Beyond Nuclear

working for a world free from nuclear power and nuclear weapons

Maximizing Health and Environmental Protection: Permanent Geologic Disposal of Nuclear Waste Far Outweighs Surface Storage

No human strategy can guarantee permanent isolation of highly radioactive nuclear waste for the millions of years it will be hazardous to humans and the environment. However, deep disposal in a permanent geologic repository, if carried out equitably via consent-based siting and according to stringent scientific requirements, would be vastly more effective at minimizing the hazards from highly radioactive nuclear waste than surface storage.

Surface Storage:	Deep Geologic Disposal:
What is it? Storage of highly radioactive nuclear waste in casks placed at the earth's surface or slightly below (i.e., within tens of meters).	**What is it?** Storage of nuclear waste in disposal casks placed in a mined repository 250-1,000 meters below the earth's surface.
High-maintenance features: Surface storage system relies entirely on human-made engineered barriers that must be maintained and replaced at least every 100 years.[1] Therefore, storage requires investment, maintenance, governmental stability, and oversight for as long as the hazard persists (i.e., a million years).	**Low-maintenance features:** Disposal system relies on a combination of human-made and natural geologic barriers designed to last a million years. Therefore, once the waste is placed in a repository, it will not require active maintenance or oversight.
Accessible: Surface or near-surface location makes nuclear waste more accessible and therefore more vulnerable to theft, re-use, or accidental exposure and release.	**Inaccessible:** Location in deep geologic repository makes access to nuclear waste extremely difficult and therefore minimizes vulnerability to theft, re-use, or accidental exposure and release.
Intergenerational inequity: Surface storage burdens future generations with the responsibility, costs, liabilities, and risks of maintaining protective barriers against exposure to radioactive toxins, even though they never enjoyed one megawatt-hour of electricity generated by the irradiation of reactor fuel.	**Intergenerational equity:** Deep geologic disposal is designed to protect future generations who did not benefit from the nuclear reactors that generated the nuclear waste. Ideally, the risk of leakage will be minimized, if not eliminated. Costs will be paid by nuclear reactor licensees through the Nuclear Waste Fund, collected during years of reactor operation.

[1]Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel, Vol. 1, page xxxi (NRC NUREG-2157, 2014).

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Surface Storage:	Deep Geologic Disposal:
Private liability: Nuclear reactor operators must retain ownership of and liability for the waste in their possession, which is currently held in surface storage casks on-site of individual nuclear power reactors. To limit their liability, nuclear reactor operators have sought to move their waste off-site to "interim" consolidated storage.	**Federal liability:** The Nuclear Waste Policy Act (NWPA) permits the Department of Energy to take title to and assume liability for nuclear waste once a permanent repository is operational.[2] Until then, private nuclear reactor operators must retain title and liability for their nuclear waste.
Statutorily disfavored: Under the NWPA, on-site surface storage was meant to be temporary. The only long-term storage solution expressly permitted by the NWPA is deep geologic disposal. However, the Nuclear Regulatory Commission has recently issued two licenses for consolidated "interim" storage facilities.[3] These facilities would store nuclear waste from decommissioned and operating nuclear reactors across the country. This storage "solution" would not address the problems that come with surface storage, as the waste would merely be consolidated, but still kept in surface storage instead of a deep geologic repository.	**Statutorily mandated:** The NWPA supports permanent geologic disposal of nuclear waste by making the siting and licensing of an underground repository a statutory requirement. However, this goal of permanent geologic disposal has been stalled for decades because Congress designated Yucca Mountain in Nevada as the sole site for a repository without any input from state/local leaders or ordinary Nevadans. To make this goal a reality, the NWPA must be amended to incorporate consent-based siting in identifying a new location for the permanent repository.

The Most Serious Risk if the U.S. Government Takes Ownership of Nuclear Waste Before a Repository Opens:

If the federal government permits consolidated nuclear waste storage at away-from-reactor sites before it knows the location and characteristics of a permanent repository, it will not have the resources or political will for the long-term logistical and financial planning and execution needed to for permanent geologic disposal. ***Without the will to build a permanent repository, nuclear waste will become stranded at "interim" near-surface storage facilities.*** *To ensure that nuclear waste eventually gets to a permanent deep geologic repository, Congress* ***must*** *have a comprehensive strategy that keeps the U.S. on the road to a repository and precludes* ***premature quick-fixes****.*

[2] *See* Nuclear Waste Policy Act of 1982 §§ 302(a)(5)(A); *see also Interim Storage Partners, L.L.C.*, 92 N.R.C. 463, 467 (2019).

[3] These licenses have been challenged in multiple different lawsuits. While one such license was challenged in a case before the Supreme Court (*NRC v. Texas*, 605 U.S. __ (2025)), the Court decided the case on a procedural issue and the Court did not take a position on whether the NWPA permits the NRC to license private companies to temporarily store spent nuclear fuel away from nuclear-reactor sites.

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