MOX FUEL FABRICATION FACILITY | Fact Sheet

MIXED OXIDE FUEL FABRICATION FACILITY AT THE SAVANNAH RIVER SITE • AIKEN, SC

What is MOX fuel?

Mixed oxide (MOX) fuel contains a mixture of approximately 95 percent uranium oxide and 5

percent plutonium oxide. Low enriched nuclear fuel that is normally used in U.S. commercial power plants only contains uranium oxide.

Typical fuel element

Shaw AREVA MOX Services, LLC is basing its design work on the successful Melox and La Hague facilities in France. These facilities currently produce MOX fuel for 30 European nuclear reactors.

The MOX Fuel Fabrication Facility will blend plutonium oxide (PuO_2) with uranium oxide (UO_2) powder to make a mixed oxide powder.

This powder is milled to ensure uniform distribution of the plutonium, and to adjust the particle size of the MOX powder. The MOX powder is made into small pellets about the size of a pencil eraser. The pellets are pressed into shape, sintered (baked at high temperatures) and ground to the required dimensions of approximately 1/3 inch in diameter and 4/10 inch in length.

MOX fuel pellets

The finished pellets are loaded into fuel rods through an open end. An end plug is then inserted into the open end of the fuel rod and the rod is welded shut. The fuel rods are inspected, decontaminated, and bundled together to form fuel assemblies. Each fuel assembly will contain 264 fuel rods. The assembly will then be prepared for transportation to a commercial reactor.

Aqueous Polishing

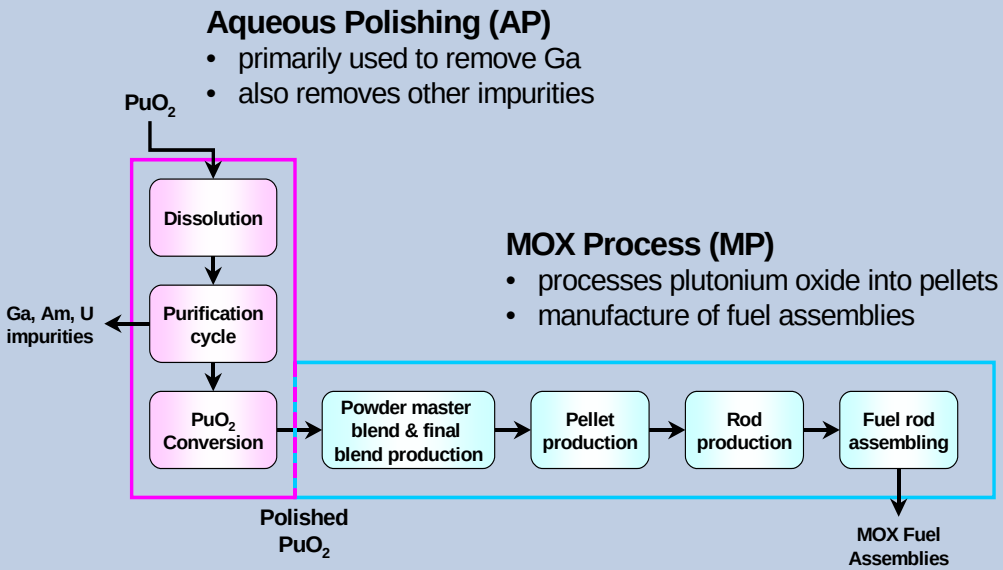
Before surplus weapon-grade plutonium can be used in mixed oxide fuel (MOX), the plutonium oxide must be purified. The purification process is a chemical process called aqueous polishing.

Aqueous polishing is accomplished in three basic steps and uses various chemicals to remove impurities such as gallium, americium and uranium. This process is conducted prior to the mechanical process of combining uranium and plutonium to produce ceramic pellets for MOX fuel rods.

Plutonium in the form of oxide is first dissolved in nitric oxide. In the second step, impurities are chemically removed with tributyl phosphate. In the last step, the purified plutonium is converted back to plutonium oxide, packaged and stored in durable cans for future production of MOX fuel pellets.

Aqueous polishing is based on the same process the French nuclear industry has safely and successfully used for over 30 years.

Much of the solid and liquid materials used during this process are recycled to reduce waste. The liquid waste contains radionuclides. This waste will be transferred from the MOX facility to locations on the Savannah River Site for treatment.



Reducing a Clear and Present Danger

In 1992, General Brent Scowcroft, then National Security Advisor to President Bush, requested the National Academy of Sciences (NAS) to perform a study of the management and disposition options for surplus weapon-usable plutonium to reduce the "clear and present danger" of theft of nuclear materials. The results of the NAS study were published in *Management and Disposition of Excess Weapons Plutonium* (NAS 1994).

Dismantled Russian missiles

The NAS recommended, among other actions, that the United States and Russia pursue a long-term plutonium disposition option that results in a form of plutonium which would be as difficult to recover for weapons use as the larger and growing quantity of plutonium in commercial spent fuel. This recommendation became known as the *Spent Fuel Standard*. The NAS report noted that two approaches could be used to achieve the Spent Fuel Standard.

One approach was fabrication and use of mixed oxide (MOX) fuel in nuclear reactors. The plutonium in the MOX fuel would be irradiated and become part of the spent fuel that will be stored in a geologic repository. The second approach was incorporation of plutonium in a vitrified high-level waste matrix (immobilization) with disposition in the same geologic repository. The study noted that the immobilization process was not an acceptable option to Russian officials who view plutonium as a resource.

After evaluating several technologies as part of the National Environmental Policy Act process, the Department of Energy (DOE) chose to pursue a dual approach to plutonium disposition. The disposition strategy allowed for the immobilization of a small percentage of the surplus plutonium and use of the remainder for the MOX program. In January 2002, DOE reevaluated the strategy after a National Security Council review of both disposition options and decided to pursue only the MOX technology

Design of the MOX facility, to be located at the Savannah River Site near Aiken, South Carolina, is now underway. Shaw AREVA MOX Services, LLC will design, construct and operate the facility for DOE. This facility will produce mixed oxide fuel assemblies that will be shipped to the McGuire and Catawba commercial reactors for irradiation. The resulting spent fuel will be disposed of in a national geologic repository.

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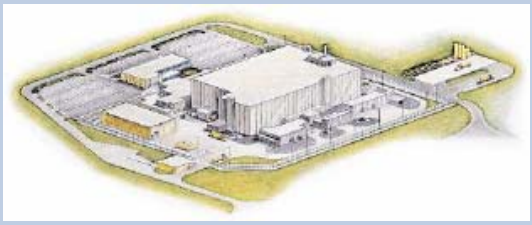
Mixed Oxide Fuel Fabrication Facility

In 1999, the Department of Energy (DOE) signed a contract with a consortium, now called Shaw AREVA MOX Services, LLC to design, build, and operate a Mixed Oxide (MOX) Fuel Fabrication Facility. This facility will be a major component in the United States' program to dispose of surplus weapon-grade plutonium.

The facility will take surplus weapon-grade plutonium, remove impurities, and mix it with uranium oxide to form MOX fuel pellets for reactor fuel assemblies. These assemblies will be irradiated in commercial nuclear power reactors.

The design of the facility is based on AREVA's MELOX and La Hague MOX facilities in France. The French have used MOX technology for almost two decades and currently supply MOX fuel to over 30 reactors world-wide.

The facility will be built at the Savannah River Site (SRS) near Aiken, South Carolina. It will be located in F Area in the center of the 310-square-mile DOE reservation.



MOX Fuel Fabrication Facility

The facility consists of two major sections. The weapon-grade material is cleaned and purified in the seven-level aqueous polishing portion of the building. The MOX area consists of three levels. This is where the fabrication of the fuel takes place, from formation of the pellets to assembly of the MOX fuel rods.

Preliminary numbers for construction of the 600,000-square-foot facility (including support facilities) indicate the use of over 170,000 cubic yards of concrete, 35,000 tons of reinforcing steel, 23,000 instruments, 1000 tons of Heating Vents and Air conditioning 500,000 linear feet of conduit, 47,000 linear feet of cable tray, 3,000,000 linear feet of power and control cable, and 80 miles of piping.

The Nuclear Regulatory Commission (NRC) will license and oversee the facility. The French design is being "Americanized" to ensure that the facility meets all federal safety and security requirements. It will also be a hardened facility, similar to a nuclear reactor. Security will be equal to the security measures currently in place at SRS. A Perimeter Intrusion Detection and Assessment System will encircle the facility for additional protection.

When operational, the facility will be capable of turning 3.5 metric tons of weapon-grade plutonium into MOX fuel assemblies annually. The facility will be licensed for 20 years, with operations expected to continue into the 2020s.