What do we mean by nuclear materials?

- **Radioactive isotopes**
  - Occur naturally and can be produced artificially (in a nuclear reactor)
- **Fissile materials**
  - Isotopes of plutonium and uranium, capable of a self-sustaining nuclear chain reaction
- **Tritium**
  - Isotope of hydrogen used in nuclear weapons
- **Spent nuclear fuel**
  - Fuel that has been withdrawn from a nuclear reactor following irradiation
How are nuclear materials used?

- Agriculture (insect control, food preservation)
- Archaeology (age measurements)
- Consumer products (smoke detectors, nonstick pans)
- Energy (20% of U.S. electricity)
- Industry (tracers, radiography)
- Medicine (diagnostics and treatment)
- Science (research)
- Security (detection of concealed material)
- Space exploration (energy source for spacecraft)
- Weapons (nuclear deterrent)
# Nuclear Materials Management: Challenges and the SRS Role

## Challenges of Nuclear Materials Management

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliable nuclear deterrent</td>
<td>Tritium gas, used in nuclear weapons, must be periodically replenished due to decay</td>
</tr>
<tr>
<td>Legacy nuclear materials</td>
<td>Cold War production left behind nuclear materials and waste products at SRS and across the country</td>
</tr>
<tr>
<td>Global Nonproliferation</td>
<td>Proliferant nuclear materials exist worldwide under varying safety and security conditions</td>
</tr>
<tr>
<td>Commercial applications</td>
<td>Increasing dependence on foreign sources of radioactive isotopes</td>
</tr>
</tbody>
</table>

## SRS Role in Nuclear Materials Management

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</tr>
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<tr>
<td>SRS prepares the nation’s only tritium supply for the U.S. nuclear weapons program</td>
<td>SRS processes nuclear materials into valuable assets and stable waste forms</td>
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</tr>
</tbody>
</table>

At SRS, SRNL develops and deploys highly innovative approaches to address nuclear materials challenges.
Nuclear Deterrent: SRS is sole provider of tritium for national defense

- Operates nation’s only full-scale tritium processing facilities
- Recycles and purifies tritium from dismantled weapons
- Extracts new tritium from irradiated target rods
- Replenishes tritium reservoirs for use in existing weapons
- Ships to Department of Defense
- Supplies helium-3 gas, used in radiation detectors
- Performs reliability testing on gas transfer systems
- SRNL recognized as world leader in tritium science/technology
Legacy Nuclear Materials: SRS provides interim storage and processing

• Savannah River Site role
  – Material receipts and secure interim storage in robust hardened facilities
    • Surplus plutonium
    • Defense Spent Nuclear Fuel (SNF)

  – Operation of nation’s only large scale radiochemical processing & waste facilities
    • Prepare surplus Pu for disposition
    • Dissolve SNF, recover uranium and blend down for commercial fuel

  – SRNL provides innovative approaches for processing legacy materials and high-level waste

Interim used fuel storage

Stable waste form
SRS maintains unique assets to manage legacy nuclear materials

Unique large scale secure interim storage facilities

L Basin
K Area
ARP/MCU
SRS maintains unique assets to manage legacy nuclear materials

Nation’s only large-scale nuclear materials separations facilities: H Canyon and HB Line
SRS maintains unique assets to manage legacy nuclear materials

Nation’s only large-scale waste vitrification facility: Defense Waste Processing Facility
Global Nonproliferation: SRS secures international nuclear materials

- Operation of unique large scale secure interim storage facilities
- Secure vulnerable materials worldwide
- Deploy response teams to quickly recover nuclear materials
- SRNL provides nuclear forensics, detection and collections capabilities
Providing international support for U. S. nonproliferation objectives

- Canada
- Germany
- Sweden
- Italy
- Japan
- Belgium
- Ukraine
- Chile
- Peru
- Jamaica
- Australia
Commercial Applications: SRS produces valuable isotopes and fuel for commerce

• Interim storage of legacy nuclear materials capable of producing rare isotopes

• Transformation of surplus weapons material into clean fuel for commercial power generation

• SRNL provides expertise in isotope production, clean energy storage and fuel cycle R&D
Savannah River National Laboratory: Providing nuclear materials innovation

• DOE’s National Laboratory for complex-wide environmental management

• Provides innovative approaches for processing legacy materials and high-level waste

• Recognized as world leader in tritium science and technology

• Provides nuclear forensics, detection and collections capabilities

• Provides expertise in isotope production, clean energy storage and fuel cycle R&D

• Supports customers at SRS, throughout DOE, at other federal agencies, across the country and the world
Safety at SRS is our highest priority

- Protection of workers, public and environment is our objective
- Employ world’s premier nuclear safety experts
- One of safest industrial complexes in the world (top 5 percent)
- Safest site in the DOE Complex
- Most secure site in the country
What is effective nuclear materials management?

• Ensuring materials are safely handled and securely stored
• Providing robust interim storage under all credible scenarios
• Advancing disposition and risk reduction of unwanted materials
• Developing new technologies to reduce costs, accelerate risk reduction
• Securing vulnerable materials
• Ensuring a reliable supply of materials to meet national needs