

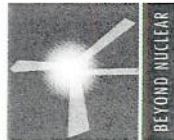
A "Permanent" Repository

- ▶ No permanent repository exists in the US for the irradiated rods, and may never exist.
- ▶ The proposed Yucca Mountain repository in Nevada, on Western Shoshone land, was finally canceled by 2011. By then, the amount of stockpiled US irradiated fuel had already surpassed Yucca's capacity, and would have required a *second* deep-geologic dump. In its Yucca regulations, the EPA acknowledged that high-level waste poses a million years of hazard.
- ▶ The search for a new US dumpsite has resumed. Any of our 48 contiguous states could be targeted.
- ▶ Efforts to isolate irradiated fuel for the requisite millennia pose scientific, ethical and fiscal challenges.

Into Eternity

To view the haunting film about Onkalo, the Finnish radioactive waste repository under construction, contact BEYOND NUCLEAR. *Into Eternity* is a thought-provoking look into humankind's deadly radioactive waste legacy.

Cover logo kindly contributed by Tom Engelhardt.



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This pamphlet is intended for reprint. You are encouraged to copy and distribute it widely. Copies can also be ordered from BEYOND NUCLEAR.

The lethal legacy of the Atomic Age 1942 → 2012 → infinity



It's time to stop making it.

Reprocessing

► At reprocessing plants, the irradiated rods are chopped up and are then dissolved in acid to extract plutonium and uranium. Separated plutonium can be used to make nuclear weapons. The global-warming gas, carbon dioxide, that is released from reprocessing plants, contains radioactive carbon-14, an extremely radiotoxic isotope with a half-life of 5,700 years. You have to multiply the half-life by at least 10 to estimate an isotope's hazardous persistence.

► Reprocessing of commercial fuel has not occurred in the US since 1972, and may never occur again, because of concerns about potential nuclear weapons proliferation, the exorbitant expense, large-scale environmental releases, and safety risks. For more information, see the BEYOND NUCLEAR pamphlet: *Nuclear Fuel Reprocessing = Weapons Proliferation*.

It Doesn't Take An Accident

Nuclear power plants cannot operate without regular, deliberate releases of radioactive liquids, gases and particles into the environment during their routine, everyday operation. That is because no economically feasible technology exists to filter out some of these wastes. The federal government therefore does not require these materials to be filtered. Any releases that do not exceed the government's permissible contaminant levels are allowed to be discharged into our air and water, unmonitored and unreported.

"Permissible" does not mean "safe"

"Centralized Interim" Storage

- "Centralized interim" storage, or parking-lot dumpsites for irradiated fuel rods, could easily become permanent if a national deep-geologic site is never located and built.
- "Centralized interim" dumpsites are often proposed for Native American lands, an environmental injustice.
- "Centralized interim" sites would multiply transport risks because wastes would have to be moved yet again if a reprocessing plant or a permanent repository were ever built.

Transport

- When radioactive wastes are transported, many shipments travel directly through major population centers.
- Severe accidents, including crashes, fires, and underwater submersions, could turn a waste truck, train or barge shipment into a radioactive disaster.
- Transport casks are not designed to withstand attacks on roads, rails or waterways.
- Barge shipments — on rivers, the Great Lakes, and seas — threaten drinking water supplies and fishing grounds, as well as vital ecological biodiversity, and tourism.
- In the late 1990s, it was revealed that a quarter to a third of all waste shipments to the French reprocessing facility involved containers externally contaminated at levels 500-3,300 times the permissible dose.
- Shipments of radioactive wastes can routinely expose transport workers and the public to penetrating gamma radiation comparable to one or more chest x-rays per hour.

From Fermi to Fukushima to Infinity

The History

On December 2, 1942, scientists created the world's first self-sustaining nuclear chain reaction at the Fermi reactor in Chicago. The Atomic Age was born — and so was radioactive waste.

In the 1950s, when commercial nuclear power plants began to produce electricity, using uranium fuel, they also began to produce tremendous amounts of radioactive waste. Much of that waste will remain hazardous for thousands of years and beyond. Radioactive wastes are produced at every stage of the uranium fuel chain — at mines, mills, chemical conversion and enrichment plants, during fuel fabrication and reprocessing, and most dangerously at the reactor sites.

No permanent, safe location or technology has ever been found to isolate even the first cupful of radioactive waste from the biosphere. And yet we continue to generate more and more — a mountain of waste 70 years high.

Radioactive Waste Streams

► Billions of tons of radioactive waste that are produced at the reactors and at the uranium fuel production locations are either left on site, are transported to a waste dump, or are dispersed into the environment.

► At nuclear power plants, some of the fuel rods are removed from the reactor after fissioning for about five years. They are replaced with fresh rods, and the irradiated fuel rods (called high-level waste) are transferred into an indoor fuel pool. Irradiated fuel is at least a million times more radioactive than fresh fuel.

► So-called "low level" waste is produced in massive amounts and includes the radioactive, saturated air and water filters; pipes, pumps, and other components that must be replaced as they wear out or malfunction; and control rods. Much of this "low-level" waste is so highly radioactive that it must be handled by remote-control equipment.

Reactor Fuel Pools

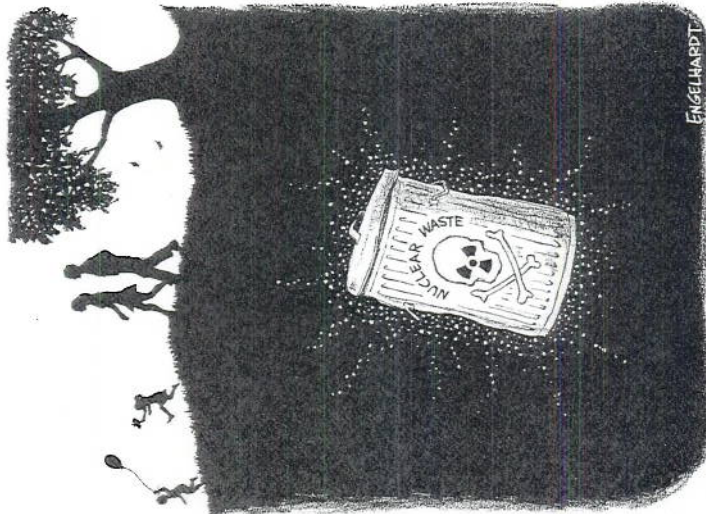
► Although designed to hold irradiated fuel for only a few years, US reactor fuel pools still contain at least 75% of all the irradiated fuel generated since 1957, the year of the first US commercial reactor.

► Most fuel pools are so tightly packed with fuel rods that extraordinary precautions must be taken to prevent an inadvertent chain reaction.

► The Nuclear Regulatory Commission does not currently require emergency backup power to run the fuel pool cooling systems, or to supply make-up water, and operate other safety equipment.

... the unsolved radioactive waste problem

- ▶ Several of the reactor fuel pools are already leaking, releasing radioactivity into the environment.



TIME CAPSULE

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Outdoor Cask Storage

- ▶ In the mid-1980s, as the indoor fuel pools filled up, some of the nation's fuel rods were transferred to concrete and/or metal casks outdoors.

- ▶ Quality assurance violations in design and fabrication of casks leave their structural integrity in question, and have led to hydrogen explosions and fires.

- ▶ The NRC does not require outdoor casks to be directly monitored for overheating, radiological releases, and other safety issues.

- ▶ Outdoor casks are not designed to withstand attacks. Tests have shown that even the highest quality casks could be breached by an anti-tank missile.

- ▶ Outdoor casks do not provide permanent isolation of the wastes. Heat, radioactivity and weather impacts wear them down. No technology currently exists to safely remove and transfer old, deteriorated fuel rods to a new cask for continued storage.

Hardened On-Site Storage (HOSS)

- ▶ The HOSS concept calls for emptying the pools, and fortifying high quality outdoor casks with thick bunkers and berms. Safeguards would be designed that would seek to protect against leaks, accidents, and attacks.

- ▶ Although nearly 200 environmental groups have endorsed HOSS as an interim storage measure, the federal government has not yet required these modifications for outdoor cask storage.