



**Savannah River
National Laboratory™**

OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

We put science to work.™

Savannah River National Laboratory: Science and Technology for National Challenges

Anita Poore
Fellow Engineer

2017 Mo-99 Topical Meeting, Montreal, Quebec

September 12, 2017

SRNL-MS-2017-00183-S



SRS By the numbers

310

square-mile site

Located near Aiken, S.C. on the Savannah River. SRS covers 198,344 acres, including parts of Aiken, Barnwell and Allendale counties in South Carolina.

11,400

current employees

contractors and federal agencies

(as of Dec. 31, 2015)



\$1.9

billion

annual budget

\$2.6

billion

annual regional economic impact across the two-state area

\$200

million

spent annually in local procurements

Environmental Management

60%

Management, stabilization and disposition of nuclear materials

Management and disposition of solid, liquid and transuranic wastes

Spent fuel management

Environmental remediation and cleanup

National Nuclear Security Administration

35%

Tritium operations, extraction

Helium-3 recovery

Nonproliferation support

Mixed Oxide Fuel Fabrication Facility

Uranium blending and shipping

Foreign fuel receipts

Work for Others

5%

Other federal agencies

Other DOE sites

Private industry

Other minor entities

Major SRS missions and programs

Nuclear Materials Management

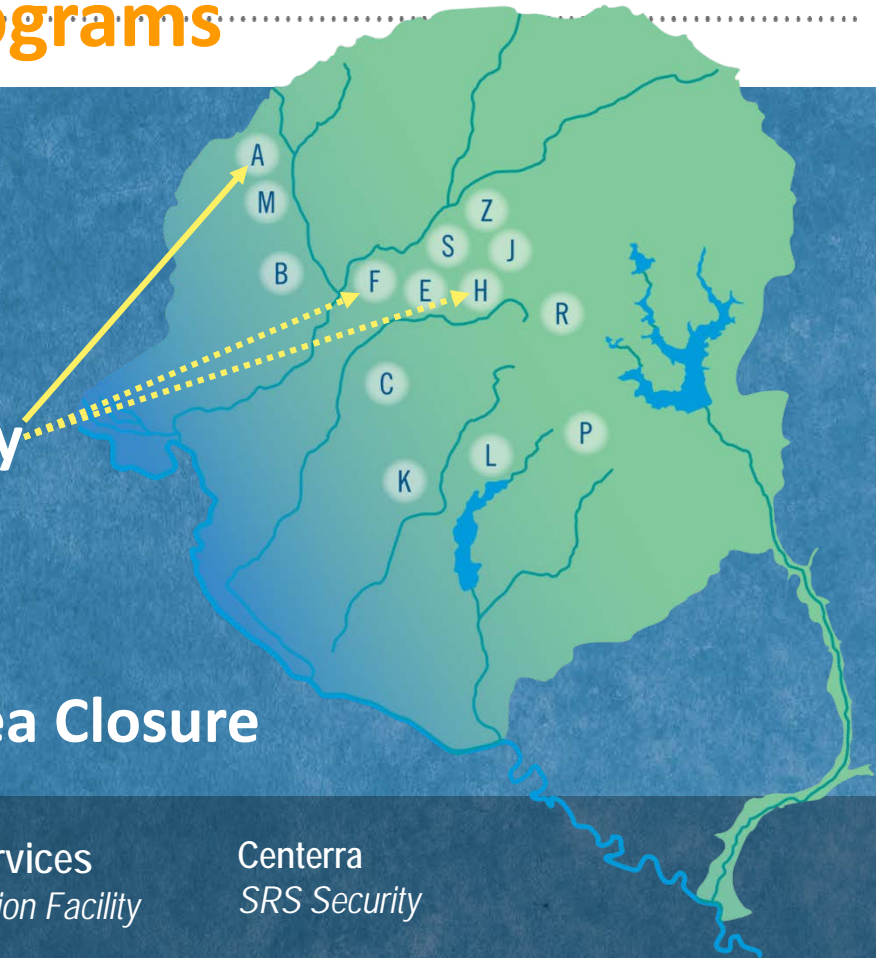
National Nuclear Security

Administration Programs

Savannah River National Laboratory

Liquid and Solid Nuclear and
Hazardous Waste Management

Environmental Compliance and Area Closure



Who's at SRS?

Savannah River
Nuclear Solutions
*Management and Operations;
Savannah River National Laboratory*

Savannah River Remediation
Liquid Waste Operations

CB&I AREVA MOX Services
*Mixed Oxide Fuel Fabrication Facility
construction*

Parsons
Salt Waste Processing Facility

Ameresco
SRS Biomass Cogeneration Facility

Centerra
SRS Security

University of Georgia
Savannah River Ecology Laboratory

U.S. Forest Service–Savannah River
Federal entity

SRNL

at a glance

Core Competencies

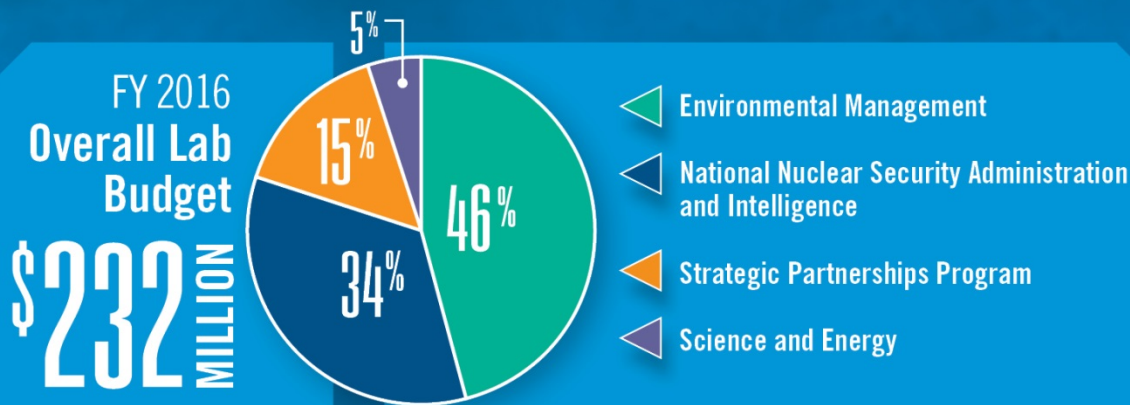
Environmental Remediation and Risk Reduction
Tritium Processing, Storage and Gas Transfer Systems
Nuclear Materials Processing and Disposition
Nuclear Materials Detection, Characterization and Assessment

Location | Aiken, South Carolina
Type | Environmental, Multi-Program
Founded | 1951
Director | Dr. Terry A. Michalske
Contractor | Savannah River Nuclear Solutions

- Multi-program national laboratory
- Solutions to environmental cleanup, nuclear security, energy and manufacturing challenges
- Unique labs and facilities:
 - Safe study and handling of radioactive materials
 - Testing and evaluating environmental cleanup technologies
 - Ultra-sensitive measurement and analysis of radioactive materials
 - Nation's only radiological crime investigation lab
- World-class culture of safety and security
- Tackling challenges in environmental stewardship, nuclear security, and energy
- Leadership for Department of Energy in nuclear chemical manufacturing

► Safety is our priority.

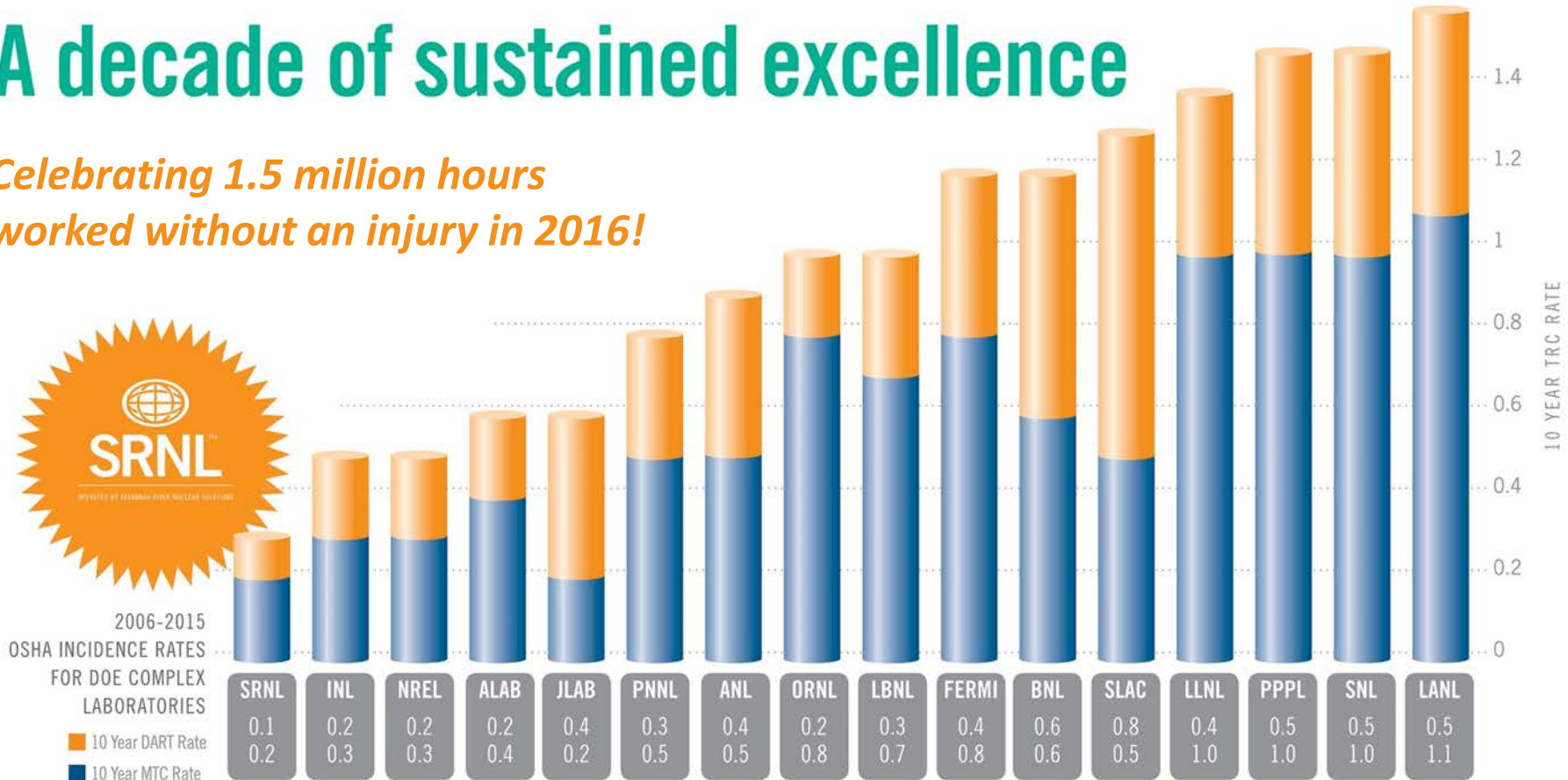
1,000 Workforce 518 Engineers and Scientists 184 Ph.Ds
12 Postdoctoral Researchers 60 Undergraduate Students
(summer 2017 projection)



Savannah River National Laboratory Uncompromised Focus on Worker Safety

A decade of sustained excellence

Celebrating 1.5 million hours worked without an injury in 2016!



OSHA Safety Performance Metrics:

TRC: Total Recordable Case (DART + MTC) DART: Days Away, Restricted or Transferred MTC: Medical Treatment Case

Data obtained from DOE Computerized Accident/Incident Reporting System

16CC00046KP

SRNL at a Glance

Applied research and technological **Innovation**

Core Competencies

- Environmental Remediation & Risk Reduction
- Nuclear Materials Processing & Disposition
- Nuclear Detection & Characterization
- Tritium Processing, Gas Transfer Systems & Storage

Talented People

- 1000 Workforce
- 520 Engineers & Scientists, 180 PhDs
- 20 Post Docs, 50 Interns



environmental
stewardship



national
security

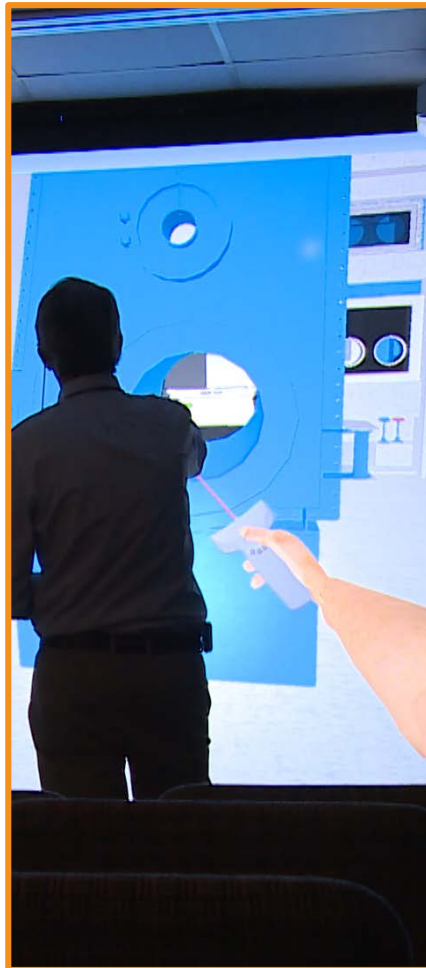


clean
energy

Environmental Stewardship



Manufacturing



Risk



Response



Recovery



National Security



Radiation Detection with DHS



Event Signatures



Tritium Expertise



Nuclear Forensics Hub for FBI



Mobile Plutonium Facility

*Spent nuclear fuel, or SNF,
is nuclear fuel that has been irradiated in a reactor.*

Nuclear Materials Management Spent Fuel Operations in L Area

L Area is home to L Disassembly Basin,
which stores SNF safely under water.

SRS stores SNF from former SRS reactors
as well as foreign and domestic research reactors.

L Basin holds approximately
3.4 million gallons of water in pool depths
from 17 to 50 feet.

Photo: A cask of spent nuclear fuel in L Basin



Clean Energy



Grid



Nuclear



Fuels



Solar



Partners to Commercialize Technology



Iridium Satellite



Rotary Microfilter



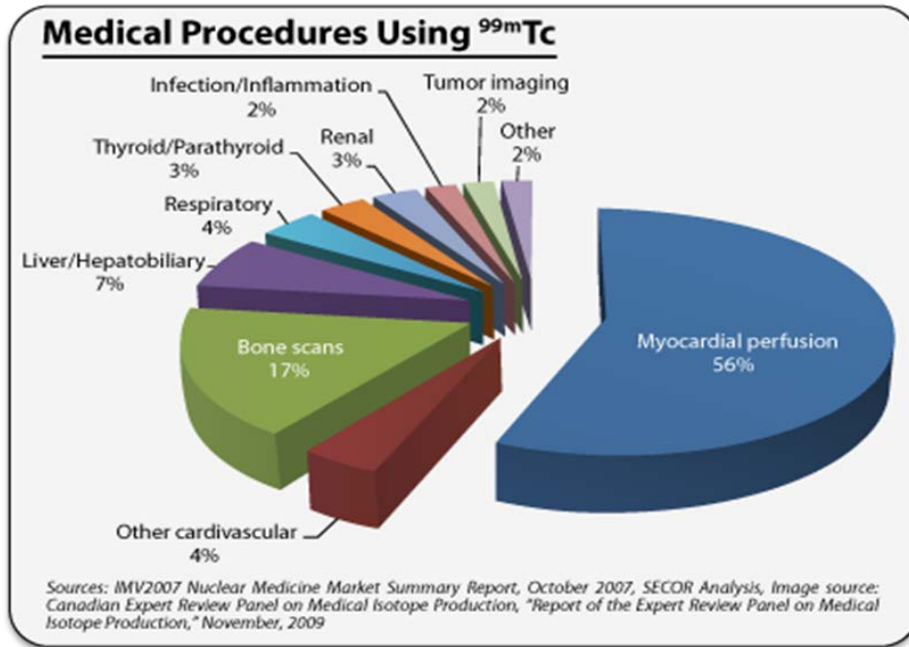
Medical Isotopes



Sound Anchor™



How Can SRNL Support the Medical Isotopes Community?



Actinide Processing Flowsheet Development and Analytical Techniques

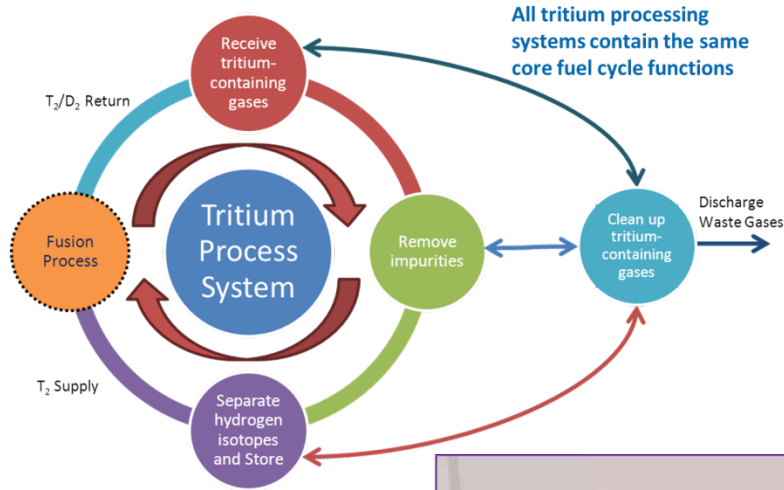
Tritium Fuel Cycle Technologies (Hydrogen Isotope Separation)

Safety Related Process Controls and Automation for Nuclear Systems (DOE/NRC)

Waste Management Disposal and Treatment Strategies



SRNL Developed the Tritium Purification System for Mo-99 SHINE® Support

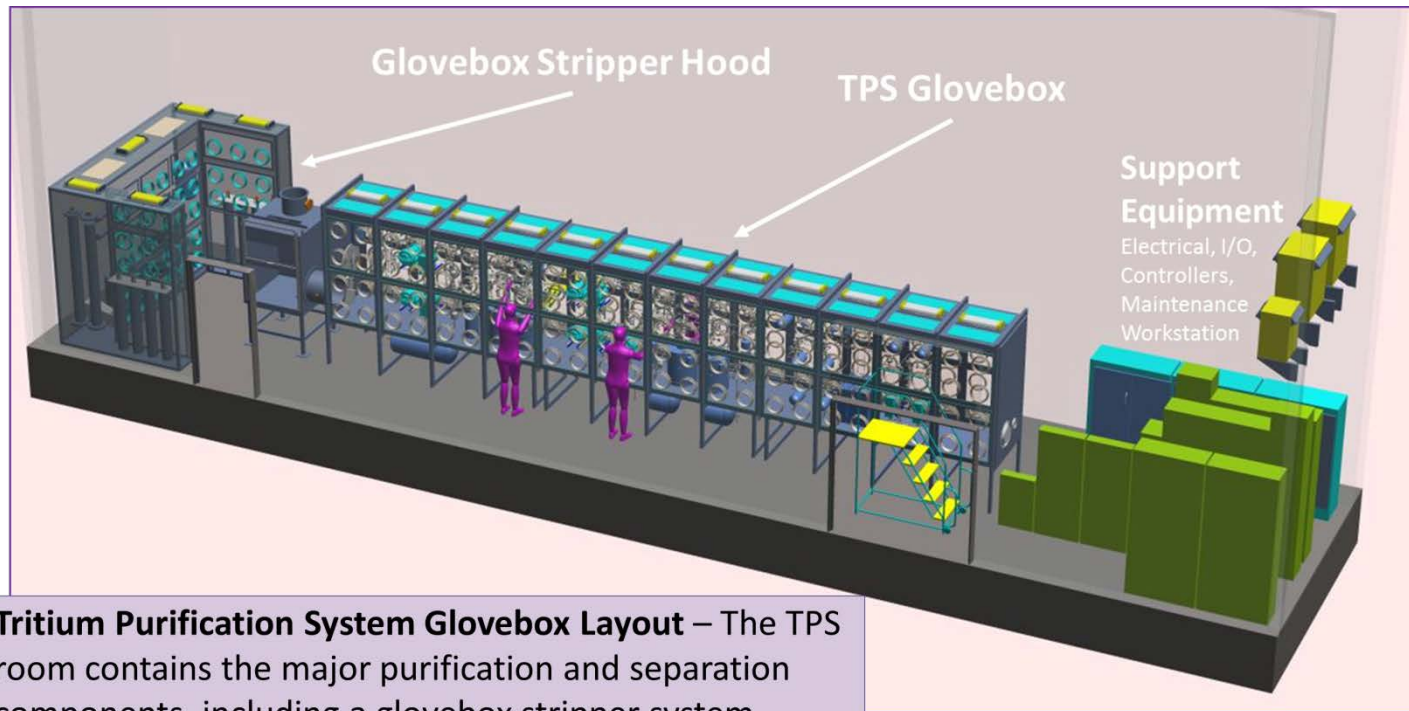


Tritium Fuel Cycle Processing Development

- SHINE recognized need for hydrogen isotope separation technology and approached SRNL because of our unique tritium isotope separation system developed for Defense Programs
- Initial TCAP interest led to further SRNL involvement in tritium system design beginning in 2012

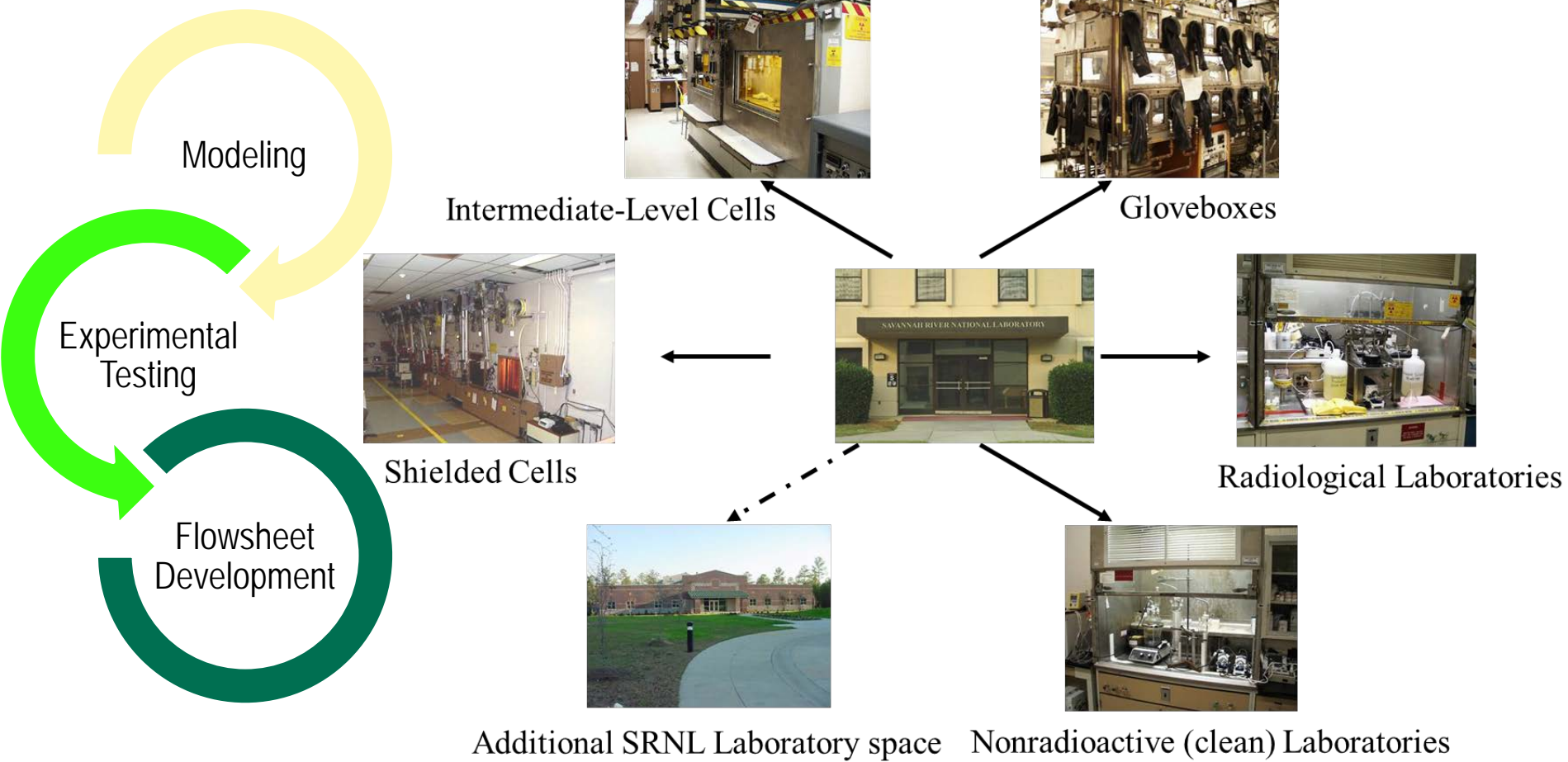


Micro TCAP for Hydrogen Isotope Separation



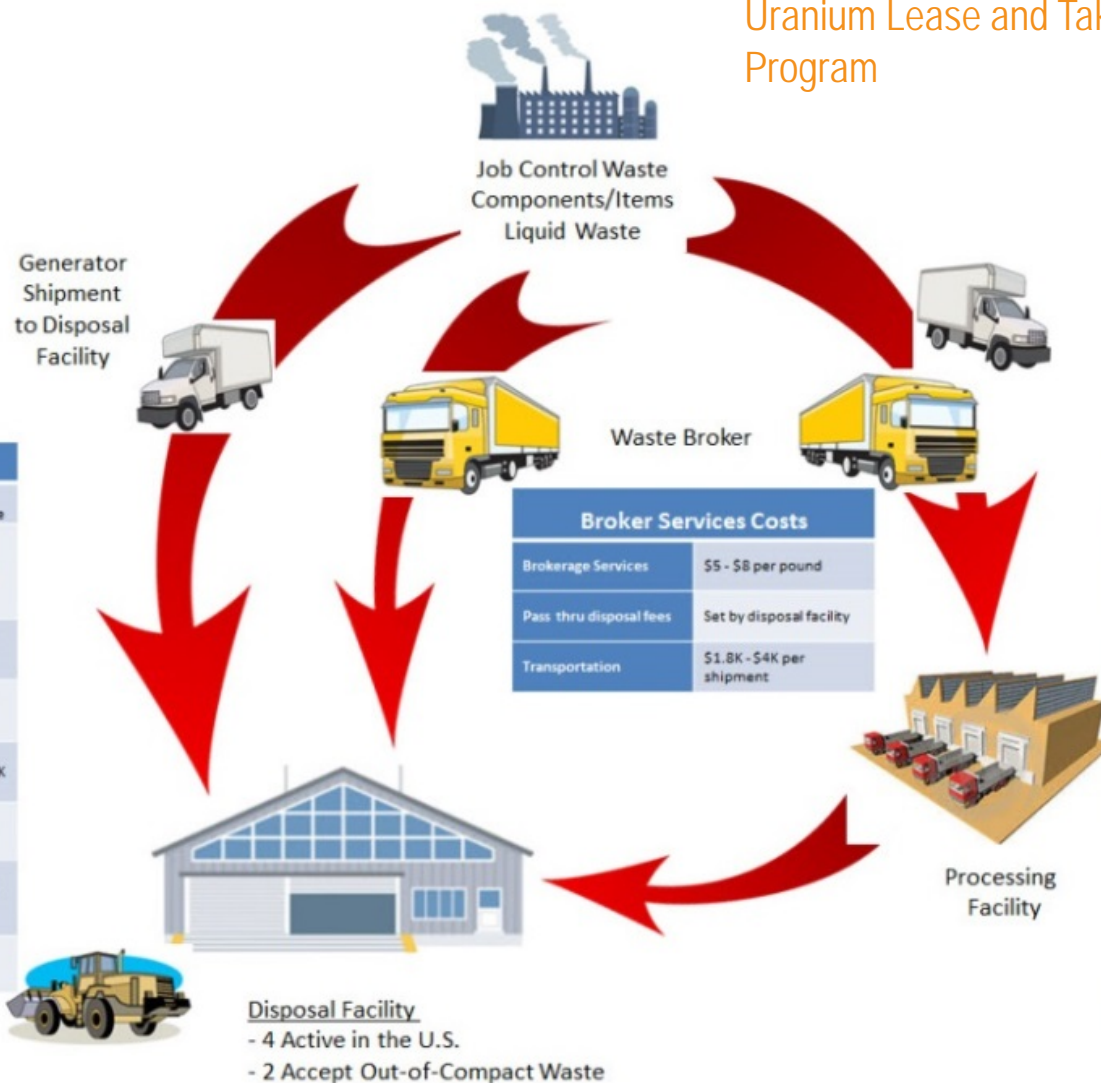
Tritium Purification System Glovebox Layout – The TPS room contains the major purification and separation components, including a glovebox stripper system.

SRNL Develops Actinide Processing Flowsheets and Analytical Techniques for Mo-99



SRNL Develops Radioactive Waste Handling and Treatment Strategies for Mo-99

...and SRNL is a key player in the NNSA M3 Uranium Lease and Take Back (ULTB) Program



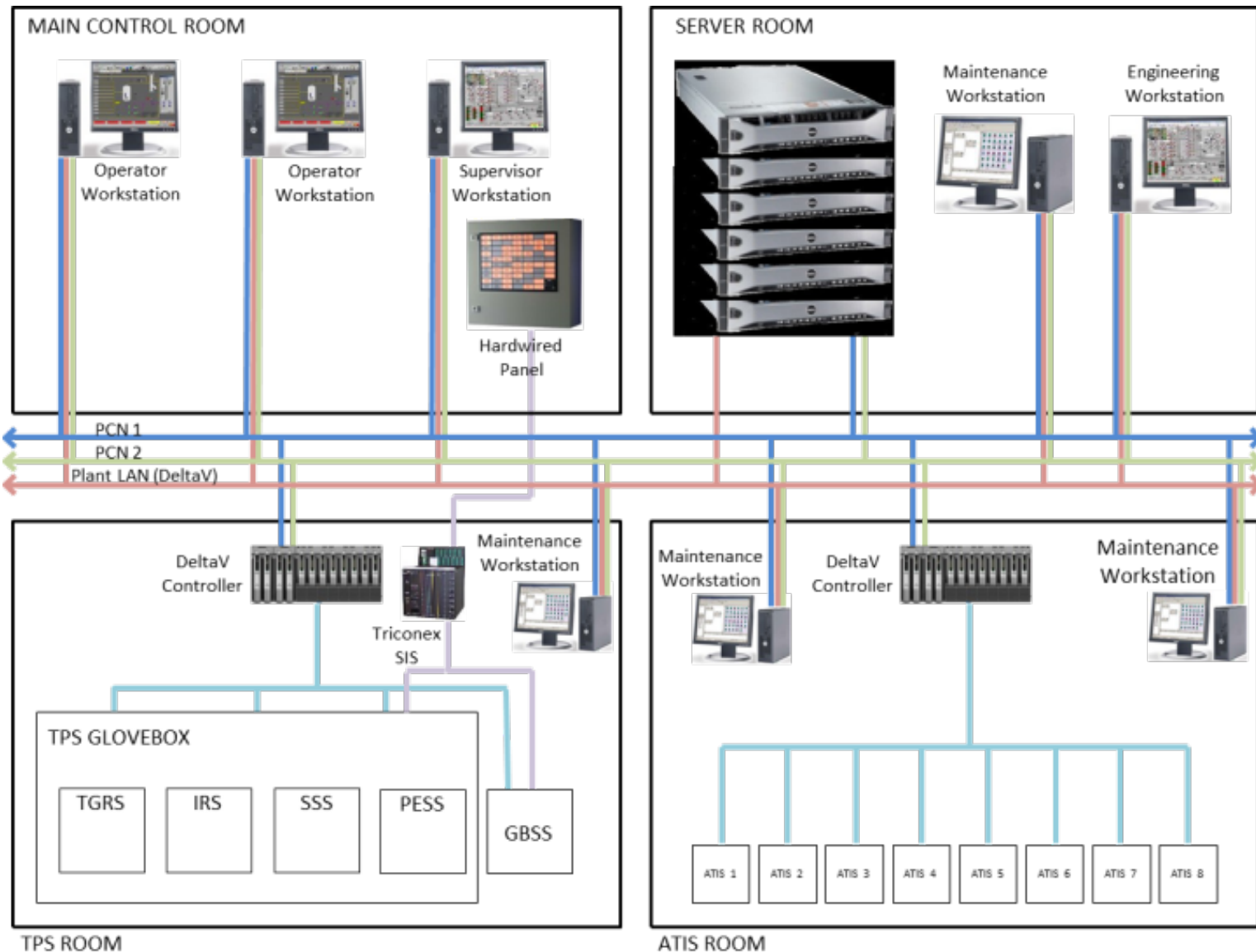
Disposal Costs			
Waste Stream	Waste Class	Waste Vol.	Cost Range
Job control waste, reduced activity, <1% Class A limit	Class A	10 m ³ /yr	<<\$50K - >\$250K
Job control waste, <10% Class A limit	Class A	10 m ³ /yr	<<\$50K - >\$250K
Job control waste, >10% Class A limit	Class A	10 m ³ /yr	<\$75K - >\$250K
Scrap metal waste, lower activity	Class A	0.5 m ³ /yr	<\$5K - \$30K
Scrap metal waste, higher activity	Class B	0.5 m ³ /yr	~\$25K - ~\$250K
Molecular sieve beds (1,000 Ci/drum)	Class B	20 drums/yr	~\$200K - ~\$400K
Nonhazardous aqueous waste	Class A	1,000 gal/yr	<\$20K

Waste Processing, Then Disposal			
Waste Stream	Waste Class	Waste Vol.	Cost Range
Job control waste, reduced activity, <1% Class A limit	Class A	10 m ³ /yr	\$40K - \$50K
Job control waste, <10% Class A limit	Class A	10 m ³ /yr	\$40K - \$55K
Job control waste, >10% Class A limit	Class A	10 m ³ /yr	~\$300K (plus rad surcharge) - \$500K
Scrap metal waste, lower activity	Class A	0.5 m ³ /yr	~\$30K - >\$100K
Scrap metal waste, higher activity	Class B	0.5 m ³ /yr	NA
Molecular sieve beds (1,000 Ci/drum)	Class B	20 drums/yr	Case by case basis
Nonhazardous aqueous waste	Class A	1,000 gal/yr	~\$400K - >\$2M



SRNL/SRNS Develops Process Controls and Automation for safety-related components (DOE/NRC)

- Process Controls
- Automation
- Safety Related Controls (redundant and independent)





Savannah River National Laboratory™

OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

New Technologies Bring Better Solutions

Bridging the gap between
Technology &

Implementation

Additive Manufacturing

- Complex Shape Manufacturing
- Integrated Waste Forms
- Materials / Component Qualification

Computational Chemistry

- First Principles Materials Design
- Ab-initio Reaction Chemistry
- Coupling to Process Modeling
- Transport and Reaction Modeling

Cyber Security

- Secure Wireless Platforms
- Manufacturing Data Security

Process Intensification

- High Throughput Experimentation
- Reactive Separations

Process Modeling

- Process Design
- Optimization
- Predictive Capability

Robotics

- Anthropomorphic Robotics
- Autonomous / Learning Platforms
- Wireless Controls
- Sensory Perception
- Self-powered

Smart Manufacturing

- Dark Factories
- Big Data Analytics
- Sensors for Extreme Environments
- Enhanced System Diagnostics

Virtual Reality

- Haptic Interface
- 3D Augmented Training
- Accident Response
- Operating System Status

