

Beyond Nuclear

working for a world free from nuclear power and nuclear weapons



Highly radioactive nuclear waste is a byproduct of the series of industrial processes used to produce electricity from uranium in a nuclear reactor. These processes encompass mining and milling of uranium ore and fabrication into reactor fuel, irradiation of the fuel for production of electricity, and storage and disposal of the irradiated or “spent” fuel as highly radioactive nuclear waste. High level liquid and solid reprocessing waste also exists from both nuclear power and weapons.

As the D.C. Circuit Court of Appeals has recognized, highly radioactive nuclear waste has “the capacity to outlast human civilization as we know it and the potential to devastate public health and the environment.” *Nuclear Energy Institute v. U.S. Environmental Protection Agency*, 373 F.3d 1251 (D.C. Cir. 2004).

Extremely high health hazard. Once reactor fuel is irradiated to produce electricity, it becomes a million times more radioactive. Indeed, it is one of the most highly radioactive materials on the earth. Unshielded exposure can deliver a lethal dose within minutes. Exposure at lower doses causes serious health effects such as increased cancer risk, birth defects, genetic damage, and reduced immunity.

Long-lasting harm. The hazards posed by the radioactivity in nuclear waste are also long-lasting – in fact, longer than human history. Radionuclides take thousands to millions of years to decay and persist in the environment ten times as long. Plutonium-239, for example, has a half-life (or rate of decay) of 24,000 years, with a hazardous persistence of 240,000 years. Iodine-129 has a half-life of 15.7 million years, with a hazardous persistence of 157 million years. Carbon-14 has a half-life of around 5,500 years, with a hazardous persistence of 55,000 years.

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Why is Highly Radioactive Nuclear Waste Dangerous?

Potential for widespread environmental harm. Dispersal of nuclear waste into the environment would cause irreparable contamination of significant areas of land, entire river and lake systems, and coastal ecosystems – potentially destroying food chains and drinking water supplies.

Potential for environmental injustice. Historically, Black communities, Indigenous communities, communities of color, and low-income earning communities have been targeted to host nuclear waste storage and disposal sites. Thus, they may bear a disproportionate share of the environmental and public health risks of long-term nuclear waste storage.

Proliferation hazard. Each metric ton of nuclear waste typically contains significantly more than one Nagasaki-bomb equivalent of plutonium. It poses a risk of theft if it is stored or disposed of in a manner that would allow access in a few hundred years, when institutional memory has been lost and the fission product radiation barrier has declined to levels that are no longer immediately lethal. And after a few hundred years, the weapons-usable plutonium will become easier for thieves to separate from nuclear waste without risking death from radiation poisoning.

Highly radioactive nuclear waste therefore must be managed in a way that minimizes the risk of radioactive releases to the environment, and ensures that the plutonium is secured and isolated from intentional or accidental human contact and release to the environment.

The Nuclear Waste Policy Act:
Bedrock Principles for the Protection of Future
Generations from the Dangers of Highly Radioactive
Nuclear Waste

In 1982, Congress codified a national commitment to deep geologic disposal of highly radioactive nuclear waste in the Nuclear Waste Policy Act (NWPA), 42 U.S.C. § 10101 *et seq.* The NWPA established a comprehensive program for the disposal of nuclear waste from U.S. commercial reactors and high-level radioactive waste from commercial and weapons reprocessing and the nuclear weapons complex.

NWPA's Bedrock Scientific Principle: By far, the least dangerous means of providing long-term, multi-generational protection of humans and their environment from the extreme and long-lived hazards posed by nuclear waste is permanent geologic disposal of that waste in a repository. *Thus, the federal government will take responsibility for siting and licensing of one or more repositories. And after a repository is operational, the federal government will take ownership of the commercial nuclear waste to be disposed of there.*

NWPA's Bedrock Equitable Principles: The NWPA is also concerned with economic, intergenerational, and political equity. By basing the NWPA on these three bedrock equitable principles, Congress apportioned responsibility for nuclear waste fairly, ensured that future generations would be maximally protected, and established a means for maintaining the political will to achieve the goal of permanent disposal.

Driven by these principles, the NWPA sets the U.S. on course to achieve a permanent geologic repository, the only viable path to disposal of highly radioactive nuclear waste.

1. **Economic equity:** Polluters must pay their own costs, not taxpayers or future generations. *Thus, the cost of a repository will be paid from a Nuclear Waste Fund, collected from reactor licensees while the reactors are in operation.* Taxpayer funds from the U.S. Treasury would cover the disposal costs for high-level nuclear waste from weapons production, and other U.S. Department of Energy irradiated nuclear fuel, including from research reactors.
2. **Intergenerational equity:** Future generations, who did not benefit from the generation of electricity from nuclear reactors, should not have to bear the health and environmental risks of highly radioactive nuclear waste. *Thus, the federal government will prioritize siting a permanent repository, as opposed to interim storage facilities, to best provide long-term, multi-generational protection of humans and their environment.*
3. **Political equity:** Recognizing that the broad consensus in support of a permanent repository could fall apart if the federal government agreed to interim half-measures, thus stranding nuclear waste in surface facilities at the peril of their host communities, the NWPA stipulates that *the U.S. government will not finance interim storage of nuclear waste, other than in extremely limited circumstances (which are now expired), and will seek to minimize transportation of nuclear waste to such storage facilities. Only when a repository is up and running will the federal government take title to nuclear waste generated by the commercial nuclear power industry. In the meantime, the NWPA minimizes environmental risks by providing that nuclear waste should remain at reactor sites until a repository is ready for operation.*