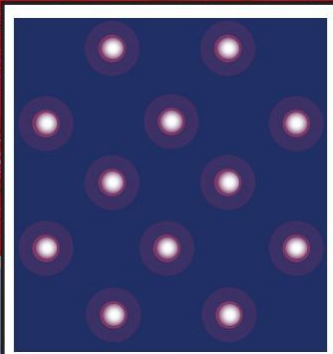
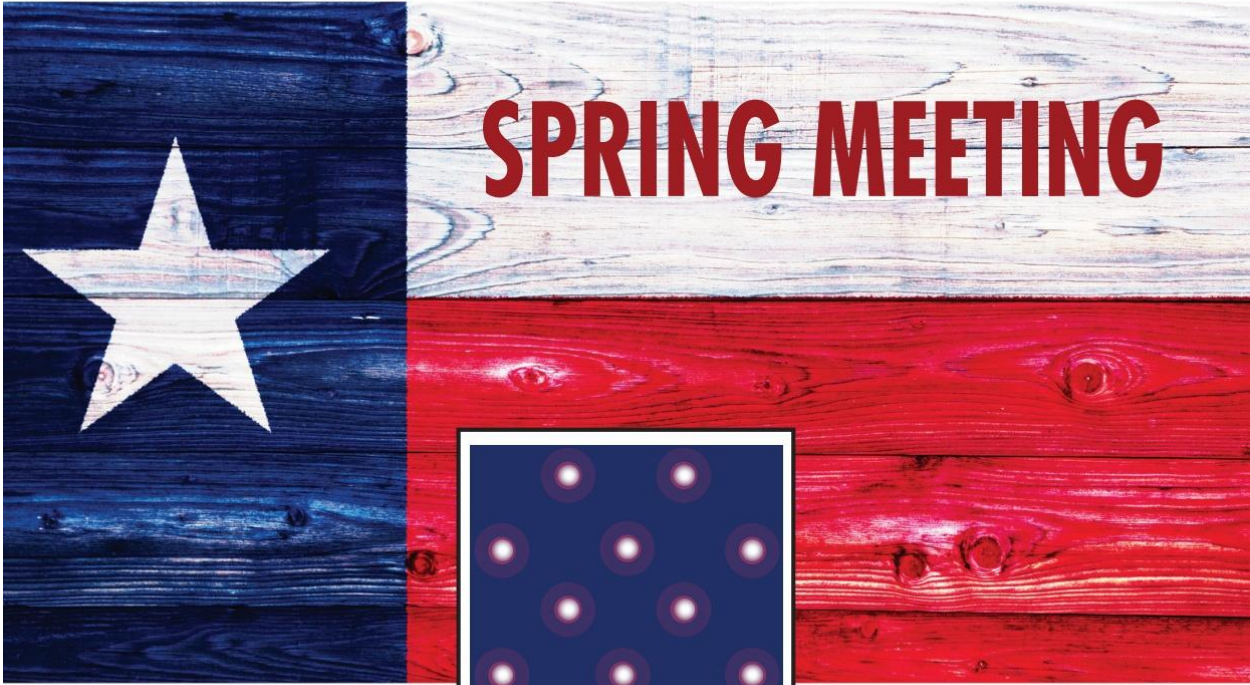
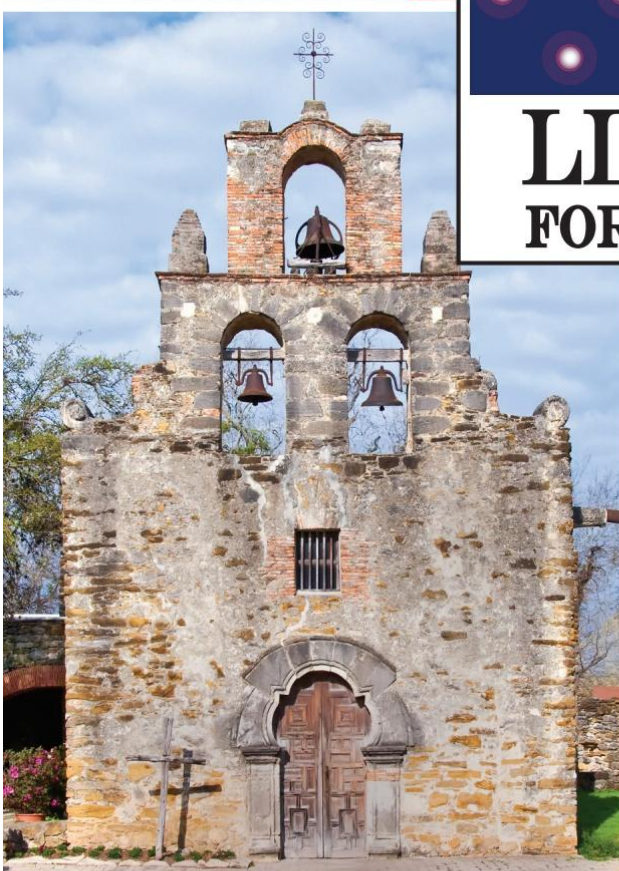


# Low-Level Radioactive Waste Forum

## SPRING MEETING



**LLW  
FORUM**



**San Antonio, TX • April 6-7, 2022**



**LOW-LEVEL RADIOACTIVE WASTE FORUM**

**309 Bradley Boulevard, Suite 201, Richland, WA 99352**  
**(801) 580-3201 \* [dshrum@llwforum.org](mailto:dshrum@llwforum.org)**

**Spring 2022 Meeting**

**AGENDA**

**Wednesday – April 6, 2022**  
**All times Central Daylight Time**

9:00 am – 9:10 am	Introductions and Announcements	
	- Welcome and Introductory Remarks	Joseph Klinger LLW Forum Chairman
9:10 am – 9:40 am	Update on the Texas Commission on Environmental Quality	Bobby Janecka TCEQ
9:40 am – 10:10 am	NRC Update	Stephen Koenick NRC
	- Very low-level radioactive waste update Programmatic assessment	
	- Part 61 & GTCC rulemaking status	
	- 20.2002 update	
	- Decommissioning rule update	
10:10 am – 10:35 am	DoD – LLRW Program	Michael Kurth Chief, Risk Management Division Rock Island Arsenal
	- Compact Interactions	
	- Locations	
	- Commodities	

10:35 am – 11:00 am	Deep Isolation	Betsy Madru VP of Global Affairs & Policy
<b>11:00 am - 11:15 am</b>	<b>Networking Break</b>	
11:15 am – 11:45 am	DOE Waste Management Update	Douglas Tonkay DOE
11:45 pm – 12:30 pm	Overview of the Southwest Research Institute Scope, Projects, Outreach	Miriam Juckett SWRI
<b>12:30 pm - 2:00 pm</b>	<b>Lunch break</b>	
2:00 pm – 2:30 pm	Introductions and updates from LLW Forum Members	
2:30 pm – 3:30 pm	Texas/Vermont Compact Interactive Session  Management Rule, Current Activities, Getting Waste to WCS  Discussion Leader – Dan Shrum	
	<u>Presenters:</u>	
		Brandon Hurley Chair, Texas/Vermont Compact
		Stephen Raines Executive Director, Texas/Vermont Compact
		Ashley Forbes Texas Commission on Environmental Quality
		Linda Morris Texas/Vermont Compact
		John Salsman Texas/Vermont Compact

3:30 pm – 4:00 pm	Waste Control Specialists (WCS) Site Update	David Carlson President & COO
4:00 pm – 4:30 pm	Overview of Advocates for Responsible Disposal in Texas	Brian Christian ARDT
4:30 pm – 5:00 pm	Overview of the LLW Forum’s Disused Sources Working Group	Michael Klebe DSWG
<b>5:00 pm</b>	<b>Session Adjourn</b>	

## Spring 2022 Meeting

### AGENDA

**Thursday – April 7, 2022**  
**All times Central Daylight Time**

9:00 am - 9:15 am	Business Session (include working group updates and resolutions)	Joseph Klinger LLW Forum Chairman
9:15 am - 9:45 am	EnergySolutions General Update Clive and Barnwell	Vern Rogers Director of Licensing and Permitting
9:45 am – 10:15 am	URENCO Uranium Enrichment Company Site Updates	Steve Magill Site Projects Manager
10:15 am – 10:45 am	US EPA Program Updates	Dan Schultheisz EPA
10:45 am - 11:15 am	<b>Break</b>	
	**Check out of hotel**	
11:15 am - 12:30 pm	NORM and TENORM Waste Discussion Panel	David Allard – Moderator Director, Pennsylvania Department of Environmental Protection
		David Carlson President and COO, Waste Control Specialists
		Leonard Slosky Executive Director, Rocky Mountain Compact
		Vern Rogers Director, Licensing and Permitting, EnergySolutions
		Dale Patrick Southwest Compact, State of North Dakota

12:30 pm - 12:35 pm

Wrap-up

Joseph Klinger

**Adjournment**

**\*\*All presentations will be shared via an on-line booklet. They will also be available on the LLW Forum website after the meeting\*\***

Please take a moment to complete our meeting survey.

Scan the QR code using your photo app to provide important feedback to the planning of future meetings.





A special thanks to our Host, Discussion Leaders and Presenters:

Joseph Klinger	LLW Forum Chairman/Host
Daniel Shrum	LLW Forum Executive Director
Bobby Janecka	Texas Commission on Environmental Quality
Steve Koenick	US Nuclear Regulatory Commission
Michael Kurth	Department of Defense – Rock Island Arsenal
Betsy Madru	Deep Isolation
Doug Tonkay	US Department of Energy
Miriam Juckett	Southwest Research Institute
Brandon Hurley	Texas Low Level Radioactive Waste Disposal Compact Commission
Stephen Raines	Texas Low Level Radioactive Waste Disposal Compact Commission
Ashley Forbes	Texas Commission on Environmental Quality
Linda Morris	Texas Low Level Radioactive Waste Disposal Compact Commission
John Salsman	Texas Low Level Radioactive Waste Disposal Compact Commission
David Carlson	Waste Control Specialists/Northstar
Brian Christian	Advocates for Responsible Disposal in Texas
Michael Klebe	Disused Sources Working Group
Vern Rogers	EnergySolutions
Steve Magill	URENCO
Dan Schultheisz	US Environmental Protection Agency
Dave Allard	Pennsylvania Department of Environmental Protection
Leonard Slosky	Rocky Mountain Compact
Dale Patrick	State of North Dakota

The LLRW Forum thanks our Compact Members:








**Appalachian States Low-Level Radioactive Waste Commission**

**ROCKY MOUNTAIN LOW-LEVEL RADIOACTIVE WASTE BOARD**

Nevada Colorado  
New Mexico

**SOUTHWESTERN LOW-LEVEL RADIOACTIVE WASTE COMMISSION**

NORTH DAKOTA  
CALIFORNIA  
SOUTH DAKOTA  
MONTANA

**The Atlantic Interstate Low-Level Radioactive Waste Management Compact**  
Connecticut New Jersey South Carolina

**CMCC** Central Midwest Interstate Low-Level Radioactive Waste Commission

The LLRW Forum thanks our Compact Members:








**Central Interstate Low-Level Radioactive Waste Commission**

**Midwest Compact**

**NORTHWEST INTERSTATE COMPACT**  
On Low-Level Radioactive Waste Management

**TEXAS LOW LEVEL RADIOACTIVE WASTE DISPOSAL COMPACT COMMISSION**

**Southeast Compact Commission**  
for Low-Level Radioactive Waste Management



The LLRW Forum thanks our State Members:



The LLRW Forum thanks our State Members:



The LLRW Forum thanks our Federal Partners:



The LLRW Forum thanks our Supporters:




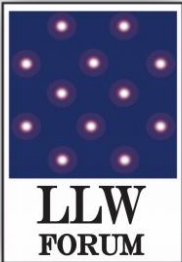
The LLRW Forum thanks our Supporters:



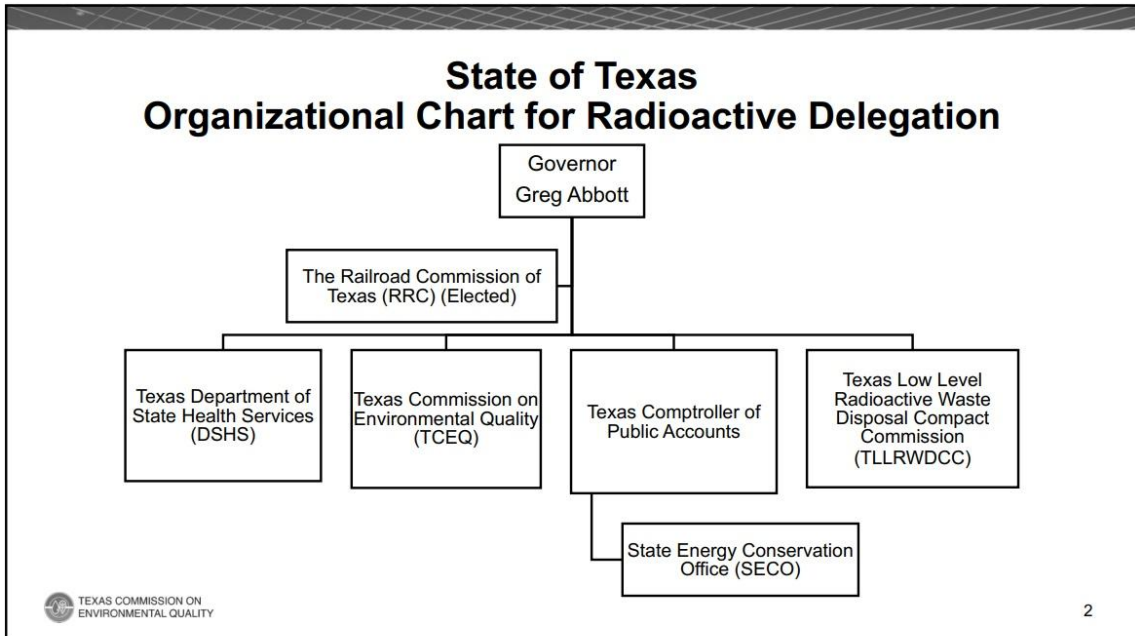
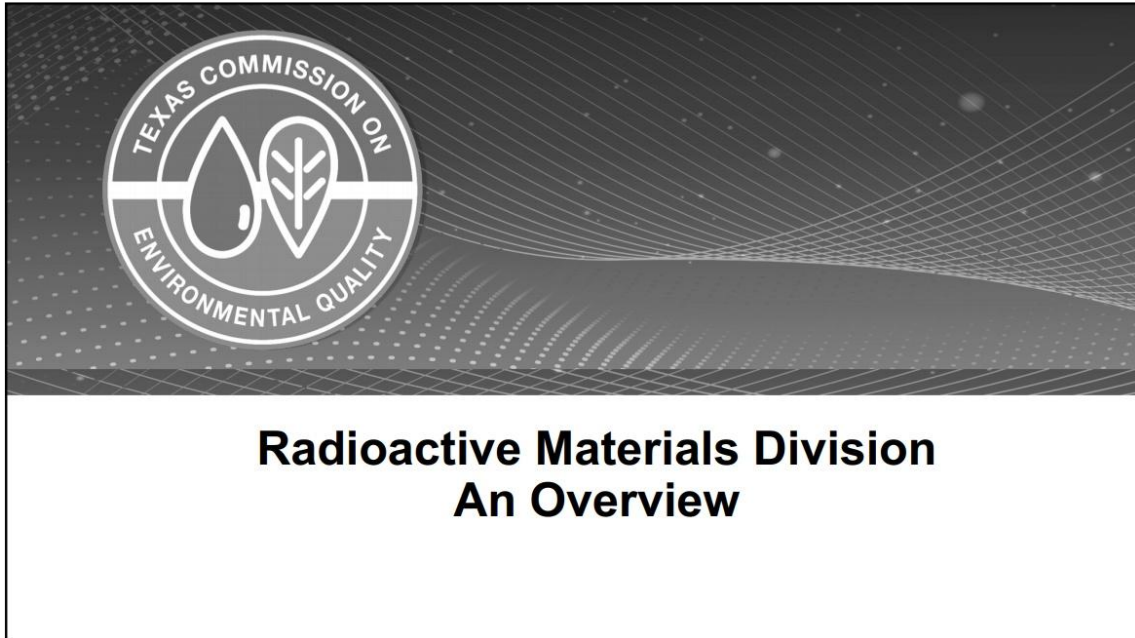
*The Law Office of  
Richard L. Adams, PLLC*



Please take a moment to provide meeting feedback



- 1 Open the camera app on your smart phone
- 2 Focus the camera on the QR code then gently tap the code displayed to lead to the survey
- 3 Follow instructions on the screen to complete the survey



# The Radioactive Materials Division

The Radioactive Materials Division issues licenses and permits for authorized activities associated with the Radioactive Materials Section and the Underground Injection Control Permits Section. The Radioactive Materials Division's goal is to protect the public and the environment from unnecessary radiation exposure and contamination resulting from the possession and disposal of radioactive materials and to protect underground sources of drinking water from improper underground injection practices.



# Our Sections

## Radioactive Materials

- Low-level radioactive waste (LLRW) and by-product disposal
- Radioactive waste storage and processing
- Uranium recovery operations
- Non-oil and gas NORM disposal

## Underground Injection Control Permits

- Class I well hazardous and non-hazardous waste disposal
- Class V Well authorizations for aquifer remediation, aquifer storage/recovery and recharge, non-hazardous waste disposal and other miscellaneous injection well
- Pre-injection unit registrations
- Programmatic reporting to the U.S. Environmental Protection Agency
- Class I and III injection well permitting and aquifer exemptions for in situ uranium recovery



## What We Do:

The Radioactive Materials Division regulates disposal of low-level radioactive wastes and by-product material waste; recovery of uranium by the in-situ solution mining process; commercial processing and treatment of radioactive substances; underground injection of hazardous and non-hazardous waste; and use of injection wells for groundwater remediation, aquifer management and other miscellaneous purposes in protection of underground sources of drinking water.

## Radioactive Materials:


The Radioactive Materials Section licenses the processing and storage of radioactive waste, disposal of LLRW, disposal of by-product material radioactive waste, and disposal of non-oil and gas NORM waste that are above certain exemption levels. These types of waste are generated by activities such as industrial operations, federal government operations, and medical facilities.


The Radioactive Materials Section also regulates the licensing of uranium recovery operations. Uranium deposits are found naturally in south Texas and this mineral can be used for a variety of industrial purposes and nuclear power generation.

## Underground Injection Control Permits:

The UIC Permits Section regulates drilling and operation of wells used for “deep well” injection of liquid wastes underground through a Class I UIC permit application review and issuance process. Due to a large industry base and favorable subsurface geology, Texas permits more Class I hazardous waste disposal wells than any other state and the UIC program is one of the largest in the country. Hazardous and non-hazardous wastes disposed in Class I injection wells are generated by a variety of industrial and municipal sources such as the petrochemical industry, power generation, and desalination projects.

The UIC Permits Section also regulates activities related to Class IV and V wells, most of which are related to groundwater remediation projects. Other types of Class V injection wells authorized by the agency include aquifer storage and recovery, aquifer recharge, disposal of drinking water treatment residuals, and stormwater drainage. Additionally, the UIC Permits Section issues Class I and III injection well permits for uranium recovery operations.

<h1>NRC Update</h1>		 <p><i>Protecting today, tomorrow, and cleaning up the past</i></p>
<p><b>LOW-LEVEL RADIOACTIVE WASTE FORUM SPRING 2022 MEETING APRIL 6-7, 2022</b></p>	<p>Stephen Koenick, Chief Low-Level Waste and Projects Branch Division of Decommissioning, Uranium Recovery, and Waste Programs Office of Nuclear Material Safety and Safeguards</p>	

<h2>Regulatory Topics</h2>
<ul style="list-style-type: none"><li>❖ <b>Low-Level Waste (LLW)</b></li><li>❖ <b>Decommissioning</b></li></ul>




## NRC'S LLW Program

<https://www.nrc.gov/waste.html>

3

## LLW Programmatic Assessment

Task	Priority	Status
1. Complete and Implement Site-Specific Analysis Rulemaking	High	On Hold- <a href="#">SECY-20-0098</a> -(Awaiting Commission Direction)
2. Address update to the 10 CFR Part 61 Waste Classification Tables	High	No action-(Awaiting task 1 completion)
3. Implement the Updated Concentration Averaging and Encapsulation BTP	High	Completed Training in March 2016 ( <a href="https://www.nrc.gov/waste/llw-disposal/llw-pa/llw-btp.html">https://www.nrc.gov/waste/llw-disposal/llw-pa/llw-btp.html</a> )
4. Prepare a regulatory basis and conduct potential rulemaking for GTCC and transuranic waste disposal	High	Regulatory Basis Completed/ Rulemaking On Hold (See Task 1)
5. Finalize internal procedure/Standard Review Plan for 10 CFR § 20.2002 requests to improve alternate disposal process	High	Completed-( <a href="https://www.nrc.gov/waste/llw-disposal/very-llw.html">https://www.nrc.gov/waste/llw-disposal/very-llw.html</a> )
6. Update NUREG/BR-0204, Rev. 2 (July 1998), "Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest"	High	Completed Published NUREG/BR-0204, Rev 3, <a href="https://www.nrc.gov/waste/llw-disposal/llw-pa/llw-uwmm.html">https://www.nrc.gov/waste/llw-disposal/llw-pa/llw-uwmm.html</a>
7. Perform VLLW Scoping Study	Medium	Completed- Issued <a href="#">SECY-21-0057</a> (June 1, 2021)
8. Update and consolidate LLRW guidance into one NUREG	Medium	No Action
9. Examine the need for guidance on defining when radioactive material becomes LLRW	Low	No Action
10. Develop and implement the national waste tracking system	Low	No Action

## LLW Rulemakings Part 61 and GTCC/TRU Rulemakings



**Combine these efforts to address overlapping technical requirements, streamline stakeholder outreach, and gain efficiency in proceeding as one rulemaking activity**



**Waiting for Commission Direction on SECY-20-0098**

5


## VLLW Developments



- ❖ **VLLW Scoping Study (SECY-21-0057)**
  - Issued on June 1, 2021
  - Concludes that NRC plans to continue with the current regulatory framework and will continue to evaluate potential enhancements within the existing VLLW regulatory framework
- ❖ **Alternative Disposal Requests (ADRs) Guidance**
  - Issued revised guidance on April 9, 2020 (ADAMS Accession No. ML19295F109)
- ❖ **Proposed interpretive rule related to 10 CFR 20.2001 "authorized recipient"**
  - Withdrawn on December 17, 2020, (85 FR 81849)

6

## Recent ADRs



**Since January 1, completed two 20.2002s and are currently reviewing a third**

- ❖ Columbia Generating Station (request approval for onsite disposal)
  - Submitted to the NRC – 12/21/2020
  - **Approved by the NRC – 3/11/2022**
- ❖ Columbia Fuel Fabrication Facility (request for disposal of material at US Ecology Idaho)
  - Submitted to the NRC – 11/5/2021 (Updated version containing missing information submitted 12/1/2021)
  - **Approved by the NRC – 3/18/2022**
- ❖ South Texas Project (request disposal at a landfill located within Texas (Agreement State))
  - Submitted to the NRC – 12/3/2021
  - Review ongoing

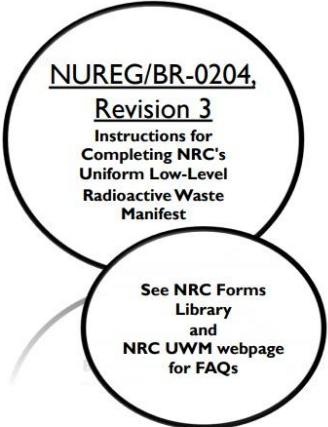
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## Uniform Waste Manifest

**Provides instructions to prepare NRC Form 540, Form 541, and Form 542**

**22 detailed answers to Frequently Asked Questions (FAQs)**

**SECY-21-0110, Retrospective Review of Administrative Requirements Evaluation (RROAR)**



**NUREG/BR-0204, Revision 3**  
Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest

See NRC Forms Library and NRC UWM webpage for FAQs

**Issued Revised Forms on June 25, 2021 (86 FR 33783)**

**Effective on September 23, 2021**

Possible industry initiatives related to characterization methods for hard to detect radionuclides (e.g., scaling factors?)

8

## Radiation Source Protection and Security Task Force



- ❖ Chaired by NRC
- ❖ Composed of 14 Federal Agencies and one State organization
- ❖ **Evaluates and provides recommendations related to security of radioactive sources in the U.S.**
- ❖ Currently preparing 2022 report to the President and Congress
- ❖ Additional information at: [www.nrc.gov/security/byproduct/task-force.html](http://www.nrc.gov/security/byproduct/task-force.html)

9

## Cleaning Up Non-Military Radium

- ❖ Focus on cleanup of remaining sites with Radium-226 contamination in Non-Agreement States
- ❖ **Current Status**
  - ❖ Implementing risk-informed approach
    - 58 sites assessed
    - 5 sites had residual radium activity requiring remediation
    - 2 sites have been cleaned up
  - ❖ Coordinating with other Federal agencies in their cleanup efforts
  - ❖ Sharing lessons learned
  - ❖ Extensive stakeholder communication and coordination – reaching out to Agreement States with radium sites



10

## Cleaning Up Federal Radium Sites

- ❖ Objective: Ensure unlicensed sites with discrete sources of radium or associated contamination do not pose a risk to public health and safety and the environment.
- ❖ NRC has MOUs with the Department of Defense (DoD) and the National Park Service describing roles in the cleanup of radium and other unlicensed radioactive materials at these sites.
- ❖ **Current Status**
  - ❖ Annual inventory of DoD sites for NRC involvement
    - ❖ Monitoring (9 sites)
    - ❖ Stay informed (8 sites)
  - ❖ Monitor three NPS sites in Gateway National Recreation Area



11

## NRC'S Decommissioning Program

<https://www.nrc.gov/waste/decommissioning/oversight.html>



12

# Seeking Public Comment on a Proposed Rule for Decommissioning Nuclear Facilities

**NUCLEAR REGULATORY COMMISSION**  
 1200 Pennsylvania Avenue, NE  
 Washington, DC 20545  
 (301) 291-6000  
[www.nrc.gov](http://www.nrc.gov)

**Regulatory Requirements for Production and Utilization Facilities Transitioning to Decommissioning**  
 NRC-2015-0070

**Executive Summary**  
 The NRC has issued proposed regulatory requirements for production and utilization facilities transitioning to decommissioning. The proposed rule is published in the Federal Register on March 3, 2022, at 87 FR 12254. The proposed rule is part of the NRC's ongoing effort to improve the decommissioning process and reduce radiological risk. The proposed rule includes requirements for emergency preparedness, decommissioning funding assurance, environmental considerations, spent fuel management planning, and record retention requirements. The proposed rule also includes requirements for the decommissioning process, including the submission of decommissioning plans and the completion of decommissioning activities. The proposed rule is published in the Federal Register on March 3, 2022, at 87 FR 12254. The proposed rule is part of the NRC's ongoing effort to improve the decommissioning process and reduce radiological risk. The proposed rule includes requirements for emergency preparedness, decommissioning funding assurance, environmental considerations, spent fuel management planning, and record retention requirements. The proposed rule also includes requirements for the decommissioning process, including the submission of decommissioning plans and the completion of decommissioning activities.

- ❖ Would implement specific regulatory requirements for different phases of the decommissioning process consistent with the reduced radiological risk. Topics include:
  - Emergency preparedness
  - Decommissioning funding assurance
  - Environmental considerations
  - Spent fuel management planning
  - Record retention requirements
- ❖ Published March 3, 2022 (87 FR 12254)
- ❖ Four draft regulatory guides available for comment in parallel with the proposed rule
- ❖ Comment period is open until **May 17, 2022**

Comments can be submitted at <https://www.regulations.gov/> by searching for Docket ID **NRC-2015-0070**

# Additional information on the NRC Public Website

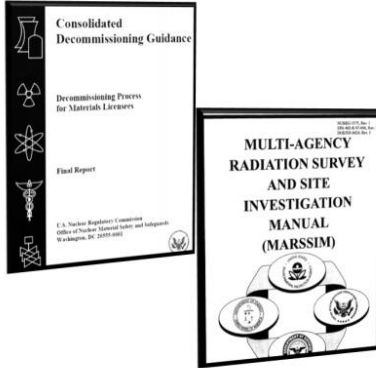


<https://go.usa.gov/xzksC>

Questions?  
 Contact Dan Doyle  
[Dan.Doyle@nrc.gov](mailto:Dan.Doyle@nrc.gov), 301-415-3748



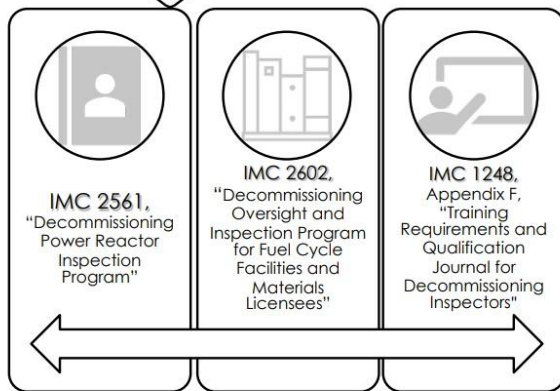
## Improving Decommissioning Process – Guidance



- ❖ NUREG-1757, “Consolidated Decommissioning Guidance”
  - Volume 1, Rev. 3, “Decommissioning Process for Materials Licensees” **(to be issued as draft for public comment)**
  - Volume 2, Rev. 2, “Characterization, Survey, and Determination of Radiological Criteria” **(to be finalized summer 2022)**
- ❖ NUREG-1575, Rev. 2, “Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)” **(to be finalized)**

15

## Risk-Informing Decommissioning Inspection Oversight Guidance



16

# Enhancing Decommissioning Outreach

## What's new

- ❖ New webpage on NRC.GOV
- ❖ Keep up-to-date on upcoming workshops and guidance releases



<https://www.nrc.gov/waste/decommissioning/whats-new.html>

17

## Questions/Comments



### Follow @NRCgov



To subscribe to e-mail updates:  
<https://www.nrc.gov/public-involve/listserver.html#lyris>

18



# DoD Low Level Radioactive Waste Lead Agent

Mike Kurth  
HQ Joint Munitions Command  
Rock Island Arsenal  
Rock Island, IL

## **Mission**

Safe, compliant, and cost-effective disposition of LLRW and mixed waste for DOD and other Federal agencies

## **Vision**

The provider for DOD LLRW disposition, providing users with a seamless end of life cycle (treatment and disposal) for excessed low-level radioactive materials

## **Governing Instruction**

DoD Instruction 4715.27 – DoD Low Level Radioactive Waste (LLRW) Program - DOD Lead Agent (DODLA) for LLRW (Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health)

2

## LLRW Scope

DoD LLRW Lead Agent program services all military property or assets containing source, special nuclear, or byproduct material that is acceptable for disposal in a land disposal facility, in accordance with the U.S. Nuclear Regulatory Commission (NRC) Regulations.

The program also includes:

- Mixed waste (hazardous and radioactive)
- Naturally occurring radioactive material waste (NORM)
- Naturally occurring and accelerator-produced radioactive material waste (NARM)

3

## LLRW Limitations

- LLRW under our program does not include:
  - Generated by the Naval Nuclear Propulsion Program in accordance with Executive Order 12344 and Section 7158 of Title 42, U.S.C.
  - Related to nuclear weapons programs
  - Decommissioning of former Army Deactivated Nuclear Power Program facilities.
  - Formerly Utilized Defense Sites (FUDS)
  - Decay in storage, release in effluents, disposal by release into sanitary sewage treatment or disposal by incineration, and disposal of specific wastes in accordance with Sections 20.2002-20.2005 and 20.2108 of Title 10 Code of Federal Regulations (CFR)

4

## JMC LLRW Program Office

### Government Staff

- Technical Team – 7 Health Physicists (4 are Emergency Essential for Contingency Operations)



### Morris Consolidation Facility (MCF)

- Unique Capabilities within all of DoD
- Allows In-House Acceptance of Most Types of Radioactive Material for Reuse, Recycle or Disposal



### Contractors

- Fixed Price - Pack and Ship Contracts
- Rapid Response

## LLRW Program Customers




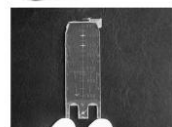

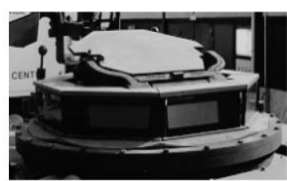


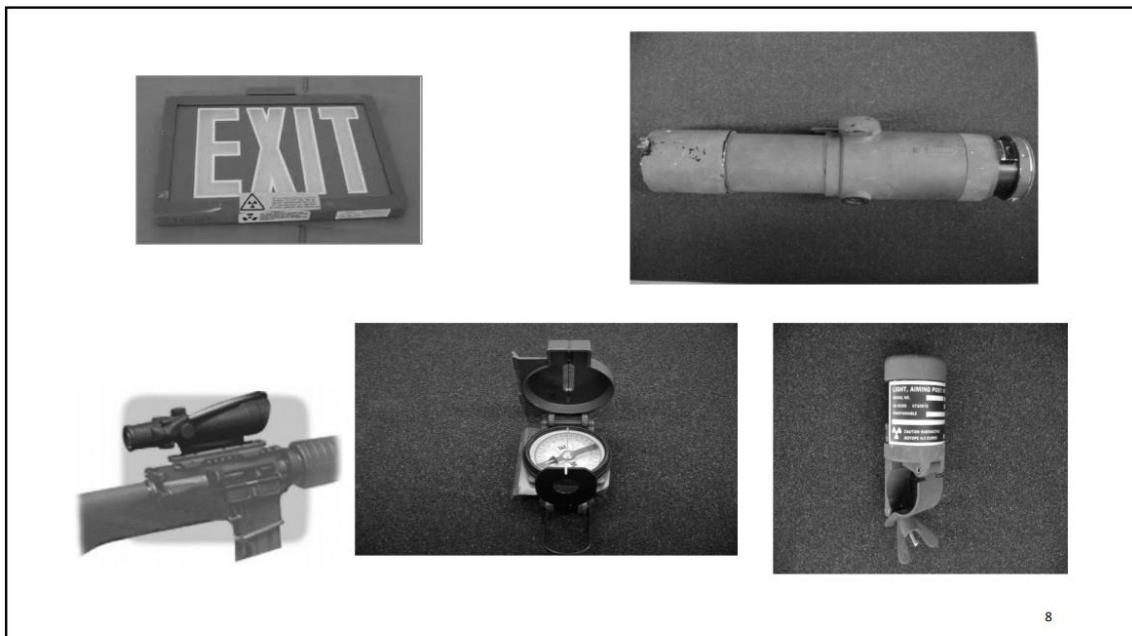
**Support to DOD** – Army, Navy/Marine Corps, Air Force, Army Corps of Engineers, Defense Logistics Agency, Defense Health Agency

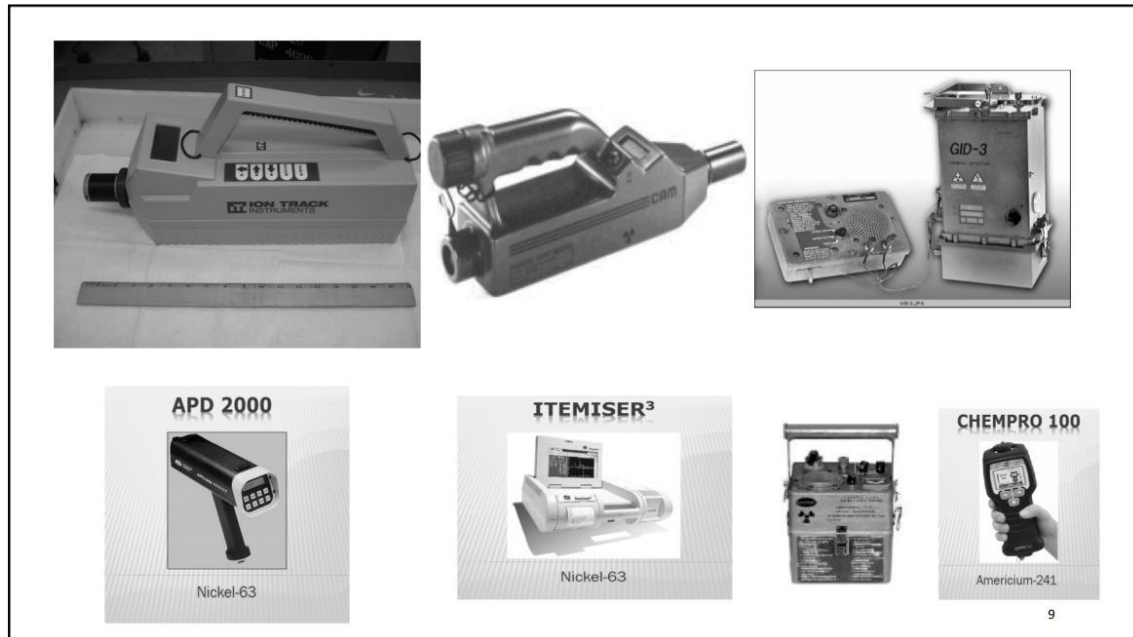
### Unique, Worldwide Response Team for Combat/Noncombat Low-Level Radioactive Materials Incidents

- Army Contaminated Equipment Retrograde Team (ACERT)
  - Rapid response for radiological clean-up and disposal

### Common Waste Streams

<p>Operations Research &amp; Development Testing Medical Clean ups</p> <ul style="list-style-type: none"><li>• Ranges</li><li>• Base closures</li><li>• Reorgs</li></ul>	<p>Depleted Uranium</p> <ul style="list-style-type: none"><li>• Munitions, armor</li></ul> <p>Radium/Tritium</p> <ul style="list-style-type: none"><li>• Luminescence</li></ul> <p>Sealed sources</p> <ul style="list-style-type: none"><li>• Chemical detection</li></ul> <p>Thorium</p> <ul style="list-style-type: none"><li>• Engines, optical lenses</li></ul>	   
		





## Partners

### Army Test, Measurement, and Diagnostic Equipment (TMDE)

- Operate Consolidation Facilities in Germany and Korea

### Wright-Patterson Air Force Base

- Recycle of Smoke Detectors and Exit Signs

### Department of Energy (DOE)

- Recovery of Tritium for Reuse in DOE
  - National Ignition Facility, LLNL
- Classified Waste Disposal

## Program Complexities

### Customer locations

Approximately 500 U.S. military bases  
States with the most bases  
California, Texas, Florida, and Virginia  
Numerous U.S. military overseas locations

### Military radioactive commodities

1000's of military radioactive items

### Regulatory licenses

Army – 60 NRC licenses  
Air Force and Navy – Master Material Licenses

### Permits

State of Washington – over 200 permits renewed annually

### Large scale/Long term projects

Depleted Uranium Munitions Demilitarization  
Chemical Detection Equipment (Ni-63 foil source)

## ACERT Team

### Army Contaminated Equipment Retrograde Team

Mission: Worldwide combat/non-combat response team to retrograde radioactively contaminated vehicles and equipment

Personnel: Four emergency essential health physicists with support from staff, contractors, Army Corps, and Public Health Command

Equipment: Three rapid response milvans



## ACERT Mission



13

## Questions?

Mike Kurth  
US Army, HQ JMC  
Rock Island Arsenal  
Rock Island, IL  
Michael.f.kurth.civ@army.mil

Cyrus Turner  
US Army, HQ JMC  
Rock Island Arsenal  
Rock Island, IL  
Cyrus.e.turner.civ@army.mil




# Innovation in radioactive waste disposal

## A perspective from Deep Isolation



Deep Isolation EMEA Limited | [www.deepisolation.com](http://www.deepisolation.com)

The world has not yet disposed any of the spent fuel it has created over the last seventy years



**Estimated size of spent fuel inventories**

- Less than 3,000 tHM
- 3,000 - 10,000 tHM
- 10,000 - 30,000 tHM
- Greater than 30,000 tHM

*Sources: Deep Isolation analysis of country-level and regional-level data in IAEA 2018 and ANS Nuclear News (March 2018)*

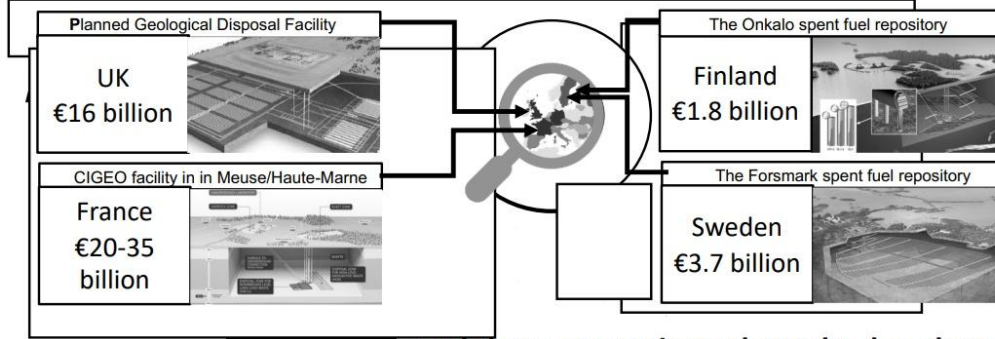
... and the current model for geological disposal is simply not scalable

**DEEP ISOLATION** © 2022 Deep Isolation, Inc. All Rights Reserved 2



# The challenge

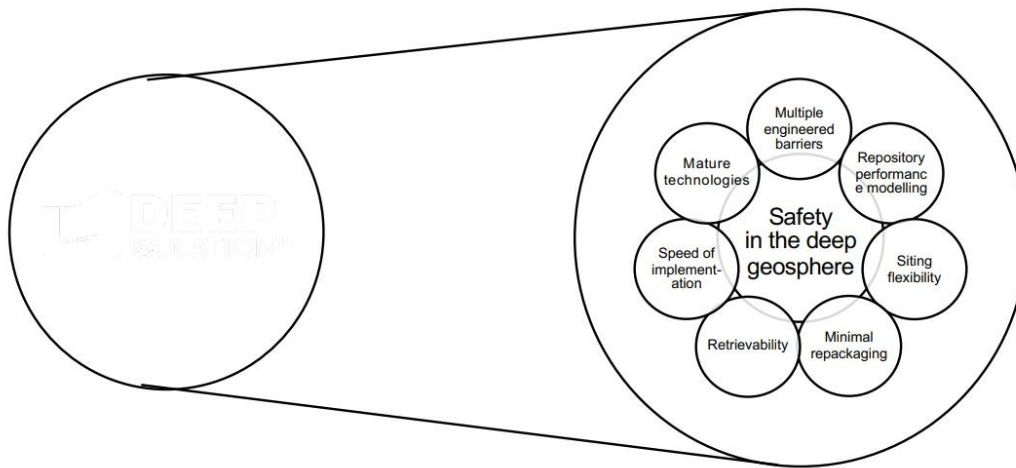
In Europe, for example, only a few nuclear countries have advanced plans for disposal of spent fuel



..... and these are projects that take decades to plan and deliver, and cost billions of Euros

Source for cost estimates: The costs of geological disposal, Professor Neil Chapman ERDD Working Group and Arius Association, IFNEC Workshop, Paris 11<sup>th</sup> December 2018

# Key features of Deep Isolation's solution



## Safety in the deep geosphere

Isolated rock formations, at depths of 1-3 km, provide a safe, secure and permanent disposal solution:

- Safety in depth:** Protection from the long-term effects of climate change and other natural processes; reduced risk of human intrusion
- Reducing conditions:** low oxygen environment at depth inhibits canister corrosion and slows release of radionuclides
- Radioactivity trapped safely in deep rock:** the inherent properties of many rock formations, coupled with long travel paths to the surface, mean the great majority of radionuclides never get near the biosphere - and peak dose at the surface is orders of magnitude lower than regulatory safe limits
- Future safety guaranteed by past performance:** we look for isotopic markers showing that host rocks have been isolated for millions to tens of millions years

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5

## Overview of Deep Isolation

- Deep Isolation offers safe, equitable and affordable disposal of nuclear waste
- Our solution:
  - Places corrosion-resistant canisters containing spent fuel into borehole repositories deep underground (far deeper than feasible with a mined repository)
  - Uses directional drilling technology to drill into suitable host rocks that have remained isolated from the environment for millions of years
  - Leverages mature technologies that are widely used in industry and that we have integrated and enhanced with our own patented innovations

DEEP  
SAFE  
ISOLATED

Secured deep underground in suitable rock, a natural protective barrier

Drill Rig

← Surface Casing

↑ Aquifer

← Backfilled/ Sealed Access Hole

↑ Spent Nuclear Fuel Canister Storage

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## Directional drilling opens up new opportunity

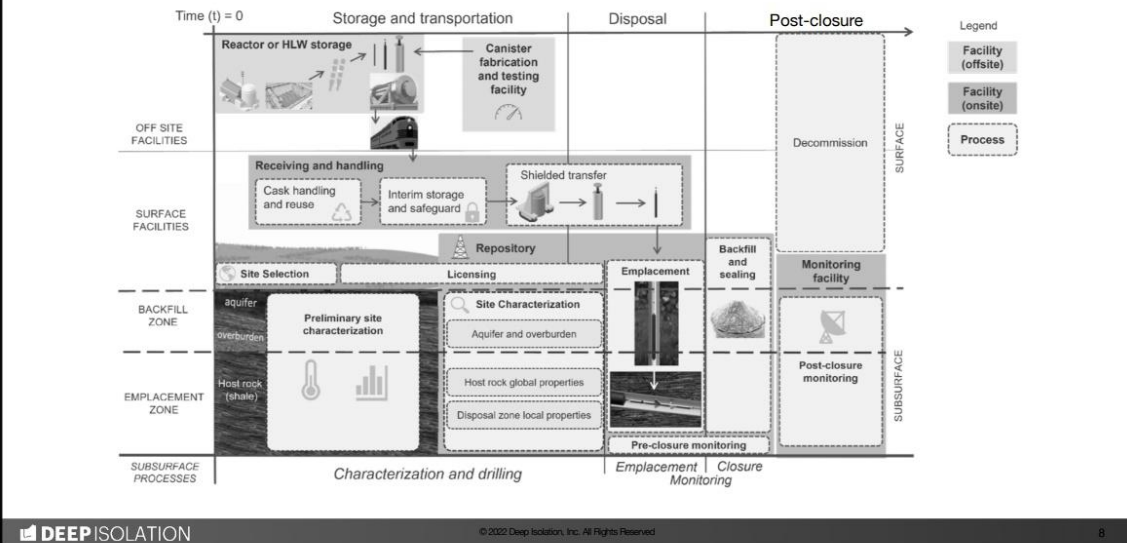
- Directional drilling allows us to tailor repository design for the needs of a specific inventory and specific geology
- Options include vertical, slanted or horizontal – our partnerships, supply chain and our IP support all of these

Horizontal boreholes:

- ✓ Deliver high levels of safety combined with cost benefits
- ✓ Enhance performance compared to vertical for larger numbers of canisters per borehole

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## Concept of Operations



## Technology Readiness Level (TRL) Definitions

TRL	TRL Definition
9	Actual system operated over the full range of expected mission conditions.
8	Actual system completed and qualified through test and demonstration.
7	Full-scale, similar (prototypical) system demonstrated in relevant environment
6	Engineering/pilot-scale, similar (prototypical) system validation in relevant environment
5	Laboratory scale, similar system validation in relevant environment
4	Component and/or system validation in laboratory environment
3	Analytical and experimental critical function and/or characteristic proof of concept
2	Technology concept and/or application formulated
1	Basic principles observed and reported

• **Purpose:**

- Clear understanding of the baseline technological maturity of all elements of the system to assess the magnitude and scope of a development program

• **Assessment Method:**

- Functional, top-down approach (based on the concept of operations and goals)

## Repository Construction

Technologies	TRL	Comments
Drilling	5	• Deep horizontal drilling is common, but there are limited examples where large-diameter (> 0.4 m) and deep (>1.5 km) horizontal holes have been drilled
Site characterization of EDZ <sup>1</sup>	6	• EDZs have been characterized for mined repositories (i.e., a relevant environment). ◦ The necessary level of detail in characterizing the EDZ will likely be lower [22] for deep boreholes
Site characterization of thermo-mechanical properties of host rock	7	• Proven successfully at a full scale in mined repositories (i.e., a relevant environment) [29]. • Relative importance of local thermo-mechanical phenomena (e.g., fracturing) in disposal zone for long term safety is likely to be lower for deep boreholes than mined repositories
Monitoring system insertion	9	• Monitoring systems have been inserted for drilling applications
Borehole stability	4	• Long term stability (>50 years) for horizontal holes at size required for PWR assemblies (~0.34 m) has not been demonstrated (additional study is needed)
Thermal management	9	• Proven successfully in drilling industry
Waste management	7	• Proven successfully in drilling industry, but not in presence of spent nuclear fuel

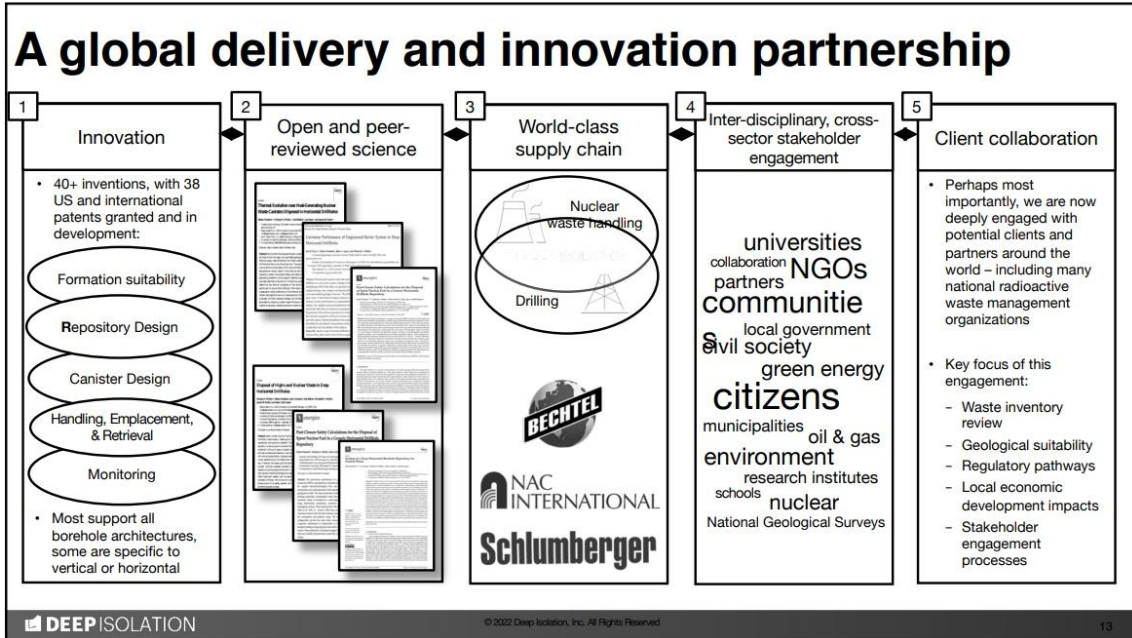
<sup>1</sup>Excavation disturbed zone

## Technical Readiness Level

- Overall, the deep borehole concept is at a **sufficient technical maturity** (TRL>4) to proceed to the conceptual level of design
- Fuel storage and processing and site characterization are **relatively mature**
- TRLs **expected to change** as the design is detailed and technical specifications are developed.
- **Key items** identified for technology demonstration and regulatory clarification:
  - Drilling and long-term borehole stability
  - Pre-closure monitoring and natural barriers (e.g., EDZ)
  - Emplacement and retrieval of canisters and axial plugs
  - Closure

## Some European case studies

- **ERDO:**
  - Preliminary estimates, based on a high-level generic design for an integrated multi-national repository using horizontal boreholes to dispose of all HLW and long-lived ILW for Croatia, Denmark, Netherlands, Norway and Slovenia suggest that delivery of such a repository would cost between €418 million and €560 million. On top of this, we estimate that the costs of regulatory compliance (including site characterization, licensing and post-closure monitoring) might cost a further €124 million – although these estimates are considerably more uncertain.
  - This total cost range of €542 – 684 million represents a **saving of half to two-thirds of the likely cost of disposal in a mined deep geological repository**, based on ERDO's earlier assessment of such costs
- **UK:**
  - Preliminary estimates suggest that all of UK's current and future high-heat generating waste could be disposed of for between £2.98 and £4.45 billion
  - Equates to **15% - 23% of budget for the UK Geological Disposal Facility** (in 2020 prices)

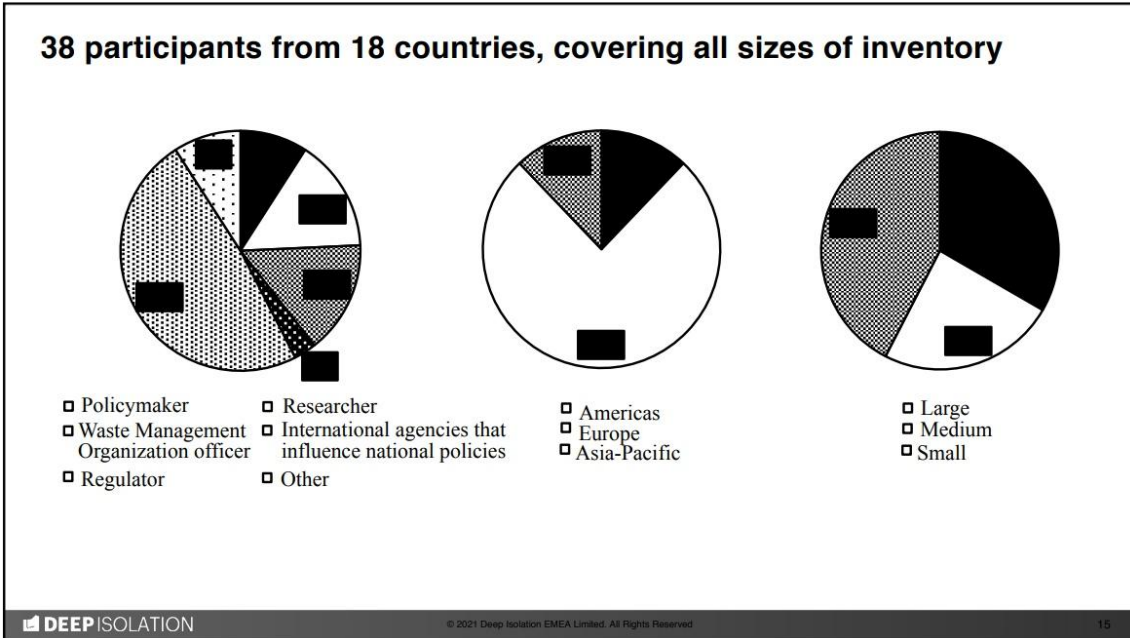


## What do stakeholders in the radioactive waste management sector think about deep borehole disposal?

*"After years of seeing largely unstructured commentary on the potential role of deep borehole disposal in national waste management programmes, this work has at last focused light on what a wide range of policy and decision-makers really think."*

Professor Neil Chapman  
University of Sheffield

DEEP ISOLATION 14



## Methodology

### 7-step process, integrating qualitative and quantitative research

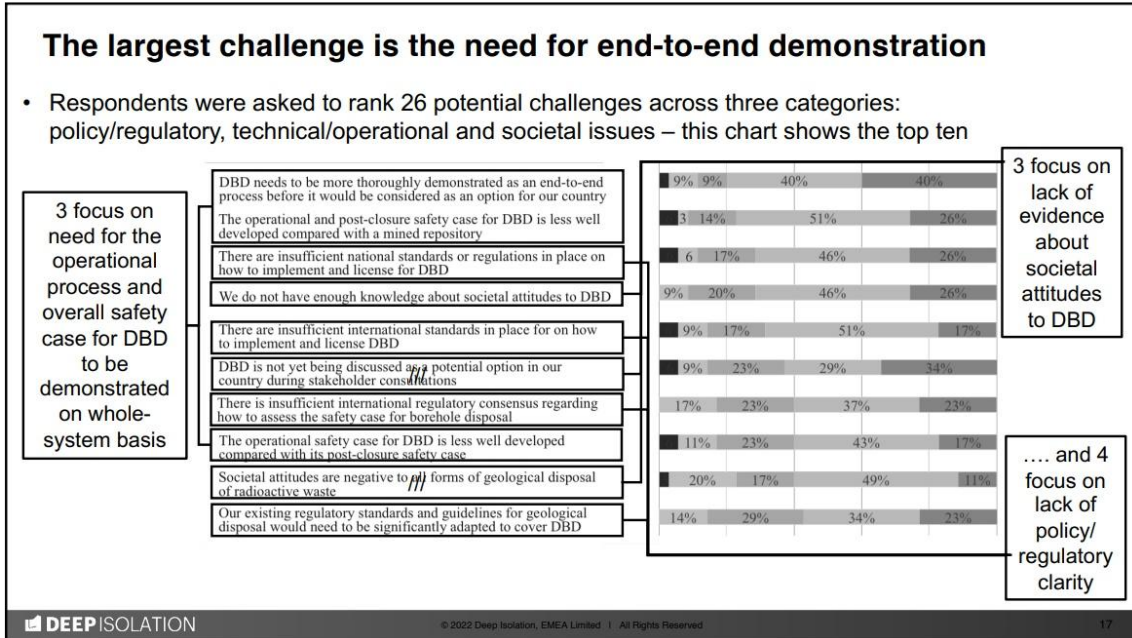
<b>1. Initial research design</b>	– Work within the project team, and in consultation with external DBD experts, to develop an initial research framework to explore Opportunities, Challenges and Enablers for DBD
<b>2. Test through initial in-depth interviews</b>	– Undertake in-depth interviews to explore Opportunities, Challenges and Enablers for DBD with 2-3 members of the target population, using a semi-structured interview format – Use the results of these to develop and refine a) the interview format and b) the survey questionnaire to be used in quantitative research
<b>3. Quantitative validation</b>	– Use a web-based survey to seek quantified and comparable views from a broader set of people in our target population
<b>4. Preliminary analysis</b>	– Initial statistical analysis of quantitative results, to develop understanding of views and priorities – and how these may vary across population sub-segments – Use a web-based survey to seek quantified and comparable views from a broader set of people in our target population
<b>5. Qualitative validation</b>	– Further round of in-depth interviews, exploring issues raised by preliminary analysis of the web survey results – In parallel, continue to expand numbers of people undertaking the web survey (including interviewees)
<b>6. Analysis and conclusions</b>	– Analysis of qualitative research results, to identify key themes and undertake role analysis – Iterative documentation of findings, referring back to both qualitative data and quantitative data and using both to test, substantiate and evidence the key themes
<b>7. Quality assurance</b>	– Review of draft report with external experts

### Target stakeholders

The target research group was senior-level stakeholders whose role involves specific responsibilities for geological disposal of higher activity radioactive waste, in the following five categories:

- Policymakers in national governments
- Waste Management Organizations
- Nuclear and environmental regulators
- International agencies that influence national policies
- Researchers in universities, national laboratories and other research institutions with a specific focus on radioactive waste disposal.

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### The interview results gave a similar picture in terms of perceived challenges for DBD


- Key themes from interviews:
  - DBD is seen as increasingly mature...
    - Literature is available to show that this is a mature technology, that deep borehole disposal is building on the experience from our oil and gas industry.
    - The drilling techniques are mature and SF/HLW handling techniques are mature.
  - ... but faces 3 main challenges before first licensed DBD disposal:
    - Need for large-scale DBD demo on whole-system basis to validate safety case
      - Somebody just needs to do it. Several studies that show that ... the actual operation is feasible, the safety assessment is feasible, compliance with existing standards is feasible. The problem is that no one has done it.
    - Lack of understanding and evidence about societal attitudes
      - We haven't done much outreach [on DBD], so I don't really think people know anything about it.
    - Relative immaturity of international guidance on developing and assessing the DBD safety case
      - International guidance or some kind of standardized 'way of doing': that would help in the licensing and development of the concept in different countries.

DEEP ISOLATION



**Historic and global advances in DBD interest in the last 2 years from Deep Isolation's awards and contracts**


CONTRACTS	Key Findings and Achievements
 	<p><b>Established the feasibility of modular onsite disposal</b> using deep boreholes in the United States, and cost savings of (69-76%) compared to mined repositories</p> 
	<p><b>"Deep borehole disposal is an important alternative option</b> for us to consider in Slovenia...[the study is] helpful in highlighting the potential benefits, the increasing maturity of, and required next steps for deep borehole disposal" said Leon Kegel, Head of Planning and Development at ARAO</p> 
 	<p><b>"EU Nuclear Waste Organizations Conclude Deep Borehole Disposal Great Option For Nuclear Waste"</b> (see Forbes article by Jim Conca)</p> 
	<p><b>Two awards granted in 2022 (\$3.6M for Deep Isolation led project)</b>        – expands the capabilities of deep borehole disposal to small modular reactors, advanced reactors, and reprocessed fuels</p> 

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**Thank you!**

Deep Isolation, Inc.  
 Betsy Madru, VP Global Affairs and Policy  
 betsy@deepisolation.com  
 info@deepisolation.com | deepisolation.com

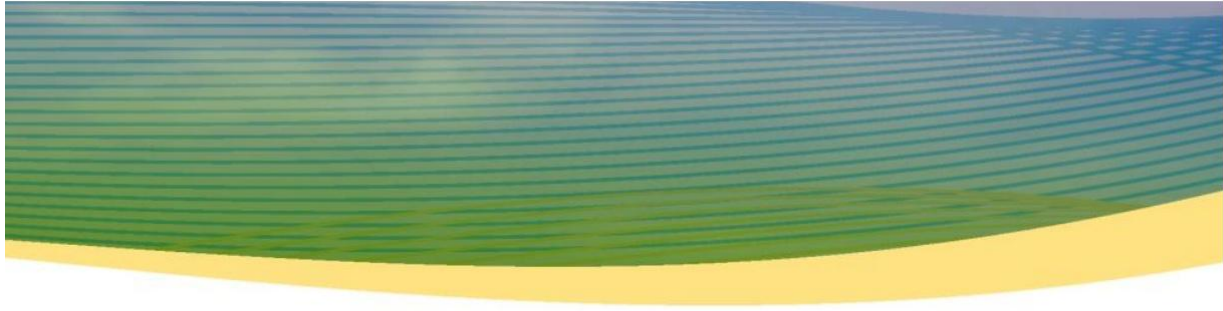
BERKELEY CA USA | WASHINGTON DC USA | LONDON UK | TOKYO JAPAN

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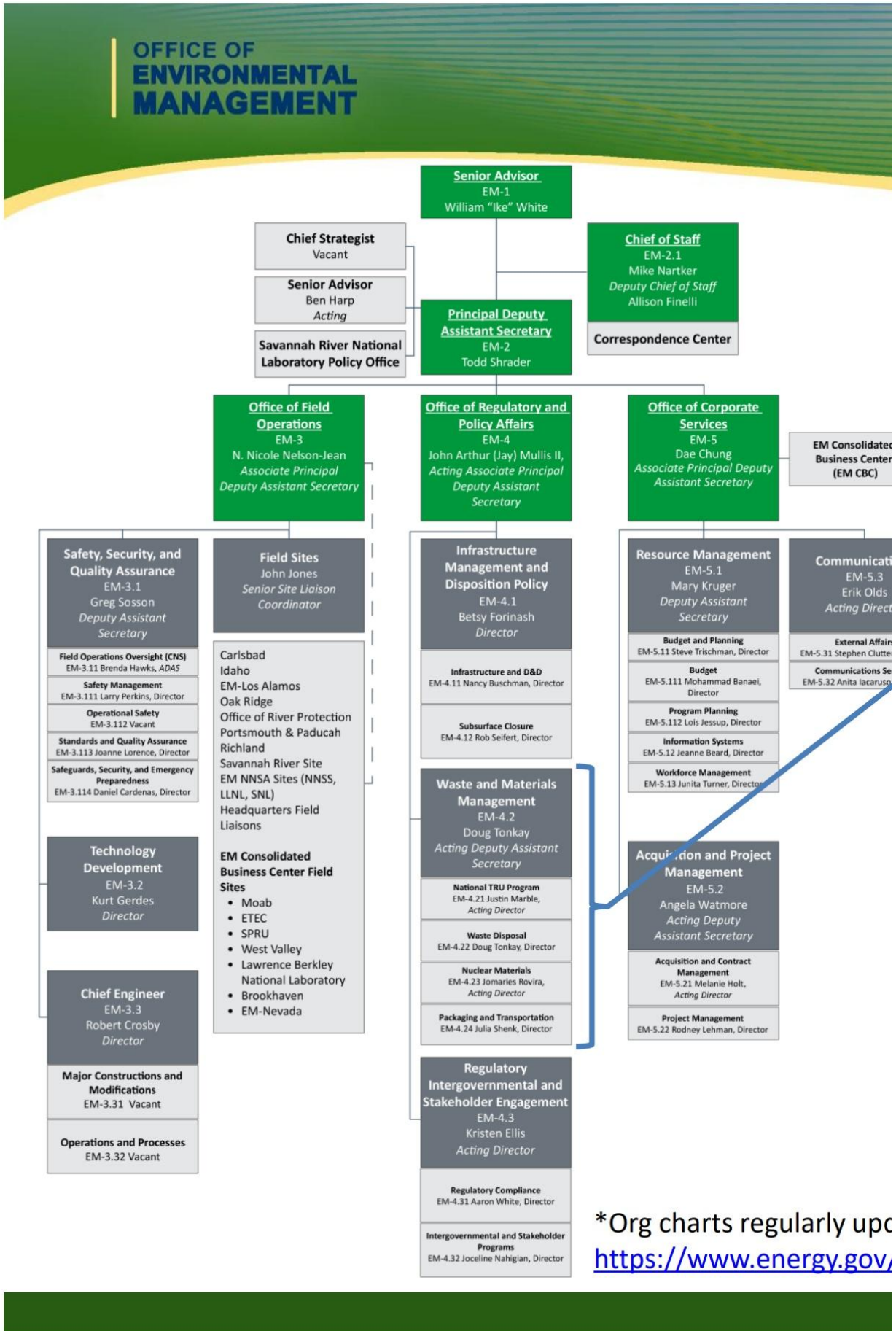
# **DOE/EM Waste Update LLW Forum Sp**

**April 6  
San Antor**

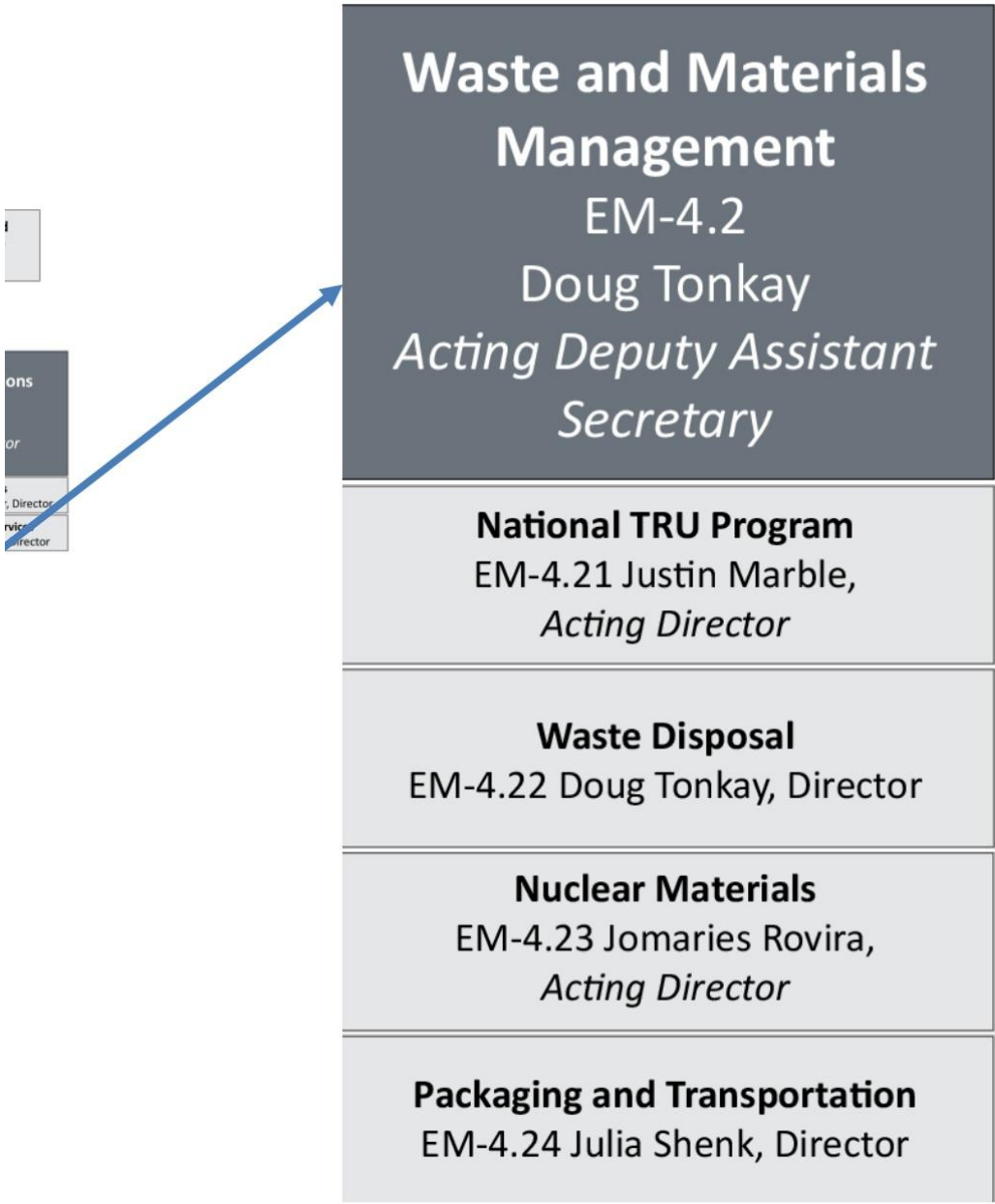


# Management late Spring Meeting

, 2022  
rio, Texas



# EM HQ Organization\* (February 2022)



lated and posted to  
[/em/articles/em-organization-chart](#)

OFFICE OF ENVIRONMENTAL MANAGEMENT

<https://www.energy.gov/em/articles/em-numbe>

100

shipments received at the Waste Isolation Pilot Plant (WIPP) in FY 2021.

3,200

hazardous materials shipments safely transported over 6 million miles in FY 2020.



20+

Packaging Certification Program actions completed in FY 2021, with 20+ new ones opened.

12,800

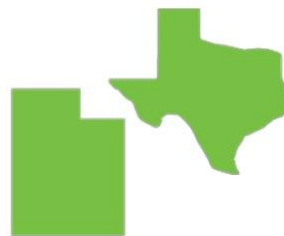
shipments to WIPP as of May 1, 2021.



99,000

cubic meters of transuranic mixed waste disposed at WIPP as of May 1, 2021.

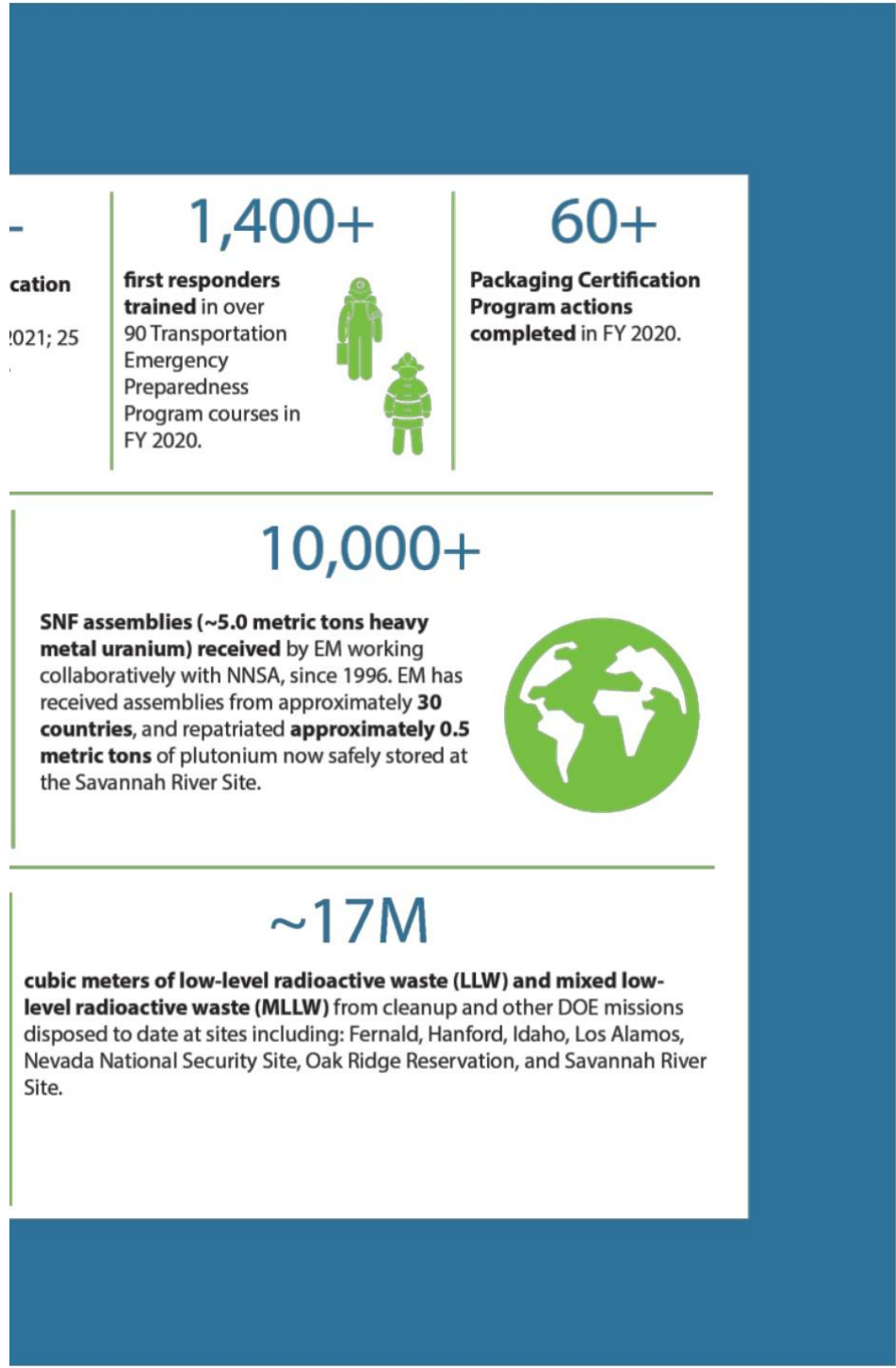
2.2M



cubic meters of LLW and MLLW disposed by DOE at licensed commercial sites in Utah and Texas.

# EM Progress By the Numbers

RS



1,400+

ation

021; 25

**first responders trained** in over 90 Transportation Emergency Preparedness Program courses in FY 2020.



60+

**Packaging Certification Program actions completed** in FY 2020.

10,000+

**SNF assemblies (~5.0 metric tons heavy metal uranium) received** by EM working collaboratively with NNSA, since 1996. EM has received assemblies from approximately **30 countries**, and repatriated **approximately 0.5 metric tons** of plutonium now safely stored at the Savannah River Site.



~17M

**cubic meters of low-level radioactive waste (LLW) and mixed low-level radioactive waste (MLLW)** from cleanup and other DOE missions disposed to date at sites including: Fernald, Hanford, Idaho, Los Alamos, Nevada National Security Site, Oak Ridge Reservation, and Savannah River Site.

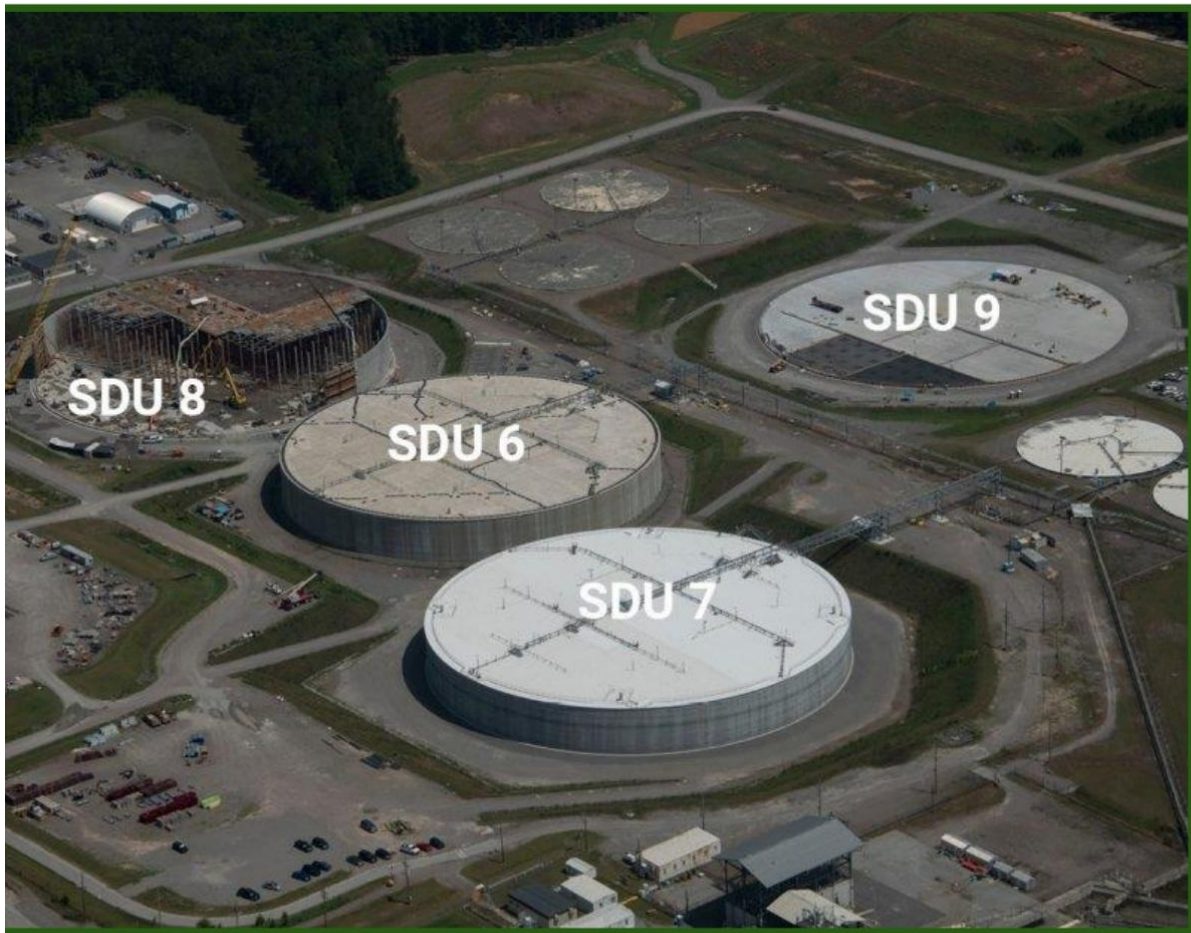
## Priority #1: Achieve Significant Construction Milestones

- Complete cold commissioning of the first WTP Melter at Hanford.
- Complete all concrete placements for Saltstone Disposal Unit (SDU) #9 at Savannah River Site (SRS).
- Complete construction of New Filter Building for the Safety Significant Confinement Ventilation Shaft at the Waste Isolation Pilot Plant (WIPP).





# DOE/EM CY2022 Waste Management Priorities



SRS continues to meet mission needs by constructing megasized SDUs to permanently dispose of decontaminated saltstone.

## Priority #2: Execute Key Cleanup

- Begin tank pre-treatment at Hanford tank operations (**complete**).
- Complete processing of 100 sodium-bearing Waste Treatment Unit in Idaho.
- Complete all Subsurface Disposal Area (**complete**).
- Treat 4 million gallons of tank waste at
- Begin hot cell processing of the high-alpha
- Install equipment to support Los Alamos from Waste Control Specialists.
- Complete 30 shipments of TRU waste
- Complete 50 percent of West Access Road
- Complete removal of a cumulative 13M

# DOE/EM CY2022 Waste Management Priorities (cont.)

## Projects

through Tank-Side Cesium Removal

earring waste containers at the Idaho

buried waste remediation at Idaho

: Savannah River.

ctivity U-233 inventory at Oak Ridge.

os transuranic (TRU) waste removal

from Los Alamos to WIPP.

Drift Mining at WIPP.

1M tons of material from the Moab Site.

## **Priority #2: Execute Key Cleanup**

***Waste Management is also a key co***

- Disposition 1 million pounds of hazardous waste
- Complete demolition of the X-326 Building at the Ohio (debris going to onsite disposal)
- Complete demolition of ancillary support buildings at the Main Plant Processing Building at Project in Western New York.
- Begin demolition of the TCC and EMA Security Site.
- Begin demolition of Building B251 at Laboratory in California.
- Complete remediation of the D1G Ditch Site in New York.

# DOE/EM CY2022 Waste Management Priorities (cont.)

## Projects (cont.)

### Component of these:

removal of hazardous refrigerant from Paducah.

Removal of asbestos abatement building at Portsmouth Site in Piketon

.

Removal of support facilities and begin demolition of the West Valley Demonstration

Removal of AD facilities at Nevada National

Removal of Lawrence Livermore National

Removal of Rich Area at Naval Reactors' Kesselring

- DOE's Radioactive Waste Management current "tiered" policy on treatment, storage, and disposal is as follows:  
*DOE waste shall be treated, stored, disposed of at the site where the waste is generated or at another DOE facility. If DOE capabilities are limited, exemptions may be approved to allow for the storage, treatment, or disposal of LLW/MLLW at other sites.*
- Waste disposal is always fully protective of the environment and in compliance with all applicable requirements, with necessary permit(s) for each specific waste.
- Sufficient LLW/MLLW disposal capacity and facilities to support the EM cleanup program.

# Disposal Considerations

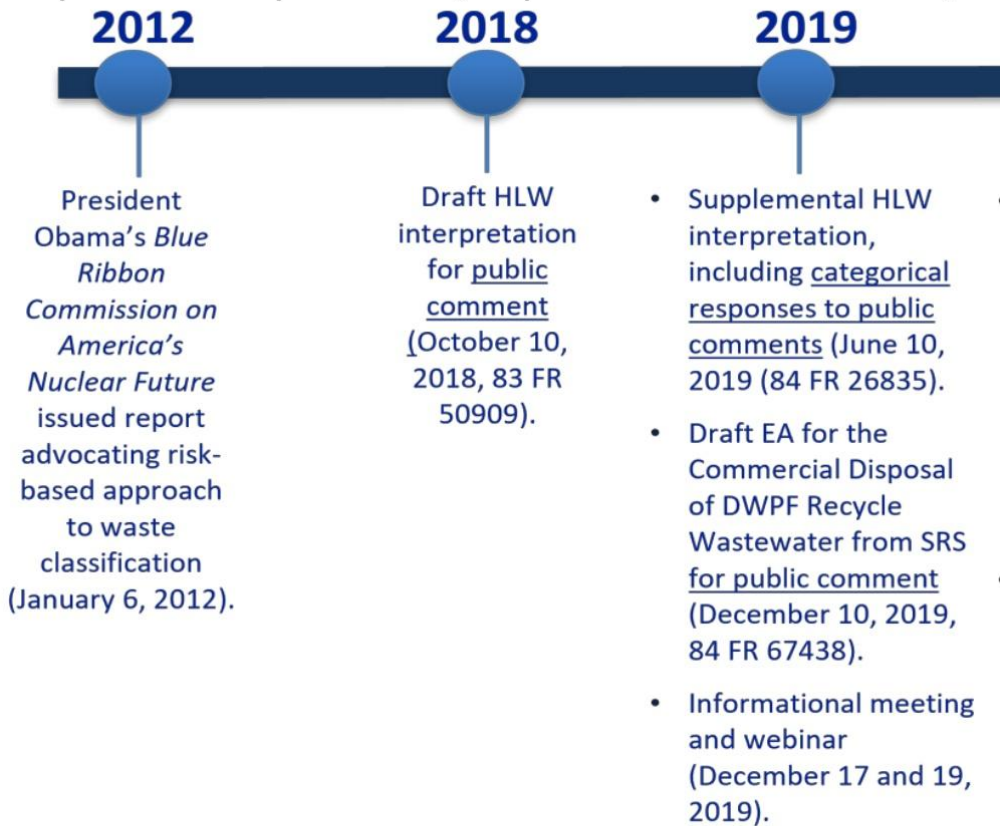
10 CFR Part 61, Subpart B, Appendix A, Section 1.1 of the 10 CFR Part 61 Manual (M435.1-1) has the following requirements for storage, and disposal:

*and in the case of low-level waste, waste is generated, if practical, or at facilities are not practical or cost effective, low use of non-DOE facilities for the DOE radioactive waste ...*

10 CFR Part 61, Subpart B, Appendix A, Section 1.1 of the 10 CFR Part 61 Manual (M435.1-1) has the following requirements for storage, and disposal: (1) protection of worker and public health and the environment; (2) applicable Federal, state, and local laws, regulations, license(s), and approval(s) for the disposal of radioactive waste.

10 CFR Part 61, Subpart B, Appendix A, Section 1.1 of the 10 CFR Part 61 Manual (M435.1-1) has the following requirements for storage, and disposal: (1) protection of worker and public health and the environment; (2) applicable Federal, state, and local laws, regulations, license(s), and approval(s) for the disposal of radioactive waste.

- Current efforts focused on completion of National Stream, i.e., *Draft Environmental Assessment for Contaminated Process Equipment* (DOE/EA-2154) comment ending February 4, 2022.
- DOE also issued a Federal Register Notice on De
- DOE is proceeding deliberately with proactive interpretation process (key milestones below).





# Level Radioactive Waste (HLW) Interpretation

Final Environmental Policy Act Analysis of 2nd Waste  
*for the Commercial Disposal of Savannah River Site*  
 (86 FR 72217), issued December 21, 2021, for 45-day public

comment period ending December 21, 2021, affirming its HLW interpretation.  
 DOE conducted stakeholder engagement throughout the HLW





- U.S. Nuclear Regulatory Commission July 2019 that analyzed:
  - 1) which GTCC waste streams could be
  - 2) what type of regulatory changes should GTCC waste present a hazard such that it be delegated to an Agreement State.
- NRC staff submitted recommendations on the path forward for the update *Requirements for Land Disposal of High-Level Waste* to consolidate rulemaking with draft R
- DOE continues to monitor NRC development of the 2005 requirement to “await action

# Less-than-Class C (GTCC) Low-Level Radioactive Waste Disposal

the Commission (NRC) issued draft Regulatory Basis in

1) how can waste be safely disposed in a near-surface facility;

2) what other options could be considered; and 3) does disposal of that waste require that NRC should retain authority or

submit recommendations to the Commission in October 2020 to amend 10 CFR Part 61, *Licensing of Radioactive Waste*, and whether to issue a new Regulatory Basis.

under the Energy Reorganization Act of 1974 and the Energy Policy Act of 1992 by Congress."

# OFFICE OF ENVIRONMENTAL MANAGEMENT

- Total number of TRU waste
- Total shipments (as of 3/19)
- FY 2022 Priority: Ramp up
- Remains a cornerstone of D



# National TRU Program (NTP) Priorities

e sites cleaned up to date: 22  
 (10/2022): 13,060 traveling over 15.6 million miles.  
 shipments to ~10 to ~12 per week.  
 DOE's ongoing cleanup efforts.



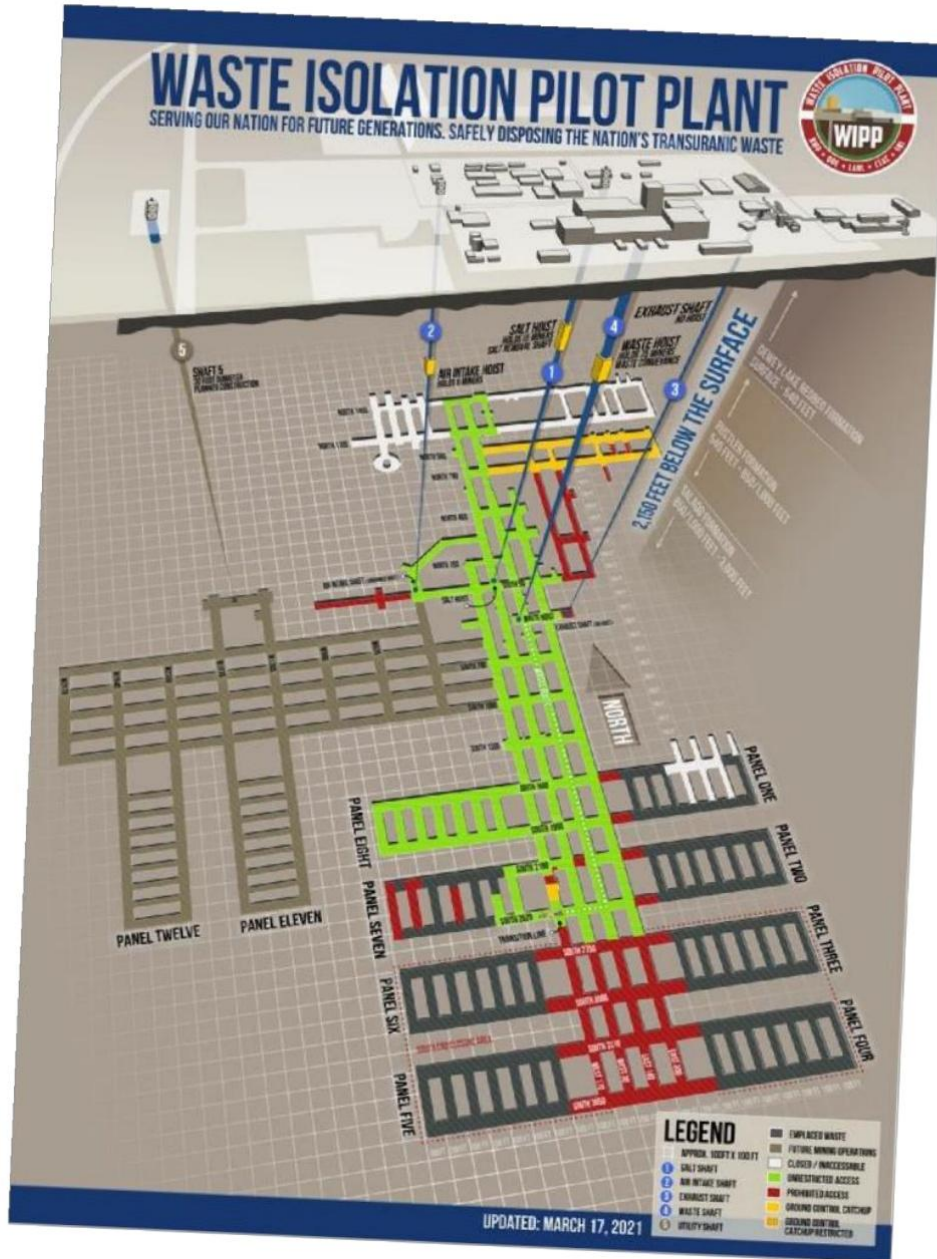
- **Worker Safety:** Initiated routine operation of the 700-C ventilation in January 2022; supports ground control and increased workforce safety.
- **Mine Capacity and Waste Emplacements:** Completed Panel 8 mining – outfitting and certification underway; continuing to optimize waste shipments to meet generator site cleanup goals.
- **Upgrade Infrastructure:** Progress continues on safety significant confinement ventilation system; utility shaft; and numerous general plant projects to upgrade WIPP facility infrastructure and plant systems.

# Waste Isolation Pilot Plant (WIPP) Priorities

Control

Waste

Quality



### Hanford Site

- Onsite LLW/MLLW and Naval Reactors LLW
- Integrated Disposal Facility awaiting commissioning (onsite vitrified low-activity waste and LLW)

- All waste is disposed in accordance with applicable regulations (see the list of sites below for examples).

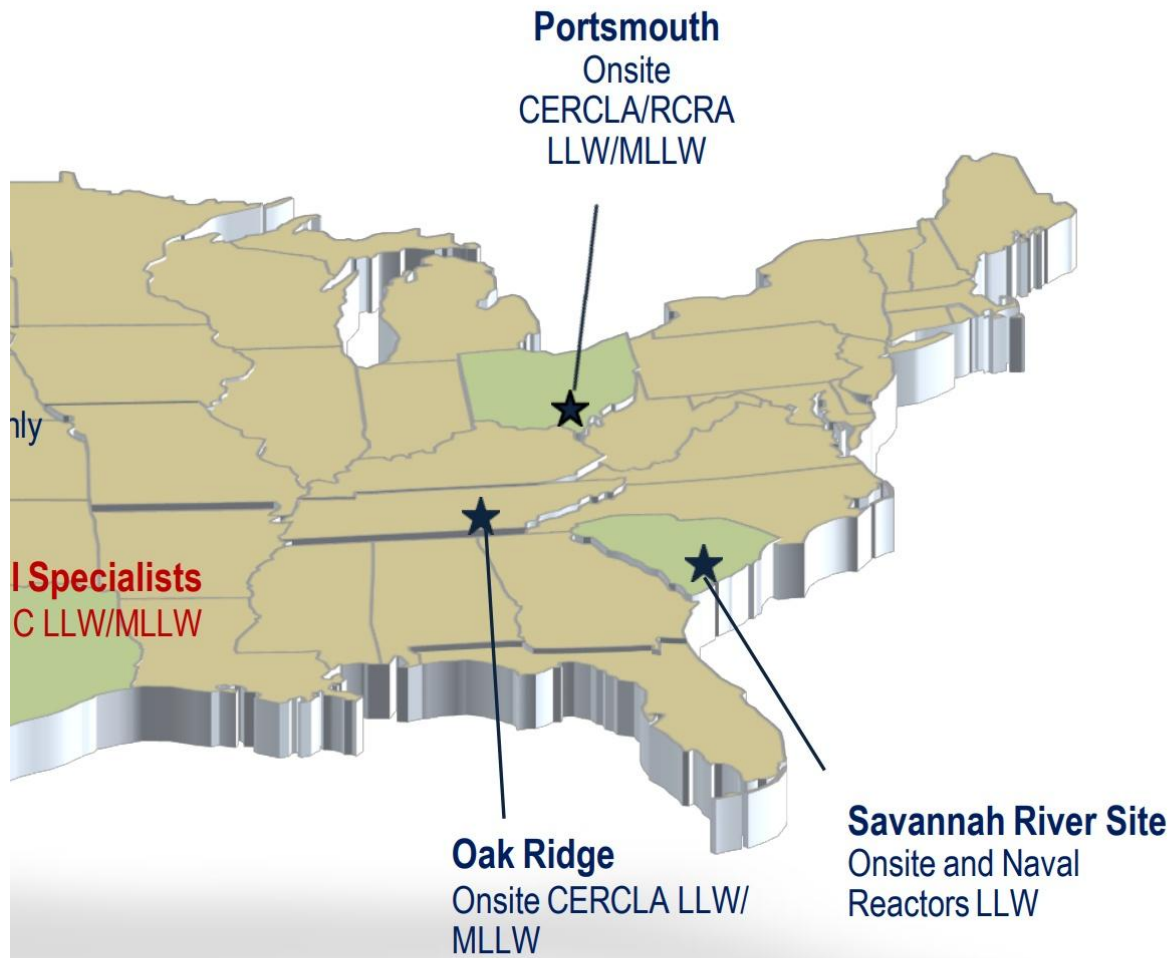


★ DOE Disposal Facility      ■ Commercial Disposal Facility  
 CERCLA – Comprehensive Environmental Response, Compensation and



# DOE & Commercial LLW Disposal Facilities Used by DOE

in accordance with each waste disposal facility's WAC. DOE is authorized to dispose of specific waste types (see map)



Liability Act; RCRA – Resource Conservation and Recovery Act



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MANAGEMENT

- Inventories of depleted uranium (DU) at the DOE's conversion facilities at Paducah sites, resulting from commercial conversion facilities.
- DOE's near-term plan is to focus on commercial sites:
  - Waste Control Specialists (WCS) is currently managing DU oxide at the site.
  - EnergySolutions of Utah is preparing for commercial conversion.
- DOE successfully completed a pilot project to transport 100 cylinders of DU oxide to disposal at the site.
- Disposal rate/timing is dependent on funding. The current approved included "an additional \$100 million for 100 cylinders."

# Depleted Uranium Oxide

DU oxide are stored at DOE's Portsmouth  
conversion of legacy DU hexafluoride at

DU oxide disposal at approved

currently licensed.

g a license application.

shipment of one railcar containing six  
WCS in September 2020.

in appropriations, FY22 budget recently  
5M for treatment and shipping of

- DOE implements *Atomic Energy Act Radioactive Waste Management*, a
- LFRG oversees DOE 435.1 requiremen
- LFRG recently reviewed technical k  
(Analysis) at Hanford and Idaho.
- FY 2021/2022 reviews are ongoing  
(Burial Grounds Performance Asse

At the Portsmouth  
On-Site Waste  
Disposal Facility,  
placement  
operations  
continue as a  
landfill compactor  
compresses debris  
from the X-326  
demolition project.



# Low-Level Waste Disposal Facility Federal Review Group (LFRG)

...ct in part through DOE Order 435.1,  
and the associated Manual.

...nents for DOE's LLW disposal facilities.

...basis documents (e.g., Composite

...;/planned at LANL (Area G), Hanford  
...ssment), and SRS (E-Area).





- Safely conducted more than 4,000 hazardous materials shipments.
- Trained 1,031 first responders in 67 courses through the Transportation Emergency Preparedness Program (TEPP).
- Completed 57 Packaging Certification Program docket.



Office  
Ric

**\*Projected year-end numbers for FY 2021**

# FY 2021 Packaging and Transportation Highlights



loading TN RAM transportation cask containing Oak Ridge National Laboratory LLW at Nevada National Security Site Area 5



- Managed by EM/HQ personnel; coordi
- Data call to all DOE sites occurs in the
- Compiled data provided to Florida Inte  
Waste Information Management System
- WIMS provides stakeholder accessible
- Current WIMS forecast data for NNSS (

  - FY 2022 – 0.79 million ft<sup>3</sup>
  - FY 2023 – 0.75 million ft<sup>3</sup>
  - FY 2024 – 0.78 million ft<sup>3</sup>

- Site inputs represent planned and bud  
September 2021.
- Out-year data reflects uncertainty due  
budget process, DOE priorities.



# HQ Baseline Disposition Data

minated with other DOE programs.

first quarter of each fiscal year.

ernational University for entry into EM  
m (WIMS).

forecast data by fiscal year.

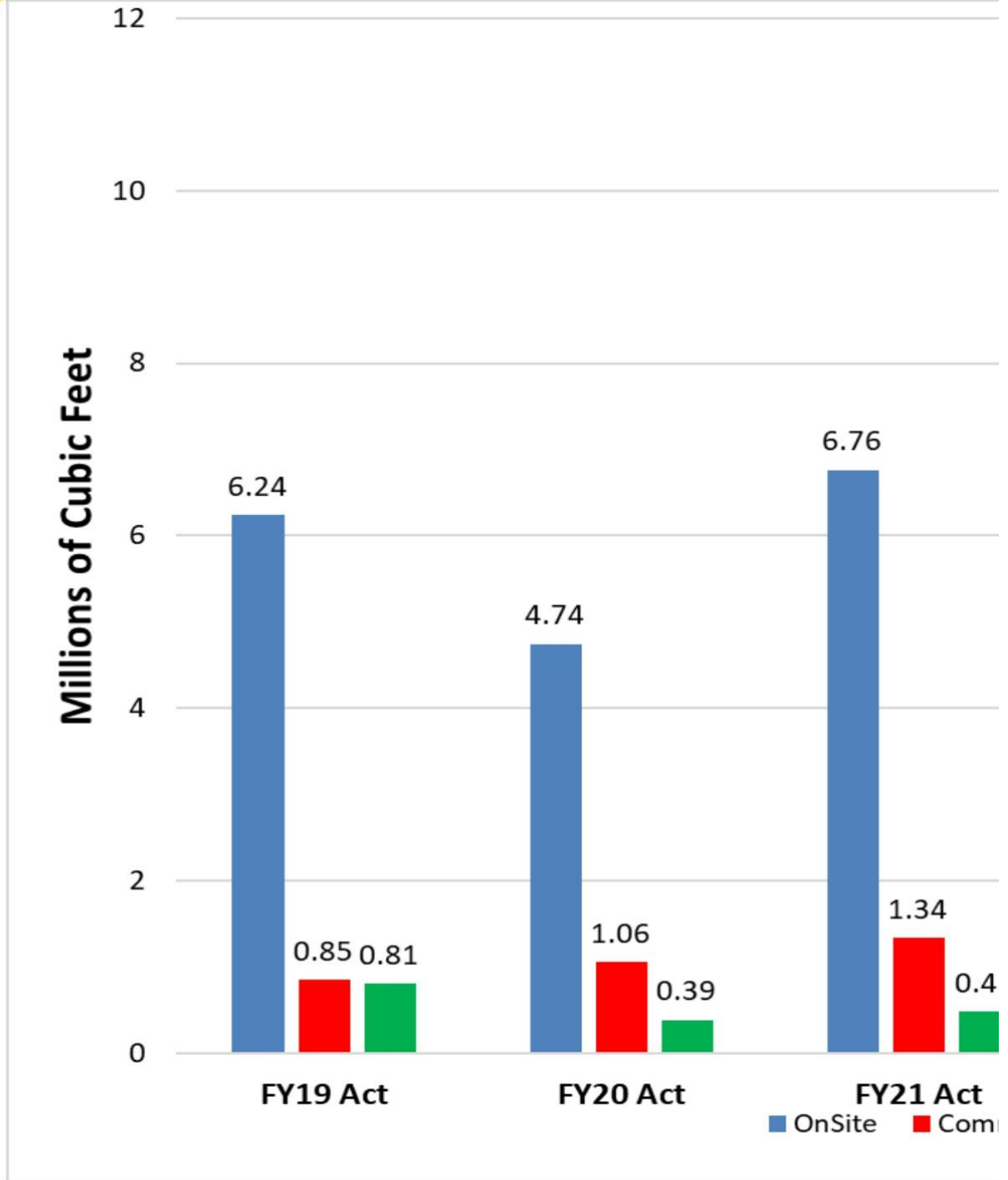
disposal:

geted program activities at the end of

to site funding adjustments, federal

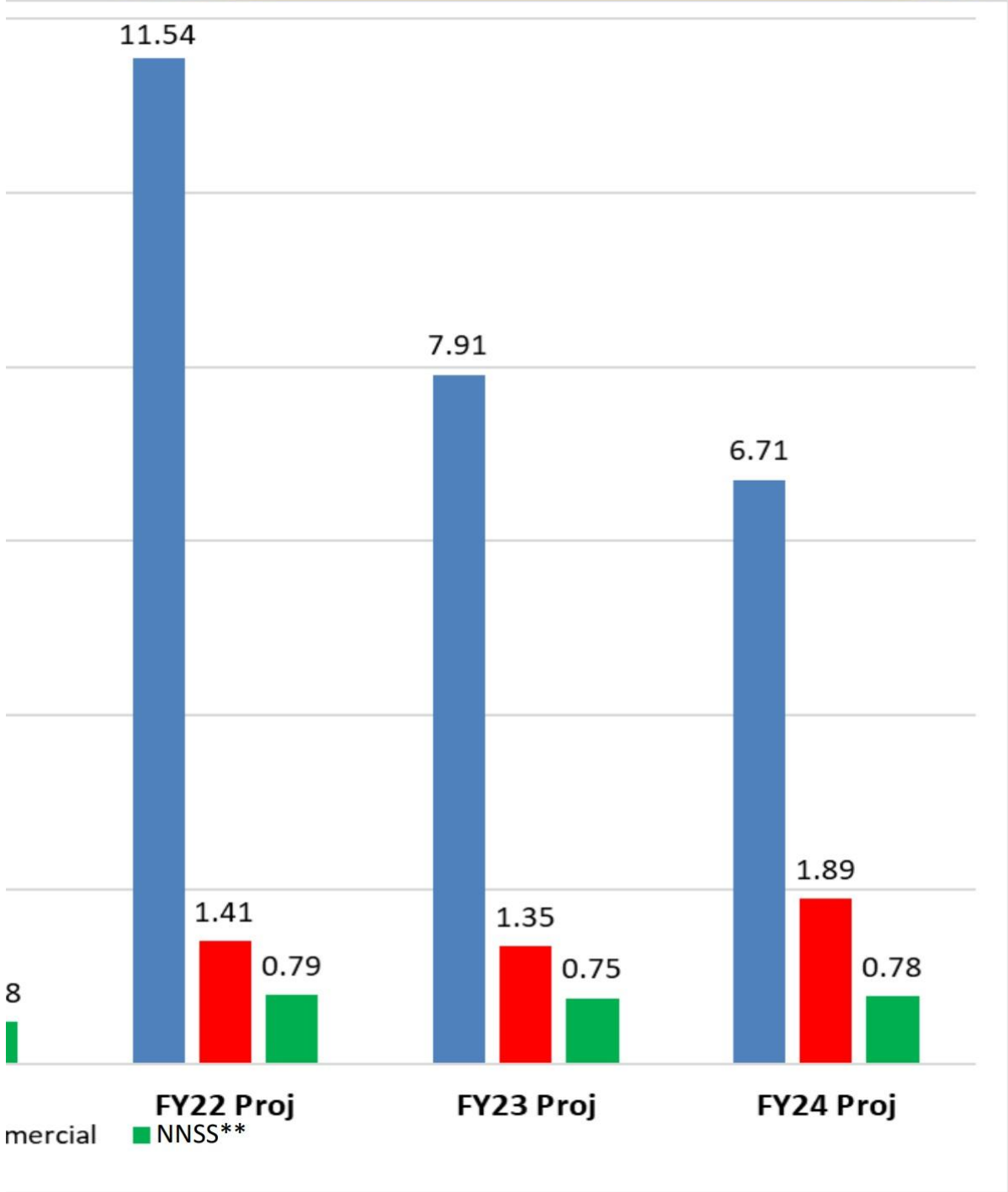
OFFICE OF ENVIRONMENTAL MANAGEMENT

# Complex-wide (MLLW) Disposal



\*\*\*"NNS" represents waste generated outside of Nevada that was disposed

# LLW/Mixed Low-Level Waste Volume by Disposal Location



ed at NNSS



## **Video of a Shipment to Site, Onsite Waste**

# Onsite Waste Disposal Facility at Piketon, Ohio

## DOE/EM's Portsmouth Waste Disposal Facility

**Special Nuclear Materials & Spent Nuclear Fuel**  
\$ 508M / 7%

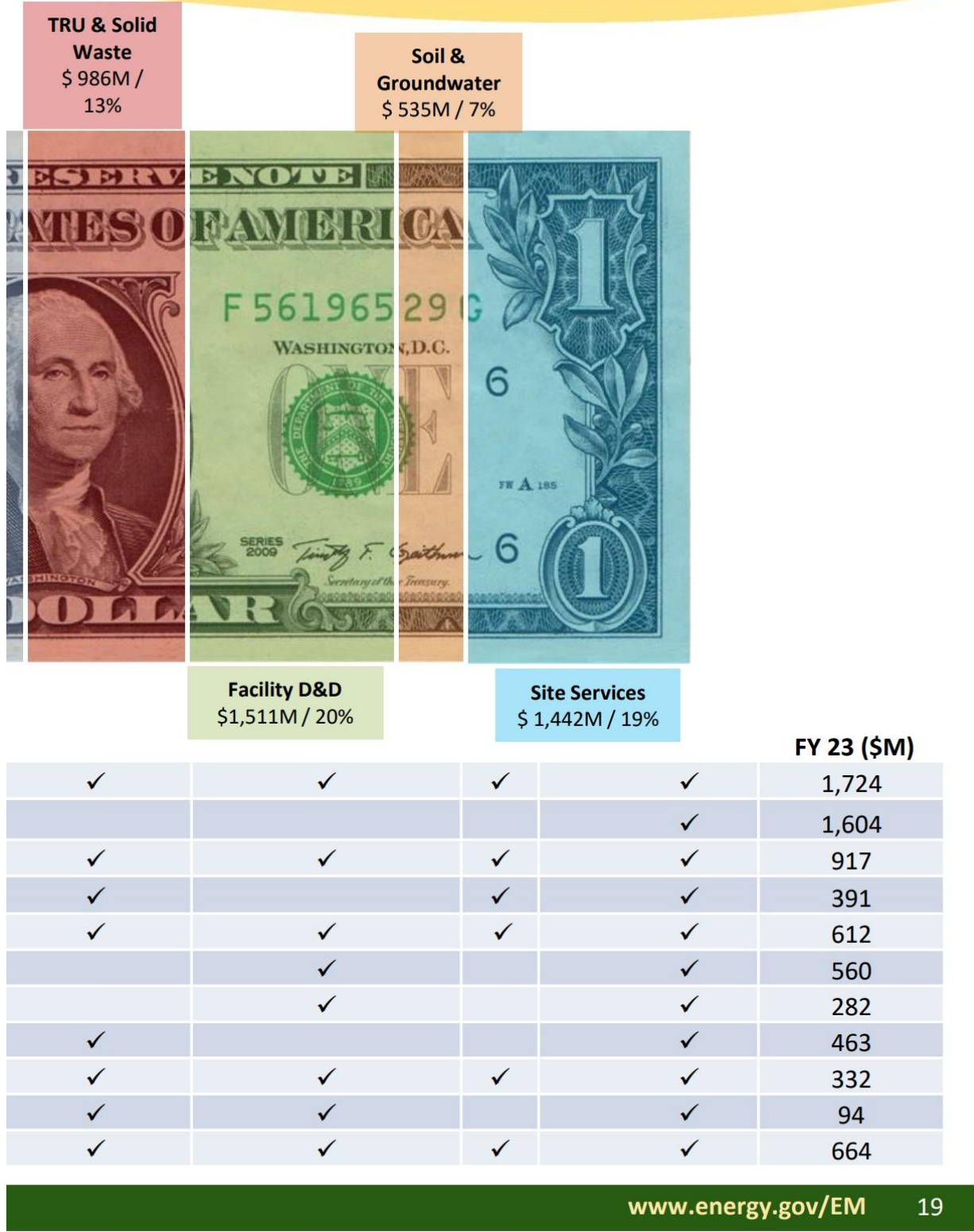


**Radioactive Tank Waste**  
\$ 2,661M / 35%

**EM Sites**

Savannah River	✓	✓
River Protection		✓
Richland		
Idaho	✓	✓
Oak Ridge	✓	
Portsmouth	✓	
Paducah	✓	
Carlsbad		
Los Alamos		
West Valley		
All Others		

# FY 23 Congressional Budget Request \$7.643B









# Southwest Research Institute®

*Benefiting government, industry, and the public through innovative science and technology*

Miriam R. Juckett  
Senior Program Manager  
April 2022

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## SwRI Core Values

- **Integrity:** Fulfilling our mission and serving our clients with excellence, honesty, and accountability.
- **Innovation:** Solving problems and creating value with novel ideas and multidisciplinary collaborations.
- **People:** Fostering an employee-centric culture in a safe, inclusive, healthy, and supportive workplace.
- **Stewardship:** Caring for our communities and protecting the environment now and for the future.


INTEGRITY	PEOPLE
INNOVATION	STEWARDSHIP

SOUTHWEST RESEARCH INSTITUTE

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## SwRI in the 1950s

- Nonprofit
- 1947 Tom Slick signed charter
- Initial budget <\$100,000
- Fewer than 20 employees
- 64 projects in the first year
- By 1958
  - Revenue exceeding \$4.5 million
  - 437 employees



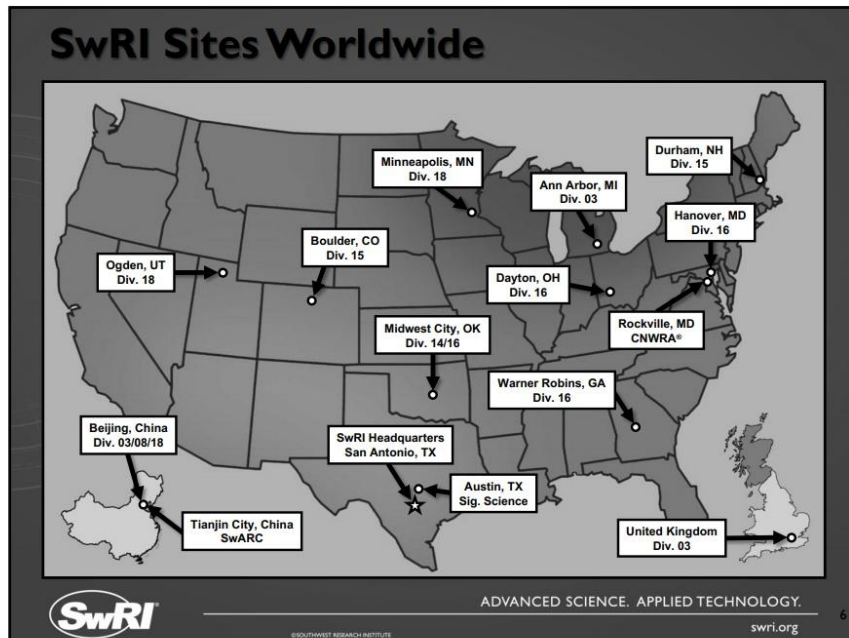
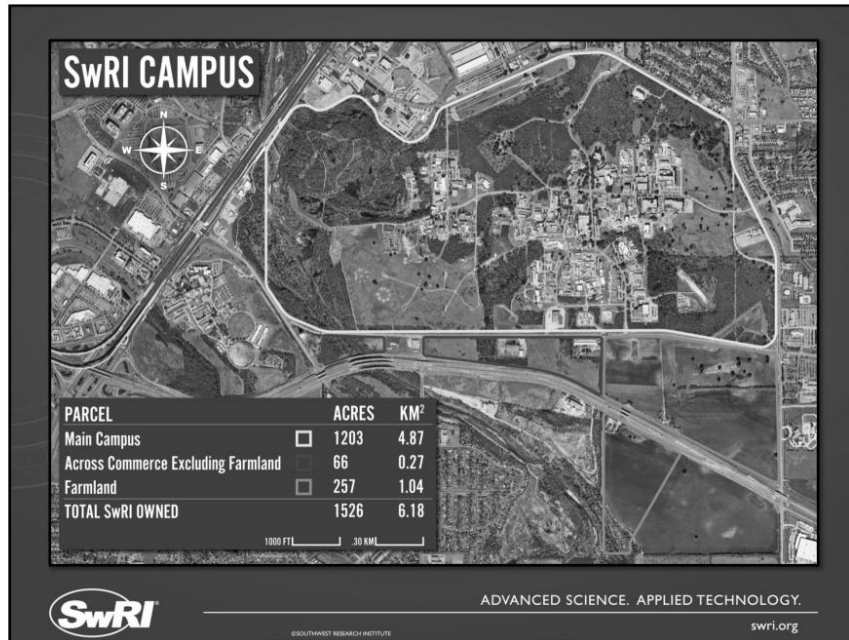
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## SwRI Today



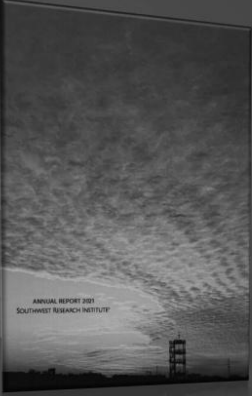
- Nonprofit
- More than 2,700 employees
- More than 1,500 acres /6.1 km<sup>2</sup> facility in San Antonio, Texas
- More than 2.3 million ft<sup>2</sup> / 214,000 m<sup>2</sup> of laboratories, workshops & offices
- More than 1400 patents
- 50 R&D 100 awards

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## Operational Characteristics


- Nonprofit
- Revenue from contracts
- Applied RDT&E services
- Physical sciences & engineering
- Broad technological base
- Capital-intensive operation
- Internal Research program
  - \$8 million in FY 2021
  - 98 projects



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## SwRI in the Technology Spectrum



Universities, National Labs

Southwest Research Institute

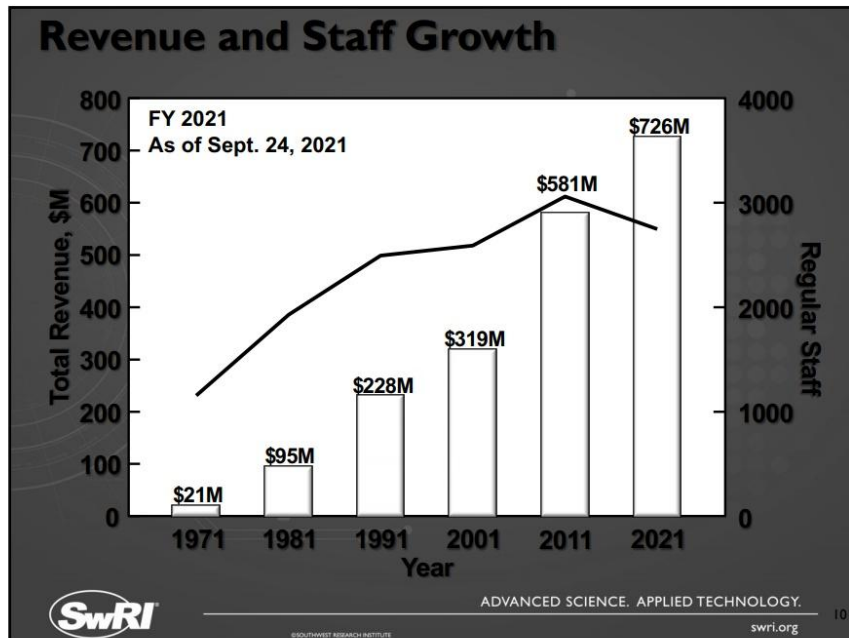
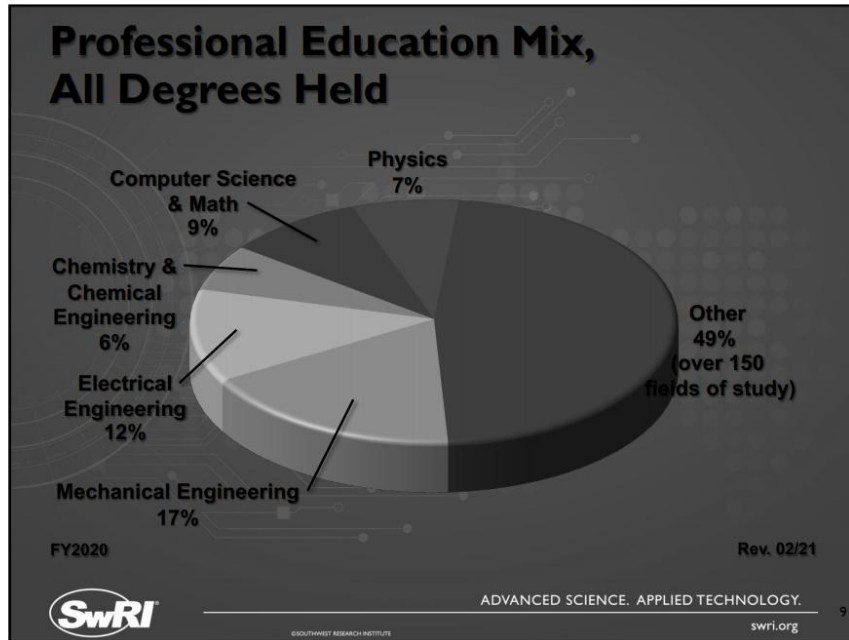
Industry

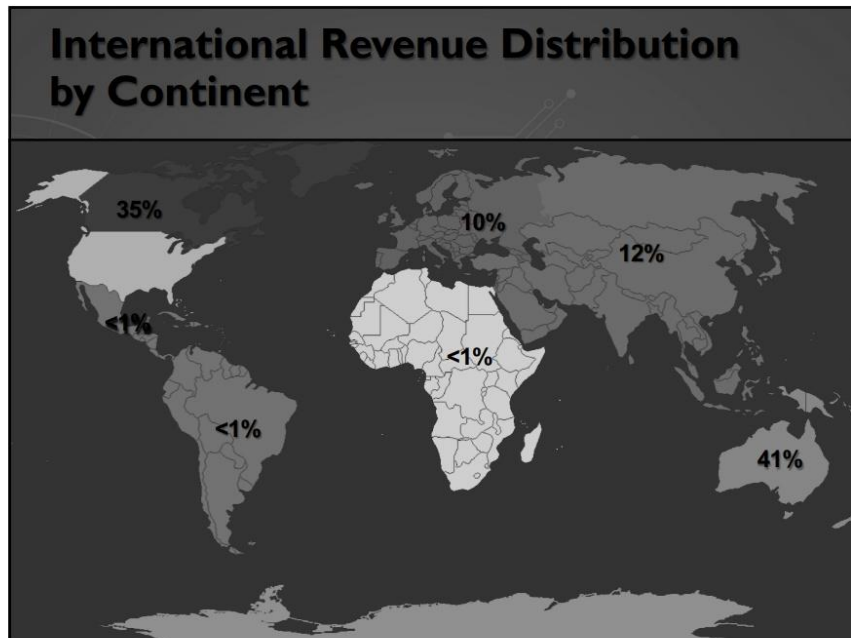
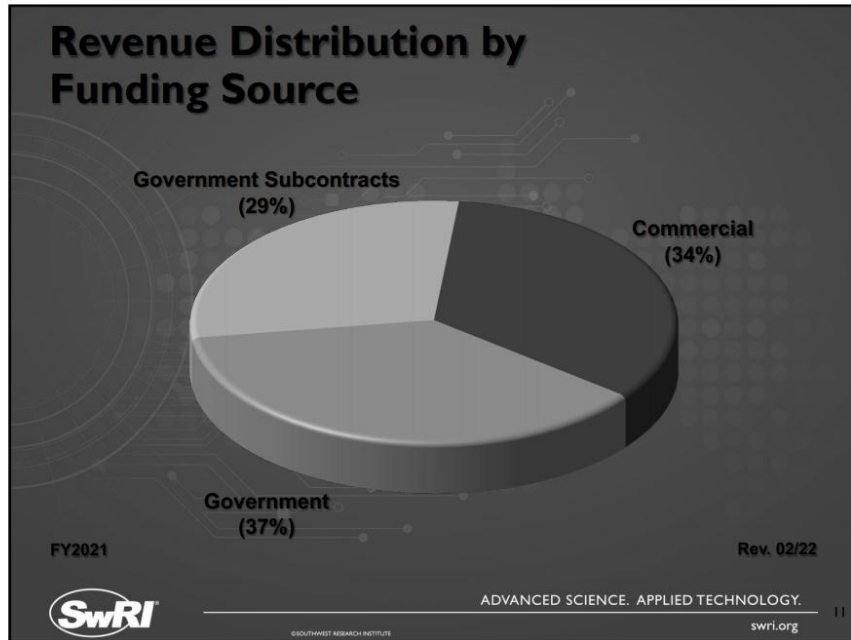
← Bridging the Technology Spectrum →

Fundamental Science   Basic Research   Applied Research   Product Development   Production

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## 2021 Internal Research & Development Program

- Turning Innovative Ideas into Advanced Technologies
- 98 New Internal Research Projects
- Expenditure – More than \$8M

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## SwRI R&D Organizations


- Applied Physics
- Applied Power
- Chemistry and Chemical Engineering
- Defense and Intelligence Solutions
- Fuels and Lubricants Research
- Intelligent Systems
- Mechanical Engineering
- Powertrain Engineering
- Space Science and Engineering
- Center for Nuclear Waste Regulatory Analyses - FFRDC

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## Market Segments We Serve



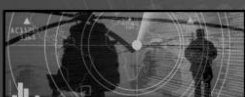
**Automotive  
& Transportation**




**Biomedical  
& Health**




**Chemistry  
& Materials**




**Defense  
& Security**




**Earth  
& Space**




**Electronics  
& Automation**



**Energy  
& Environment**



**Manufacturing  
& Construction**



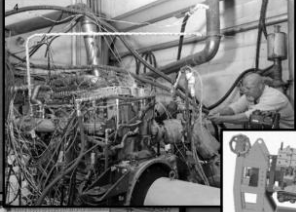





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## Automotive & Transportation

▪ Aerospace ▪ Automotive ▪ Fuels & Lubricants ▪ Locomotive



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## Biomedical & Health

- Biomedical Devices
- Computational Biomedicine
- Food Safety
- Pharmaceutical Development
- Human Performance

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## Chemistry & Materials

- Chemical Engineering
- Fire
- Materials
- Analytical
- Corrosion
- Surface Coatings

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## Defense & Security

- Blast & Impact
- Defense Aerospace & Aircraft
- Software Electronics & Cyber Technology
- Unmanned Systems


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## Earth & Space

- Earth Science
- Space Research & Technology

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## Electronics & Automation



- Computational Modeling & Simulation Tools
- Electronics
- Machine Learning Technologies
- Software
- Robotics

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## Energy & Environment



- Environment
- Machinery
- Oil & Gas
- Power Generation & Utilities
- Battery Technology

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## Manufacturing & Construction

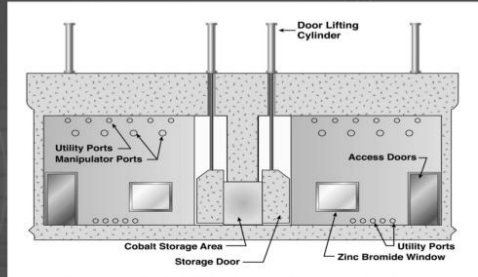
- Manufacturing Technologies
- Reliability Engineering Services
- Standardized Testing
- Structural Integrity
- Performance Assessment

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## Radiological Facilities and Projects

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## Radiation Testing and Off-Site Source Recovery Program



SwRI has a High-Level Radiation-Effects Facility that provides clients with high-intensity gamma radiation for research and testing. This facility consists of two irradiation cells that can be used for studying radiation effects on equipment, animals, plants, and food. With a Specific Radioactive Materials License issued by the Texas Department of State Health Services, we can possess, use, and store Category 1 and 2 Cesium and Cobalt sealed sources to support the Off-Site Source Recovery Program to remove excess, unwanted, or disused radioactive sealed sources that pose a potential risk to national security, health, and safety.

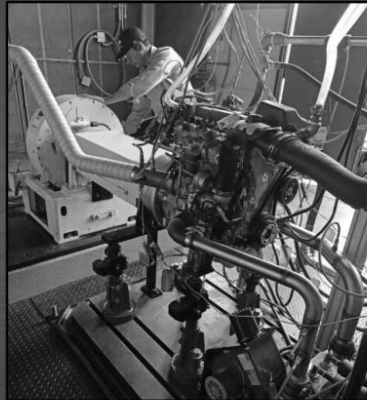


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## Radioactive Tracer Capabilities



- Used for highly accurate real-time wear measurements for engine components




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26


## Radiochemical Analysis Services



- **Alpha Spectrometry:** Identifies and measures alpha particles emitted by radionuclides during decay
- **Gamma Spectrometry:** Identifies and quantifies gamma-emitting radionuclides
- **Liquid Scintillation Counting:** Quantifies low energy beta particles emitted by radionuclides
- **Gas Flow Proportional Counting:** Quantifies alpha and beta particles emitted by radionuclides
- **Inductively Coupled Plasma – Mass Spectrometry (ICP-MS):** Measures most elements in the periodic table, including individual isotopes

▪ *Radioactive materials and constituents are understood through radiochemistry. To meet growing concerns about the radioactive levels in mixed wastes and other types of samples, we have a dedicated facility to identify and quantify more than 400 isotopes. With a Broad Scope Radioactive Materials License issued by the Texas Department of State Health Services, we can possess, use, and store any radioisotope (atomic numbers 1 through 110) in any physical form, as long as the total activity of the sample does not exceed 1 millicurie per gram. This unique, open-ended license allows SwRI to receive many samples that ordinary laboratories cannot handle. We provide environmental analysis, radioactive tracer studies, nuclear medicinal analysis, and method development.*

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## Center for Nuclear Waste Regulatory Analyses (CNWRA)

- Established in 1987 by U.S. Nuclear Regulatory Commission (NRC) as a Federally Funded Research and Development Center (FFRDC)
- Chartered to assist NRC with Yucca Mountain licensing review
- Significant support for NRC Safety Evaluation Report
- Independent testing and analysis on behalf of NRC
- Environmental adoption review and supplement support





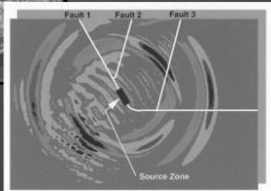

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
## Evaluating a Geologic Repository

- **Safety, Environmental, & Regulatory**
  - Transportation
  - Waste handling failure modes
  - Geomorphology/Geology
  - Seismology
  - Volcanology
  - Hydrology
  - Geochemistry
  - Corrosion
  - Biosphere (Health Physics)
  - Performance Assessment
- **Laboratory, Field, Modeling**



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## Recent Work on Low-Level Waste

- Dose calculations to support NRC technical basis document on disposal of greater-than-Class C (GTCC) and transuranic (TRU) waste under 10 CFR Part 61
  - Acute and chronic doses under intruder and accident scenarios; CNWRA-developed BDOSE™ (ADAMS ML19192A200)
  - Offsite groundwater pathway dose; GoldSim® (ADAMS ML19191A019)
- Insights into how the radiological properties of various GTCC waste streams and exposure scenario considerations may affect required compliance demonstrations for disposal of GTCC waste streams

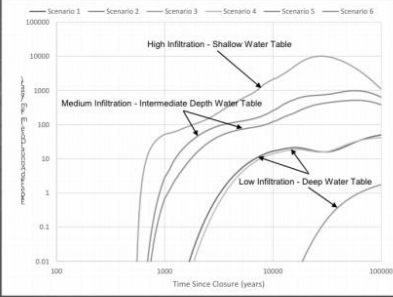




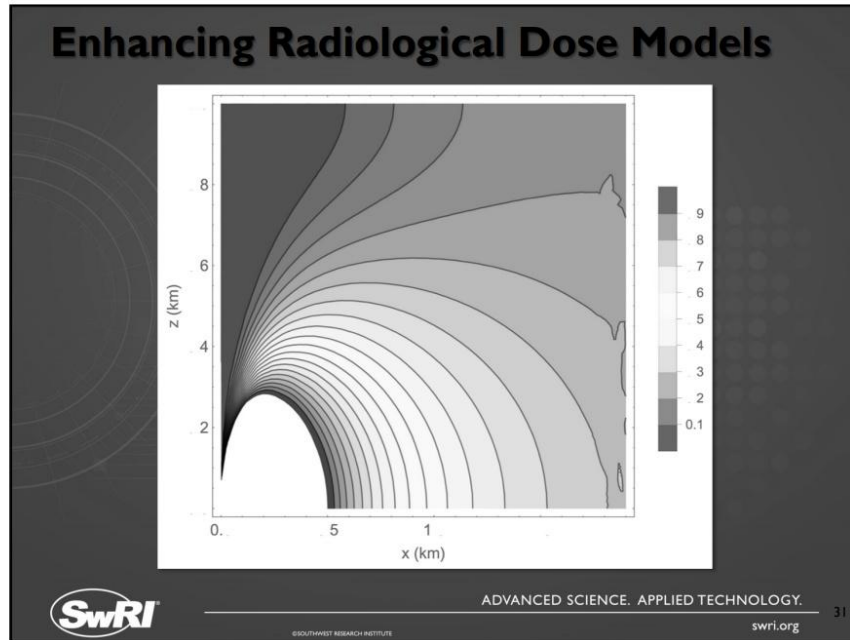
Figure 5. Expected annual dose versus time from all waste streams being disposed in a single disposal cell.



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### Work on Wastes Incidental to Reprocessing



- Many years of technical assistance for NRC's consultation and monitoring role with respect to DOE non-high-level waste determinations at legacy sites
- Technical reviews of reports on tank cleanup and closure, as well as saltstone waste disposal, with emphasis on compliance with 10 CFR Part 61 performance objectives
- Independent research on cementitious material physical behavior and grout waste form performance (e.g., Tc-99 leaching from saltstone)


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## Baseline and Operational Monitoring


- MCNP shielding and criticality analyses for anticipated operations
- Evaluated conditions and contamination at commercial and defense program sites
- Radiological surveys from ground-based and aerial platforms
- Field sampling and laboratory analyses for gaseous, liquid, and solid effluents
- Modeled release and transport of contaminants
- Assessed airborne releases and indoor resuspension
- Calculated dose and risk for workers and the public under normal and accident conditions






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33

## Related Work Areas


- Nuclear Power Plant Safety Reviews




- Spent Fuel Storage and Transportation




- Hazard Assessment




- Fire Protection





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34

## Environmental Evaluations




- NEPA and regulatory documentation
- Site characterization
- Facilities across the nuclear cycle
  - Uranium mining and milling
  - Fuel fabrication
  - Spent fuel storage
  - Disposal
  - Reprocessing
  - Legacy sites

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## Public Outreach and Stakeholder Engagement

- Needed because of increased public scrutiny and awareness; strong influence of social media
- Concerns often related to “perceived risk”
- Need proactive, holistic approach






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## Public Outreach and Stakeholder Engagement


- Communication planning
- Identification of key stakeholders
- Effective public engagement (meetings, workshops) to collect and distribute meaningful information
- Plain-language materials explaining technical content
- Public comment response
- FAQs and recovery planning



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## Independent, advanced science and applied technology.



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**210.522.3266**  
**[www.swri.org](http://www.swri.org)**


**SOUTHWEST RESEARCH INSTITUTE®**  
Advanced science. Applied technology.



**TCEQ Certification Process for Nonparty Low-Level Radioactive Waste Import Applications**

**Ashley Forbes**  
**Deputy Director**  
**Office of Waste**  
**Radioactive Materials Division**

[ashley.forbes@tceq.texas.gov](mailto:ashley.forbes@tceq.texas.gov)  
512.239.0493



2

## Authority for Certification

- Texas Health and Safety Code §401.207(d) requires that TCEQ must certify through a written evaluation that the waste is authorized for disposal under the license.
- The TCEQ reviews applications for importation of nonparty compact waste for disposal at the Compact Waste Disposal Facility.

## TCEQ Review Process

The following items are reviewed for each import application:

- Waste classification (Class A, B, C)
- Waste volume (cubic feet) and radioactivity (curies) – no more than 30% of the initial licensed capacity
- Waste is not of international origin
- Waste meets the Waste Acceptance Criteria under radioactive material license R04100

## Waste Certification

- After certifying that the waste proposed for import meets all requirements in statute, rule and the R04100 license, the TCEQ generates a letter to certify that the waste is authorized for disposal under R04100. A copy of the letter is sent to WCS and the TLLRWDC.

## Additional information

Waste Generator Disposal Guide on TCEQ's webpage.

<https://www.tceq.texas.gov/permitting/radmat/licensing/generator-site-access#summary>



## Contracts for Nonparty Compact Waste Disposal

- In accordance with Texas Health and Safety Code Sec. 401.2456, rates and contract terms negotiated for nonparty compact waste disposal are subject to review and approval by TCEQ.

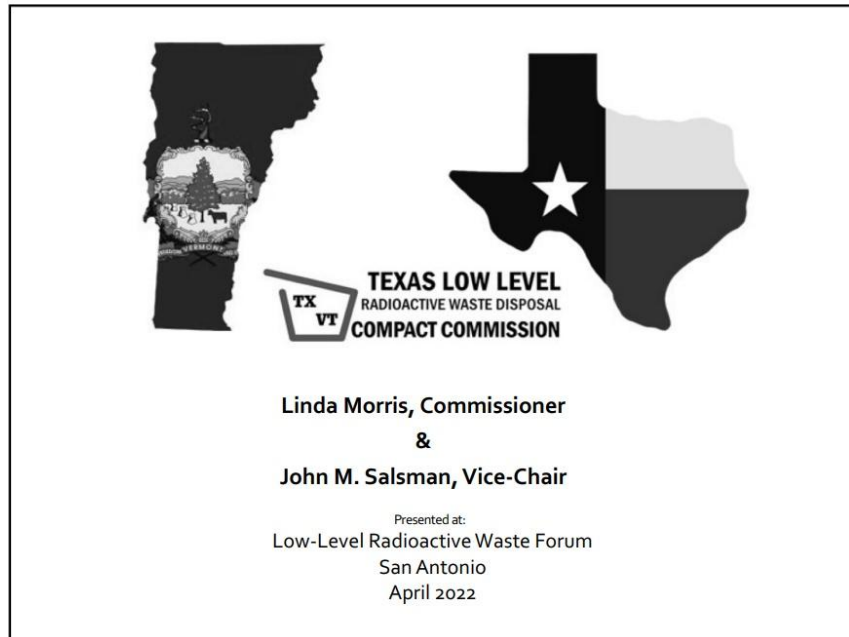


## Contracts for Nonparty Compact Waste Disposal cont.

- Negotiated rates must be set both by a price per curie and a price per cubic foot.
- Fees resulting from the negotiated rates must be greater than the compact waste disposal fees as set by TCEQ that are in effect at the time the rates are negotiated.
- A contract must:
  - Be negotiated in good faith;
  - Conform to applicable antitrust statutes and regulations; and
  - Be nondiscriminatory.

# Questions?





## Presentation Overview

- Management Rule update
- Review of Import Applications
- Review of Export Petitions

### 31 Texas Administrative Code §675.24

“Requirement to Report on the Importation of Certain Low-Level Radioactive Waste for the Management or Disposal that is not Required to be Disposed of in the Compact Facility”

- The current rule became effective on March 28, 2018
- In summary, the rule requires that persons bringing low-level radioactive waste into Texas must sign an agreement to report certain information on a regular basis to the TLLRWDCC if that material is not to be disposed of at the CWF
- Current Texas companies with agreements: 2
- The rule revision is in committee
- Informal comments have been requested with only three received
- Updated status will be presented at a future TLLRWDCC meeting

## Review of Import Applications

- Submit the application via the electronic portal
  - Help ensure applications received before deadline (35 days)
  - Prevents any mail receipt issues
- Received applications posted to Commission website and is available to the Technical Committee for review
- Technical Committee review includes:
  - General info - name, address, signature, no violations problems with Commission or other regulatory agencies, no international waste, is the application fully completed, etc
  - Is this a broker application
    - What business sector(s)

## Import Review – cont'd

- Have they requested a different disposal period
- Do the volume, Curies, and waste description make sense
- Does the request include irradiated hardware
  - If >15,000 Curies – no other waste streams and conditional approval
- Is this only sealed sources
- Where and from whom is the waste coming
  - Does the associated Compact(s) require export authorization
  - Broker – have they provided needed export authorizations generator authorizations
- Are they requesting small quantity generator status
  - Nuclear power facility waste is preempted
- Has the Commission received any comments
- If this is an amendment request, have they provided an explanation

## Review of Export Petitions

- General – Name, address, etc
  - Many are submitted by a broker on behalf of another party
- Have they indicated:
  - Where material is being sent
  - Any processing
  - Final disposal location
- Why are they requesting export
- Volume and Curies
- Export period
- Has the Commission received any comments

## What other TLLRWDC Committees might have a role in petition approvals?

- Rules Committee - as new rules or rule revisions occur
- Technical Committee – Reviews all petitions and makes recommendations to Commission (Sassman, Morris, Hurley, and Bradford). The Technical Committee also:
  - Reviews reports and other documents provided to the Commission on a regular basis
  - Conducts inquiries into possible violations of rules
  - Suggests changes to petition application to provide clarification as needed

## Capacity Committee

- The Capacity Committee is finalizing metrics for evaluating current and future capacity at the CWF
- These metrics will provide an “in-house” tool for Commission use

## Other Supporting Documents


Already presented information on the Conditional Approval  
which is a Policy

Small quantity generator (SQG) designation

Technical Position Paper on Assigning Generator

### TLLRWDC Technical Position Statement: "Establishing the Generator of Low-Level Radioactive Waste For the Purpose of Determining Party vs. Non-Party Status For the Texas Low- Level Radioactive Waste Disposal Compact"


- This document provides guidance to the Commission if there is a question as to who is the generator of the LLRW
- It is based on the concept used by the Texas Commission on Environmental Quality in its shipping document TCEQ Form 20225 to determine "original generator" as being the last person to put the material to practical use
- The document is not a rule, and is only one consideration among many when making the generator determination



<http://www.tllrwdcc.org/>

Stephen Raines, Executive Director : 512-350-6241  
stephen.raines@tllrwdcc.org






WASTE CONTROL SPECIALISTS

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## Waste Control Specialists Site Overview - 2022


Andrews, Texas

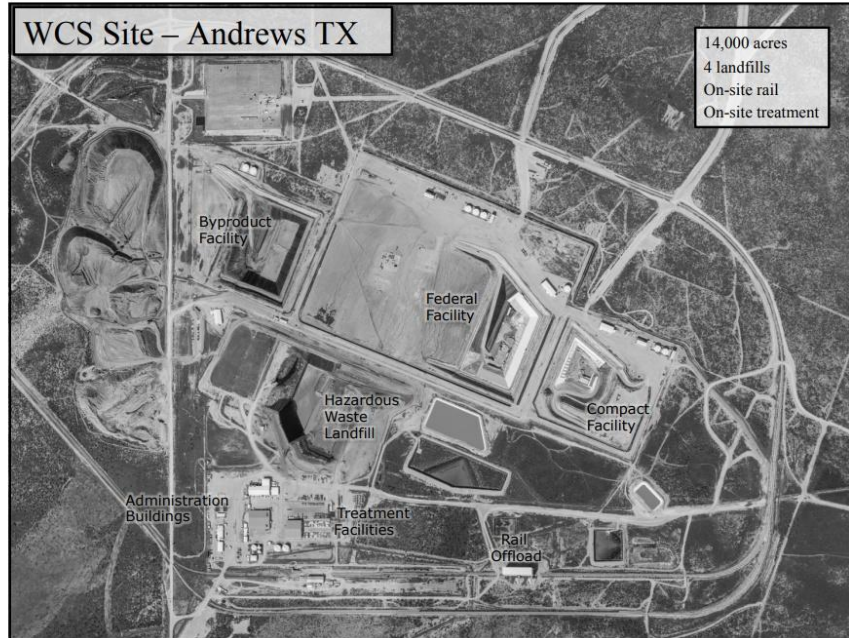


### What We Do

- ▶ Safe Disposal of Radioactive Waste
  - Class A/B/C and Mixed Low-Level Radioactive Waste (LLRW)
  - NORM and Byproduct material
- ▶ Disposal for:
  - Nuclear Power Plants
  - Industrial Customers
  - US Government (DOE, DOD, etc.)
  - Hospitals and Research Laboratories



2



### WCS Environmental Protection (vs. Generic Facility)

#### WCS Disposal

#### Other Facilities

**Key Attributes of WCS site:**

- 1) Sub-Grade Design
- 2) Natural Claystone Barrier
- 3) No viable pathway to groundwater

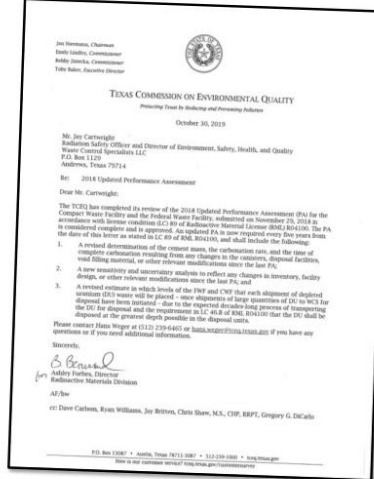
- ▶ WCS Performance Assessment examines site geology, surface water and groundwater, future weather changes, residential and intrusion scenarios, and future land uses
- ▶ Facility meets Texas regulatory requirement for protection for one million years

WCS is the Newest and Most Robust LLRW facility in the US

4

### Protectiveness - Performance Assessment – 2018 Update

- ▶ Uses sophisticated GoldSim-based modeling
- ▶ PA examines site geology, surface water and groundwater, potential future weather changes, residential and intrusion scenarios, and possible future uses of the land
- ▶ Evaluated to one million years
- ▶ Current disposed inventory has a peak dose of 0.5 millirem per year at 170,000 years from closure



### Compact Waste Facility



### CWF Disposal Capacity

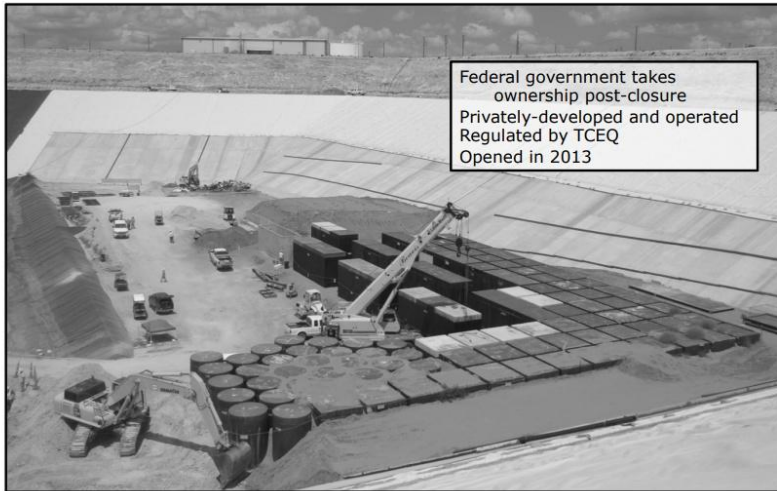
- **TX Compact Waste Facility (CWF):**
  - Opened in April 2012
  - 9,000,000 cubic feet of licensed volume
  - 475,000 cubic feet currently constructed (1<sup>st</sup> phase)
  - 236,873 cubic feet used to date (2.6% of licensed capacity)
  - Texas owns the privately developed Texas Compact Landfill
- **License Term** – through September 2024 with provision for 10-year renewals thereafter



7

7

### Federal Waste Facility



8

## FWF Disposal Capacity

- **Federal Waste Disposal Facility:**
  - Opened in June 2013
  - 26,000,000 cubic feet of licensed volume
  - 2,640,000 cubic feet currently constructed (1<sup>st</sup> phase)
  - 455,500 cubic feet used to date (1.8% of licensed capacity)
  - Also permitted for “mixed waste” (radioactive and hazardous)
  - DOE Agreement to take ownership after closure
- **License Term** – through September 2024 with provision for 10-year renewals thereafter



9

9

## Low-Activity (Exempt) RCRA Landfill



## Low Activity Radioactive Waste

### • Hazardous Waste (RCRA Subtitle C) Disposal Facility:

- Opened for hazardous in 1997, Exempt LLRW added in 2015
- 62,000,000 cubic feet of currently permitted capacity
- Currently used = 21,700,000 ft<sup>3</sup> (35% of permitted capacity)
- NRC-reviewed agreement state exemption process allows low activity waste (lowest 10% of Class A LLRW) to be disposed
- Efficient option for large-volume and low activity waste streams
- Highly cost-competitive with other alternatives
- WCS site is 14,000 acres with space for additional future cell expansion

More than **95%** of decommissioning waste qualifies for exemption



11 11

## Heavy Equipment

**WCS owns and operates high-capacity material handling equipment that has been designed and built for safe and efficient operations**

Large Components are disposed in the CWF or LAW landfills

- ▶ Jacking System – 600 ton (1,200,000 pounds)
- ▶ Goldhofer – 240 ton
- ▶ Modified Stacker – 57 ton
- ▶ Mobile Gantry Crane – 150 ton



Stacker



Jacking System



Goldhofer



12

## Transportation Casks

- ▶ The most modern and state-of-the-art casks in service
- ▶ Provides protection of the public and the environment in the event of the most severe accident scenarios
- ▶ Regulated by the Nuclear Regulatory Commission and the Department of Transportation
- ▶ WCS-160 Type B casks – 3 units
- ▶ WCS-215 Type A casks – 2 units



13

## Rail Transportation

- WCS has has the only rail line in Andrews County and operates 2 locomotives
- Rail loop encircles the entire licensed site
- 5 miles of owned rail line from site to Eunice, NM
- Rail shipments increase efficiency for large volume projects and reduce traffic on public highways



14

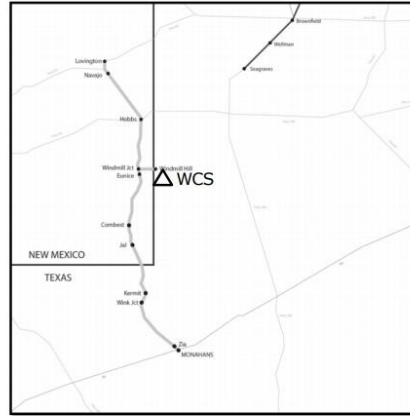
## Rail Access

### Direct Rail:


- Texas and New Mexico Railway (TXN) interchange to Union Pacific (UP) at Monahans

### Transload to Truck:

- Lubbock and Western Railway (LBWR) interchange to BNSF at Lubbock and transload at Seagraves
- WCS has the infrastructure to support transportation of heavy loads
- Rail lines upgraded to support shipments over 450,000 lbs







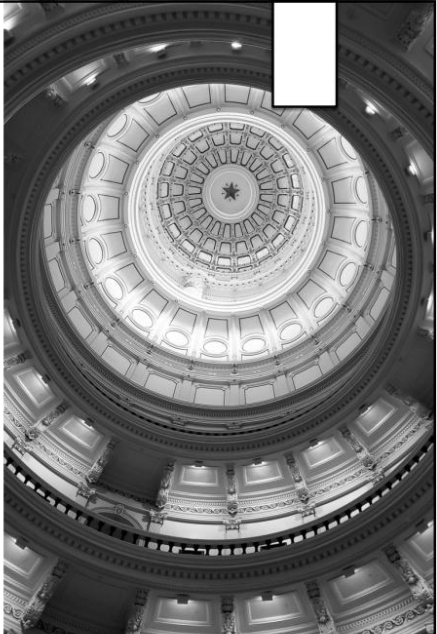
**Advocates for  
Responsible  
Disposal in  
Texas**

**LLW  
Forum**

SAN ANTONIO, TEXAS  
APRIL 6-7, 2022

**ARDT Est. 1994**

- ▶ Formed by LLRW generators to support the Texas Low-Level Radioactive Waste Disposal Authority
- ▶ Served as a platform to voice support at city, county, state, and federal levels for the development and construction of a LLRW disposal facility
- ▶ Played a major role in the public hearings on the proposed disposal facility in Sierra Blanca, TX
- ▶ Deployed highly credentialed experts to speak out on specific topics at the Texas Capitol, including:
  - ▶ Members of ARDT's Advisory Board, such as Dr. Lee Peddicord, Dr. Dale Klein, Dr. Robert Bernstein; and
  - ▶ ARDT's Student Chapter, comprised of nuclear engineering students
- ▶ Recipient of the Richard S. Hodes Honor Lecture Award from the Southeast Compact Commission

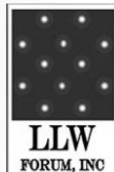


## Goals and Principles

- ▶ Support the State of Texas as it provides for the permanent disposal of LLRW
- ▶ Provide information about LLRW disposal to:
  - ▶ The general public
  - ▶ Decision-makers, including state leadership and the Texas Legislature
  - ▶ Local governments
- ▶ Guiding Principles
  - ▶ It is in the **best interest of the public** to provide permanent disposal of LLRW within a safe and technologically sound system
  - ▶ It is in the **best interest of LLRW generators** to develop a viable option for disposal with fair rates

## ARDT's Commitment

Help scientists and engineers share their expertise in radiation issues with legislators, decision-makers, local governments and the public



## Role in Licensing the WCS Compact Waste Disposal Facility

- ▶ Utilizing experts from the nuclear plants, hospitals, and health physics society, we focused on technical issues related to the Texas Commission on Environmental Quality's (TCEQ's) license conditions
- ▶ ARDT provided a coordinated technical critique on important facets, such as waste acceptance criteria
- ▶ ARDT served as a central unifying organization to analyze proposed disposal rates
  - ▶ Expert witnesses reviewed the proposed rate package with a critical eye on issues such as rate of return
  - ▶ Shared costs of experts made the review very economical

*Photo source: WCS Media Kit, wctestexas.com/media-kit/*



## Capitol Advocacy

- ▶ During legislative sessions, ARDT serves as a central clearinghouse for generators to:
  - ▶ Collaborate on policy issues
  - ▶ Analyze and develop positions on proposed legislation
  - ▶ Provide support and direction to governmental affairs teams





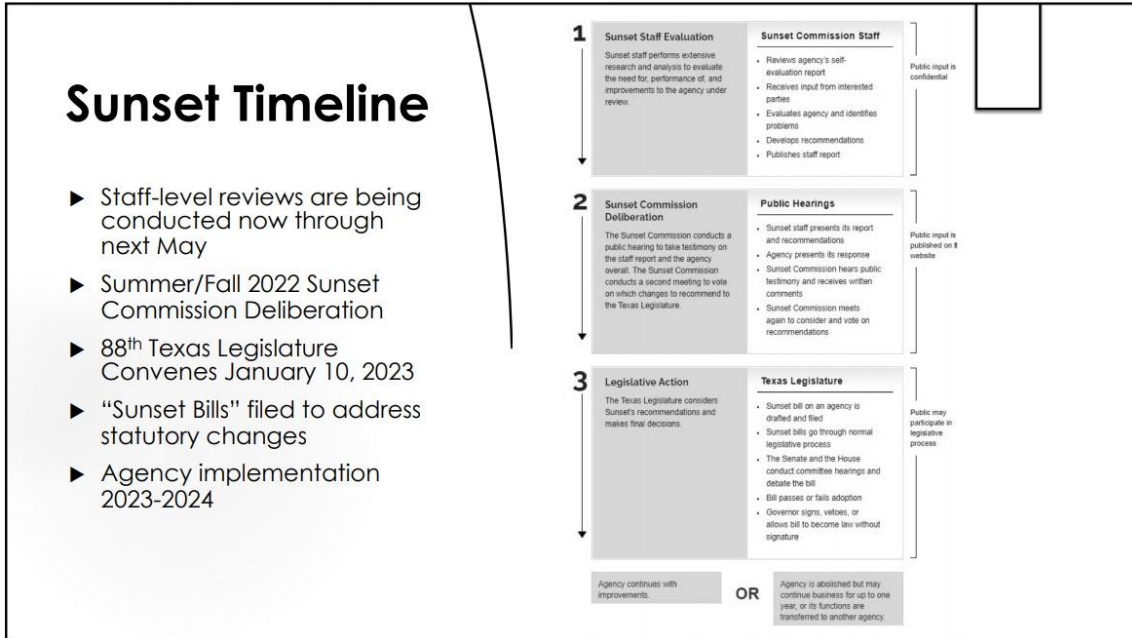
## Texas Sunset Review

- Regularly scheduled, periodic review of Texas State regulatory agencies
- Designed to make sure an agency is still needed and/or is not duplicating the functions of another agency or entity
- Overseen by a 12-member Sunset Commission (10 legislators and two members of the public)

## Why We Care

- ▶ TCEQ and the Texas Low-Level Radioactive Waste Disposal Compact Commission are both up for review
- ▶ Both agencies have elevated LLRW issues for examination
  - ▶ TCEQ's role in rate-making and disposal contracts
  - ▶ TLLRWDCC's enforcement authority and contingency plan for the WCS site
- ▶ Opportunity for stakeholders to engage
  - ▶ ARDT is a stakeholder for both agencies
  - ▶ Confidential input between now and May
  - ▶ Public comment during the Sunset Commission's deliberations this summer



# But That's Not All...

Monitoring	<p>Monitoring emerging issues at Federal and State Regulatory Agencies</p> <ul style="list-style-type: none"> <li>• NRC and DOE (LLRW Forum an indispensable resource for this)</li> <li>• TCEQ and TLLLRWDCC regulatory initiatives and WCS License amendments</li> </ul>
Partnering	<p>Partnering with Higher Education</p> <ul style="list-style-type: none"> <li>• Long-standing relationships with UT-Austin and TAMU</li> <li>• Develop a new relationship with Abilene Christian University</li> </ul>
Developing	<p>Developing Educational Materials</p> <ul style="list-style-type: none"> <li>• LLRW "Primer" in 2021</li> <li>• Focused materials on GTCC, etc.</li> </ul>

## Connect with ARDT

▶ [www.ardt.org](http://www.ardt.org)

▶ Edward Selig  
▶ Government Relations Consultant  
▶ [eselig@ardt.org](mailto:eselig@ardt.org)  
▶ 512.413.0902

▶ Brian Christian  
▶ Environmental Policy Specialist  
▶ [bchristian@ardt.org](mailto:bchristian@ardt.org)  
▶ 512.937.2490




**Advocates for  
Responsible  
Disposal in  
Texas**

**DISUSED SOURCES**  
*The Need for Proper Management and Disposition*

**Overview of the LLW Forum's  
 Disused Sources Working Group**

**Michael Klebe**  
 April 6, 20221



2

**DSWG Current Membership**

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- **Members:**

Joseph Klinger, CMCC – Chair	Earl Fordham, WA
Rich Janati, PA	John Williamson, FL
Kevin Siebert, WA	Michael Kurth, US Army
- **Organizational Liaisons**

Denny Galloway, CRCPD	Craig Little, HPS
Augustinus Ong, OAS	
- **Staff**

Dan Shrum	Michael Klebe	Cecilia Snyder
Lori Beagles		



3

## Disused Sources Working Group Origin

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- DSWG formed in 2011 at the request of the NNSA/GTRI to address the problem of disused radioactive sealed sources
  - Approximately 2 million sealed sources in use
  - Tens of thousands disused sources with no exact knowledge of number, activity, and storage security



4

## Disused Source Problem Contributing Factors

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- Life-cycle costs for managing and disposing of sources not internalized
- Inconsistent view of which sources pose a security threat
- Regulatory system inadequacies for a post-9/11 threat environment
- No financial incentive for reuse, recycle, or disposal
- Opportunities for recycling and reusing sources are underutilized
- Type B shipping container availability and cost






5

## DSWG Report

---

- Report published – March 2014
- 24 recommendations for improving the security of sealed sources
- Several recommendations have been completed
- Currently revising the priority of the remaining recommendations




REPORT OF THE DISUSED SOURCES WORKING GROUP

*A Study of the Management and Disposition of Sealed Sources from a National Security Perspective*



Low-Level Radioactive Waste Forum, Inc.  
March 2014




6

## US NRC BTP on Concentration Averaging and Encapsulation

---

- BTP provides:
  - Guidance for proper classification of waste for disposal
  - Acceptable methods for averaging radionuclide concentrations over the volume or mass of waste
- Original in 1995
- Revised in 2015:
  - Improve clarity
  - Update position on LLRW blending
  - Align the BTP with the NRC's risk-informed performance regulatory approach





7

## DSWG Report

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- Report published – May 2021
  - Evaluates the revised BTP as it relates to sealed sources
  - Describes classification process for encapsulated sealed sources
  - Provide a classification example
  - Discusses alternative approach for waste classification
  - Identifies some BTP related obstacles for sealed source disposal





8

## US NRC BTP on Concentration Averaging and Encapsulation

---

- Revised BTP does not appear to have increased the disposal of sealed sources.
- General industry consensus is the revised BTP has improved the classification process
  - Adds clarity
  - Reduced interpretation
  - Allows for the use of larger containers
  - Provides flexibility to apply the least restrictive classification




9

## Obstacles for Sealed Source Disposal

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- Type B shipping cask
  - Cost and availability
  - Commercial fleet (EnergySolutions and WCS)
  - NNSA designed
  - NAC International Optimus
- Incentive

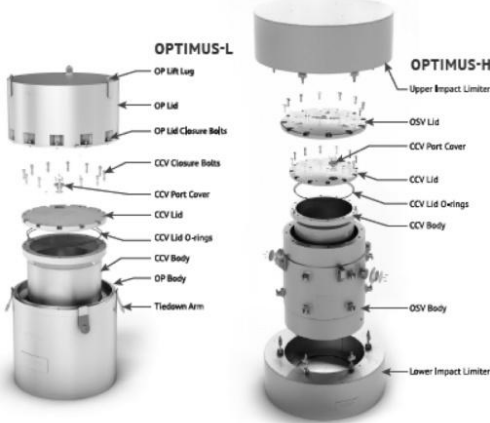



10

## NAC International Inc. – Optimus L & H

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- Cavity dimension:
  - 32.5” dia. x 47”
- Optimus L
  - 49” dia. x 70”
  - Weights:
    - Contents – 3,150 lbs.
    - Gross – 9,200 lbs.
- Optimus H
  - 74.2” dia. x 83.2”
  - Weights
    - Contents – 7,300 lbs.
    - Gross – 32,000 lbs.

11

## NAC International Inc. – Optimus L & H

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- Optimus L
  - Certificate of Compliance issued December 2021
  - 2 constructed and delivered in June 2022
  - 2 to be constructed and delivered in December 2022
  - Additional casks constructed in 2023 and 2024
- Optimus H
  - Submitted to NRC for approval
  - Certificate of Compliance anticipated in December 2022



12

## Obstacles for Sealed Source Disposal

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- Lack of an incentive for licensees to dispose of unused sources
- Not a priority for regulatory programs
- Possible options:
  - Possession limit (2-year)
  - Possession fee (annual source fee)
- Management awareness
  - Use of the inspection entrance and exit interview process
- Discussed at the Friday's DSWG meeting



## Additional Information:

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A project of the Low-Level Radioactive Waste Forum, Inc.

[www.disusedsources.org](http://www.disusedsources.org)



**DISUSED SOURCES**  
*The Need for Proper Management and Disposition*

The DWSG was formed to develop recommendations for improving the management of disused sealed radioactive sources.

[www.disusedsources.org](http://www.disusedsources.org)

Additional Resources Include:

- > Report of the Disused Sources Working Group
- > Brochures for current and prospective licensees re: lifecycle costs of sealed source ownership
- > Report on Disposition Options and Costs for Certain Radioactive Sealed Sources and Devices
- > Report on Compact Import and Export Requirements





**Experts in operational waste management and nuclear decommissioning**

**Updates for Clive and Barnwell Disposal Facilities**

presented by *Vern Rogers*  
 Director of Regulatory Affairs

*LLW Forum – Spring 2022*  
 April 7, 2022

**Fundamental Focus on Safety**



■ **Industrial**


- VPP Star - 2017
- Behavior Based/HPI
- Between 2011 & 2021, over 6.8 million hours worked without a lost-time injury
- Utah Safety Council Award of Merit
  - 2006, 2007, 2008, 2009, 2012, 2013, 2015, 2016, 2018, 2020, 2021
- Utah Safety Council Perfect Record Award
  - 2011, 2012, 2013, 2015, 2016, 2017
- Utah Safety Council 1 Million Man Hour Award
  - 2013, 2016, 2020
- Utah Safety Council Award of Honor
  - 2017, 2019
- National Safety Council Perfect Record Award
  - 2005, 2006, 2007, 2008, 2010, 2015, 2017
- National Safety Council Million Man Hour Award
  - 2006, 2008, 2013, 2017, 2020

- ALARA
- Personnel exposures very low
- 41 mrem average annual employee exposure

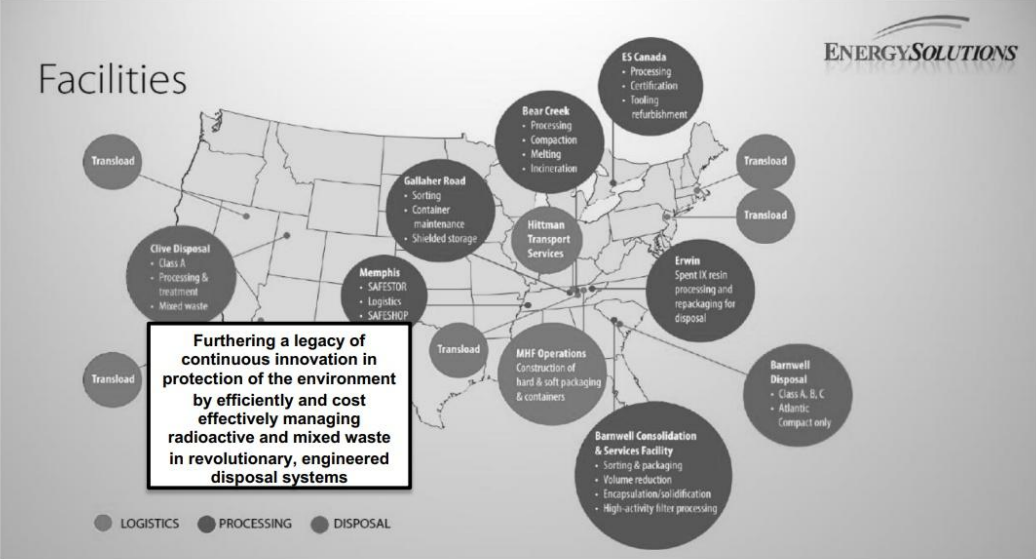


■ **Radiological**

## Broad Range of Industry-Critical Services



### Facilities





**Furthering a legacy of continuous innovation in protection of the environment by efficiently and cost effectively managing radioactive and mixed waste in revolutionary, engineered disposal systems**

● LOGISTICS    ● PROCESSING    ● DISPOSAL


3

## Logistics, Processing and Disposal







**Casks and Containers**



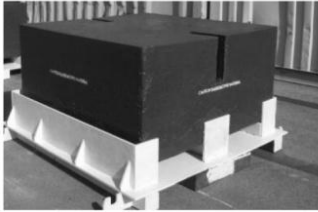
**Liquid Processing Equipment**




**Analytical Services**



**Decontamination and Decommissioning**



**Metal Melt & Beneficial Reuse**




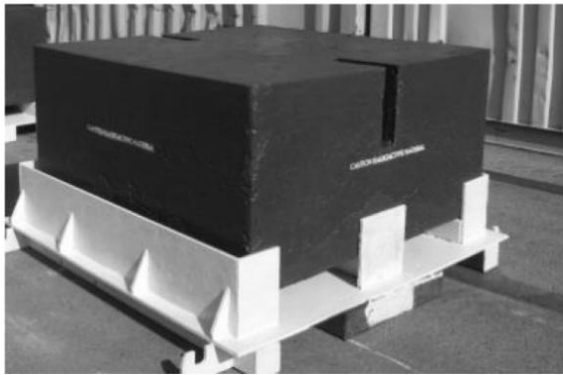

**Large Component Transportation**

4

## Presentation Outline

- **Change in company ownership**
- **Clive Enhancements**
  - Correct licensed volume
  - Propose an Exempted Waste Cell
  - Propose a Federal Cell (depleted uranium)
  - Request authority for sealed source disposal
  - Capital Improvements
  - Ample Capacity
- **Barnwell Operations**




## Change in Ownership

**Energy Capital Partners**  
*(2013 – 2022)*

**TriArtisan Capital Advisors**  
*(2018-2022)*



**TriArtisan Capital Advisors**

*EnergySolutions CEO Ken Robuck, said “We are delighted that TriArtisan has made a substantial additional investment in the Company to become our majority owner, and we look forward to continuing our close partnership with them. Our management team and I are excited to continue seamlessly executing on the current business plan.”*


6



Stewards of the environment

# Clive Facility Disposal Developments

ENERGYSOLUTIONS



7

www.energysolutions.com 7

Stewards of the environment

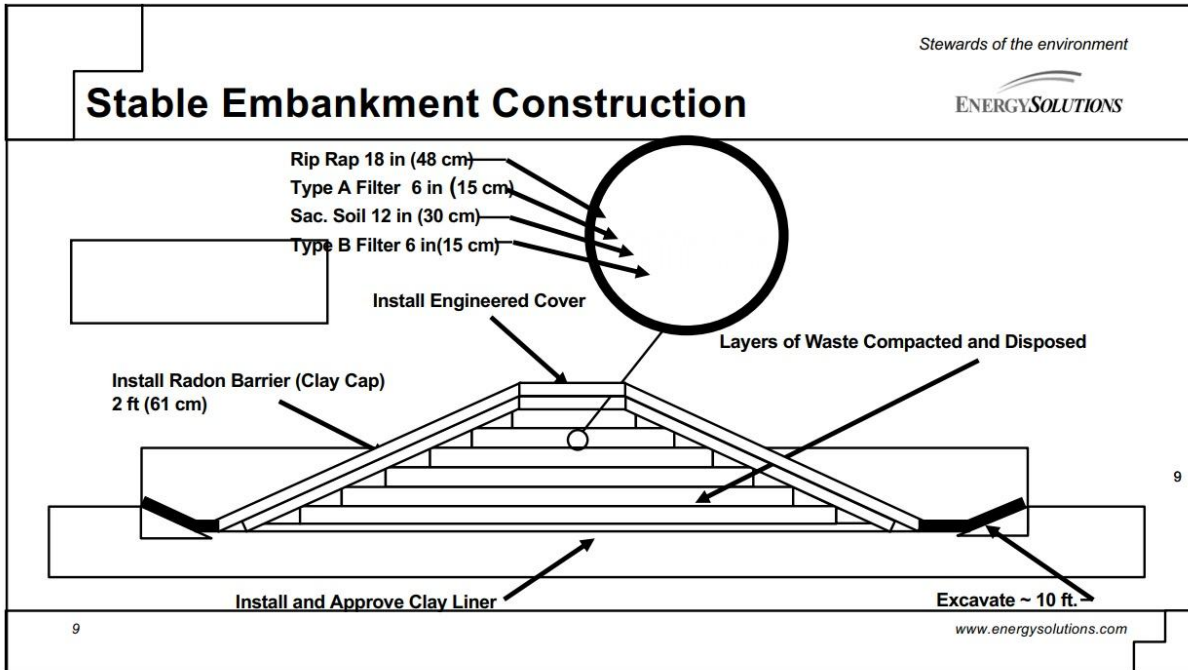
# Clive Facility Disposal Developments

ENERGYSOLUTIONS



8

com 8



## Correct Licensed Volume


**LICENSE AMENDMENT 26**


- Class A West engineering design for 8,724,097 yd<sup>3</sup> Class A LLRW waste volume.
- Class A West modeled (performance assessment) of 8,724,097 yd<sup>3</sup> Class A LLRW waste volume.
- Different licensed volume limit unrelated to engineering design or performance assessment modeling results

*Stewards of the environment*

## Exempted Waste Cell


- Significant volumes of non-impacted/suspect waste generated by D&D projects
- Clive facility has a long history of managing this type of waste
- Waste shipped to Clive must be Class A LLRW - screened to determine if it can be exempted from some of the controls w/o increasing risk to human health
- Exemption is being evaluated by Utah Division of Waste Management and Radiation Control
- Tracking and reporting to compacts will continue

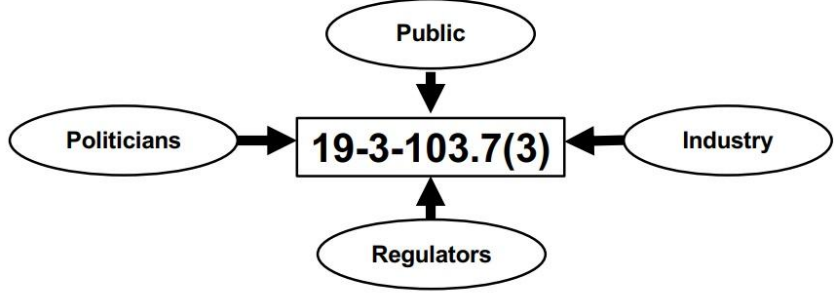




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## Federal Cell Facility





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graph TD
    Public([Public]) --> Center[19-3-103.7(3)]
    Industry([Industry]) --> Center
    Regulators([Regulators]) --> Center
    Politicians([Politicians]) --> Center
  
```

1. Site-specific Performance Assessment
2. Designation of a Federal Cell Facility
3. Perpetual stewardship agreement with DOE

12

*Stewards of the environment*  
**ENERGYSOLUTIONS**

## Sealed Source Disposal

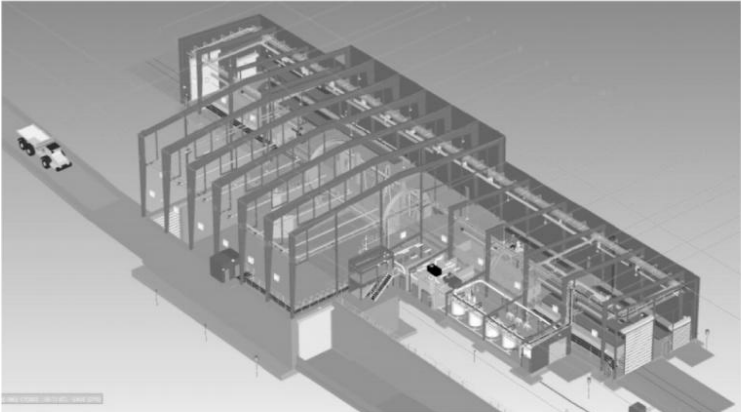


- **2013 Joint effort with CRCPD and State of Utah**
- **License exemptions granted for disposal of Class A sealed sources on a per-source basis**
- **Received and managed 41,190 sealed sources between 2013 and 2015**
- **2020 permanent license amendment requested and is under consideration**

13
[www.energysolutions.com](http://www.energysolutions.com)

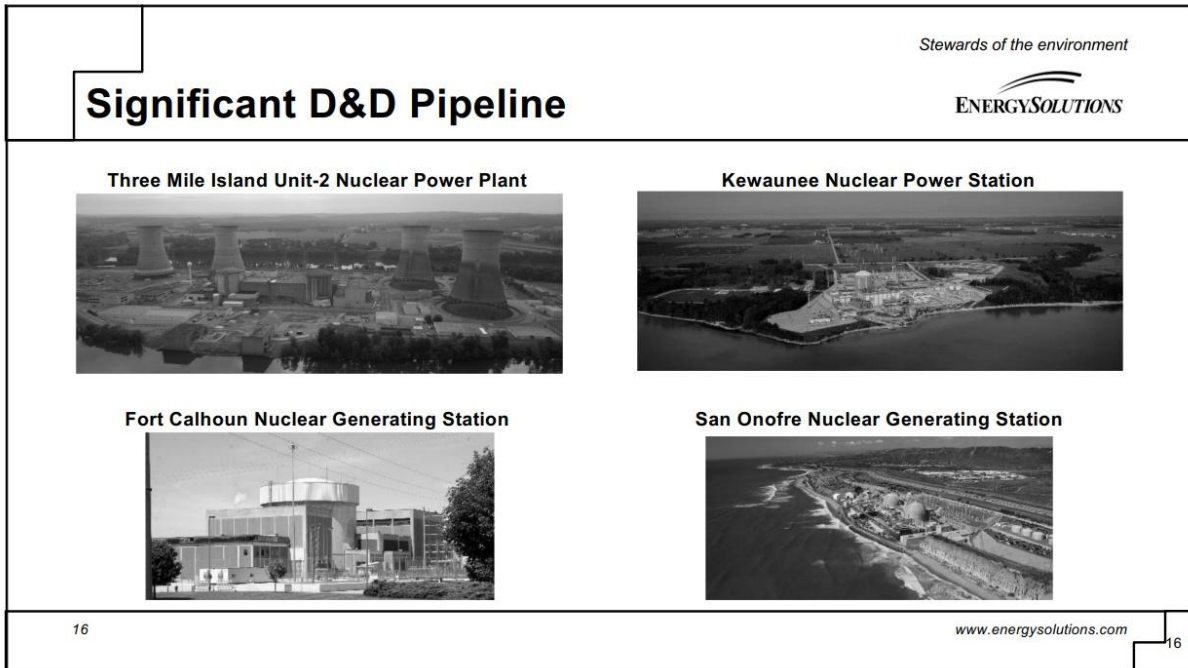
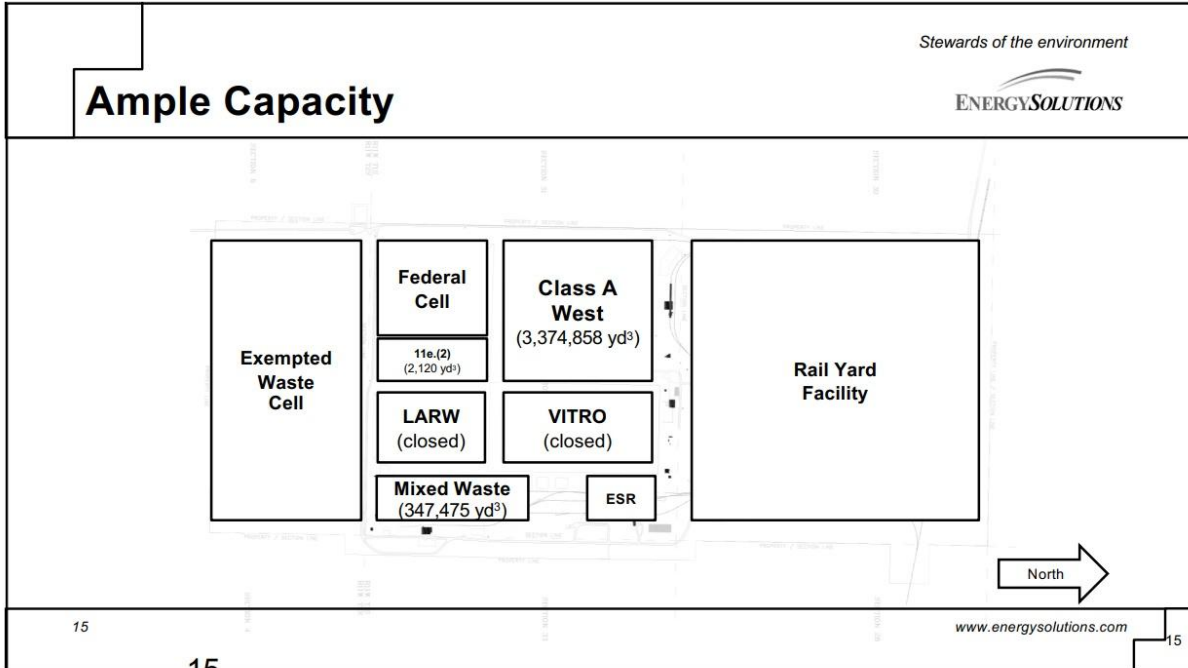
*Stewards of the environment*  
**ENERGYSOLUTIONS**

## Capital Improvements



- **East Side Rotary**
- **Railyard Maintenance and Storage Facility**
- **Mobile equipment fleet upgrades**
- **Evaporative storage expansion**
- **Operational safety enhancements**

14
[www.energysolutions.com](http://www.energysolutions.com)

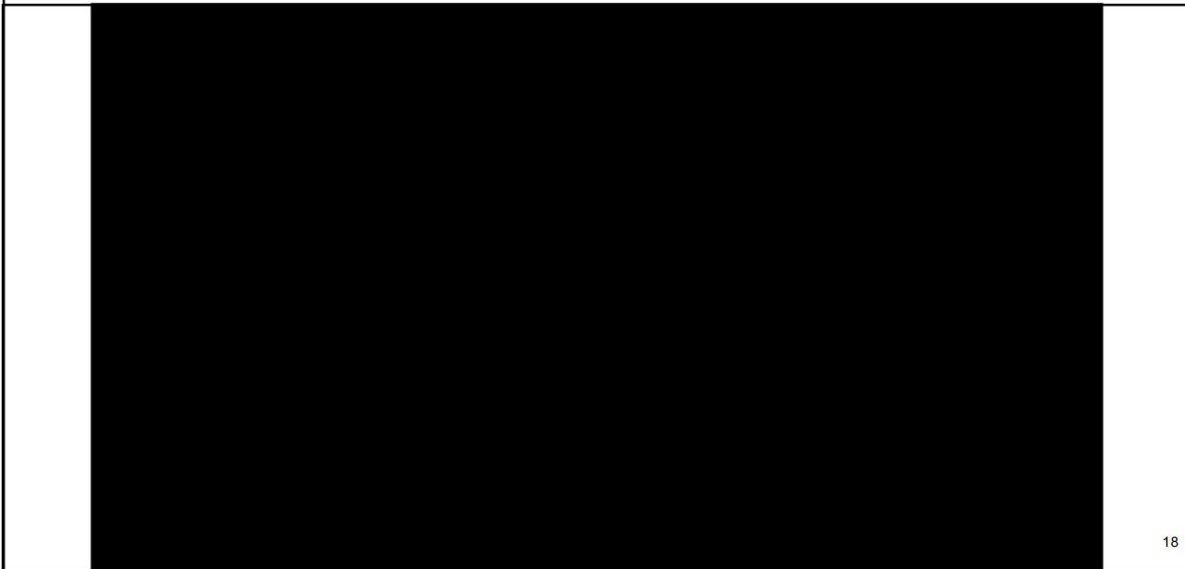


## Barnwell Disposal Facility








17

## Barnwell Disposal Facility




18

<div data-bbox="256 323 763 422" style="border: 1px solid black; padding: 5px;"> <h2 style="margin: 0;">Barnwell Facility</h2> </div> <ul style="list-style-type: none"> <li>• The Barnwell Disposal Facility is owned by the state of South Carolina and operated by EnergySolutions. The facility is the host disposal site for the Atlantic Compact which is comprised of South Carolina, New Jersey, and Connecticut.</li> <li>• The Facility began operations in 1971 and has provided continuous disposal operations for over 45 years. The site is licensed to dispose of Class A, B and C low-level wastes, including irradiated hardware and large components, steam generators, resins, and reactor pressure vessels.</li> </ul> <div data-bbox="267 802 487 892" style="text-align: center;">  <p>Stewards of the environment</p> </div>	<div data-bbox="909 399 1315 651" style="border: 1px solid black; margin-bottom: 5px;">  </div> <div data-bbox="909 661 1315 913" style="border: 1px solid black;">  </div>
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<p style="font-size: small;">Stewards of the environment</p> 	
<div data-bbox="284 1144 803 1197" style="border: 1px solid black; padding: 5px;"> <h2 style="margin: 0;">Barnwell Disposal Facility</h2> </div> <div data-bbox="243 1213 722 1663" style="border: 1px solid black; margin-top: 10px;">  </div>	<ul style="list-style-type: none"> <li>• &gt; 90% of facility in closed condition, under institutional monitoring</li> <li>• Following 2019 litigation, SC DHEC requested an application for license renewal.</li> <li>• September 2019 – Renewal application submitted</li> <li>• Radioactive Material License under timely renewal</li> </ul>
<p style="font-size: x-small;">20</p>	<p style="font-size: x-small;">www.energysolutions.com</p>

*Stewards of the environment*  
**ENERGYSOLUTIONS**

## Barnwell Disposal Operational Updates






- Large Component Disposal
  - Campaign 1 – 3 Ocone rotors and 42 diaphragms disposed
  - Campaign 2 – 3 Ocone rotors and 42 diaphragms disposed
  - Campaign 3 – 3 Ocone rotors and 42 diaphragms disposed
- License 097 Renewal Application (2019)
- Ongoing Operational Efficiencies

21 www.energysolutions.com

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**ENERGYSOLUTIONS**

## Rotor and Diaphragm Disposal






22 www.energysolutions.com





**Thank You**




# Ureco USA Update

Steve Magill

© 2021 Ureco USA Inc.

The slide features a background graphic of overlapping semi-circles in shades of gray on the right side.



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## Safety & Culture Moment

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2

## UUSA Key Results










3

## UUSA Culture



I collaborate across the organization to achieve success through aligned priorities

**1 Urenco**

I continuously improve to challenge the status quo and ensure sustainability



**Innovate Now!**

I take accountability for driving Urenco's success


**Drive 2 Win**

I own our full results and invest my talents!

**All In**

4





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Introduction to UUSA, Fuel Cycle  
and Enrichment Process

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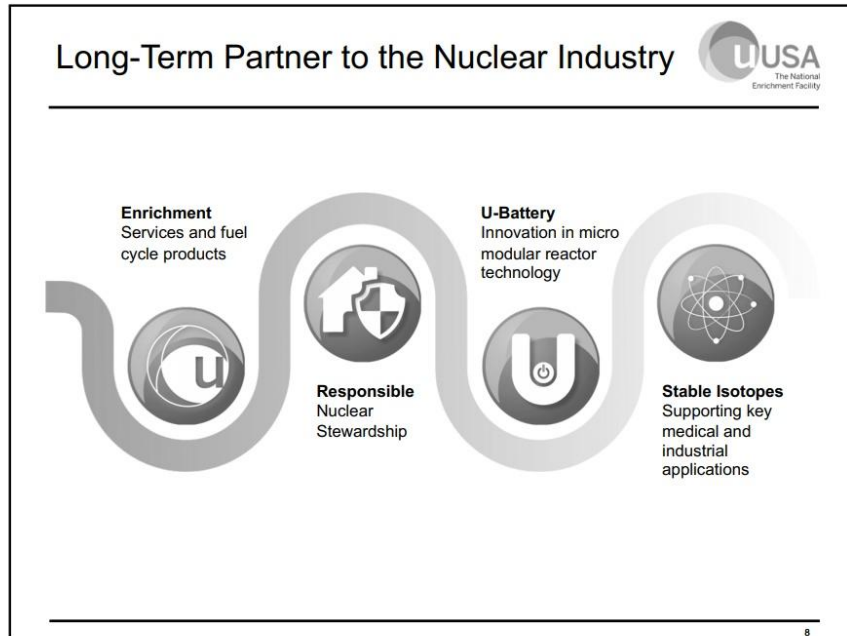
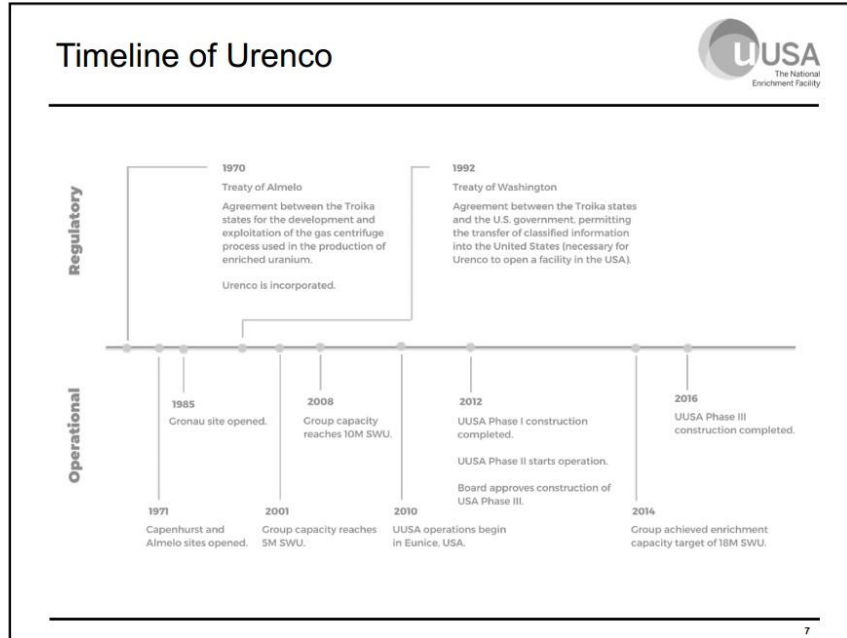
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Urenco USA Overview




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6



## Urenco USA (UUSA)





- Located in southeast New Mexico
- 1<sup>st</sup> new nuclear facility in the US in more than 30 years
- Nuclear Regulatory Commission license issued in 2006
- Operation commenced in 2010
- Only uranium enrichment plant in North America



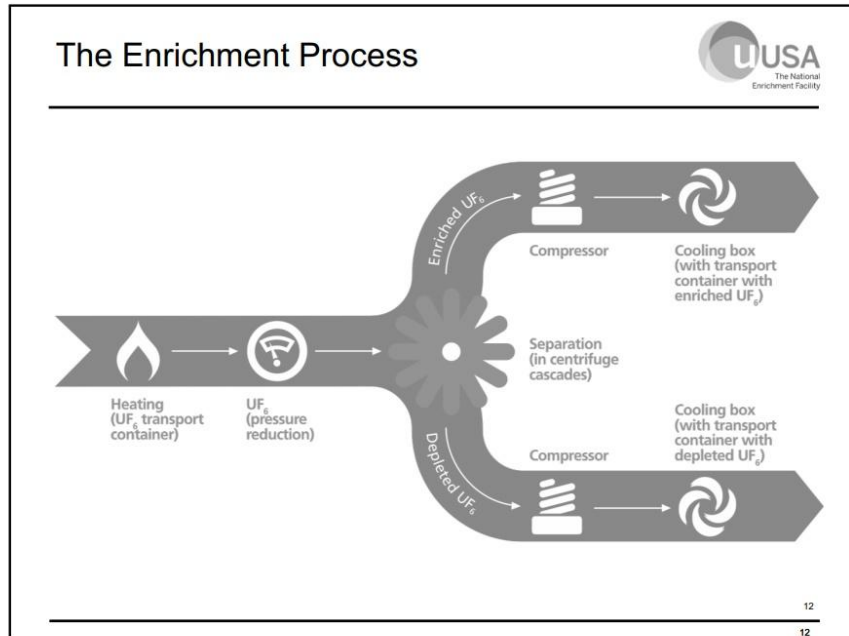
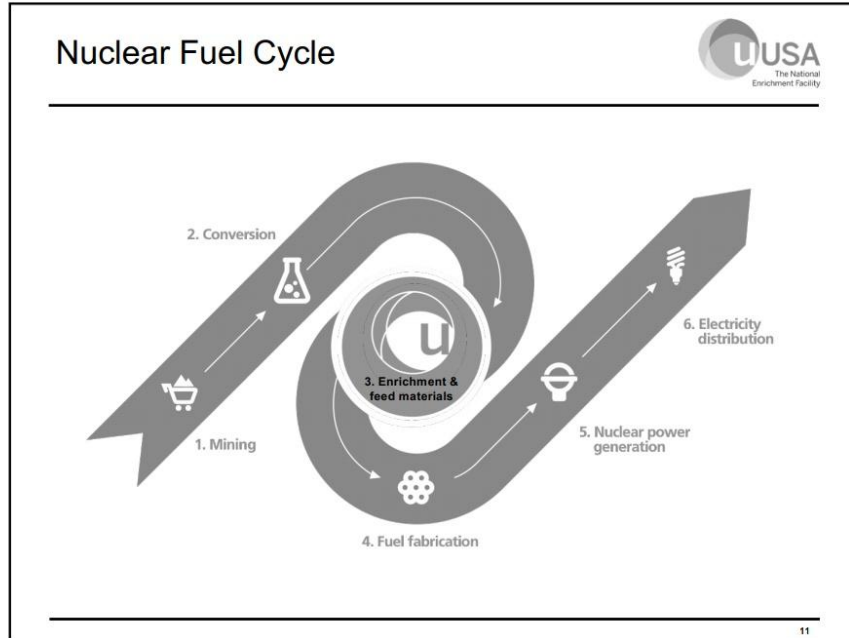
9

## UUSA Today



- Current Capacity – 4.9 Million SWU
- Capital Investment – \$5 Billion
- Current Employees – 230
- Provides one third of the U.S. demand for enrichment services

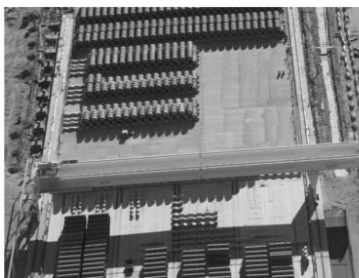
10



## Tails Management



- Disposal of depleted Uranic material
  - Urenco has a Tails Management Facility in Capenhurst, UK
  - UUSA is having conversations with potential US partners for domestic disposal
  - UUSA can store up to 25,000 cylinders at our site in Eunice, NM, and is only obligated to move them if they are older than 25 years
    - The oldest cylinder at UUSA is only 12 years old



13

## Demand for Advanced Fuels



- Advanced fuels are needed for advanced reactors that are smaller, more efficient and flexible, with more passive safety features
  - Advanced reactors require uranium with up to 20%  $U^{235}$  (HALEU)
- DOE issued Request for Information in December 2021 to assist it in establishing the program
- US, Canada and the UK are incorporating advanced reactors into clean energy policies
- Limited Sources of Supply
  - Russia is currently the sole commercial source
  - Energy Act of 2020 directed DOE to establish a domestic High-Assay Low Enriched Uranium (HALEU) Availability Program

14



## Advanced Fuels at UUSA



- Producing Advanced Fuels at UUSA would be the most efficient and lowest cost enrichment option in the United States by leveraging existing infrastructure, trained workforce, and Urenco's 50+ years of operating experience
- U<sup>235</sup> enriched to 5.5% - 10% - Anticipated product availability in 2024
- U<sup>235</sup> enriched from 10% - 20% - Estimated product availability is 6-7 years

15

## Advanced Fuels at UUSA



- Advanced Fuels production does not require any change to our current activities (i.e. uses same equipment, processes and personnel)
- Development and construction of an Advanced Fuels facility would provide additional jobs and economic support to our local communities
- This initiative would support state and federal energy transition and clean energy goals

16

## Net Zero



- We demonstrate our commitment to tackling climate change by aspiring to achieve net zero carbon emissions by 2040.
- We pledge to continue to invest in research and development, and widen our portfolio of products and services that contribute to net zero carbon emissions and add societal value.
- We protect the environment through the responsible use of natural resources, including water and electricity.
- UUSA is doing our part by:
  - Playing a key role in facilitating low carbon electricity
  - Looking into solar projects for power
  - Installing a new HVAC system on-site with less emissions, using 30% less energy

17


## Community Support




- Career Technical Education Center
- Governor's STEM Challenge
- Scholarships and Internships
- 9/11 Day of Service
- Richie's Science Workshops
- United Way



18

Promoting the Nuclear Industry 


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<p><b>Charitable Giving</b></p> <ul style="list-style-type: none"> <li>• UUSA has been the largest donor to Lea County United Way since 2008</li> <li>• To date, our employees have given nearly \$2.5 million</li> </ul>	<p><b>Scholarships/Internships</b></p> <ul style="list-style-type: none"> <li>• Each year, UUSA offers academic scholarships to dependents of employees and students in the local community</li> <li>• A summer internship program is available to college juniors and seniors</li> </ul>
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19

9/11 Day of Service 

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- The 9/11 Day of Service started with the grassroots efforts of Plant Engineering to repair an elderly woman's home in 2008.
- Since 2008, UUSA has made separate repairs on 168 senior citizens homes in the communities where our employees live.
- The 9/11 Day of Service has evolved to include community service projects, such as beautification and non-profit assistance.

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20

## Richie Enrichment Science Workshops

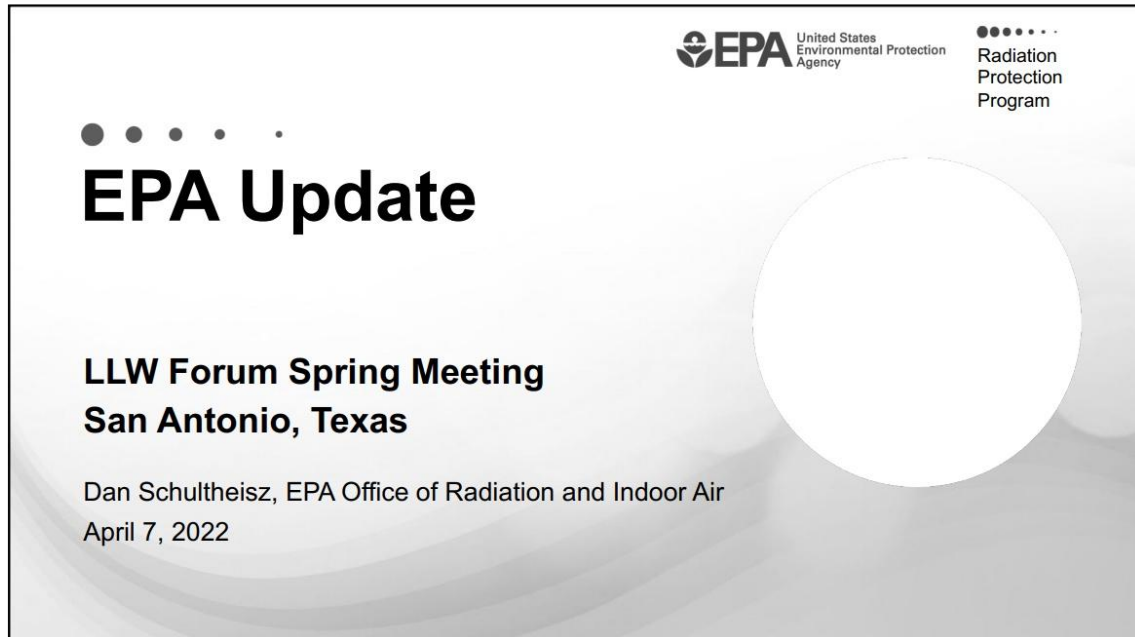


- Provides workshops within a 50-mile radius of the UUSA site
- Annually reaches 20 schools and approximately 1,800 students
- Utilizes 150 employee volunteers
- During 2020, we were able to provide over 1,500 fifth-grade students with a take-home science kit, in lieu of hosting workshops due to Covid-19 restrictions.

21

## Questions



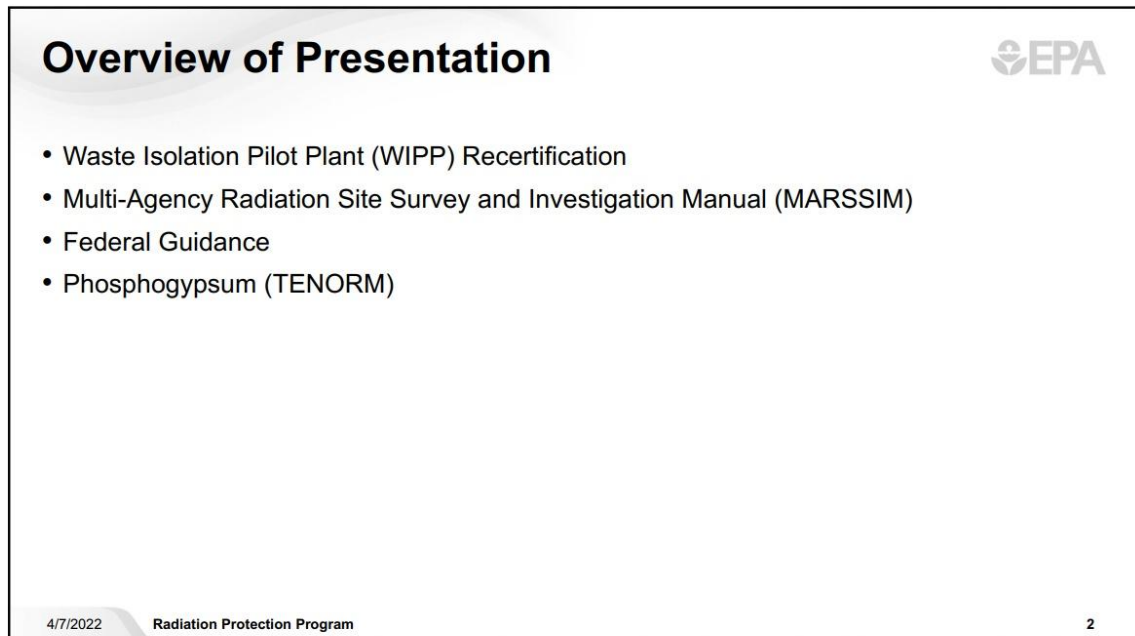


The slide features the EPA logo in the top right corner, which includes the text "United States Environmental Protection Agency" and "Radiation Protection Program" next to a series of five dots. On the left side, there is a decorative graphic of five dots of varying sizes above the main title "EPA Update". Below the title, the text reads "LLW Forum Spring Meeting San Antonio, Texas", followed by "Dan Schultheisz, EPA Office of Radiation and Indoor Air" and "April 7, 2022". A large white circle is positioned on the right side of the slide.

**EPA Update**

**LLW Forum Spring Meeting  
San Antonio, Texas**

Dan Schultheisz, EPA Office of Radiation and Indoor Air  
April 7, 2022



The slide has the EPA logo in the top right corner. The main title "Overview of Presentation" is located at the top left. Below the title is a bulleted list of four items. At the bottom left, there is a date "4/7/2022" and the text "Radiation Protection Program". At the bottom right, there is a small number "2".


**Overview of Presentation**

- Waste Isolation Pilot Plant (WIPP) Recertification
- Multi-Agency Radiation Site Survey and Investigation Manual (MARSSIM)
- Federal Guidance
- Phosphogypsum (TENORM)



4/7/2022 Radiation Protection Program 2


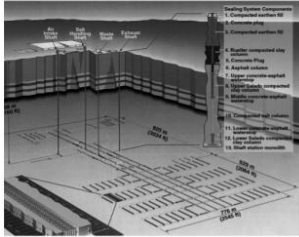
## Background on WIPP

### The Waste Isolation Pilot Plant and EPA's Regulatory Authority



- WIPP is a deep geologic repository near Carlsbad in southeastern New Mexico, located in bedded salt
- The facility disposes transuranic (TRU) radioactive waste from the manufacture of atomic weapons and from DOE defense clean-up
- EPA performs oversight for the radioactive portion of waste per the WIPP Land Withdrawal Act of 1992
  - This includes a recertification every five years where DOE demonstrates WIPP meets the requirements of 40 CFR parts 191 and 194 for long-term disposal
    - Most recent recertification was in 2017 for the 2014 Compliance Recertification Application (CRA)
    - Opportunity to identify changes/updates to information about disposal site and actual waste emplacement at WIPP, and incorporate new info in our compliance decision
    - Recertification is not a rulemaking and is not subject to judicial review
  - Recertification includes a performance assessment (PA) probabilistic model that calculates potential repository releases





4/7/2022 Radiation Protection Program
3

## Background on WIPP


### Activities at the WIPP



- 2014 radiological event has had long-term repercussions
  - In February 2014, two separate incidents in the repository, a truck fire and a radiological release, halted operations
    - Radiological contamination from February 14 incident forced DOE to abandon waste Panels 3-6 and 9
    - DOE resumed waste emplacement in 2017 after instituting new procedures, addressing NMED violations
  - DOE's CRA-2014, submitted in March 2014, did not reflect the incident
- Anticipated activities (post CRA-2019) in response to the incident and new inventory
  - Excavation and completion of a new utility shaft and ventilation system to increase underground air circulation
  - Mining additional waste panels outside the initial repository footprint
    - EPA expects notice of two initial panels in early 2023
    - DOE plans a total of nine additional panels
  - Addition of 40 metric tons (MT) of downblended surplus Pu waste
    - 6 MT currently in waste inventory and included in CRA-2019

4/7/2022 Radiation Protection Program
4

## WIPP Recertification




### EPA's Review of 2019 Compliance Recertification Application

- DOE submitted the first portion of the recertification application on March 29, 2019, and the remaining section, which included the deferred performance assessment, on December 20, 2019
  - EPA review started in earnest in January 2020
- EPA has spent the past roughly 2 years reviewing the DOE application for completeness and technical content
  - DOE had 13 responses to EPA's 6 letters of completeness questions
  - Several smaller items of correspondence for individual questions
  - Several technical exchanges between EPA and DOE staff to allow EPA to better understand specific sections of the recertification application
  - Additional calculations requested from DOE to expand sections of the recertification application that EPA found needed further development
  - Application declared complete via letter to DOE on November 17, 2021 (86 FR 67424, Nov. 26)

4/7/2022      Radiation Protection Program 5

## Next Steps



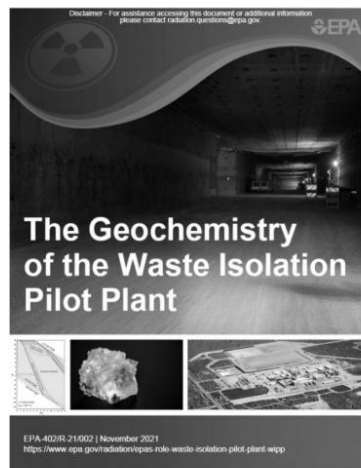
### Looking to the Future of WIPP

- Recertification decision expected April 2022 in *Federal Register*
- Interaction with DOE on technical issues for future recertifications
  - Disposition of surplus plutonium
  - Characterization of previously unexcavated areas (e.g., pressurized brine)
  - Excavation of new waste panels
  - New performance assessment model under development
  - Approval of new waste panels may require rulemaking
- Continuing compliance activities
  - Site inspections (typically annual, not conducted in 2020-2021)
  - Waste characterization inspections and audits at waste generator sites
  - Review of change notices/requests

4/7/2022      Radiation Protection Program 6

## Recent WIPP Technical Publication

- Provides a basic overview of various geochemical concepts incorporated in WIPP performance assessment, e.g.,
  - Solution chemistry
  - Mineral precipitation and dissolution
  - Complexation
  - Oxidation-reduction
- Relates PA concepts to specific conditions and experimental and observed data
- Sections can be stand-alone or combined for context on PA model elements
- [https://www.epa.gov/system/files/documents/2022-02/the-geochemistry-of-the-waste-isolation-pilot-plant\\_final.pdf](https://www.epa.gov/system/files/documents/2022-02/the-geochemistry-of-the-waste-isolation-pilot-plant_final.pdf)



4/7/2021

Radiation Protection Program

7

## Multi-Agency Radiation Site Survey and Investigation Manual (MARSSIM)



- MARSSIM provides a federal consensus approach for conducting radiation surveys
  - Final status surveys at sites, particularly of buildings and soils
  - Revision 1 of MARSSIM issued in August 2000
  - Companion documents
    - MARSAME – survey of materials and equipment
    - MARLAP – laboratory radioanalytical protocols
- MARSSIM Workgroup includes four federal agencies:
  - Environmental Protection Agency
  - Department of Defense
  - Department of Energy
  - Nuclear Regulatory Commission

4/7/2022


Radiation Protection Program

8



## MARSSIM


### Revision 2



- Revision 2 will update science and implement lessons learned, such as:
  - Statistical approaches when release criteria are effectively zero (or zero above background);
  - Using scanning methods for proving compliance with release criteria;
  - Use of measurement quality objectives in MARSSIM surveys.
  
- Draft for public comment issued May 2020
  
- EPA Science Advisory Board (SAB) review initiated in late 2020
  - MARSSIM workgroup addressing comments, working to clear through workgroup agencies
  - Final SAB report anticipated April 2022
  
- More information at <https://www.epa.gov/radiation/multi-agency-radiation-survey-and-site-investigation-manual-marssim>

4/7/2022
Radiation Protection Program
9

## Federal Guidance




- Reorganization Plan No. 3 of 1970 transferred to EPA responsibility to "...advise the President with respect to radiation matters, directly or indirectly, affecting health, including guidance for all Federal agencies in the formulation of radiation standards"
  - Previously exercised by the Federal Radiation Council
  
- Guidance has been issued to cover technical information and policy recommendations
  - Guidance applies to Federal agencies, but often considered or adopted more widely
  - Considered "Presidential" guidance if signed by the President (most recent in 1987)
  - Most recent report was FGR 15, which updated and expanded Report No. 12
    - External Exposure to Radionuclides in Air, Water and Soil (2019)
  - Technical work by Oak Ridge National Lab, Center for Radiation Protection Knowledge
    - Work has historically received financial support by DOE and NRC, as well as EPA
  
- See <https://www.epa.gov/radiation/federal-guidance-radiation-protection>

4/7/2022
Radiation Protection Program
10

## Federal Guidance Report No. 16

### Risk Coefficients




- FGR 16 will provide updated cancer risk coefficients for ingestion, inhalation, and external exposure for more than 1000 radionuclides
  - Update of FGR 13, “Cancer Risk Coefficients for Environmental Exposure to Radionuclides,” published in 1999
  - Technical work ongoing for several years
  
- EPA anticipates submitting the draft report for peer review this year
  - Interagency review, possibly through Interagency Steering Committee on Radiation Standards
  - SAB review starting later in the year
    - SAB requesting nominations for an expert panel by April 11
    - <https://www.govinfo.gov/content/pkg/FR-2022-03-21/pdf/2022-05871.pdf>

4/7/2022    Radiation Protection Program

11

## Phosphogypsum

### TENORM and the “Circular Economy”



- Phosphogypsum regulated under the Clean Air Act (40 CFR part 61, subpart R)
  - Managed in stacks, limited agriculture and research uses approved by rule
  - Process for requesting approval of other uses (risk assessment required)
  - EPA review of road construction proposal presented at previous LLW Forum meetings
- Continuing interest in alternate uses of phosphogypsum and other TENORM materials
  - Growing emphasis on “circular economy” to reuse, recycle, repurpose presents challenges
  - Research on extracting rare earths and other critical minerals from PG, red muds
  - White Mesa uranium mill has established a circuit to produce mixed rare earth concentrate
  - NORM X conference theme: “Residues Applied in a Circular Economy” (May 2022)
- Continuing in radioactivity associated with the oil and gas sector
  - Management of large liquid and other waste streams
  - Worker exposure hazards
  - What are radon emissions from wellhead and flaring?

4/7/2022    Radiation Protection Program

12



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# QUESTIONS?

<https://www.epa.gov/radiation>

8/25/2021 Radiation Protection Program 13

## North Dakota TENORM 10 years and counting

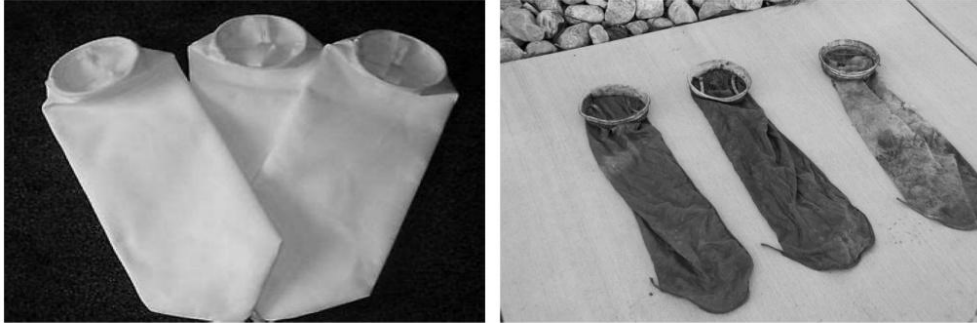
- Late summer of 2013
  - Filter Socks found on 2 open bed trailers near Watford City, ND



## March of 2014 Abandoned Gas Station, Noonan, ND



## New and used Filter socks



## What is the Solution?

- License Amendment for Radioactive Tracer Licensee crossed my desk
- Tracer Licenses are issued for a 10 year period and this licensee still had a number of years before renewal
- I noticed that this licensee was originally allowed to store radioactive waste in a reserve pit till it decayed to background
- I knew that the ND Legislature had banned reserve pits 2 years earlier

- I had a conversation in the office of the Director of the oil and gas division and asked these questions:
  - Could the licensee use a small reserve pit to store radioactive waste that was properly signed and secured? **Answer - NO**
  - Could Oil and Gas require all new permits to keep filter socks on the well pad?  
**Answer - YES**
  - Could Oil and Gas Division amend existing drilling permits to require filter socks to remain on the well pad?  
**Answer - YES**
  - Could Oil and Gas issue an order requiring that socks remain on the well pad?  
**Answer - YES**

## Late March 2014

Effective June 1, 2014, all operators of disposal wells in North Dakota will be required to maintain an on-site container to store filters until they can be properly disposed of in an authorized facility. Such containers must be: leakproof to prevent any fluids from escaping the container covered to prevent precipitation from entering the container placard to indicate only filters are to be placed in the container If the operator will not utilize a filtration system, a waiver to the container requirement will be considered, but only upon the operator submitting a Sundry Notice (Form 4) justifying their request.

## January 1, 2016

- The North Dakota Department of Health previous draft rules are now effective as of January 1, 2016. The final draft rule was in acted as a final regulation. The waste disposal limit for landfills is raised from **5 pCi/g of Radium226 and Radium228 to 50 pCi/g**, however landfills must apply to the Department of Health to have the authorization to accept higher concentrations.

## Why 5 pCi/gram?

The image shows the cover of a report from the U.S. Environmental Protection Agency (EPA). At the top left is the EPA logo. The title of the report is "Report on the Survey of Abandoned Uraniferous Lignite Mines in Southwestern North Dakota". The authors listed are Robert J. Lyon\*, Daphne Prochaska\*, Jeffrey L. Burgess\*\*, and Dale Patricke\*\*. The report is dated March 1986. At the bottom right, there are footnotes: \*U.S. Environmental Protection Agency, Office of Radiation Programs-Las Vegas Facility, P.O. Box 10416, Las Vegas, Nevada 89116; and \*\*North Dakota State Department of Health, Bismarck, North Dakota 58501. A large graphic of concentric circles is at the bottom left.

## Background

- This Survey was conducted to determine the extend of contamination prior to reclamation
- Uranium was mined in ND in the 50's and early 60's
- Much of the time the coal bed was burned to recover the uranium in the ash.



## Radium Levels

- Assays determined the radium-226 content to be between 1.4 pCi/gram and 9.7 pCi/gram
- This data was used in determining an average of 4.2 pCi/gram for background
- **5pCi/gram** was to be used as the background for reclamation
  - **This then became the number used today**
- As of January 1, 2016, TENORM rules became effective in North Dakota



## North Dakota TENORM Rules NDAC 33.1-10-23

- Conference of Radiation Control Program Directors (CRCPD) rules Part N adopted with some additions

## Licensing Requirements

- A general license is hereby issued to possess, use, transfer, distribute or dispose of TENORM without regard to quantity, except for those activities requiring a specific license.
- A specific license is required to manufacture and distribute any consumer or retail product containing TENORM unless the manufacture and distribution are:
  - a. Authorized as specified by section 33-10-23-10;
  - b. Licensed under the provisions of chapter 33-10-03.1; or
  - c. Otherwise exempt in accordance with another chapter of article 33-10.

## Specific License Requirements

### Highlights continued:

- Specific License**
  - Application is required (fee required)
  - Financial Assurance is required
  - Operating and Emergency procedures manual is required
  - Criminal history background under ND Century Code is required
  - RSO required
  - Applies to all treatment facilities
  - Employee training program is required
  - Registration with ND Secretary of State is required



42

## Other Requirements

- Licensure required for transporters of TENORM
- Licensure required for Treatment and Disposal facilities
- Establish standards for Radiation Protection
- Establish record keeping requirements
- Describes financial assurance requirements
- Establishes Radiation Safety Officer requirements
- Outlines worker training requirements



42

## Treatment Facilities

### North Dakota Proposed Rules

- CRCPD Part N – modified to include Solid Waste Program
- North Dakota is licensing those companies that treat TENORM (must have trained RSO)
- Transfer stations require licensure
- TENORM transporters are required to be licensed
  - Solid waste permit required
  - Registration with the ND Secretary of State is required
  - Drivers must have HAZMAT endorsement
  - Quarterly load reports are required
    - Standard format used and filed electronically
  - Must have a qualified person responsible for their program

### Quarterly Load Report

COMPANY NAME:		License #	Year	Qtr	Quarter:	or Quarter Report			
Quantity	Calculation Rate	Package Count	Package Type	Element Content	Weight (kg)	Physical Form	Concentration (Bq/g)	Can No.	Can No.

## Landfill Licensing

- Argonne National Laboratory study:
  - Radiation Dose and Risk Assessment done in 2013
    - Landfill disposal not more than 50 pCi/g
    - Landfill can not dispose of more than 25,000 tons per year
    - Landfill can not dispose of more than 3000 tons per month

## Waste Disposal Locations

- Secure Energy 13 mile Landfill in North Dakota
  - Probably approved mid summer 2022
- US Ecology in Idaho
- Oaks Landfill in Montana
- Clean Harbors in Colorado
- Arlington in Oregon – Oil Field Waste Logistics
  - **Waste Management Disposal Services of Oregon, Inc.**

## Enforcement Actions

- Oil Field Waste Logistics (OWL) – Jason LaQua
  - Waste hauled to Arlington, Oregon
- Dyad – Dan McNair
  - 14 Felonies in Alaska (charged in 2014)
- Noonan - Ken Ward
  - 4 months, 2.5 years probation, \$13,000 fine
  - Felony charges for escape and stealing \$100,000 truck
- Renewable Resources – Shawn Kluver
- There are similar incidents across the country – Kentucky is another example

- Dale Patrick, MS
- Bismarck, ND
- 701-220-2288