

2 ENVIRONMENTAL MANAGEMENT SYSTEM

The U.S. Department of Energy (DOE) is committed to implementing sound stewardship practices to protect the air, water, land, and other natural, archaeological, and cultural resources potentially affected by Savannah River Site (SRS) construction, operations, maintenance, and decommissioning activities. The Environmental Management System (EMS) provides for the systematic planning, integrated execution, and evaluation of SRS activities for: (1) public health and environmental protection, (2) pollution prevention and waste minimization, (3) compliance with applicable environmental and cultural resource protection requirements, and (4) continuous improvement. The SRS activities discussed in this chapter portray the EMS goals and objectives in the areas of waste minimization, water management, renewable energy, greenhouse gas reduction, sustainable acquisition, sustainable remediation and best management practices on site. The SRS Site Sustainability Plan contains more information on the goals and progress towards meeting those goals.

2015 Highlights

The Savannah River Nuclear Solutions (SRNS) – Savannah River Remediation (SRR) EMS program review confirmed that both organizations are compliant with the requirements of DOE Orders and International Organization for Standardization (ISO) 14001. Some of the most notable environmental sustainability goals met during the year include:

Pollution Prevention/Waste Minimization

SRS saved \$3.6 million through initiatives that avoided or diverted hazardous and radioactive wastes from disposal.

Water Management

SRS has reduced potable water usage by 37% since 2000.

Renewable Energy Intensity

48% of electric energy used in 2015 came from renewable energy sources

Greenhouse Gas Reduction

SRS has reduced greenhouse gas emissions over 68% since 2008.

Transportation and Fleet Management

Over 90% of SRS light duty vehicles are hybrid, electric, or use E85 (ethanol) fuel.

Best Practices/Lessons Learned

SRS shipped \$20.8 million in usable assets (equipment and supplies) for reuse and recovery.

Chapter 2 - Key Terms

Environmental aspects are elements of an organization's activities, products, or services that can interact with the environment causing potential impacts.

Environmental impacts are any change to the environment, whether adverse or beneficial, wholly or partly resulting from an organization's activities, products, or services.

Environmental policy is an organization's state of intentions and principles in relation to its overall environmental performance. It provides a framework for action and for setting objectives and targets.

Environmental objectives support the environmental policy. They define the organization's goals.

Environmental targets are the specific measures that must be met to achieve the objectives.

Environmental sustainability is the responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality. It includes reducing the amount of waste produced, using less energy, and developing processes that maintain the quality of the environment on a long-term basis.

2.1 SRS EMS IMPLEMENTATION

2.1.1 Introduction

DOE has chosen the ISO Standard 14001 (Environmental Management Systems) as the framework to employ EMS and sustainable practices. The ISO14001 standard specifies the actual requirements for an environmental management system. It applies to those environmental aspects of which the organization has control and over which the organization can be expected to have an influence. The standard involves a repetitive cycle of developing a management system, planning and implementation, operation of the management system; checking (evaluation), corrective action and management review. Ultimately, ISO14001 aims to continuously assure itself that it can implement, maintain and improve an environmental management system. EMS also meets the criteria of Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management, and DOE Order 436.1, "Departmental Sustainability," that require federal facilities to use environmental management systems.

The EMS integrates environmental protection into daily activities throughout operations at SRS. Environmental protection is integrated with safety and health hazard identification, as well as quality management processes. It is an approach to planning, executing, evaluating, and modifying how SRS operates so that the Site has minimal impact on the environment. SRS uses the EMS as a platform for the Site Sustainability Plan (SSP) implementation, as well as to carry out programs with goals and measurable targets that contribute to SRS meeting its sustainability goals. The SRS EMS and SSP targets and goals, along with the status of the Site's progress toward meeting these goals, are available on the [SRS website](#). These documents, combined with site policies and procedures, ensure SRS remains a leader in environmental protection and reduction in energy and water usage.

The following contractors maintain ISO14001 credentials: SRNS, SRR, Centerra and CB&I Areva. A March 2015 audit of the SRNS-SRR EMS program found it conformed with the ISO14001 requirements. A copy of the audit report can be found on the [SRS website](#). Centerra re-registered in 2015.

Ameresco, operator of three of the four biomass plants, provides information for use in the Site Sustainability Plan, and their contribution to greenhouse gas reduction is counted in the Site's reductions.

The SRS Integrated Safety Management System is a process to integrate safety into management and work practices at all levels so that the Site accomplishes missions, while protecting the public, the worker, and the environment. Integrated Safety Management System execution is comprised of five functions: (1) Define Scope of Work, (2) Analyze Hazards, (3) Develop and Implement Controls, (4) Perform Work, and (5) Feedback and Improvement.

SRS organizations follow this ISMS approach in their programs and procedures.



**Integrated Safety Management
System Continual Improvement
Framework**

Through the EMS, SRS identifies significant facility and operational activities (aspects) that interact with the environment, and sets targets and goals for continuous improvement and reduction in SRS environmental impacts.

New targets and goals are set each year to meet these aspects and to support DOE's environmental objectives.

Table 2-1 shows some examples of environmental aspects and their potential impacts.

Table 2-1 Environmental Aspects (Cause) and Environmental Impacts (Effect)

Cause	Effect
Emissions of smoke particles	Air pollution; decreased visibility
Discharges to streams	Degradation of aquatic habitat and drinking water supplies
Spills and leaks	Soil and groundwater contamination
Electricity use	Air pollution; global climate change
Resource Use	Natural resource depletion
Waste generation	Resource depletion; landfill space depleted; potential land contamination

Through the EMS, SRS sets targets and goals on an annual basis in support of DOE environmental objectives, which include:

- Reduction in total energy usage
- Increase utilization of renewable energy
- Reduction in water usage
- Purchasing of "green" products and services
- Reduction in solid waste generation
- Reduction in chemical usage

- Increase in the number of sustainable buildings
- Reduction in fleet and petroleum usage
- Use of energy compliant electronic devices
- Maintenance of compliance with requirements

These goals cover the topic areas of Clean Energy Initiatives, Sustainability, and Environmental Protection. Appendix A presents the goals, identifies the strategies for implementation, and the status of SRS's progress towards achieving them. Additional information is contained in this chapter on how SRS is moving forward in supporting DOE environmental objectives.

2.2 SUSTAINABILITY ACCOMPLISHMENTS

The following topics summarize the major accomplishments discussed in the SSP.

2.2.1 Pollution Prevention/Waste Minimization

SRS uses the North Augusta, SC Material Recovery Facility (NA-MRF) for routine waste (typical office and municipal-type waste) and recycling services. For 2015, about 43% of this stream, (approximately 680 tons) was recycled at the facility. SRS worked with NA-MRF to support process and program improvements to strive for attainment of a 50% recovery rate. During 2015, NA-MRF added new front-end processing equipment to improve waste segregation and reduce labor that increased the recovery rate of recyclable materials. Other efforts at their facility included the initiation of a vendor contract to purchase plastic waste bags and operations procedure revisions to improve recovery rates. For the month of September 2015, the NA-MRF achieved an approximate 60% recovery rate.

SRS strives to prevent or reduce pollution and waste generation whenever possible. In 2015, 15 pollution prevention (P2) initiatives avoided or diverted 459 yd³ of hazardous and radioactive wastes from disposal, saving the Site over \$3.6 million annually.

Table 2-2 shows a summary of the pollution prevention and waste minimization projects.



**North Augusta Material Recovery
Facility**

Table 2-2 Summary of SRS Pollution Prevention Activities

Waste Reduction Activity Description	Waste Minimized or Recycled (weight or volume)
Hazardous waste generation avoided due to pollution prevention projects	9 yd ³
Low level radioactive waste generation avoided due to pollution prevention projects	115 yd ³
Mixed hazardous and low level mixed waste generation avoided due to pollution prevention projects	21 yd ³
Light bulbs recycled	24,680 lbs
Used oil recycled	8,350 gals
Lead-acid batteries recycled	280,179 lbs
Used tires recycled	24,000 lbs
Metals recycled	1,045,300 lbs
Furniture recycled/reused	62,800 lbs
Scrap electronic devices recycled (Does not include computers returned to vendor for reissuance)	93,900 lbs
PCB Waste Oil Recycled	56,920 gals
Mixed papers (to the NA- MRF)	1,366,200 lbs

2.2.2 Water Management

Potable water consumption has been reduced by 36.9% since 2000. The intensity reduction (gallons per gross square foot) is 22% since 2007, meeting the interim goal of a 16% reduction by this year.

Industrial/Landscape/Agricultural water consumption has decreased by 64.3% from a 2010 baseline; far exceeding the 30% reduction goal. The electric and steam generation Biomass Cogeneration Facility is more water-efficient than the old and out of date coal-fired steam plants that SRS had previously used, thus ensuring large reductions in Industrial/Landscape/Agricultural water consumption will continue for many years to come.

Continuing in 2015, SRS used WaterSense® water fixtures or other water conserving products including low-flow toilet flush valves, low-flow urinal flush valves, and low-flow faucets for all routine corrective maintenance practices.

2.2.3 Renewable Energy

The Biomass Cogeneration Facility is in its third year of full operation and has played a significant role in supporting renewable and alternative energy goals. In May 2015, a new biomass heating plant broke ground that will increase critical steam security and provide additional green power at SRS.



Solar power is a Site renewable energy source

SRS is currently exceeding the 2025 goal of 25% of thermal and electric energy accounted for by renewable and alternative energy with 48% of electric energy used in 2015 coming from the biomass plants, and 100% of the steam used on site generated using renewable biomass fuels. The Savannah River National Laboratory (SRNL) continues developing cutting-edge renewable energy technologies in the areas of hydrogen, solar, wind, and biofuels. Details related to renewable energy developments at SRS can be found on the [Savannah River National Laboratory webpage](#).

2.2.4 Greenhouse Gas (GHG) Reduction

SRS is committed to reducing GHG Scope 1 & 2 emissions. Scope 1 consists of direct emissions such as on-site combustion of fossil fuels or fugitive GHG emissions; whereas, Scope 2 consists of indirect emissions associated with the consumption of electricity, heat, or steam. SRS has achieved a 68.4% reduction from the 2008 baseline thus far in Scope 1 & 2 greenhouse gas emissions.

Scope 1 and 2 GHG emissions are currently generated from the following source types at SRS:

- Purchased electricity
- Wood (biomass)
- Fuel Oil
- Propane
- Gasoline
- Diesel
- E85 (ethanol)
- Jet fuel
- Fugitive emissions



E85 fueling station provides fuel for Site vehicles

In 2015, the Site continued to make great progress in reducing Scope 1 and 2 greenhouse gas emissions. This was primarily due to the Biomass Cogeneration Facility and the operation of the three biomass facilities located in A Area, L Area, and K Area. Excellent tracking mechanisms combine and organize GHG data associated with the various impact sources, such as Site energy use, alternative workplace arrangements/space optimization, and vehicle/equipment use. These mechanisms allow for the development, and subsequent management, of a comprehensive inventory.

2.2.5 Transportation and Fleet Management

SRS continues to reduce the use of petroleum. Alternative fuel use accounted for over 50% of the site fuel usage in FY 2015. At the close of the fiscal year, over 90% of the site's light-duty fleet consists of alternative fueled vehicles; i.e., E85-ethanol, hybrid, and electric.

SRS continues to replace conventional unleaded fuel vehicles with alternate fueled vehicles. The site now has three E85 fuel stations located at strategic locations across the SRS.

2.2.6 Sustainable Acquisition

In 2015, over 95% of applicable solicitations for new contracts included a requirement to use cost-effective Environmentally Preferable Purchasing (EPP) products. SRS changed several acquisition processes to encourage EPP procurement practices, including:

- Review and approval of chemical purchases. This review monitors usage of hazardous chemicals and, where appropriate, recommends EPP products.
- Procurement and leasing of desktops, laptops, and monitors that meet Electronic Product Environmental Assessment Tool (EPEAT) standards and copiers that are Energy Star compliant. These standards set minimum energy efficiencies for many electrical and electronic products.
- Procurement of EPP substitutions under various new and existing contracts, including bulk janitorial supplies (e.g., cleaners, paper products) and safety items (e.g., earplugs, filters).

2.2.7 Electronic Assets Management



SRS implements numerous electronics stewardship strategies to reduce energy use, waste, and associated costs. In 2015, SRS continued exemplary performance and met sustainable electronics purchasing and disposal goals. SRS purchased EPEAT registered and ENERGY STAR qualified products for 100% of laptops, desktops, monitors, and printers. In total, 99.76% of SRS eligible electronic acquisitions meet EPEAT standards.

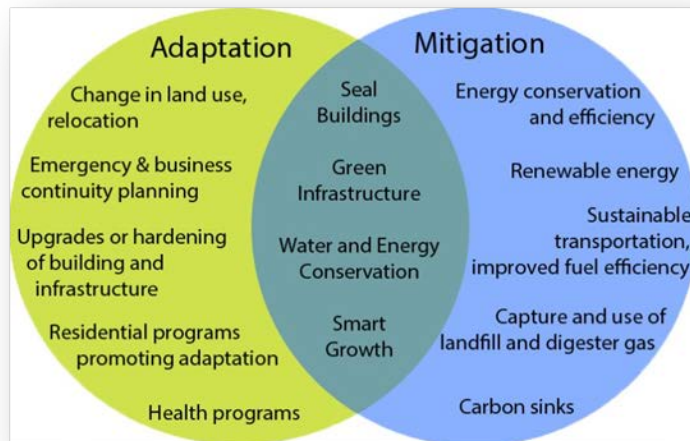
2.2.8 Sustainable Buildings

In order to meet long-range goals of SRS, and ongoing sustainability efforts, SRS works to achieve maximum facility, space and warehouse utilization. Doing so reduces the administrative and support footprint, and therefore reduces operating, routine surveillance, and maintenance costs. In 2015, SRS disconnected utilities from 41 vacated, aging trailers that were no longer in use. Of the 41 trailers, 16 were removed from the Site representing approximately 19,000 square feet of footprint reduction for SRS. In addition, eight facility roofs (106,356 sq ft.) were replaced with new green roof technology. These replacements not only significantly reduce costs, but also extend the life of the roofing system due to reduced thermal deterioration.

2.2.9 Climate Change Resilience

Climate change projections for the Site come from an online repository of global climate model (GCM) simulations and GCM simulations produced at SRNL. These simulations have undergone a process called downscaling, which uses large-scale simulations to make predictions at a local level. This process allows for a more detailed analysis of risks. The variables forecast at SRS include temperature, precipitation, humidity, and wind speed. The time period for this forecast is the years 2020-2049. A report of the downscaling process and results is under development, as is a description of observed climate change at SRS. A more extensive description of the downscaling at SRS and the results is contained in the 2015 SSP on the SRS homepage.

The analysis suggests that the major concern at SRS is the projection of more hot and humid days, which could impede outdoor work on the Site. The models generally agree that temperatures will rise, and specific humidity will naturally rise along with it. There is less agreement concerning changes in precipitation, with little overall trend towards greater rainfall at SRS, and reduced precipitation extremes. This conclusion tends to agree with the National Climate Assessment, in which extreme hot days (>95° F) are expected to become more common, rising from 15 to 30 days per year (4% to 8% of all days) to 60 to 75 days per year (16% to 20% of all days).



SRS has begun the process of applying this data to estimate the vulnerabilities of site assets, making use of the U.S. Department of Transportation's Vulnerability Assessment Scoring Tool, part of the [U.S. Climate Resilience Toolkit](#). SRS is producing formal documents that address the climate change resilience work that has been done over the past year. These documents will be reviewed externally and include:

1. An official report on observed climate change at SRS.
2. An official report on future climate change at SRS.
3. A report on the vulnerability assessments of mission critical buildings and outdoor workers at SRS.

2.2.10 Sustainable Remediation

SRS uses cost effective and sustainable remediation practices where possible. SRS currently has 515 identified waste sites, 400 of which either have completed remediation or are in various stages of characterization and remediation. SRNS frequently collaborates with SRNL and other entities to identify remedies that are both sustainable and appropriate. These sustainable remedies may include solar powered vapor extraction, barometric pressure powered soil vapor extraction, subsurface barrier walls, injection of material that allow for in situ remediation, phytoremediation, and monitored natural attenuation. See Chapter 7, “Groundwater Management Program”, for additional information.



Solar energy provides power to microblower that removes volatile contaminants from beneath the ground surface

SRS currently has 37 remediation systems in place. Eleven such systems are low energy/enhanced natural systems, with an additional 18 that are passive systems requiring no energy to implement. Solar-powered vadose zone extraction wells are an example of low energy/enhanced natural systems being deployed at SRS.

Fourteen active systems have successfully transitioned from aggressive, high-energy remediation activities to more sustainable monitored natural attenuation or low energy remedies.

2.3 EMS BEST PRACTICES/LESSONS LEARNED

2.3.1 Sustainability Campaign

SRS continued to implement the “One Simple Act of Green” environmental awareness campaign. The program promotes individual action by connecting SRS employees to information, tools, and programs to make positive impacts on the environment, such as turning off lights when leaving a room or workspace.



2.3.2 Earth Day

SRS participated in the Earth Day celebrations in Aiken, SC on April 18, 2015. Four separate displays and booths made up the SRS contribution to the festivities that day. Over 750 visitors viewed the various interactive and informational displays at the event.

SRS displays included:

- The 2014 Chevrolet Volt hybrid electric vehicle, which is part of a General Services Administration (GSA) pilot program at SRS,
- Robots that sample and clean Waste Tanks at SRS,
- The “Reduce, Reuse and Recycle” Program,
- Highlights of the SRS Sustainability Program (including E85 fuel usage, biomass power generation as well as ideas for home recycling),
- A mock fuel assembly,
- Posters on nuclear power and its impact on the environment, and
- A demonstration on how fission works that featured mousetraps and ping-pong balls.



Children monitor natural radiation in rock during Earth Day 2015

2.3.3 Excess Equipment and Materials

SRS shipped \$20.8 million in usable assets during 2015 (equipment and supplies) through Site Excess Operations for reuse and recovery. For example, fluorescent light bulbs, anti-freeze, and photographic developing solutions (that contain silver) were recovered and processed for reuse. The SSP contains such examples.

2.3.4 Challenges and Barriers to Implementation

SRS encourages its employees to adopt green behavior to improve performance, cost and delivery as we make SRS a rewarding place to work. Although limited funding to support the Sustainability Program has been a challenge, SRS continues to work toward meeting established goals by adhering to existing sustainability and conservation policies and practices across the Site. In 2015, SRS has been proactive in requesting funds through initiatives from the DOE Sustainability Program Office. SRS was the only DOE site that submitted a FY 2017 – FY 2021 Site Sustainability Program funding request. In addition, there was an opportunity presented to each site to apply for funds through the Sustainability Performance Office Funding Opportunity Announcement (SPOFOA). Although the requests were not funded, SRS completed and submitted SPOFOA applications for several sustainability related projects (i.e., LED Lighting, HVAC, and cool roof replacements).

SRS is a leader in conservation activities and management of resources and has accomplished much in this regard over many years. However, the cost effectiveness of achieving new goals is becoming significantly more difficult. SRS has many aging nuclear production and support (administrative, shops, laboratories,

warehouses, etc.) facilities necessary to accomplish DOE missions yet make implementation of DOE's sustainability initiatives challenging. Economic paybacks are typically long due to low energy costs and high implementation costs. Additionally, the Site will be experiencing major energy and greenhouse gas emission increases over time as additional processing facilities such as the MOX Fuel Fabrication Facility and the Salt Waste Processing Facility begin operation. This is a major concern for 2016 and beyond.

The SRS will remain a leader in the DOE's sustainability program by continuing to make progress in energy reduction and the conservation of natural resources. The dedication of the department's staff and site contractors will ensure SRS continues to strive to meet the goals.

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