

Glossary of Nuclear Waste Terms

Atom

The basic component of all matter; it is the smallest part of an element having all the chemical properties of that element. Atoms are made up of protons and neutrons (in the nucleus) and electrons.

Background Radiation

Radiation arising from natural radioactive material and always present in the environment, including solar and cosmic radiation and radioactive elements in the upper atmosphere, the ground, building materials and the human body.

Canister

The outermost container into which vitrified high-level waste or spent fuel rods are to be placed. Made of stainless steel or inert alloy.

Cask

Container that provides shielding during transportation of canisters of radioactive material. Usually measures 12 feet in diameter by 22 feet long and weighs 200 tons.

Chain Reaction

A self-sustaining series of nuclear fissions taking place in a reactor core. Neutrons produced in one fission cause the next fission.

Civilian Waste

Low-level and high-level (including spent fuel) radioactive waste generated by commercial nuclear power plants, manufacturing industries and institutions (hospitals, universities and research institutions.)

Cladding

Protective alloy shielding in which fissionable fuel is inserted. Cladding is relatively resistant to radiation and to the physical and chemical conditions in a reactor core. Cladding may be made of stainless steel or an alloy such as zircaloy.

Closed Fuel Cycle

A closed fuel cycle includes chemical reprocessing to recover the fissionable material remaining in the spent fuel. An open fuel cycle does not. (See Fuel Cycle).

Curie

A measure of the rate of radioactive decay; it is equivalent to the radioactivity of one gram of radium or 37 billion disintegrations per second. A nanocurie is one billionth of a curie; a picocurie is one trillionth of a curie.

Daughter Product

Nuclides resulting from the radioactive decay of other nuclides. A daughter product may be either stable or radioactive.

Decay

Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles, photons or both.

Decommissioning

Preparations taken for retirement of a nuclear facility from active service, accompanied by a program to reduce or stabilize radioactive contamination.

Decontamination

The removal of radioactive material from the surface of or from within another material.

Defense Waste

Radioactive waste resulting from weapons research and development, the operation of naval reactors, the production of weapons material, the reprocessing of defense spent fuel and the decommissioning of nuclear-powered ships and submarines.

Defense Waste Processing Facility (DWPF)

The largest radioactive waste glassification plant in the world, the Defense Waste Processing Facility (DWPF) converts the liquid nuclear waste currently stored at the Savannah River Site (SRS) into a solid glass form suitable for long-term storage and disposal.

Disposal

Permanent removal from the human environment with no provision for continuous human control and maintenance.

Dose

A quantity of radiation or energy absorbed; measured in rads.

Dry Cask Storage

Heavily shielded, air-cooled storage casks for storing spent fuel.

Exposure

A measure of ionization produced in air by X-rays or by gamma radiation. Acute exposure generally refers to a high level of exposure of short duration; chronic exposure is lower-level exposure of long duration.

Fissile

Able to be split by a low-energy neutron, for example, U-235.

Fission

The splitting or breaking apart of a heavy atom such as uranium. When a uranium atom is split, large amounts of energy and one or more neutrons are released.

Fission Products

A general term for the complex mixture of nuclides produced as a result of nuclear fission. Most, but not all, nuclides in the mixture are radioactive, and they decay, forming additional (daughter) products. The complex mixture of fission products contains about 200 different isotopes of over 35 elements.

Fuel Cycle

The complete series of steps involved in supplying fuel for nuclear reactors. It includes mining, refining, the fabrication of fuel elements, their use in a reactor and management of spent fuel and radioactive waste.

Half-Life

Time required for a radioactive substance to lose 50 percent of its activity by decay. The half-life of the radioisotope plutonium-239, for example, is about 24,000 years. Starting with a pound of plutonium-239, in 24,000 years there will be one-half pound of plutonium-239, in another 24,000 years there will be $\frac{1}{4}$ pound, and so on. (A pound of actual material remains but it gradually becomes a stable element.)

High Level Waste

Highly radioactive material containing fission products, traces of uranium and plutonium and other transuranic elements; it results from chemical reprocessing of spent fuel. Originally produced in liquid form, high level waste must be solidified before disposal.

Interim Storage

The temporary holding of waste on or away from the generator's site when disposal space is not available. Monitoring and human control are provided and subsequent action involving treatment, transportation or final disposition is expected.

Low Level Waste

Radioactive waste not classified as high level waste, transuranic waste, spent fuel or by-product material. Most are generally short-lived and have low radioactivity. An example is protective gloves used by workers in a nuclear facility.

Mixed Waste

Waste that contains both radioactive and hazardous chemical components.

Radiation

Particles or waves from atomic or nuclear processes (or from certain machines). Prolonged exposure to these particles or rays may be harmful.

Radioactive Waste

Liquid, solid, or gaseous waste resulting from mining of radioactive ore, production of reactor fuel materials, reactor operation, processing of irradiated reactor fuels, and related operations, and from use of radioactive materials in research, industry, and medicine.

Radioactivity

The spontaneous emission of radiation from the nucleus of an atom. Radioisotopes of elements lose particles and energy through the process of radioactive decay.

Repository

A permanent disposal facility for high-level of transuranic waste and spent fuel.

Reprocessing

The process by which spent fuel is separated into waste material for disposal and into material such as uranium and plutonium to be reused as fuel.

Spent Fuel

Fuel that has been “burned” (irradiated) in a nuclear power plant’s reactor to the point where it no longer contributes efficiently to the nuclear chain reaction. Spent fuel is thermally hot and highly radioactive.

Storage

Operations that are designed to provide isolation and easy recovery of radioactive material and which rely on continuous human monitoring, maintenance and protection from human intrusion for a specified period of time.

Tank Farms

Underground storage tanks at some Department of Energy facilities used to store liquid radioactive waste prior to vitrification. The liquid nuclear waste in tank storage exists in two forms, a sludge form and a salt form. The sludge form, while comprising only about 10% of the

volume in the tanks, contains about half of the radioactivity. The salt form readily dissolves in water, comprises about 90% of the volume and contains the balance of the radioactivity

Transuranic Waste (TRU)

Waste material contaminated with U-233 (and its daughter products), certain isotopes of plutonium and nuclides with an atomic number greater than 92 (uranium). It is produced primarily from reprocessing spent fuel and from use of plutonium in fabrication of nuclear weapons.

Vitrification

The conversion of high-level waste into a glassy or non-crystalline solid for subsequent disposal.

Volume Reduction

Various methods of waste treatment, such as evaporation for liquids or compaction for solids, aimed at reducing the volume of waste.

Waste Isolation Pilot Plant (WIPP)

The Waste Isolation Pilot Plant – known as WIPP – in New Mexico is the world's first underground repository licensed to safely and permanently dispose of transuranic radioactive waste left from the research and production of nuclear weapons.

Yucca Mountain

Yucca Mountain is located in a remote desert on federally protected land within the secure boundaries of the Nevada Test Site in Nye County, Nevada. It is approximately 90 miles northwest of Las Vegas. The U. S. Department of Energy began studying Yucca Mountain in 1978 to determine whether it would be suitable for the nation's first long-term geologic repository for spent nuclear fuel and high-level radioactive waste. Currently stored at 121 sites around the nation, these materials are a result of nuclear power generation and national defense programs.