

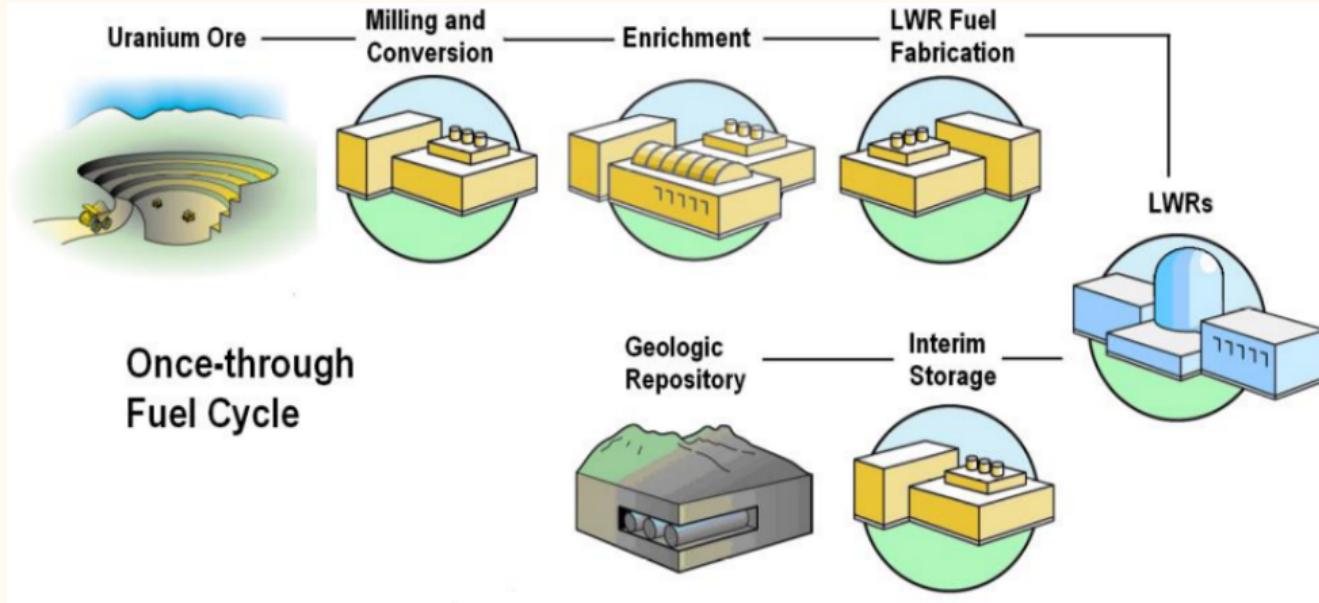
Spent Nuclear Fuel Primer

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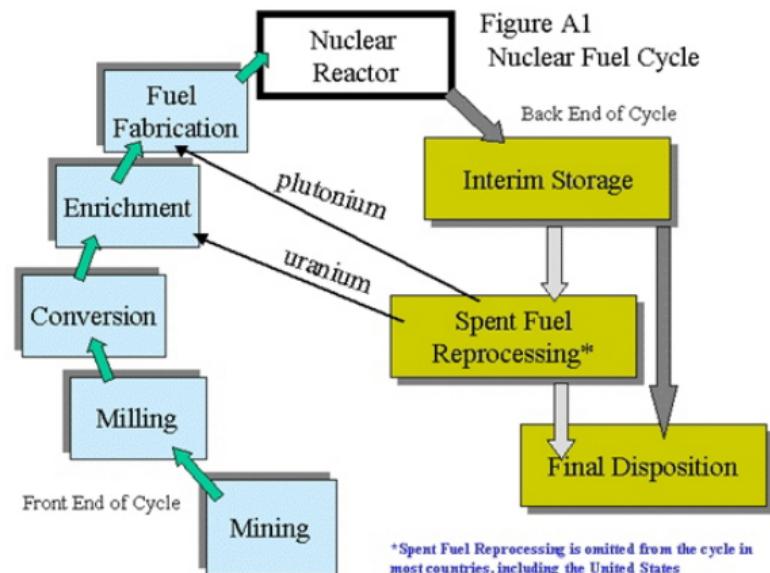
2024.07.18

Nuclear fuel cycle



[1] Wigeland, R., et al., 2011. Identification, Description, and Characterization of Existing and Alternative Nuclear Energy Systems. INL/MIS-10-19680

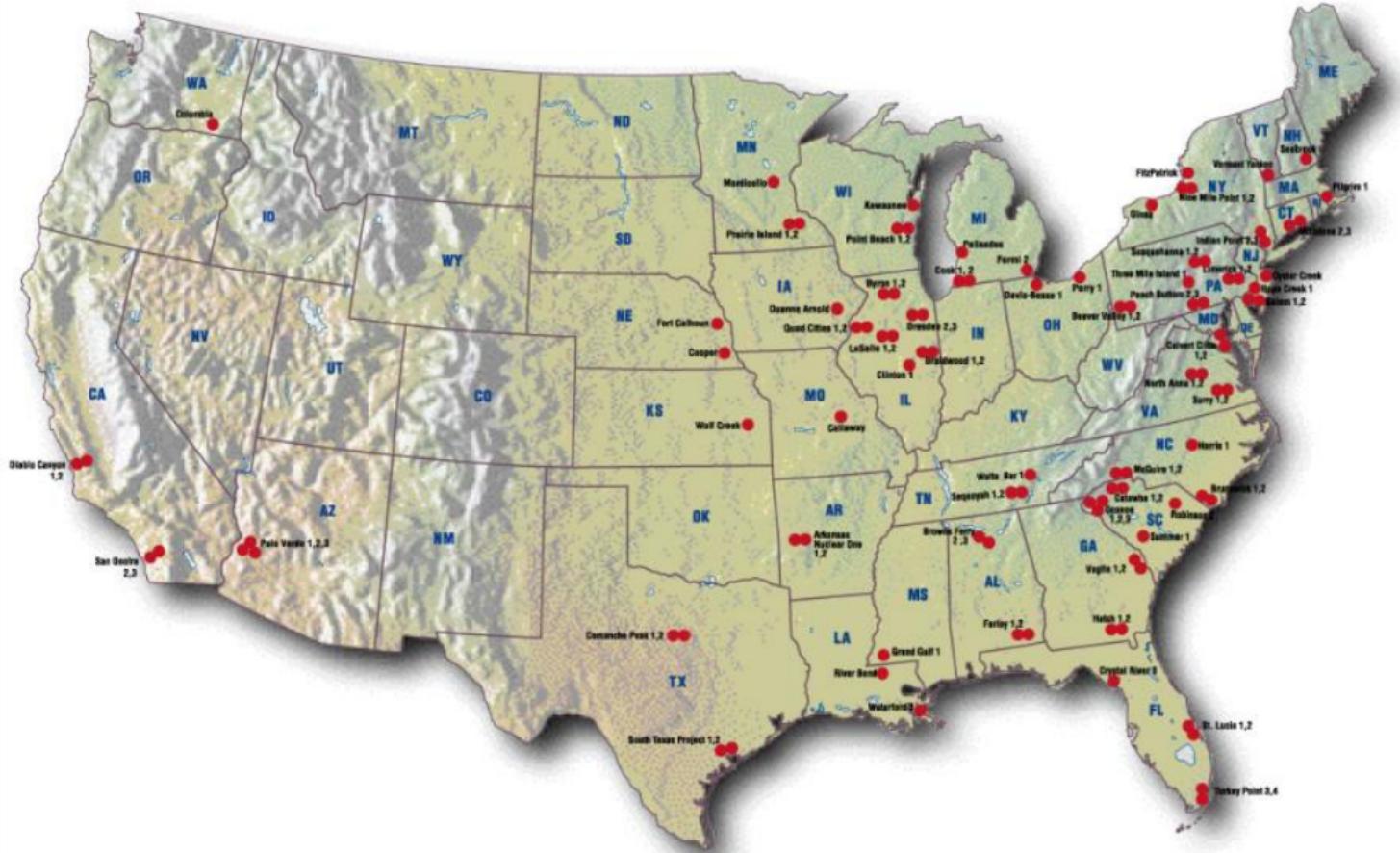
We are only talking about commercial reactors



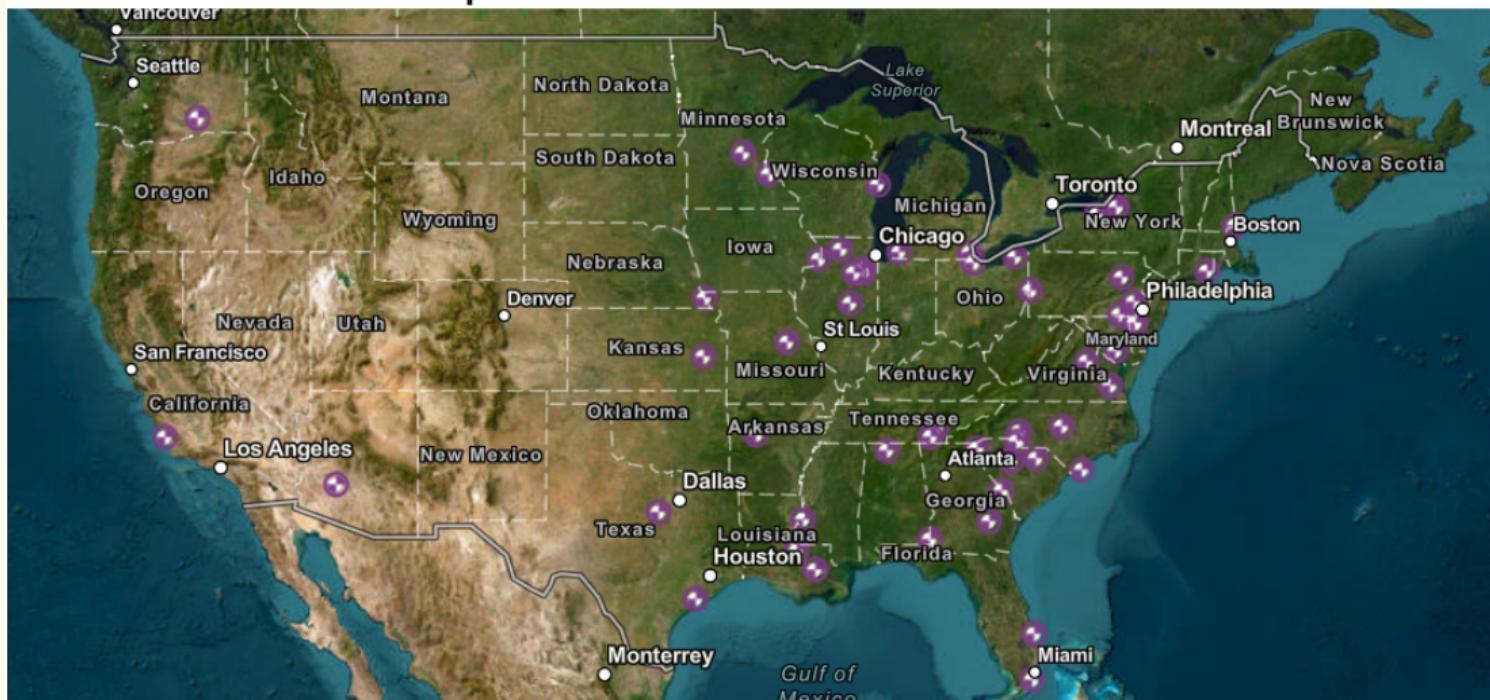
Front end – Making the fuel and putting it in the reactor

Back end – What happens when you take it out of the reactor

Locations of commercial Nuclear Power Plants



Locations of U.S. nuclear plants

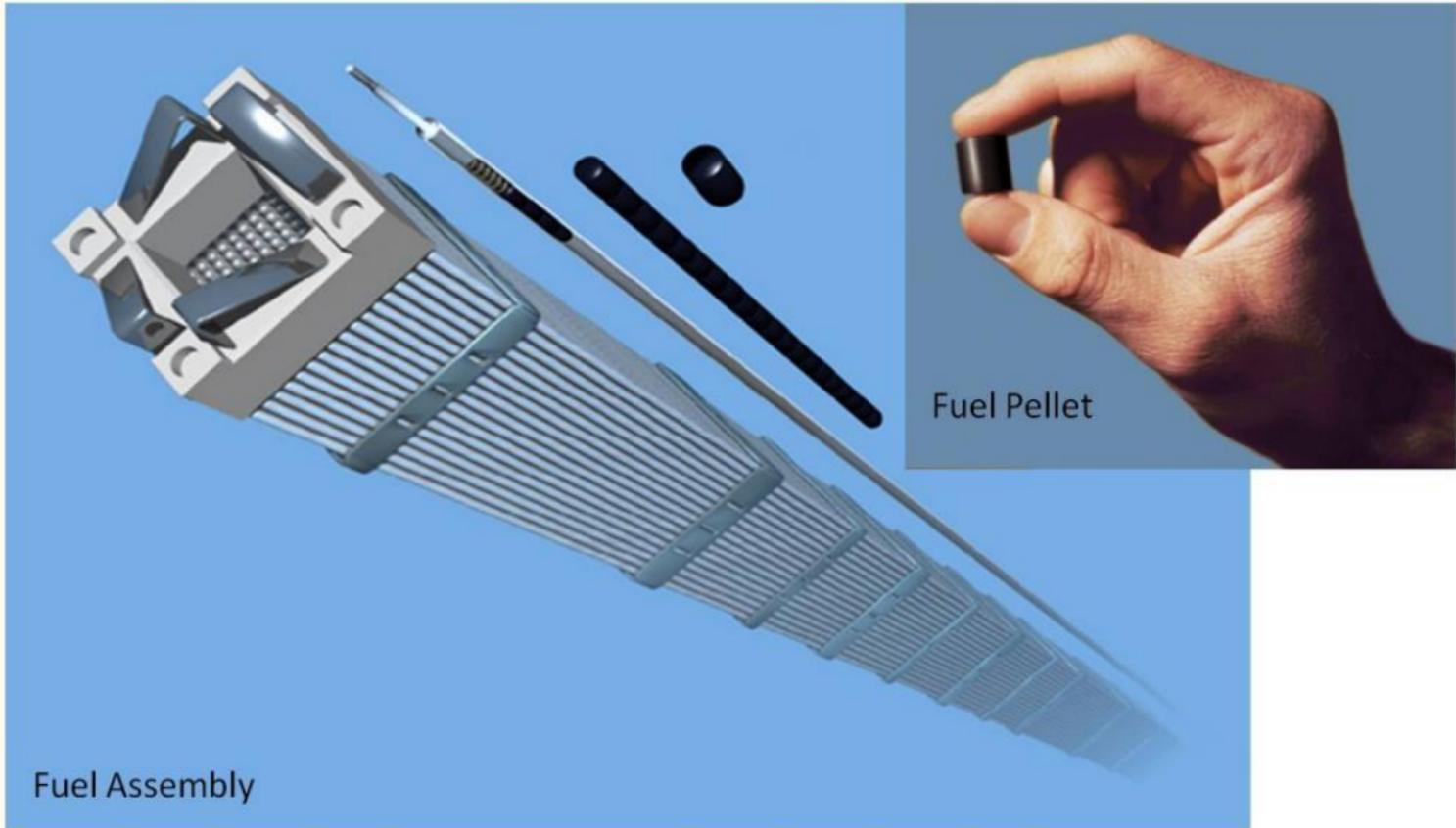


Source: U.S. Energy Information Administration, U.S. Energy Atlas, June 2023



What does nuclear fuel look like?

Pellets are about an inch and a half long



Fuel Assembly

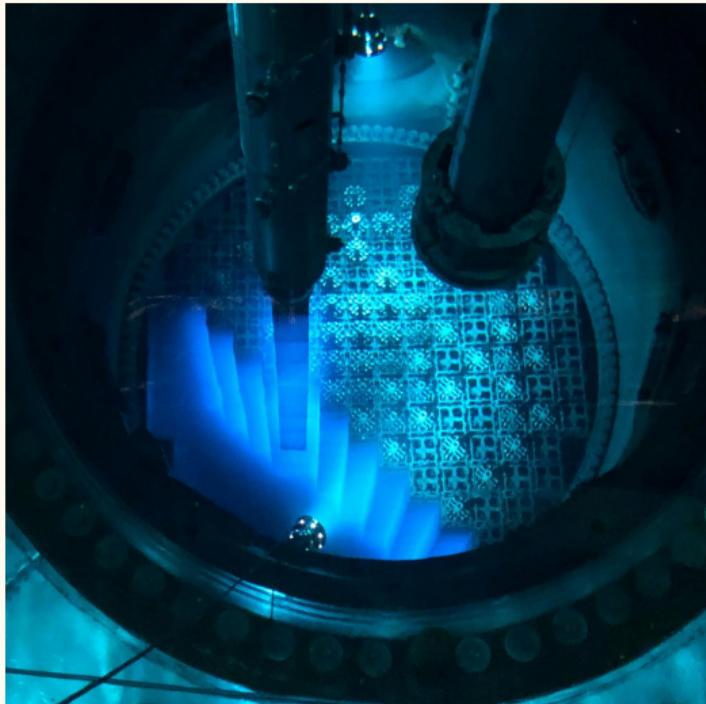
Fuel Pellet

Fuel assemblies are twelve feet long



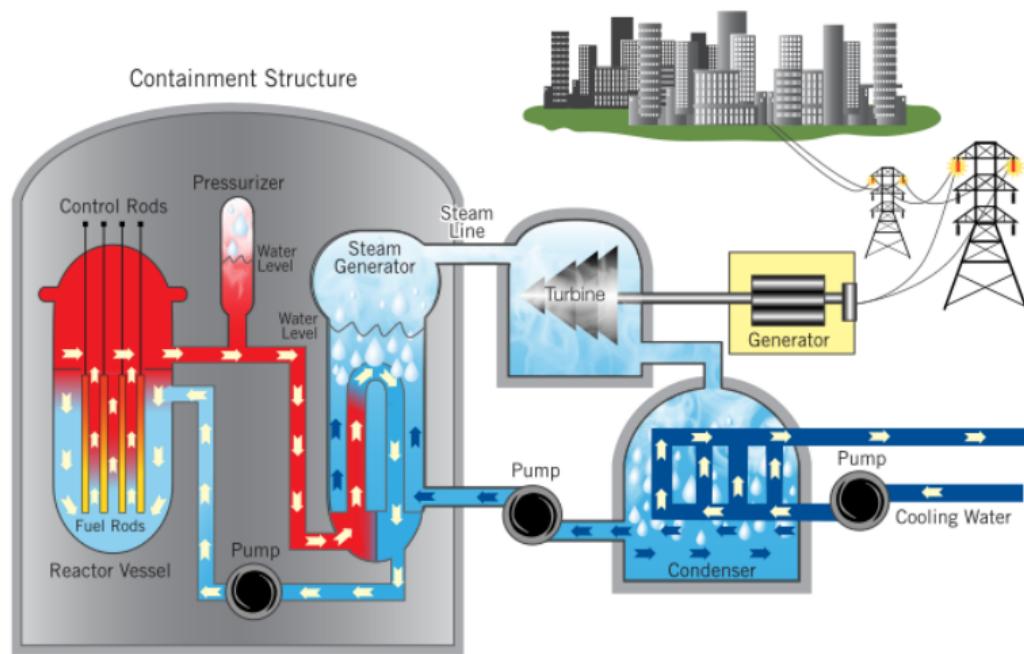


This is what the inside of the reactor looks like

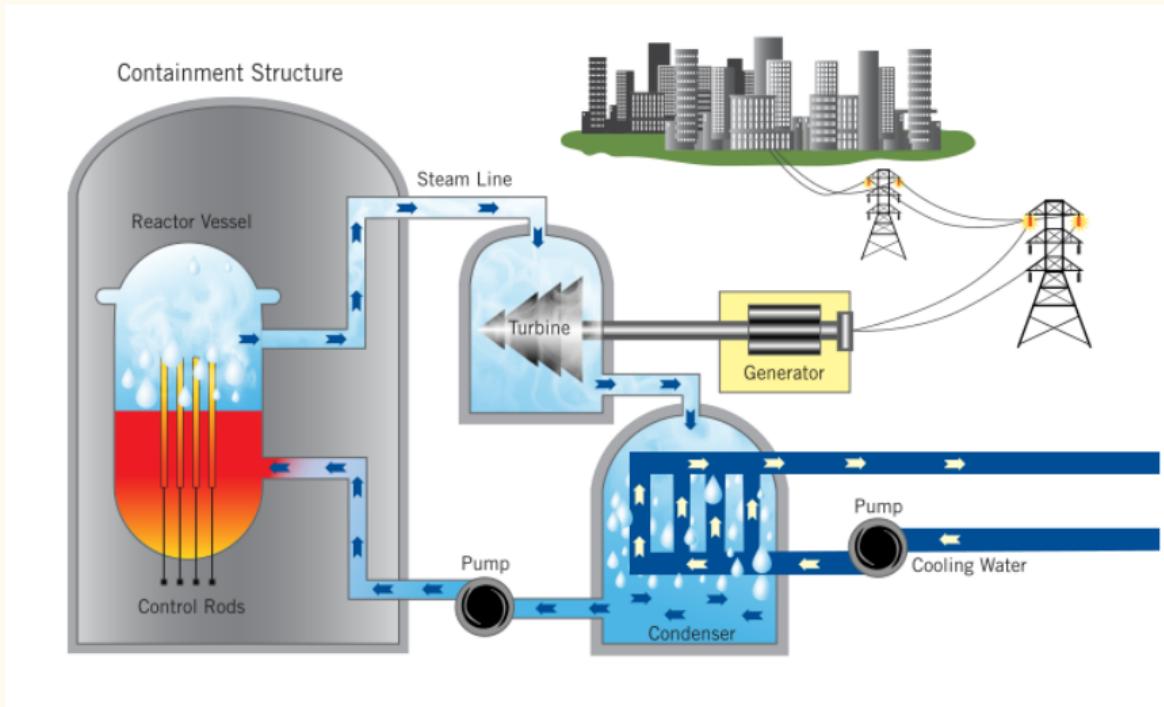


How does a nuclear reactor work?

The Pressurized Water Reactor heats water but does not boil



The Boiling Water Reactor does boil water in the reactor vessel



What is Spent Nuclear Fuel and what do we do with it?

Fuel that has ‘fissioned out’ is ‘spent’ and needs to be changed



About one third of the fuel in the core is taken out about every two years

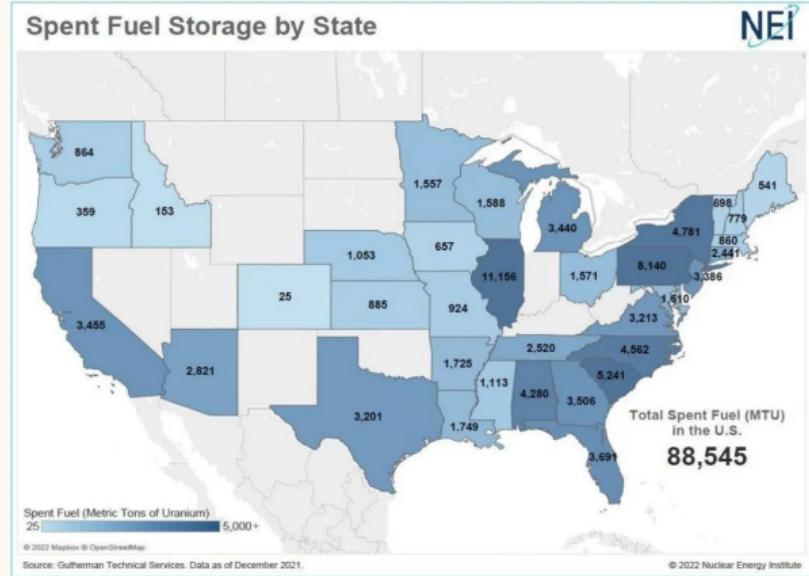
Stored in the pool anywhere 3 – 20 years

Can be moved to dry casks – Air cooled, steel and concrete build for shielding an structure

Currently all Spent Nuclear Fuel is stored on the reactor site in either the pool or cask

Some sites are ‘orphan’ where the reactor is gone but the dry storage still there

There is about 89,000 tons of Spent Nuclear Fuel in the US



Most in the east because that is where most Nuclear Power Plants are.

About 2000 tons Spent Nuclear Fuel generated annually

And we have some new plants recently operating

Some coal plants shutting down will have smaller Nuclear Power Plants installed

[2] Nuclear Energy Institute, 2022. Spent fuel storage by state

What does dry storage look like?

Casks hold about 10 tons of Spent Nuclear Fuel



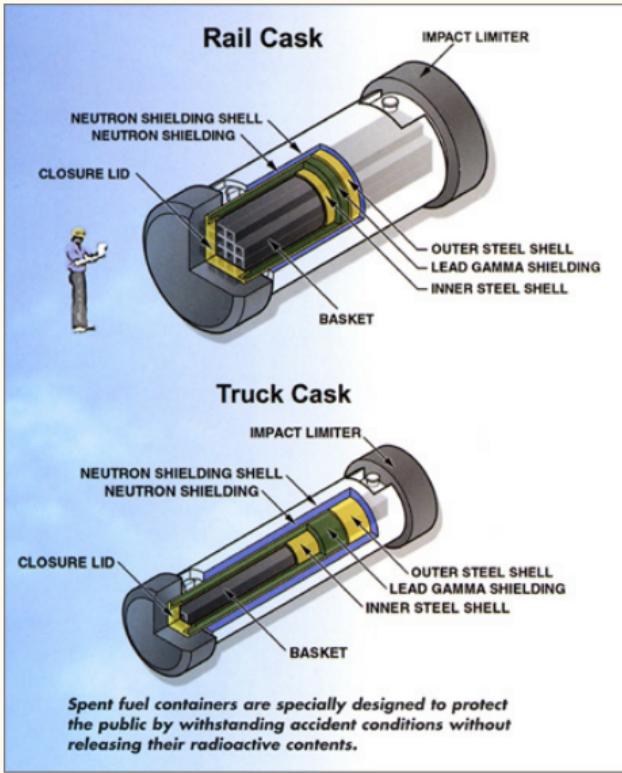




How about **up close?**

A quick note on transport

Companies are designing canisters for transport and storage altogether





Atlas railcar

References

1. Wigeland, R., et al., 2011. Identification, Description, and Characterization of Existing and Alternative Nuclear Energy Systems. INL/MIS-10-19680.
2. Nuclear Energy Institute, 2022. Spent fuel storage by state.

