



The nuclear fuel cycle

encompasses the various activities associated with the production of electricity from nuclear reactors. All steps of the cycle generate radioactive waste.



#1 Mining and Milling

Uranium mining scars the landscape and devastates the environment. It is commonly done on indigenous and tribal peoples' lands, destroying their communities.

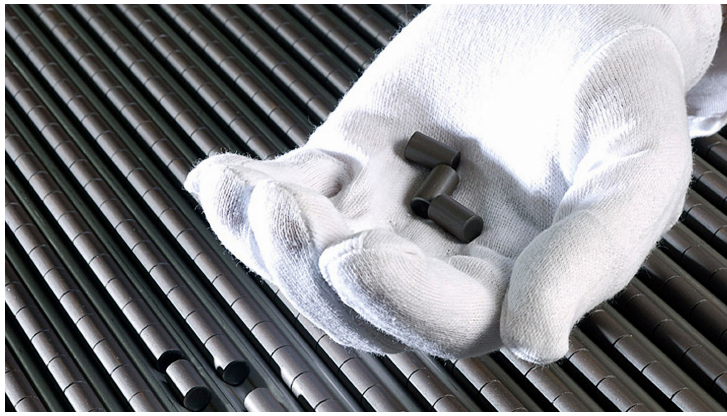
The byproduct of uranium mining is dangerous dirt called "tailings", a sandy waste containing heavy metals and radium, which is radioactive. Often the tailings are simply dumped on the land near the mine and left to the elements. A tailings pile may be a large trench or a former mine pit. Wind carries radon gas and radioactive dust from these tailings for many miles. Contaminated rainwater enters the soil, the watershed, and eventually the food chain, endangering health.

The uranium ore is delivered to the mill where it is crushed into smaller particles before being extracted with strong acids or bases. The uranium ore is concentrated into a solid substance called "yellowcake."



#2 Enrichment

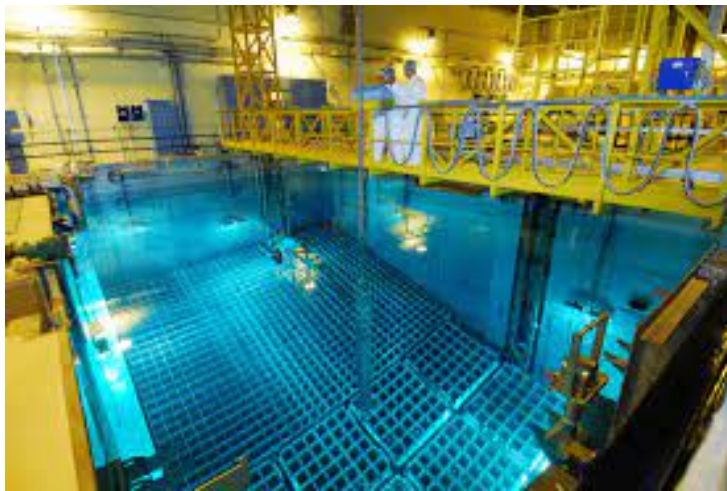
A nuclear reactor requires a higher concentration of the U235 isotope than that which exists in natural uranium ore. So the yellowcake must be "enriched" at large industrial chemical conversion plants. The uranium in yellowcake is converted to uranium hexafluoride (UF₆), a compound that can be made into nuclear fuel. This conversion process is carbon intensive. It involves large amounts of water and electricity as well as a number of volatile chemicals, creating risks associated with inhalation if a release occurred. In addition, the conversion process uses hydrogen gas which is flammable and could create an explosion hazard.



#3 Fabrication of Fuel

Fuel fabrication is the last step in the process of turning uranium into nuclear fuel rods. The enriched uranium is converted into fuel “pellets” and placed into thin metal rods. Each rod joins hundreds of others in a bundle called a fuel “assembly” to be loaded into the reactor core of the nuclear power plant.

#4 Storage of Used or “Spent” Nuclear Fuel: High Level Radioactive Waste



Nuclear fuel is typically used in the reactor for 3-6 years and then must be removed. The rods are highly radioactive and must be stored under water for cooling and radiation shielding. After years in the overcrowded pools, the spent fuel assemblies are moved into dry storage casks which will deteriorate over time.

There is no permanent solution for its disposal or storage which makes this issue particularly dangerous. Short-term solutions do not address the grave health and environmental effects of nuclear waste that last for a million years.

Resources:

<https://www.iaea.org/sites/default/files/18/10/nuclearfuelcycle.pdf>

<https://www.nrc.gov/reading-rm/doc-collections/fact-sheets>

<https://www.reachingcriticalwill.org/resources/fact-sheets/critical-issues/5446-nuclear-fuel-cycle>

<https://www.sciencedirect.com/topics/engineering/nuclear-fuel-cycle>

