

Facts

from the **Savannah River Site**

ENVIRONMENTAL STEWARDSHIP • NATIONAL SECURITY • SCIENCE AND ENERGY

SRS Occupants

Federal

- Department of Energy:
Savannah River Operations Office
- National Nuclear
Security Administration
- 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*
- Parsons
– *Salt Waste Processing Facility*
- Centerra Group, LLC
– *SRS Security*
- University of Georgia
– *Savannah River Ecology Laboratory*

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.



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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

The U.S. Department of Energy’s Savannah River National Laboratory (SRNL) is a multi-program research and development center, where accomplished scientists and engineers solve our nation’s challenging environmental and security problems.

SRNL protects the nation by applying science to discover practical solutions to environmental, national security, nuclear materials management and energy security challenges. The laboratory uses its unique scientific and engineering expertise to develop and deploy solutions with high returns on investment for the nation. SRNL innovations include advances in energy storage technology, materials science and nuclear nonproliferation, as well as nuclear facility decommissioning, environmental cleanup, and safe transport and storage of nuclear materials.

SRNL conducts research in laboratories specialized for the safe study and handling of radioactive materials, laboratories for ultra-sensitive measurement and analysis of radioactive materials, internationally accredited analytical laboratories, and the only radiological crime investigation laboratory in the U.S.

Working with an established and growing network of industry, academic and public partners, SRNL advances



SRNL advanced glass formulation

scientific discovery and commercial innovation. SRNL also fuels the nation’s economy by licensing its patented technologies to private companies for commercialization.

Whether it is optimizing chemical processes to safely dispose of legacy nuclear waste, collaborating with partners on electrical grid security, or using its expertise in nuclear materials science to make the world safer, SRNL works every day to secure the nation’s future.



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National Nuclear Security Administration

Stockpile Support The purpose for establishing SRS in the 1950s was to support the nation's nuclear defense. Today, the site continues to fulfill that purpose. As it has since the site's earliest years, SRS carries out crucial missions related to tritium, the radioactive isotope of hydrogen necessary to the modern nuclear stockpile. In addition, NNSA and the Department of Defense jointly announced in 2018 that the recommended alternative for supplying plutonium pits—needed to meet future stockpile requirements—will also rely on SRS. Under this proposed strategy, the Mixed Oxide Fuel Fabrication Facility, an unfinished facility under construction at SRS, would be repurposed as the Savannah River Plutonium Processing Facility to produce no fewer than 50 pits per year by 2030, with Los Alamos National Laboratory producing another 30 pits per year. Preliminary work is underway to enable a final decision on the proposed strategy.

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.



Preparing to package a can of downblended plutonium for shipment out of South Carolina

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 is to dispose of and manage excess weapon-useable plutonium from both domestic stockpiles and plutonium returned from abroad. SRS is expediting removal of surplus plutonium from South Carolina, with a goal to remove the first metric ton by January 1, 2020. NNSA is also evaluating the "Dilute and Dispose" approach as the preferred, cost-effective alternative to disposition 34 metric tons of weapon-grade plutonium. Dilute and Dispose entails mixing the plutonium with an adulterant material (a.k.a. "downblending") to ensure it is not recoverable without extensive processing, followed by geological repository disposal at the Waste Isolation Pilot Plant in New Mexico.



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H Canyon at the Savannah River Site

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 TVA's 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.



A shipment of low enriched uranium on its way to TVA



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Nuclear Materials Management

Operations at SRS's K Area Complex (KAC) provide for the storage and management of 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.

In 2017, the KAC initiated plutonium downblend operations, a nonproliferation initiative that mixes the surplus SNM oxide with an adulterant mixture. The material is then packaged in preparation for safe and permanent disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, N.M. The downblend process (also referred to as 'dilute and dispose') continues to be pursued as the disposition strategy for much of the surplus SNM inventory for the complex. As the facility continues to be tasked for additional SNM handling and disposition scope, the K Area mission is evolving from storage to management of nuclear materials.

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 2,400 casks containing over 47,500 SNF assemblies.



Activities in the K Area Complex



A cask receipt in L Basin



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Waste Management

Liquid Waste Operations

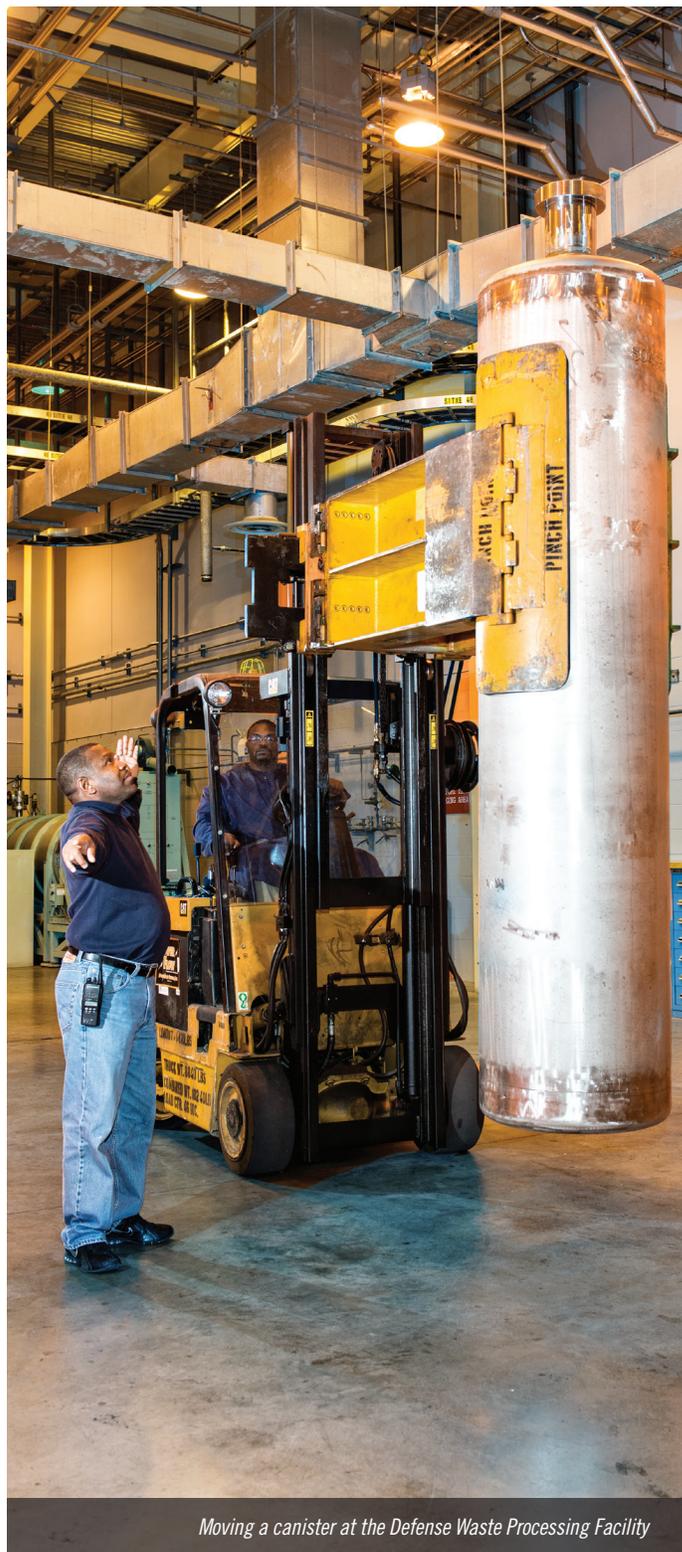
Past SRS nuclear material production created unusable by-products, such as radioactive liquid waste. About 35 million gallons of radioactive liquid waste are stored in 43 underground tanks at SRS.

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

The majority of 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 processes that will be used in the Salt Waste Processing Facility (SWPF), currently in testing and commissioning. 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 a high-volume, decontaminated salt solution to the Saltstone Production Facility (SPF) for disposal as low-level waste.

Decontaminated salt solution from salt processing is sent to the SPF, where it is mixed with cement, ash and furnace slag and poured into above-ground, cylindrical concrete storage units called Saltstone Disposal Units (SDU) for permanent disposition. These SDUs are 10 times larger than the other SRS SDUs and will hold approximately 32 million gallons of grouted decontaminated salt solution. Filled units will eventually 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.

A new technology, called Tank Closure Cesium Removal (TCCR), began operations in 2019. TCCR is a demonstration project designed to accelerate removal of radioactive salt waste from the SRS underground waste tanks to support tank closure. The process involves transferring salt waste from a waste tank into the remotely-operated TCCR processing module, where the waste is treated with an engineered resin to remove cesium, a radioactive chemical element. Cesium must be removed before the tanks can be operationally closed. The decontaminated salt solution is then transferred to the SPF for disposal at SRS.



Moving a canister at the Defense Waste Processing Facility



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Waste Management *(continued)*

Liquid Radioactive Waste Tank Closure

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.

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

Tank 20, the first closed, was certified operationally 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.

DOE, SCDHEC, the U.S. Environmental Protection Agency 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, once agreements and closure plans with state and federal regulators are finalized, radioactive waste is removed from each tank to the maximum extent practical. The final closure activities begin with workers pouring specially formulated grout (a cement-like substance) into

Solid Waste

Solid Waste Management is responsible for the disposition of SRS solid waste, which includes hazardous, sanitary, construction and demolition (C&D) waste, plus low-level (LLW) and transuranic (TRU) radioactive waste. Sanitary waste is household materials and items that are 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 permitted landfill. Hazardous waste is collected and disposed of offsite at a permitted facility. Radioactive waste is classified into two categories, the majority of which is LLW, which is contaminated with predominately short-lived isotopes and is disposed of at SRS in engineered facilities. LLW that is also hazardous waste is disposed of offsite at a permitted facility.

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 (including mixed TRU waste) is collected, characterized and packaged for offsite disposal at WIPP in New Mexico.



F Area Tank Farm in process of closure

one-million-gallon 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 using cement trucks and tank top penetrations are sealed.

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. The site has made over 1,660 shipments to WIPP through 2018.



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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 10,000 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



Remediation work at the D Area Ash Basin

and post-closure care/maintenance of inactive SRS waste units, e.g., seepage basins, rubble pits, rubble piles and disposal facilities.

Site remediation continues at SRS with more than 79 percent of the 515 total number of waste units completed, and over 25 percent of 1,127 total number of excess facilities safely disposed 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	SDU	Saltstone Disposal Unit
DWPF	Defense Waste Processing Facility	SNF	spent nuclear fuel
EC&ACP	Environmental Compliance and Area Completion Projects	SNM	special nuclear material
KAC	K Area Complex	SRNL	Savannah River National Laboratory
LEU	low enriched uranium	SRS	Savannah River Site
LLW	low level waste	SWPF	Salt Waste Processing Facility
NNSA	National Nuclear Security Administration	TRU	transuranic
R&D	Research and Development	TVA	Tennessee Valley Authority
SCDHEC	South Carolina Department of Health and Environmental Control	WIPP	Waste Isolation Pilot Plant



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