UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
2300 Clarendon Boulevard, Suite 1300
Arlington, VA 22201-3367

March 18, 2025

The Honorable Mike Johnson
Speaker of the House
United States House of Representatives
Washington, DC 20515

The Honorable Chuck Grassley
President Pro Tempore
United States Senate
Washington, DC 20510

The Honorable Christopher Wright
Secretary
United States Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Speaker Johnson, Senator Grassley, and Secretary Wright:

The U.S. Nuclear Waste Technical Review Board was established as an independent federal agency in the 1987 Amendments to the Nuclear Waste Policy Act (NWPA) and is charged with performing an independent evaluation of the technical and scientific validity of activities undertaken by the Secretary of Energy to implement the NWPA. The Board is required by Section 508 of the NWPA, as amended, to report its findings, conclusions, and recommendations to Congress and the Secretary of Energy.

Since its inception, the Board has provided independent expert review of U.S. Department of Energy (DOE) activities, and the Board strives to offer constructive and actionable recommendations that, if implemented, serve to bolster the success of, and confidence in, the national nuclear waste management program. To fulfill its mission, the Board must work closely with the DOE. In this regard, the Board specifically thanks the current DOE team within the Office of Nuclear Energy (NE), led by Acting Assistant Secretary Michael Goff and Deputy Assistant Secretary Paul Murray for their ongoing support of our mission. We commend the entire DOE-NE team for their commitment to moving the nation toward a permanent solution for the management of the nation's spent nuclear fuel and high-level radioactive waste.

In providing this letter as our first report of 2025, the Board takes the opportunity to summarize a small number of broad observations clearly and directly to a new Congress and a new Secretary. In part, we are restating and expanding on observations that we have made in the past that relate directly to the technical and scientific activities essential for a successful program for managing spent nuclear fuel and high-level radioactive waste. These observations are rooted both in our

long history of reviewing the DOE's program and from lessons learned from other nations actively conducting nuclear waste management. We present our observations here in formal terms as a finding, two conclusions, and a recommendation. Additional information supporting our bases for these points is provided in an attachment to this letter. None of the points raised here should come as a surprise to anyone; each has been noted before by this Board and by others. We believe, however, that there is value in emphasizing them at this time of transition.

Finding: The nation needs one or more deep geologic repositories for permanent disposal of domestic spent nuclear fuel and high-level radioactive waste.

The Board finds that a successful program for safe long-term management of spent nuclear fuel and high-level radioactive waste will require a geologic repository for safe permanent disposal. As described further in the attachment, this finding is consistent with decades of scientific research and expert review in the U.S. and other nations, and is a fundamental premise of the NWPA of 1982. Without a geologic repository the nation will be unable to fulfill its responsibilities for managing and disposing of spent nuclear fuel and high-level radioactive waste that have been created since the 1940s, are still being produced for national defense and energy needs, and will likely expand to meet future national needs.

Conclusion 1: The Department of Energy does not have an effective program, as of December 2024, that could lead to a deep geologic repository.

Based on our review of the technical and scientific basis for the DOE-NE activities, the Board concludes that the existing research and development program evaluating hypothetical disposal concepts without actions to identify one or more specific sites for consideration will not alone be sufficient to meet the national responsibility to develop a repository for permanent disposal of spent nuclear fuel and high-level radioactive waste. As described further in the attachment, this conclusion is not meant to be a criticism of technical and scientific work done within the existing DOE program; the Board has in past reviews found merit in much of that work. Permanent disposal of radioactive waste requires knowledge of the geologic system that can only be gained through site-specific activities. The conclusion is based on the common-sense observation that a research program cannot, on its own, lead directly to the disposal of radioactive wastes in a geologic repository without site-specific investigations.

Conclusion 2: The lack of an effective repository program brings a high risk that ongoing efforts to site one or more federal interim storage facilities will ultimately be unsuccessful.

Also based on its ongoing review, the Board concludes that the DOE-NE efforts to develop one or more federal consolidated interim storage facilities for commercial spent nuclear fuel are unlikely to meet with full success without substantive progress toward implementing a geologic disposal solution. Specifically, confidence that a repository for permanent disposal will be available in the future is likely to be a significant factor in achieving acceptance at local, state, and national levels for new interim storage facilities. As described further in the attachment, this conclusion is a restatement of an observation made by this Board in April 2024.

Consistent with this finding and these conclusions, the Board offers the following recommendation:

> ***Recommendation: The Board recommends that the Department of Energy 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.***

Consistent with the Board's statutory mandate and as explained in the attachment, the finding, conclusions, and recommendation presented here are based solely on considerations of the technical and scientific aspects of those activities needed to successfully implement an integrated nuclear waste management program. We make no recommendations regarding policy actions that may or may not be associated with efforts to establish an effective repository program. The Board welcomes the opportunity to discuss any of these topics further with you.

Sincerely,

Peter Swift
Chair

Enclosure

cc: The Honorable Mike Lee, U.S. Senate
The Honorable Martin Heinrich, U.S. Senate
The Honorable John Kennedy, U.S. Senate
The Honorable Patty Murray, U.S. Senate
The Honorable Bob Latta, U.S. House of Representatives
The Honorable Kathy Castor, U.S. House of Representatives
The Honorable Chuck Fleischmann, U.S. House of Representatives
The Honorable Marcy Kaptur, U.S. House of Representatives
Dr. Michael Goff, Office of Nuclear Energy, U.S. Department of Energy

Note: Current and past Members of the U.S. Nuclear Waste Technical Review Board who have contributed to this letter include P. Swift (Chair), R. Allen-King, R. Ballinger, L. Barrett, M. Greiner, S. Jurisson, N. Siu, S. Tuler, S. Tyler, and B. Woods. Support was provided by the professional and administrative staff of the U.S. NWTRB.

Attachment

Additional Information Supporting the Finding, Conclusions, and Recommendation Contained in the Letter of March 18, 2025, from the U.S. Nuclear Waste Technical Review Board to Congress and the Secretary of Energy

As described in the preceding letter dated March 18, 2025, the U.S. Nuclear Waste Technical Review Board is required in Section 508 of the Nuclear Waste Policy Act of 1982 as amended (NWPA) to report its findings, conclusions, and recommendations to Congress and the Secretary of Energy. The letter identifies one finding, two conclusions, and one recommendation. Additional information is provided here regarding each of these points.

> ***Finding: The nation needs one or more deep geologic repositories for permanent disposal of domestic spent nuclear fuel and high-level radioactive waste.***

There is nothing new in this finding, but nonetheless, the Board sees merit in restating it. The recognition that deep geologic disposal is the best option for permanent management of high-level radioactive waste dates back to the 1950s (e.g., National Research Council 1957), and has been reiterated over the past 60-plus years by multiple scientific studies and expert reviews in the U.S. and all other nations with significant quantities of highly radioactive wastes (e.g., National Research Council 1978, 1990, 2001; NASEM 2023; BRC 2012; NWTRB 2014; see NWTRB 2022a for a summary of waste management programs in other nations). The U.S. Department of Energy's 1980 *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste* (DOE 1980) provided a definitive summary of a decade or more of research on alternatives for long-term radioactive waste management when it concluded that "disposal of commercially generated radioactive wastes in deep geologic repositories is warranted." The DOE's 1980 study further noted that "[t]his conclusion applies whether the wastes are generated in the once-through or in the reprocessing fuel cycle option" (DOE 1980, section 1.8). The 1980 study considered a full range of disposal options, including very deep boreholes, rock melt concepts, island-based disposal concepts, sub-seabed disposal, ice sheet disposal, well injections, transmutation, and space disposal, all both with and without reprocessing of spent nuclear fuel to separate fissile material for reuse. "A mined geologic repository is the preferred alternative based on evaluation of radiological effects during the operational period, non-radiological effects on the human environment, status of development, conformance with existing National and international law, independence from future development of the nuclear industry and potential for corrective or mitigating actions" (DOE 1980, section 1.8). Based in part on this conclusion, the need for one or more mined repositories became a fundamental basis for U.S. national policy in the Nuclear Waste Policy Act (NWPA) of 1982, "An Act to provide for the development of repositories for the disposal of high-level radioactive and spent nuclear fuel …" (Public Law 97-425, January 7, 1983).

Two questions warrant further discussion relevant to any assertion that the basic conclusions of the DOE's 1980 study and every substantive review since remain valid. First, have there been advances in disposal technologies during the intervening decades that would change the

conclusion? Second, have there been advances in nuclear engineering, either in reactor design, nuclear fuel design, or in spent fuel processing technology, that might change the conclusion?

With respect to possible impacts of advances in disposal technology, no entirely new concepts have appeared in the realm of practical engineering since 1980. Further research on some of the approaches that were evaluated in 1980 have shown them to be no more suitable now for large scale implementation than they were then (e.g., space launch, transmutation), and others (e.g., sub-seabed disposal) are precluded by international treaty (Rechard et al. 2011). One concept evaluated in 1980 that has seen major advances in relevant technology in the intervening years is disposal in deep boreholes. Two points are critical here to the finding that the U.S. needs a mined geologic repository regardless. First, the borehole disposal concept remains untested at full scale, and much work remains to be done before the concept can be brought to licensing, if ever (e.g., NWTRB 2016a; Swift and Newman 2022). Second, and more importantly, even if borehole disposal can be demonstrated and implemented, it will not obviate the need for mined geologic repositories in the U.S. or other nations that have large inventories of wastes, including some that already exist in configurations that preclude disposal in conventional boreholes without expensive and dose-intensive waste treatment and/or repackaging. As this Board has noted previously, "[e]ven if disposal of some radioactive waste in deep boreholes is determined to be feasible, the need for a mined, geologic repository is not eliminated" (NWTRB 2016a, p. iv).

With respect to the possible impacts of advances in nuclear technology on options for disposal, the Board recognizes that newer reactor and fuel designs allow for more efficient use of fissile materials and may therefore generate smaller volumes of waste requiring deep geologic disposal. However, no advances in nuclear technology will completely remove the need for deep geologic disposal of at least some wastes. In part, this is because large quantities of spent nuclear fuel exist today with no plausible pathway for reuse: as the DOE concluded in 2013, "approximately 98 percent of the [then-existing] total current inventory of commercial used nuclear fuel by mass can proceed to permanent disposal without the need to ensure post-closure recovery for reuse" (DOE 2013, p. 7). As the authors of the underlying technical analysis supporting this conclusion noted, the potential for future reuse of the then-existing spent nuclear fuel is low. "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 [used nuclear fuel] discharges and inventory ***at that time*** (emphasis added), rather than [used nuclear fuel] feedstock that is no longer being produced" (Wagner et al. 2012, p. xii). Furthermore, regardless of the efficiency of future reactor and fuel designs, some high-level wastes will continue to be generated, although perhaps in smaller quantities. As a National Academies review panel concluded in 2023, "advanced reactors and their associated fuel cycles would not eliminate the requirement for geologic repositories for some radioactive wastes, because even advanced reactors will require disposal of radioactive fission products" (NASEM 2023, p. 1). The Board concurs with this conclusion.

> ***Conclusion 1: The Department of Energy does not have an effective program, as of December 2024, that could lead to a geologic repository.***

The Board has reviewed the DOE Office of Nuclear Energy's activities relevant to geologic disposal within the Used Fuel Disposition program, and its successor, the Spent Fuel and High-Level Waste Disposition program, since 2011. From the beginning, this program has defined its

activities relevant to the permanent disposal of spent nuclear fuel and high-level radioactive waste as research, rather than as work that will lead to the siting, licensing, construction, and operation of a repository. As described by the DOE in February 2011, a near-term objective of the Used Fuel Disposition Campaign was to "Develop a comprehensive understanding of the current technical bases for disposing of used nuclear fuel, low-level nuclear waste, and high-level waste in a range of potential disposal environments to identify opportunities for long-term research and development" (Boyle 2011, p. 7). A long-term objective at that time was to "Develop a fundamental understanding of disposal system performance in a range of environments for potential wastes that could arise from future nuclear fuel cycle alternatives through theory, simulation, and experimentation" (Boyle 2011, p. 8). In 2024, the stated objectives had been updated, but the message was similar; the three goals of the DOE's disposal research program were defined to be: 1) provide a sound technical basis for multiple viable disposal options in the U.S., 2) to increase confidence in the robustness of generic (i.e., non-site-specific) disposal concepts, and 3) develop the science and engineering tools needed to support disposal concept implementation (Sassani 2024, p. 4).

Throughout this period the Board has found much of value in the DOE's disposal research program and has offered detailed and constructive observations and recommendations about how to make the best use of the available resources to address relevant technical and scientific topics (e.g., NWTRB 2014, 2016b, 2021a, 2021b, 2022b). The conclusion offered here is in no way a criticism or a judgment of the disposal research program, which has added greatly to the scientific understanding of the nation's options for geologic disposal. The conclusion is based on a simple common-sense observation that a research program without a site cannot, on its own, lead directly to the disposal of radioactive wastes in a geologic repository.

The Board noted in 2021 that timely progress toward permanent disposal "is still required," and provided specific recommendations regarding actions that could help create the capability to successfully implement a geologic repository (NWTRB 2021b). The DOE has made substantive progress relevant to some of these recommendations, including actions to engage the public and other stakeholders early in the planning process regarding the siting of centralized interim storage facilities, but, overall, the national repository program remains on hold. The DOE summarized an overarching strategic goal for disposal research in a presentation to the Board in 2024 as to "Poise Program to Leap into Next Stage" (Sassani 2024, p. 4). The Board concurs with this goal.

> ***Conclusion 2: The lack of an effective repository program brings a high risk that ongoing efforts to site one or more federal interim storage facilities will ultimately be unsuccessful.***

This conclusion builds on an observation previously noted by the Board in its letter report to DOE-NE Assistant Secretary Huff in 2024 (Siu 2024, p. 7) that "timely progress on a geologic disposal program … is needed now to provide confidence that storage of [spent nuclear fuel] at a federal consolidated storage facility will be interim and not permanent. Such confidence will be necessary for consent from states, Tribes, and communities." This conclusion is based on the Board's past and recent reviews of experiences in both the U.S. and other nations and is consistent with the scientific understanding of the importance of trust and confidence in building public acceptance for collaborative siting decisions (e.g., NWTRB 2024).

Concerns about the possibility that interim storage facilities could become a de facto permanent storage facility in the absence of a geologic repository are not new to the U.S. program. The 1987 Nuclear Waste Policy Amendments Act (Public Law 100-203, Title V) addressed these potential concerns directly by introducing requirements into the NWPA that precluded construction of a Monitored Retrievable Storage (MRS) facility (i.e., a federal consolidated interim storage facility) until after a repository had received a license for construction (NWPA section 148(d)(1)). The intent of the law notwithstanding, Governor Mike Sullivan of Wyoming cited exactly this concern in his 1992 veto of a proposed MRS facility in Fremont County, Wyoming. "Can we and are we willing to trust the federal government's assurances that the MRS site will be temporary? Can we be paid enough or place enough in trust to accept a permanent repository that was intended to be temporary? It is my belief we cannot." (Sullivan 1992). In 1997, Governor Mike Leavitt of Utah cited the same concern in issuing an executive order opposing temporary spent nuclear fuel storage at the proposed Private Fuel Storage facility. He stated, "If nuclear waste comes to Utah, chances are it won't be moved again" and "The fallacy of the term 'temporary facility' will be exposed" (Leavitt 1997).

These concerns continue to persist. In 2020, Governor Lujan Grisham of New Mexico raised the concern again in voicing opposition to a proposed private spent fuel storage facility in southeastern New Mexico by stating "At this time, the [Nuclear Regulatory Commission] cannot guarantee that a permanent repository for spent nuclear fuel in the United States will be developed in 40, 80, or 120 years, or that the proposed Holtec [consolidated interim storage facility] will not become a permanent repository" (Lujan Grisham 2020). Responses to a DOE 2021 Federal Register request for information on "Using a Consent-Based Siting Process to Identify Federal Interim Storage Facilities" (86 FR 68244) show that a concern raised by at least some state government officials regarding the eventual removal of spent nuclear fuel from interim storage is widely held, at least among those who provided written responses to the request: "Numerous commenters expressed concern that a consolidated interim storage facility will become a de facto permanent storage facility since a repository for final disposal of spent nuclear fuel does not yet exist" (DOE 2022, p. 37). More recently, a bill in the Wyoming legislature that would have opened the possibility for that state to reconsider temporary storage of spent nuclear fuel failed to come to a vote in the state House of Representatives, in part, over concerns about the federal government's failure to establish a permanent repository (as reported by Bleizeffer 2025).

Based on both the historical record and the DOE's preliminary observations from its ongoing work on consent-based and collaborative siting processes, the Board concludes that there is a high likelihood that concerns about the potential for interim storage to persist indefinitely will continue to be raised regarding proposals for federal storage facilities until the DOE has demonstrated a clear path to siting, licensing, and constructing a permanent repository.

> ***Recommendation: The Board recommends that the Department of Energy 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.***

This recommendation is consistent with recommendations made by others in the past (e.g., BRC 2012) and builds on recommendations made previously by this Board that "will support the

creation of a robust, safe, and effective nuclear waste management capability for the nation, including laying the groundwork for a successful geologic repository" (NWTRB 2021b). In keeping with the Board's statutory mandate to provide findings, conclusions, and recommendations specific to the technical and scientific basis for the DOE's activities managing the nation's 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. Regardless of the approach taken, we reiterate that, in our technical and scientific judgment, a geologic repository for permanent disposal of spent nuclear fuel and high-level radioactive waste is essential, and that the national nuclear waste management program will remain stalled until an effective repository program is in place.

REFERENCES

Bleizeffer, D. 2025. *Lawmakers say no to storing nuclear waste in Wyoming.* WyoFile, January 30, 2025. https://wyofile.com/lawmakers-say-no-to-storing-nuclear-waste-in-wyoming/ (last accessed February 25, 2025).

Boyle, W. 2011. *R&D Activities for Used Nuclear Fuel Disposition: Storage, Transportation & Disposal.* Director, U.S. Department of Energy Office of Used Nuclear Fuel Disposition Research and Development, presentation to the Nuclear Waste Technical Review Board Winter Meeting, February 16, 2011. https://www.nwtrb.gov/docs/default-source/meetings/2011/february/boyle.pdf?sfvrsn=9922f605_9 (last accessed February 25, 2025).

BRC (Blue Ribbon Commission on America's Nuclear Future). 2012. *Report to the Secretary of Energy, January 2012*. https://www.energy.gov/sites/prod/files/2013/04/f0/brc_finalreport_jan2012.pdf (last accessed February 25, 2025).

DOE (U.S. Department of Energy). 1980. *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste*. DOE/EIS-0046F. Washington, DC: US Department of Energy. https://www.energy.gov/sites/prod/files/EIS-0046-FEIS-1980.pdf (last accessed February 25, 2025).

DOE (U.S. Department of Energy). 2013. *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste.* U.S. Department of Energy, January 2013. https://www.energy.gov/sites/prod/files/Strategy%20for%20the%20Management%20and%20Disposal%20of%20Used%20Nuclear%20Fuel%20and%20High%20Level%20Radioactive%20Waste.pdf (last accessed February 25, 2025).

DOE (U.S. Department of Energy). 2022. *Consent-Based Siting: Request for Information Comment Summary and Analysis,* U.S. Department of Energy Office of Nuclear Energy. https://www.energy.gov/sites/default/files/2022-09/Consent-Based%20Siting%20RFI%20Summary%20Report%200915.pdf (last accessed February 25, 2025).

Leavitt, M. 1997. *Governor's Executive Order: Creating a Task Force to Oppose Nuclear Waste Siting.* April 15, 1997. Salt Lake City, Utah. https://www.eesi.org/files/Letter_to_President_Trump-New_Mexico_Gov_Grisham_Opposes_Nuclear_Waste_Consolidated_Interim_Storage_Facilities.pdf (last accessed February 25, 2025).

Lujan Grisham, M. 2020. Letter to President Trump from M. Lujan Grisham, Governor, State of New Mexico. July 28, 2020, Santa Fe, New Mexico. https://www.eesi.org/files/Letter_to_President_Trump-New_Mexico_Gov_Grisham_Opposes_Nuclear_Waste_Consolidated_Interim_Storage_Facilities.pdf (last accessed February 25, 2025).

NASEM (National Academies of Sciences, Engineering, and Medicine). 2023. *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. https://nap.nationalacademies.org/read/26500/chapter/1#xi (last accessed February 25, 2025).

National Research Council. 1957. *The Disposal of Radioactive Waste on Land*. Publication 519. Washington, DC: The National Academy Press. https://nap.nationalacademies.org/catalog/10294/the-disposal-of-radioactive-waste-on-land (last accessed February 25, 2025).

National Research Council. 1978. *Geological Criteria for Repositories for High-Level Radioactive Wastes*. Washington, DC: The National Academies Press. https://nap.nationalacademies.org/catalog/20000/geological-criteria-for-repositories-for-high-level-radioactive-wastes (last accessed February 25, 2025).

National Research Council. 1990. *Rethinking High-Level Radioactive Waste Disposal: A Position Statement of the Board on Radioactive Waste Management*. Washington, DC: The National Academies Press. https://nap.nationalacademies.org/catalog/10293/rethinking-high-level-radioactive-waste-disposal-a-position-statement-of (last accessed February 25, 2025).

National Research Council. 2001. *Disposition of High-Level Waste and Spent Nuclear Fuel: The Continuing Societal and Technical Challenges*. Washington, DC: The National Academies Press. https://nap.nationalacademies.org/catalog/10119/disposition-of-high-level-waste-and-spent-nuclear-fuel-the (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2014. *A Report to the U.S. Congress and the Secretary of Energy: Board Activities for the Period January 1, 2008 – December 31, 2012.* *https://www.nwtrb.gov/docs/default-source/reports/nwtrb_sumrpt14.pdf?sfvrsn=a4f4f605_10* (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2016a. *Technical Evaluation of the U.S. Department of Energy Deep Borehole Disposal Research and Development Program.* *https://www.nwtrb.gov/docs/default-source/reports/dbd_final.pdf?sfvrsn=34f6f605_7* (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2016b. *Report to the U.S. Congress and the Secretary of Energy: Board Activities for the Period January 1, 2013 – December 31, 2015.* *https://www.nwtrb.gov/docs/default-source/reports/summary_report_2016.pdf?sfvrsn=bcd5f405_6* (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2021a. *A Report to the U.S. Congress and the Secretary of Energy: Board Activities for the Period January 1, 2016 – December 31, 2018.* https://www.nwtrb.gov/docs/default-source/reports/nwtrb-summary-report-_08302021_508_final_9-7-21_edit.pdf?sfvrsn=adc0f105_6 (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2021b. *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.* *https://www.nwtrb.gov/docs/default-source/reports/nwtrb-six-recommendations-report.pdf?sfvrsn=2e98f105_20* (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2022a. *Survey of National Programs for Managing High-Level Radioactive Waste and Spent Nuclear Fuel: 2023 Update: A Report to Congress and the Secretary of Energy.* *https://www.nwtrb.gov/docs/default-source/reports/nwtrb-2022-survey-report.pdf?sfvrsn=854df105_6* (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2022b. *A Report to the U.S. Congress and the Secretary of Energy: Board Activities for the Period January 1, 2019– December 31, 2021.* https://www.nwtrb.gov/docs/default-source/reports/nwtrb-summary-report-2019-2021.pdf?sfvrsn=e0a2f005_6 (last accessed February 25, 2025).

NWTRB (U.S. Nuclear Waste Technical Review Board). 2024. *Proceedings of the Board's 2023 International Workshop on Siting of Radioactive Waste Facilities.* https://www.nwtrb.gov/docs/default-source/reports/nwtrb_2024_proceedings-report.pdf?sfvrsn=d004c305_3 (last accessed February 25, 2025).

Rechard, R.P., B. Goldstein, L.H. Brush, J.A. Blink, M. Sutton, and F.V. Perry. 2011. *Basis for Identification of Disposal Options for Research and Development for Spent Nuclear Fuel and High-Level Waste.* FCRD-USED-2011.000071, U.S. Department of Energy Used Fuel Disposition Campaign. https://www.energy.gov/sites/prod/files/2013/06/f1/FY11%20-%20Basis%20for%20Identification%20of%20Disposal%20Options%20for%20R%26D%20for%20Spent%20Nuclear%20Fuel%20and%20High-Level%20Waste_2.pdf (last accessed February 25, 2025).

Sassani, D. 2024. *Overview of Disposal R&D Activities.* National Technical Director, US DOE Office of Nuclear Energy Spent Fuel and Waste Science and Technology, presentation to the Nuclear Waste Technical Review Board Spring Meeting, May 21, 2024. Sandia National Laboratories, SAND2024-06184PE. https://www.nwtrb.gov/docs/default-source/meetings/2024/may/day1_sassani-disposal-randd-overview.pdf (last accessed February 25, 2025).

Siu, N. 2024. Board letter to Dr. Kathryn Huff, Assistant Secretary for Nuclear Energy, U.S. Department of Energy, from the U.S. Nuclear Waste Technical Review Board. https://www.nwtrb.gov/docs/default-source/correspondence/nos011vf---board-letter-august-workshop-and-meeting.pdf?sfvrsn=4e43f005_4 (last accessed February 25, 2025).

Sullivan, M. 1992. Letter to the Fremont County Commissioners, Fremont County, Wyoming, from M. Sullivan, Governor, State of Wyoming. August 21, 1992. https://wyofile.com/wp-content/uploads/2024/08/Gov.-Sullivan_letter_declining_MRS.pdf (last accessed February 25, 2025).

Swift, P.N. and A. Newman. 2022. *Deep Borehole Disposal of Radioactive Waste: Next Steps and Applicability to National Programs,* Columbia University School of International and Public Affairs Center on Global Energy Policy, energypolicy.columbia.edu, November 17, 2022, 28 p. https://www.energypolicy.columbia.edu/publications/deep-borehole-disposal-radioactive-waste-next-steps-and-applicability-national-programs/ (last accessed February 25, 2025).

Wagner, J.C., J.L. Peterson, D.E. Mueller, J.C. Gehin, A. Worrall, T. Taiwo, M. Nutt, M.A. Williamson, M. Todosow, R. Wigeland, W. G. Halsey, R.P. Omberg, P.N. Swift, and J.C. Carter. 2012. *Categorization of Used Nuclear Fuel Inventory in Support of a Comprehensive National Nuclear Fuel Cycle Strategy,* ORNL/TM-2012/308 FCRD-FCT-2012-000232. Oak Ridge National Laboratory. https://fissilematerials.org/library/ornl12.pdf (last accessed February 25, 2025).