

Used Nuclear Fuel

What you need to know
about the nuclear waste
aspects of expanded use of
nuclear energy

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Global Status of Used Fuel Management

(Table Includes Nations with ~90% of World Nuclear Capacity)



		GW Nuclear	Consolidated Storage	Reprocessing	Repository
United States		97	2 Private Licensed, not ready to build; Federal at Early Stage	Currently No, but Advanced Rx's Interested	None
France		61	At Reprocessing Facility	Since 1969	Site Selected; Pilot Phase (2025) , Ops (2040)
China		50	None	Pilot Plant will startup in 2025	Site Selected; Planned Ops (2041)
Japan		32	Operational November 2024	In Delayed Startup	Site Selection Underway (2031)
Russia		28	??	Yes	Underground Research Ongoing
South Korea		23	Recommended but No Schedule	Not Allowed By U.S.	Site Selection Underway (2028)
Canada		14	No	No	Site Selected (2025) Ops (2040)
Ukraine		13	Shipments to Chernobyl CIS ongoing	No	None
Sweden		7	Operational	No	Site Approved and Under Construction, Operations (2030s)
UK		6	At Former Reprocessing Facility	Discontinued	Site Selection Underway Operations (2050s)
Czech Rep		4	No	No	Exploratory Investigations Underway at 4 Sites
Finland		3	Not Necessary	No	Site Licensed and Under Construction, Operation (2025)
Switzerland		3	Operational	No	Site Approved

Note: Belgium and UAE are in the early stages of repository planning

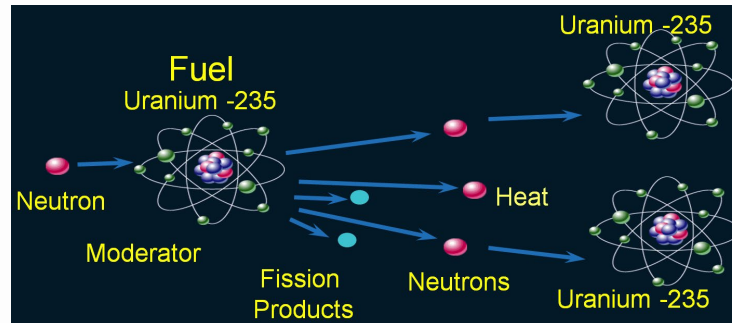
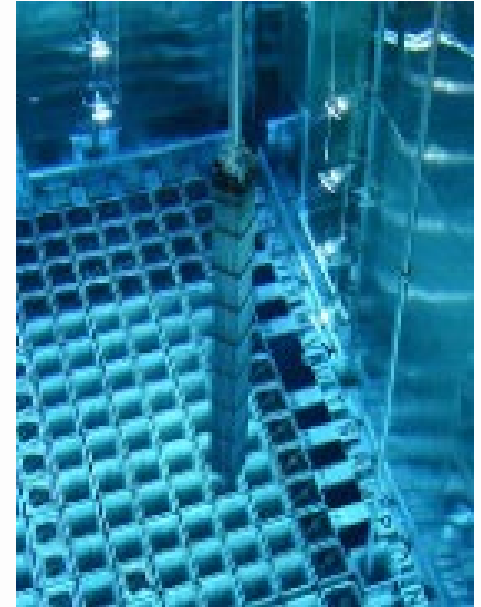
What is Used Nuclear Fuel?

New Nuclear Fuel



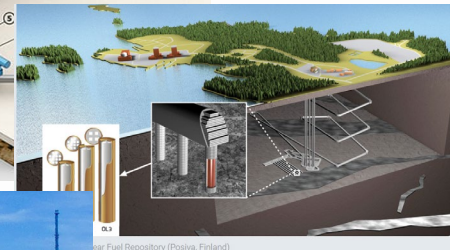
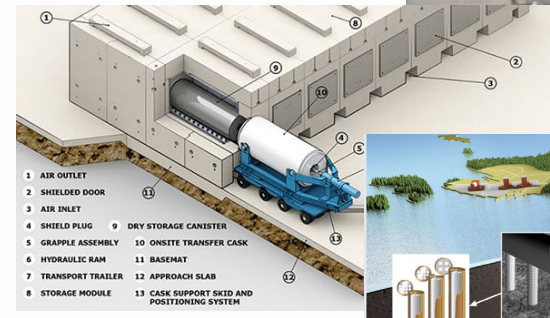
There is little to no outward difference between the condition of the fuel before it goes into the reactor and when it is discharged. However, inside the fuel rods, the radioactive byproducts of nuclear fission remain. The condition of cladding is carefully monitored at every stage.

Used Nuclear Fuel



Used Fuel Management

- Inside the plant* – cooled and shielded under 20+ feet of water
- Outside the plant* – contained in robust dry cask storage systems
- Away from the plant – dry cask storage systems can be moved to consolidated facilities for more efficient management
- Away from the plant and back again – recycling can extract more energy
- Away from civilization – international scientific consensus backs permanent disposal in a deep geologic repository



Storage of Used Nuclear Fuel in the US



Used fuel inventory*

~Approximately 96,000 MTU
Increases 2 - 2.4k MTU annually

ISFSI** storage

194,488 assemblies
~55,000 MTU (57%)
4,304 casks/modules loaded
75 Operating dry storage ISFSIs
21 sites where reactor operations have ceased
Dry storage systems are also transportable

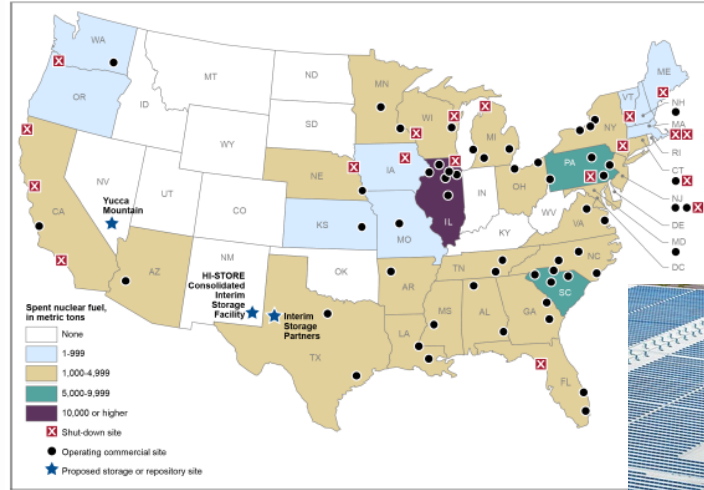
Long-term commitment

First Casks Loaded in 1986
Licenses being extended to 60 years
Licenses extensions approved at 67 sites
Licenses renewable for additional 40 yr. periods
NRC determined casks safe for “at least” 100 yrs

*As of July 2025

** ISFSI = Independent Spent Fuel Storage Installation

Figure 1: Stored Commercial Spent Nuclear Fuel Amounts, through 2019, and Locations, as of June 2021



All of the pools and casks in which this fuel is stored could be comfortably arranged inside a single big box store distribution warehouse

Transportation is routinely conducted



New Fuel Types

40 Advanced Reactors fall into 10 general categories

Reactor Type
UO2 Fuel, Water or Gas Cooled
Metal Fuel, Sodium Cooled
Molten Salt (Uranium)
Molten Salt (Thorium)
MOX Fuel, Lead Cooled
TRISO Fuel, Gas Cooled
TRISO Fuel, Salt Cooled
TRISO Fueled, Sodium Heat Pipe
Bespoke Reactors/Batteries
Deep Underground UO2/LWR



Oklo (shown)
Approximately a dozen in
development

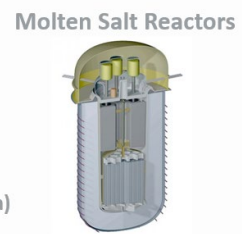
NuScale (shown)
GEH X-300
Holtec SMR-160



X-energy (shown)
Several in development



TerraPower Sodium (shown)
Several in development



Terrestrial (shown)
Several in development

Non-Water Cooled
Most <300MW, some as large as 1,000 MW

Advanced Reactors and Recycling

- US advanced reactor designs coming to market to meet clean and reliable energy needs.
- Future reactors can economically recycle used nuclear fuel to extract even more energy from uranium already mined



- Several advanced reactor designers are considering powering their machines with used fuel
- Multiple US/Canadian suppliers are developing recycling technology to meet anticipated demand
- **Recycling would not replace the need for disposal in a geologic repository**

Local Disposal?

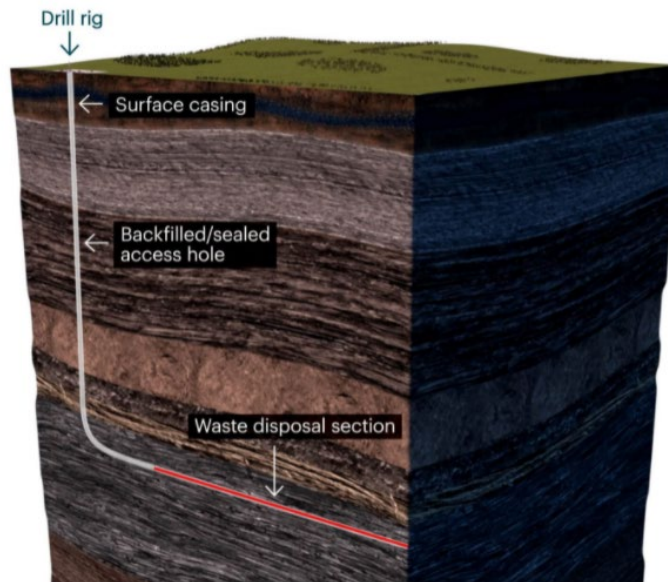


EPRI Report Says Deep Horizontal Boreholes Offer Safe, Affordable Nuclear Waste Disposal for Advanced Reactors

Berkeley, California – A comprehensive report published today by the [Electric Power Research Institute](#) (EPRI) provides the most detailed analysis to date of how deep horizontal boreholes can offer a safe and secure disposal pathway for waste from advanced nuclear reactors.

The study, a first-of-its-kind collaboration among EPRI, [Southern Company](#), Deep Isolation, the [Nuclear Energy Institute](#), Auburn University and J Kessler and Associates, assesses the feasibility of onsite horizontal deep borehole disposal for advanced nuclear energy systems. The 173-page report examines physical site characteristics, disposal operations, safety performance analysis, and regulatory and licensing considerations. The report also outlines an approach to engaging with the public in ways designed to build trust and support for the undertaking.

Advanced nuclear reactors are a low-carbon source of energy, which makes them an important part of responding to the pressing need to address climate change.



“In our every deliberation we must consider the impact of our decisions on the next seven generations.”
-From the Great Law of the Iroquois Confederacy

Nuclear New Build

