Nuclear Fuel Cycle

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November 4, 2026

Oklahoma Nuclear Lifecycle Innovation Campus

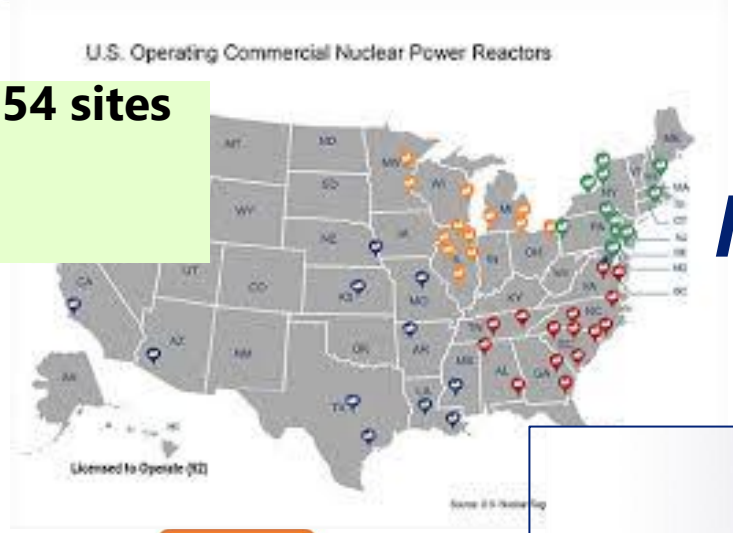
GAIN
Gateway for Accelerated Innovation in Nuclear

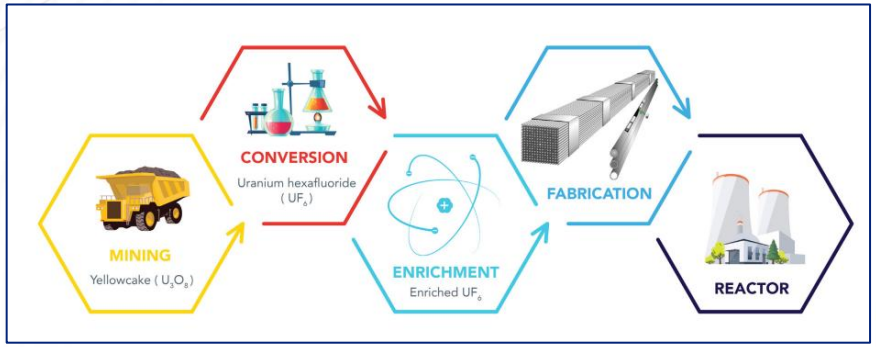
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Nuclear Ecosystem

US has 94 operating nuclear reactors @ 54 sites

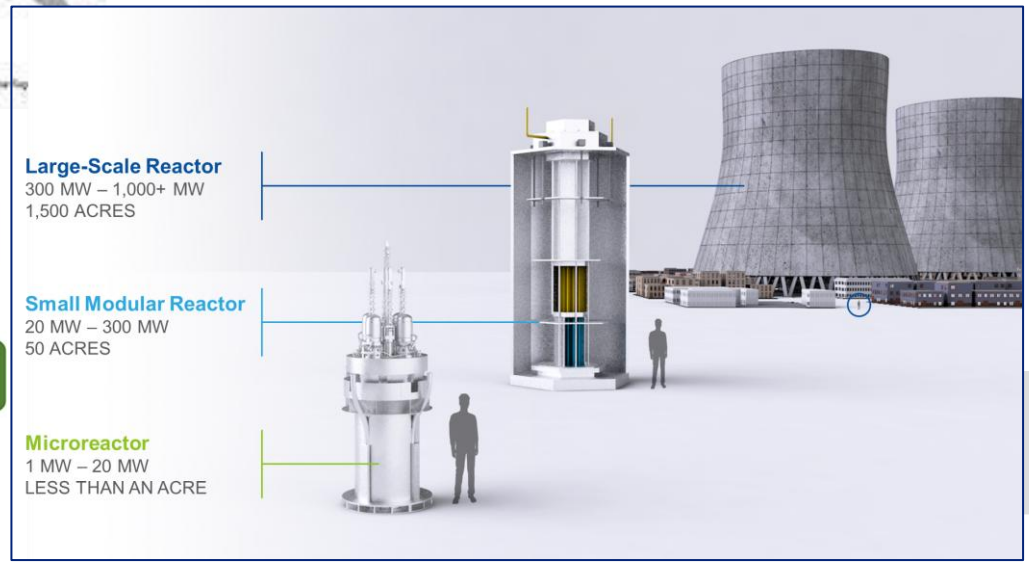
- 86 units w/licenses that expire by 2050;
- 33 units w/licenses that expire by 2035.

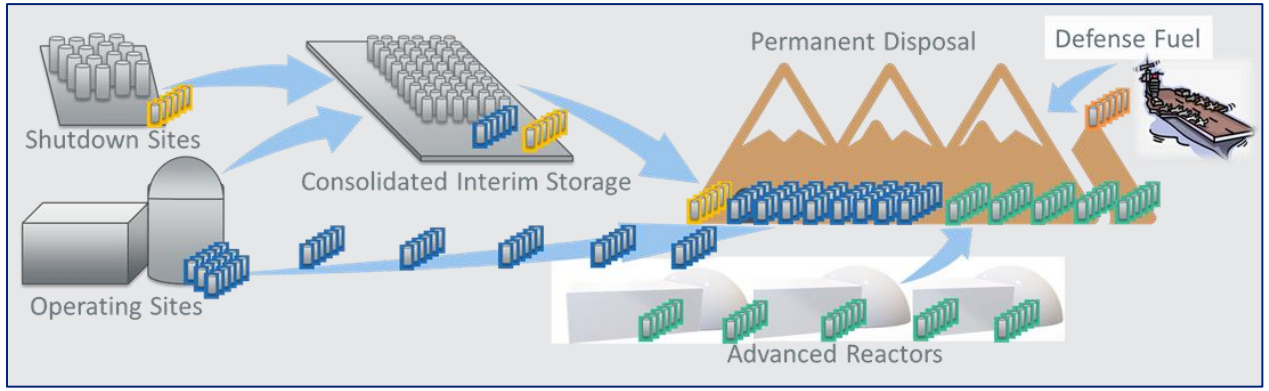




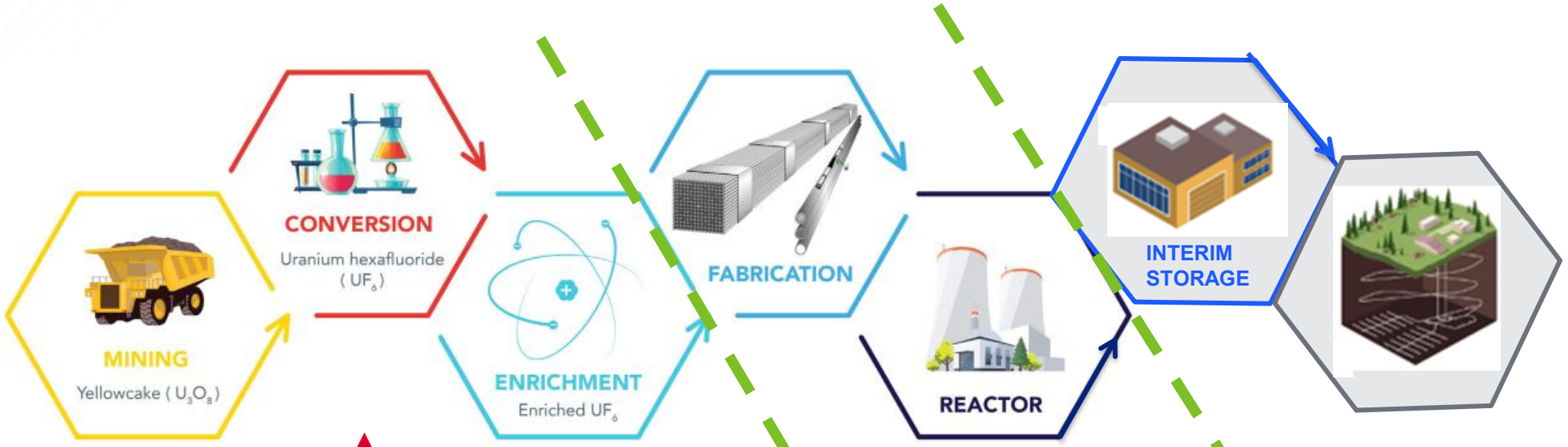








Current U.S. nuclear fuel cycle



Canada
Australia
Namibia
Kazakhstan
Uzbekistan
South Africa
Russia

Canada
United Kingdom
Australia
South Africa
Germany
Netherlands
Russia
France

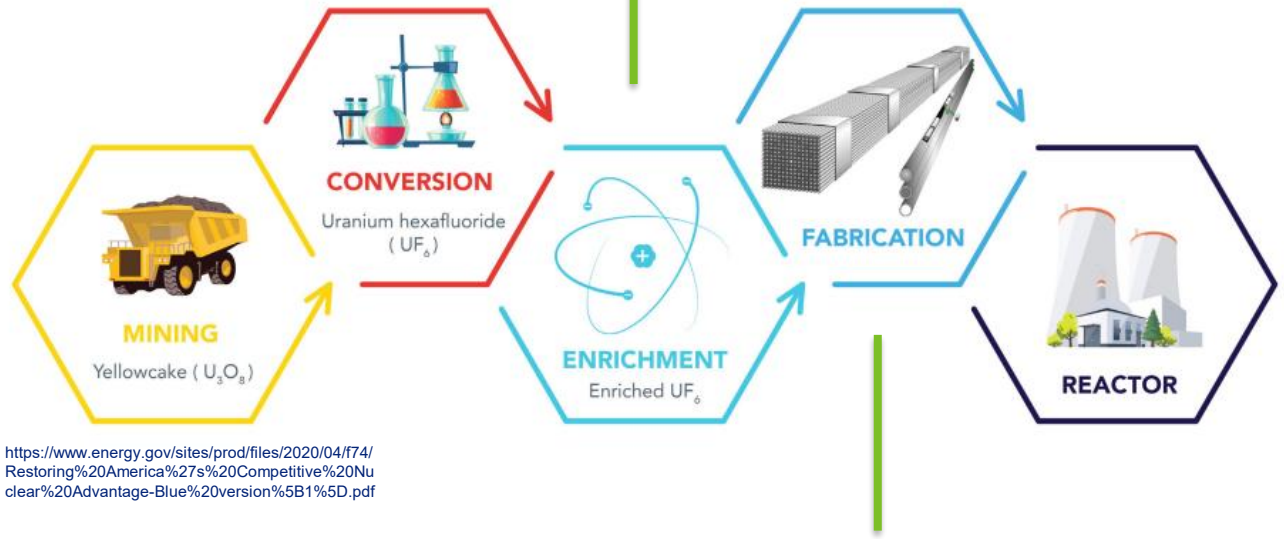
Russia
United Kingdom
Netherlands
France
Germany

Used fuel options

- Direct disposal
- Recycling with HLW disposal

https://www.energy.gov/sites/prod/files/2020/04/f74/Restoring%20America%27s%20Competitive%20Nuclear%20Advantage-Blue%20version%5B1%5D.pdf

Enrichment and Fuel Fabrication: Reprocessing Plugs in Here



https://www.energy.gov/sites/prod/files/2020/04/f74/Restoring%20America%27s%20Competitive%20Nuclear%20Advantage-Blue%20version%5B1%5D.pdf

Enrichment



Natural Uranium (NU)

- 99.28% U-238
- **0.71% U-235**
- 0.005% U-234



Low Enriched Uranium (LEU)

- 95.46% U-238
- **4.5% U-235**
- 0.04% U-234



High Assay Low Enriched Uranium (HALEU)

- 80.09% U-238
- **19.75% U-235**
- 0.16% U-234

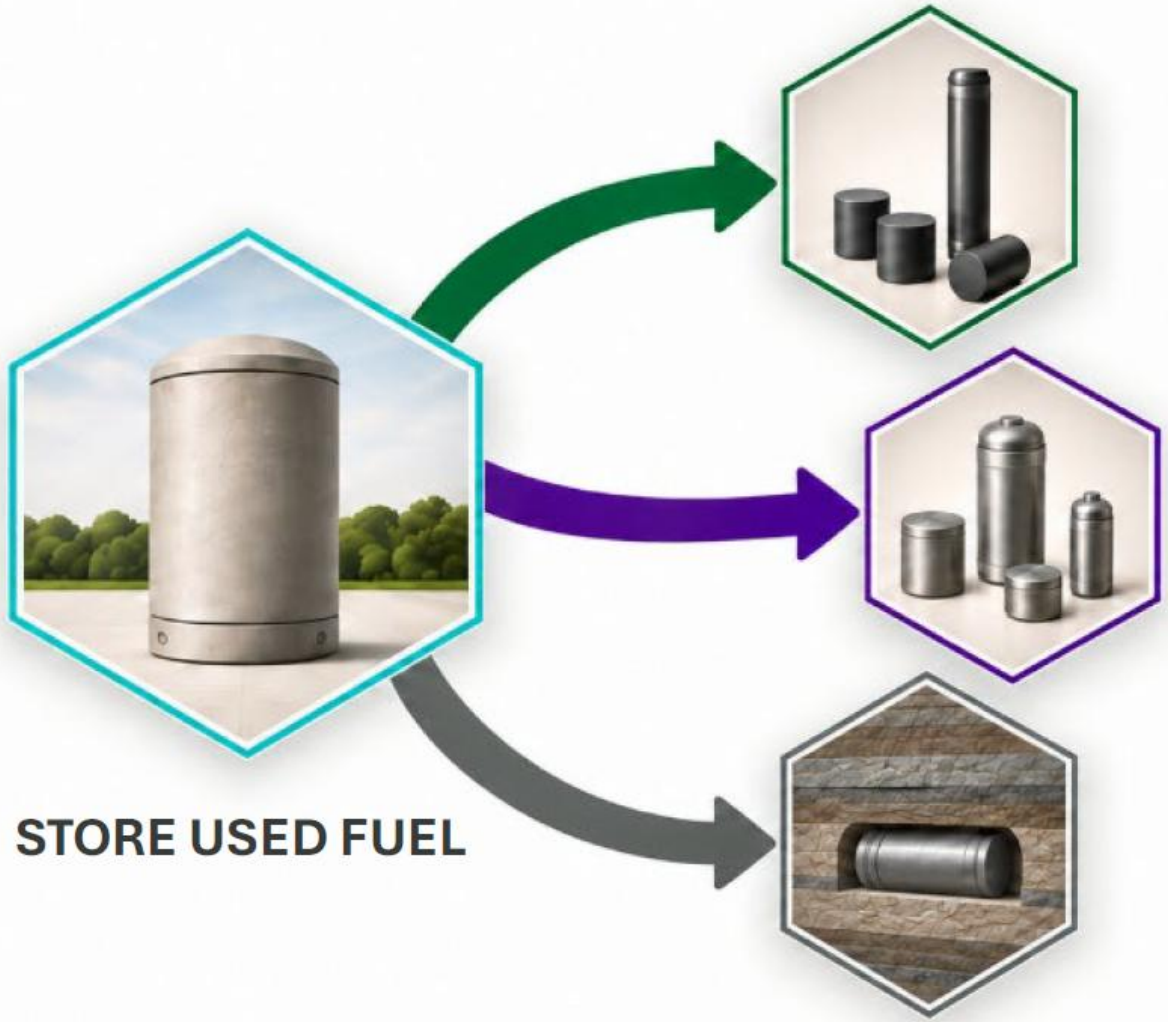
Fuel characteristics

Enrichments: LEU, HALEU
Fissile materials: uranium (U-235), plutonium, thorium (U-233)
Composition: oxides, metal, molten salts (U, F, Cl, Li, Be)
Forms: assemblies, pebble bed/TRISO, liquid

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Used fuel contains different materials

Research can allow some useful materials to be separated and recovered



COULD BE REUSED AS FUEL

USEFUL ISOTOPES
Special forms of elements with other important uses

STILL NEEDS SAFE DISPOSAL

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Used fuel contains several useful materials

Different nuclear processes make isotopes available for medicine, safety and technology

RESOURCE RECOVERED FUEL



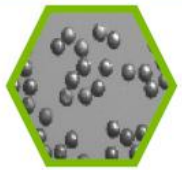
URANIUM

FUEL FOR EXISTING REACTORS



PLUTONIUM

NEW FUEL FOR EXISTING AND ADVANCED REACTORS



MINOR ACTINIDES

ADVANCED REACTOR FUEL

RESOURCE RECOVERED ISOTOPES



AMERICIUM-241

SMOKE DETECTORS



KRYPTON & XENON

SENSITIVE ELECTRONICS

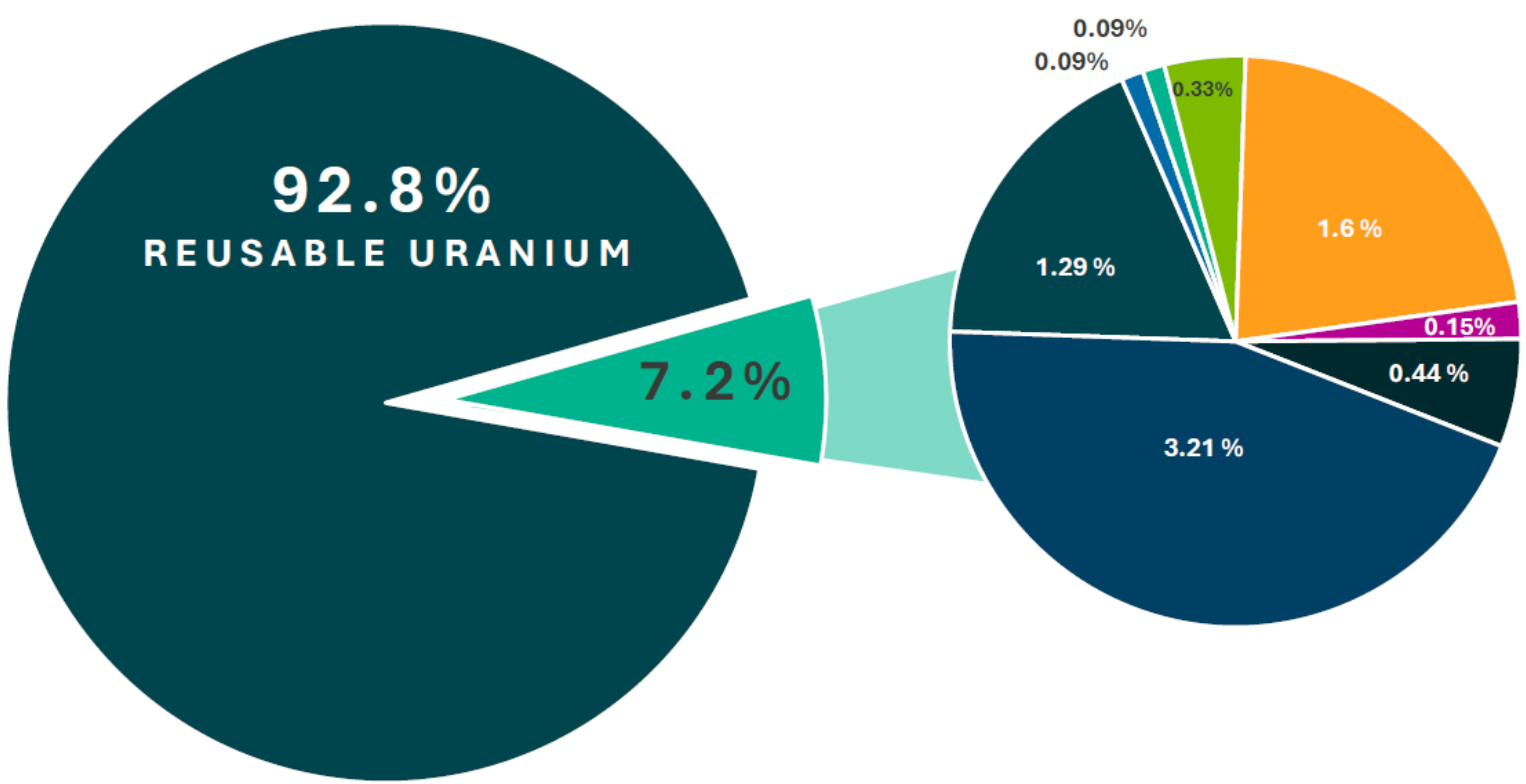


STRONTIUM-90

REMOTE BATTERY POWER

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How much material needs to be placed in long-term storage?



- Plutonium
- Minor Actinides

Additional resources recovered for fuel

- Neptunium
- Cesium & Strontium
- Rare Earth

Resource recovered for isotopes

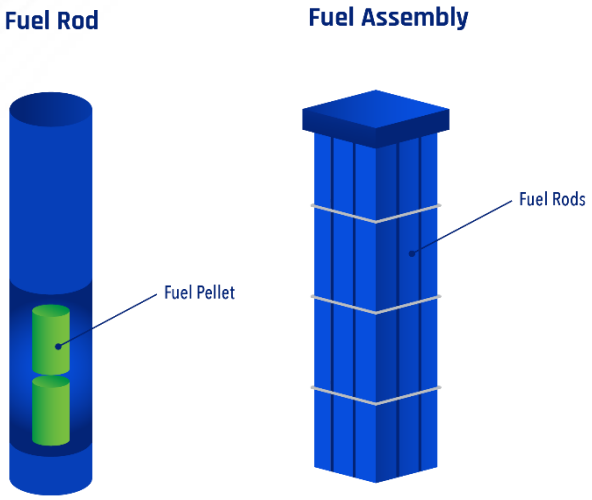
- Iodine & Technetium
- Other long-lived fission products

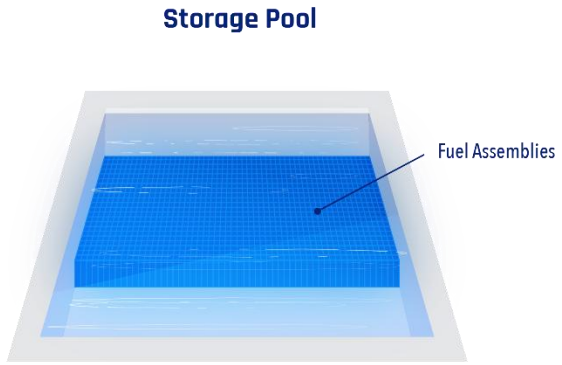
Disposition in glass or long-term storage

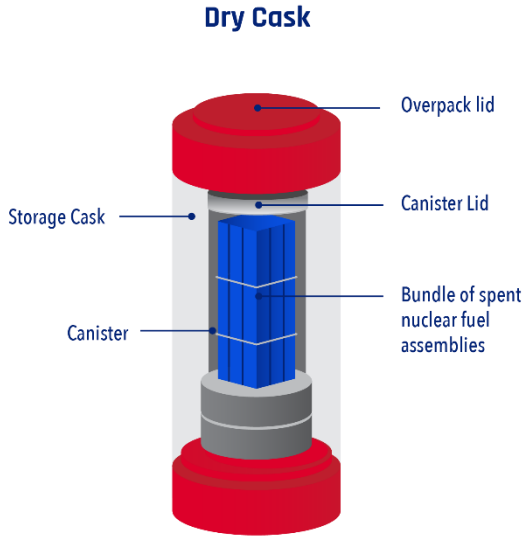
After resource recovery, every ton of used fuel will result in approximately 66 pounds of material for disposal, or the equivalent of a large checked bag at the airport.

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Spent Nuclear Fuel 101







IN THE REACTOR

- Small ceramic uranium pellets are stacked inside metal tubes, called fuel rods.
- Fuel rods are bundled together into fuel assemblies that are placed inside the nuclear reactor.

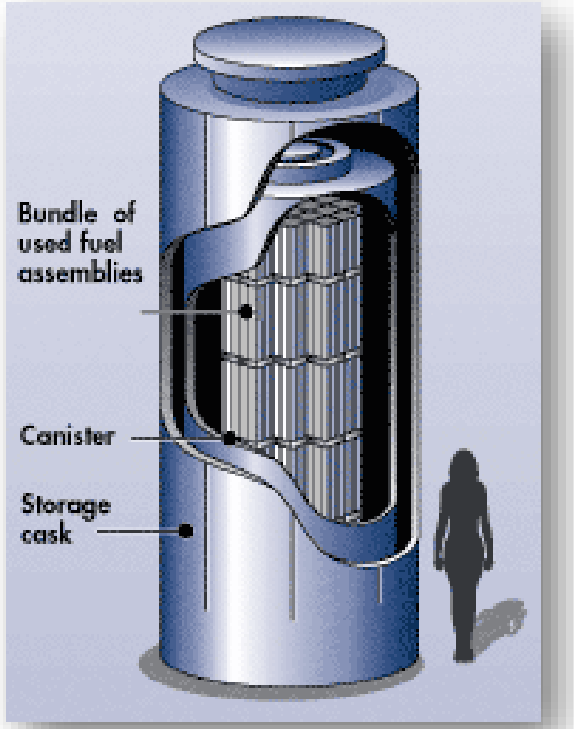
AFTER USE

- Assemblies are moved underwater from the reactor to a storage pool located inside or next to the reactor building
- While the fuel cools, the water in the pool shields workers from radiation emitted from the spent nuclear fuel.

FIVE+ YEARS LATER

- Spent nuclear fuel assemblies are transferred from the pool to dry storage casks.
- The casks are designed and certified to provide radiation shielding.

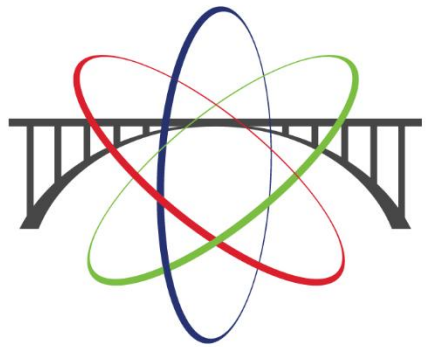
On-site storage of used commercial fuel





The 57 used fuel casks hold all the fuel from 49 years of the DC Cook Plant in Michigan operations. Both units at DC Cook are still operating.





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