Savannah River NUCLEAR SOLUTIONS℠
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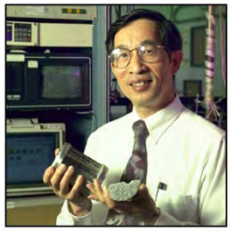
SRNL™ SAVANNAH RIVER NATIONAL LABORATORY
Operated by Savannah River Nuclear Solutions, LLC
We Put Science To Work

Savannah River National Laboratory

Dr. Terry A. Michalske
Laboratory Director
Savannah River National Laboratory

May 1, 2012






CAB Strategic and Legacy Management Committee

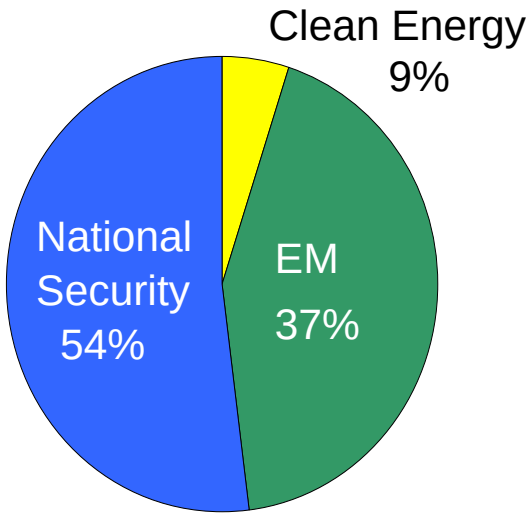
U.S. DEPARTMENT OF ENERGY

Purpose

- To satisfy the request of the Committee to provide an overview of SRNL capabilities and activities.
- To satisfy CAB work plan item to be briefed on SRNL.
- To brief the Committee on SRNL contributions to environmental cleanup of the site, its status as the Environmental Management National Laboratory, and its growth as a National Laboratory to address national needs.

SRNL at a Glance

- ~1,000 Staff
- ~ $230M (FY12 Funding Forecast)
- Safest Laboratory – 10 million hours and counting
- Multi-Program Laboratory
  - >65% of funding from non-SRS customers



SRNL FY11 Revenue

Expertise

- Chemical Processing/Separation
- Materials
- Tritium/Hydrogen
- Environmental Science

10 Million Safe Hours!
...and counting.

Multi-Program National Laboratory

Environmental Stewardship

- Waste Treatment
- Materials Stabilization and Disposition
- Remediation and Cleanup
- Assessments and Verification

National Security

- Nuclear Defense
- Plutonium Technology
- Homeland Security
- Nonproliferation
- Nuclear Forensics

Clean Energy

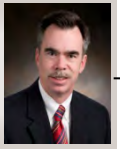
- Hydrogen Production and Storage
- Nuclear Fuel Cycle R&D
- Renewable Energy Research
- Small Modular Reactors

SRNL Organization

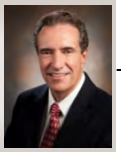
Dr. Terry A. Michalske
Executive Vice President
& Laboratory Director

David E. Eyler
Senior Vice President &
Deputy Laboratory Director

Dr. Thomas (Tom) L. Sanders
Associate Laboratory Director for
Clean Energy



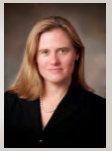
Dr. Jeffrey (Jeff) C. Griffin
Associate Laboratory Director for
Environmental Stewardship



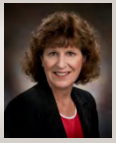
Richard (Rick) M. Sprague
Associate Laboratory Director for
Nuclear Materials Program
Integration

Dr. Anthony (Tony) E. Burris
Associate Laboratory Director for
National Security Programs

Dr. John E. Marra
Associate Laboratory Director for
Science & Technology



Wendolyn S. Holland
Director of Strategic Development
and Technical Partnerships



Margaret (Peggy) A. Davis
Business Manager and SRNS CFO

Frederick (Freddie) M. Grimm
Director, Research Operations

SRNL Innovation Impacts Broad National Priorities

Environmental Management

CCR Collaboration Award

Solvent Extraction Technology for Salt Waste Processing

Rotary Microfilter

National and Homeland Security

FBI Forensics

Selected for the 2011 DNI Tech Expo

Tracking and locating technology

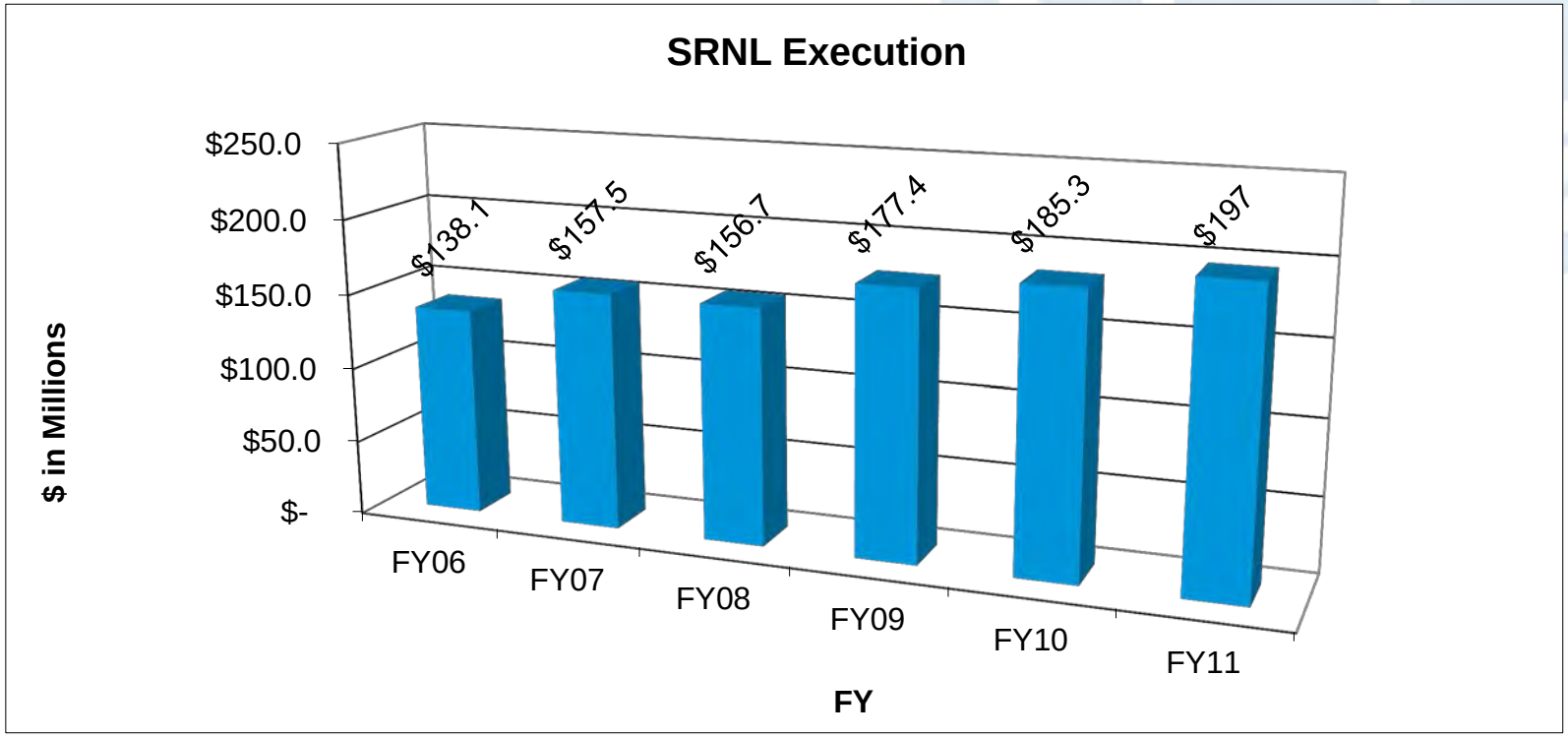
Energy Security

2011 R&D 100

Porous wall hollow glass microspheres

Testing SODAR to measure off-shore wind

SRNL: A Track Record of Mission Growth



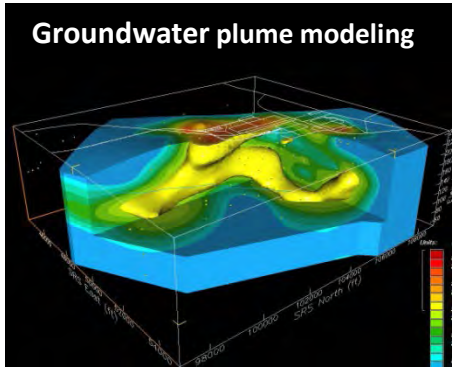
Demonstrated ability to innovate, bring solutions to customers

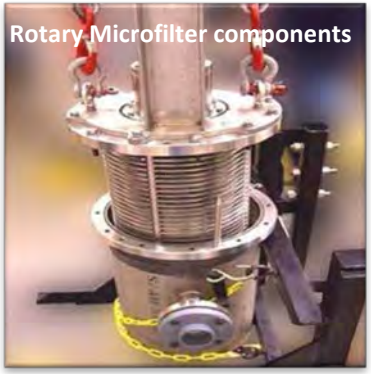
SRNL: DOE's Environmental Management Lab

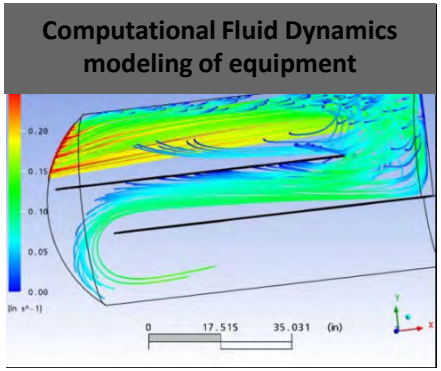
- SRNL's original mandate was to conduct research and development to enable the Savannah River Site's mission of producing nuclear materials for national defense.
- SRNL continues to lead the development and implementation of all major technologies operated on this site, including those for nuclear waste clean-up and nuclear material disposition.
- Building on its applied research and development history, SRNL has invented or been instrumental in advancing almost every major technical process in use in the US DOE environmental management program.
- Recognizing the breadth of SRNL's environmental management expertise, US DOE designated SRNL as the Environmental Management National Laboratory "to assist sites in meeting cleanup requirements."

SRNL Core Environmental Management Capabilities

- Support operating waste storage, retrieval, treatment, and immobilization facilities
  - Integrated with end users
  - Experienced in deployment and operations
- Internationally recognized expertise
  - Glass/ceramic waste forms and grouts
  - Actinide chemistry and separations
  - Radiological ecology
  - Groundwater and soil modeling, analysis, and treatment
- Broad science and engineering proficiencies
  - Nuclear Materials
  - Radioactive and chemical process development
  - Materials Science
  - Modeling and computational science
  - Mechanical engineering, remote systems, and robotics
  - Pilot-scale capability
  - Environmental science and biotechnology
  - Facility closure technologies







SRNL expertise is applied to meet clean-up challenges

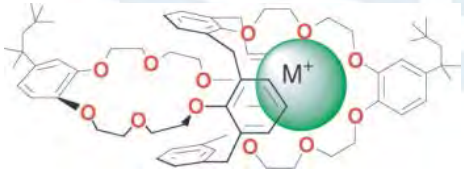
The SRNL Approach to Developing Solutions

- A strong focus on identifying key needs and end-states
  - Longer-term perspective is critically important – must address near-term AND long-term needs
  - Deep technical understanding of issues and viable solutions
  - Commitment to two-way communication
- Detailed planning with national, regional, and local communities and regulators
  - Government and local community leaders, Citizens Advisory Board, regulatory agencies (EPA, South Carolina DHEC)
- A drive for the best implementable technical solutions
  - Science-based
  - Tested and demonstrated
  - Optimized deployment
- Thorough assessment of solutions

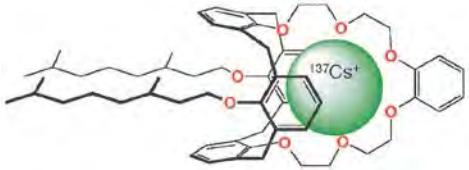
SRNL Led Team Solves Critical Clean-up Problem

CHALLENGE:
400 million liters of highly radioactive liquid waste require treatment.

SOLUTION:
SRNL collaborated with National Laboratories and industry to develop and improve advanced solvents.



OUTCOME:
- Initial solution successfully removed cesium using solvent extraction.
- Solvent was subsequently improved to
  - Increases throughput by 30%
  - Reduce treatment time by 3 years.



SRNL Summary

- As the Environmental Management National Laboratory, SRNL has developed a comprehensive approach to solving clean-up challenges.
  - Expertise recognized, as exemplified by Deputy Secretary Poneman's recommendation for Tokyo Electric Power Company to collaborate with SRNL on Fukushima cleanup
- This comprehensive approach includes:
  - An overall plan for the clean-up
  - Rigorous development, selection, and deployment of technologies, and
  - Science-based regulatory assessment of outcomes.
- SRNL has grown into a true National Laboratory, with impact in several areas that are critical to the national interest.

Backup Slides

Example – Area Closure Approach to Clean-up of Groundwater Contamination (M Area) *Key SRNL Roles*

Planning

- Definition of challenges related to chlorinated solvents in groundwater
  - Identified target zones that are suited to different classes of technology solutions
- Development of holistic "area" cleanup and closure approach
  - Assistance in regulatory and stakeholder negotiations
- Identification and analysis of candidate technologies
- Technology selection process
- Development of implementation schedule

Technology Development & Deployment

- Development and testing of technologies for specific contaminant zones
  - Source Zone
  - Primary Plume
  - Distal Plume
- Development of supplemental technologies
  - Improved subsurface access
  - Removal of co-contaminants
- Field demonstrations and laboratory studies to define operating parameters for each technology
- Transfer technologies to site program organization for implementation

Assessment

- Evaluation of monitoring data to verify performance
  - Product quality
  - Process performance against permit limit
- Continued enhancement of technologies to maintain efficiency and effectiveness
  - Process optimization
  - Innovative characterization / monitoring
- Support for discussions with regulators and stakeholders

Example – In Situ Decommissioning for Reactors

Key SRNL Roles

Planning

- Definition and understanding of the challenge.
  - Considerations of residual risk, cost of disposal, ability to implement
  - Technical analyses to support option development (residual activities, etc.)
- Identification and analysis of disposal options
  - Conceptual modeling
  - Groundwater & engineering structural modeling
- Disposal option selection process
  - Support for regulatory and public discussions
- Implementation schedule development
  - Technology readiness input
- Development of technical requirements for reactor fill materials
  - Feasibility – constructability
- Rapid prototype modeling

Technology Development & Deployment

- Development of cementitious fill materials
  - Fill material characteristics tailored for specific applications
  - Placement sequencing / strategies
  - Residual contamination and water management
- Development and deployment of enabling technologies
  - Remote camera system for remote area grout placement.
  - Thermocouple arrays for grout as-placed quality confirmation.
  - Ultrasonic velocity apparatus
  - Thermal transient and hydrogen modeling

Assessment

- Performance and durability testing on fill materials
  - Validates product quality
  - Validates model assumptions
- Modeling confirmation of conceptual model
- ISD Sensor network test bed array under development for long-term assessments
  - Assess cementitious material durability
  - Assess moisture-fluid flow through cementitious material
  - Assess resulting potential for contaminant mobility in a decommissioned closed nuclear facility

Example – Development of Vitrification for High Level Waste

Key SRNL Roles

Planning

- Definition and understanding of the challenge. Key considerations of stability, transport, production.
- Identification and analysis of candidate waste forms.
- Waste form selection process.
  - Yielded borosilicate glass waste form by vitrification
- Validation of selection.
  - Independent reviews – involving technical experts from SRNL, other laboratories, and academia

Technology Development & Deployment

- Development of waste form (glass) chemistry.
- Development of the vitrification process operational details.
- Process testing
  - Scaled testing
  - Real waste testing
  - Develop understanding of process operating limits
- Demonstration of product performance
  - Product quality
  - Interface with regulators and stakeholders

Assessment

- Process feed “batch” development and qualification
  - Required for every batch
  - Assures process safety
  - Ensures product quality
- Validation/verification of process changes
  - Process safety
  - Product quality
  - Process performance
- Process improvements
  - Waste loading
  - Processing rate
  - Results from deep process understanding and close involvement