

Facts

from the **Savannah River Site**

ENVIRONMENTAL STEWARDSHIP • NATIONAL SECURITY • SCIENCE AND ENERGY

SRS Site Occupants

Federal

- Department of Energy:
Savannah River Operations Office
- National Nuclear Security Administration
 - Savannah River Field Office
 - Office of Fissile Materials Disposition
 - MOX Project Office
- U.S. Forest Service–Savannah River
- U.S. Nuclear Regulatory Commission
- U.S. Army Corps of Engineers

Contractors

- Savannah River Nuclear Solutions, LLC
 - Management and operations of SRS and Savannah River National Laboratory
- Savannah River Remediation LLC
 - Liquid waste operations
- CB&I AREVA MOX Services
 - Mixed Oxide Fuel Fabrication Facility construction
- Parsons
 - Salt Waste Processing Facility
- Centerra Group, LLC
 - SRS Security
- University of Georgia
 - Savannah River Ecology Laboratory

www.srs.gov



Savannah River Site

Dedicated to maintaining the highest possible safety and security standards, the Savannah River Site (SRS) is a key Department of Energy (DOE) industrial complex responsible for disposition of nuclear materials, waste management, environmental cleanup and environmental stewardship.

Safety

SRS is committed to its people, missions and the future. SRS has a long track record of being one of the safest sites in the DOE complex and one of the safest major industrial sites in the world. Protecting workers, the public, the environment and national security interests are our highest goals.

Missions

SRS processes and stores nuclear materials in support of national defense and U.S. nuclear nonproliferation efforts. The site also develops and deploys technologies to improve the environment and treat solid and liquid nuclear and hazardous wastes left from the Cold War. While current missions remain the highest priority, SRS leadership places great importance on developing broader missions for SRS that use its unique capabilities in order to address critical national missions.

History

During the 1950s, SRS began to produce materials used in nuclear weapons, primarily tritium and plutonium-239. Five reactors and support facilities were built to produce these nuclear materials. Irradiated materials were moved from the reactors to one of

The Savannah River Site

SRS is a 310-square-mile site located near Aiken, S.C., on the Savannah River, which borders South Carolina and Georgia. SRS covers 198,046 acres, including parts of Aiken, Barnwell and Allendale counties in South Carolina. The SRS annual budget is approximately \$2 billion, with a workforce of about 11,000.



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.



the two chemical separations plants. In these facilities, known as “canyons,” the irradiated fuel and target assemblies were chemically processed to separate useful products from waste. After refinement, nuclear materials were shipped to other DOE sites for final application. SRS produced about 36 metric tons of plutonium from 1953 to 1988.

Environment

Once known for its rural communities and small farms, SRS now supports diverse natural habitats including pine and hardwood forest communities, riverine environments, and hundreds of individual wetland areas. In 1972, SRS was designated as the first

National Environmental Research Park to provide opportunities for studying the environmental impacts of energy and defense-related technologies.

SRS natural resources are managed by the U.S. Forest Service-Savannah River in cooperation with the Savannah River Ecology Laboratory and the South Carolina Department of Natural Resources.

Today, white-tailed deer, turkeys, eagles, alligators, and many species of snakes, amphibians and songbirds thrive on the SRS. In addition, SRS also manages endangered species populations of the red-cockaded woodpecker, pond berry and smooth purple cone flower.

Savannah River National Laboratory

Savannah River National Laboratory (SRNL) is a multi-program national laboratory that puts science to work to provide practical, cost-effective solutions for our nation’s environmental cleanup, nuclear security and clean energy challenges.

The laboratory has a staff of more than 1,000, including many internationally recognized experts. SRNL researchers have made significant scientific and technological advances in glass technology, hydrogen storage technology, nonproliferation, environmental characterization and cleanup, radioactive waste treatment, sensors and probes, and other fields.

SRNL is the national laboratory for DOE’s Environmental Management program. In this capacity, SRNL applies its expertise and applied technology capabilities to assist sites across the DOE complex in meeting cleanup requirements.

SRNL’s unique facilities include laboratories for the safe study and handling of radioactive materials, a field demonstration site for testing and evaluating environmental cleanup technologies, laboratories for ultra-sensitive measurement and analysis of radioactive materials, and the only radiological crime investigation laboratory for contaminated evidence in the U.S.

While the laboratory continues to provide the science and technology support for SRS operations, much of SRNL’s work comes from non-SRS customers, including DOE-HQ, National Nuclear Security Administration (NNSA)-HQ, other DOE sites, and federal agencies such as the Department of Homeland Security and the Federal Bureau of Investigation.



To maximize the nation’s return for its investment in the laboratory, SRNL forms strategic partnerships with private industry, academia and government agencies to apply the laboratory’s unique expertise to challenges of mutual interest. The laboratory also shares its expertise by licensing private companies to manufacture and market technologies created at SRNL, a move that helps American businesses sharpen their competitive edge and provides taxpayers a second return on their investment.

Underpinning the laboratory is a world-class culture of safety and security that enables SRNL to tackle some of the nation’s most difficult challenges in environmental stewardship, nuclear security and clean energy, and to provide leadership for DOE in nuclear chemical manufacturing.



Gas transfer system testing

Savannah River Tritium Enterprise

SRS is the nation's only facility for extracting, recycling, purifying and reloading tritium, a radioactive isotope of hydrogen that is a key element of modern nuclear weapons.

SRS supports five tritium and gas transfer system-related missions on behalf of NNSA: tritium supply, stockpile maintenance, stockpile evaluation, helium-3 recovery, and research and development (R&D).

Missions

With a half-life of only 12.3 years, tritium must be continually replenished. SRS accomplishes this in two ways: by recycling it from existing warheads and by extracting it from target rods that have been irradiated in a Tennessee Valley Authority (TVA) commercial power nuclear reactor.

SRS helps maintain the U.S. nuclear stockpile by replenishing gas transfer systems, which ensure performance of nuclear weapons; reservoirs are loaded with a mixture of tritium and deuterium gases, finished, assembled, inspected, packaged and shipped.

In the absence of nuclear weapons testing, designers must rely on SRS evaluation data to certify the reliability of U.S. nuclear weapons; samples of nuclear weapons are removed from the active stockpile, and their gas transfer systems are sent to SRS for testing.

Helium-3, which is a by-product of SRS tritium processing, is a precious commodity used in neutron detection equipment and other applications, and SRS is its sole U.S. source.

SRNL researchers use their expertise in tritium to conduct R&D that enhances processing in the SRS Tritium Facilities. SRNL researchers also work in partnership with NNSA's weapon design laboratories, conducting R&D that supports new gas transfer system designs.

Plutonium Disposition

SRS missions include the use of its unique facilities, capabilities and expertise to address issues of national security and nonproliferation, including legacy material disposition. Plutonium and nuclear material management missions have long been conducted at SRS, using facilities in various areas. The current Plutonium Disposition mission includes disposition of excess material from across the DOE complex and other materials returned to the U.S. through the Gap Removal program. Additionally, SRS missions include disposition of nuclear material from dismantled weapons, consistent with the U.S.-Russian agreement on nonproliferation. The Mixed Oxide (MOX) Fuel Fabrication Facility being constructed at SRS is designed to convert excess weapons-usable plutonium to a form that can be used in commercial power reactors. DOE is also evaluating an alternate approach to dispose of this excess weapons-grade material by mixing the nuclear material with inhibitor material, which is referred to as "down-blend and disposal."



H Canyon Operations

SRS's two primary separations facilities, called "canyons," are located in F and H Areas. F Canyon and H Canyon—together with FB Line and HB Line, which are located atop the canyons—are where nuclear materials historically have been chemically recovered and purified. F Canyon and FB Line have been deactivated and await further disposition decisions.

H Canyon and HB Line support the DOE Enriched Uranium and Plutonium Disposition programs by reducing the quantity of fissile materials in storage throughout the U.S. This supports environmental cleanup and nuclear nonproliferation efforts, and a smaller, safer, more secure and less expensive nuclear weapons complex.

H Canyon is the only operating production-scale, nuclear chemical separations facility in the U.S. The facility's operations historically recovered uranium-235 and neptunium-237 from spent nuclear fuel rods from Site production reactors and from domestic and foreign research reactor programs.

More recently, SRS has used H Canyon to downblend highly enriched uranium, which can be used in nuclear weapons, into low enriched uranium (LEU). LEU is not desirable for weapons use and can be used to make fuel for the Tennessee Valley Authority's (TVA) commercial power reactors. Since March 2003, over 330 trailers of LEU have been shipped to TVA, providing enough LEU to provide power for all the homes in South Carolina for over 8.5 years or every home in the U.S. for approximately 47 days.



Nuclear Materials Management

Operations at SRS's K Area Complex (KAC) provide for the handling and interim safe storage for much of DOE's excess plutonium and other special nuclear materials (SNM). The principal operations building formerly housed K Reactor, which produced nuclear materials to support the U.S. during the Cold War for nearly four decades. It was DOE's last operating production reactor, shutting down in 1992. A DOE decision in 2000 allowed K Reactor to go through significant seismic, structural and security upgrades to become DOE's only Category 1 SNM storage facility designated for interim safe storage of plutonium and highly enriched uranium at SRS. Since that time, SRS has assisted DOE in saving millions of taxpayer dollars through the safe receipt and storage of nuclear materials from the Rocky Flats Environmental Technology Site, SRS's FB Line, the Hanford Site, Lawrence Livermore National Laboratory and Los Alamos National Laboratory. Verification measurements and other surveillance examinations ensure the security of SNM in K Area. In the future, stabilization and repackaging capability can be added to the KAC to further enhance DOE's ability to manage excess plutonium and other SNM until a final disposition path is achieved.

Spent Nuclear Fuel

Spent nuclear fuel (SNF) is nuclear fuel that has been irradiated in a nuclear reactor. SNF from the Site's former production reactors and from foreign and domestic research reactor programs is currently safely stored in an underwater storage facility in L Area, called a disassembly basin. L Basin has concrete walls two and a half to seven feet thick and holds approximately 3.4 million gallons of water, with pool depths of 17 to 50 feet. The basin water provides shielding to protect workers from radiation. Since 1964, SRS has received more than 2,300 casks containing over 46,000 SNF assemblies.



Activities in the K Area Complex



A cask receipt in L Basin

Waste Management

Liquid Waste Operations

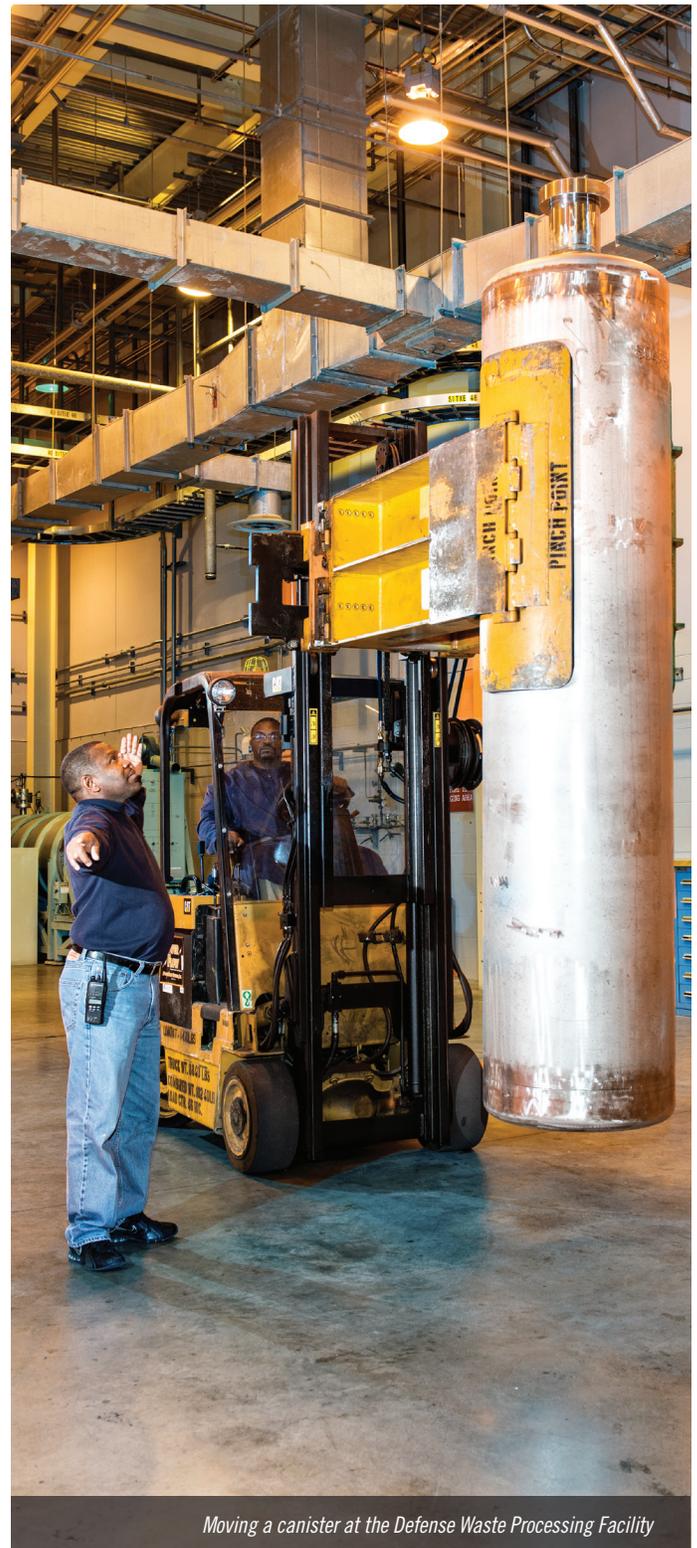
Past SRS nuclear material production created unusable by-products, such as radioactive waste. About 35 million gallons of radioactive liquid waste are stored in 43 underground tanks at SRS.

The Defense Waste Processing Facility (DWPF) is processing the high-activity waste by immobilizing radioactive elements within a borosilicate glass structure, a stable disposition waste form. Since DWPF began operations in March 1996, more than 16 million pounds of radioactive glass have been produced.

Much of the liquid waste in the tanks is separated as a decontaminated salt solution through an innovative approach to salt waste processing, called the Actinide Removal Process and Modular Caustic Side Solvent Extraction Unit. The facilities use the same unit processes that will be used in the Salt Waste Processing Facility (SWPF), currently scheduled to begin radioactive operations in December 2018. SWPF will be the key liquid waste facility for processing approximately 90 percent of the 35 million gallons of tank waste. SWPF will separate the salt waste into a low-volume, high-radioactivity fraction for vitrification in DWPF and high-volume, decontaminated salt solution to the Saltstone Facility for disposal as low-level waste.

Decontaminated salt solution from salt processing is sent to the Saltstone Production Facility, where it is mixed with cement, ash and furnace slag and poured into above-ground, cylindrical concrete vaults called Saltstone Disposal Units (SDU) for permanent disposition. SDU-6, currently under construction, will be 10 times larger than the other SDUs, and will hold more than 30 million gallons of grouted decontaminated salt solution. Filled units will be capped with an engineered cover consisting of several layers of impermeable materials, isolating them from the environment. SRS is the first site in the DOE complex to disposition salt waste.

SRS waste tanks have provided more than 60 years of safe storage for nuclear waste. Removing waste from the tanks will allow for operational closure of the Site's high-level waste tanks. To date, eight waste tanks have been closed.



Moving a canister at the Defense Waste Processing Facility

Waste Management *(continued)*

Liquid Radioactive Waste Tank Closure

SRS is home to the first two liquid radioactive waste tank operational closures in the nation. These two closures were followed by two in 2012, two in 2013, one in 2015 and one in 2016.

Tank 20, the first closed, was certified closed by the South Carolina Department of Health and Environmental Control (SCDHEC) and applicable DOE Orders in July 1997. SCDHEC certified closure of Tank 17 in December 1997. Both tanks were constructed in 1958 and first used in 1960.

The DOE, SCDHEC, the U.S. Environmental Protection Agency, SRS workers and the public worked closely together to establish strict closure requirements that supported all state and Federal regulations.

Closure activities for the tanks begin years before the actual operational closing of the tanks. Initially, radioactive waste is removed from each tank to the extent practical and agreements and closure plans with state and federal regulators are finalized.

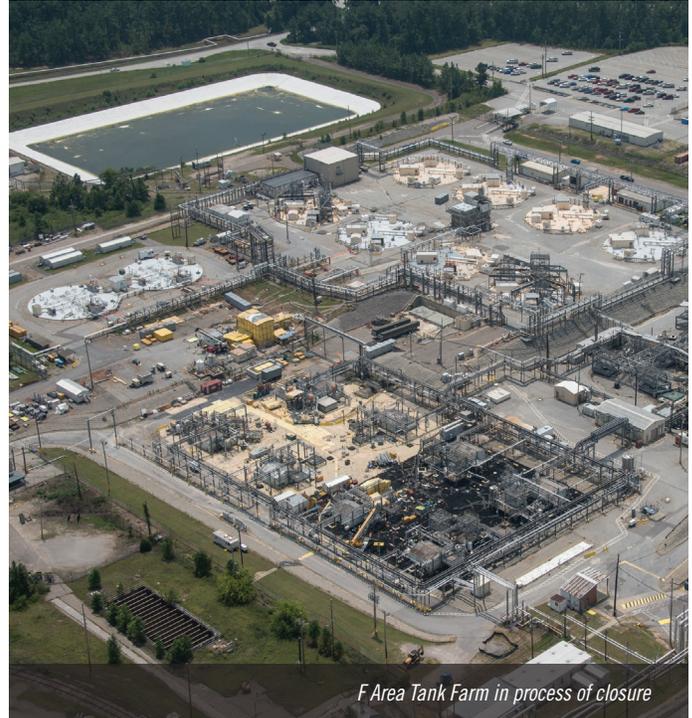
The final closure activities begin with workers pouring specially formulated grout (a cement-like substance) into the tanks. This special grout stabilizes the tank and is used to impede the leaching and migration of the waste. Over the course of several weeks, the tanks are filled with grout and tank top penetrations are sealed.

Solid Waste

Solid Waste Management is responsible for the disposition of SRS solid waste, which includes sanitary, construction and demolition (C&D), hazardous, low-level (LLW) and transuranic (TRU) radioactive waste. Sanitary is household waste that is recycled or disposed of at the Three Rivers Landfill. C&D waste is generated by SRS construction activities and is disposed of in a SCDHEC landfill. Hazardous waste is collected and then disposed off-site.

Radioactive waste is classified into two categories, the majority of which is LLW. LLW waste is contaminated with predominately short-lived isotopes. This waste is disposed of at SRS in engineered facilities.

The second category of radioactive waste is TRU waste. This waste typically consists of protective clothing, tools, rags, equipment and miscellaneous items contaminated with small amounts of plutonium. TRU waste is collected, characterized and packaged for offsite shipping to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, N.M.



F Area Tank Farm in process of closure

The old-style waste tanks are being closed in accordance with the Federal Facility Agreement. This process reduces risks to human health and the environment by securing residual waste in the tanks, which minimizes the potential for groundwater contamination.



Waste container at SRS

When the SRS TRU Ship-to-WIPP program began, over 30,000 containers of TRU waste were stored at SRS. SRS has made over 1,650 shipments to WIPP through 2014. All remaining legacy TRU waste at SRS is packaged and ready to be shipped to WIPP.

Environmental Compliance and Area Completion Projects

SRS Environmental Compliance and Area Completion Projects (EC&ACP) coordinates and provides environmental support and compliance-based oversight of SRS operations. EC&ACP ensures that SRS activities are conducted in accordance with state and federal environmental regulations and are safe and protective of workers, the public and the environment.

EC&ACP also manages extensive environmental and groundwater monitoring programs to determine impacts, if any, from SRS operations to the public, surrounding communities and the environment. More than 9,000 environmental and groundwater samples are collected at SRS and in neighboring areas each year, and are analyzed for radionuclides, metals or other chemicals.

EC&ACP investigates and remediates environmental contamination, e.g., by removing, treating, capping or immobilizing the source of contamination preventing or mitigating the spread of contamination. SRS performs these remedial activities in accordance with the Federal Facility Agreement (FFA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA), with public involvement and the full support of DOE-SR, the U.S. Environmental Protection Agency-Region 4 and the South Carolina Department of Health and Environmental Control. Fieldwork is a top priority and includes closure and post-closure care/maintenance of



Remediation work at the D Area Ash Basin

inactive SRS waste units, e.g., seepage basins, rubble pits, rubble piles and disposal facilities.

Site remediation continues at SRS with more than 78 percent of the 515 total number of waste units completed, and over 25 percent of 1,126 total number of excess facilities safely dispositioned to date.

Cleanup and decommissioning will continue until all areas at SRS are completed. Units at which waste is left, are placed under post-closure care with institutional controls including access and land use restrictions, inspections, maintenance, long-term monitoring and reporting, and ground water corrective actions and effectiveness monitoring are performed as appropriate.

Acronyms appearing in this fact sheet

DOE Department of Energy
 DWPF Defense Waste Processing Facility
 EC&ACP Environmental Compliance and Area Completion Projects
 KAC K Area Complex
 LEU low enriched uranium
 LLW low level waste
 MOX Mixed oxide
 NNSA National Nuclear Security Administration
 R&D Research and Development
 SCDHEC South Carolina Department of Health and Environmental Control

SDU Saltstone Disposal Unit
 SNF spent nuclear fuel
 SNM special nuclear material
 SRNL Savannah River National Laboratory
 SRS Savannah River Site
 SWPF Salt Waste Processing Facility
 TRU transuranic
 TVA Tennessee Valley Authority
 WIPP Waste Isolation Pilot Plant