that breach. To date, more than 70 lawsuits have been filed, and more than 50 lawsuits remain pending against the government for delay damages.

Between 1998 and 2004, all ten decommissioned reactor utilities filed cases against the government for its delay. Claims for two of the decommissioned reactor utilities have been settled, and claims for the other eight decommissioned reactor utilities remain pending either in the U.S. Court of Federal Claims (trial courts) or in the U.S. Court of Appeals for Federal Circuit (appellate court). The government has appealed trial court damage awards of approximately \$226 million for five decommissioned reactors, but no final rulings have been issued in those cases.

3.3 FINANCIAL LIABILITIES DUE TO DELAY IN WASTE ACCEPTANCE

The government has settled claims with utilities covering 29 of the 118 operating and decommissioned reactors, nearly 25 percent of the commercial nuclear power reactors covered by Standard Contracts. If the Department begins to accept SNF by 2020, the Department

estimates that the federal government's liability for delay damages may be up to approximately \$11 billion. For each additional year of delay, the Department estimates that there may be hundreds of millions of dollars of additional damages.

As discussed in Section 2.1, seven of the nine decommissioned nuclear power reactor sites have already constructed interim storage facilities at the reactor sites and deployed dry cask storage systems for their entire SNF inventory. In most cases the government will be responsible for a portion of the costs incurred at these sites due to the Department's failure to begin accepting SNF in 1998, and those costs will be paid from the Judgment Fund. Accepting SNF from decommissioned reactors is unlikely to have any effect on the amount of damages unless the legislation that established the limited demonstration program was to make the elimination or reduction of damages a condition of participation.

Because most of the ten decommissioned reactors have already incurred costs for their onsite storage facilities, a limited demonstration program to remove the SNF from these sites to an interim storage facility would not significantly change the estimated overall liability of \$11 billion. At the same time, directing the priority acceptance of SNF from the ten decommissioned reactors would likely result in additional litigation from contract holders with operating reactors, as well as in demands for acceptance of their SNF at an interim storage facility.

4. HISTORY OF INTERIM STORAGE POLICY IN THE U.S.

This section provides a review of the history of interim storage policy to date. The Department has under certain circumstances accepted commercial SNF under the authority of the Atomic Energy Act of 1954 (AEA) (42 U.S.C. 2011 et seq.). The NWPA, however, severely limits the Department's authority to accept such SNF for interim storage.

4.1 DOE AUTHORITY TO ACCEPT SNF UNDER THE ATOMIC ENERGY ACT OF 1954

Prior to the enactment of the NWPA in 1982, the Department had authority and continues to have authority to accept SNF in certain circumstances pursuant to the AEA. Section 55 of the AEA, as amended (42 U.S.C. 2075), provides that the Department "is authorized, to the extent it deems necessary to effectuate the provisions of [the Act], to purchase, ... take, requisition, condemn, or otherwise acquire any special nuclear material or any interest therein." The authority under the AEA may be exercised to further any of its purposes, including international cooperation and nuclear nonproliferation, support of research and development in nuclear power, and management of the U.S. nuclear defense programs (42 U.S.C. 2011, 42 U.S.C. 2012, 42 U.S.C. 2013, 42 U.S.C. 2051(a), and 42 U.S.C. 2052).

Pursuant to this AEA authority, the Department has accepted and stored U.S.-supplied foreign reactor fuel at various DOE sites. The Department has also used this authority to accept small amounts of SNF for research and development purposes, such as parts of the Three Mile Island Unit 2 damaged reactor core and other damaged SNF. The Department has also accepted commercial SNF under settlement of disputes resulting from contracts that predate enactment of the NWPA.

However, the later-enacted NWPA provided a detailed statutory scheme for SNF storage and disposal and limited the Department's authority to accept SNF under the AEA except in compelling circumstances such as acceptance of SNF to abate a public health risk in an emergency. For the Department to accept any commercial SNF under the AEA, the Department could do so only under certain circumstances determined to be identifiable exceptions in the AEA like those discussed previously. In the absence of statutory direction to accept SNF from decommissioned reactors that explicitly addressed the limitations imposed by the NWPA, the Department does not believe that the acceptance of the SNF from the ten decommissioned reactors considered in this report would be permitted under an identifiable exception in the AEA.

4.2 DOE AUTHORITY UNDER THE NUCLEAR WASTE POLICY ACT OF 1982

With enactment of the NWPA, Congress provided a detailed statutory scheme for commercial SNF storage and disposal that, by its specificity, limits the Department's commercial SNF storage and disposal options as follows.

The NWPA permits the Department to undertake interim storage in two distinct instances, descriptions of which follow, neither of which can currently be exercised.

First, Section 135 of the NWPA (Subtitle B—Interim Storage Program) authorized the Department to enter into contracts to assist or provide temporary storage, known as federal interim storage, for a limited amount of SNF under certain specified conditions (including a separate fee) until a repository was available. This authority expired in 1990.

Second, Section 141 of the NWPA (Subtitle C, Monitored Retrievable Storage), authorized the Department to site, construct, and operate a monitored retrievable storage (MRS) facility but restricted the ability of the Department to pursue this option by linking any activity under this section to milestones tied to progress in the development of the Yucca Mountain repository (42 U.S.C. 10155 to 42 U.S.C. 10157). For example, before the MRS can be constructed, the NRC must have issued a construction authorization for the Yucca Mountain repository; and until the Yucca Mountain repository starts accepting SNF, the quantity of SNF stored at the MRS site cannot exceed 10,000 MTHM. After the Yucca Mountain repository starts accepting SNF, the total quantity of SNF at the MRS site cannot exceed 15,000 MTHM at any one time. Additionally, the NWPA stipulated that the MRS cannot be located in the State of Nevada.

In 1994, in an effort to consider all available avenues to accept commercial SNF, the Department issued a Notice of Inquiry on Waste Acceptance Issues seeking public comment on, among other issues, whether the Department had statutory authority under the NWPA to provide interim storage of SNF (59 FR 27007). In the subsequent 1995 final report responding to public comments, the Department determined again that the NWPA explicitly contemplated interim storage in only two instances: interim storage under Section 135 of the NWPA and an MRS under Section 141 of the NWPA (Office of Civilian Radioactive Waste Management; Nuclear Waste Acceptance Issues, 60 FR 21793). However, the report also noted that *the interim storage provision had expired and the MRS provisions were unusable because of the required linkages to repository development*. The report concluded that because neither of the NWPA's explicit interim storage authorities applied and because the NWPA precluded the Secretary from spending Nuclear Waste Fund (NWF) monies for construction or expansion of a facility without

express authorization from Congress, the Department lacked authority at that time to provide interim storage under existing law. Specifically, the report stated the following:

Interim storage by DOE was contemplated by the Act in only two situations, neither of which currently applies. Under the Act, DOE had authority to offer a limited interim storage option. See 42 U.S.C. 10156. However, that authority has, by its express terms, expired. Under the Act, DOE also has the authority to provide for interim storage in an MRS. That authority also is inapplicable, however, because the Act ties construction of an MRS to the schedule for development of a repository. See 42 U.S.C. 10165, 10168. Because these are the only interim storage authorities provided by the Act, and because the Act expressly forbids use of the Nuclear Waste Fund to construct or expand any facility without express congressional authorization (42 U.S.C. 10222(d)), *DOE lacks authority under the Act to provide interim storage services under present circumstances.* (60 FR 21793; emphasis added)

In addition, whether or not the Department can begin accepting SNF from commercial utilities prior to receiving construction authorization for the Yucca Mountain repository has been one of the issues litigated by contract holders. No court has found that the Department has authority under the NWPA to accept SNF from commercial utilities at this time.

For these reasons, the Department believes that any statutory direction to begin accepting SNF from decommissioned reactors would also need to address the limitations on the current exercise by the Department of its authority under the AEA to accept commercial SNF, as discussed earlier in this section.

5. PREREQUISITES FOR A LIMITED DEMONSTRATION OF INTERIM STORAGE OF SNF FROM NINE DECOMMISSIONED NUCLEAR POWER REACTOR SITES

The Department has identified a number of issues that would need to be addressed in any legislation that would direct the Department to begin accepting SNF from decommissioned reactors in order for the Department to have the ability to implement such direction in a timely and efficient manner. As noted previously, the limitations in the NWPA on the current exercise by the Department of its authority under the AEA to accept commercial SNF would need to be rendered inapplicable to SNF from decommissioned reactors. In addition, the Department has concluded that the existing provisions in the NWPA relating to interim storage would not result in the timely and efficient implementation of statutory direction to begin accepting SNF from decommissioned reactors because of the length of time and the potential of the state to veto the site under the existing provision of the NWPA. To proceed in a timely manner, the Department would require legislation to (1) direct the Department to take SNF from decommissioned reactors as soon as possible under its AEA authority; (2) establish an expedited siting process; and (3) authorize the Department to construct and operate the facility under its own regulatory authority, or, if the facility were to be constructed and operated under an NRC license, to provide for an expedited licensing process. Moreover, to be effective, any legislation would need to include funding reform to ensure that the Department has prompt access to the annual fees and interest paid into the NWF so that the Department could undertake its obligations to construct both the interim storage facility and the Yucca Mountain repository in a timely and efficient manner and thereby fulfill its commitments to all contract holders.

5.1 AUTHORITY

Because of the limitations on the current exercise of the Department's authority under the AEA, any legislation would need to make those limitations inapplicable to SNF from decommissioned commercial nuclear power reactors. In addition, to minimize the potential for further litigation from other contract holders, the legislation would likely need to expressly direct the Department to exercise its discretionary authority under the Standard Contract to take SNF from the decommissioned reactors on a priority basis as part of a statutorily mandated limited demonstration program.

5.2 SITING PROCESS

The Department has concluded that timely and efficient implementation of a limited demonstration program would also require establishment of a new statutorily mandated expedited siting process, rather than use of the existing siting processes in Subtitles B and C of the NWPA.

5.2.1 Existing Interim Storage Siting Requirements under the NWPA

Under Subtitle B, Interim Storage Program, the Department was authorized to (1) assist or provide temporary interim storage at government facilities, (2) provide for the acquisition of temporary storage casks for federal or civilian nuclear sites, or (3) construct storage capacity at any civilian nuclear power site. This subtitle expired in 1990.

Under Subtitle C, Monitored Retrievable Storage, the Department is authorized to site, design, and license a storage facility. The Department cannot construct the facility, however, until the Department has received a construction authorization from the NRC for the Yucca Mountain repository. In addition, Section 145 of the Act also prohibits the Secretary from selecting a site that is located in the State of Nevada. The MRS Commission was established pursuant to Section 143 of the NWPA and delivered its report to Congress in 1989. The Department recommended the Yucca Mountain site for the development of a repository in 2002. The Department could proceed with the siting of an interim storage facility in accordance with the requirements of Sections 144 through 146 of the NWPA. Section 144 requires the Secretary to survey and evaluate potentially suitable sites. From a technical standpoint, such a facility could be successfully developed virtually anywhere in the nation, other than Nevada; however, as specifically stated in Section 144, the NWPA limits the Secretary's consideration stating that the Secretary shall consider the extent to which siting an MRS facility would:

1. Enhance the reliability and flexibility of the system for the disposal of spent nuclear fuel and high-level radioactive waste established under this Act;
2. Minimize the impacts of transportation and handling of such fuel and waste;
3. Provide for public confidence in the ability of such system to safely dispose of the fuel and waste;
4. Impose minimal adverse effects on the local economy and the local environment;

5. Provide a high probability that the facility will meet applicable environmental, health, and safety requirements in a timely fashion;
6. Provide such other benefits to the system for the disposal of spent nuclear fuel and high-level radioactive waste as the Secretary deems appropriate; and
7. Unduly burden a State in which significant volumes of high-level radioactive waste resulting from atomic energy defense activities are stored.

Upon completion of the site surveys, the Secretary can select a site in accordance with the provisions of Section 145 of the NWPA. The Secretary may select a site from the sites evaluated under Section 144 that the Secretary determines on the basis of available information to be the most suitable for the development of an interim storage facility that is an integral part of the system for the disposal of SNF and HLW. The Secretary shall also prepare an environmental assessment with respect to such a selection and shall submit the environmental assessment to Congress at the time the site is selected.

Additionally, at least six months before selecting a site, the Secretary must notify the governor and legislature of the state in which the site is located (or the governing body of the affected Indian tribe where such site is located) of the potential selection and the basis for such selection. At least one public meeting must be held in the vicinity of the potential site to solicit input from interested parties. Section 145 also prohibits the Secretary from selecting a site that is located in the State of Nevada.

Once the Secretary notifies Congress of the selection of a site, the selection is effective at the end of 60 calendar days from the date of Congressional notification, unless the governor and state legislature (or the governing body of the affected Indian tribe if the site is located on a reservation) have submitted to Congress a notice of disapproval with respect to the site. If a notice of disapproval is received, the selection of the site is not effective unless Congress overrides the notice of disapproval as provided under Section 115(c) of the NWPA.

The NWPA also stipulates the amount of financial assistance (grants, technical assistance, and other financial assistance) that the Department can provide the host state of the interim storage facility. This amount includes benefit payments of \$5 million per year prior to the start of storage facility operations and \$10 million per year thereafter.

5.2.2 Possible Expedited Siting Process

The Department has concluded that in order to allow for the timely implementation of an interim storage facility, the siting process for the interim storage facility for the demonstration program, to a very large extent, would need to follow the process that would be utilized for siting a commercial away-from-reactor storage facility. That is, there should be (1) no special provisions that link the siting, construction, or operation to events related to the Yucca Mountain repository; (2) no provisions for Presidential or Congressional involvement in approval of the site; and (3) no provisions for a veto. In addition, the siting process would be facilitated if substantial benefit payments were potentially available to the host state.

5.2.3 POTENTIAL LOCATIONS

As requested by Congress, the Department has considered the consolidation of the SNF from decommissioned reactors at an existing federal site, at one or more existing operating reactor sites, or at a competitively selected interim storage site, including sites that volunteered to host Global Nuclear Energy Partnership (GNEP) facilities as part of this competitive process. It is likely that state or local governments at or around the host site would impose limitations on the interim storage facility, such as a capacity limit to prevent the site from future expansion beyond an agreed-upon capacity or a financial penalty if the SNF is left in place and not removed to the Yucca Mountain repository within a specified time period.

5.2.3.1 Existing Federal Site

An interim storage facility could be developed at a DOE site or at many other federal sites. The Department's sites at Savannah River, Hanford, and Idaho possess existing infrastructures, including security programs for SNF, operational and regulatory expertise, fully developed environmental baselines, and rail access that would facilitate acceptance. The Idaho National Engineering Laboratory site may present some unique issues due to prior agreements between the Department and the State of Idaho regarding the acceptance of commercial SNF.

5.2.3.2 One or More Existing Operating Reactor Sites

The Department could solicit expressions of interest for the consolidation of SNF from decommissioned reactors at one or more operating reactor sites. If an existing NRC-licensed site were chosen, it would be necessary to develop the interim storage facility under NRC licensing requirements. Under current NRC regulations, the reactor operators are licensed to possess quantities of SNF only as required to operate their reactors. Accepting SNF from decommissioned reactors at an operating reactor site would require a modification to the operating reactor's NRC license. This process may require hearings that could be contentious, thus delaying acceptance. Like the Department's sites, existing reactor sites have fully developed nuclear infrastructures and environmental baselines.

5.2.3.3 Competitively Selected Interim Storage Site

The Department could broadly solicit expressions of interest for the development an interim storage site for the SNF from the decommissioned reactors. This effort could build upon recent Department efforts in developing site characterization reports for eleven potential sites as part of the Department's GNEP program and other industry initiatives. As with the GNEP siting effort, the competitive process for selection of an interim storage facility should have the benefit of identifying a willing and supportive host. The sites may or may not have an existing nuclear infrastructure, and they could require more time for development and establishment of an environmental baseline. It should be noted, however, that local willingness and support for a site initially does not ensure continued support for the facility during the long timeframe needed to license and build such a facility.

5.3 LICENSING AND ENVIRONMENTAL REVIEW

Under Section 202 of the Energy Reorganization Act of 1972, any Department facility used primarily for the interim storage of commercial SNF must be licensed by the NRC. Information obtained from the NRC Web site indicates that the development of SNF storage facilities at nuclear power reactor sites typically takes up to three years from the decision to implement through operation.¹ The NRC review of the Private Fuel Storage license application for a proposed interim storage facility in Utah, which encountered significant public opposition, took over eight years. Since the SNF currently in storage at the nine decommissioned reactor sites is stored in six different types of storage systems, the license application for the interim storage facility would have to address the use of all these types of storage systems, and would be, therefore, more complex than the license application for existing facilities, which each use only one type of storage system.

Construction and operation of the interim storage facility would be expedited if the Department were authorized to use its authority under the AEA to regulate the facility. Alternatively, if the NRC were to license the facility, the NRC should be directed to use an expedited licensing process such as making use of the existing general license for certain interim SNF storage facilities. In addition, the NRC should be directed by statute to adopt DOE National Environmental Policy Act of 1969 (42 U.S.C. 4321) documents for the interim storage facility in a manner similar to the current approach in the NWPA, with respect to the environmental impact statement for the Yucca Mountain repository. Furthermore, as in the case for SNF that will be transported to the Yucca Mountain repository, the Department and not the NRC should be responsible for regulating the transportation of SNF to the interim storage facility.

5.4 CONSTRUCTION, TRANSPORTATION, AND OPERATIONS

Construction of the interim storage facility would be expedited if the interim storage facility were located at a site with existing nuclear infrastructure, rail transportation, and security services. At such a site, the required facilities would include a simplified canister receipt facility that could be utilized to remove the storage canisters from the transportation cask system and place them in appropriate onsite storage overpacks, an overpack fabrication facility for the onsite fabrication of the storage overpacks, an onsite transporter for transporting the loaded storage systems from the canister receipt facility to the storage pads, and one or more reinforced concrete storage pads. Based on experience at commercial nuclear facilities, the construction of these facilities could be completed in 12 to 24 months, assuming adequate funding, the issuance of all necessary permits, no linkage of construction to events related to the Yucca Mountain repository, and the absence of litigation-related delays.

Transportation—For the purpose of this report, the Department has developed an illustrative waste acceptance schedule for the acceptance of the SNF from the nine decommissioned reactor

¹ <http://www.nrc.gov/waste/spent-fuel-storage/sf-storage-licensing/license-considerations.html>

sites. To expedite acceptance in the near term, the Department has developed this schedule based on an approach that focuses on efficiency in transporting the SNF to the interim storage facility and does not follow the notification and scheduling requirements contained in the Standard Contracts. As shown in Table 2, the schedule presumes that all the SNF is removed from the nine decommissioned reactor sites in a period of four years.

Table 2. Waste Acceptance Schedule for the Acceptance of the SNF from the Nine Decommissioned Commercial Nuclear Power Reactor Sites

Shipping Schedule	MTHM	Shipments/Year
Year 1	400	46
Year 2	600	57
Year 3	794	85
Year 4	1,019	106
TOTAL	2,813	294

NOTE: The waste acceptance schedule does not consider technical attributes, such as the condition of the commercial SNF, that could affect the order and timing in which the Department could accept SNF for disposal.

SNF = spent nuclear fuel.

To implement transportation in accordance with this schedule, the Department would need to acquire more than 20 NRC-certified transportation casks and associated equipment, including rail rolling stock. While the number of casks required may appear high for such a small inventory of SNF, it is because the SNF at the seven decommissioned reactor sites with existing dry storage facilities is stored in six different types of SNF storage systems, each requiring a specific type of transportation cask system.

Operations—It is anticipated that the Department would store the SNF in NRC-approved storage systems in the same manner that the SNF is currently stored at the decommissioned reactor sites. As noted previously, this action would require the acquisition of six different types of storage systems and associated handling equipment. If the site is adjacent to an existing nuclear facility, utilization of the existing operational infrastructure would minimize cost and time before start-up.

5.5 FUNDING

5.5.1 Project Cost and Schedule

The Department has developed a preliminary cost estimate and schedule for the development and operation of an interim storage facility, if authorized by Congress, designed to accept and store the approximately 2,800 MTHM of SNF from the nine decommissioned reactor sites (Table 3). Table 3 shows that if successfully developed, under the assumptions discussed previously, such an interim storage facility could be developed to begin operations in 2015 at the earliest and to operate through 2028 at a cost of \$743 million. The schedule and estimate assume that the site selected has a preexisting nuclear infrastructure, adequate funding, adequate rail access and an expedited site selection process with no opposition or litigation. Once accepted at the interim storage facility, the SNF would remain on site until it could be delivered to the Yucca Mountain repository without adversely impacting the acceptance of SNF from operating reactors.

Table 3. Estimated Cost and Schedule for Interim Storage of SNF from Decommissioned Nuclear Power Reactors Sites

Shutdown Storage Time Estimate	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
Siting																				
NWPA Amendment																				
EIS																				
License Application																				
Licensing																				
Construction																				
Transportation	Plan	Acquire					Operations					Ship to Repository								
Storage Facility Operations																				
Shutdown Storage Cost Estimate	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
Siting	\$10																			\$10
EIS/LA/Licensing		\$4	\$6	\$4	\$4	\$2	\$0													\$20
Storage Facility Construction				\$4	\$6	\$10														\$20
Storage Overpacks						\$12	\$19	\$25	\$32											\$88
Transportation Equipment						\$72	\$72													\$144
Transportation Operations							\$12	\$19	\$25	\$32							\$29	\$29	\$29	\$176
Storage Facility Operations							\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$130
Site Benefits NWPA Sec.171		\$5	\$5	\$5	\$5	\$5	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$155
Total	\$10	\$9	\$11	\$13	\$15	\$101	\$123	\$64	\$77	\$52	\$20	\$20	\$20	\$20	\$20	\$20	\$49	\$49	\$49	\$743

NOTE: The waste acceptance schedule does not consider technical attributes, such as the condition of the commercial SNF, that could affect the order and timing in which the Department could accept it for disposal. This estimate also assumes enactment of all necessary legislation, optimal project funding, the issuance of all necessary authorizations and permits, and the absence of litigation-related delays.

EIS = environmental impact statement; LA = license application; NWPA = Nuclear Waste Policy Act of 1982, as amended; SNF = spent nuclear fuel.

5.5.2 Legislative Funding Reform

In the absence of statutory language that authorizes the use of the NWF, the Department expects that the use of any funds from the NWF for a limited demonstration program would be subject to challenge. Thus, any legislation should make clear that construction and operation of the interim storage facility is an authorized use of the NWF.

In addition, in order to provide for the timely and efficient construction and operation of both the interim storage facility and the Yucca Mountain repository, any legislation should include funding reform that ensures that the Department has prompt access to annual fees and interest deposited in the NWF. In the absence of funding reform, interim storage costs would be part of the Department's budget allocation, which would exacerbate the existing problem of competing for limited resources within the Department's budget allocation. Without funding reform, Congressional appropriators and the administration would need to prioritize each year between other Department activities, Yucca Mountain repository efforts, and the development of an interim storage facility for the acceptance of SNF from the nine decommissioned reactor sites.

Legislation providing direction for interim storage without funding reform would further jeopardize the Yucca Mountain project and increase taxpayer liability. Regardless of whether direction is given to begin accepting SNF from decommissioned reactors, the liability costs incurred by the Department's delay under the Standard Contract will increase for every year that the repository is delayed.

5.5.3 Impact on the Adequacy of the Fee

The inclusion of the development and operations of an interim storage facility for the SNF from decommissioned reactors would increase the total system life cycle costs of the repository program under the NWPA. A new fee adequacy assessment would need to be conducted to assess whether the additional near-term costs of an estimated \$743 million would have an impact on the nuclear waste disposal fee. The program would be required to construct both an interim storage facility and a repository simultaneously, resulting in significantly higher near-term expenditures.

The adequacy of the fee is based on sufficient investment accumulation for the repository out-year needs after fee revenue is no longer provided to the government. Near-term increases in funding requirements could result in a negative impact on the adequacy of the 1 mill per kilowatt hour fee currently paid by utilities.

6. CONCLUSION

The Department has reviewed its authority to accept SNF from decommissioned nuclear power reactor sites for interim storage and has concluded that it has no such currently exercisable authority. Legislation is required that would eliminate the limitations in the NWPA on taking commercial SNF for interim storage prior to the opening of the Yucca Mountain repository. In addition, in order to undertake interim storage in a timely and efficient manner, legislation would be needed (1) to direct the Department to take SNF from decommissioned nuclear power reactors as soon as possible; (2) to establish an expedited siting process; and (3) to authorize the Department to construct and operate the facility under its regulatory authority, or, if the facility

were to be constructed and operated under an NRC license, to provide for an expedited siting and licensing process. Furthermore, legislation should also provide for funding reform to ensure the Department access each year to the additions to the NWF from fees and interest. Reliable and sufficient funding is necessary for the simultaneous development of the Yucca Mountain repository and an interim storage facility.

While moving the SNF from the nine decommissioned commercial nuclear power reactor sites would demonstrate that the Department can move forward prior to the opening of the repository, any reduction in the Department's liability for failing to begin accepting commercial SNF in 1998 would be minimal. The ongoing liability associated with the Department's delay in waste acceptance (currently \$11 billion, assuming that operation of the Yucca Mountain repository begins in 2020) would not be reduced in any significant way and could be increased if providing priority acceptance of the SNF from the nine decommissioned commercial nuclear power reactor sites resulted in additional litigation from contract holders with operating reactors, as well as in demands for acceptance of their SNF at the interim storage facility.

If Congress authorizes the Department to initiate interim storage for the consolidation of the spent nuclear fuel from decommissioned commercial nuclear power reactors and amends the interim storage siting provisions provided in the Nuclear Waste Policy Act of 1982, as amended, the Department would consider either an existing federal site, one or more existing operating commercial nuclear power reactors, or a competitively selected interim storage site, engaging the sites that have volunteered to host Global Nuclear Energy Partnership facilities as part of the competitive process.

Authorization and funding by Congress to perform interim storage would provide the Department an option in addition to Yucca Mountain to allow the Department to begin to meet its contractual obligations with the owners of commercial spent nuclear fuel. This option could prove beneficial should Yucca Mountain experience delays due to licensing, litigation, lack of funding or other causes, but only if the enabling legislation adequately addresses the issues discussed in this report.

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Considerations for Reprocessing of Spent Nuclear Fuel

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Nuclear reactors generate about 20% of U.S. commercial electric power and almost half of the nation's low carbon electricity generation. However, nuclear reactors also produce highly radioactive spent nuclear fuel (SNF) that results from the fission (splitting) of uranium nuclei in the reactor fuel. SNF must be isolated from the environment for thousands of years to prevent harm.

About 91,000 metric tons of SNF is stored at nuclear plant sites around the United States, awaiting consolidated storage and permanent underground disposal. The Nuclear Waste Policy Act (P.L. 97-425), as amended, designated Yucca Mountain, NV, as the only candidate site for a national deep geologic repository for the disposal of SNF and other high-level nuclear waste. Political and legal opposition to the project has indefinitely delayed the licensing, construction, and operation of the proposed Yucca Mountain repository.

Direct disposal of SNF, as currently planned in the United States, is called the "once through" fuel cycle. About 95% of SNF consists of uranium from the fresh fuel that was originally loaded into the reactor and 1% consists of fissile plutonium produced from irradiated uranium, both of which can be used in new fuel. The remaining 4% of SNF consists of highly radioactive fragments of uranium and plutonium (fission products) that must be disposed of.

SNF can be reprocessed through chemical dissolution or melting to allow uranium and plutonium to be separated from the fission products and made into new fuel. Repeated reprocessing of SNF is called the "closed cycle," a major alternative to the once-through cycle. Reprocessing is currently carried out in France, Russia, and a few other countries; however, there are no commercial reprocessing operations in the United States. Reprocessed uranium and plutonium currently can be recycled only once into new fuel for current reactor designs, as additional recycling would require advanced reactors, specifically fast neutron reactors.

The United States developed technology for the reprocessing of SNF during World War II and for decades operated some of the largest reprocessing facilities in the world, primarily for nuclear weapons material production purposes. Commercial reprocessing activities in the United States ended during the 1970s and early 1980s because of rising costs and policy concerns about the potential worldwide growth of stockpiles of weapons-usable plutonium.

Interest in reprocessing in the United States has renewed among some policymakers and stakeholders primarily because of its potential for reducing the volume and toxicity of nuclear waste. In principle, indefinite reprocessing of SNF could eliminate the need for permanent disposal of uranium and plutonium, which would be made into new fuel, and require permanent disposal of only the fission products, which would be immobilized in glass or other insoluble materials. However, there are potential waste-related disadvantages. The degree to which total waste volumes and long-lived toxicity would be reduced by any future reprocessing and recycling remains uncertain—along with the costs—and largely dependent on future technology development.

Congress has supported the Department of Energy's reprocessing research and development program in recent years through a funding authorization in the Energy Act of 2020 (Division Z of P.L. 116-260) and subsequent annual appropriations. The Energy Act of 2020 and the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) authorized and appropriated more than \$2 billion for demonstrations of advanced reactors, including fast neutron reactors that could indefinitely recycle SNF plutonium. In the 118th Congress, hearings on nuclear waste management and recycling were held in the House Energy and Commerce and Senate Energy and Natural Resources Committees, and the House Appropriations Committee in report language called for commercialization of reprocessing by 2033 (H.Rept. 118-580).

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Introduction

Nuclear reactors produce highly radioactive spent nuclear fuel (SNF) as a result of power production. During reactor operation, some of the uranium in nuclear fuel is split (fissioned) to produce energy. The resulting fission products are intensely radioactive and thermally hot. Some of the uranium also is converted to plutonium. After several years, reactor fuel can no longer efficiently sustain a nuclear chain reaction and is placed into storage as SNF.

The Nuclear Waste Policy Act of 1982,¹ as amended, designated Yucca Mountain, NV, as the only location where the Department of Energy (DOE) could construct a national high-level nuclear waste repository for the permanent disposal of SNF and high-level radioactive waste. Political and legal opposition to the project has indefinitely delayed the licensing, construction, and operation of the proposed Yucca Mountain repository. As a result, currently SNF is stored at the nuclear power plant where it was produced.

Reprocessing refers generally to the technical process of extracting uranium, plutonium, and certain other elements from the SNF to be used as new fuel. Advocates of reprocessing cite two major potential benefits: (1) extracting and reusing the fissile material (uranium-235 and plutonium-239)² to take advantage of the potential embedded energy value remaining after the nuclear fuel has been “burned”³ and removed from a nuclear reactor, and (2) reducing the long-lived radioactivity of nuclear waste to facilitate disposal options.

The United States developed technology for the reprocessing of SNF during World War II and for decades operated some of the largest reprocessing facilities in the world to produce plutonium for nuclear weapons. From 1966 to 1972, a reprocessing plant operated in West Valley, NY, to separate uranium and plutonium for commercial reactor fuel. However, commercial reprocessing was subsequently abandoned in the United States because of high costs and concerns about nuclear weapons proliferation. Other countries, such as France, the United Kingdom, and Russia, operate commercial reprocessing plants. Interest in reprocessing efforts in the United States has renewed among some policymakers and stakeholders due to considerations pertaining to alternative solutions for the management of high-level nuclear waste and the development of “advanced” nuclear reactors, some of which would include a fuel cycle supported by reprocessed SNF.

Some have argued for Congress to support reprocessing operations as an option to eliminate or decrease the volume of nuclear waste required for a permanent repository, as well as to utilize fuel that could be produced from SNF. On the other hand, others may argue that reprocessing could lead to increased proliferation risks, waste management and disposal issues, and

¹ P.L. 97-425, 42 U.S.C. §§10101 et seq.

² In addition to these fissile materials, a variety of isotopes that are used in medical, industrial testing and scientific activities can be extracted through chemical separations from spent nuclear fuel (SNF). In addition to producing energy by reusing the fissile material, reusing the isotopes takes advantage of the energy and money invested in the original front end of the nuclear fuel cycle for activities from mining, processing, and enrichment to create the fresh nuclear fuel.

³ While the term *burn* is often used to refer to fission in a reactor, and the term *high burnup* reactors refers to the process of increasingly making more efficient use of uranium, no combustion occurs and no combustion products (e.g., carbon dioxide [CO₂], sulfur oxides [SO_x], nitrogen oxides [NO_x], or particulates) are emitted directly from nuclear power production. Also, the reason for removing nuclear fuel from a reactor is not primarily the burnup or loss of fission products (e.g., U-235), but rather the buildup of fission products that absorb neutrons and decrease the fuel’s ability to generate heat cost-effectively. Much of the U-235, and hence the potential energy value, that is put into a reactor as fresh fuel is later taken out as spent fuel, along with newly created fissile materials, such as plutonium, and fission products that result from the splitting of uranium and plutonium nuclei. Reprocessing separates out these fission products from fissile materials that can be reused for nuclear fuel.

uncertainties about costs. This report describes reprocessing in the context of the nuclear fuel cycle and provides general considerations regarding U.S. policy, nonproliferation, the regulatory framework, waste management and disposal, environmental concerns, and economics. The final section discusses recent congressional action involving reprocessing, high-level waste management, and advanced reactors.

Background

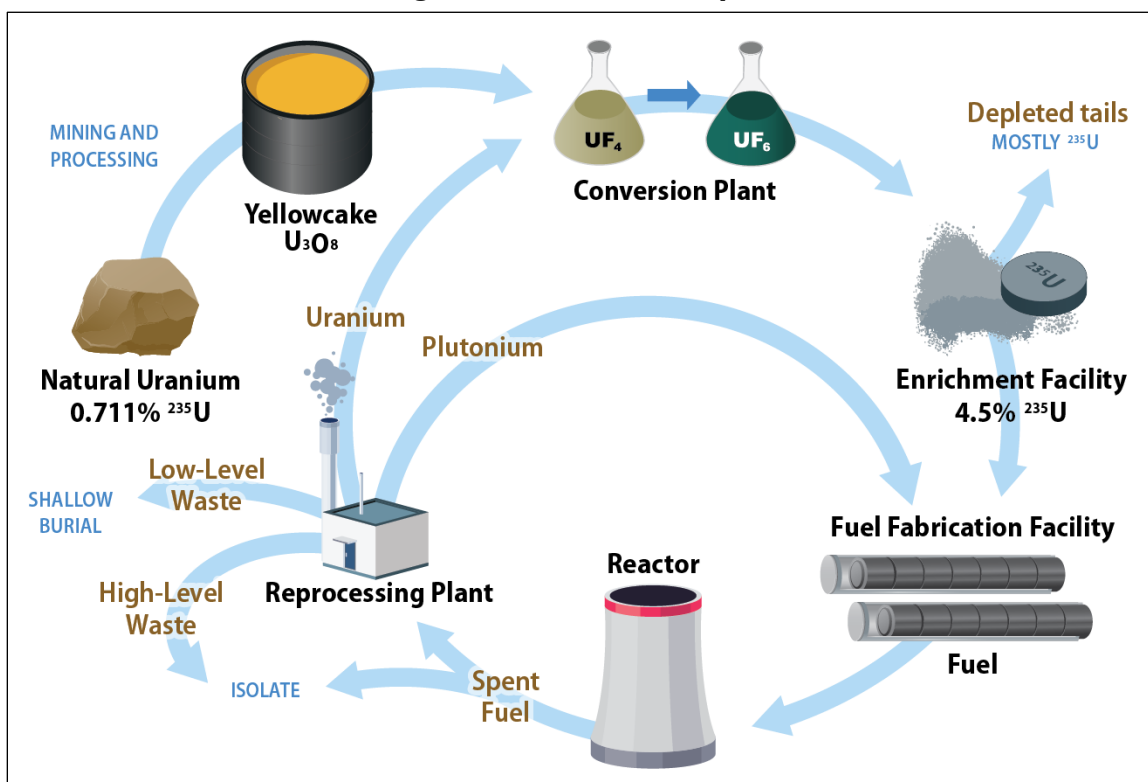
The U.S. Nuclear Fuel Cycle

The U.S. nuclear fuel cycle includes the process of extracting uranium from the earth, enriching the uranium to increase the concentration of the fissile form of uranium (U-235), fabricating the enriched uranium into fuel rod assemblies capable of being used in nuclear reactors for generating electric power, and managing the resulting SNF. Commercial civilian nuclear reactors in the United States use low-enriched uranium (LEU) oxide fuel assemblies to generate nuclear power through fission reactions.⁴ The fuel rods are bundled into fuel assemblies for placement in the reactor core. These assemblies facilitate a controlled nuclear fission chain reaction that generates heat, which is used to drive turbines to produce electric power. Approximately every 18-24 months, the reactor fuel becomes incapable of economically producing power and must be replaced (i.e., it is considered “spent”). Fuel assemblies removed from the reactor following power production are called SNF.⁵

⁴ Natural uranium has an isotopic composition of approximately 0.71% U-235, the fissile isotope of uranium. Civilian nuclear power fuel is generally enriched to 3%-5% U-235. Until 2013, uranium enrichment in the United States was largely performed using a gaseous diffusion technology. Currently, one uranium enrichment plant, which employs gas centrifuge technology, operates in the United States.

⁵ The Nuclear Waste Policy Act of 1982, as amended, defines *SNF* as the fuel assemblies “withdrawn from a nuclear reactor following irradiation.” 42 U.S.C. §10101.

Figure 1. Nuclear Fuel Cycle



Source: U.S. Government Accountability Office, *Commercial Spent Nuclear Fuel - Congressional Action Needed to Break Impasse and Develop a Permanent Disposal Solution*, GAO-21-603, 2021.

SNF is currently stored in one of two ways: in storage pools or dry casks. Immediately following power production, SNF is discharged from the reactors and stored in pools of water on-site, as it remains intensely radioactive and thermally hot. Wet pools provide regulated conditions allowing the fuel to cool, while water is circulated and maintained to keep it from boiling off and uncovering the fuel. In dry cask storage, the SNF is stored in sealed, steel canisters surrounded by radiation shielding materials, such as steel, concrete, or other materials. Wet storage capacity for SNF can be limited, prompting most reactor sites to store SNF using a combination of wet storage and dry casks.⁶ As of December 2022, 91,000 metric tons of SNF were stored in the United States, mostly at nuclear power plant sites, increasing by about 2,200 metric tons per year.⁷

The U.S. nuclear power industry is considered an “open fuel cycle” or “once-through fuel cycle,” as new uranium as fuel must be mined and processed to replace the nuclear fuel used in reactors. The once-through fuel cycle uses only a fraction of the 0.7% of U-235 found in natural uranium, plus a small fraction of the dominant isotope U-238 that is converted to plutonium during reactor operation. The vast majority of the initially mined uranium is planned for disposal.

In a “closed fuel cycle,” reprocessing of SNF would extract uranium, plutonium, and certain other elements from the SNF to be used as new fuel. Plutonium is a particularly important fissile

⁶ In dry storage, spent fuel is placed in sealed containers filled with inert gas and cooled by natural air circulation. For more information, see CRS Report RL33461, *Civilian Nuclear Waste Disposal*, by Mark Holt.

⁷ Pacific Northwest National Laboratory, *Spent Nuclear Fuel and Reprocessing Waste Inventory*, December 2024, https://curie.pnnl.gov/system/files/SNF%20and%20Rep%20Waste%20Inventory%20PNNL%2033938%20Rev.%201.1_0.pdf.

material that can be used in nuclear reactor fuel instead of enriched uranium. Proponents of a closed fuel cycle assert this cycle could continue indefinitely and be used to fuel some advanced reactors so that only relatively short-lived fission products would need permanent disposal.⁸ High-level waste from reprocessing would initially be similar to spent fuel in heat and radioactivity but would decay to near background levels after several hundred years because plutonium and other long-lived radioactive materials would be removed and used as new fuel. In addition, proponents assert the closed fuel cycle could extract from the fuel many times the amount of energy that could be produced with the once-through cycle.⁹

Reprocessing of Spent Nuclear Fuel

In general, reprocessing of SNF involves separating uranium, plutonium, and minor actinides¹⁰ from the SNF for reuse in other purposes, such as nuclear warhead production or fuel for further civilian use. Because separated plutonium is one of two materials that can be used to make a nuclear weapon (the other being enriched uranium), international controls on spent fuel reprocessing are a fundamental element in weapons nonproliferation policy. The United States has long sought to discourage additional countries from building reprocessing facilities. The U.S. Nuclear Regulatory Commission (NRC) defines *reprocessing* as “the processes used to separate spent nuclear reactor fuel into nuclear materials that may be recycled for use in new fuel and material that would be discarded as waste.”¹¹

According to the World Nuclear Association (WNA), all commercial reprocessing facilities operating in five other countries use the PUREX (plutonium-uranium extraction) technique, although with some variation depending upon the fuel cycle needs.¹² In general, the PUREX technique involves a series of processing steps, including dissolving the SNF in nitric acid; chemically separating uranium (U) and plutonium (Pu) using various organic solvent extraction methods; and finally converting the Pu and U to respective powder forms, plutonium oxide (PuO₂) and uranium oxide (UO₂). In part to address issues experienced with potentially harmful environmental releases, proliferation vulnerability, and costs, other reprocessing technologies have been proposed, such as UREX (uranium extraction only) and UREX+,¹³ that would not fully separate plutonium.¹⁴ Additionally, researchers have examined other reprocessing techniques, such as pyroprocessing and electrometallurgical refining.¹⁵ Not all such processes for recycling

⁸ Argonne National Laboratory, *Nuclear Fuel Recycling Could Offer Plentiful Energy*, 2012, <https://www.anl.gov/article/nuclear-fuel-recycling-could-offer-plentiful-energy>.

⁹ For example, see World Nuclear Association, “Processing of Used Nuclear Fuel,” 2020, <https://world-nuclear.org/information-library/nuclear-fuel-cycle/fuel-recycling/processing-of-used-nuclear-fuel>.

¹⁰ Actinides are a group of elements on the periodic table from mass number 89 (actinium) to 103 (lawrencium). In the context of SNF, minor actinides are typically americium, neptunium, and curium.

¹¹ U.S. Nuclear Regulatory Commission, *Reprocessing*, <https://www.nrc.gov/materials/reprocessing.html#background>.

¹² The World Nuclear Association (WNA) identifies five countries with facilities capable of commercial reprocessing: France, Russia, Japan, United Kingdom, and India. WNA, *Processing of Used Nuclear Fuel*, updated 2020, <https://world-nuclear.org/information-library/nuclear-fuel-cycle/fuel-recycling/processing-of-used-nuclear-fuel.aspx>.

¹³ There have been many different proposed UREX+ designs with various products and waste streams. See *ibid*.

¹⁴ M. C. Regalbuto, “Alternative Separation and Extraction: UREX+ Processes for Actinide and Targeted Fission Product Recovery,” in *Advanced Separation Techniques for Nuclear Fuel Reprocessing and Radioactive Waste Treatment* (Woodhead Publishing, 2011).

¹⁵ World Nuclear Association, “Processing of Used Nuclear Fuel,” updated December 2020, <https://world-nuclear.org/information-library/nuclear-fuel-cycle/fuel-recycling/processing-of-used-nuclear-fuel.aspx>. See section on “Electrometallurgical ‘Pyroprocessing.’” Additional discussion of reprocessing technology can be found in Section 4.3.6 of National Academies of Sciences, Engineering, and Medicine (NASEM), *Merits and Viability of Different* (continued...)

SNF would result in fully separated plutonium, which is a weapons-usable material.¹⁶ If plutonium is not fully separated from the highly radioactive fission products in SNF, it is generally considered less attractive to be used as weapons material.

The volume and radiotoxicity of waste products from reprocessing depends on the separation process employed, which affects both the extent to which SNF is separated and the degree of transmutation¹⁷ of critical components.¹⁸ In general, the waste liquid remaining after reprocessing SNF and separating Pu and U (which make up about 97% of the spent fuel) is considered high-level waste (HLW), which is highly radioactive and thermally hot. The liquid HLW contains the highly radioactive fission products and minor actinides that constituted about 3% of the spent fuel before it was reprocessed.¹⁹ This liquid waste can be conditioned with certain dry materials in order to convert (i.e., vitrify) it into a more stable borosilicate glass for long-term management. U.S. reprocessing plants associated with defense activities stored liquid HLW in large underground tanks where treatment and disposal remain pending. Data on existing waste treatment technologies are available from currently operating plants such as DOE's large HLW glassification (i.e., vitrification) facility at the Savannah River Site in South Carolina (Defense Waste Processing Facility), which started operating in 1996.

A 2023 study from the National Academies of Sciences, Engineering, and Medicine (referred to in this report as the "NASEM study")²⁰ noted that reprocessing generates a wide variety of waste streams: "Some of these waste streams are captured in waste forms for disposal in low-level waste disposal facilities or a geologic repository, while others are released to the environment either in liquid or gaseous forms."²¹ For a future commercial reprocessing facility, any degree of risk from emissions would be dependent upon NRC regulations governing these operations, and compliance with those regulations.

Considerations for U.S. Reprocessing

The following sections discuss considerations associated with developing commercial reprocessing operations in the United States. As noted above, reprocessing operations exist in five other countries, but not in the United States. These sections provide general considerations regarding U.S. policy, nonproliferation, the regulatory framework, waste management and disposal, environmental concerns, and costs. These sections do not intend to address the technical and/or economic viability of any proposed reprocessing or advanced reactor designs, nor do they assume that any future reprocessing operations could not address these considerations.

Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors, 2023, <https://doi.org/10.17226/26500>.

¹⁶ National Research Council, *Review of DOE's Nuclear Energy Research and Development Program*, Washington, DC, 2008, pp. 48-49.

¹⁷ *Transmutation* is a change in number of protons or neutrons in an atomic nucleus through nuclear reactions or nuclear decay.

¹⁸ M. C. Regalbuto, "Alternative Separation and Extraction: UREX+ Processes for Actinide and Targeted Fission Product Recovery," in *Advanced Separation Techniques for Nuclear Fuel Reprocessing and Radioactive Waste Treatment* (Woodhead Publishing, 2011).

¹⁹ World Nuclear Association, *Processing of Used Nuclear Fuel*, 2020, <https://world-nuclear.org/information-library/nuclear-fuel-cycle/fuel-recycling/processing-of-used-nuclear-fuel.aspx>.

²⁰ NASEM, *Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors*, 2023, <https://doi.org/10.17226/26500>.

²¹ See *ibid.*, p. 136.

U.S. Policy—History and Developments

U.S. policies that support commercial reprocessing have varied since reprocessing activities began for defense activities during World War II. Fissile materials were first produced by the U.S. government by enriching natural uranium to uranium-235 (Oak Ridge, TN) and reprocessing irradiated uranium fuel and separating out the plutonium (Hanford, WA) during World War II under the Manhattan Project.

In the Atomic Energy Act of 1946 (AEA), Congress defined “fissionable materials” to include plutonium, uranium-235, and other materials determined to be capable of releasing substantial quantities of energy through nuclear fission.²² Congress amended the AEA in 1954 to define “special nuclear material” to supplant “fissionable materials,” and included uranium-233, material determined to be special nuclear material, and any artificially enriched material.²³ Additionally, the AEA of 1954 authorized the Atomic Energy Commission (AEC) to license commercial nuclear reactors and eased restrictions on private companies using special nuclear materials. The U.S. government held the title to any special nuclear materials used or produced at a licensed U.S. facility.

Interest in commercial reprocessing of SNF began in the 1950s. In 1966, the AEC granted a commercial reprocessing permit to Nuclear Fuel Services for the West Valley facility, near Buffalo, NY. The facility operated until 1972 when it shut down for upgrades to meet stricter regulatory requirements and never operated again.²⁴ During operation, 2,500 cubic meters (m³) of HLW was produced, stored, and later vitrified.²⁵ During roughly the same time, other commercial reprocessing operations were proposed or partially constructed, but never operated.²⁶

Nonproliferation

The reprocessing of SNF results in at least the partial separation of plutonium, a key material in nuclear weapons. As a result, concern about nuclear weapons proliferation throughout the world is a major element in the debate over reprocessing policy. Light water nuclear reactors (LWRs)—the type of all commercial nuclear reactors operating in the United States—create plutonium during operation when uranium-238 absorbs neutrons and undergoes radioactive decay to become plutonium-239. Thus, SNF removed from a reactor includes various plutonium and uranium isotopes. This plutonium poses relatively low proliferation risk unless it is separated from fission products.²⁷ Once separated through reprocessing, the plutonium could be used to produce fuel for LWRs; fast neutron breeder reactors; or nuclear warheads, provided the availability of technical expertise and specialized facilities.²⁸ The 2023 NASEM study noted that “fuel cycles involving

²² P.L. 79-585.

²³ P.L. 83-703.

²⁴ Congressional Budget Office, *Nuclear Reprocessing and Proliferation: Alternative Approaches and their Implications for the Federal Budget*, May 1977.

²⁵ Qin-Hong Hu et al., “Sources of Anthropogenic Radionuclides in the Environment: A Review,” *Journal of Environmental Radioactivity* (2010).

²⁶ General Electric proposed a reprocessing plant at Morris, IL, and Allied-General Nuclear Services began construction at a facility in Barnwell, SC.

²⁷ National Academy of Sciences, *Management and Disposition of Excess Weapons Plutonium* (Washington, DC: The National Academies Press, 1994), <https://doi.org/10.17226/2345>. The report proposed a “Spent Fuel Standard” as a basis for comparing the risks to the fissile material “self-protected” in a spent fuel rod.

²⁸ U.S. Department of Energy (DOE), *Additional Information Concerning Underground Nuclear Weapon Test of Reactor-Grade Plutonium*, <https://www.osti.gov/opennet/forms?formurl=document/press/pc29.html>; DOE, (continued...)

reprocessing and separation of fissile material that could be weapons usable pose greater proliferation and terrorism risks than the once-through uranium fuel cycle with direct disposal of spent fuel, as the separated fissile material would not be uniformly mixed with highly radioactive fission products.”²⁹ International safeguards against diversion of plutonium and enriched uranium for weapons, as discussed below, can be a means of reducing proliferation risk.

Existing global stockpiles of plutonium and uranium, which are substantial, also pose a proliferation concern. According to the International Panel on Fissile Materials, as of December 31, 2022, the global stockpile of separated plutonium was 560 metric tons (MT), of which 140 MT was available for weapons.³⁰ The remaining 420 MT of plutonium stockpiles were characterized as not suitable for weapons, because they were produced outside of weapon programs, covered by obligations prohibiting the use in weapons, or not directly suitable for weapons.³¹ The largest stockpiles of plutonium available for weapons were generally in countries where reprocessing has occurred for defense or commercial purposes: Russia (88.0 MT), the United States (38.4 MT), the United Kingdom (3.2 MT), France (6.0 MT), and China (2.9 MT). Global stockpiles of highly enriched uranium (HEU) were 1,245 MT as of December 31, 2022, and mostly located in Russia (55%) and the United States (39%), with lesser amounts held in other countries.

These existing stockpiles of plutonium and HEU can be regarded as both an energy resource for nuclear power plant reactor fuel as well as a liability due to the storage costs and proliferation risk. A variety of domestic and international systems and institutions provide safeguards for these stockpiles.

The International Atomic Energy Agency (IAEA) was established in 1957 to ensure that civilian nuclear facilities and materials, such as those related to reprocessing, are not diverted for military uses.³² Safeguards are designed to enable the IAEA to detect the diversion of nuclear material from peaceful purposes to nuclear weapons uses.³³ Increasing the stockpiles of separated fissile materials through reprocessing would likely increase the requirements for IAEA technical staff

“Plutonium: The First 50 Years,” DOE/DP-0137, 1996; and Gregory S. Jones, “Reactor-Grade Plutonium and Nuclear Weapons: Ending the Debate,” *Nonproliferation Review*, vol. 26 (2019), pp. 1-2, 61-81, <https://doi.org/10.1080/10736700.2019.1603497>.

²⁹ NASEM, *Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors*, 2023, <https://doi.org/10.17226/26500>, p. 13.

³⁰ International Panel on Fissile Materials, *Fissile Material Stocks*, <https://fissilematerials.org/#:~:text=Fissile%20material%20stocks&text=The%20global%20stockpile%20of%20separated,not%20directly%20suitable%20for%20weapons>. Different countries have different criteria for determining what material are available for weapons.

³¹ See *ibid*.

³² The International Atomic Energy Agency (IAEA), an autonomous intergovernmental organization that has a relationship agreement with the United Nations, has 172 member states, including the United States. The agency’s missions include promoting nuclear power, nuclear safety, nuclear security, and nuclear technology for medical and agricultural purposes, as well as implementing safeguards agreements in more than 180 countries.

³³ IAEA safeguards are designed “to provide credible assurance to the international community that nuclear material and other specified items are not diverted from peaceful nuclear uses” (IAEA, *The Safeguards System of the International Atomic Energy Agency*). The Nuclear Nonproliferation Treaty (NPT) requires nonnuclear-weapon states parties to conclude comprehensive IAEA safeguards agreements. Such agreements apply safeguards “on all nuclear material in all nuclear activities in a State” (IAEA, *IAEA Safeguards Glossary 2001 Edition*, International Nuclear Verification Series No. 3). The NPT defines a *nuclear-weapon state* as “one which has manufactured and exploded a nuclear weapon or other nuclear explosive device” prior to January 1, 1967. These states are China, France, Russia, the United Kingdom, and the United States. All other countries are not nuclear weapon states. See also CRS Report R41910, *Nuclear Energy Cooperation with Foreign Countries: Issues for Congress*, by Paul K. Kerr, Mary Beth D. Nikitin, and Mark Holt.

and other resources to maintain these safeguards. The IAEA recognized in 2021 that it was addressing a “growing gap between demand and resources ... [with] increasing demands on the Agency for support.”³⁴

While domestic and international safeguards are intended to prevent the diversion of a sufficient quantity and quality of fissile materials to fabricate a nuclear explosive device, some have expressed concerns that these materials may be obtained by a politically unstable state or a terrorist organization—a well-financed organization with the ability to hire or recruit the necessary abilities to create a nuclear explosive device—if domestic reprocessing were to lack sufficiently high security measures. Furthermore, reprocessing plants would require a high level of security, with associated increased costs, to safeguard the materials stored at the facility.³⁵

Another long-standing concern has been the policy signal potentially sent to other countries if the United States resumes reprocessing. Any proposal to resume commercial reprocessing in the United States to make reactor fuel may raise concerns about an increase in global commerce in fissile material and undermine long-standing U.S. policy to discourage the development of reprocessing and enrichment capacity in nonnuclear-weapon states.³⁶

The use of plutonium-based fuel in nuclear power plants has been a recurring congressional issue. When Congress deliberated funding for the Global Nuclear Energy Partnership (GNEP) in 2008 (see “Reprocessing Policy History, In Brief” below), the House committee report accompanying the Energy and Water Development and Related Agencies Appropriations Act, 2008, expressed concern that too many GNEP partner countries wanted to be nuclear fuel suppliers (producing enriched uranium and plutonium fuel for domestic use and export) rather than recipients. According to the report,

At the recent DOE-sponsored international ministerial meeting on GNEP, the Administration abandoned any pretext that GNEP will promote international nuclear nonproliferation by relenting to partner demands that “partnership” countries can continue to produce weapons-usable plutonium in their reprocessing activities. The Committee is disappointed that the Administration would support any effort that leads to increased availability of plutonium anywhere in the world.³⁷

Reprocessing Policy History, In Brief

When the commercial nuclear power industry was under development in the 1950s and 1960s by the U.S. Atomic Energy Commission, it was widely expected that SNF from power reactors would be reprocessed to separate the remaining uranium and plutonium for new fuel. With up to 1,000 reactors expected to be built in the United States by the end of the 20th century, reprocessing was considered essential for making the maximum use of what were believed to be limited uranium resources. Early reactors were designed with relatively small spent fuel pools to hold discharged SNF until it could be shipped to a commercial reprocessing plant. However, India’s diversion of reprocessed plutonium from its nuclear power program to produce a nuclear explosive device in 1974 generated worldwide controversy about the future expansion of commercial reprocessing, including in the United States.

In 1976, President Ford announced that “the reprocessing and recycling of plutonium should not proceed unless there is sound reason to conclude that the world community can effectively overcome the associated risks of proliferation ... [and] that the United States should no longer regard reprocessing of used nuclear fuel to produce

³⁴ IAEA, *The Agency’s Programme and Budget 2022–2023*, GC(65)/(2), 2021.

³⁵ Mark Hibbs and Fred McGoldrick, “A Realistic and Effective Policy on Sensitive Nuclear Activities,” Carnegie Endowment for International Peace, 2013, <https://carnegieendowment.org/research/2013/10/a-realistic-and-effective-policy-on-sensitive-nuclear-activities?lang=en>.

³⁶ CRS Report RL34234, *Managing the Nuclear Fuel Cycle: Policy Implications of Expanding Global Access to Nuclear Power*, coordinated by Mary Beth D. Nikitin.

³⁷ U.S. Congress, House Committee on Appropriations, *Energy and Water Development Appropriations Bill, 2008*, committee print, 110th Cong., H.Rept. 110-185 (Washington: GPO, 2008), p. 67.

plutonium as a necessary and inevitable step in the nuclear fuel cycle, and that we should pursue reprocessing and recycling in the future only if they are found to be consistent with our international objectives.” The following year, President Carter announced a shift in policy: “We will defer indefinitely the commercial reprocessing and recycling of plutonium produced in the U.S. nuclear power programs.” In 1981, President Reagan announced that he “was lifting the indefinite ban which previous administrations placed on commercial reprocessing activities in the United States.” At the same time, however, federal funding for a commercial reprocessing plant in South Carolina was terminated, and the project was abandoned.

In 1992, President George H. W. Bush announced in a statement on nuclear nonproliferation,

I have set forth today a set of principles to guide our nonproliferation efforts in the years ahead and directed a number of steps to supplement our existing efforts. These steps include a decision not to produce plutonium and highly enriched uranium for nuclear explosive purposes and a number of proposals to strengthen international actions against those who contribute to the spread of weapons of mass destruction and the missiles that deliver them.

In 1993, President Clinton announced, “The United States does not encourage the civil use of plutonium and, accordingly, does not itself engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes. The United States, however, will maintain its existing commitments regarding the use of plutonium in civil nuclear programs in Western Europe and Japan.”

President George W. Bush in 2006 proposed to establish the Global Nuclear Energy Partnership (GNEP) with the goal of addressing issues of nuclear proliferation and nuclear waste. Through the GNEP, countries with nuclear fuel infrastructure, including the United States, would have supplied nuclear fuel and technologies to countries without nuclear power capabilities. In turn, the countries using nuclear power would agree to return the SNF, which would be reprocessed in the original country and be used as a source of fuel for reactors. In DOE’s description, this aspect of GNEP would be nonproliferative because participating countries would be forgoing their own enrichment and/or separations activities.

In 2009, President Obama ended work on the previous Administration’s programmatic environmental impact statement for GNEP. The program was transformed into the International Framework for Nuclear Energy Cooperation (IFNEC) under the Obama Administration and has continued as an international fuel cycle forum.

More recently, DOE continues to carry out reprocessing operations at various defense sites to manage SNF. For commercial nuclear power plants, however, the 2023 NASEM study recommended that “the current U.S. policy of using a once-through fuel cycle with the direct disposal of commercial spent nuclear fuel into a repository should continue for the foreseeable future,” but also that “DOE should develop and implement a phased, long-range research and development program that focuses on advanced separations and transmutations technologies.”

Sources:

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- National Academies of Sciences, Engineering, and Medicine, *Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors* (Washington, DC: The National Academies Press, 2023), p. 85.

Regulatory Framework

As discussed above, no commercial reprocessing facilities are currently operating in the United States. If such a facility were proposed, it would be required to obtain an NRC license under the Atomic Energy Act of 1954, as amended, and would need to adhere to any other applicable federal permitting requirements.³⁸ The NRC has only regulated a single operational commercial reprocessing facility, at West Valley, NY, which operated from 1966 to 1972. In June 2007, the NRC commissioners directed NRC staff to conduct a regulatory gap analysis and identify regulatory requirements necessary to license reprocessing facilities.³⁹ In 2013, NRC staff recommended a rulemaking for reprocessing facilities based on the findings of the gap analysis. The rulemaking activities were suspended in 2016 due to “budgetary constraints and an apparent lack of commercial interest in reprocessing.”⁴⁰ On July 28, 2021, NRC discontinued the rulemaking activity for spent fuel reprocessing “based on the estimated costs to conduct the rulemaking and the limited interest expressed or expected from industry to submit an application for any type of facility involving reprocessing technologies in the near-term.”⁴¹ NRC estimated the rulemaking would cost \$2.5 million to complete, and did not anticipate reviewing a license application for a reprocessing facility within 10-20 years. In the event that commercial reprocessing license applications are submitted to NRC prior to implementation of new reprocessing regulations, the NRC stated it would license those facilities under current regulations, typically used for licensing of nuclear reactors.⁴²

On December 29, 2022, Oklo Inc. contacted NRC to begin pre-application activities to seek a license for a commercial-scale spent fuel reprocessing facility.⁴³ Reportedly, Oklo is working with Argonne National Laboratory to develop electrorefining technology and to use spent fuel elements to produce new nuclear fuel.⁴⁴

Waste Management and Contaminant Remediation Issues

Reprocessing of SNF for defense and civilian uses in the past has resulted in extensive environmental contamination and waste management challenges, particularly the treatment and disposal of stored HLW. Thus, the management and disposal of wastes from future reprocessing would be an important consideration for the operation of these facilities. While reprocessing SNF would change the nature and composition of the nuclear waste, this option would raise multiple technical, legal, and policy considerations regarding the long-term management and disposal waste produced from reprocessing operations. Under current law, wastes produced from

³⁸ 42 U.S.C. §§2011 et seq.

³⁹ U.S. Nuclear Regulatory Commission, *Staff Requirements—SECY-07-0081—Regulatory Options for Licensing Facilities Associated with the Global Nuclear Energy Partnership (GNEP)*, ML071800084, 2007.

⁴⁰ Nuclear Energy Institute, *NEI Comments on Spent Fuel Reprocessing Rulemaking*, ML20154K554, 2020.

⁴¹ U.S. Nuclear Regulatory Commission, “Spent Fuel Reprocessing,” 86 *Federal Register* 40764, 2021.

⁴² See 10 C.F.R. Part 50 - “Domestic Licensing of Production and Utilization Facilities.”

⁴³ Oklo, *Oklo Inc. Licensing Project Plan: Fuel Recycling Technologies (Initial)*, 2022, <https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML22363A080>.

⁴⁴ Jeff Beattie, “Eight Months After NRC’s Rejection, Oklo Applies Again to License Microreactor,” *Nucleonics Week*, 2022, p. 3.

reprocessing would still require disposal in a permanent geologic repository at Yucca Mountain, NV. This section discusses the history of the environmental problems resulting from past reprocessing as well as technologies and regulations to reduce environmental risk at future reprocessing plants.

U.S. government reprocessing facilities during and following World War II generally operated prior to the establishment of regulatory requirements for nuclear waste management. Thus, the ongoing remediation and waste management operations at sites where reprocessing activities occurred in support of nuclear weapons production in the United States may not be analogous to potential impacts of future commercial reprocessing operations. Historical activities at many of these facilities resulted in the contamination of various soil, surface water, and groundwater. Much of the understanding of the potential environmental impacts from the production of HLW from reprocessing have stemmed from operational experiences at reprocessing facilities for U.S. nuclear weapons production during and after World War II. Generally, the DOE Office of Environmental Management (EM) is responsible for remediating these types of sites. The nature of contaminants, areas affected, environmental and ecological issues, and remedial actions vary widely at DOE-EM sites.⁴⁵ Many of these DOE-EM sites require environmental remediation activities that will remain ongoing for decades, and require long-term stewardship in perpetuity, currently undertaken by DOE's Office of Legacy Management, after the remedial activities are complete. State and federal regulations for future commercial reprocessing facilities, and the management of the associated wastes, would be required to prevent or minimize similar potential impacts.

DOE manages HLW resulting from reprocessing SNF, generally from the historical production of nuclear warheads. In the United States, some DOE-owned or -managed sites maintain HLW inventories from reprocessing SNF, as well as material shipped there from commercial power reactors in limited circumstances. In some instances, these DOE sites may store various types of HLW and SNF.⁴⁶ At these sites, DOE has vitrified some liquid HLW to be stored on-site until it can be permanently disposed of in a future geologic repository. At some DOE sites, such as Hanford, WA, and Savannah River Site, SC, considerable amounts of HLW remain in liquid form. According to the Government Accountability Office,

DOE oversees the treatment and disposal of about 54 million gallons of radioactive and hazardous waste at the Hanford Site in Washington State. Before treating the tank waste, DOE plans to separate it into two streams: (1) a high-activity portion, which DOE estimates will contain about 5 percent of the volume but more than 70 percent of the radioactivity; and (2) a low-activity portion, which will contain about 95 percent of the volume.⁴⁷

Additionally, the Nuclear Waste Technical Review Board estimates the volume of vitrified HLW to increase from 3,200 m³ to 26,300 m³ from 2012 to 2048.⁴⁸

⁴⁵ For examples, see F. W. Whicker et al., "Avoiding Destructive Remediation at DOE Sites," *Science*, vol. 303, no. 5664 (2004); Joana Burger et al., "Assessing Ecological Resources for Remediation and Future Land Uses on Contaminated Lands," *Environmental Management*, vol. 34 (2004); Mark J. Peterson, Rebecca A. Efromson, and S. Marshall Adams, "Long-Term Biological Monitoring of an Impaired Stream: Synthesis and Environmental Management Implications," *Environmental Management*, vol. 47 (2011); Joanna Burger et al., "Role of Uncertainties in Protecting Ecological Resources During Remediation and Restoration," *Journal of Toxicology and Environmental Health, Part A*, vol. 84, no. 12 (2021).

⁴⁶ CRS In Focus IF11201, *Nuclear Waste Storage Sites in the United States*, by Lance N. Larson.

⁴⁷ Government Accountability Office, *Hanford Cleanup: DOE Should Validate Its Analysis of High-Level Waste Treatment Alternatives*, GAO-23-106093, May 2023, <https://www.gao.gov/assets/gao-23-106093.pdf>.

⁴⁸ U.S. Nuclear Waste Technical Review Board, *Six Overarching Recommendations for How to Move the Nation's Nuclear Waste Management Program Forward: A Report to the U.S. Congress and the Secretary of Energy*, 2021.

The origin of radioactive waste, rather than its radiologic characteristics, often determines its classification and disposal requirements. The Nuclear Waste Policy Act (NWPA)⁴⁹ defines *SNF* as being “withdrawn from a nuclear reactor following irradiation”⁵⁰ and *HLW* as “highly radioactive material from reprocessing spent nuclear fuel.”⁵¹ Although they are quite different technically, both fall under the broader definition of “high-level radioactive waste.”⁵² SNF is sometimes referred to as “used” nuclear fuel.

The NWPA authorized DOE to site a geologic repository for the permanent disposal of SNF and HLW. Congress amended the NWPA in 1987 to designate Yucca Mountain as the only location to be considered by DOE to construct a national high-level nuclear waste repository. Political and legal opposition to the project has indefinitely delayed the licensing, construction, and operation of the proposed Yucca Mountain repository. NWPA authorized DOE to enter into agreements with nuclear utilities and other reactor owners to collect fees to pay for DOE’s disposal of the SNF. However, because DOE had not begun operating a permanent repository as required by NWPA, the federal government has paid roughly \$10.6 billion to nuclear utilities and other reactor owners pursuant to court settlements and final judgments as of September 30, 2023.⁵³ Under current law, without the availability of a long-term geologic repository or consolidated interim storage facility, all SNF and HLW will remain on-site at 80 facilities in the United States, which are predominantly commercial nuclear power plants and DOE facilities.⁵⁴

One of the main intended benefits of SNF reprocessing would be to decrease or eliminate the disposal of plutonium, uranium, and long-lived fission products in the SNF. Some research indicates that reprocessing SNF would decrease the surface footprint and volume required for a geologic repository, as well as reduce the overall radiotoxicity of certain waste forms intended for repository disposal.⁵⁵ The degree to which reprocessing could affect the total required HLW storage would depend on the types of reprocessing technologies employed and the waste characterizations. Nevertheless, studies have generally found that any fuel cycle concept would require some form of waste management in a geologic repository.

In the United States, wastes produced by commercial reprocessing would be regulated by NRC under the AEA. HLW produced from reprocessing may include a mix of radiological and chemical constituents. Depending upon the type of operation and the wastes produced, the facility may require permitting under other federal environmental laws, such as the Clean Air Act or the Clean Water Act. Discharges or emissions into the environment would also be subject to the terms of the NRC license and other federal permits, and the federal agency issuing the license or permit would be responsible for enforcing compliance with those requirements. The extent to which a release of constituents would affect the environment would depend on the nature of the

⁴⁹ P.L. 97-425.

⁵⁰ 42 U.S.C. §10101(23).

⁵¹ 42 U.S.C. §10101(12).

⁵² See 42 U.S.C. §10101(23), 10 C.F.R. §60.2, 10 C.F.R. §63.2, and 40 C.F.R. §197.2. Under 42 U.S.C. §10101(12):

The term “high-level radioactive waste” means—

(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.

⁵³ U.S. Department of Energy, *Agency Financial Report*, FY2023.

⁵⁴ CRS In Focus IF11201, *Nuclear Waste Storage Sites in the United States*, by Lance N. Larson.

⁵⁵ Robin Taylor et al., “A Review of Environmental and Economic Implications of Closing the Nuclear Fuel Cycle - Part One Wastes and Environmental Impacts,” *Energies*, vol. 15, no. 1433 (2022).

constituents, the duration of the release, the amount of the release, and the location of the incident, among other factors.

In addition to the potential benefits described above, some stakeholders contend another benefit of reprocessing may be the reduced need for uranium production and the associated environmental impacts. For example, the 2023 NASEM study found that the “main advantage” of SNF reprocessing and recycling of uranium and plutonium “is the conservation of uranium resources at the front end of the fuel cycle and the associated reduction in the environmental impact of uranium mining.”⁵⁶

Economics

Economic costs and benefits are an important consideration for private and public investments in commercial reprocessing. Currently operating U.S. nuclear power plants have faced economic challenges due to increasing competition from power plants using natural gas and renewable energy.⁵⁷ For commercial reprocessing to be economically viable, it would need to produce nuclear reactor fuel (made with reprocessed plutonium and/or uranium) at a price competitive with existing uranium fuel, or reduce nuclear plants’ waste management costs. Given the economic challenges already faced by some U.S. nuclear power plants and uncertainties regarding costs of reprocessing, government policy interventions may be necessary for commercial reprocessing to be economically viable.

In 2003, a Harvard University study concluded that reprocessing “will be more expensive than direct disposal of spent fuel until the uranium price reaches over \$360 per kilogram of uranium (kgU)⁵⁸—a price that is not likely to be seen for many decades, if then.”⁵⁹ Furthermore, that study argued that its findings may be conservative, as the study did not include other potential costs associated with reprocessing, such as costs for storage of separated plutonium or removal of americium, additional security, licensing and shutdown costs, and geologic disposal of spent mixed oxide (MOX) fuel.⁶⁰ The principal author of the study reiterated those findings in a 2021 presentation to the NASEM Committee on Advanced Reactors and Fuel Cycles, contending that a kilogram of plutonium fuel would cost six times as much as a kilogram of conventional uranium fuel.⁶¹

⁵⁶ See NASEM, *Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors*, 2023, <https://doi.org/10.17226/26500>, p. 158.

⁵⁷ Steve Clemmer et al., *The Nuclear Power Dilemma*, Union of Concerned Scientists, 2018, <https://www.ucsusa.org/sites/default/files/attach/2018/11/Nuclear-Power-Dilemma-full-report.pdf>.

⁵⁸ This amount would be approximately \$164 per pound. In comparison, the average uranium spot price for October 2024 was \$80.50 per pound. Cameco, Uranium Price, <https://www.cameco.com/invest/markets/uranium-price>.

⁵⁹ Matthew Bunn et al., *The Economics of Reprocessing vs. Direct Disposal of Spent Nuclear Fuel*, Harvard University, Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Final Report, 2003.

⁶⁰ For more information about MOX fuel use in the United States, see Oak Ridge National Laboratory, *The Use of MOX Fuel in the United States: Bibliography of Important Documents and Discussion of Key Issues*, ORNL/LTR - 2012/315, <https://info.ornl.gov/sites/publications/files/Pub38036.pdf>.

⁶¹ Matthew Bunn, “The Economics of Reprocessing and Recycling vs. Direct Disposal of Spent Nuclear Fuel,” presentation to the Committee on Advanced Reactors and Fuel Cycles of the National Academies of Sciences, Engineering, and Medicine, 2021.

Other researchers have reported costs of “closed cycles” are on average higher than “open cycles” by between less than 5% to 20%; however, they report there may be overlap in costs depending upon the various operation factors, assumptions, and uncertainties.⁶²

When Congress deliberated about funding GNEP in 2008, the House Appropriations Committee expressed concern regarding the life cycle costs of the program:

Embarking on a costly process leading to major new construction projects is unwise, particularly where there is no urgency, and the Department has failed to persuade the Committee of the critical need to proceed with GNEP now. In addition, before the Department can expect the Committee to support funding for a major new initiative, the Department must provide a complete and credible estimate of the life-cycle costs of the program [and] demonstrate that it can manage and control the costs of its ongoing projects.⁶³

The 2023 NASEM study reviewed previous studies of reprocessing economics and made the following observation:

Like all such studies, the specific methodologies vary, and there are many important assumptions made regarding the input data used to calculate costs, making cost comparisons challenging. A common conclusion reached across many cost and modeling studies is that, while spent fuel management represents a relatively small fraction of the total LCOE [levelized cost of electricity], differences in that area could result in large absolute costs depending on the size of the nuclear program and the duration of electricity generation.⁶⁴

A more positive assessment of reprocessing economics is provided by the French nuclear fuel services company Orano, which has operated a commercial reprocessing plant at La Hague, France, since 1966. According to Orano, its costs for SNF reprocessing per megawatt-hour of electricity generated have dropped 40% during the past 10 years. “The cost of used fuel recycling for French society represents less than 2% of the national electricity bill, or around €10 per year per household,” according to the company. “This amount is going down each year thanks to increased competitiveness made possible by efficient management of industrial facilities, use of innovative processes and technologies, and optimized use of fuel in reactors.” Orano further contends that the cost of reprocessing/recycling is “roughly equivalent” to that of the once-through fuel cycle.⁶⁵ The experiences of Orano may not represent those of potential reprocessing plants in the United States, due to differences in regulatory requirements among countries.

As this discussion indicates, the extent to which any reprocessing technology could be a viable, cost-effective alternative to current plans for storage and disposal of SNF would depend on a host of factors.

⁶² Robin Tayler et al., “A Review of Environmental and Economic Implications of Closing the Nuclear Fuel Cycle—Part Two: Economic Impacts,” *Energies*, vol. 15, no. 2472 (2022).

⁶³ U.S. Congress, House Committee on Appropriations, *Energy and Water Development Appropriations Bill, 2008*, committee print, 110th Cong., H.Rept. 110-185 (Washington: GPO, 2008), p. 68.

⁶⁴ See NASEM, *Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors*, 2023, <https://doi.org/10.17226/26500>, p. 130.

⁶⁵ Orano, “All About Used Fuel Processing and Recycling,” accessed January 7, 2025, <https://www.orano.group/en/unpacking-nuclear/all-about-used-fuel-processing-and-recycling>.

Congressional Action

Congress has enacted a variety of measures in recent years to develop advanced nuclear reactor technologies, including SNF reprocessing and recycling.⁶⁶ In the most recent example, President Biden signed the Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy (ADVANCE) Act on July 9, 2024 (Division B of P.L. 118-870), which includes a provision to reimburse NRC licensing fees paid by the first U.S. advanced reactor that uses recycled nuclear fuel. The Energy Act of 2020 (Division Z of P.L. 116-260) authorized \$60 million per year through FY2025 for DOE advanced fuel cycle research, development, demonstration, and commercial application activities, including “fuel recycling and transmutation technologies, including advanced reprocessing technologies.”

Congress appropriated \$322 million for all DOE fuel cycle research and development programs in FY2024, including about \$45 million for Material Recovery and Waste Form Development (MRWFD), which includes reprocessing technologies.⁶⁷ For FY2025, the House Appropriations Committee recommended in report language that DOE use at least \$10 million in the MRWFD program “to continue the Department’s competitive, cost-shared program for reprocessing spent nuclear fuel” with the goal of commercial application by 2033.⁶⁸

The Energy Act of 2020 also authorized \$2.14 billion through FY2025 for DOE’s Advanced Reactor Demonstration Program (ARDP), which includes fast neutron reactors that would be necessary for indefinite recycling of plutonium fuel. The Infrastructure Investment and Jobs Act (IIJA) authorized and appropriated \$2.477 billion for ARDP through FY2025, in addition to regular annual appropriations for the program. ARDP is currently funding up to 50% of the cost of two advanced reactor demonstrations in Wyoming and Texas.⁶⁹

Reprocessing is not currently being proposed in conjunction with the ARDP demonstration projects. If reprocessing were used to supply fuel for any of these or other commercial advanced reactor designs, the extent to which it would resolve issues discussed previously in this report would depend on a host of factors. As discussed above, these technologies would not eliminate the need to manage nuclear waste resulting from such operations.

Members of the House Energy and Commerce Committee’s Subcommittee on Energy, Climate, and Grid Security expressed interest in SNF recycling as a potential element of U.S. nuclear waste management policy during an April 10, 2024, hearing on “American Nuclear Energy Expansion: Spent Fuel Policy and Innovation.”⁷⁰ The Senate Energy and Natural Resources Committee held a hearing on the nuclear fuel cycle on March 9, 2023, that included discussions of reprocessing and recycling of advanced reactor fuels.⁷¹

⁶⁶ For example, see the Joint Explanatory Statement (Division C for H.R. 1865) accompanying the Further Consolidated Appropriations Act, 2020 (P.L. 116-94), and §40321 of the Infrastructure Investment and Jobs Act (P.L. 117-58), and §13105 of the Inflation Reduction Act (P.L. 117-169).

⁶⁷ Energy and Water Development and Related Agencies Act, 2024, P.L. 118-42, Division D. The exact amount for Material Recovery and Waste Form Development is not specified.

⁶⁸ House Committee on Appropriations, *Report to Accompany Energy and Water Development and Related Agencies Appropriations Act*, H.Rept. 118-580, 2025, p. 112.

⁶⁹ DOE Office of Clean Energy Demonstrations, “Advanced Reactor Demonstration Projects,” accessed July 11, 2024.

⁷⁰ U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy, Climate, and Grid Security, *American Nuclear Energy Expansion: Spent Fuel Policy and Innovation*, hearing, 118th Cong., April 10, 2024.

⁷¹ U.S. Congress, Senate Committee on Energy and Natural Resources, *Full Committee Hearing to Examine the Nuclear Fuel Cycle*, hearing, 118th Cong., March 9, 2023.

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Categorization of Used Nuclear Fuel Inventory in Support of a Comprehensive National Nuclear Fuel Cycle Strategy

December 2012

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Reactor and Nuclear Systems Division

**CATEGORIZATION OF USED NUCLEAR FUEL INVENTORY IN SUPPORT OF A
COMPREHENSIVE NATIONAL NUCLEAR FUEL CYCLE STRATEGY**

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ACRONYMS

AC	Allis Chalmers
ANF	Advanced Nuclear Fuels
APSRA	axial power shaping rod assembly
B&W	Babcock and Wilcox
BPRA	burnable poison rod assemblies
BWR	boiling water reactor
CE	Combustion Engineering
COL	Combined (construct and operate) license
DOE	Department of Energy
DOE-EM	Department of Energy, Office of Environmental Management
DOE-NE	Department of Energy, Office of Nuclear Energy
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
FCT	Fuel Cycle Technologies
GA	General Atomics
GE	General Electric
GNF	Global Nuclear Fuels
GWd	gigawatt-day
HEU	highly enriched uranium
INL	Idaho National Laboratory
ISFSI	independent spent fuel storage installations
LWR	light water reactor
MOX	mixed oxide
MTHM	metric ton of heavy metal
MTU	metric ton uranium
MWd	megawatt-day
NFS	Nuclear Fuel Services
NRC	Nuclear Regulatory Commission
NU	Northeast Utilities
NWTRB	Nuclear Waste Technical Review Board
PWR	pressurized water reactor
RCCA	rod control cluster assembly
R&D	research and development
RD&D	research, development, and demonstration
UFDC	Used Fuel Disposition Campaign
UNC	United Nuclear Corporation
UNF	used nuclear fuel
WE	Westinghouse Electric
wt %	weight percent

EXECUTIVE SUMMARY

The Department of Energy's Office of Fuel Cycle Technologies (FCT) in the Office of Nuclear Energy (DOE-NE) has conducted a technical review and assessment of the total current inventory [~70,150 MTHM (metric ton of heavy metal) as of 2011] of domestic discharged used nuclear fuel (UNF) and estimated that up to ~1700 MTHM of existing commercial UNF should be considered for retention to support research, development, and demonstration (RD&D) needs and national security interests. The 70,150 MTHM includes commercial (~67,600 MTHM), highly enriched uranium (HEU) (~50 MTHM), and DOE-owned (~2500 MTHM) UNF. The remainder, ~68,450 MTHM (both DOE-owned and commercial UNF) or ~98% of the total current inventory by mass, can proceed to permanent disposal without the need to ensure retrievability for reuse or research purposes. The assumptions used for this assessment are consistent with the DOE-NE R&D Roadmap;^{*} specifically, the time to complete the needed RD&D places commercial reprocessing availability no sooner than the 2030 time frame. This assessment does not assume any decision about future fuel cycle options or preclude any potential options, including those with potential recycling of commercial UNF, since the ~2000 MTHM that is generated annually could provide the feedstock needed for deployment of alternative fuel cycles; for example, by 2030 an additional ~40,000 MTHM of commercial UNF will have been generated.

The technical assessment considered discharged UNF from commercial nuclear electricity generation and defense and research programs and divided the current (as of 2011) UNF inventory into the following three categories:

1. Disposal – excess material that is not needed for other purposes;
2. Research – material needed for RD&D purposes to support waste management (e.g., UNF storage, transportation, and disposal) and development of alternative fuel cycles (e.g., separations and advanced fuels); and
3. Recycle/Recovery – material with inherent and/or strategic value.

As a result of consideration of RD&D needs within the DOE-NE programs, time frames in which recycle fuel cycles could be deployed, projections for electricity and nuclear growth, and possible uses to support national security interests, it is proposed that the vast majority of the total UNF inventory should be placed in the first category and permanently disposed, without the need to make fuel retrievable from disposal for reuse or research purposes. It is proposed that material in the latter two categories should be retained to support ongoing and planned RD&D needs and national security interests. The amount of material designated for retention includes a sufficient margin to provide assurance that future retrievability from disposal will not be necessary for reuse or research purposes.

Key tenets and assumptions used in this technical assessment include the following.

1. Access to some amount of UNF is needed to support RD&D for the DOE-NE FCT program objectives related to UNF management and alternative fuel cycles.
2. The two principal options for addressing UNF management are geologic disposal and recycling.
3. U.S. nuclear power plants will continue to discharge ~2000 MTHM annually for the next couple of decades; projections beyond the next couple of decades are less certain.

^{*}*Nuclear Energy Research and Development Roadmap*, Report to Congress, U.S. Department of Energy, Office of Nuclear Energy, Washington, DC, April 2010, http://www.ne.doe.gov/pdfFiles/NuclearEnergy_Roadmap_Final.pdf.

4. The option of recycling commercial UNF at a future date is maintained, pending a decision.
5. Although fuel recycling depends on future decisions, it is assumed that industrial-scale (100s to 1000s of MTHM/y) recycling of commercial UNF is unlikely to begin for at least 20 years (2030 time frame), at which time an additional ~40,000 MTHM of UNF will have been discharged.
6. Recycling in any potential future alternative fuel cycle would likely be designed and optimized for the material needs of the associated reactor fleet based on the current and projected UNF discharges and inventory at that time, rather than UNF feedstock that is no longer being produced.
7. The time frame for the development of alternative fuel cycles is assumed to be consistent with the schedule in the DOE-NE R&D Roadmap.
8. It is assumed that the transportation and placement of the current UNF inventory in disposal is unlikely to begin for at least 10 years and will take several decades.*

The current inventory of domestic UNF is massive, diverse, dispersed, and increasing. Approximately 67,600 MTHM of commercial UNF, representing a total of ~23 billion curies of long-lived radioactivity,[†] ~2500 MTHM of DOE-owned UNF, and ~50 MTHM of HEU UNF are currently stored at 79 sites in 34 states. The commercial UNF inventory is currently increasing annually by ~2000 MTHM[‡] and will increase at a greater rate in the future if nuclear power generation increases. Reactor and fuel designs, as well as reactor operating conditions, have evolved in the United States since the first commercial development of nuclear power, resulting in considerable variation in the characteristics (e.g., fuel assembly and cladding materials, initial enrichment, discharge burnup, and irradiation exposure conditions) of the current UNF inventory. These variations may raise issues with aspects of nuclear fuel management, for example, demonstrating compliance with storage, transportation, and disposal regulatory criteria for all the variations present in the current UNF inventory.

The technical assessment of the domestic UNF inventory included a set of attributes relative to permanent geologic disposal, UNF research needs, deployment of alternative fuel cycles, and national security materials strategy and then used the attributes to categorize the current UNF inventory. Attributes considered include isotopic compositions (e.g., fissile and non-fissile content), physical and material characteristics that impact recycling and/or disposal facility design and operations (e.g., accessibility of material, diversity of material, condition of material, and material hazards), national security materials strategy, and current and projected RD&D needs to support UNF management and alternative fuel cycle development. Consideration was given to the fact that since the United States is generating ~2000 MTHM annually, disposal of the majority of the current commercial UNF does not preclude the option of recycling commercial UNF at a future date. For example, assuming the current discharge rate remains constant, if the United States built and began operation of an industrial-scale reprocessing facility with annual capacity of up to 2000 MTHM by 2030 that used 5-year-cooled fuel, a portion of the discharged UNF would not need to be retained to support this facility until 2025.

**Spent Nuclear Fuel: Accumulating Quantities at Commercial Reactors Present Storage and Other Challenges*, GAO-12-797, U.S. Government Accountability Office, August 2012.

[†]J. T. Carter, A. J. Luptak, and J. Gastelum, *Fuel Cycle Potential Waste Inventory for Disposition*, FCR&D-USED-2010-000031 REV 5, U.S. Department of Energy, July 2012.

[‡]*Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned*, GAO-11-229, U.S. Government Accountability Office, April 2011.

An example projection of the identified material for disposal and retention (research and recycle) on a per-decade basis is provided in Figure ES-1. This figure shows the total current UNF inventory in 2011 and designates all but ~1700 MTHM for disposal. For UNF generated in subsequent decades, the figure identifies the material for disposal and retention assuming a constant discharge rate of 2000 MTHM/y and a recycling strategy implemented by 2030. Note that UNF is systematically retained for RD&D purposes prior to 2025, after which the UNF is retained principally for recycling. This example is just one possible scenario and is only provided to illustrate the point that disposal of the current UNF inventory will not adversely impact deployment of an alternative fuel cycle in the future, even for a recycle fuel cycle.

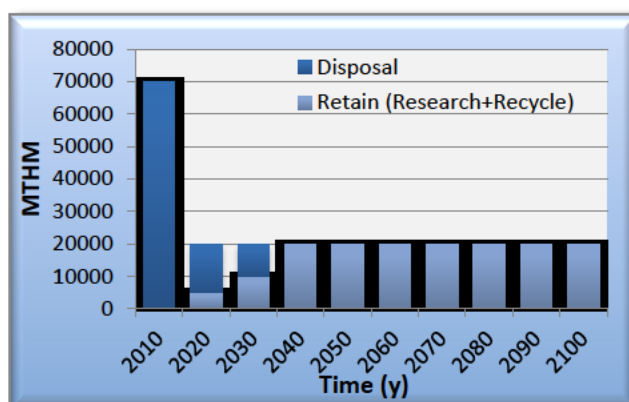


Figure ES-1. Categorization of UNF assuming current discharge rate and recycling beginning in 2030.

Based on the technical assessment, ~68,450 MTHM or ~98% of the total current inventory by mass, can proceed to permanent disposal without the need to ensure retrievability for reuse or research purposes.

Execution of the DOE-NE's Office of FCT mission* requires immediate and continued access to select UNF material for research purposes. Access to this material is needed to support the development of the safety basis for extended storage of commercial UNF and transportation following extended storage periods (e.g., commercial UNF with varying cladding materials and exposure conditions may be needed to address long term fuel integrity) and disposal (e.g., a range of uranium oxide fuel may be needed to demonstrate how UNF degrades in various environments). Additionally, access to material is needed for RD&D to support development of potential future alternative fuel cycles. As recommended by the Blue Ribbon Commission on America's Nuclear Future,[†] fuel cycle R&D activities are critical to maintaining "Active U.S. leadership in international efforts to address safety, waste management, non-proliferation, and security concerns."

HEU UNF may be useful to support national security missions and represents a small fraction of the current UNF inventory (up to ~50 MTHM). This material represents U.S.-origin enriched uranium that is not subject to international consent agreements. For example, it could be used to offset the need for a dedicated enrichment plant to support national security missions. Given the special nature of this material, it is recommended that a study be conducted to evaluate the benefits of recovering this material.

In conclusion, an assessment of the UNF inventory and the RD&D needs has estimated that access to ~1700 MTHM of the existing commercial UNF inventory should be retained to support the DOE-NE FCT mission. The quantity was determined based on projected RD&D needs and practical considerations for access to a sufficient quantity of representative samples of the diverse commercial UNF inventory to

*"to develop used nuclear fuel management strategies and technologies to support meeting federal government responsibility to manage and dispose of the nation's commercial used nuclear fuel and high-level waste; develop sustainable fuel cycle technologies and options that improve resource utilization and energy generation, and reduce waste generation, enhance safety, and limit proliferation risk."

[†]Blue Ribbon Commission on America's Nuclear Future, *Report to the Secretary of Energy*, January 2012, http://brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf.

support UNF storage, transportation, and disposal; access to high-burnup UNF representative of future discharges in quantities sufficient to support fuel cycle technology development; and a sufficient margin to provide assurance that future retrievability from disposal will not be necessary. The main conclusion of this assessment is not the specific amounts or specific assemblies for retention and disposal but rather that access to some small fraction of the existing UNF should be retained, while the remainder can proceed to disposal without the need to ensure retrievability for reuse or research purposes. Because a repository is not anticipated to be available for more than a decade, time is available to refine, if needed, the specific amounts and select specific assemblies as the RD&D programs proceed and the associated UNF material needs are better defined.

Finally, note that categorization of UNF for disposal does not require a determination that it has no value. In principle, all irradiated fuel has some potential value as an energy source. The determination instead supports a comprehensive national fuel cycle strategy.

ACKNOWLEDGMENTS

This work was supported by the Department of Energy Office of Nuclear Energy's (DOE-NE) Office of Fuel Cycle Technologies (FCT). The authors gratefully acknowledge the initiation of this study by Monica Regalbuto and the subsequent guidance and review throughout the performance of this work by Monica Regalbuto, John Herczeg, Jeff Williams, and Pete Lyons of DOE-NE. The authors also gratefully acknowledge the thoughtful reviews of the draft report by Robert Howard and Cecil Parks of Oak Ridge National Laboratory, Burton Richter of Stanford Linear Accelerator Center, Everett L. Redmond II of the Nuclear Energy Institute, Andrew Sowder of the Electric Power Research Institute, and the U.S. Nuclear Waste Technical Review Board. Finally, the authors are grateful to Debbie Weaver for document preparation and formatting and Debbie Stevens for editorial review of this report.

September 15, 2026

The Honorable Bob Latta
Chairman
Subcommittee on Energy
Committee on Energy and Commerce
House of Representatives
2125 Rayburn House Office Building
Washington, DC 20515

The Honorable Kathy Castor
Ranking Member
Subcommittee on Energy
Committee on Energy and Commerce
House of Representatives
2323 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Latta and Ranking Member Castor:

In light of the Subcommittee's September 15 hearing, Nuclear Spent Fuel Policy: Examining Nuclear Lifecycle Innovation Campuses, attached please find Western Governors' Association (WGA) policy resolutions 2025-01, Energy in the West, and 2025-07, Radioactive Materials Management.

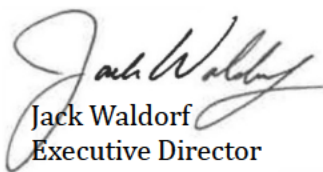
Western Governors recognize the important role of nuclear energy in meeting growing demand and enabling more reliable, affordable, and abundant energy. As Congress and the Department of Energy develop Nuclear Lifecycle Innovation Campuses and consider durable nuclear waste disposal strategies, Governors emphasize that these strategies should be developed in close coordination with states and should appropriately consider state involvement, expertise, and consent in nuclear fuel cycle activities. The Governors affirm that "no consolidated facility for nuclear waste, whether interim or permanent, or privately or federally owned and operated, shall be located within the geographic boundaries of a western state or U.S. territory without the written consent of the current Governor in whose state or territory the facility is to be located."

Addressing the full nuclear fuel cycle, including fuel production, enrichment, reprocessing, storage, and final disposition of used nuclear fuel is critical to enabling the continued development of nuclear energy. Western Governors further outline their bipartisan recommendations to develop and deploy nuclear energy and bolster the domestic nuclear fuel cycle in the 2026 initiative report, *Energy Superabundance: Unlocking Prosperity in the West*, which serves as the culmination of a year-long stakeholder engagement process led by former WGA Chair, Utah Governor Spencer Cox.

I request that this document be included in the permanent record of the hearing, as it articulates Western Governors' collective and bipartisan policy positions and recommendations on this important issue.

Thank you for your consideration of this request. Please contact me if you have any questions or require further information.

Sincerely,



Jack Waldorf
Executive Director

Attachments



Policy Resolution 2025-01

Energy in the West

A. **BACKGROUND**

Western energy production, and its related delivery, are indispensable to meeting our nation's energy demands, and the energy sector is a significant contributor to the economic success of many western communities. Electricity generation and delivery systems are undergoing rapid, significant change across the West. The increasing effects of extreme weather events, the integration of clean energy and distributed energy resources, rapidly increasing demand from data centers and new technologies, the electrification of vehicles and buildings, and the retirement of traditional energy generating assets are all contributing to fundamental shifts in the electricity sector. Ensuring the reliability of energy generation and delivery systems is a priority of every Western Governor.

Western Governors recognize that approaches to energy use and development vary among our states and territories. The West has the vast majority of high-quality energy resources in the United States, including geothermal energy capacity, wind and solar power resources, the majority of oil and natural gas, coal, hydropower, and non-federal United States petroleum. Further, the West has the largest contiguous areas of high-yield biomass energy resource potential, is uniquely situated to produce low carbon intensity, clean hydrogen, and leads the nation in domestic uranium production and advanced nuclear reactor technology development. The presence of federal lands affects energy projects and infrastructure deployment across the West. Planning, permitting, and siting energy generating assets and transmission and pipeline infrastructure requires close coordination between states, private developers, utilities, and federal agencies to create an effective state-federal partnership in energy development, land management, and environmental protection.

B. **GOVERNORS' POLICY STATEMENT**

Governors' Energy Priorities

1. Western Governors recognize the following as energy policy priorities for the West:
 - a. Secure the United States' energy supply and delivery systems, and safeguard against both physical and cybersecurity risks.
 - b. Ensure energy is clean, affordable, equitable, and reliable by providing a balanced portfolio of resources.
 - c. Increase energy efficiency associated with electricity, natural gas, and other energy sources and uses to enhance energy affordability and to effectively meet environmental goals.
 - d. Advance efficient environmental review, siting, and permitting processes that facilitate clean energy development and the improvement and construction of necessary energy infrastructure, while ensuring environmental and natural resource protection.

- e. Improve the United States' electric grid's reliability and resilience.
- f. Protect western wildlife, natural resources, and the environment, including clean air and clean water, and reduce greenhouse gas emissions.
- g. Make the West a leader in energy education, technology development, research, and innovation.
- h. Utilize an all-of-the-above approach to energy development and use in the West, while protecting the environment, wildlife, and natural resources, and reducing emissions.

Grid Modernization and Resilience

- 2. A robust, resilient, and well-maintained energy delivery system is vital to the economy and quality of life in the West. Grid infrastructure in the West faces potential disruptions due to natural disasters, particularly wildfires and extreme heat events, as well as a growing cyber threat landscape. Increased grid threats due to wildfires and extreme weather events highlight the need to develop and use energy systems that are both reliable and resilient to climate change. Upgrades to transmission and distribution infrastructure, including information technology systems, are needed to properly address these risk factors, as well as anticipated increased electricity demand. Coordination between electricity providers and states in energy markets can lead to cost-effective energy for ratepayers and leverage regional resources.
- 3. Transmission infrastructure in western states often crosses one or multiple federal lands jurisdictions. In these situations, close coordination between states, utilities, and federal agencies is needed to ensure that projects are planned, permitted, and sited in a timely, efficient manner. Western Governors encourage federal agencies to streamline project-permitting reviews to minimize timelines without compromising environmental and natural resource protection or states' roles in those processes.
- 4. Western Governors encourage Congress to provide federal agencies, particularly the Bureau of Land Management (BLM), the Environmental Protection Agency, the Department of Energy (DOE), the Federal Energy Regulatory Commission, the U.S. Forest Service (USFS), the Bureau of Ocean Energy Management, and the U.S. Fish and Wildlife Service with additional support to enhance staff and resource capacity to conduct environmental review and permitting activities associated with transmission infrastructure.
- 5. Western Governors recommend federal agencies leverage designated West-wide Energy Corridors to support the effective and efficient permitting and siting of energy infrastructure assets. Where applicable, Western Governors encourage BLM and USFS to integrate designated corridor specifications into local land use plans.
- 6. Western Governors believe clear, coordinated, and consistent wildfire mitigation strategies, including application of federal vegetation management practices, is integral to maintaining the health of western forests, preventing dangerous and damaging wildfires, and maintaining grid reliability. The Governors support effective and efficient cross-jurisdictional coordination that enables vegetation management for federal transmission and distribution rights-of-way.

Innovation and Technology

7. Western Governors encourage innovation and application of short- and long-duration energy storage, including battery, hydrogen, pumped hydropower, geothermal, and compressed air technologies, where cost-effective. Western Governors also support reconsideration of federal definitions of short- and long-term energy storage with an eye toward incentivizing progressively longer storage capacity.
8. The potential for geothermal energy in the West is vast and brings many benefits, from baseload energy generation to heating and cooling efficiencies. The Heat Beneath Our Feet Chair initiative report is a roadmap for accelerating the development and deployment of geothermal technologies. Western Governors incorporate the recommendations identified in the Heat Beneath Our Feet Chair initiative report into this resolution by reference.
9. Western states are leading the development and deployment of decarbonization technologies and strategies, including carbon capture, utilization, and storage, engineered carbon dioxide (CO₂) removal, and natural sequestration. The Decarbonizing the West Chair initiative report contains recommendations to advance these technologies and strategies to position western states at the forefront of innovation and reduce CO₂ in the atmosphere. Western Governors incorporate the recommendations identified in the Decarbonizing the West Chair initiative report into this resolution by reference.
10. Western Governors are committed to considering advanced and small modular reactors as a reliable and emission-free energy resource.
11. Western Governors are committed to developing regional hydrogen hubs to spur economic development and add more clean energy sources to the region's resource mix.
12. The developing floating offshore wind industry presents a strong economic and sustainable energy generation opportunity for the West. Western states can work collectively, and in consultation with tribal governments and in coordination with stakeholders, to address workforce, economic, infrastructure, social, environmental, and manufacturing challenges associated with offshore wind planning, siting, and deployment.
13. Western Governors commend efforts by the United States Geological Survey and state geological surveys to identify potential critical minerals deposits for alternative energy technologies and other consumer products vital to modern society.
14. Governors also support development of emerging tools and technologies that address barriers to mineral supply chain reliability, including technologies that help recycle or reuse existing critical mineral resources for use in clean energy technologies.
15. Western Governors are committed to leveraging the vast expertise in the West's industry, academic institutions, and national laboratories to make the region an international hub for new energy technology research and development, and energy education.
16. Western Governors encourage Congress and DOE to support and fund research, development, demonstration, and deployment of advanced energy technologies.

17. Western Governors support the creation of public-private research and development partnerships among industry, academia, the national laboratories, and federal agencies to identify promising new technologies, including energy efficiency technologies that advance clean energy with reduced environmental impacts.

Economic and Workforce Development

18. Western Governors and states are committed to encouraging training and education in energy-related fields and ensuring there is an adequate workforce operating under the highest safety standards.
19. Many western states and communities have been affected by localized job losses due to changes in the energy sector and the closure of coal power plants. Western Governors and states are working diligently to facilitate the creation of employment opportunities for displaced energy sector workers.
20. Western Governors offer their support for the U.S. Department of Agriculture (USDA) Rural Energy for America program, which has benefited farmers, ranchers, and rural businesses that are often underserved by other federal energy efforts.
21. Western Governors support funding and long-term authorization for the State Energy Program (SEP), Weatherization Assistance Program (WAP), and Low-Income Home Energy Assistance Program (LIHEAP).
22. Western Governors support legislative measures that promote flexibility for rural electric cooperatives to refinance or adjust loans secured through the USDA Rural Utilities Service.
23. Western Governors support increasing the development and use of energy storage and low- and zero-emissions vehicles and associated infrastructure. WGA's Electric Vehicles Roadmap initiative report provides valuable insights on strategies to effectively integrate electric vehicle charging equipment with local grid infrastructure.
24. Western Governors call on the federal government to lift a barrier to domestic free trade between the contiguous United States and the noncontiguous states and territories in the Merchant Marine Act of 1920 by allowing those jurisdictions to receive energy commodities produced on the mainland but transported by foreign vessels, should those jurisdictions, and the jurisdictions whose ports are being used to ship these materials, desire it.
25. Redundant federal regulation of energy development, transport, and use is not required where sufficient state or territorial regulations exist. Existing state authority should not be replaced or impeded by Congress or federal agencies. Where additional regulations are necessary, federal agencies should consult and coordinate with states, territories, and tribes to ensure collaboration and understanding of unique circumstances within individual states, territories, and tribal nations.

C. GOVERNORS' MANAGEMENT DIRECTIVE

1. The Governors direct WGA staff to work with congressional committees of jurisdiction, the Executive Branch, and other entities, where appropriate, to achieve the objectives of this resolution.

2. Furthermore, the Governors direct WGA staff to consult with the Staff Advisory Council regarding its efforts to realize the objectives of this resolution and to keep the Governors apprised of its progress in this regard.

This resolution will expire in December 2027. Western Governors enact new policy resolutions and amend existing resolutions on a semiannual basis. Please consult <http://www.westgov.org/resolutions> for the most current copy of a resolution and a list of all current WGA policy resolutions.



Policy Resolution 2025-07

Radioactive Materials Management

A. **BACKGROUND**

Western states have a vested interest in the safe management of radioactive materials, from mining and milling of uranium ore, to the production and use of radioactive materials for commercial and national defense purposes, to the transportation, storage and disposal of radioactive materials and waste. Large amounts of high-level radioactive waste (HLW) have been, and will continue to be, transported through western states, both as a result of environmental cleanup of federal sites involved in the development and manufacture of nuclear weapons and for storage or disposal of spent nuclear fuel (SNF) used for research or to generate electricity.

The Waste Isolation Pilot Plant (WIPP) located in New Mexico was constructed to serve as a permanent repository for defense-related transuranic (TRU) waste. WIPP received its first truck shipment of TRU waste in 1999. Since then, the WIPP shipping campaign has consistently demonstrated the safe transportation of TRU waste. The success of the WIPP TRU waste transportation campaign is directly attributable to the collaborative partnership and planning effort between the Department of Energy (DOE) and western states to develop and implement the WIPP Transportation Safety Program.

B. **GOVERNORS' POLICY STATEMENT**

1. Western Governors believe that safe and event-free transport must be paramount in all federal policies regarding transportation of radioactive materials and SNF. This is true of all transportation modes, including truck and railway. The Governors support existing federal radioactive waste transport safety requirements designed to protect public health and safety, including the Hazardous Materials Transportation Authorization Act. Early coordination and effective communication with state, tribal, and local governments are essential to the ultimate success of any nuclear waste transportation safety program.
2. The WIPP Transportation Safety Program Implementation Guide is an excellent model for transportation planning, and a similar guide should be used as a base document for DOE transportation programs including shipments of SNF, or HLW, to any storage and/or disposal facility.
3. If DOE decides to transport radioactive waste – such as SNF, HLW or TRU – by rail, federal agencies should work with states to design and implement such a transportation system. The rail industry should fully cooperate in this process and commit to implementing best practices for such a transportation system. Congress should provide a firm legal basis for transportation system design and implementation.
4. Trains transporting SNF and HLW should be inspected by fully qualified inspectors, using a consistent approach which has been developed cooperatively with the help of western states. To the extent practical, the inspection protocol should be commensurate with the

Commercial Vehicle Safety Alliance Level VI inspection program, which has been successfully used by all highway shipments to WIPP.

5. The Federal Railroad Administration Rail Safety Program and revised Safety Compliance Oversight Plan should be fully implemented along any route affected by prospective SNF or HLW shipments in any western state. Five years prior to the start of such shipments, each affected western state should receive financial and technical support from DOE to ensure sufficient trained state rail safety inspectors.
6. The WIPP Transportation Safety Program is essential to the expeditious cleanup and disposal of TRU waste from the U.S. nuclear weapons complex and the operation of WIPP. Western Governors expect DOE to fulfill commitments made by the Secretary of Energy as set forth in Memorandums of Agreement with WGA signed in 1995, 2003 and 2009. DOE must continue to provide sufficient and timely in-kind, financial, technical, and other appropriate assistance to any state or Indian tribe through whose jurisdiction TRU waste will be transported for the purpose of planning, developing, and implementing the WIPP Transportation Safety Program. The Governors also expect DOE to follow the safety standards, principles and procedures as contained in the WIPP Transportation Safety Program Implementation Guide, as amended, for the transport of all TRU waste, whether to WIPP or to an interim site for storage, characterization, and/or repackaging.
7. DOE must continue to comply with both the letter and spirit of all applicable requirements specified in the WIPP Land Withdrawal Act (Pub. L. 102-579, as amended by Pub. L. 104-201, 106 Stat. 4777 et seq.), especially regarding transportation safety, emergency preparedness and accident prevention. Further, the Governors support resumption of the economic assistance payments authorized in Section 15 of the Act.
8. The Governors believe it is the responsibility of the generators of SNF and HLW and the federal government, not the states and tribes, to pay for all costs associated with assuring safe transportation, responding effectively to accidents and emergencies that may occur, and otherwise assuring public health and safety. This includes costs associated with route evaluations and inspecting and escorting shipments. In addition, funding allocations to states and tribes should be made on a needs-based rather than formula-based system.
9. In any radiological materials/waste shipping campaign, including SNF or HLW, no federal agency or other entity should have the authority to privatize or delegate to a contractor any key transportation responsibilities unless approved by the states. Such responsibilities include but are not limited to: interacting with states, tribes, and affected units of local government; selection of transportation modes, routes, and casks; preparation of an environmental impact statement that addresses transportation issues; preparation of transportation plans in concurrence with states and tribes; and decisions regarding the provision of technical assistance and funding to the states in preparation for shipments.
10. Although DOE has the authority to self-regulate its shipments of SNF and HLW, the Governors believe DOE should adopt the U.S. Nuclear Regulatory Commission (NRC) physical protection requirements for all such shipments. NRC regulations establish a comprehensive physical protection system designed both to minimize the potential for theft, diversion, or radiological sabotage of such shipments, and to facilitate the location and recovery of such shipments that may have come under the control of unauthorized persons.

11. DOE should invoke provisions of its Standard Contract with nuclear utilities to prioritize shut-down nuclear reactors over operating reactors in terms of shipment priority. In addition, DOE should adopt a policy of shipping “oldest fuel first,” so as to reduce the radiological risk during transportation.
12. The Governors strongly encourage DOE, NRC, the Department of Transportation (DOT), and the Environmental Protection Agency, to work cooperatively with the states and tribal governments in implementing a policy to ensure the safe management, transportation, storage, and disposal of SNF and HLW and to comply with any and all agreements negotiated and entered into by a state’s Governor and all applicable state laws regarding these matters.
13. No consolidated facility for nuclear waste, whether interim or permanent, or privately or federally owned and operated, shall be located within the geographic boundaries of a western state or U.S. territory without the written consent of the current Governor in whose state or territory the facility is to be located. Specifically, the federal government should develop a consent process for consolidated nuclear waste storage or disposal facilities, whether publicly or privately owned, that explicitly includes states in the siting and licensing process.
14. Any proposal to store or otherwise dispose of HLW and/or SNF must be viewed as being part of an integrated program that considers all aspects of necessary operation and intergovernmental considerations. Specifically, states, localities, and tribes should be consulted about transportation and logistical considerations such as proximity to population centers, tribal lands, or military installations along transportation routes or near proposed sites prior to initiating such a project. Further, states, localities, and tribes that could be directly and materially affected by the transport to, storage in, or disposal at a particular facility must be consulted in the decision-making process, regardless of whether the transportation routes or sites are located within their geographic boundaries.
15. Commercial SNF should remain at reactor sites until:
 - One or more storage and/or disposal sites or reprocessing facilities are fully operational with appropriate permits and financial assurance as required by the state.
 - DOE and the nuclear utility companies have consulted with states along the waste transportation corridor and implemented a mutually acceptable transportation plan for shipping the SNF waste to interim storage facilities or permanent disposal sites.
 - DOE and the nuclear utility companies have put into place adequate infrastructure capacity to handle, store and dispose of this waste.
 - DOE, DOT, and the nuclear utility companies have ensured and funded adequate state and local emergency and medical responder training and resources in case of an accident or terrorist attack while shipping this waste.
16. The creation of interim storage sites for SNF would be a direct result of the federal government’s failure to begin accepting spent fuel on schedule. Therefore, the Governors maintain that it is the federal government’s responsibility to ensure adequate preparation for shipments to these facilities, coordination with states, and provision of adequate federal

funding, to reimburse the states for costs associated with shipments to any interim storage facility, whether publicly or privately owned and operated. The Governors consider it to be entirely appropriate to use the Nuclear Waste Fund to pay for these activities.

C. GOVERNORS' MANAGEMENT DIRECTIVE

1. The Governors direct WGA staff to work with Congressional committees of jurisdiction, the Executive Branch, and other entities, where appropriate, to achieve the objectives of this resolution.
2. Furthermore, the Governors direct WGA staff to consult with the Staff Advisory Council regarding its efforts to realize the objectives of this resolution and to keep the Governors apprised of its progress in this regard.

This resolution will expire in June 2028. Western Governors enact new policy resolutions and amend existing resolutions on a semiannual basis. Please consult <http://www.westgov.org/resolutions> for the most current copy of a resolution and a list of all current WGA policy resolutions.

DEPARTMENT OF ENERGY

Request for Information on Establishment of Nuclear Lifecycle Innovation Campuses

AGENCY: Department of Energy.

ACTION: Request for information (RFI).

SUMMARY: The United States is undertaking an initiative to reestablish global leadership in nuclear energy, guided by Executive Orders signed on May 23, 2025. The U.S. Department of Energy (DOE, or Department) seeks input from states interested in hosting potential Nuclear Lifecycle Innovation Campuses to anchor integrated, full-cycle nuclear ecosystems that could co-locate and support the entire nuclear value chain while exploring durable pathways for managing used nuclear materials in a safe, secure, and fiscally responsible manner. These campuses must support functions such as fuel fabrication, enrichment, reprocessing used nuclear fuel, and disposition of waste, and could additionally support functions such as advanced reactor deployment, power generation, advanced manufacturing, and co-located data centers, through integrated, forward-looking solutions, consistent with national safety, security, stewardship, long-term and fiscal responsibility goals.

States are invited to indicate their interest and provide constructive feedback on the structure of the Innovation Campuses by submitting a clear articulation of their strategic priorities-- such as workforce development, infrastructure investment, economic diversification, or technology leadership-- along with their proposed appropriate scope of the Innovation Campuses and the specific funding structures, risk-sharing approaches, and other support, incentives, or federal partnerships they would require to successfully host and sustain an Innovation Campus. DOE seeks information on approaches that (1) prioritize private and state capital; (2) rely on targeted, conditional, and time-limited federal support, subject to the availability of appropriations and statutory authority; and (3) include robust financial assurances to protect federal taxpayers from open-ended liabilities. DOE envisions significant workforce development, environmental safeguards, and proliferation-resistant operations. This initiative has the potential to generate significant benefits, improve energy security and enhance international nuclear leadership.

DATES: Responses to the RFI are requested no later than April 1, 2026. States are strongly encouraged to respond as soon as possible, as submissions will be reviewed on a rolling basis.

ADDRESSES: Responses should be submitted electronically to nlic-rfi@nuclear.energy.gov and include “Nuclear Lifecycle Innovation Campus RFI Response” in the subject line of the email. Any information that may be business proprietary and exempt by law from public disclosure should be submitted as described in Section VI of this document.

FOR FURTHER INFORMATION CONTACT: Questions may be addressed to Bryan Kellogg, Deputy Assistant Secretary for Intergovernmental Affairs, through Bryan.Kellogg@hq.doe.gov or by phone at (240) 997-7773.

SUPPLEMENTARY INFORMATION:

I. Background

The United States is exploring the concept of a private sector led initiative to establish comprehensive Nuclear Lifecycle Innovation Campuses (Innovation Campuses). This initiative directly aligns with the Executive Orders signed on May 23, 2025- Reinvigorating the Nuclear Industrial Base (14302), Deploying Advanced Nuclear Reactor Technologies for National Security (14299), Ordering the Reform of the Nuclear Regulatory Commission (14300), and Reforming Nuclear Reactor Testing at the Department of Energy (14301). Collectively, these Executive Orders underscore the urgent national imperative to secure economic resilience, energy independence, national defense, and technological leadership. The creation of modern, secure, sustainable, and fully integrated nuclear campuses could play an important role in this effort.

For more than seventy years, DOE and its National Laboratories have been at the forefront of nuclear science and technology, driving innovation in advanced reactor designs, advanced manufacturing, accident-tolerant fuels, proliferation-resistant fuel cycles, and sustainable waste management solutions. This legacy of leadership makes DOE an ideal partner for federal-state collaborations to develop integrated Innovation Campuses that would serve as a model for innovation, safety, and economic growth. The envisioned Innovation Campuses would focus primarily on fuel fabrication, enrichment, used nuclear material reprocessing or recycling, advanced separations, and the management of waste streams, but could also fully integrate, and to the extent possible, co-locate the entire nuclear value chain. This integration could span research and development (R&D), uranium mining and milling, conversion, deconversion, advanced reactor deployment, advanced manufacturing, and data center construction and operations. The Innovation Campuses could also support isotope production for medical, industrial, and national security applications, and ensure proliferation resistance through advanced safeguards, material control, and compliance. These facilities could also serve as testbeds for next-generation reactors, microgrids, and energy storage solutions, further accelerating the deployment of advanced energy technologies.

Workforce development, as articulated in Executive Order 14302, will be central to the success of these Innovation Campuses. Campuses would ideally prioritize training, apprenticeships, and partnerships with universities and technical colleges to cultivate a new generation of nuclear scientists, engineers, operators, and skilled trades all

operating in a safe environment. These efforts could create thousands of high-paying jobs and foster a culture of safety, innovation, and excellence.

Environmental stewardship and public trust will be ensured through robust monitoring programs, radiological safety protocols, and strict compliance with streamlined federal and state regulatory frameworks. The private sector's experience in site characterization, permitting, and community engagement, are anticipated to facilitate transparent, science-based decision-making and long-term public support.

The economic impact of these Innovation Campuses is projected to be potentially significant, with investments and economic activity that could reach billions of dollars over the coming decades, subject to market conditions, policy choices, future budget decisions, and availability of appropriations. Host states and communities may benefit from regional development, infrastructure upgrades, and increased recognition in nuclear energy, technology, and security. Innovation Campuses may also enable the export of advanced reactors, nuclear fuels, and related technologies, strengthening international partnerships and U.S. leadership in the global nuclear market.

Through this RFI, the Department of Energy (DOE) seeks information from states interested in hosting Innovation Campuses. Candidate sites would need to offer sufficient land to accommodate enrichment plants, fuel fabrication facilities, advanced reactor demonstration and testing complexes, reprocessing plants, waste storage and disposal capabilities, data centers, and supporting industries, as applicable based on the sites' proposed scope, as well as the infrastructure needed for secure transportation and long-term monitoring. Ideal sites would also provide robust infrastructure and secure physical and cyber systems and demonstrate strong state and local government support to ensure public acceptance and long-term success, including a willingness to share financial responsibility and provide financial assurances, to the maximum extent permitted by law, for decommissioning, long-term waste management, and site remediation.

II. Innovation Campus Functions and Capabilities

DOE envisions these campuses would be deployed quickly, with initial facilities online in the 2027 timeframe. The following non-exhaustive functions and characteristics of Innovation Campuses are illustrative and are intended to guide respondents in preparing responses. These examples do not represent final design decisions or limitations. DOE encourages bold, innovative, and constructive feedback that spans the full nuclear lifecycle. To foster innovation, DOE envisions minimizing prescriptive constraints allowing states and private-sector partners to tailor responses to regional strengths and national goals. State input is essential to shaping the technical, programmatic, and regulatory framework, ensuring visionary yet feasible configurations.

States should indicate when they believe they could begin construction and commence operations on Innovation Campuses within the scopes of their proposals. Preference will be given to States with more ambitious timelines.

1. Nuclear Fuel Reprocessing or Recycling

Scope: Reprocessing facilities could recover uranium, plutonium, and other isotopes from used nuclear fuel for reuse. Recovered uranium can be re-enriched, while plutonium may be fabricated into metal fuel for fast reactors or into mixed-oxide (MOX) fuel for light water reactors. The Innovation Campuses could build on existing research to develop industrially scalable, proliferation-resistant methods that enhance fuel cycle efficiency and deploy the latest safeguard technologies to ensure that separated products can be securely managed and reused to produce fuel for conventional and advanced reactors. The facilities could also separate waste products into a distinct stream, which will require stabilization into engineered waste forms suitable for secure storage and long-term disposal. Resulting high-level waste (HLW), excess used nuclear fuel (UNF), and secondary waste from reprocessing would be treated, stored, and disposed of in accordance with federal, state and local regulations.

Expected Infrastructure: Large commercial complexes incorporating reprocessing plants, waste treatment facilities, isotope separation systems, and fuel fabrication units. Specialized chemical processing facilities, hot cells, and integrated waste handling systems co-located with reprocessing plants. These facilities will require significant power and water resources.

Workforce: Requires many construction jobs as well as more permanent positions including specialized jobs for chemists, nuclear engineers, and process operators.

2. Disposition of Waste Streams

Scope: Innovation Campuses could develop and implement safe and compliant disposal solutions for materials requiring long term management, as in interim storage or recycling, and permanent final disposition.

Expected Infrastructure: Geologically stable sites, drilling or excavation equipment, and long-term monitoring systems. Requires extensive regulatory compliance and public engagement.

3. Fuel Fabrication for Fresh and Reprocessed Material

Scope: Fuel fabrication facilities could produce fuel assemblies for light water reactors (LWRs), small modular reactors (SMRs), microreactors, and fast reactors. They could use low-enriched uranium (LEU), high-assay low-enriched uranium (HALEU), and potentially MOX fuel for plutonium-based systems. Innovation Campuses could develop

advanced fuel forms (e.g., TRISO, metallic, fast reactor fuels) to enhance safety and performance, supporting both civilian power generation and defense applications.

Expected Infrastructure: Precision manufacturing facilities, hot cells for handling radioactive materials, quality control systems and secure storage for fuel assemblies.

Workforce: Manufacturing technicians, nuclear engineers, and quality assurance specialists.

4. Conversion for Fresh and Reprocessed Material

Scope: Conversion transforms yellowcake into uranium hexafluoride (UF₆) for enrichment, a critical step in the uranium fuel cycle. Facilities located within Innovation Campuses could use chemical processes to produce high-purity uranium hexafluoride (UF₆), suitable for LEU and HALEU. The Campuses could also explore advanced conversion methods to improve efficiency and reduce waste.

Expected Infrastructure: Chemical processing plants, secure storage for UF₆ cylinders, and waste treatment systems. Facilities must comply with radiological safety and environmental regulations.

Workforce: Requires chemical engineers, process operators, and safety specialists.

5. Uranium Enrichment for Fresh and Reprocessed Uranium

Scope: Enrichment increases the proportion of uranium-235 to uranium-238 to produce usable nuclear fuel. Concentrations are categorized as follows: LEU, used in most commercial reactors, contains approximately 3–5% U-235; HALEU intended for most advanced reactors, has a U-235 concentration between greater than 10% and less than 20%. Highly enriched uranium (HEU), primarily used for defense applications and specialized reactors, contains 20% or more U-235. Campuses could explore building or expanding uranium enrichment facilities.

Expected Infrastructure: High-security enrichment plants, power-intensive systems (100–300 MW per plant), and robust safeguards to prevent proliferation.

Workforce: Engineers, technicians, and security personnel.

6. Deconversion for Fresh and Reprocessed Material.

Scope: Deconversion transforms UF₆ into solid forms suitable for fuel fabrication, often uranium dioxide (UO₂). Facilities use chemical processes to convert UF₆ into intermediary compounds before reducing and converting them into UO₂ powder, which can be fabricated into fuel pellets, TRISO particles, or other fuel forms. This activity would require chemical processing plants, secure UF₆ cylinder storage, and other equipment.

Expected Infrastructure: Chemical processing plants, secure UF6 cylinder storage, reduction furnaces, and processing equipment.

Workforce: Requires chemical engineers, process operators, and safety specialists at each facility.

7. Data Center Construction and Operations

Scope: Innovation Campuses may host nuclear-powered data centers, classified as critical defense infrastructure, to support high-performance computing for national security, scientific research, and commercial applications. The Campuses' unique combination of nuclear expertise, secure infrastructure, and proximity to advanced reactor deployment may attract leading technology companies to establish data centers within or near the Innovation Campuses.

Expected Infrastructure: High-security data centers will require: advanced cooling systems (e.g., liquid cooling for high-density servers); robust cyber infrastructure (e.g., quantum-resistant encryption, redundant networks); dedicated nuclear power sources (e.g., SMRs or microreactors) capable of servicing load; acres of land, secure perimeters, and high-bandwidth telecommunications access; and supporting infrastructure to ensure uninterrupted operation. Co-location with large nuclear reactors or SMRs necessitates proximity to reactor sites with cooling water access, water rights, and radiological safety systems. The clustering of data centers may drive demand for additional SMRs and large nuclear reactors, requiring multiple reactors per data center to meet power needs, and further integrating nuclear and digital infrastructure.

Workforce: Information technology (IT) specialists, data scientists, cybersecurity experts, nuclear engineers, reactor operators, and construction workers. Each data center could employ a direct workforce, while associated SMRs and large nuclear reactors will add operations and maintenance roles.

8. Advanced Reactor Deployment

Scope: Innovation Campuses may serve as testbeds and deployment sites for advanced reactors, in support of the long-term goal of achieving 400 gigawatts (GW) of nuclear capacity in the United States by 2050. Deployment could include electric power generation and process heat production that could support other on-site or nearby energy intensive infrastructure such as nuclear fuel-cycle facilities or AI data centers, national security and defense applications and powering AI data centers.

Expected Infrastructure: Reactor sites with cooling systems, transmission infrastructure, and integrated safety systems.

9. Uranium Mining and Milling

Scope: Extraction of uranium ore and processing it into uranium oxide (U₃O₈, or “yellowcake”) for conversion, in compliance with environmental and safety standards.

Expected Infrastructure: Access to uranium deposits (if available), heavy equipment, and supporting facilities.

Workforce: Miners, equipment operators, and environmental specialists. Import-focused Innovation Campuses shift jobs to logistics and processing.

10. Isotope Production for Medical, Industrial, and National Security Applications

Scope: Innovation Campuses could produce critical isotopes such as molybdenum-99 for medical imaging, cobalt-60 for industrial applications and actinides for national security-using reactors or accelerators-based systems. These capabilities could strengthen U.S. leadership in isotope supply chains, reduce reliance on foreign sources, and support both civilian and defense needs.

Expected Infrastructure: Research and production reactors, hot cells for isotope handling, radiochemistry laboratories, and secure storage and distribution facilities.

Workforce: Radiochemists, nuclear engineers, medical physicists, and production technicians.

11. Advanced Manufacturing and Other Support Industries

Scope: Innovation Campuses could catalyze a broad ecosystem of secondary and tertiary support industries, including: manufacturing (e.g., reactor components, cooling systems, construction materials); services (e.g., maintenance, logistics, security, IT support); housing and community development (e.g., residential areas for workers and their families, supported high-quality schools, hospitals, and recreational facilities); and ancillary sectors (e.g., healthcare, education, retail, hospitality). Ecosystems should support the operational needs of the Innovation Campuses and accommodate workforce growth, creating vibrant regional economic clusters.

Infrastructure Requirements: Industrial parks for manufacturing, service centers for logistics and maintenance, residential developments, and community infrastructure (e.g., high-quality schools, hospitals, retail centers). Requires robust utility networks (power, water, telecommunications), transportation systems (roads, rail, airports), and urban planning to support population growth.

Workforce: Manufacturing technicians, construction workers, electricians, IT specialists, security personnel, healthcare providers, educators, and retail workers. Housing development would require construction and real estate roles, while hospitality and retail industries could also expand to support community growth.

12. Proliferation Resistance through Advanced Safeguards, Material Control, and IAEA Compliance

Scope: Reducing proliferation risks across the nuclear fuel cycle is a long-standing U.S. national security objective. Innovation Campuses must implement advanced safeguards, and material protection, control, and accountability systems to prevent unauthorized use of nuclear materials. Measures may include real-time monitoring, secure storage of products and fresh fuel, and compliance with IAEA standards.

Expected Infrastructure: High-security facilities, advanced monitoring equipment, and cyber-secure data systems to track nuclear materials.

Workforce: Employs safeguards specialists, security personnel, and cybersecurity experts.

13. Workforce Development

Scope: Innovation Campuses may establish training academies, apprenticeships, and partnerships with universities, technical colleges, and labor organizations to cultivate a skilled workforce in nuclear science, engineering, operations, and cybersecurity.

14. Safety

Scope: Innovation Campuses must implement advanced technologies and protocols to ensure public safety near facilities handling nuclear materials. This includes continuous monitoring, emergency preparedness, and transparent communication with surrounding communities.

Expected Infrastructure: Radiological safety systems, emergency response facilities, and community outreach centers.

Workforce: Safety officers, community liaisons, radiological experts, as well as software and hardware developers.

15. Environmental Stewardship

Scope: Innovation Campuses must adopt advanced environmental monitoring systems, radiological safety protocols, and strict compliance with federal and state regulations to protect the environment and public health. Activities will include air and water quality monitoring, radiation detection, and proactive public engagement to build trust and ensure compliance.

Expected Infrastructure: Environmental monitoring stations, radiological safety systems, and community outreach centers.

Workforce: Environmental scientists, safety officers, and community liaisons.

16. Secure Transportation Networks

Scope: Secure transportation systems would move nuclear materials (e.g., UF₆, fuel assemblies, UNF, isotopes) and waste between Innovation Campus facilities and external sites (e.g., LLW disposal sites, international export ports). Transport could include rail, road, and potentially maritime systems, meeting all DOE, DOT and NRC requirements.

Expected Infrastructure: Dedicated transportation routes, specially designed rail cars, secure vehicles, and tracking/monitoring systems to ensure safety and safeguards compliance.

Workforce: Logistics coordinators, drivers, and security personnel.

17. Decommissioning and Site Remediation

Scope: Innovation Campuses must plan for the eventual decommissioning of reactors, fuel cycle facilities, and other infrastructure, including site remediation to restore land for future use. Activities would include dismantling facilities, managing residual waste, and ensuring long-term environmental protection.

Expected Infrastructure: Decommissioning equipment, waste storage systems, and remediation facilities integrated with disposal facilities.

Workforce: Decommissioning specialists, environmental engineers, and waste managers.

Benefits to the host states:

The establishment of a comprehensive Innovation Campus offers opportunities for host states to advance nuclear innovation, energy security, and long-term economic development while assuming substantial responsibilities for environmental, safety, and fiscal stewardship. By integrating the critical functions described previously, Innovation Campuses could transform host state economies through significant investment, job creation, and infrastructure development, but also require sustained commitment to regulatory compliance, long-term waste management, and decommissioning.

Economic Impact

Innovation Campuses have the potential to deliver substantial economic activity over many decades, driven by direct investments, job creation, and secondary economic activity, recognizing that such outcomes will depend on project specific decisions, market conditions, and the availability of private and state capital.

- Direct investment: The construction and operation of Innovation Campus facilities—including R&D centers, enrichment plants, reprocessing facilities, advanced reactors, advanced manufacturing, data centers, and waste management infrastructure—could require and generate tens of billions of

dollars in aggregate investment over time, largely from private and state sources.

- Job creation: Innovation Campuses could create high-quality jobs, both direct and indirect, across diverse sectors. Direct employment may include:
 - R&D: Scientists, engineers, and data analysts for nuclear research and AI development.
 - Fuel Cycle Operations: Workers for mining, milling, conversion, enrichment, and fuel fabrication, including specialized roles for plutonium handling.
 - Reactor Deployment: Reactor designers, construction workers, reactor operators, and maintenance technicians for large reactors, SMRs, microreactors, and fast reactors.
 - Data Centers: IT specialists, data scientists, and cybersecurity experts.
 - Waste Management: Engineers and scientists to design, build, and operate waste management systems.
 - Support Industries: Manufacturing (e.g., reactor components), services (e.g., logistics, maintenance), housing, healthcare, and retail.
- The U.S. nuclear industry currently employs ~80,000 workers. A single Innovation Campus could dramatically increase this figure in the host state, particularly for high-paying, specialized nuclear and other technical roles. Indirect jobs in construction, supply chains, and community services could add another 2–3 jobs per direct job. For example, an Innovation Campus employing 50,000 direct workers might generate 100,000–150,000 indirect jobs, contributing billions annually in wages to the state economy, depending on the proposed scope and size of the Innovation Campus.
- Economic multipliers: Innovation Campuses may stimulate secondary and tertiary industries, potentially creating a multiplier effect on local and regional economies. Constructing industrial parks, residential communities, high quality

schools, hospitals, and retail centers could support substantial economic development over the coming decades.

- Fiscal impacts: Innovation Campuses may generate state and local tax revenue through corporate taxes, property taxes, sales taxes, and income taxes from workers, depending on state tax structures and project configurations. States should evaluate how potential tax revenues could fund long-term obligations (for example, decommissioning, environmental monitoring, and community benefit programs), and describe how they could mitigate the need for future state or federal assistance.

Societal and Community Benefits

Beyond economic gains, Innovation Campuses may provide long-term societal benefits to local communities, including high-quality employment opportunities, educational and training programs, and infrastructure improvements. These benefits should be designed and implemented alongside robust community engagement, and clear communication of risks and responsibilities associated with long-term waste management or site remediation.

- Community Development: The influx of workers and families may drive the creation of new or expanded communities, including housing, schools, hospitals, and recreational facilities. For example, 50,000 workers could require 10,000–20,000 housing units, spurring real estate investment. These developments could create vibrant, high-income, sustainable communities with access to modern amenities, improving living standards and attracting further investment. States are encouraged to plan for these developments, as relevant based on the applicable scope of the proposed Campus, using tools such as impact fees, user charges, and other state or locally administered mechanisms.
- Workforce Development and Education: Training academies, apprenticeships, and university partnerships may create a pipeline of skilled workers in nuclear science, engineering, AI, and related fields. States could leverage DOE's National Laboratories to develop world-class educational programs. This could elevate the state's educational infrastructure, attract top talent, and provide lifelong career opportunities for residents- reducing unemployment and boosting social mobility. States should describe how they will fund and sustain these programs over time, including through partnerships with private entities and educational institutions, and how they will leverage but not rely exclusively on federal grants.

- Community Benefit Sharing: States may negotiate community benefit agreements to provide to host communities direct advantages, such as job training programs, infrastructure upgrades, and support for schools and healthcare.
- Energy Access and Affordability: Advanced reactors at the Innovation Campus could provide reliable and affordable energy to the state's grid, supporting AI data centers, industrial parks, and residential communities.

Environmental and Safety Benefits

While nuclear endeavors present challenges, the Innovation Campuses should be proposed and designed to minimize undue risks and deliver significant environmental benefits:

- Robust Public Safety Stewardship: Innovation Campuses may implement advanced radiological safety protocols, environmental monitoring, and promote inherently safe reactor designs, all in compliance with federal and state regulations. Technologies such as real-time radiation monitoring, advanced waste treatment, and secure transportation systems could mitigate risks associated with mining, reprocessing, and waste disposal. Deep geologic disposal facilities (including boreholes) for HLW would ensure safe, long-term isolation of radioactive waste, protecting communities and ecosystems.
- Reliable Energy Leadership: A single Innovation Campus could generate 2–5 gigawatts of power, positioning the state as a leader in energy and attracting energy-intensive industries and associated jobs.
- Sustainable Fuel Cycles: Reprocessing and advanced separations can reduce the volume and radiotoxicity of waste, including HLW, that needs long term management, by recovering uranium and plutonium for reuse, and putting the remaining waste into an engineered waste form designed for permanent disposal.
- Risk Mitigation through Technology: Innovation Campuses could leverage AI-driven predictive maintenance, digital twins, and proliferation-resistant technologies to enhance safety and security.

Strategic and National Benefits

Hosting an Innovation Campus could position the state as a critical player in both national and global arenas:

- National Security Contributions: Innovation Campuses may support defense applications, such as isotope production for national security. This could elevate host states' strategic importance, fostering federal partnerships and sustained funding.
- Global Leadership in Nuclear Innovation: By developing infrastructure for international exports of reactors, fuels, and isotopes, the state could position itself as a global center for nuclear technology. This could generate significant export revenue for private industry, in addition to potential state tax revenue, while strengthening U.S. alliances.
- Technological Innovation Center: The integration of data centers and R&D facilities could make the state an attractive location for technology companies, researchers, and innovators. This synergy between nuclear science, data centers, and clean energy could attract billions in additional investment, driving breakthroughs across multiple sectors.

III. Addressing Challenges and Risks

The primary challenges associated with nuclear development—such as addressing the fuel cycle and waste, proliferation risks, and public concern—are manageable through advanced technology, robust regulation, and proactive engagement. DOE seeks information from states on how they plan to address these challenges.

DOE expects the benefits of economic growth, job creation, clean energy, and global leadership to outweigh challenges, as the Innovation Campuses should be designed with cutting-edge technologies and robust regulatory frameworks to ensure safety, sustainability, and public trust.

DOE-Host State Agreement

Innovation Campuses will require formal agreements between DOE and host states to define roles, responsibilities, and commitments, including clear allocation of financial risk and long-term obligations. The agreement should align the Innovation Campuses' functions with a balanced approach towards economic opportunity, safety, security, and fiscal stewardship.

Purpose

A legally binding agreement between DOE and a host state would establish a framework to support the development, operation, and long-term management of a comprehensive nuclear ecosystem integrating the functions and capabilities described in Section II. The agreement would aim to:

- Facilitate Site Development: Ensure state support for site selection, infrastructure, and regulatory approvals on federal or state-provided lands, including state commitments to provide or facilitate necessary transportation, utility, and security infrastructure.
- Secure Economic Benefits: Enable the state and private sector to capture potential economic benefits through private investment and state and federal funding, as specified in the agreement.
- Address Environmental and Safety Concerns: Balance nuclear innovation with robust environmental stewardship, radiological safety, and long-term management of used fuel and waste, including clear allocation of responsibilities and financial assurances for decommissioning and waste management.
- Align with Executive Orders: Meet timelines and national security objectives identified in Executive Orders and relevant statutes.

Legal Framework and Authorities

The agreement would be grounded in existing and any applicable future federal authorities, ensuring enforceability, including:

- Atomic Energy Act of 1954: Authorizes DOE to manage nuclear energy programs- including fuel cycle activities, reactor deployment, and waste management- and to enter cooperative agreements with states.
- Energy Policy Acts of 1992 and 2005: Enables DOE to provide financial assistance (e.g., cost-sharing, loan guarantees) and enter cooperative agreements for nuclear projects, as demonstrated in the Advanced Reactor Demonstration Program (ARDP).
- Defense Production Act (DPA): Allows DOE to enter voluntary agreements with states and private entities to prioritize critical materials (e.g., HALEU, isotopes) and infrastructure, as referenced in recent Executive Orders.
- Nuclear Waste Policy Act of 1982 (NWPA): Governs the disposal of HLW and UNF, and may allow for allocation of additional funds. The NWPA, along with the Low-Level Radioactive Waste Policy Amendments Act (LLRWPA) may require targeted amendments to support expanded funding and waste management responsibilities.

Potential Provisions of the Agreement

A legally binding agreement could include the following key provisions, tailored to the Innovation Campus's scope and the state's role:

- Site Selection and Land Use: The agreement should specify whether they intend to use private, state, federal, or mixed land for Innovation Campus facilities, and also identify suitable sites within the state. The agreement should also specify responsibility for zoning and permitting support, as well as ownership and lease agreements for land.
- Infrastructure Development: The agreement should identify sources of private and public funding for facility-specific infrastructure. Further, the agreement should clearly delineate between state responsibility for infrastructure and federal assistance on a case-by-case basis.
- Regulatory and Permitting Support: The agreement should specify specific actions the state will take to streamline state-level environmental and zoning regulations, and the extent to which states intend to align with DOE's NEPA streamlining and NRC licensing reforms.
- Waste Management: The agreement should define responsibilities for managing used nuclear fuel and waste along with secondary waste streams.
- Workforce Development: The agreement should specify whether the state intends to establish training academies and partnerships with universities and labor organizations, and whether the state intends to use private partners to fund apprenticeships.
- Stakeholder Engagement and Community Benefits: The agreement should identify private, state, and federal roles with respect to public engagement, including outreach to local communities, Tribal nations, and environmental groups, to build support for Innovation Campus activities. The agreement should also specify whether and to what extent the state intends to execute benefit agreements to provide funding for high-quality schools, infrastructure, and workforce programs.
- Compliance and Enforcement: The agreement should contain mechanisms for monitoring and enforcement, and the state should explain whether compliance would fall under state, federal, or joint jurisdiction. Nevertheless, the

agreement should recognize federal oversight responsibilities for nuclear facilities.

- Termination and Dispute Resolution: The agreement should contain conditions for dispute resolution, including mediation or arbitration, to address conflicts between DOE, the host state, and private partners. These mechanisms would ensure timely resolution of disputes while maintaining project momentum and protecting stakeholder interests.

IV. Funding

Innovation Campuses' integration of all enterprise functions create unique ecosystems, reducing costs through economies of scale and attracting investors seeking diversified revenue streams (e.g., power, fuels, isotopes). However, the development and operation of the Innovation Campuses represent a substantial multi-year undertaking. The funding model prioritizes private investment to leverage industry expertise and capital, with DOE potentially complementing these investments through cost-sharing, loan guarantees, and other mechanisms under existing authorities such as the Atomic Energy Act of 1954, the Energy Policy Act of 2005, and the DPA.

For the long-term management of material, the DOE will negotiate with the state suitable terms and conditions that are acceptable to both parties subject to appropriations and existing DOE authorities.

Private Investment as the Primary Funding Source.

Private investment should serve as the cornerstone of funding for the Innovation Campuses, driven by the significant economic opportunities and long-term revenue potential across the enterprise functions. The private sector's role is critical to achieving the scale and speed envisioned by Executive Orders, particularly for capital-intensive functions such as enrichment, reprocessing, reactor deployment, data centers and HLW disposal.

Key sources of private investment may include:

- Nuclear Industry Leaders: Established and emerging companies may invest in advanced reactor development, fuel fabrication, and reprocessing, waste management facilities, drawn by the Innovation Campuses' potential to supply fuels and reactors for domestic and global markets. For example, each Innovation Campus can host multiple advanced reactors that would generate revenue through electricity sales to grids, AI data centers, and military installations, providing stable, long-term returns for investors. Likewise, enrichment and fuel fabrication facilities could supply LEU, HALEU, and

MOX fuels to both domestic and international markets. Additionally, reprocessing and waste disposal services could generate revenue through contracts and agreements with utilities and federal agencies, including the Department of War (DoW), offsetting operational costs.

- Technology and AI Firms: Leading technology companies—particularly hyperscalers increasingly investing in nuclear-powered data centers—may fund data center construction and operations, leveraging the Innovation Campuses’ reliable energy supply. Each Innovation Campus could host multiple data centers.
- Energy and Infrastructure Companies: Private firms may invest in enrichment plants, reprocessing facilities, and associated infrastructure (e.g., manufacturing, transportation), motivated by long-term contracts and export opportunities.
- Financial Institutions and Investment Funds: Private equity firms, venture capital, and infrastructure funds may provide capital for Innovation Campus facilities, attracted by stable returns from power generation, isotope sales, and exports.
- Isotope and Medical Sector: Companies in the medical and industrial isotope markets may invest in isotope production facilities, driven by growing demand. The isotope market is projected to grow from \$12 billion in 2024 to \$21 billion in 2033.

Financial Provisions

Any DOE financial assistance or credit support under the agreement would be provided only to the extent authorized by statute, subject to the availability of appropriations, and in accordance with applicable federal guidance on credit and budget scoring. Facility-specific infrastructure and associated capital investments should be funded primarily by private partners and, where appropriate, state and local entities, with DOE support limited to specific, authorized assistance mechanisms. The agreement should include provisions requiring:

- Establishment and maintenance of decommissioning and closure funds sized to projected end-of-life costs.

- Financial assurance mechanisms (for example, surety bonds, insurance, escrowed funds, or other instruments) to cover projected long-term costs to the maximum extent permitted by law.
- Cost-sharing and risk-sharing arrangements among private sponsors, the host state, and federal entities consistent with statutory authorities and appropriations.
- For long-term management of material requiring long-duration stewardship, DOE anticipates that any federal role would be defined strictly by existing or future statutory authorities and subject to appropriations.

DOE Financial Assistance Mechanisms

While private investment should dominate, the DOE may provide targeted financial assistance to de-risk projects, attract private capital, and ensure alignment with federal objectives. These mechanisms, authorized under existing legislation, include:

- Cost-Sharing:
 1. Mechanism: DOE may share costs with private partners for high-risk, high-reward functions such as R&D, reprocessing, and advanced reactor demonstrations, leveraging authorities under the Energy Policy Act of 2005. For example, DOE's ARDP has historically provided cost-sharing for reactor projects.
 2. Application: Cost-sharing may support activities such as R&D, reprocessing facility development, and test reactors. This reduces private-sector risk and encourages investment in emerging technologies such as pyro-processing.
 3. Impact: By covering a percentage of costs, DOE can leverage multiple dollars of private investment for every dollar spent, amplifying total capital deployment.
- Loan Guarantees:
 1. Mechanism: DOE's Loan Programs Office (LPO), authorized under Title XVII of the Energy Policy Act, may provide loan guarantees to cover eligible project costs for energy, infrastructure, and advanced technology

projects, subject to applicable restrictions. Eligible nuclear projects alone could access over \$100 billion in existing LPO funds.

2. Application: Loan guarantees could support the construction of Innovation Center fuel cycle facilities, power generation, transmission, and component manufacturing facilities, reducing financing costs and improving project bankability.
 3. Impact: DOE loan guarantees unlock access to large-scale private financing, accelerating deployment timelines and lowering overall capital costs.
- Voluntary Agreements under the Defense Production Act (DPA):
 1. Mechanism: The DPA allows DOE to enter voluntary agreements with private companies to prioritize production of critical materials (e.g., HALEU, HEU, isotopes) for national security. These agreements may include incentives such as advance purchase commitments or price supports.
 2. Application: DPA agreements may support activities such as HALEU production, isotope manufacturing, and defense-related fuel fabrication. For example, DOE could commit to purchasing HALEU at fixed prices, ensuring predictable revenue for private operators.
 3. Impact: These agreements could de-risk investments in high-security functions such as plutonium reprocessing and HEU production, encouraging private-sector participation in national-security related nuclear activities.
 - Grants and Cooperative Agreements:
 1. Mechanism: DOE may provide grants and cooperative agreements under the Atomic Energy Act of 1954 and Energy Policy Act of 2005 to support activities such as R&D, workforce development, and environmental stewardship. Cooperative agreements- used for initiatives like the Advanced Reactor Demonstration Program (ARDP) enable shared funding and technical collaboration.
 2. Application: Grants may fund activities such as workforce training academies, environmental monitoring systems, and R&D collaborations

with National Laboratories. Cooperative Agreements may support partnerships for activities such as reprocessing, waste disposal and fuel cycle development.

3. **Impact:** These mechanisms reduce upfront costs for private partners, particularly for non-revenue-generating functions such as workforce development, while leveraging federal expertise and infrastructure.

This RFI does not announce or commit DOE to provide any specific form of financial assistance, incentives, or other funding in connection with Nuclear Lifecycle Innovation Campuses. Instead, DOE expects the private sector and states to lead and finance efforts undertaken in response to this RFI, which could generate substantial benefits to local businesses, communities, and taxpayers.

DOW Financial Assistance Mechanisms

In addition to private investment and DOE support, the DoW may also provide funding for power reactors and compensate for defense-related waste offtake through the Army's Executive Agent program. This funding reinforces the strategic value of the Innovation Campuses and ensures alignment with national defense objectives.

V. RFI Questions to be Answered by Interested States

The following questions seek detailed information regarding each state's interest, capabilities, infrastructure, policies, and strategic vision to support the development and long-term operation of the transformative Innovation Campuses.

1. **State Interest:** What level of interest does your state have in hosting a comprehensive Nuclear Lifecycle Innovation Campus? Provide a detailed description of your state's strategic vision and approach to developing an Innovation Campus that integrates all functions outlined in Section II of this RFI, or, if not all functions are integrated, please specify why. Additionally, please identify what your state requires from the federal government in order to be a host for an Innovation Campus, or what private resources may be required, and what resources the state would plan to contribute.
2. **Proposed Sites Within the State:** What specific sites within your state would you propose for hosting a Nuclear Lifecycle Innovation Campus, and why are they viable and suitable for the necessary functions? Please consider existing nuclear infrastructure, proximity to DOE sites, land availability, zoning, and environmental suitability. Include details on site characteristics, such as maps, geologic stability, access to utilities, and transportation networks.

3. **Potential Private Sector Partners:** Which private sector partners does your state anticipate working with to develop these Nuclear Lifecycle Innovation Campuses? What roles will those partners play? Provide details on the process and timeline for selecting and engaging these partners.
4. **Site Infrastructure Requirements:** What infrastructure and resources can your state provide or support at the proposed site(s) to meet the requirements of all Innovation Campus functions? Detail availability of power (e.g., grid reliability, capacity for enrichment plants, AI data centers), water (e.g., cooling for reactors and reprocessing), waste storage, secure transportation corridors, and physical/cyber security systems. Specify any state investments or upgrades needed (e.g., transmission lines, rail networks, cybersecurity infrastructure).
5. **Regulatory Framework and Licensing Support:** How would your state approach regulatory oversight for the Nuclear Lifecycle Innovation Campus? What regulatory streamlining and expedited permitting can your state offer (e.g., RCRA), while ensuring compliance with federal standards? In areas where DOE assumes ultimate safety responsibility, how would your state partner with DOE to exercise oversight?
6. **Legislative and Policy Requirements:** Are there any federal or state statutes, regulations, or policies that need to be amended or enacted to facilitate the development and operation of a Nuclear Lifecycle Innovation Campus in your state? Provide specific examples of legislative barriers (e.g., restrictions on nuclear waste storage or disposal, reprocessing bans, or zoning laws) and propose strategies to address them, including timelines for legislative changes.
7. **Timeline for State Support:** What is your state's proposed timelines for providing regulatory approvals, infrastructure development, and community agreements to support the Nuclear Lifecycle Innovation Campus? Include key milestones, such as site selection, permit reviews and issuance, infrastructure upgrades, workforce training program launches, and community engagement initiatives.
8. **Anticipated Public and Stakeholder Concerns:** What challenges do you anticipate within your state to any of the Nuclear Lifecycle Innovation Campus functions (e.g., from environmental groups, local communities, Tribal nations, or political entities), particularly for sensitive activities such as reprocessing, plutonium handling, or waste disposal?

9. **Stakeholder Engagement Strategy and Cooperation Mechanisms:** What is your state's plan to engage stakeholders- including political entities, local communities, Tribal nations, environmental groups, industry partners- to ensure timely public acceptance and compliance with regulatory frameworks for all Nuclear Lifecycle Innovation Campus functions? Provide a conceptual strategy, including community outreach programs, public hearings, Tribal consultations, and partnerships with local organizations. Include examples of successful stakeholder engagement from past nuclear, industrial, or infrastructure projects in your state.
10. **HLW Management, Treatment, Storage and Disposal:** How would your state implement the management of material requiring long term management? Describe proposed infrastructure (e.g., interim storage facilities, reprocessing options, deep geologic disposal facilities including boreholes) and compliance with state and federal environmental regulations. Specify any existing capabilities (e.g., licensed storage sites).
11. **State-Specific Limitations:** What state-specific limitations- regulatory, political, environmental, geologic, or community-based- might hinder the development of any of the Nuclear Lifecycle Innovation Campus functions outlined in Section II of this RFI? Provide a general assessment of these barriers and propose strategies to address them, including regulatory reforms, public engagement, or infrastructure investments.
12. **Environmental and Safety Stewardship:** What strategies will your state employ to ensure environmental stewardship and radiological safety across all Nuclear Lifecycle Innovation Campus functions, particularly for activities such as enrichment, reprocessing, and waste disposal? Provide conceptual plans for environmental monitoring systems, safety protocols, emergency response capabilities, and compliance with federal and state regulations.
13. **Transportation Corridors:** What intrastate and interstate transportation corridor challenges exist in your state for the secure movement of nuclear materials (e.g., UF₆, fuel assemblies, UNF, isotopes, HLW)? Identify existing infrastructure (e.g., rail lines, highways, ports), regulatory requirements (e.g., state DOT approvals, federal transport regulations), and potential public acceptance challenges. Propose solutions to enhance transportation networks, including infrastructure upgrades or stakeholder engagement plans.

14. **Proposed Agreement Framework:** What type of agreement should be employed to support the development and operation of the Nuclear Lifecycle Innovation Campus- such as cooperative agreements, contracts, financial assistance mechanisms, loan guarantees, or voluntary agreements under the DPA? Limit suggestions to contractual authorities already granted to DOE (e.g., under the Atomic Energy Act of 1954, Energy Policy Act of 2005, or DPA). Describe how these agreement frameworks will facilitate partnerships and align with private funding and operational needs across enterprise functions.
15. **Technology and Industry Partnerships:** What experience, interest, or concern does your state have regarding specific technologies for the Nuclear Lifecycle Innovation Campus- such as advanced reactor designs, reprocessing methods, or AI-driven systems for data centers and operations? Describe existing nuclear industry collaborations, state incentives to attract private-sector partners, and proposed partnerships to support all enterprise functions, including manufacturing, R&D, and isotope production.
16. **Secondary Waste Management:** How would your state assist in managing, storing, and disposing of secondary waste streams generated by Nuclear Lifecycle Innovation Campus activities? Describe compliance with state environmental regulations, access to existing commercial LLW disposal sites, and any proposed state investments in waste management infrastructure.
17. **Government Furnished Data/Technology/Equipment:** What government-furnished data, technology, or equipment (e.g., reactor designs, reprocessing technologies, safeguards systems) would your state require to support the Nuclear Lifecycle Innovation Campus functions? Specify whether your state currently holds rights or licenses for such data or technology, and if not, outline how you would pursue acquiring them through DOE, DoW, or other federal entities.
18. **International Export Capabilities:** How will your state support the development of infrastructure and policies to support international exports of advanced reactors, nuclear fuels, isotopes, and technologies from the Nuclear Lifecycle Innovation Campus? Describe existing or proposed export infrastructure (e.g., ports), state policies to support global partnerships, and strategies to ensure compliance with export control laws and IAEA regulations.
19. **Constraints and Inhibiting Factors:** What potential barriers or impediments could affect the successful siting and operation of a Nuclear Lifecycle

Innovation Campus in your state, considering all nuclear functions? For example, what resources, information, or expert assistance would be necessary to ensure that potentially interested communities have adequate knowledge and support to address concerns related to mining, reprocessing, waste disposal, or supporting industries?

20. **Unaddressed Considerations:** What additional issues should DOE consider in implementing a successful Nuclear Lifecycle Innovation Campus in your state? Provide insights on state capabilities, policies, or prior experience with nuclear, industrial, or large-scale infrastructure projects that reinforce your state's suitability as a host.
21. **Additional State Information:** Please provide any additional information about your state's capabilities, policies, or prior experience with nuclear or related projects (e.g., energy, defense, industrial development) that supports its suitability to host a Nuclear Lifecycle Innovation Campus. Include details on existing infrastructure, economic development programs, or community support initiatives that enhance your state's readiness to support the desired nuclear innovation.
22. **Financial responsibility, Cost Sharing, and Assurances:** Describe how your state would approach cost-sharing and risk allocation for the development, operation, and closure of a Nuclear Lifecycle Innovation Campus. In particular, how would your state expect private entities to fund capital costs, operations, decommissioning, and long-term waste management (for example, decommissioning funds, closure funds, insurance, and other financial assurances)? What state or local contributions, if any, would be contemplated, and how would they be conditioned (for example, performance-based incentives, clawback provisions)?
23. **Revenue Sources and Cost-Recovery Approaches:** What approaches would your state consider to ensure that beneficiaries of the Nuclear Lifecycle Innovation Campus (for example, reactor operators, fuel cycle companies, data center operators, utilities) contribute appropriately to the costs of long-term waste management, decommissioning, and environmental monitoring (for example, user fees, surcharges, host-community agreements)?

VI. Confidential Business Information

DOE aims to protect information that identifies any party's interest in any particular location. Pursuant to 10 CFR 1004.11, any person submitting information that he or

she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked “confidential” including all the information believed to be confidential, and one copy of the document marked “non-confidential” with the information believed to be confidential deleted. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose. If your state’s response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

“Notice of Restriction on Disclosure and Use of Data

Pages [list applicable pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.”

In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: “Contains, Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure” and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with [[double brackets]] or highlighting.

Please be aware that DOE may make available for public inspection all other comments, in their entirety, submitted by organizations and businesses (except as provided above for proprietary information) or by individuals identifying themselves as representatives of organizations or businesses.

VII. Disclaimer

This RFI is issued solely for information and planning purposes and does not constitute a solicitation.

Responses to this notice are not offers and cannot be accepted by the Government to form a binding agreement. DOE is not seeking proposals through this RFI and will not accept unsolicited proposals.

Respondents are solely responsible for all expenses associated with responding to this RFI. Not responding to this RFI does not preclude participation in any future agreement, if conducted. No proprietary information should be included in any submittal except via the process outlined in Section VI of this RFI.



UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
2300 Clarendon Boulevard, Suite 1300
Arlington, VA 22201-3369

July 24, 2026

Mr. Theodore J. Garrish
Assistant Secretary for Nuclear Energy
United States Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Garrish:

This letter transmits the U.S. Nuclear Waste Technical Review Board (Board) observations from its June 9, 2026, meeting in Arlington, VA,¹ on Technical Lessons Learned from National Deep Geologic Repository Programs. The Board was established as a federal agency in the 1987 Amendments to the Nuclear Waste Policy Act (NWPA) to evaluate the technical and scientific validity of activities undertaken by the Secretary of Energy to implement the NWPA, including (i) site characterization activities, and (ii), activities relating to the packaging or transportation of spent nuclear fuel and high-level radioactive waste. Specific to the topic of the June 9 meeting, information provided by radioactive waste management programs in other nations supports the Board's mission to provide independent scientific and technical expert advice to the Secretary of Energy and Congress on efforts to implement the NWPA.

In March of 2025, the Board found that the U.S. needs one or more deep geologic repositories and recommended that the U.S. Department of Energy (DOE) create a workable pathway to site, license, construct, and operate a geologic repository for the permanent disposal of spent nuclear fuel and high-level radioactive waste, working with Congress as needed.² The Board's position has not changed. In January 2026, DOE issued a request for information inviting states to express interest in hosting a Nuclear Lifecycle Innovation Campus that includes a waste disposition function.³ The Board commends DOE for beginning a public dialog that includes looking for solutions for spent nuclear fuel and high-level waste disposal and is encouraged by the publicly available responses from states. Recognizing that this development puts the U.S. in the opening stages of a siting process, the Board convened this meeting to examine lessons learned from other national programs during the siting and development of deep geologic disposal facilities for spent nuclear fuel and high-level radioactive waste and is using this letter to provide the Board's observations on those lessons to DOE.

¹ The meeting agenda, presentation materials, transcript, and an archived recording of the webcast are available online at <https://www.nwtrb.gov/meetings/past-meetings/spring-2026-board-meeting---june-9--2026>.

² [Board Letter to Congress and Secretary of Energy, March 2025](#).

³ [Request for Information on Establishment of Nuclear Lifecycle Innovation Campuses](#).

Summary of the Meeting

The objective of the June 2026 meeting was to understand other countries' experiences from the siting and development of deep geologic disposal facilities for spent nuclear fuel and high-level radioactive waste. Implementers from four countries in early stages of repository site selection (Republic of Korea, Japan, Germany, the Czech Republic), one country with site selection completed (Switzerland), and one country preparing to begin disposal operations (Finland) described their experiences. The presentations addressed national approaches to repository siting, including policy and regulatory frameworks; technical and scientific criteria; the tools and methodologies used in site selection; the influence of siting decisions on post-selection activities, including licensing, design evolution, and implementation; and the lessons derived from these experiences. The attachment includes additional information on the meeting and summaries of the presentations with the lessons presented.

The common lessons learned by implementers include the importance of:

- Ensuring sufficient disposal capacity to accommodate current and future inventories of spent nuclear fuel and high-level radioactive waste.
- Establishing organizational capacity, tools, and processes early in the siting process to support siting, licensing, and implementation.
- Establishing a robust legislative and institutional framework to support repository development and implementation prior to starting, or restarting, a repository program. Such a framework will have a significant impact on scientific and technical activities undertaken in all stages of the disposal program.
- Adopting a phased, flexible, and adaptable repository program development approach is necessary so programs can periodically assess and change as knowledge and experience grows.
- Focusing on safety early, and throughout repository development, helps the implementer prepare for their eventual role as a licensee and the interrelated role of interacting with stakeholders during siting and subsequent steps.

In addition, the Board notes that those programs where early decisions were made to limit considerations for repository siting to a single rock type (e.g., crystalline rocks in the Czech Republic, argillaceous rocks in Switzerland) report benefits from having an underground research laboratory or characterization facility that can support repository program development.

Board Observations on Lessons Learned

A significant lesson is the need to ensure sufficient disposal capacity to accommodate a nation's existing and projected waste inventory. In its March 2025 letter,⁴ the Board found "the nation needs one or more deep geologic repositories for permanent disposal of domestic spent nuclear fuel and high-level radioactive waste." The Board's evaluation documented that almost all existing spent nuclear fuel has no plausible pathway for reuse and precludes disposal in deep boreholes without expensive and dose-intensive waste treatment and/or repackaging. The Board

⁴ [Board Letter to Congress and Secretary of Energy, March 2025.](#)

recognizes that DOE is in the initial stages of the Nuclear Lifecycle Innovation Campus initiative and that DOE has not prescribed the waste amount or disposition modes (deep borehole or deep geologic repository) that states may wish to pursue. This is consistent with the intent of the Nuclear Life Cycle Campus approach, and leads the Board to observe that the full set of disposal solutions pursued by DOE should address the total inventory of spent nuclear fuel and high-level radioactive waste, including both existing and future inventories. The Board therefore reiterates its March 2025 finding that one or more deep geologic repositories will be required to dispose of this inventory.

Another important observation is that countries whose repository programs have advanced beyond siting learned that the implementer should have established organizational capacity, tools, and processes earlier in the siting process to support siting, licensing, and implementation. The Board observes that recent DOE efforts, such as the January 2026 Request for Information that initiated the Nuclear Lifecycle Innovation Campuses program, have focused on the siting process for new radioactive waste management facilities, while DOE has given less attention to putting in place the organizational capacity, tools and procedures that DOE will need once it decides how to move forward. Experience from other national programs shows that delaying key safety capabilities—such as quality assurance, requirements management, and related licensing support systems—often leads to avoidable inefficiencies and delays. Those same experiences also highlight the importance for implementers to focus on repository design, continuity over a multi-decadal program duration, and overall system optimization from the beginning, rather than trying to incorporate these considerations after major decisions.

As the implementers from the six nations observed, establishing a robust legislative and institutional framework to support repository development and implementation prior to starting, or restarting, a repository program is an important contributor to program success. Such a framework has a significant impact on scientific and technical activities undertaken in all stages of the disposal program. Consistent with the Board’s statutory mandate, the Board’s observation presented here is limited to the technical and scientific aspects of those activities needed to successfully implement an integrated nuclear waste management program. The Board concurs that creating a workable pathway to site, license, construct, and operate a repository includes the need for a clear and durable legislative and institutional framework. Such a framework will guide a disposal program, and as the implementers described, define the roles and responsibilities of the implementing organization, the regulator, industry, and other stakeholders and specify the decision-making processes. In its March 2025 letter,⁵ the Board recommended that DOE take the steps necessary, working with Congress as needed, to create a workable pathway to site, license, construct, and operate a geologic repository for the permanent disposal of spent nuclear fuel and high-level radioactive waste. We make no recommendations regarding policy actions that may be taken to create a workable pathway to geologic disposal but observe that each nation established its own pathway prior to starting, or restarting, a repository program.

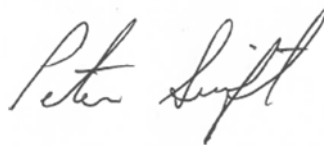
The Board observes that nations that have chosen to focus their disposal programs on a single host rock type and that have access to an underground characterization facility—either at a candidate disposal site or at a separate underground research laboratory in geologically equivalent host rock—have found that the facility serves important and variable roles depending

⁵ [Board Letter to Congress and Secretary of Energy, March 2025.](#)

on repository program maturity. Early in the siting process a facility in a geologically equivalent host rock provides confidence that the nation can develop a repository elsewhere. Such a facility can reduce uncertainty, build confidence in site characterization techniques that the implementer will apply during the repository siting process and serve as an information basis for discriminating among candidate sites at an early stage. An underground characterization facility supports the development and testing of models and engineered barrier concepts in situ that are directly relevant to licensing, while providing practical insights that inform later design and implementation decisions. The Board specifically notes that Czech Republic program's use of an underground research facility at repository-relevant depth in crystalline rock illustrates how data and insights gained early in an equivalent geologic setting can be effectively transferred to prospective disposal sites through application of generic safety assessments and can be used to inform subsequent design and implementation decisions. The Board makes no recommendations specific to the U.S. program at this time regarding construction of a new underground characterization facility, recognizing the merits of keeping multiple host rock options open in the early stages of site selection. Rather, the Board notes that DOE has made good use in the past of information gathered from existing underground characterization activities in various rock types worldwide.

The Board believes the lessons from other national repository implementers and our observations can help DOE determine a workable pathway towards the permanent disposal of spent nuclear fuel and high-level radioactive waste. We look forward to learning more about DOE's Nuclear Lifecycle Innovation Campus initiative and continuing our ongoing evaluation of the technical and scientific validity of DOE's activities related to managing and disposing of spent nuclear fuel and high-level radioactive waste.

Sincerely,

A handwritten signature in dark ink, appearing to read "Peter Swift", with a stylized, cursive script.

Peter Swift
Chair

cc: Ms. Marla Morales, Acting Deputy Assistant Secretary, Office of Spent Fuel and High-Level Waste Disposition

Attachment

Meeting Details and Summaries of Presentations Including Lessons Presented

The Board held a meeting in Arlington, VA, on June 9, 2026, on technical lessons learned from national deep geologic repository programs during the siting and development of deep geologic repositories for the disposal of spent nuclear fuel and high-level radioactive waste.⁶ The meeting examined programs in the Republic of Korea, Japan, the Czech Republic, Germany, Finland, and Switzerland to provide perspective across the full range of repository development activities. These countries collectively illustrate how a repository program progresses from early conceptual planning through site selection and implementation. For instance, the Republic of Korea is at an early stage in shaping its siting approach, while the Czech Republic has narrowed an initial group of thirty-two candidate areas to four potential sites. By contrast, Finland and Switzerland have selected repository sites and are focusing on post-selection activities, including site characterization, regulatory licensing and construction. Viewed collectively, these experiences illustrate how repository programs, and the range of considerations, evolve over time. While the Board recognizes that both technical and social considerations are important and interrelated in repository site selection, the Board focused the June 2026 meeting on the technical factors that support successful repository program outcomes.⁷

The presenters, all representing repository implementers, organized their presentations around a shared set of questions listed in the meeting agenda and provided in advance by the Board. These questions focused on national approaches to repository siting such as policy and regulatory frameworks, technical and scientific criteria, tools, and methodologies used in site selection, lessons learned, and how siting decisions influenced post-selection stages such as licensing, design evolution, and implementation. The Board also sought insight into the value of early application of practices such as quality assurance, requirements management, and systems engineering. Reflecting the order of their respective stages of repository program development, the following paragraphs summarize the presentations and technical lessons from the Republic of Korea, Germany Japan, , the Czech Republic, Switzerland, and Finland implementers.

Dr. Sungbok Lee described the Republic of Korea's high-level radioactive waste management program. The country established the legal and institutional framework in the 2025 Special Act on High-Level Waste Management and set a clear national path toward interim storage and deep geologic disposal. He chronicled how the program has moved from planning into implementation through a consent-based, stepwise siting process that begins with nationwide screening to exclude unsuitable areas. The program will progress to voluntary participation and increasingly detailed surface and subsurface investigations. The implementer, the Korea Radioactive Waste Agency (KORAD), uses a phased safety assessment approach that systematically evaluates geological conditions, engineered barriers, and long-term radionuclide isolation, which will culminate in the safety case required for licensing, to guide repository

⁶ The meeting agenda, presentation materials, transcript, and an archived recording of the webcast are available online at <https://www.nwtrb.gov/meetings/past-meetings/spring-2026-board-meeting---june-9--2026>.

⁷ The Board's international siting workshop in 2023 focused on the social and institutional considerations for developing consent during siting of a new radioactive waste facility. https://www.nwtrb.gov/docs/default-source/reports/nwtrb_2024_proceedings-report.pdf?sfvrsn=d004c305_3.

development. KORAD will design the repository to accommodate their inventory of spent fuel from both pressurized water and pressurized heavy water reactors. Research and demonstration activities include development of a generic underground research laboratory in crystalline rock. KORAD is using its research and demonstration program, including repository design and performance assessment efforts to build technical confidence and support future storage and disposal facilities.

Dr. Axel Liebscher described Germany's repository site selection program including the inventory of spent nuclear fuel and vitrified high-level waste that needs disposal in a deep geologic repository.⁸ The program is guided by a systematic and robust legal framework based on the 2017 Repository Site Selection Act and 2020 safety ordinances. The Act established a multi-phase process that begins with a "white map," meaning no sites are preselected. Other main principles in the Act include a participative, science-based, transparent, self-questioning, and learning procedure for siting and the requirement to meet a "best possible safety" for a period of one-million years standard. Using information gathered by the implementer, Bundesgesellschaft für Endlagerung (Federal Company for Radioactive Waste Disposal, BGE), the German parliament and the regulator will decide what that "best possible safety" standard means. BGE is conducting representative preliminary safety analyses which follow an iterative, four-step screening sequence to evaluate all potential repository sites identified in salt, crystalline and argillite host rocks found in Germany. The implementer applies uniform exclusion criteria and progressively detailed safety and geoscientific requirements to identify areas with the largest safety margins. In 2025, BGE largely completed the initial representative preliminary safety analyses steps and published interim results, which showed that many sub-areas in the country have advanced beyond preliminary safety screening. BGE anticipates identifying the first areas of high suitability in 2026, and a formal proposal for siting regions for surface investigations by the end of 2027. BGE learned it needed to define host-rock-specific safety criteria and develop comparison methodologies to effectively distinguish among different geologic environments and support identification of the most suitable sites because generic host-independent criteria in the site selection act were insufficient.

Mr. Hiromitsu Saegusa presented an overview of Japan's deep geologic repository program, describing a phased site-selection process established under the Final Disposal Act of 2000. As of 2026, Japan has 28,000 canisters of vitrified waste and the implementer, the Nuclear Waste Management Organization of Japan (NUMO), is planning the disposal facility to accommodate more than 40,000 canisters. Disposal of vitrified high-level waste would occur at depths greater than three hundred meters in stable geologic settings and rely on a multi-barrier system that combines engineered components with the surrounding host rock. NUMO conducts its site selection activities and safety evaluations under clearly defined statutory and regulatory criteria. The criteria screen out areas affected by active faults, Quaternary volcanism, significant uplift or erosion, or economically valuable mineral resources. NUMO supports its siting process by conducting site descriptive modeling to understand long-term geologic conditions. The siting process begins with a literature survey based on desk-top evaluations and will advance, only with local consent, to progressively more detailed investigations. As of mid-2026, NUMO has literature survey activities underway in four locations. NUMO's completed literature surveys in two municipalities helped clarify program readiness to move forward, including identifying

⁸ Germany's inventory of waste is fixed because the nation stopped producing nuclear power in 2023.

specific technical issues that NUMO would address if the siting process moved forward. Mr. Saegusa emphasized that the nationwide map of scientific features has played a vital role in supporting dialogue and improving public understanding in the siting process by clearly distinguishing favorable and unfavorable areas and showing that geological disposal is feasible in Japan.

Dr. Markéta Dohnálková presented the Czech Republic's approach to siting a deep geologic repository. Správa úložišť radioaktivních odpadů (Czech Radioactive Waste Repository Authority, SÚRAO) implements this program within a defined legislative and regulatory framework in which long-term safety is the primary basis for decision-making. The program follows a phased, stepwise process—screening, preliminary safety assessment, and comparative evaluation—to narrow candidate locations to a final and backup site. The Czech repository siting approach requires identification of a sufficiently large and suitable rock volume, with an adequate reserve, to accommodate the entire, current, and projected, Czech waste inventory of radioactive wastes requiring deep geologic isolation. Site evaluations consider the structural integrity and thermal properties of the host rock to support long-term performance at a depth of five hundred meters in crystalline rock. SÚRAO uses a reference-site safety case that defines transferability parameters to compare with site-specific data to assess whether the disposal concept can perform safely under local conditions. The Czech program uses the Bukov Underground Research Facility to generate site-relevant data and test key aspects of the repository concept, helping to inform both safety assessment and design. Dr. Dohnálková described SÚRAO's program as an evidence-based approach in which siting decisions are transparent, traceable, and grounded in systematic evaluation of geologic conditions and barrier system performance. SÚRAO has learned that a clear, well-defined process and a consistent focus on safety supports credible decision-making. As the Czech repository program has progressed, SÚRAO has learned that transparency, stakeholder engagement, and systematic management of uncertainty are essential throughout the disposal program. Dr. Dohnálková concluded that the Czech deep geologic repository program's long-term progress depends on sustained commitment, continuity of expertise, and allowing sufficient time for data collection and evaluation.

Dr. Michael Schnellmann described Switzerland's radioactive waste management program. The deep geologic repository will contain all Swiss spent nuclear fuel and high-level radioactive waste. Switzerland used the federal Sectoral Plan for Deep Geological Repositories, which is a legally defined, stepwise, and safety-driven process for siting. The sectoral plan clearly defines institutional roles and responsibilities, requires federal review of decisions, and includes a provision for a national referendum at final approval. The implementer, Nationale Genossenschaft für die Lagerung radioaktiver Abfälle (National Cooperative for the Disposal of Radioactive Waste, Nagra), advanced through successive stages of technical screening and confirmation using a set of explicit safety criteria and extensive site investigations to identify a preferred location in northern Switzerland for the repository site. The site investigations included large-area three-dimensional seismic surveys and multiple deep exploration boreholes that provided a robust data set for comparative safety evaluation and demonstration of long-term isolation capability. The location is not tectonically complex, which would allow Nagra to develop the entire multi-square-kilometer repository in a single block of rock not crossed by faults. The site is underlain by a thick and laterally extensive clay-rich formation with favorable and well-characterized properties, including very low hydraulic conductivity, strong sorption

capacity, efficient self-sealing behavior, and long-term geologic stability. Nagra learned that a science-based, criteria-driven approach, staged decision making supported by progressively more detailed data, early and sustained engagement with regulators, stakeholders, and local communities, and transparent sharing and discussion of technical information to build trust and avoid delays were keys to their success. Nagra has submitted general license applications for the repository project, which are under regulatory review, and has begun transitioning to project development. Nagra is planning a detailed shaft design, preparing more subsurface investigations, establishing site monitoring systems, completing an environmental impact assessment, and continuing data acquisition to support confirmation of reference models, the safety case, and subsequent construction licensing and implementation.

Dr. Barbara Pastina described the Finnish implementer's (Posiva) experience as a source of practical lessons on siting, licensing, construction, and implementation. Posiva's phased repository program began with site investigation and selection and then focused on preparing a construction license application. The program evolved to focus on constructing the repository and preparing an operating license application. Posiva is now preparing to operate the facility and is further developing the disposal system. Dr. Pastina described the phased, iterative, flexible, adaptive process for repository design development, emphasized that change is expected, and explained how Posiva's knowledge and experience grew during each phase of the program. Posiva learned that planning for safety and long-term performance from the outset is important. The organization developed increasingly robust and streamlined designs that met all safety requirements, while relying more on proven, off-the-shelf, components and well-established processes—an approach that improves implementability and reduces sensitivity to operational variations or human error. Dr. Pastina noted that requirements management is important particularly during the early phases and during optimization and highlighted the value of employing a formal requirements management system to document and track evolving site-specific design criteria. Such a system maintains transparency and traceability as the repository design is refined over time and ensures that modifications remain aligned with safety objectives. Because repository development spans several decades, the implementing organization must be flexible and plan and adapt its management structure and technical competencies as the project evolves. Posiva learned that a strong safety culture and sustained, open dialogue with regulators and other stakeholders are essential for facilitating safe implementation of changes, sustaining trust, and ensuring that continuous improvement is achieved throughout the repository program's lifecycle.

The following common key lessons are relevant to the siting and development of deep geologic repositories.

1. Disposal programs are developed to dispose of the existing and projected inventories of waste. Five implementers summarized their current and projected inventories and their disposal plans. SÚRAO and Nagra use adequacy of host rock size as a criterion in their siting process to determine whether a site could contain a repository and its wastes.
2. All disposal programs benefit from a robust legislative and institutional framework that is established before siting begins, including well-defined laws and regulations governing safety, security, and environmental protection. The framework supports repository

program development, from site selection and licensing through repository closure, and provides the clarity and direction needed for implementation.

3. All national programs use a phased, flexible, and adaptable approach to develop their repositories and a stepwise site selection process beginning with some version of a nationwide screening, progressively narrowing candidate sites through surveys, boreholes, and underground investigations.
4. Underground research and characterization facilities can play an important role in repository programs. Five countries highlighted planned or existing underground research laboratories that can collect long-term data, assess models, and build scientific and technical capacity. Finland, Germany, and Switzerland have used, or plan to develop, underground characterization facilities at candidate repository sites to test and demonstrate technologies and for additional detailed site characterization.
5. Focusing on safety early, and continuously, helps the implementer prepare to become a licensee and facilitates interactions with stakeholders during siting and subsequent steps. Five countries described using safety assessments as well as explicit safety criteria approved by the regulator to justify the selection or exclusion of candidate sites. Posiva noted that early planning around safety ensures they can comply with regulatory safety requirements even as their program evolves.
6. Organizational capacity, tools, and processes are needed to support licensing and implementation from the outset. Presentations from countries in more advanced stages of repository development, particularly Finland and Switzerland, highlighted the importance of maintaining the technical capabilities, institutional processes, and management systems needed to sustain progress through successive phases of licensing, construction, and disposal.



THE REPORT TO THE PRESIDENT AND THE CONGRESS BY THE SECRETARY OF ENERGY ON THE NEED FOR A SECOND REPOSITORY

December 2008

U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Washington, D.C.



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THE REPORT TO THE PRESIDENT AND THE CONGRESS BY THE SECRETARY OF ENERGY ON THE NEED FOR A SECOND REPOSITORY

1. FINDING AND RECOMMENDATION

The Nuclear Waste Policy Act of 1982, as amended (NWPAA), sets a statutory capacity limit of 70,000 metric tons heavy metal (MTHM) for the Nation's first spent nuclear fuel (SNF) and high-level radioactive waste (HLW) geologic repository, which has been designated by the Congress and the President to be sited in Yucca Mountain in Nye County, Nevada. Under the NWPAA, this statutory limit on the amount of SNF and HLW to be disposed of at Yucca Mountain will remain in place until a second repository is in operation. The inventories of commercial and Federal Government SNF and HLW in the United States are projected to exceed 70,000 MTHM by 2010, therefore additional repository capacity is needed. The 70,000 MTHM statutory limit for the first repository is not based on any technical considerations related to Yucca Mountain, and studies indicate that the repository layout at Yucca Mountain can be expanded to accommodate three times, or more, the current statutory limit of 70,000 MTHM. This capacity would be sufficient for disposing of the SNF from the existing fleet of reactors, even if all of their licenses are extended to allow them to operate for 60 years. If the number of nuclear power plants grows, a second repository may ultimately be needed beyond expansion of Yucca Mountain. The Secretary of Energy recommends that, consistent with legislation that the Administration proposed in 2007, Congress act promptly to remove the statutory limit of 70,000 MTHM for the Yucca Mountain repository, thereby permitting a deferral of a decision regarding the need for a second repository. This deferral allows for the decision regarding a second repository to consider how much additional capacity is needed, whether or not recycling of SNF is appropriate and should be implemented, and what waste management approaches for the additional SNF may be most appropriate.

2. EXECUTIVE SUMMARY

The Nuclear Waste Policy Act of 1982, as amended (NWPAA), establishes a process for the siting, construction and operation of one or more national repositories for permanent disposal of the Nation's spent nuclear fuel (SNF) and high-level radioactive waste (HLW). In 1987, after the Department of Energy (the Department or DOE) had conducted studies of nine potential repository sites located throughout the United States, Congress amended the NWPAA and selected the Yucca Mountain site in Nye County, Nevada as the only site for further study for the first national repository. In 2002, Congress passed and the President signed Public Law 107-200, which approved Yucca Mountain as the site for that repository. On June 3, 2008, the

Department submitted a license application to the Nuclear Regulatory Commission (NRC) seeking construction authorization for the repository at Yucca Mountain.

This report is prepared pursuant to Section 161 of the NWPAⁱ, which requires the Secretary of Energy (the Secretary) to report to the President and to the Congress on or after January 1, 2007, but not later than January 1, 2010, on the need for a second repository. In preparing this report, the Department has considered the relevant statutory provisions of the NWPA, the current and projected inventories of SNF and HLW, and the projected capacity of the proposed Yucca Mountain repository.

In particular, the Department has considered the provisions of the NWPA which currently set a statutory capacity limit on the amount of commercial and government-owned SNF and HLW that can be emplaced in the Nation's first repository to 70,000 metric tons of heavy metal (MTHM), until a second repository is in operation. Specifically, Section 114(d) of the NWPAⁱⁱ "prohibit[s] the emplacement in the first repository of a quantity of spent fuel containing in excess of 70,000 metric tons of heavy metal or a quantity of solidified high-level radioactive waste resulting from the reprocessing of such a quantity of spent fuel until such time as a second repository is in operation."

The Department has also considered President Reagan's decision in 1985, pursuant to Section 8 of the NWPA, to use the disposal capacity of the first repository for the disposal of HLW, including DOE and U.S. Navy SNF, resulting from national defense activities. Subsequent to President Reagan's decision, the Department established a policy to allocate ninety percent (90%) of the first repository capacity (in MTHM) to civilian SNF and ten percent (10%) of the repository capacity to Department-managed SNF and HLW. Accordingly, 63,000 MTHM of the 70,000 MTHM statutory limit is allocated to civilian waste and 7,000 MTHM of the 70,000 MTHM statutory limit is allocated to national defense waste.

The Department has considered that there is currently more than 58,000 MTHM of commercial SNF in storage in the United States, and the total inventory of commercial SNF continues to increase at a rate of about 2,000 MTHM per year. DOE expects that, by 2010, commercial nuclear power plants will have generated the entire amount of commercial SNF (that is, 63,000 MTHM) that is allocated for disposal in the Yucca Mountain repository under the current statutory cap. Assuming all existing operating nuclear reactors in the United States request license extensions from the NRC to operate for 60 years, the amount of commercial SNF from these reactors in the United States requiring permanent disposal is projected to be approximately 130,000 MTHM. Further, there is currently approximately 12,800 MTHM of DOE SNF and HLW, including naval SNF, in storage at government sites. This quantity exceeds the 7,000 MTHM of national defense waste allocated for disposal in the Yucca Mountain repository. Additionally, nuclear utilities have expressed their intention to file, by the end of 2010, license applications seeking approval for the construction and operation of 34 new nuclear reactors. If these reactors become operational, they would substantially increase the amount of nuclear generation and will result in additional spent nuclear fuel requiring disposal. **Unless Congress raises or eliminates the current statutory capacity limit of 70,000 MTHM in the NWPA, the Nation will need a second repository for SNF and HLW.**

To address this need, the Department has further considered the following three alternatives and possible ways to move forward:

- (1) Remove the statutory limit of 70,000 MTHM for Yucca Mountain and dispose of currently projected quantities of SNF and HLW at the Yucca Mountain repository;
- (2) Begin the process of siting, designing, licensing and constructing a second repository as soon as possible so it will be ready to receive SNF and HLW by the time 70,000 MTHM has been emplaced in the Yucca Mountain repository; or,
- (3) Defer the decision and prolong the time commercial SNF generated after 2010 will be stored at reactor sites, as well as the time DOE SNF and HLW will be stored at DOE sites.

In addressing the first alternative of removing the statutory limit and placing more than 70,000 MTHM of SNF and HLW at Yucca Mountain, the Department has considered the additional area available for disposal at Yucca Mountain. The 70,000 MTHM statutory limit that Congress established in 1982 for the first repository is not based on any technical considerations related to Yucca Mountain. Studies indicate that three times, or more, this statutory limit could be accommodated by expanding the repository layout at Yucca Mountain.

In addressing the second alternative of developing a second repository, the Department has considered previous work performed to identify candidate repository sites. That work shows that all states in the contiguous United States have an identified potential site or area that could be considered for a second repository.

In considering the third alternative of deferring a decision, the Department has considered the impacts of leaving uncertain the disposal path for the commercial SNF and national defense waste in excess of the current 70,000 MTHM statutory limit. Each year a decision is deferred, the Federal Government will incur additional financial liabilities. In addition, deferral of a decision increases the possibility the Department will be unable to honor, in a full and timely manner, its commitments to states that currently store national defense HLW and SNF within their borders—including Washington, Idaho, and South Carolina, among others.

Finally, the Department has also considered legislative actions that would be needed to implement the alternatives. The first alternative would require removing the current statutory limit of 70,000 MTHM, as the Administration has proposed previously. The second alternative would require legislative action to specify the process for siting, design, licensing and constructing a second repository. The third alternative would require Congressional direction to the Department on how to address the damages resulting from the delay and on what to do with the HLW and SNF that could not be placed in Yucca Mountain.

As set forth more fully below, the Secretary recommends that the preferred course of action is legislative removal of the statutory capacity limit of 70,000 MTHM. Removal of this statutory limit would defer the urgency in evaluating the issues associated with a second repository.

3. HISTORY OF THE NWPA

When first enacted in 1982, the NWPA provided for the development by the Department of two geologic repositories. Specifically, the NWPA directed the Department to identify three candidate sites for the first repository and to conduct a multi-year evaluation of each of the sites. The site characterization process was to be repeated for a second set of sites for the second repository. The Department was directed to issue general guidelines for the program, which were finalized in December 1984 as General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories (10 CFR Part 960). In addition, the NWPAⁱⁱⁱ established a statutory limit on the quantity of SNF that could be emplaced in the first repository until such time as a second repository is in operation. This statutory limit is 70,000 MTHM, or a comparable quantity of solidified HLW resulting from the reprocessing of such a quantity of SNF.

Through passage of the Nuclear Waste Policy Amendments Act of 1987 (the Amendments Act), Congress redirected the Department to focus its site characterization activities only at Yucca Mountain, Nevada. The Amendments Act also terminated site-specific activities at all candidate sites other than the Yucca Mountain site (i.e., the Deaf Smith County, Texas and Hanford, Washington sites). The Amendments Act also banned future site-specific activities with respect to a second repository unless and until Congress specifically authorizes and appropriates funds for such activities, and requires the Secretary to report to the President and to Congress on or after January 1, 2007, but not later than January 1, 2010, on the need for a second repository. The Amendments Act did not modify the statutory capacity limit of 70,000 MTHM for the first repository.

In 2002, in accordance with the framework established by the NWPA, as amended, the Secretary recommended the Yucca Mountain site to the President for development as a repository. The President accepted the Secretary's recommendation and submitted the recommendation to Congress. Subsequently, the Governor of Nevada submitted a Notice of Disapproval. Congress passed a joint resolution approving the Yucca Mountain site for development and the President signed the resolution into law (Public Law 107-200).

4. FUNDING FOR SNF AND HLW DISPOSAL ACTIVITIES

The NWPA authorizes the Secretary to enter into contracts with utilities for the acceptance and disposal of SNF. The terms for these contracts, which are known as the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract), are set forth in 10 CFR Part 961. The Department has executed contracts with individual utilities operating the nation's current fleet of nuclear power plants. The Standard Contract provides that, in return for the payment of fees, the Department will take title to and dispose of SNF covered by the contract as expeditiously as practicable following commencement of operation of a repository, beginning not later than January 31, 1998. The failure of DOE to begin acceptance of SNF under the contracts has been the subject of litigation between DOE and the utilities.

The Standard Contract also provides for the payment of fees into the Nuclear Waste Fund to fund activities associated with the disposal of civilian SNF. Those fees have to date been set at 1.0 mill (one-tenth of one cent) per kilowatt-hour, on the commercial generation of nuclear power by contract-holders. The Secretary must review the fee annually to determine its

adequacy, and propose adjustments, as needed, to ensure full cost recovery. In addition, costs associated with the disposal of DOE SNF and HLW are paid by appropriations of general revenue funds.

5. WASTE STREAM FOR DISPOSAL

The SNF and HLW planned for disposal in Yucca Mountain consists of two principal types: 1) commercial SNF generated by nuclear power reactors and 2) DOE SNF and HLW. The inventory of material at DOE sites is essentially fixed, and consists principally of DOE SNF resulting from government nuclear weapons programs, research reactors, reactor prototypes, and nuclear-powered naval vessels; and HLW created from reprocessing commercial and DOE SNF. Only the inventory of naval SNF, which is critical to the Nation's national security needs, continues to increase materially. The inventory of material at DOE sites is approximately 2,500 MTHM of DOE SNF and approximately 10,300 MTHM of DOE HLW, for a total of approximately 12,800 MTHM^{iv}. This exceeds the 7,000 MTHM portion of the 70,000 MTHM statutory limit for Yucca Mountain that is currently allocated to DOE SNF and HLW.

The commercial SNF inventory, which includes commercial SNF generated by 104 operating reactors and 14 reactors that have ceased operation, currently is approximately 58,000 MTHM and is increasing by approximately 2,000 MTHM annually. It is also possible to make reasonable projections of the total amount of spent fuel that will be generated by the existing fleet. The major variable in making projections concerning future generation of commercial SNF from the existing fleet is the issuance of 20-year operating license extensions to many reactors (for a possible total lifetime of 60 years). As of January 2007, 47 license extensions had been granted. Figure 1 shows the historical and projected commercial SNF inventory if all currently operating reactors operate to the end of their licensed lifetimes (note that currently, no reactor has operated even to the end of its initial 40 year license). Projections are shown for a case that assumes only 47 reactor-life extensions and a bounding case that assumes all 104 operating reactors receive life extensions. The 47 reactor-life extension projection is approximately 109,300 MTHM, and the 104 life extension projection is approximately 130,000 MTHM. It should be noted that, regardless of the number of life extensions assumed, the current 63,000 MTHM portion of the 70,000 MTHM statutory limit for Yucca Mountain that is allocated to commercial SNF will be exceeded by 2010.

The projections used in preparing this report do not include any commercial SNF from the future operation of possible new reactors. The projections used in this report also do not take into account the possible effects of any decision to proceed with any of the reprocessing options being considered as part of the Global Nuclear Energy Partnership (GNEP) initiative. The current 70,000 MTHM statutory limit as defined in the NWPA pertains to the heavy metal content of the original fuel. As a result, from a repository capacity standpoint, it does not matter if SNF is emplaced as the original spent fuel rods or the SNF is reprocessed and only the resulting HLW is emplaced. Only the waste forms that originate from 70,000 MTHM can be emplaced. In any event, all reprocessing technologies under consideration as part of the GNEP initiative would produce wastes requiring disposal in a repository and moreover, deployment of reprocessing technologies would have little, if any, effect on the quantity of DOE SNF and HLW as they are not likely candidates for reprocessing.

It should be noted, however, that under a scenario where the number of future new nuclear plants grows substantially, the use of reprocessing technologies would extend the use of the Yucca Mountain repository, and if a second repository ultimately is necessary, would also prolong the use of that repository. Further, to the extent that reprocessing reduces or eliminates the need for retrievability of waste between the time it is emplaced in a repository and closure of that repository, this could result in increased operational efficiencies, lower costs for repository construction and operations, and open additional geologic media, such as salt formations, to consideration.

As far as the conclusions contained in this report are concerned, the projections of waste considered in this report are based on reasonable assumptions reflecting current policy, and speculation as to future policy has been limited to the extent practicable.

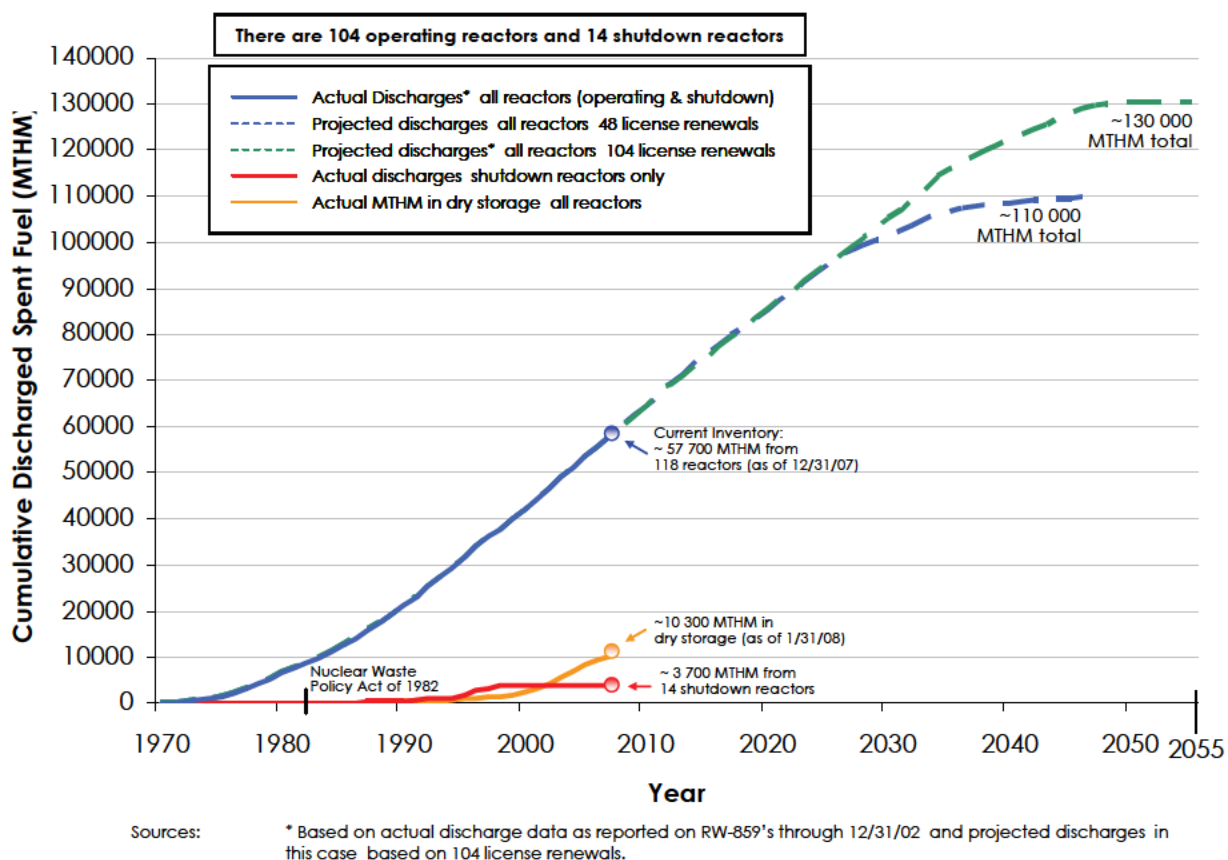


Figure 1. Historical and Projected Commercial SNF Generation Inventory from Existing Fleet (if all currently operating reactors operate to the end of their licensed lifetimes)

6. THREE ALTERNATIVES CONSIDERED

A repository at Yucca Mountain subject to the NWPA statutory capacity limit of 70,000 MTHM cannot accommodate the projected amount of 122,100 MTHM. The 63,000 MTHM allocation for commercial SNF within the 70,000 MTHM statutory capacity limit will be reached by SNF discharged by existing reactors by 2010, well before the Yucca Mountain repository begins operations. Accordingly, there is a need for additional repository capacity beyond the current statutory limit on the Yucca Mountain repository if the Department is to be able to carry out the mandate of the NWPA to provide for the disposal of defense and commercial SNF and HLW produced in the United States. If the statutory limit on the Yucca Mountain repository is not lifted, then a second repository will be needed.

The Department has considered three alternatives for addressing this need for disposal capacity beyond the 70,000 MTHM limit:

- Removing of the statutory limit of 70,000 MTHM for Yucca Mountain and disposal of currently projected quantities of SNF and HLW at the Yucca Mountain repository;
- Beginning the process of siting, designing, licensing and constructing a second repository as soon as possible so it will be ready to receive SNF and HLW by the time 70,000 MTHM has been emplaced in the Yucca Mountain repository; or
- Deferring the decision and prolonging the time commercial SNF generated after 2010 will be stored at reactor sites, as well as the time DOE SNF and HLW will be stored at DOE sites.

6.1 REMOVING THE STATUTORY LIMIT OF 70,000 MTHM FOR YUCCA MOUNTAIN

Lifting the statutory limit of 70,000 MTHM would provide a substantial increase in the capability of the Department to accept SNF and HLW for disposal without the need for a second repository. It would avoid the additional costs and timing

uncertainties associated with an effort to site and develop a second repository. The Yucca Mountain repository would likely have sufficient capacity to dispose of the entire defense waste inventory plus the commercial SNF expected to be produced by the existing fleet of nuclear power reactors. The conclusion that removing the 70,000 MTHM limit on the Yucca Mountain repository can meet the currently projected needs for additional disposal capacity is based on studies indicating that Yucca Mountain has the physical capability to allow disposal of a much larger inventory. The 70,000 MTHM statutory limit on capacity of the first repository until a second repository is in operation is not based on any technical considerations related to the characteristics of possible repository sites or geologic media.

The NWP provides no limit on the amount of SNF and HLW disposed of in the first repository after a second repository begins operation.

The Physical Capacity of Yucca Mountain

The 70,000 MTHM limit on the amount of waste that can be placed in the first repository is a statutory capacity limit, and the limit only applies until a second repository is in operation. If that statutory limit was removed, the amount of waste that could be placed in a Yucca Mountain repository would be a function of design constraints that address the heat load that the waste would introduce in the rock mass and the volume

The current repository layout encompasses 1250 acres. Past studies examined design layouts that encompass as much as 4200 acres; this is more than three times the area of the layout used to accommodate 70,000 MTHM.

of rock of sufficient quality to allow the design to meet the constraints. The heat load, which is a function of burn-up and age of the SNF, is dictated by which SNF is shipped to the repository (referred to as the waste stream), how the SNF is loaded in waste packages, whether the waste packages are aged prior to emplacement, and the spacing or sequencing of waste packages when emplaced. The length of ventilation time prior to repository closure is also a key parameter in determining the amount of waste that can be placed in a given volume of rock. The volume of rock is dictated by the geologic characteristics of the site.

As the design of the repository evolved, DOE undertook additional studies^v of potential expansion areas. Questions and comments related to both the capacity of Yucca Mountain and the types of waste that could be placed in a repository led the Department to evaluate the cumulative impacts for an inventory larger than the Proposed Action in the 2002 Final Environmental Impact Statement (Final EIS)^{vi} prepared at the time of Site Recommendation. The additional waste considered consisted of the remainder of the total projected inventory of commercial SNF, DOE SNF and DOE HLW.

The current repository layout encompasses 1,250 acres at a thermal load of approximately 55 to 60 MTHM/acre. Past studies have shown design layouts that encompass as much as 4,200 acres, which is more than three times the area of the layout currently used to accommodate 70,000 MTHM (Figure 2). Also, recent thermal loading studies^{vii} indicate that the allowable thermal load is greater than the 55 to 60 MTHM/acre value currently used. More importantly, those studies, which are based on extrapolation of data from the area that has been characterized in detail for the 70,000 MTHM inventory in the Yucca Mountain license application to NRC, indicate that significantly greater thermal loads can be accommodated by extending the time that the repository is open and ventilated prior to repository closure.

Taken together, those studies provide confidence that a repository at Yucca Mountain has the capacity to handle all of the DOE SNF and HLW and the projected inventory of commercial SNF assuming operating life extensions for all of the existing commercial nuclear power reactors.

An independent study^{viii} found similar results, concluding that the current statutory limit on Yucca Mountain disposal capacity is a small fraction of the actual available physical disposal capacity at the Yucca Mountain site. That study concluded that at least four times this statutory limit established by Congress could be emplaced at Yucca Mountain, and that, with additional site characterization, potentially as much as nine times the statutory limit could be emplaced.

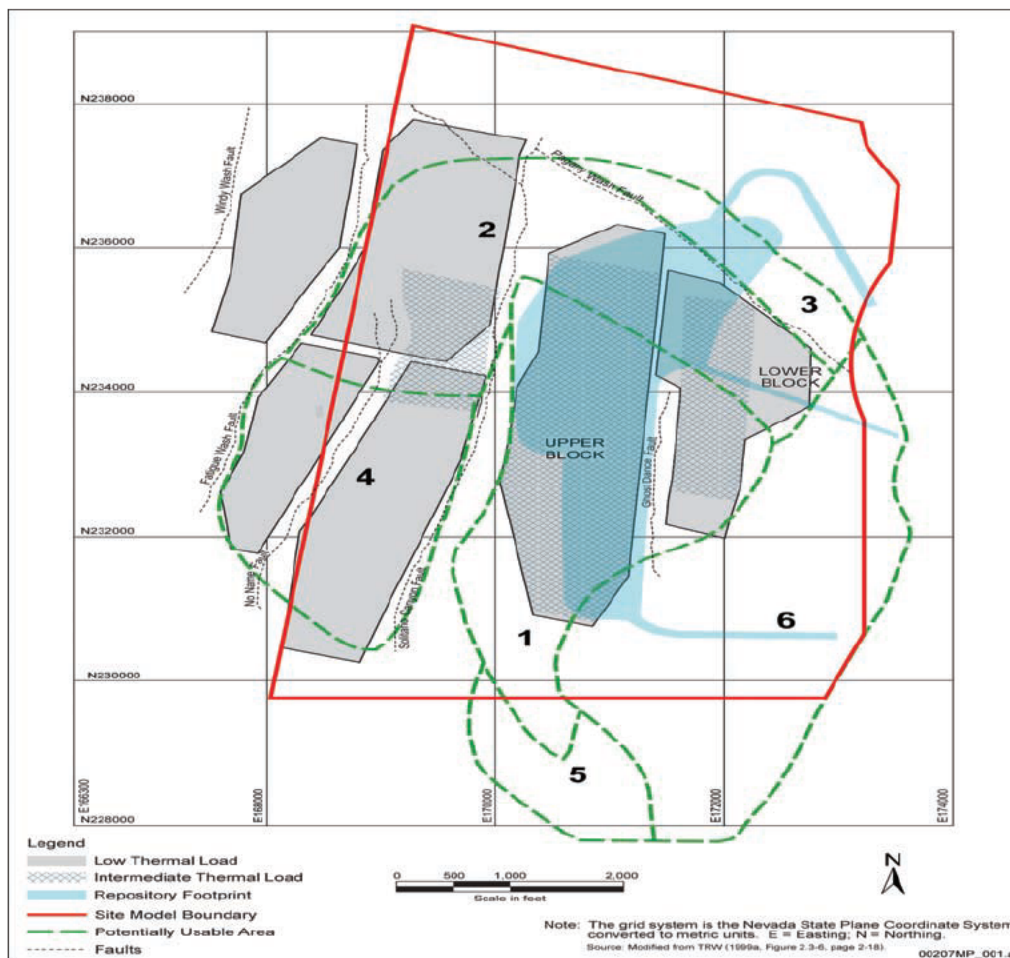


Figure 2. Potential Repository Emplacement Areas (after Mansure and Ortiz) ^{ix}

Total of potential emplacement areas is 9,500 acres. Also shown are current and past repository layouts and areas.

6.2 BEGINNING THE PROCESS OF SITING, DESIGNING, LICENSING, AND CONSTRUCTING A SECOND REPOSITORY AS SOON AS POSSIBLE

If the statutory limit of 70,000 MTHM is not modified, a second repository is needed. Due to specific limitations included in the NWPA,^x new authorizing legislation and specific appropriations would be needed before the Department could conduct any site-specific work on a second repository. In addition, specific authorization would be needed to construct a second repository since the NWPA authorizes only the first repository and limits use of the Nuclear Waste Fund to construction of facilities specifically authorized by law. Finally, the Amendments Act deleted the provisions relating to siting a second repository and amended the key provisions in Section 114 relating to site recommendation, National Environmental Policy Act requirements, and licensing to apply specifically to Yucca Mountain. These changes leave the process for siting and licensing a second repository undefined.

The analysis in this report assumes a second repository would have to begin operation by 2041 in order to permit DOE to continue waste acceptance without disruption. This assumption is based on emplacing the 70,000 MTHM permitted by current law in Yucca Mountain by 2041. The schedule for the second repository assumes that the siting, designing, licensing, and construction process for the second repository would begin in 2011, allowing 28 years for the completion of that process. The 1987 Mission Plan Amendment, issued before the Amendments Act was passed, presented a schedule for siting and developing a second repository following a national site survey. The process was estimated to take about 28 years. That estimate was based on use of the second repository provisions of the NWPA of 1982, which specified the details of the siting and licensing process. That period may be considered optimistic, since the time between the start of the first repository siting process in 1983 and the earliest possible start of operations at Yucca Mountain in 2020 is 37 years.

In addition, the need for legislation before any site-specific work could be performed introduces substantial uncertainty into the schedule for a second repository. Opening the NWPA to reinstate a second repository program could reopen all of the issues about the siting process that took years of congressional effort to resolve prior to passage of the Act in 1982 – the role of host states, the number of sites to be characterized, criteria for guidelines, the site recommendation process, voluntary versus directed siting, and other matters. One approach would be simply to reinstate the deleted second repository provisions and add authorization for construction of a second repository. Even then, however, the elimination of parallel characterization of three sites for the first repository in 1987 suggests that the number of sites to be characterized for a second repository would need to be revisited.

Assuming the process must begin around 2011 to avoid a halt in receipts between the time Yucca Mountain reaches the statutory limit and the second repository is in operation, Congressional action to establish the siting process and provide the needed funding would be needed by 2010.

Siting a Second Repository

If the Congress chooses not to raise or eliminate the statutory cap on the disposal capacity at Yucca Mountain and instead chooses to authorize a second repository program, the most efficient path to identifying potential sites for a second repository would be to start with the other sites and areas that were under consideration for either the first or second repository before the Amendments Act was passed. The nine sites comprising the first Repository Screening Program were:

First Repository Sites	Geologic Media
Vacherie Dome, Louisiana	Dome salt
Cypress Creek Dome, Mississippi	Dome salt
Richton Dome, Mississippi	Dome salt
Yucca Mountain, Nevada	Tuff
Deaf Smith County, Texas	Bedded salt
Swisher County, Texas	Bedded salt
Davis Canyon, Utah	Bedded salt
Lavender Canyon, Utah	Bedded salt
Hanford Site, Washington	Basalt flows

DOE reference documents^{xi} prepared in the same timeframe identify 17 states within which there were granitic bodies believed to be adequate for investigation for siting a repository for the second repository program. The states identified included:

Minnesota	Wisconsin
Michigan	Maine
New Hampshire	Vermont
Massachusetts	Connecticut
Pennsylvania	New York
New Jersey	Delaware
Maryland	Virginia
North Carolina	South Carolina
Georgia	

Supporting references^{xii, xiii} identify eight additional states under consideration by the crystalline rock program as having granitic bodies that could be adequate for investigation for siting a repository for the second repository program:

Washington
Idaho
Arizona
Wyoming
Texas
Alabama
South Dakota
Oklahoma

Therefore, from the original first and second repository programs a total of 31 states have been identified that have potential sites or areas that could be evaluated for their potential for a second repository. These states are illustrated on Figure 3.

In the 1987 Mission Plan Amendment released before passage of the Amendments Act, the Department described an alternative program for proceeding with a second repository that started the second repository program over again with a national site screening process that would expand the types of geologic media and number of geographical areas considered. Some work already existed at that time to provide a basis for such an alternative approach. For example, in order to increase the diversity of rock types under consideration by the geologic repository program, the Department had initiated the Sedimentary Rock Program (SERP) in 1984. The objective of this program was to evaluate five types of sedimentary rock (sandstone, shale, chalk, carbonate rocks, and anhydrite) to determine the potential for locating a geologic repository site in one of these rock types. In that evaluation,^{xiv} shales were found to be equal to, or better than, the other four rock types.^{xv} Hard or rocklike shales having the favorable characteristics leading to this conclusion occur extensively in the conterminous United States.

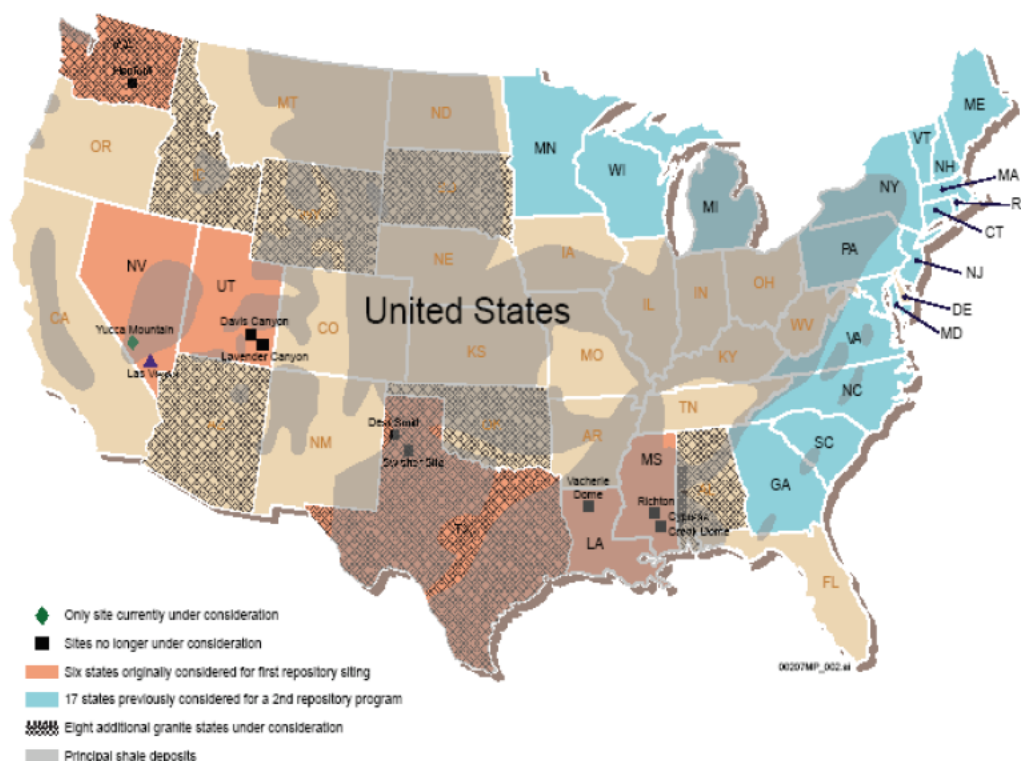


Figure 3. Map of the United States Illustrating First Repository Program Sites, Second Repository Program Areas Under Consideration, and Shale Deposits Potentially Suitable for a Repository

The outline of these shale deposits is overlain on Figure 3. This figure shows that, with the addition of states that have potentially suitable shale deposits, all states in the contiguous United States have a potential area that could be considered for the second repository.

6.3 DEFERRING THE DECISION

If the statutory limit of 70,000 MTHM is not modified, and the decision to build a second repository is deferred indefinitely, this would raise a number of significant issues. The Department has assessed the impacts of deferring such a decision. As a general matter, deferring this decision would prolong the time commercial SNF generated after 2010 will be stored at reactor sites, as well as the time DOE SNF and HLW will be stored at DOE sites. As noted previously, by 2010 the inventory of SNF generated by commercial nuclear power reactors will reach 63,000 MTHM which is the portion of the 70,000 MTHM statutory limit allocated to commercial SNF. Thus, if the current statutory cap remains in place, commercial SNF generated after 2010 cannot be emplaced in a repository until a second repository begins operation. Also, as noted previously, about half of the DOE SNF and HLW (approximately 5,800 MTHM) cannot be emplaced in a repository until a second repository begins operation.

With respect to commercial SNF, deferral of a decision would likely result in additional liabilities under the Standard Contracts. Under federal court decisions related to the Department's failure to begin accepting waste for disposal in 1998, as required by current law,

the Department has been found to be liable for certain damages attributable to the delay in SNF acceptance. In a 2002 decision, the 11th U.S. Circuit Court of Appeals held that the Department is not authorized to spend Nuclear Waste Fund monies on settlement agreements compensating the utilities for their onsite storage costs.^{xvi} Rather, damages are paid by federal taxpayers through the U.S. Treasury's Judgment Fund. DOE has estimated that the liability associated with the delay in waste acceptance, based upon the beginning of operations at Yucca Mountain in 2020, and continuing without interruption until all the spent nuclear fuel has been received, may be up to \$11 billion, and could increase significantly for each additional year operations are delayed or interrupted.

Deferring a decision on the second repository until a choice is made whether to pursue one of the reprocessing options currently under consideration does not affect the analysis concerning commercial SNF. As noted previously, application of the current 70,000 MTHM statutory limit is the same whether SNF is emplaced as the original spent fuel rods or the SNF is reprocessed and only the resulting HLW is emplaced. In addition, while reprocessing offers the potential to make the fuel cycle and disposal more efficient, there is no basis to speculate what, if any, volume of SNF generated before the deployment of reprocessing technology will be reprocessed. It is highly uncertain to what extent the economic and technical factors that would support the business case for reprocessing SNF as it is being generated would also support the reprocessing of legacy SNF.

Deferring action also increases uncertainties about final disposition of the DOE HLW and SNF that is not included in the 7,000 MTHM portion of the 70,000 MTHM statutory limit allocated to national defense waste. Lack of any knowledge about the characteristics of the site and repository design that might be used for disposal of this material complicates decisions about final waste solidification and other steps in preparation for disposal. Uncertainty about the timing of availability of the needed additional disposal capacity would also complicate planning for final cleanup and decommissioning of the sites and facilities where the material is now stored. Continued deferral of a decision to add that disposal capacity will add to the costs of management at the current sites, and could threaten the Department's ability to fulfill agreements with the states hosting those sites to remove the waste for permanent disposal.

7. POTENTIAL LEGISLATIVE ACTIONS

Legislative action is required for the first and second alternatives and most likely is required for the third alternative. Using the Yucca Mountain repository for all of the projected SNF and HLW would require elimination of the 70,000 MTHM statutory limit. The Administration already has proposed legislation to accomplish this objective. Deciding to proceed with a second repository also would require legislation to authorize the repository and to specify how the second repository would be sited and licensed. While deferring the decision on the second repository does not require legislation to implement, it most likely would produce results that would require Congressional actions, such as direction on how to deal with the failure to honor contracts concerning commercial SNF and commitments and agreements concerning DOE SNF and HLW.

8. CONCLUSIONS

This report concludes that considerably more than 70,000 MTHM of SNF and HLW will require disposal in a geologic repository. In fact, at this time there is more than 58,000 MTHM of commercial SNF in storage, increasing at a rate of about 2,000 MTHM per year, and approximately 12,800 MTHM of SNF and HLW in storage at government sites. The inventory of waste materials planned for disposal in Yucca Mountain, which includes 7,000 MTHM of DOE SNF and HLW in addition to the commercial SNF, will reach the 70,000 MTHM statutory capacity limit in 2010.

A repository at Yucca Mountain that remains subject to the current NWPA statutory capacity limit of 70,000 MTHM cannot accommodate all of the currently projected commercial and DOE and U.S. Navy SNF and HLW. If the statutory limit on the first repository is not lifted, then a second repository will be needed. However, studies indicate that three times the statutory limit of 70,000 MTHM, or possibly more, could be accommodated by expanding the repository layout at Yucca Mountain. Lifting the statutory limit on the disposal capacity at Yucca Mountain provides an opportunity to defer the need to reassess repository capacity requirements. During this deferral period the future growth of nuclear energy and impacts from nuclear fuel recycling will become more clear, enabling a more informed decision regarding the need for a second repository. Based on the above, the Secretary of Energy recommends that Congress act promptly to remove the statutory limit of 70,000 MTHM for the Yucca Mountain repository and defer a decision regarding the need for a second repository.

Endnotes

- i Public Law 97-425, Jan.7, 1983, Section 161(b) [42 U.S.C.10172(b)]
- ii Public Law 97-425, Jan.7, 1983, Section 114(d) [42 U.S.C. 10134(d)]
- iii Public Law 97-425, Jan.7, 1983, Section 114(d) [42 U.S.C. 10134(d)]
- iv Huizenga, D. 2001. "Integrated Acceptance Schedule for Department of Energy Spent Nuclear Fuel and High-Level Waste." Memorandum from D.G. Huizenga (U.S. DOE Office of Environmental Management [EM]) to L.H. Barrett (OCRWM). July 11, 2001. ACC: MOL.20010821.0087.
- v CRWMS M&O, 1995, Generic Subsurface Layouts for Various Repository Thermal Loadings. BC000000-01717-5705-00002, Rev. 00
- vi DOE 2002. Final Environment Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada. DOE/EIS-0250. Washington, D.C.: U.S. DOE Office of Civilian Radioactive Waste Management (OCRWM). ACC: MOL.20020524.0314 through MOL.20040524.0320
- vii DOE 2008. Postclosure Analysis of the Range of Design Thermal Loadings, concurrence review copy dated January 2008. ANL-NBS-00057 Rev. 00C.
- viii Electric Power Research Institute, 2006, Analysis of the Maximum Disposal Capacity for Commercial Spent Nuclear Fuel in a Yucca Mountain Repository, 1013523, Technical Update.
- ix Mansure, Arthur J., and Terri Smith Ortiz, 1984, Preliminary Evaluation Of The Surface Area Available For A Potential Nuclear Waste Repository At Yucca Mountain, Sandia Report, SAND84-0175.
- x Section 161 of the NWSA provides that the Secretary may not conduct site-specific activities with respect to a second repository unless Congress has specifically authorized and appropriated funds for such activities. 42 U.S.C. 10172a.
- xi DOE 1985. Mission Plan for the Civilian Radioactive Waste Management Program, Vol. I. DOE/RW-0005 Volume 1 of 3 volumes, p. 40 for six states originally considered for first repository siting, p. 42 for the 17 states considered for potential second repository crystalline (granite) sites.
- xii OCRD, 1983 A National Survey Of Crystalline Rocks And Recommendations Of Regions To Be Explored For High-Level Radioactive Waste Repository Sites Office of Crystalline Repository Development, OCRD-1 [Fig 17].
- xiii DOE, 1986. Draft Area Recommendation Report for the Crystalline Repository Project U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Crystalline Repository Project Office, DOE/CH-15(0).
- xiv Croff, A. G., T. F. Lomenick, R. S. Lowrie, and S. H. Stow, 2003, Evaluation of Five Sedimentary Rocks Other than Salt for Geologic Repository Siting Purposes Volume 1: Main Report, Oak Ridge National Laboratory, ORNL/TM-2003/256/V1.
- xv Ibid. The report also includes the results of a survey of foreign activities concerning sedimentary rocks other than salt that disclosed that only shale-like rocks were being seriously considered. Shales and/or clays (along with granite) were the geologic media of choice in Belgium, Italy, and Japan. Shales and clays were considered to be alternatives in France, England, and Canada. Clays were also being considered in virtually every country for use as backfill material.
- xvi Office of Civilian Radioactive Waste Management Fiscal Year 2002 Annual Report to Congress, DOE/RW-0560, page 27.

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Nye County

Nuclear Waste Repository Project Office

2101 E. Calvada Blvd. Ste., 100 • Pahrump, Nevada 89048
(775) 727-7727 • Fax (775) 727-7919

11-044-DL (L)

April 5, 2011

U.S. Department of Energy
Attn: Dr. Peter Lyons, Office of Nuclear Energy
1000 Pennsylvania Avenue
Washington, D.C. 20585

Re: Local Community Support for the Yucca Mountain Project

Dear Dr. Lyons,

On March 31, 2011 you testified before a HEARING OF THE ENERGY AND WATER DEVELOPMENT SUBCOMMITTEE OF THE HOUSE APPROPRIATIONS COMMITTEE.

At that hearing you were asked by Congressman Simpson to explain what "unworkable" meant in the context of the Department's decision to terminate the Yucca Mountain Project. Your response, as quoted from the transcript of the record of the hearing was: *"The secretary has made it clear that to be workable requires both a technical -- from a technical perspective and a local support perspective. The technical perspective, I don't think I'm prepared to comment on. That has not been determined. From a local support perspective, it has certainly not enjoyed that support."*

Nye County takes exception to your response.

Yucca Mountain is wholly contained in Nye County, NV. Nye County was designated as the site county for the nation's repository in July 2002. The attached letter from Nye County to the BRC, accompanied by the resolutions the county passed on the same subject should be clear and convincing evidence that your response to the subcommittee was at best an uninformed opinion or one where you have for some reason been mis-informed.

The presumed community acceptance of the WIPP in New Mexico, relied upon by DOE as an example of cooperation, is distorted hindsight. The WIPP project was opposed by some locals, resulted in federal litigation, and took several decades to complete. The fact that WIPP is operational without major safety failures has dramatically changed acceptance of the facility over time.

The NWPA eliminated State veto power over repository siting after the Governors of the states informed Congress that political pressure on the states to exercise a veto regardless of the technical merit of a repository location could result in a repository never being sited and built. The NWPA was therefore structured with an over-ride of state disapproval, and that over-ride

Dr. Lyons
April 5, 2011
Page 2

was exercised by Congress and the President in the case of Yucca Mountain after Nevada objected.

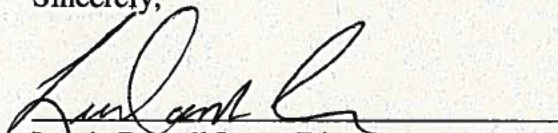
We respectfully request that you utilize this information and the attachments to this message (letter) as a basis to revise and extend your testimony to the subcommittee.

While we cannot speak for other Nevada counties, we have reason to believe that Esmeralda, Mineral, Lander, Churchill, White Pine and Lincoln Counties support YM in Nevada.

We have not yet had the opportunity to meet with you, however, our interactions with what was DOE's Office of Civilian Radioactive Waste Management were many and often. On our next visit to Washington, D.C. we will contact your office to arrange a meeting with you. If you come out to Nevada, we invite you to visit Nye County and hope you will visit the YM site.

Thank you for your time and consideration.

Sincerely,



Lewis Darrell Lacy, Director
Nye County Nuclear Waste Repository Project Office

DL/wm

Attachments: Nye County Letter to the BRC, Feb 7, 2011
Nye County Resolution 2002-07
Nye County Resolution 2002-22
Nye County Resolution 2004-25
Nye County Resolution 2011-21

cc: U.S. DOE, Dr. Chu
Staff Director, The House Energy and Water Development Subcommittee of the House
Appropriations Committee
CM Simpson
CM Pastor
CM Frelinghuysen
CM Rehberg
CM Fattah
CM Nunnelee
CM Walberg
CW Lowey
NRC, Chairman Jaczko



**Board of County Commissioners
Nye County
Pahrump, Nevada**

Pahrump Office
2100 E. Walt Williams Drive
Pahrump, NV 89048
Phone (775) 751-7075
Fax (775) 751-7093

February 7, 2011

U.S. Department of Energy
Attn: Blue Ribbon Commission
1000 Independence Ave., S.W.
Washington, DC 20585

Subject: Additional Comments for Blue Ribbon Commission Consideration

Chairman Hamilton & Chairman Scowcroft:

We respectfully submit the following comments for your consideration.

Prior to the BRC meetings in New Mexico we forwarded three (3) Nye County resolutions (attached) associated with the Yucca Mountain Project that specifically demonstrate local government support for the Yucca Mountain Project. Local officials in Carlsbad have demonstrated their support for WIPP and have clearly stated their desire to extend that support for receipt of high-level defense waste. This has the potential of at least a partial solution to the nation's nuclear waste dilemma. We commend their efforts. New Mexico's Governor and Attorney General stated their openness to expanded operations at WIPP as long as those operations are supported by science.

Considering that the BRC is not a siting commission, and the fact that Yucca Mountain is by law the designated site for the nation's geologic repository for spent nuclear fuel and defense high level waste, we would like to point out, one more time, that strong local community support for Yucca Mountain exists at the host county level. Our own research, conducted with Nuclear Waste Policy Act provided funds, convinces us that the science embodied in DOE's license application for Yucca Mountain and its hundreds of supporting documents is sound. That conclusion is supported at least in part by the Nuclear Regulatory Commission staff review of the documents, wherein they have formally stated that they have no further questions and were about to issue their Safety Evaluation report when politics took over. While Nevada's Governor and Attorney General in concert with Nevada's federal delegation oppose a geologic repository at Yucca Mountain, it is still the law. In 1975 Nevada actually supported what would become the Yucca Mountain Project (resolution attached). Similarly, it is possible that New Mexico is only one election away from losing state support regardless of what sound science indicates if political winds change.

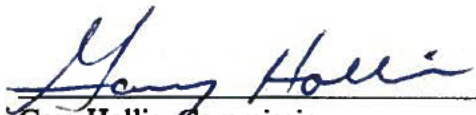
At the February 1, 2011 BRC meeting in Washington, D.C. expert witnesses present for the meeting testified to the importance of local government support and the necessity of a definitive role for state government. It took eleven years for the State of New Mexico to agree to the terms of its definitive role with WIPP. The business of Yucca Mountain is as yet unfinished, hi-jacked by the politics of a single powerful senator and what some view as complicity by the NRC Chairman. **As a minimum, for the sake of the science and other lessons that can be learned from the experience, we ask that the BRC recommend completion of the NRC review of the Yucca Mountain license application.** It is difficult to understand how a tour of WIPP without a comparable tour of Yucca Mountain and review of the technical issues provides any basis for beginning a dialog on paths forward for repository development. We invite the BRC to Nye County to visit Yucca Mountain and our Yucca Mountain Information center where we have retained what we believe to be the best public multi-media collection of Yucca Mountain history.

The complexity of the task you face is immense. Various subject matter experts testified to you that at the end of the day the nation needs to provide for geologic disposal of our nation's nuclear waste streams. We ask you not to lose sight of the following facts and issues:

- The nation needs more clean base load energy and nuclear fills that bill.
- Nuclear waste has always been an Achilles heel for nuclear energy development; the waste issue must be resolved for new nuclear to be successful. We need geologic disposal no matter what choices are made for future fuel cycles. In fact, most studies indicate the need for more than one repository.
- No site will be perfect - we need safe acceptable sites. We can waste years arguing whether WIPP or Yucca Mountain is better; please do not lose sight of the facts that the New Mexico proposal is for high-level radioactive waste and not spent fuel. Also, recent studies, as you are no doubt aware, suggest that even if the U.S. proceeds with an advanced fuel cycle involving reprocessing, the legacy wastes are not likely to be reprocessed. WIPP will probably need another 10 to 20 years to be characterized, resolve questions regarding high heat loads and complete NRC licensing required under current law. Yucca Mountain took nearly 30 years before a license application was submitted. **We urge you to recommend finishing the Yucca Mountain licensing process and start characterizing WIPP to the applicable NRC standards. The nearer term solution does not have to be an "either/or" process.**

- Our current waste definitions need to be revised as there are several orphan streams such as Greater than Class C (GTCC) low level radioactive waste. WIPP may be a good site for some of these and they could possibly be technically and legally approved for disposal in a time frame to keep WIPP operational. It would be a shame to shut down WIPP when the legislative limit of TRU waste is emplaced while other nuclear waste streams do not have a home.
- No matter what recommendations the BRC comes up with, they must emphasize that any policy is only good if it's followed. Congress must define the policy and it's everyone else's job to follow it until and unless Congress changes it. Nothing the BRC does will be of use if the direction of Congress is not followed.

Sincerely,
NYE COUNTY, NEVADA



Gary Hollis, Commissioner

DL/cs

Enclosures: Resolution 2002-22
Resolution 2002-007
Resolution 2004-25 support YMP
Resolution-YM NC Res. Accepting HLRW.SNF 1975

cc: Nye County Board of Commissioners
Rick Osborne, Nye County Manager
Cash Jaszczak, Consultant, Nye County

**BOARD OF COUNTY COMMISSIONERS
COUNTY OF NYE, STATE OF NEVADA**

**RESOLUTION SETTING FORTH NYE COUNTY'S
POSITION REGARDING THE PROPOSED HIGH LEVEL
NUCLEAR WASTE REPOSITORY AT YUCCA MOUNTAIN
AND THE SITUS COUNTY COMMUNITY PROTECTION PLAN**

WHEREAS, the President has now formally recommended Yucca Mountain, in Nye County, as the site to which the federal government would transfer the Nation's highly radioactive wastes for interim storage, waste handling, and permanent disposal; and

WHEREAS, Nye County is the location of the Nevada Test Site where, for over 40 years, the Nation conducted nearly 1,000 atmospheric and underground nuclear weapons tests which permanently contaminated large tracts of land and groundwater; and recent studies reveal that radiation released in 828 underground nuclear detonations is migrating in poorly understood regional groundwater systems; and

WHEREAS, the program instituted by the United States Department of Energy (USDOE) to clean up the Nation's defense complex relies heavily on the disposal of low-level radioactive wastes at the Nevada Test Site, in Nye County;

WHEREAS, these low-level wastes arrive by truck on two-lane roads that go through four Nye County communities; in fiscal 2001, about 600 shipments containing 750,000 cubic feet of low-level wastes traveled 107,000 shipment miles on rural highways in the destination county; and

WHEREAS, Nye County also is the site of the Nellis Test and Training Range, a premier training range where the Nation trains its best fighter pilots for combat preparedness; and

WHEREAS, Nye County also is the site of the Tonopah Test Range, a restricted facility where the Nation has developed and based new-technology combat aircraft; and

WHEREAS, these activities (the Nevada Test Site, the Nellis Test and Training Range, and the Tonopah Test Range) have made major contributions to national defense but meager contribution to the Nye County's economic or revenue base; and

WHEREAS, the management and use of 11 million acres of public lands, comprising 98% of the Nye County's total land area, by a variety of federal land management agencies contributes very little to the Nye County's economic or revenue base, and forecloses opportunity for local community development; and

WHEREAS, Nye County has not sought to provide the site to which the federal government would transfer the Nation's highly radioactive wastes for interim storage, waste handling, and permanent disposal; and

WHEREAS, the USDOE claims that the proposed Yucca Mountain Project will be good for national health and safety, good for the nuclear power industry and their ratepayers, good for 80 communities in which highly radioactive wastes are now stored, good for 35 states that do not want to become permanent storage locations for highly radioactive wastes, and/or good for the federal government which has legal obligations to dispose of commercial spent fuel; and

WHEREAS, it is clear that the Yucca Mountain Project, if implemented as proposed, will achieve the expected benefits for others by the transfer of the Nation's highly radioactive wastes, along with all its attendant risks and uncertainties, from 80 sites in 35 states to a single community in Nevada—Nye County; and

WHEREAS, the elected government of Nye County has responsibility to protect local health, safety, and welfare, and is the only representative government whose first and overriding responsibility is to provide such protection in the situs county; and

WHEREAS, since 1995 Nye County has conducted independent scientific investigations in areas downgradient from the proposed Yucca Mountain repository, focusing on geologic and hydrologic conditions affecting the potential for contamination in the repository's major exposure pathways; and

WHEREAS, these independent investigations have identified uncertainties and contingencies—in science, design, and in implementing organization and funding— that require continued independent inquiry and confirmation; and

WHEREAS, in recognition of all of the above, Nye County has prepared a "Community Protection Plan" that identifies the legitimate objectives of the situs county, and the protections it expects in the event that the federal government decides to transfer the Nation's highly radioactive wastes to Yucca Mountain; and

WHEREAS, the Nye County Board of Commissioners deems it imperative that it set forth Nye County's statement of history, policy and intent regarding this issue,

NOW THEREFORE, it hereby is resolved as follows:

- 1. Nye County has not sought to provide the site to which the federal government would transfer the Nation's highly radioactive wastes for permanent disposal.**
- 2. The Nation and the various parties who stand to benefit have a special obligation to the single local jurisdiction to which they desire to transfer their unwanted radioactive wastes.**
- 3. If the Nation decides to transfer its highly radioactive wastes to this single community—Nye County—it has an obligation to do so under conditions that address the situs county's concerns and that assist rather than jeopardize legitimate site county objectives, as these are outlined Nye County's "Community Protection Plan."**
- 4. Among these concerns and objectives are the following:**

- ☐ **Protection of Health, Safety, and the Environment**
The situs county—Nye County—should be empowered to conduct independent oversight and monitoring of USDOE activity in the situs county throughout Yucca Mountain site characterization, licensing, construction, operations, and performance confirmation. Situs county empowerment should be permanently financed, and should not be dependent on annual federal appropriations over the expected 50-300 years of repository operations.

Federal activities to confirm repository performance and to conduct research and development related to waste handling and potential reuse should be headquartered in Nye County—the only community in which repository performance, and the potential consequences of poor repository performance, would be an urgent daily concern throughout the expected 50-300 years of repository operations.
- ☐ **Equity in Nuclear Waste Transportation**
Transportation of highly radioactive wastes in the situs county should be conducted by rail, and under policies which minimize the risks for Nye County communities of all high and low-level radioactive waste shipments.
- ☐ **A Viable Local Economic & Revenue Base**
Special federal actions should be taken to provide the situs county an opportunity to develop a viable economic and revenue base, with facility and service systems comparable to those in other communities hosting USDOE nuclear facilities—even as the federal government plans to make an extraordinary future imposition in addition to the extraordinary impositions of the past.

6. Nye County opposes any program for repository implementation that does not fully and forthrightly address its situs county concerns and aspirations.

Adopted by unanimous vote on April 16, 2002 by the Nye County Board of Commissioners

[illegible]

Nye County, Nevada Board of Commissioners

RESOLUTION STATING THE INTENT OF NYE COUNTY TO ACTIVELY AND CONSTRUCTIVELY ENGAGE WITH THE U.S. DEPARTMENT OF ENERGY (DOE), THE ADMINISTRATION, AND CONGRESS AS THE YUCCA MOUNTAIN PROJECT PROCEEDS TO FINAL DESIGN, LICENSING, AND IMPLEMENTATION:

WHEREAS, the United States Congress has voted to move the Administration's proposed Yucca Mountain Project, located in Nye County, Nevada, towards final design, licensing, and implementation.

WHEREAS, since 1940 the federal government has selected sites in Nye County for nuclear weapons testing, air force fighter training, and low-level radioactive waste disposal in cleanup of other sites in the nation's weapons complex.

WHEREAS, these activities (the Nevada Test Site, the Nellis Test and Training Range, and the Tonopah Test Range) have made major contributions to national defense but meager contribution to the Site County's economic or revenue base.

WHEREAS, the management of 11 million acres of federal lands in Nye County, comprising 98% of the county's total land area, makes meager contribution to the Site County's economic or revenue base, and forecloses opportunity for local community development.

WHEREAS, while the President has recommended and the Congress has mandated that DOE should prepare and apply for a license from the Nuclear Regulatory Commission to construct a repository at Yucca Mountain, many questions and issues regarding the Yucca Mountain Project remain to be addressed—including the safety and equity of the Yucca Mountain Project as proposed, and whether the Yucca Mountain Project will be implemented as proposed.

WHEREAS, the duty of the representative local government to ensure the health, safety, and welfare of its citizens requires the active engagement of Nye County to ensure that the questions and issues referenced above are addressed in design and licensing as well as in implementation, and to provide assurance of same for the residents of the single local entity to which the nation's highly radioactive wastes would be transferred.

WHEREAS, Nye County has prepared a "Community Protection Plan" that identifies the legitimate objectives of the site county, and the protections it expects in the event that the federal government transfers the nation's highly radioactive wastes from 131 sites in 39 states to a single site at Yucca Mountain, in Nye County.

WHEREAS, if implemented, the Yucca Mountain Project should be more than just a repository 12 miles north of Lathrop Wells in the Nye County community of Amargosa Valley, but the center for a community of synergistic scientific, engineering, educational, and entrepreneurial activities for management and possible reuse of the nation's highly radioactive wastes, and for the demonstration of alternative forms of energy for future generations.

Resolution No. 2002-22

WHEREAS, it is just such a vision for the Yucca Mountain Project that offers the best long-run prospect for converting long-standing resistance and mistrust within the State of Nevada to constructive engagement and cooperation.

WHEREAS, DOE can most effectively and efficiently implement the above-stated vision for the Yucca Mountain Project through close coordination and cooperation with its Nevada Site County, and Nye County intends to constructively engage with DOE to achieve this vision.

NOW THEREFORE, BE IT RESOLVED:

1. Nye County intends to engage energetically and constructively with the Department of Energy and the U.S. Congress as the Yucca Mountain Project proceeds to final design, licensing, and implementation.
2. Nye County intends to make constructive scientific, technical, and strategy contributions to address key issues in repository design, licensing, and performance confirmation, as well as transportation and project management.
3. Nye County anticipates constructive engagement by DOE, the Administration, and Congress in addressing such issues in ways that also address the concerns and aspirations of DOE's Site County in Nevada.
4. Nye County will use its "Community Protection Plan" as a resource and framework for its constructive engagement with DOE, the Administration, and Congress as the Yucca Mountain Project proceeds to design, licensing, and possible implementation.
5. Nye County will vigorously pursue the objectives articulated in its Community Protection Plan: local empowerment for assurance of safety and health; equity in transportation; and development of community capacity and resources. The vision is that, if implemented, the Yucca Mountain Project should not be just a repository where the nation's highly radioactive wastes are transferred for storage in perpetuity, but the center for a community of synergistic scientific, engineering, educational, and entrepreneurial activities for management and possible reuse of the nation's highly radioactive wastes, and for the demonstration of alternative forms of energy for future generations.

Adopted by unanimous vote on August 6, 2002 by the Nye County Board of Commissioners.

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1 **NYE COUNTY RESOLUTION NO. 2004-25**

2 **RESOLUTION CONCERNING THE INTENT OF NYE COUNTY TO TAKE ACTION TO**
3 **MAXIMIZE THE SAFETY, ECONOMIC OPPORTUNITY AND SUCCESSFUL OUTCOME OF**
4 **THE YUCCA MOUNTAIN REPOSITORY AND TRANSPORTATION SYSTEM BY ACTIVELY**
5 **AND CONSTRUCTIVELY ENGAGING ALL RELEVANT PARTIES.**

6 WHEREAS the Nuclear Waste Policy Act of 1982 as amended designates Yucca Mountain,
7 located in Nye County, Nevada as the only site for consideration as the nation's repository for high-level
8 nuclear waste and spent fuel; and

9 WHEREAS the site has been determined to be a suitable location for a repository, the U.S Court
10 of Appeal dismissed all challenges to the site selection of Yucca Mountain, the scientific basis for the
11 selection process and the constitutionality of the resolution approving Yucca Mountain; and

12 WHEREAS the Department of Energy is preparing a license application for the repository and
13 expects to begin operation beginning in 2010; and

14 WHEREAS the Department intends to use rail transportation, the mode of transportation Nye
15 County prefers, to the maximum extent possible and the Department has made progress in planning the
16 transportation system by selecting the Caliente route; and

17 WHEREAS the Department is beginning the process of identifying repository and transportation
18 facilities which could be located off-site and is considering other means of maximizing local economic
19 opportunity; and

20 WHEREAS the Nye County "Community Protection Plan" has established a vision for
21 protecting the community and for the local development of synergistic economic, scientific and
22 educational activities for management and possible future reuse of material which will be stored at
23 Yucca Mountain; and

24 WHEREAS it is just such a vision for the Yucca Mountain Project that offers the best long-term
25 prospect for converting long-standing resistance and mistrust within the State of Nevada to constructive
engagement and cooperation; and

1 WHEREAS Nye County intends to work cooperatively with communities along the Caliente
2 route, the Department of Energy, and any other appropriate group for the purpose of achieving this
3 vision,

4 NOW THEREFORE, BE IT RESOLVED that Nye County intends to fully, constructively and
5 energetically support:

- 6 1. Development of a safe repository at Yucca Mountain,
- 7 2. Development of policy that empowers the County concerning repository and
8 transportation safety and health,
- 9 3. Creation of synergistic scientific, engineering, educational and entrepreneurial economic
10 opportunities in the County,
- 11 4. Assisting the United States of America in fulfilling the commitment to provide a geologic
12 repository for spent nuclear fuel and high-level waste to protect the health, safety and
13 welfare of the citizens of the United States,
- 14 5. Assisting the United States Department of Energy in meeting their timeline for the
15 reception of spent nuclear fuel and high-level waste at Yucca Mountain,
- 16 6. Maximizing jobs and economic opportunities for Nye County citizens,
- 17 7. Working cooperatively with appropriate federal entities, rural Nevada communities along
18 the transportation route and other parties willing to constructively engage in the
19 development of a repository that is safe and offers significant economic benefit to Nye
20 County and others most affected by the operation of a repository and related
21 transportation systems.

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ATTEST:

**Sandra "Sam" L. Merlino, Nye County Clerk
and Ex-Officio Clerk of the Board**

///

1 **NYE COUNTY RESOLUTION NO. 2011-21**

2
3 **A RESOLUTION OF THE NYE COUNTY BOARD OF COMMISSIONERS RESOLUTION**
4 **SUPPORTING COMPLETION OF THE NUCLEAR REGULATORY COMMISSION'S REVIEW OF**
5 **THE YUCCA MOUNTAIN LICENSE APPLICATION**

6 WHEREAS, the Nuclear Waste Policy Act of 1982, as amended, ("Act") selected Yucca
7 Mountain, located in Nye County as the only site to be characterized as the nation's first high-level
8 radioactive waste repository; and

9 WHEREAS, Congress in July 2002, in accordance with provisions of the
10 Act, as amended, overrode Nevada's notice of disapproval; and

11 WHEREAS, Yucca Mountain was designated to be the site for development of a permanent
12 repository for United States spent nuclear fuel and defense high level radioactive waste; and

13 WHEREAS, the U.S. Department of Energy ("USDOE"), in accordance with the Act, submitted
14 a License Application (LA) to the Nuclear Regulatory Commission (NRC); and

15 WHEREAS, that LA, in accordance with NRC regulations, was accepted for review by the NRC;
16 and

17 WHEREAS, the USDOE has since requested withdrawal of its submission of the LA "with
18 prejudice"; and

19 WHEREAS, the request for withdrawal has been denied by the Atomic Safety and Licensing
20 Board (ASLB) and challenged in Federal Court; and

21 WHEREAS, the Commissioners of the NRC have not issued a final ruling on their review of the
22 ASLB decision that USDOE does not have the legal authority to withdraw the Yucca Mountain license
23 application; and

24 WHEREAS, the nation needs to move forward on the established NWP strategy that provides
25 for the permanent storage of spent nuclear fuel and high level waste; and,

WHEREAS, the Nye County Board of Commissioners (Board) recognizes that further delays in
the development of a permanent geologic repository will result in significant public expenditures and
potentially jeopardizes the future expansion of nuclear power production and energy independence; and

1 WHEREAS, the Board is convinced that until such time as the NRC completes its review of the
2 LA, Nye County, the State of Nevada and the nation will be denied a scientific and technical
3 determination of the potential of the Yucca Mountain repository to be built and operated safely and
4 successfully; and

5 WHEREAS, Nye County adopted Resolutions 2002-7, 2002-22 and 2004-25 defining the
6 County's involvement as the site county for the nation's geologic repository for spent nuclear fuel and
7 defense high level waste,

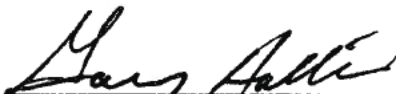
8 NOW THEREFORE, it hereby is resolved as follows:

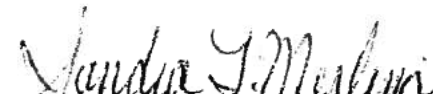
- 9
- 10 1. The Yucca Mountain licensing proceedings should be restarted and the NRC should
11 complete a thorough and detailed review of the License Application; and
 - 12 2. If upon completion of the license application review by the NRC staff and the licensing
13 proceeding before the ASLB, the conclusion is that the Yucca Mountain repository can
14 be constructed and operated safely, Nye County reaffirms our prior resolutions and
15 supports such construction and operation consistent with these prior resolutions ; and

16 APPROVED this 15th day of March, 2011.

17
18 NYE COUNTY BOARD OF
19 COUNTY COMMISSIONERS:

ATTEST:

20 
21 Gary Hollis, Chairman

22 
23 Sandra "Sam" L. Merlino, Nye County Clerk
24 And Ex-Officio Clerk of the Board
25

As the coast begins to crumble, the clock ticks on moving San Onofre's radioactive waste



A view of decommissioning work around San Onofre Nuclear Generating Station reactor containment domes in San Clemente on Aug. 21. (Allen J. Schaben / Los Angeles Times)

By [Blanca Begert](#)

Staff Writer

Photography by [Allen J. Schaben](#)

Sept. 12, 2026 3 AM PT

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8 min

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- Storm-driven erosion exposes vulnerability of California coast, reviving questions about keeping 3.6 million pounds of radioactive waste just 100 feet from the Pacific at decommissioned San Onofre nuclear power plant.
- Utility officials say seawalls and a steel canister storage system can withstand tsunamis, quakes and rising seas for decades, even as scientists warn of hazards of storing nuclear waste indefinitely in a seismically active area next to the ocean.
- With Yucca Mountain effectively canceled, federal officials promote new 'campus' storage sites in Utah and other states, promising jobs and consent-based siting while communities debate becoming America's long-term nuclear waste repository.

As parts of the Southern California coastline [crumbled into the sea](#), slammed by intense waves and flooding in recent days, oceanographer Kim McCoy had one thing on his mind: the nuclear waste set in concrete on the beach near San Clemente at the shuttered San Onofre nuclear power plant.

“Rising sea levels, storm waves, El Niño which increases wave height ... these could wash away a section of the walkway that protects the San Onofre seawall, and the waste canisters are just 100 feet away from that,” the former wave dynamics researcher and longtime advocate against beach storage of nuclear waste said.

Most experts agree the risk of erosion damaging the nuclear waste storage system is extremely low in the near term. The plant's owner, Southern California Edison, has promised the California Coastal Commission to move the waste to higher elevation on-site if modeling shows sea level rise and erosion will start to pose a challenge.

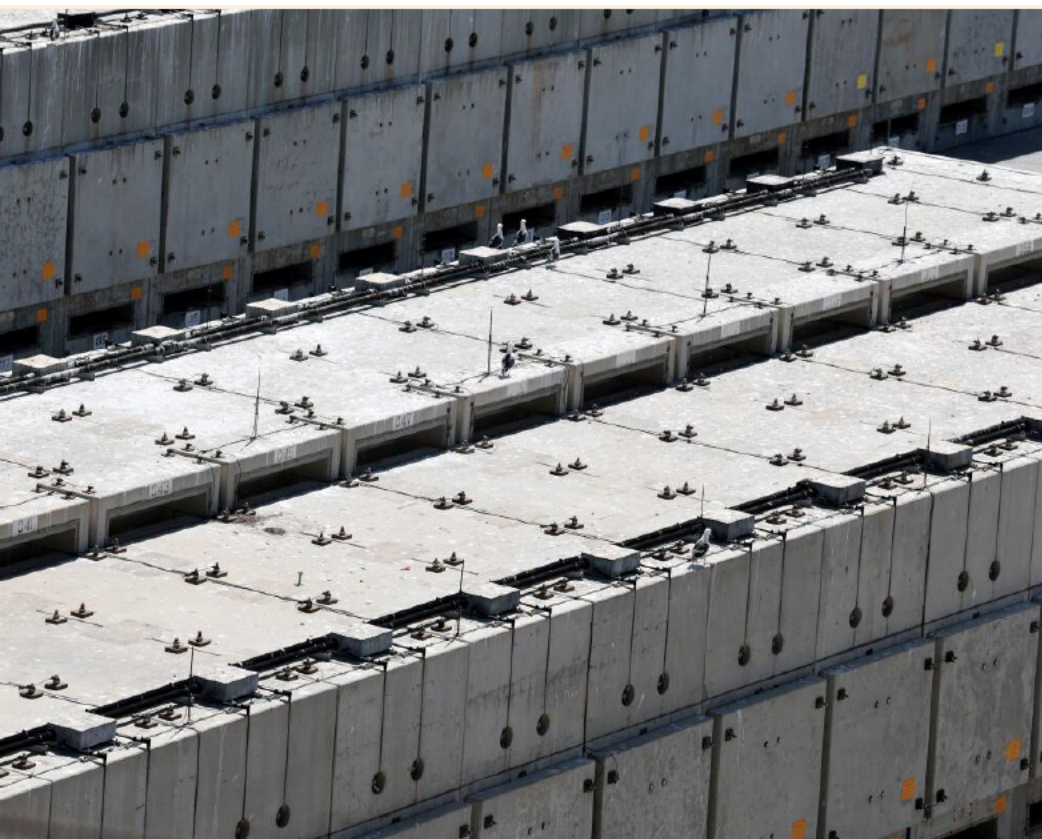
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But the recent waves, fueled by Hurricane Marie far away in the Pacific, resurfaced the issue of the ultimate fate of the highly radioactive spent fuel that used to power the reactors.

“At the moment, it is under control, I think it’s essential to say that,” said James Day, a geology professor at UC San Diego. “But geologically we must be thinking long term. The waste lasts for hundreds, if not thousands of generations.”







Concrete vaults, each holding a canister of used nuclear fuel, sit underground at the Independent Spent Fuel Storage Installation at the former San Onofre Nuclear Generating Station (ISFSI) where dry cask storage of used nuclear fuel is stored horizontally at the decommissioning San Onofre Nuclear Generating Station. A photograph above the San Onofre Nuclear Generating Station hangs on the wall of a conference room at the facility.

Seen from Interstate 5, the twin domes of San Onofre look like they're part of an operating facility. Red lights flash at the top of each sphere, visible from afar, among the chaparral and military buildings of Marine Corps Base Camp Pendleton.

But go behind the security checkpoint and you see a demolition site. Trailers and tents now sit where acres of office buildings, steam turbines, diesel generators, control rooms, cooling pools and water treatment plants have been knocked down and hauled away, since a scandal involving faulty steam generators [shut down the plant](#) in 2013.

Most of the rubble, which is only mildly radioactive or not at all, has already been sent to sites in Utah, Texas and Arizona.

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The distinctive twin domes that once housed the reactor cores will start coming down early next year. But the 3.6 million pounds of high-level waste will stay in the coastal community indefinitely.

How much of a safety hazard that is depends on whom you ask.

“San Onofre is sitting on some fairly young rocks in a seismically active region,” Day said at a recent symposium at the Scripps Seaside Forum in La Jolla, hosted by the Samuel Lawrence Foundation. “This is not the sort of place you would leave nuclear waste.”

Others noted that collapse of beach slopes could make the site more vulnerable to tsunamis. They spoke of the corrosive effects of the ocean air on the steel canisters that hold the waste.



principal manager, strategic planning, San Onofre Nuclear Generating Station, talks about nuclear waste storage with a model of a nuclear fuel assembly in
Clemente. (Allen J. Schaben / Los Angeles Times)

“They could be doing more monitoring,” Greg Jaczko, former head of the Nuclear Regulatory Commission, said of Edison. The utility tracks air temperature and radioactivity, checks canisters for cracks on the outside and inspects test canisters that mimic the active waste ones for signs of degradation.

Edison says its system will be safe for decades to come.

“The maximum credible tsunami here would not even overtake the seawall,” said Manuel Camargo, principal manager of decommissioning for Edison, standing on the concrete pad that holds the steel waste storage canisters. “The maximum credible earthquake, somewhere around a 7.0 magnitude, would produce something about half of what this system is designed to withstand.”

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As he spoke, just in front of the plant, surfers were catching waves. He pointed out where Edison is bolstering a path below the seawall. Based on state data from the California Ocean Protection Council, the seawall would not be inundated before 2050, Camargo said. “It’s an extremely robust system.”



crete vaults, each holding a canister of used nuclear fuel. The system, built into the bluff above the Pacific Ocean, holds dozens of canisters of radioactive and fire, flood and tsunami.

Yet despite confidence in its protective measures, even the utility wants the waste out of there as soon as possible. Because this status quo is expensive.

From 1982 through 2014, Edison customers, like many ratepayers around the country, paid into a federal fund for a promised permanent nuclear waste storage site. But plans for a deep geological repository beneath Yucca Mountain in Nevada crumbled in the face of local opposition in 2011.

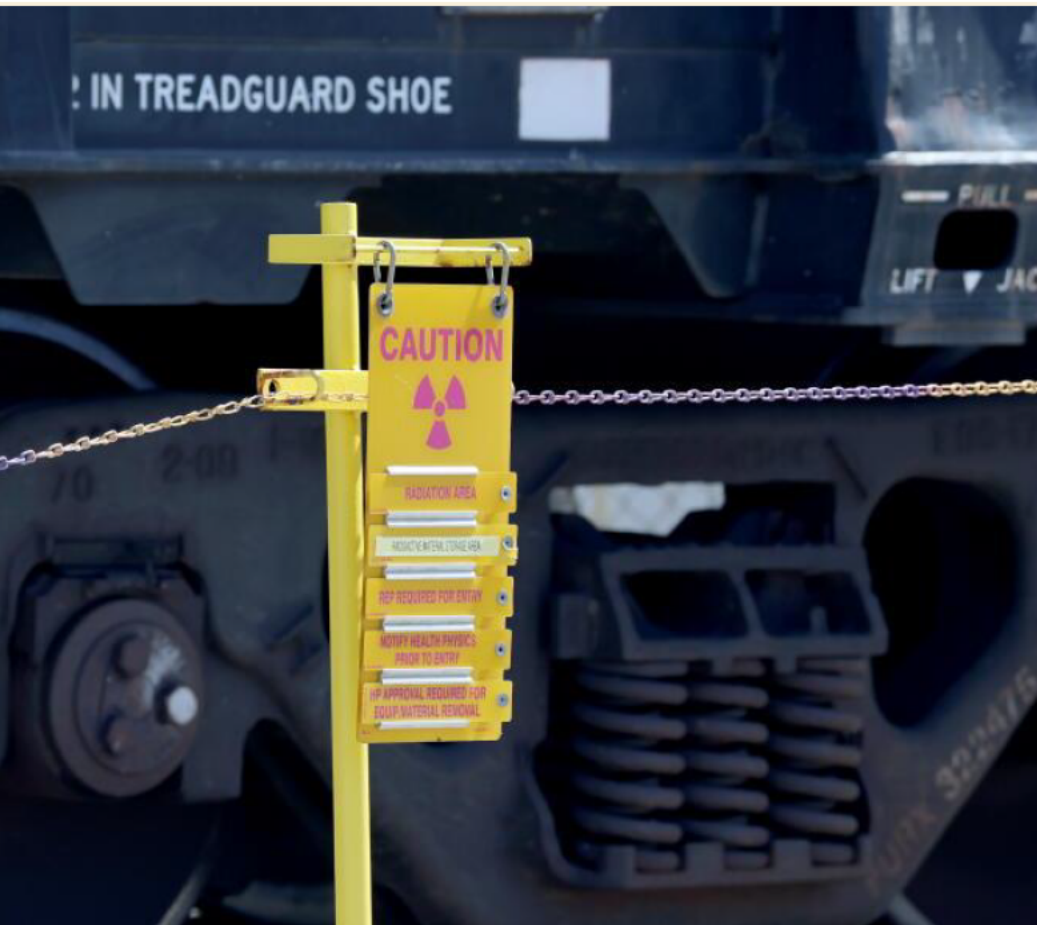
Utilities around the U.S. now sue the federal government every year to recoup their storage expenses because the Department of Energy has not come through on its promise. The lawsuits cost taxpayers \$2 million a day, according to Camargo.

“It’s so safe that it’s almost a problem,” Camargo said. “It’s not a priority to a lot of folks to move it.”

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ctive material sign is posted as Kevin Sheek, senior advisor for Emergency Planning, San Onofre Nuclear Generating Station, gives a tour of the Independence (ISFSI) . **2.** An estimated 5,000 rail cars wait to be loaded to haul away dismantled plant materials. **3.** The plant is located on an 84-acre site on the Pacific Marine Corps Base Camp Pendleton in San Diego County.

Camargo, like so many in the nuclear power industry, is hanging his hopes on a new idea. The Trump administration's Department of Energy wants to create "campuses" in several states to store waste and, in exchange, give local jurisdictions funding to develop different aspects of the nuclear cycle — such as fuel creation, power generation and potentially fuel recycling.

The administration wants to address the fact that waste is sitting at 80 reactor sites around the country. It also needs places for waste from new reactors it wants to build. Several states including California have bans on new nuclear power until there is permanent federal storage. Some state leaders are trying to make an exception for small modular reactors such as the one [the Port of Long Beach wants to build](#) on a floating barge offshore.

For the record:

4:45 p.m. Sept. 12, 2026*A previous version of this article listed Indiana as one of the five potential states to host nuclear waste campuses. The fifth state is Louisiana.*

The Energy Department announced in July that it had signed memorandums of understanding with Utah, Tennessee, Oklahoma, Idaho and Louisiana to explore their potential as campus hosts. U.S. Reps. Scott Peters (D-San Diego) and Mike Levin (D-San Juan Capistrano), whose district includes San Onofre, support this idea, and Camargo said Edison was in discussions with Utah and Tennessee about how it can help.

Other efforts to create nuclear waste storage facilities since Yucca Mountain have floundered. But boosters of the campus idea say this will be different, because the plan draws on principles of "consent-based siting" developed under the Obama administration and offers money and jobs.

“The community engagement piece has been central to our entire strategy, and we’re giving the community these options and funding to win,” said Tim Kowalchik, research director at Utah’s Office of Energy Development.

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Others in Utah disagree, indicating it could be a long road to community buy-in. “What we’re seeing still is very limited community engagement and transparency about these proposed plans,” said Carmen Valdez, radioactive program manager with the nonprofit Heal Utah. “Our communities have always said no to becoming a waste site. We don’t want to be the toilet bowl of the nation.”



Kevin Sheek points to decommissioning work around reactor containment domes during a tour of the nuclear waste storage facility. (Allen J. Schaben / Los Angeles Times)

Finland is the country furthest along in building a deep, permanent geological storage for nuclear fuel. It will soon place canisters thousands of feet underground in stable rock formations and seal them off. Sweden has also broken ground on a facility, and Switzerland and Canada have chosen sites.

Camacho and lawmakers are optimistic that the U.S. can create something similar and remove the waste from San Onfre in 10 to 15 years. If not, in 2103, when the site's earliest canisters' approach their intended 100-year lifespans, the utility may have to start transferring the fuel into new ones.



Congress of the United States
House of Representatives
Washington, DC 20515-0549

September 15, 2026

The Honorable Bob Latta
Chairman
Energy Subcommittee
House Energy and Commerce Committee
2125 Rayburn House Office Building
Washington, D.C. 20515

The Honorable Kathy Castor
Ranking Member
Energy Subcommittee
House Energy and Commerce Committee
2322A Rayburn House Office Building
Washington, DC 20515

Dear Chairman Latta and Ranking Member Castor,

As the Energy Subcommittee conducts its hearing titled “*Nuclear Spent Fuel Policy: Examining Nuclear Lifecycle Innovation Campuses*,” I write on behalf of my constituents in California’s 49th Congressional District to share our perspectives on spent nuclear fuel issues as a district that is home to the shutdown San Onofre Nuclear Generating Station (SONGS). I appreciate the Subcommittee’s attention to such a long-standing issue that impacts Congressional districts across the country, including the one I am proud to represent and call home. I am encouraged by the recent work at the Department of Energy (DOE) on the Nuclear Lifecycle Innovation Campuses and look forward to further conversations in Congress about how to advance solutions to our spent fuel challenges in a bipartisan and bicameral way.

Our nation has long struggled with what to do about the radioactive byproducts generated by nuclear energy production. Since the 1950s, spent nuclear fuel from commercial nuclear power generation has been stored on site at nuclear power plants across the country. In 1982, Congress passed the *Nuclear Waste Policy Act*, which mandated that the U.S. government take possession of spent nuclear fuel beginning in 1998, and assigned the DOE the responsibility to manage spent nuclear fuel from commercial reactors. Then in 1987, Congress designated Yucca Mountain as the sole candidate for a permanent geologic repository—without engagement with or acceptance from the state.

Largely attributable to the state’s opposition to the Yucca Mountain project, the 1998 deadline for DOE to take title to the waste came and went without any movement of the spent fuel. Because the federal government did not meet its contractual deadlines, it has been found to be in partial breach of its contract with owners of commercial nuclear power reactors and must use taxpayer dollars to pay for damages of this breach. The FY25 Nuclear Waste Fund Audit Report by the DOE Inspector General found that this partial breach has cost taxpayers \$56.6 billion, including over \$3 million per day in FY25 alone, all due to the lack of a workable solution for spent fuel. For comparison, the federal government has only spent \$15 billion on the Yucca Mountain project; the often-underappreciated reality is that the federal government will spend *nearly four times* as much money paying down its liabilities because it tried to select a location for nuclear waste without taking into account the communities near where the waste would be stored.

The federal government’s partial breach of contract is not only a cost to the taxpayers, but a harm to the communities left shouldering the burden of storing spent nuclear fuel indefinitely. SONGS in my district is in the process of decommissioning, which is expected to be completed by the end of 2028—at which point, all that will remain will be the onsite independent spent fuel storage installation (ISFSI) storing the spent fuel until the

federal government identifies a permanent disposal location. SONGS stores more than 1,600 tons of spent nuclear fuel just 100 feet from the Pacific Ocean, near active fault lines, surrounded by highly populated areas and on Marine Corps Base Camp Pendleton. SONGS and other shutdown sites across the country were never meant to store spent fuel in perpetuity.

The past few years have seen a resurgence in the federal government's efforts to identify a long-term solution for our nuclear waste challenges. The Biden Administration began a consent-based process to site a consolidated interim storage (CIS) facility, which included the establishment of a consent-based siting consortia to engage in mutual learning opportunities with communities across the country on the idea of hosting spent fuel facilities. This effort laid the groundwork for the Trump Administration to engage with states and communities collaboratively to host Nuclear Lifecycle Innovation Campuses (NLIC), an effort to house solutions for the nation's spent fuel challenges by supporting activities across the full nuclear fuel cycle, including fuel fabrication, enrichment, reprocessing spent nuclear fuel, and disposal of waste.

I am encouraged by the interest of states in the NLICs, including the six states that have signed memorandums of understanding (MOU) with DOE to continue discussions about hosting a campus. This is a good first step, but this also marks the beginning of the difficult work of finding suitable sites, engaging in negotiations with states, ensuring that local communities are on board, and licensing and constructing these campuses. The federal government has a bad track record on nuclear waste and has not kept its promises to communities for many decades. DOE must be consistent, transparent, and honest with states and communities as it completes the selection process for the NLICs and sets them up for success year after year and administration after administration. The Administration must also be transparent and engage in good faith in a bipartisan, bicameral fashion with Congress to ensure the authorization, funding, and success of this program. Today's hearing is a positive step in that direction.

For an issue as consequential as spent nuclear fuel policy, Congress must assert its responsibilities to guide the NLIC program in a way that works best for the nation. Congress must prioritize amendments to the Nuclear Waste Policy Act (NWPA) of 1982 and the subsequent amendments in 1987 in order for this program to proceed. From my years advocating for solutions to nuclear waste and working with experts and community members, I believe there are key amendments that Congress must make, and additional issues for Congress to consider and debate.

Key legislative changes that Congress must make include:

- The elimination of Yucca Mountain as the exclusive site for disposal of high-level nuclear waste;
- Clear direction to utilize a collaborative siting process for siting nuclear waste facilities, including robust engagement with host communities and states, as well as communities along transportation routes;
- Prioritization for spent fuel removal from shutdown plants, with the highest priority accorded to sites where continued storage of spent fuel poses the greatest risk to public safety;
- Reliable access to the ratepayer dollars and accrued interest in the Nuclear Waste Fund (NWF) for its intended use of nuclear waste disposal;
- Authorization for CIS facilities to store spent fuel prior to disposal or reprocessing in order to begin to bring down the federal liability; and
- Appropriate independent oversight to ensure the public interest is protected, as well as transparency for Congress, states and communities.

A core issue Congress must assess and debate is what organization would be the best implementer for this program. The NWPA tasked DOE with the responsibility to run this program. Though DOE has made strides in recent years, the Department faces a number of structural limitations in implementing the program, including that DOE is not independent from the Administration, so is subject to changes in priorities and programs every

four years; DOE remains reliant on annual appropriations, which to date have not been sufficient for DOE to run this program long-term; and DOE is subject to the political winds changing, making sustained progress challenging.

With a dedicated office within DOE, such as a reestablished Office of Civilian Radioactive Waste Management (OCRWM), progress may be more achievable. However, expert recommendations through the years, including the Blue Ribbon Commission in 2012 and the *Path Forward for Nuclear Waste in the U.S.* report in 2026 have recommended establishing a new single purpose organization to manage the spent nuclear fuel program. Several bills in Congress, including my bipartisan *Nuclear Waste Administration Act of 2024* (H.R. 9786 in the 118th Congress) would establish such an independent organization. If Congress does choose to establish a new organization to manage spent fuel, there should be an adequate plan to transition the program to ensure that discussions with states and progress on the NLICs are not interrupted.

In order for a spent nuclear fuel program to be durable and successful, Congress must act in a bipartisan, bicameral fashion and engage with the Administration and a wide array of stakeholders to develop and advance the most appropriate legislative solutions.

Communities across the country, including my own, have waited patiently for action on this matter. It is past time that we end the continued stalemate that is wasteful of taxpayer resources. The path ahead will not be easy and will require many difficult conversations. But there is strong, bipartisan consensus behind finding a solution, and for the first time, states are raising their hands to be considered as candidate sites.

I am committed to seeing this through, and I hope to work with you and your staff to finally fulfill the federal government's responsibility to manage spent nuclear fuel.

Sincerely,

A handwritten signature in black ink that reads "Mike Levin". The signature is fluid and cursive, with a horizontal line extending from the end of the name.

Mike Levin
United States Representative