

Glossary

- Blendstock:** uranium that is mixed with more highly enriched uranium in a downblending operation.
- Breakout:** rapid change in strategic posture or a rapid reversal of a formal or informal agreement about nuclear weapons status. For example, a rapid increase in the number of U.S. nuclear missiles would be a breakout from the START I treaty.
- Cermet:** a type of fuel used in nuclear reactors that is made from uranium-dioxide power dispersed almost homogeneously in an aluminum matrix or framework. Also referred to as dispersion fuel.
- Critical assembly:** simulation of a nuclear reactor core, a reactor that cannot generate any power because it does not have a high enough concentration of fissile material to maintain a self-sustaining nuclear chain reaction. Researchers use these reactors to study the neutron-physics of reactor cores but do not use them to generate power because they do not have cooling arrangements to carry away the heat released by fission.
- Depleted uranium tails:** a waste product of the uranium enrichment process. The typical concentration of U-235 in depleted uranium tails is at most one-half its concentration in natural uranium.
- Deployed:** on a launch vehicle such as a missile or bomber (refers to a warhead).
- Disposition:** disposal and other means of long-term fissile materials management, including their use as fuel in nuclear reactors. The term has a broader meaning than the word *disposal*.
- Enrichment:** a process in which the concentration of uranium-235 is increased in a sample of uranium.
- Fissile material:** material capable of sustaining a fast-neutron chain reaction. This chain reaction is a series of events in which atomic nuclei are split in two and release neutrons in the process. These neutrons, in turn, cause other nuclei to split and release more neutrons, thereby perpetuating the reaction. Fissile material can be used in the fission core of a nuclear reactor or in a nuclear explosive.
- Fission:** the disintegration of a heavy atomic nucleus into two or more lighter fragments. Nuclear energy is released in the process.
- Feed stock:** Uranium that is fed into an enrichment plant to produce uranium that is more enriched—i.e. composed of a higher percentage of U-235.
- Gun-barrel weapons:** a simple way of creating a nuclear explosion in which two pieces of high enriched uranium are brought together, causing a mass to become supercritical and a nuclear fission chain reaction to occur. Because of its simplicity, scientists and policy makers fear that this type of device may be used by terrorists if they obtain sufficient fissile material.
- High-density LEU fuel:** uranium fuel that is low-enriched in U-235, but has a high overall density of uranium. This type of fuel has the potential to serve as a safe substitute for HEU in nuclear reactors because its low degree of enrichment means that it cannot be used to make a nuclear weapon. At the same time, its U-235 concentration is high enough to allow the reactor to “go critical”, meaning it can maintain a self-sustaining nuclear chain reaction.
- HEU (high-enriched uranium):** Uranium that has been enriched to greater than 20-percent U-235.
- HEU deal:** the 1993 agreement between Russia and the US to blend Russian weapons-origin HEU down to LEU for sale through a US agent.
- Inactive:** not ready for launch.
- Irradiation test:** a test of uranium fuel cores that determines if they are safe to use—i.e. they do not release fission products into the coolant—usually water. A suitable reactor core should contain its radioactive fission products; otherwise large amounts of contaminated, radioactive coolant are generated.

Isotopes: members of a chemical-element family with the same number of protons in its nucleus, but a different number of neutrons, so that while they have the same chemical attributes, they often display different physical attributes. For example, U-235, which can maintain a nuclear chain-reaction, and U-238, which can not, are different isotopes of uranium.

kg (kilogram): one thousand grams, roughly equal to 2.2 pounds.

LEU (low-enriched uranium): by definition, uranium that is less than 20 percent enriched in U-235. There are two ways to get LEU: (1) High enriched uranium is blended with naturally occurring uranium in order to reduce the concentration of U-235, a process often referred to as downblending. (2) Naturally occurring uranium is processed at an enrichment plant to produce uranium that is only moderately enriched.

Low-power reactors: reactors that generate steady power at a very low level.

MW (megawatt): 1 million watts. A watt is a measure of energy flow per unit time. For example, nuclear power generators in the U.S. typically produce 1,000 megawatts of electricity.

Metric ton: a measure of mass. 1 metric ton equals 1000 kilograms or 2,205 pounds.

Neutron: a particle that is found in the nucleus of an atom and has zero charge and approximately the same mass as a proton. They are used to sustain fission chain reactions.

Neutron flux: the flow of neutrons across some surface.

Pulsed reactors: reactors that deliver bursts of neutrons.

Radioactive: containing unstable atoms. In order to regain their stability, these atoms give off, or emit, one or more of three kinds of radiation: alpha, beta or gamma rays. Depending on the intensity and duration of exposure, these radioactive rays can pose health risks either by causing tissue damage or by increasing the risk

of cancer. Therefore, highly radioactive materials such as spent fuel cores are difficult to handle without risking one's health or even one's life.

Silicide: a compound of silicon and uranium used in one type of high-density LEU fuel.

Strategic nuclear warheads: nuclear weapons mounted on long-range missiles or bombers.

Tactical nuclear warheads: nuclear weapons for shorter range missiles, aircraft, artillery or land mines.

Tenex: Russian government owned company that is currently serving as the Russian executive agent for the HEU deal.

Thermal Research Reactor: (Russian acronym—IRT) nuclear reactors that use neutrons in the thermal energy range.

U-Mo fuel: uranium-molybdenum alloy fuel, a type of high-density LEU fuel that is currently under development. It has been proposed as an alternative fuel that could be used to convert Soviet-designed research reactors.

U-235 (uranium-235): the chain-reacting isotope of uranium.

Uranium-dioxide: a molecule composed of one uranium atom and two oxygen atoms. This substance is used in the fuel of nuclear-power reactors.

Uranium-hexafluoride: a molecule containing one atom of uranium and six fluorine atoms. Uranium hexafluoride is the form of uranium used in the blending process. It is the preferred form for down-blending, because it becomes a gas at relatively low temperatures.

USEC Inc: a formerly government owned but now private company that is currently serving as the U.S. executive agent for the HEU deal with Russia.

Water-Water Reactor: (Russian acronym—VVR) nuclear reactors in which water is used both to slow the neutrons in the chain reaction and to remove the fission heat.