Facts from the Savannah River Site
ENVIRONMENTAL STEWARDSHIP • NATIONAL SECURITY • SCIENCE AND ENERGY

Defense Waste Processing Facility

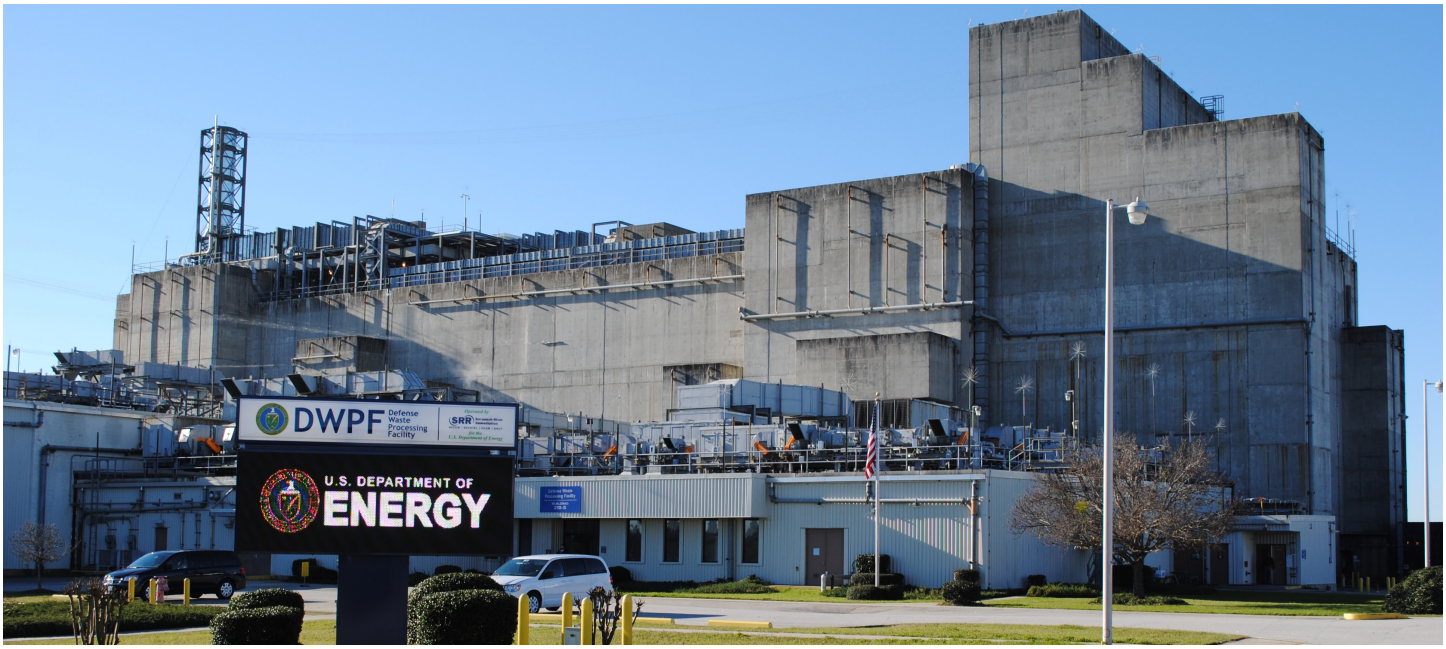
TThe Defense Waste Processing Facility (DWPF) is the only operating radioactive waste glassification plant in the nation. This facility, which began radioactive operations in March 1996, uses a vitrification process to convert high-level radioactive liquid waste currently stored at the Savannah River Site (SRS) into a solid glass form suitable for long-term storage and disposal.

Scientists have long considered vitrification as the preferred option for treating radioactive liquid waste. By immobilizing the radioactivity in glass, DWPF reduces the risks associated with the continued storage of liquid waste at SRS and prepares the waste for final disposal in a federal repository. Approximately 35 million gallons of liquid waste is stored in the remaining 43 underground carbon-steel waste tanks at SRS. This waste contains approximately 240 million curies of radioactivity.

To complete its waste vitrification mission, DWPF is projected to produce approximately 8,121 canisters.

Waste Feed

Radioactive liquid waste in tank storage exists in essentially two forms: a sludge form and a salt form. DWPF is designed to treat the high-activity radionuclides from both forms of this waste. The sludge form, while comprising only about eight percent of the volume in the tanks, contains approximately 47 percent of the radioactivity. The salt form comprises approximately 92 percent of the volume and contains the balance of the radioactivity. Beginning in 2008, the Actinide Removal Process (ARP) and the Modular Caustic Side Solvent Extraction Unit (MCU) decontaminated the salt solution feed from the site's tank farms. The high-activity radionuclides were transferred to DWPF for vitrification, while the decontaminated salt solution was pumped to the Saltstone Production Facility. Both ARP and MCU ceased operations in 2019. The Salt Waste Processing Facility (SWPF) will process most of the salt waste inventory that remains at SRS. In January 2019, Tank Closure Cesium Removal (TCCR), a pilot demonstration of innovative technology, was deployed at SRS to assist in the acceleration of tank closure.



DWPF began radioactive operations in March 1996.

U.S. DEPARTMENT OF ENERGY

The Savannah River Site is owned by the U.S. Department of Energy. Savannah River Nuclear Solutions is the management and operations contractor at the Savannah River Site. Savannah River Remediation is the current liquid waste contractor at the Savannah River Site.

SRS™ SAVANNAH RIVER SITE

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DWPF Operations

DWPF is vitrifying sludge from the radioactive liquid waste currently stored in waste tanks, along with actinides, cesium, and strontium removed from the salt forms in the waste. In this vitrification process, a sand-like borosilicate glass (called "frit") is mixed with the waste and sent to the plant's 75-ton steel and ceramic melter. The melter is a refractory-lined stainless-steel vessel surrounded by a water-cooled jacket. In the melter, electricity is used to heat the waste/frit mixture to nearly 2,100 degrees Fahrenheit until molten. This molten glass-waste mixture is poured, in a pencil-thin stream, into stainless steel canisters to cool and harden.

Each canister is 10 feet tall and 2 feet in diameter and weighs approximately 1,000 pounds when empty. Filling one canister can take approximately one day. A filled canister weighs approximately 5,000 pounds.

After filling, the exterior of each canister is blasted with a frit-water mixture to remove any surface contamination. A stainless-steel plug is fitted into the neck of each filled canister, then welded into place using an electrical current of 250,000 amps applied for 1.5 seconds, while 80,000 pounds of force simultaneously presses the plug into the neck of the canister. The resulting weld is as strong as the three-eighths-inch thick stainless-steel canister itself.

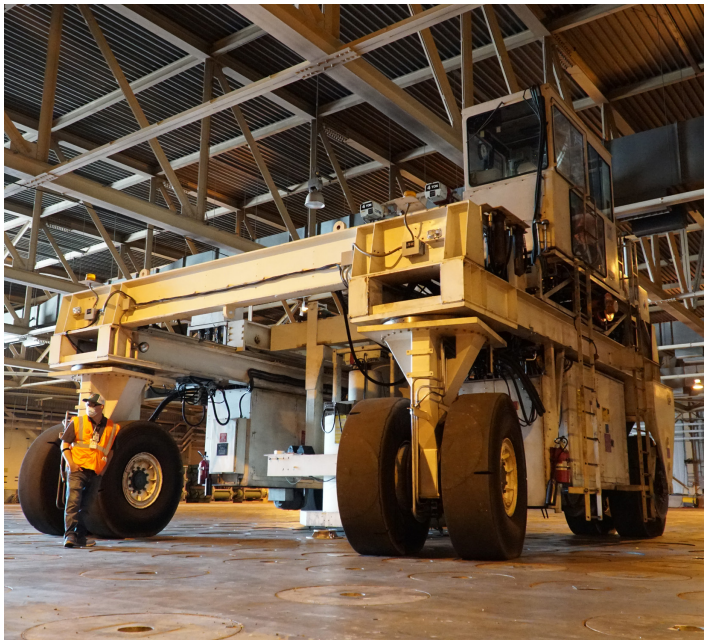
Temporary Storage

The canisters of vitrified high-level waste (HLW) produced by the DWPF are currently stored onsite in one of two Glass Waste Storage Buildings (GWSB). GWSB-1 consists of a below-grade seismically qualified concrete vault containing support frames for vertical storage of 2,262 standard canisters. Beginning in May 1996, canisters were stored in GWSB-1. In 2015, Savannah River Remediation (SRR), the current liquid waste contractor, re-evaluated the existing design of GWSB-1 and determined through several studies that with some minor modifications to the shielded storage plug and removal of the canister support crossbars that a second canister could be safely stored on top of the first one. Subsequently, SRR began moving canisters from GWSB-2 to the converted storage locations in GWSB-1. This innovation, which is recognized as Canister Double-Stack, increased the available storage capacity in GWSB-1 to 4,524 canisters.

GWSB-2, with a similar design to GWSB-1, has 2,340 canister storage locations. The first canister was placed in GWSB-2 on July 10, 2006. A Canister Double-Stack engineering evaluation, like the one conducted on GWSB-1, was completed for GWSB-2 in September 2020, concluding that double-stacking is feasible. This new arrangement will increase capacity in GWSB-2 to 4,680 canisters. The canisters will be stored on site until a federal repository is identified.

A specially designed vehicle, called the Shielded Canister Transporter, moves each sealed canister, one at a time, from DWPF to the GWSB. This transporter, more than 18 feet tall, 25 feet long and weighing 235,000 pounds, is a two-wheel-drive vehicle powered by redundant diesel engines. It has a center module with a shielding cask, floor plug cavity, and associated canister lifting equipment. At DWPF, the transporter draws canisters up into the shielded cask for the short trip to the storage building. At the storage buildings, the transporter lowers each canister into an underground, reinforced, seismically qualified concrete vault.

Please visit https://www.youtube.com/watch?v=rESXUcSeQYU for more information about DWPF.



The Shielded Canister Transporter is used to move filled canisters to storage inside the Glass Waste Storage Buildings.

Workers use a special forklift to move an empty canister for its inspection at DWPF. The canister will be filled with vitrified high-level waste.

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