FACTS
ABOUT THE SAVANNAH RIVER SITE

Liquid Nuclear Waste Processing Facilities

Radioactive liquid waste is generated at SRS as by-products from the processing of nuclear materials for national defense, research and medical programs. The waste, totaling about 36 million gallons, is currently stored in 49 underground carbon-steel waste tanks grouped into two “tank farms” at SRS.

Tank Farms

There are four types of waste tank designs:

Type I Tanks

- 12 Type I tanks were built 1951-53
- 750,000 gallon capacity, 75 feet in diameter by 24-1/2 feet high
- Partial secondary containment and leak detection
- Contain approximately 12 percent of the site’s waste volume
- Seven Type I tanks have leaked waste into the tank annulus; waste stored in these tanks is below the known leak sites.

Type II Tanks

- Four Type II tanks were built 1955-56
- 1,030,000 gallon capacity, 85 feet in diameter by 27 feet high
- Partial secondary containment and leak detection
- Contain approximately 4 percent of the site’s waste volume
- Four Type II tanks have leaked waste into the tank annulus; waste stored in these tanks is below the known leak sites.

Type III Tanks

- 27 Type III tanks were built 1967-81
- 1.3 million gallon capacity, 85 feet in diameter by 33 feet high
- State-of-the-art design, including heat stress relief of the tank walls to prevent cracking
- Full height secondary containment and leak detection
- Contain approximately 77 percent of the site’s waste volume
- No Type III tanks have leaked any waste.

Type IV Tanks

- Eight Type IV tanks were built 1953-63 (two of the eight tanks certified closed after being filled with grout and cement)
- 1.3 million gallon capacity, 85 feet in diameter by 34 feet high
- No secondary containment
- No active leak detection system

- Contain approximately 7 percent of the site's waste volume
- One Type IV tank has had groundwater in-leakage, but that tank is now empty.

The Type I, II and IV tanks do not meet current secondary containment requirements, and will be emptied and retired as soon as possible. The Type III tanks have state-of-the-art designs and will be emptied last.

Evaporators

While the waste is stored in the tanks, it separates into two parts: a sludge that settles on the bottom of the tank, and a liquid supernate that resides on top of the sludge. The waste is reduced to about 30 percent of its original volume by evaporation. The condensed evaporator "overheads", water removed from the waste, are transferred to the Effluent Treatment Facility for final cleanup prior to release to the environment. As the concentrate cools a portion of it crystalizes forming solid saltcake. The concentrated supernate and saltcake are less mobile and therefore less likely to escape to the environment in the event of a tank crack or leak.

SRS currently has three evaporators operating.

2F Evaporator, located in F Area

- Single-stage, bent tube design
- Began operating in 1980

2H Evaporator, located in H Area

- Single-stage, bent tube design
- Began operating in 1982

3H Evaporator, located in H Area

- Single-stage, bent tube design
- Began operating in 2000

Two other evaporators have previously operated on site, but SRS does not plan to use them in the future.

Effluent Treatment Facility

The Effluent Treatment Facility, located in H Area, treats the low-level radioactive wastewater that was formerly sent to seepage basins. Treated streams include evaporator overheads, segregated cooling water, contaminated surface water runoff, transfer line catch tank streams and others.

- Began operating in 1988
- Processes approximately 20 million gallons of wastewater per year
- Treatment processes include pH adjustment, filtration, organic removal, reverse osmosis and ion exchange
- Treated waste water streams are released to a permitted outfall

Waste Removal

Sludge and saltcake must be removed from the storage tanks to be processed for ultimate disposal, and so that the tanks can either be reused or retired, as appropriate. This process is ongoing.

- Sludge waste is removed by installing slurry pumps and adding water. The slurry pumps suspend the sludge in the water so that it can be transferred to the Extended Sludge Processing Facility.
- Saltcake waste is removed by installing slurry pumps and adding water. The slurry pumps circulate the water to dissolve the saltcake before transferring it to a salt processing facility.

Extended Sludge Processing Facility

The Extended Sludge Processing Facility washes the sludge to remove excess soluble salts before the sludge is ready to feed to the Defense Waste Processing Facility.

- Process includes washing to remove dissolved salts, gravity settling and decanting the salt solution.
- Slurry pumps provide agitation of the sludge during washing.
- Wash water is either treated through evaporation or recycled and used to dissolve saltcake.

Defense Waste Processing Facility

DWPF, located in S Area, immobilizes the radioactive waste sludge, by vitrifying it into a solid glass waste form.

- The sludge and borosilicate glass "frit" is mixed together forming melter feed.
- The sludge/precipitate/glass mixture is fed to a melter and heated to approximately 2,100 degrees F (1,150 degrees C).
- The molten glass is poured into stainless steel canisters to cool and harden.
- Each canister is 10 feet tall and 2 feet in diameter.
- The glass canisters are sealed, decontaminated, welded shut and then stored on site in a building designed for safe interim storage until a federal repository is available.
- DWPF began processing radioactive sludge in March 1996.

Salt Waste Processing

In February 1998, work was suspended on the In–Tank Precipitation (ITP) Facility. ITP was expected to process the “salt cake” and supernate (the result of the evaporation process) waste in tanks to remove cesium, strontium, and actinides. Between 1998 and 2000, several teams evaluated various salt processing technologies and options to replace the salt waste processing capability. In September 2001, a National Environmental Policy Act (NEPA) Record of Decision (ROD) was issued that selected the caustic side solvent extraction (CSSX) technology to form the basis for the design and construction of a Salt Waste Processing Facility (SWPF).

The SWPF is currently in the design phase and construction is expected to begin in 2007 with the start of radioactive operations planned for FY 2011.

Salt Waste Processing Facility

The SWPF will use MonoSodiumTitanate (MST) to remove the strontium and actinides from the waste and the CSSX process to remove the cesium. The actinide and strontium laden MST slurry and the cesium solution will be transferred to the DWPF. The decontaminated salt waste will be transferred to the Saltstone Processing Facility for final treatment and disposal in above ground vaults.

Interim Salt Processing

Due to a shortage of Type III tank space, some salt waste disposition is required between 2007 and 2011 to ensure sufficient tank space for continued sludge washing and sufficient tank space for the initial salt processing by the SWPF. Only limited quantities of salt waste will be processed in this manner. In order to accomplish this, the following activities are currently planned.

- **Actinide Removal Process (ARP)**

  Building 512-S, formerly called the Late Wash Facility, has been modified to remove strontium and actinides from the salt waste. This facility will use the same MST process as the SWPF. Building 241-96H, the former ITP Filter Stripper Building, is currently being modified to increase the capacity of the actinide removal step.

  Building 241-96H modifications are currently in the design phase and radioactive operations are expected to begin in FY-2007.

- **Modular CSSX Unit (MCU)**

  A portion of the ARP output will be further treated in the MCU to remove the majority of the cesium from the waste. The process will be the same as that used in the SWPF. The cesium solution will be transferred to the DWPF for incorporation into glass and the decontaminated salt waste will be transferred to the Saltstone Processing Facility for final treatment and disposal.

  The MCU is in preliminary design and is expected to begin radioactive operations near the end of FY 2007. The MCU will cease operations when the SWPF begins operations in FY 2011.

Saltstone Facility

The Saltstone Processing Facility, operating intermittently since 1990, treats and permanently disposes of low-level liquid waste by stabilizing it in a solid, cement-based waste form.

- Liquid waste is combined with a dry blend of cement, slag and flyash.
- The resulting mixture is referred to as “grout.”
- The grout is pumped to above-ground engineered vaults, where it solidifies into “saltstone.”
- Saltstone is a non-hazardous waste form.

This facility has been modified to accommodate higher radioactivity levels in support of the interim salt processing strategy. Additional vaults beyond the 2 existing ones will be constructed as needed to receive and store the treated salt waste as it is processed over the next 15 years.

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