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*two states, one future*

# **Infrastructure at the Savannah River Site: Modernizing for 21<sup>st</sup> Century Missions**

**January 2011**

## Executive Summary

As it has for more than 60 years, the Savannah River Site (SRS) remains one of the crown jewels in America's quest for national security, innovative technology and new energy sources. SRS is well-suited to continue to perform nuclear-related missions with every assurance of quality, safety and innovation.

SRS is not a closure site. It has clearly defined future missions extending well into this century. In the near term, those missions center on tritium production, solidification of liquid waste into a vitrified glass form for permanent storage and disposition of excess weapons plutonium by converting into Mixed Oxide Fuel suitable for use in nuclear power reactors. In the longer horizon, SRS can lead national efforts in nuclear non-proliferation and in resolving complex issues related to closing the back end of the nuclear fuel cycle through reprocessing.

By any measure, SRS has all the assets required in people, land, expertise and community support to continue to play a key leadership role in America's nuclear complex and energy future through the 21<sup>st</sup> Century and beyond. SRS leads the DOE complex in safety and is situated in the most nuclear-friendly community in the United States.

While SRS is poised to meet critical national needs, there is broad consensus that maintenance of the general SRS infrastructure has not been adequately funded for the past two decades. If not addressed, this lack of funding could dampen the Savannah River Site's ability to attract new missions and meet national challenges.

At Savannah River National Laboratory, for example, recent infrastructure expenditures have been less than one percent of the replacement value of the Lab's facilities, woefully below commercial standards and benchmarks established at other national laboratories. Major initiatives of national importance continue at SRS in spite of the aged infrastructure. However, needed improvements in SRS infrastructure will only enhance and expand SRS' role in the nation's nuclear issues and energy future.

However, as the primary SRS contractor's 2010 Mission Plan points out, it is important to note that the current landlord, DOE's Office of Environmental Management (EM) is not currently structured, funded, nor tasked to support a program of infrastructure investment.

Even though, DOE recognizes SRS as the premier location for new initiatives in the areas of energy independence, innovative technology, nuclear security and nonproliferation, as well as environmental stewardship, the DOE-SR infrastructure is approaching 60 years old with one third of its administrative facilities being greater than 45 years old. Spending for infrastructure repairs/replacements has declined considerably as budget pressures increased and funds were needed to support direct mission activities.

These two elements, aged infrastructure and under funding, have resulted in a large volume of deferred maintenance and the need for capital improvements. Appropriate planning and funding for SRS infrastructure will ensure that long-term investments are made to meet the priority needs of DOE-SR missions.

DOE recognizes two distinct types of infrastructure – **base infrastructure and mission-specific infrastructure**. As its name implies, base infrastructure includes the basic things needed for operating a site (e.g. roads, bridges, electrical supply, water systems, steam, etc.)

Mission-specific infrastructure is an expanded list of features that attracts any given program or mission to a DOE site. The managers of new program missions generally want to step into an existing base infrastructure support system that is adequate – even superior – for their needs. While they understand the need to make limited enhancements to existing infrastructure to meet their needs, they do not want to pay for the base infrastructure they feel should already be in place.

As the 2010 Mission Plan issued by the primary SRS contractor, Savannah River Nuclear Solutions, points out, many facilities are operating beyond their design life. Many components are obsolete and parts are no longer available. Annual budgets over the last 10 years have reflected a declining EM mission in the future as cleanup progresses, resulting in a considerable decline in funding for long-term infrastructure upgrades. Even so, DOE continues to recognize SRS as the premier location for new initiatives in the areas of energy independence, innovative technology, nuclear security and nonproliferation, as well as environmental stewardship.

### **Recommendations:**

Accordingly, the SRSCRO Board of Directors has adopted the following recommendations:

- 1. We recommend that DOE place a high priority on addressing the aging infrastructure at SRS.**
- 2. We recommend that separate, *new* Federal funding be designated immediately for infrastructure improvements at Savannah River Site based on a priority plan established by the Site contractor(s) and approved by DOE;**
- 3. Finally, any funding for infrastructure improvements must not impede or impact the SRS mission or budget for DOE-EM's environmental cleanup mission, including the liquid waste remediation effort or the NNSA Defense Programs and nonproliferation missions at SRS.**

### **Methodology**

This White Paper is based on a compilation of views and perspectives gleaned from interviews with more than two dozen knowledgeable individuals who have close association with the Department of Energy and/or involvement on some level with the Savannah River Site.

Each of these individuals was interviewed at length concerning his or her perspective on the current state of SRS. The interviews were conducted with a pledge of confidentiality and with the understanding that there would be no attribution to individuals in the final product.

### **Audience**

This White Paper was developed for senior Department of Energy officials, including the Secretary of Energy, Deputy Secretary, Under Secretary, the Assistant Secretary for Environmental Management and the Administrator of the National Nuclear Security Administration.

It is also intended for members of the South Carolina and Georgia Congressional delegations and for stakeholders in the Central Savannah River Area (CSRA) of Georgia and South Carolina who have an interest in the future of the Savannah River Site.

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## Savannah River Site Infrastructure

**While SRS is poised to meet critical national needs, there is broad consensus that the general infrastructure of the Savannah River Site has not been properly maintained which, if not addressed, could dampen the Savannah River Site's ability to attract new missions. As the primary SRS contractor's 2010 Mission Plan points out, the current SRS landlord, the Office of Environmental Management, is not currently structured, funded, nor tasked to support a program of infrastructure investment.**

Under the oversight of the Department of Energy's Office of Environmental Management (EM), the Savannah River Site has not experienced any appreciable infrastructure improvements since the 1990s when new Administration Buildings were constructed, roads and bridges that no longer met Department of Transportation standards were repaired, a waste water treatment plant was built, a new power generation system was added and a domestic water system was completed. Due primarily to EM's limited mandate, little attention has been devoted to infrastructure enhancements in more than a decade.

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Mission-specific infrastructure is an expanded list of features that attracts any given program or mission to a DOE site. The managers of new program missions generally want to step into an existing base infrastructure support system that is adequate – even superior – for their needs. While they understand the need to make limited enhancements to existing

infrastructure to meet their needs, they do not want to pay for the base infrastructure they feel should already be in place.

So, while a new mission manager might, for example, be willing to pay to increase the volume of river water needed to meet their specific need, they are not willing to invest in the basic infrastructure they feel should already exist to get water from the river in the first place. The absence of any mandate for EM to invest in building and maintaining base infrastructure thus becomes a potential deterrent to the Savannah River Site's long-term ability to attract new job-producing missions.

There is broad consensus among informed parties that, under the constraints imposed by Environmental Management's operational mandate which provides little discretionary funding, the general base infrastructure has not been maintained to a degree required for new mission programs to be interested and attracted to SRS. Mission support infrastructure is adequate to complete programs and ensure safe operations but is currently only improved or maintained as existing budgets will allow.

### **Environmental Management's Perspective on Infrastructure**

Environmental Management explains its approach to site infrastructure in its 2010 Program Management Plan as follows:

SRS Infrastructure provides the utilities and services that are the foundation for activities at DOE-SR. The infrastructure mission is to efficiently configure and optimize DOE-SR infrastructure to meet the 21<sup>st</sup> century stewardship programs as required. Part of that mission goal is to provide the following benefits:

- Maximize the beneficial use of available resources by aligning infrastructure lifecycle activities with the DOE-SR missions, present and future

- Provide a consistent basis for making decisions regarding ongoing infrastructure systems maintenance and operational needs that support SRS mission's lifecycle
- Minimize the cost of providing the infrastructure services to site organizations

The SRS Infrastructure Program and associated projects support the DOE-SR strategic objectives to:

- Install a new Biomass Cogeneration Facility to replace existing coal-fired cogeneration plant by the end of 2011
- Improve and maintain SRS infrastructure
- Manage technical challenges of aging systems and equipment to avoid risk of outages and mission disruptions
- Develop and implement a plan to reduce greenhouse gas emissions at the SRS
- Incorporate long-term Site legacy management activities under regulatory requirements and DOE Orders into Site planning

The SRS Infrastructure Program is responsible for fourteen systems. These systems are also commonly referred to as DOE-SR utilities, which include systems such as steam, domestic water, and electrical distribution. The operating costs, with the exception of the cost to purchase power, are small with respect to the cost to install and maintain the delivery infrastructure. The utilities must remain in place until entire portions/areas of SRS go through D&D.

While the goals of the 2010 Program Management Plan are laudable, available funding and continued downward pressure on budgets may prevent these goals from being accomplished. The DOE-SR infrastructure is approaching 60 years old with one third of the site's administrative facilities being greater than 45 years old. Spending for infrastructure repairs/replacements has declined considerably as budget pressures increased and funds were needed to support direct mission activities.

These two elements, aged infrastructure and under funding, have resulted in a large volume of deferred maintenance and the need for capital improvements. Appropriate planning and funding for SRS infrastructure will ensure that long-term investments are made to meet the priority needs of DOE-SR missions. SRS remains the U. S. model best suited for new missions in nonproliferation and nuclear security.

In the current period (2010 – 2014), the program will focus on the maintenance of existing systems, the replacement of the D Area Powerhouse with a biomass cogeneration facility, support to new missions as they come on line (MOX Fuel Fabrication Facility, Waste Solidification Building and Salt Waste Processing Facility).

The program will also look at reconfigurations as a result of SRS footprint reductions that result from the completion of the ARRA program.

In the out years (2015 – 2038), the program will continue to reconfigure the systems to support new missions at the center of SRS, the reduction of the industrial footprint and the reduction of the demands from the EM facilities as they are deactivated and then decommissioned. In order to maintain infrastructure elements in an acceptable condition, reasonable annual infrastructure investments, with an emphasis on reconfiguration to remain cost-effective, will be necessary to support current and future missions through FY2038.

### **The SRS Contractor's Perspective**

In its June 2010 Mission Plan, the SRS Management & Operations contractor, Savannah River Nuclear Solutions, weighed in on infrastructure needs this way:

*SRNS has developed an Infrastructure Mission Alignment Plan to identify critical infrastructure upgrades and modernization required to support current and future SRS missions. Near-term projects will focus on providing reliable and modern utilities systems, upgrading Site communications systems, repairing Site roads/bridges, and modernizing Site facilities. A key focus would be on facilities and equipment, which*

*would extend the life of SRNL's nuclear facilities and provide new non-nuclear capabilities to replace the antiquated infrastructure that exists today. It is expected that overall infrastructure funding near \$700 million over the next five years will be required.*

*SRS's aging facilities are approaching 60 years old. Many facilities are operating beyond their design life. Many components are obsolete and parts are no longer available. Annual budgets of the last 10 years have reflected a declining EM mission in the future as cleanup progresses, resulting in a considerable decline in funding for long-term infrastructure upgrades. DOE now recognizes SRS as the premier Site for new initiatives in the areas of energy independence, innovative technology, nuclear security and nonproliferation, as well as environmental stewardship.*

*This vision involves a transformation of SRS by accelerating cleanup of waste sites and reducing the Site's operating footprint, while positioning SRS as a national asset prepared for future missions and national challenges. In addition, SRNL has been challenged to grow its business considerably. All of these require a significant modernization of the site infrastructure. SRNS will leverage the strengths of its parent companies to help DOE achieve this modernization in a systematic, cost effective manner.*

## Savannah River National Laboratory

**At SRNL, recent annual infrastructure expenditures have been less than one percent of the replacement value of the Lab's facilities, woefully below the national standard. The current SRNL infrastructure spending rate is shortening the expected service life of facilities and degrading their performance.**

### The Largest Laboratory System

The Department of Energy has the Government's largest laboratory system. DOE laboratories support four major mission areas:

- National Security
- Nuclear Energy and Other Energy Sources
- Science and Technology
- Environmental Quality

Secondary missions include technology transfer and scientific education.

DOE laboratories receive more than 40 percent of total Government funding for basic research in the physical sciences in the United States. The system includes 11 major DOE laboratories. In addition to these national laboratories, DOE has a dozen smaller laboratories such as the Fermi National Accelerator Laboratory, Thomas Jefferson National Accelerator Facility and the Stanford Linear Accelerator Center. Most of these laboratories fall under the purview of DOE's Office of Science.

As the only applied research and development laboratory for DOE-EM, the Savannah River National Laboratory (SRNL) has earned a world-class reputation based on its talented people and their unwavering commitment to safety, security and quality in the delivery of technology solutions that work.

SRNL applies this commitment to solving some of the most complex problems of our times, including the detection of weapons of mass destruction, the cleanup of contaminated groundwater and soils, the development of hydrogen as an energy source, the need for a viable national defense, and the safe management of hazardous materials.

SRNL is building on 50-plus years of technological achievement and a framework of vital core competencies. Under fresh leadership, the laboratory is working to identify, develop and deploy innovative technologies to meet the needs of a variety of customers across the Savannah River Site, the Department of Energy and the nation.

### **SRNL Needs Infrastructure Improvements**

Despite its contribution and potential, in recent years, funding for infrastructure maintenance and enhancement at SRNL has been well below industry-established standards for recapitalization spending. Recapitalization means putting money back into an investment for maintenance, improvement or expansion. It usually includes the replacement of building subsystems such as roofs, electrical distribution equipment, HVAC equipment (e.g. air handlers, compressors, chillers and boilers), building control systems, paving, and fire protection apparatus.

A major building subsystem is regularly maintained to keep it functioning in the manner for which it was designed. Lubricating pumps, changing the oil in engines or cleaning carpets is *maintenance*. Discarding the pump, engine, or carpet and replacing it with a new version is *recapitalization*.

The building industry has adopted national standards for spending on recapitalization. Under the standard, an annual maintenance and repair budget should range between two and four percent of the replacement value of a facility. By contrast, at SRNL, recent infrastructure expenditures have been less than one percent of the replacement value of the Lab's facilities, woefully below the national standard. The current SRNL infrastructure spending rate is shortening the expected service life of facilities and potentially degrading their performance.

In general, Lab renovation projects fall into three basic types:

- **Maintenance-related recapitalization** that is undertaken because old systems have reached the stage of escalating maintenance and repair costs.
- **Transformational recapitalization** that is undertaken because the types of research or research processes have changed.
- **Technological obsolescence recapitalization** that is undertaken because new building subsystems (usually HVAC) have become available, or are mandated, offering operating cost savings, greater safety, or a better work environment.

Laboratory buildings such as those at SRNL which are now more than 50 years old are prime candidates for all three types of recapitalization projects.

### **Immediate Investment Needed**

In September 2010, SRNS delivered to DOE-SR a self-financed Statement of Mission Need (“CD-0 Package”) titled the ***SRNL Mission and Infrastructure Alignment Project***. The CD-0 Package documents a comprehensive analysis of the mission needs of DOE and the nation which could be served by SRNL. It concludes there is need for immediate investment in infrastructure to support future work in three areas—Environmental Management (EM), National and Homeland Security (N&HS), and Energy Security (ES).

In its CD-O package document, SRNS prescribed a detailed strategy for investing in critical EM infrastructure. This EM strategy has two primary components, as follows:

- **Reutilization and modernization of existing mission-critical infrastructure in Buildings 773-A, 705-A, 703-41A, 772-25B, 772-26B, and 772-27B at a cost of approximately \$100 million.**
- **Construction in A-Area of a new Multi-Use Technology Deployment Facility estimated to cost between \$130 and \$165 million.**

## **SRNL: A National Asset**

There is general agreement that a new mindset of foresight and facilitation could greatly enhance SRNL's opportunities for future growth and success. Like other major national laboratories, Savannah River National Laboratory is an asset that must receive priority attention from its sponsoring DOE Program Office, the community and key political leaders.

Despite its dated infrastructure and physical challenges, SRNL is excelling as an exemplary national laboratory and could become the top lab in the DOE complex in its specialty areas with appropriate funding. Currently, the Savannah River National Laboratory (SRNL) provides support for SRS and DOE Complex-wide missions. It also performs work-for-others, including support for federal agencies such as the Department of Defense and Department of Homeland Security, as well as initiatives for organizations like the Center for Hydrogen Research.

With its slogan of "*We Put Science to Work*", SRNL's 50-year heritage of applying science to meet the needs of DOE and the nation distinguishes it from the other DOE national laboratories. The Savannah River Nuclear Solutions (SRNS) 2010 Mission Development Plan notes that in the coming years the Savannah River National Laboratory (SRNL) will continue to grow as the demonstrated leader in applying science-based approaches and innovations to achieve national goals.

This unique position will enable SRNL to lead the nation in translating basic research into practical application. The Lab's near-term objective is to aggressively expand the application of SRNL expertise and technologies to solve critical national issues, especially in national security and secure, sustainable energy. SRNL's management projects that the Lab will double in size by 2013.

As SRNL grows and diversifies, it will increasingly be recognized as a world-class laboratory. With new facilities, equipment and instrumentation in place, the Lab will attract,

develop, and retain the best scientific and engineering staff available. This flourishing growth will be achieved through implementation of the SRNL Strategic, Infrastructure, and Human Capital Plans and by streamlining of critical business systems and interfaces.

## Foundation for the Future

**By any measure, SRS has all the assets required in human capital, land, expertise and community support to play a key leadership role in America's nuclear complex and energy future through the 21<sup>st</sup> Century and beyond. SRS leads the DOE complex in safety and is situated in the most nuclear-friendly community in the United States.**

The Savannah River Site boasts 310 square miles of incredible geography – highly characterized, very secure and well-understood. For nearly four decades, SRS has been recognized by the Department of Energy as a National Environmental Research Park and was the first DOE site to receive this designation anywhere. The designation has led to successful research concerning major nuclear and industrial impacts on a biologically diverse and productive natural area. In addition, SRS is one of very few large Government-owned sites in the United States that can ensure proper buffer between sensitive projects and the public.

The Savannah River Site is ideally situated in the heart of the burgeoning nuclear renaissance. Nuclear energy already plays a key role in our two-state economy and its role is expected to grow significantly. Today, Georgia's four nuclear units account for more than one-fourth of the State's electricity generation. South Carolina's five nuclear units supply about half of the State's electricity demand. Plans are on the drawing board for expansion of commercial nuclear power facilities in both states.

The Savannah River itself also provides an important asset for transportation, as a water source for industrial or production purposes, and a popular site for environmentally friendly recreational activities.

SRS is not a closure site. It has clearly defined future missions extending well into this century. In the near term, those missions center on tritium production, solidification of liquid waste into a vitrified glass form for permanent storage and disposition of excess weapons plutonium by converting into Mixed Oxide Fuel suitable for use in nuclear power reactors. In the longer horizon, SRS can lead national efforts in nuclear non-proliferation and in resolving complex issues related to closing the back end of the nuclear fuel cycle through reprocessing.

By any measure, SRS has all the assets required in human capital, land, expertise and community support to play a key leadership role in America's nuclear complex and energy future through the 21<sup>st</sup> Century and beyond. SRS leads the DOE complex in safety and is situated in the most nuclear-friendly community in the United States.

The biggest need now is priority attention to improving a deteriorating infrastructure in a way that can maximize SRS contributions and potential in the years ahead.

**Recommendations:**

Accordingly, the SRSCRO Board of Directors has adopted the following recommendations:

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