



# Nuclear Energy Fuel Cycle (NEFC) Knowledge Management Project

## Building the Used Fuel Workforce of the Future – May 3, 2022 Las Vegas, NV



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Sandia National Laboratories



# NEFC Knowledge Management Project



## ISSUE: POTENTIAL LOSS OF EXPERTISE

Loss of expertise and critical knowledge in the field of Nuclear Waste Management (NWM) is a serious problem worldwide.

- The NRC estimates an average 10-15 year turnover rate for NWM experts

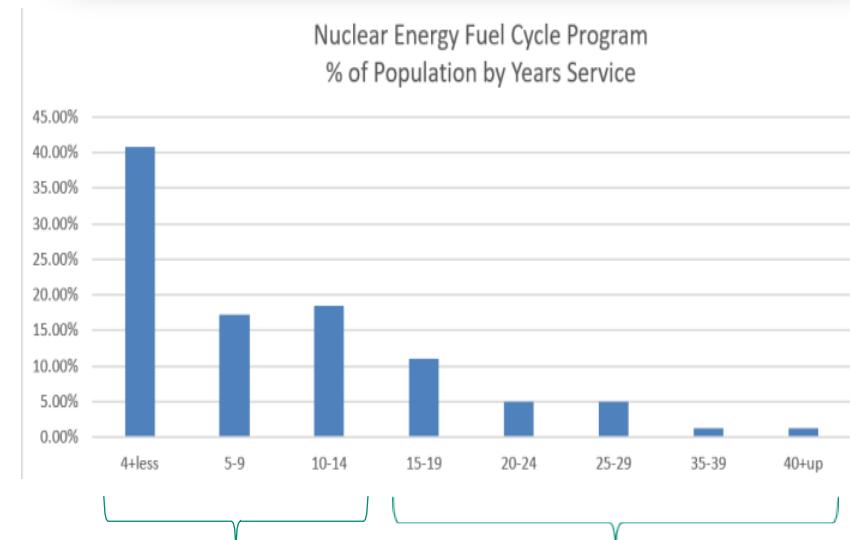
Risk recognized by DOE-NE and Sandia Leadership

- No active HLW Disposal project in the US since 2010
- Subject Matter Experts (SMEs) retiring without an effective means to transfer their experience to new or less experienced staff
- Urgent needed to maintain staff competence and share information across the generations



## NUCLEAR WASTE PROJECT EXPERIENCE

75% of the Lab staff have little or no experience working on an active nuclear waste management project



>75% of Population  
has little or no  
NWMP experience

<25% of Population  
has some amount of  
NWMP experience

# Critical Tacit Knowledge

## KNOWLEDGE TYPES



- **Tacit:** knowledge that is held in a person's mind and has typically not been captured or transferred in any form
- **Explicit:** knowledge that is contained in, for example, documents, drawings, calculations, designs, databases, procedures, and manuals

(Reference: IAEA Safety Glossary)

## CRITICAL KNOWLEDGE CRITERIA



- Only a few experts in the organization possess this knowledge
- This knowledge is difficult to 'buy' (external experts are hard to find or the costs are very high)
- This knowledge will be needed in the future - The expertise is crucial from a long term point of view
- The knowledge holder is considered a primary subject matter expert



# NEFC Knowledge Management Project

## NEFC PILOT PROJECT FOCUS: CRITICAL TACIT KNOWLEDGE

**Objective:** Address the risk of critical tacit knowledge loss due to retirement or attrition

- Quick project start required due to recent and impending SME retirements
- Phased approach for KM implementation
  - Begin with the strategic essentials
  - Work incrementally towards a full KM program implementation



KM PROGRAM  
STRATEGY  
DEVELOPMENT



NEFC STAFF FOCUS  
GROUPS



MULTI-DAY WORKSHOP  
14 PRESENTATIONS



10 HALF-DAY DEEP  
DIVE SESSIONS



KM REPOSITORY &  
TAXONOMY  
DEVELOPMENT

# KM Program Strategy



## KM STRATEGY 4 PRIMARY COMPONENTS

KM COMPONENTS	CONTENT MANAGEMENT	KNOWLEDGE CAPTURE & TRANSFER	COLLABORATION	SUBJECT MATTER EXPERTS
	<ul style="list-style-type: none"> <li>» Enterprise Content Management</li> <li>» Content Taxonomy and Metadata Schema</li> <li>» Robust Search Capabilities</li> <li>» Document Management</li> </ul>	<ul style="list-style-type: none"> <li>» Knowledge Capture and Transfer - Tacit and Explicit</li> <li>» Knowledge Retention for both 1) Execution and 2) Continuity of Trust</li> <li>» Best Practices</li> <li>» Lessons Learned</li> <li>» Training, Coaching, Mentoring skills transfer on the job</li> </ul>	<ul style="list-style-type: none"> <li>» Communities of Practice</li> <li>» Communities of Interest (blogs/wikis)</li> <li>» Centers of Excellence</li> <li>» Collaboration Workspaces</li> <li>» Workshops/Forums</li> </ul>	<ul style="list-style-type: none"> <li>» Experts - what we know, ask, and share</li> <li>» Skills Documentation</li> <li>» Community Finder</li> <li>» Skills/People Finder</li> </ul>

# KM Program Strategy



## KM ENABLERS FOR PROGRAM SUCCESS

<b>KM ENABLERS</b>	 <b>SUPPORTING KM PROCESSES &amp; METHODS</b>	<b>Knowledge Management Transfer Methods</b> <ul style="list-style-type: none"><li>» Critical Knowledge Assessments and Mapping, Process and Skills Mapping</li><li>» Peer Assistance, Lessons Learned/After Action Reviews/Storytelling</li><li>» Knowledge Capture, Retention and Transfer</li><li>» Best Practice Harvest, Lunch &amp; Learns, Knowledge Cafes</li></ul>
	 <b>GOVERNANCE &amp; OPERATIONS</b>	<b>Operational Support</b> <ul style="list-style-type: none"><li>» KM Governance/ Code of Practice. Performance Management and KPIs</li><li>» Staff Engagement - Rewards and Recognition</li><li>» Change Management, Communications, Branding, Training</li></ul>
	 <b>TECHNOLOGY</b>	<b>Technology Enablers</b> <ul style="list-style-type: none"><li>» Information Portal, Collaboration, Team Sites, Document Management</li><li>» Content/Social/Search/Video Enabled/Business Intelligence/Analytics</li><li>» Enterprise Information &amp; Data</li></ul>

# KM Program Strategy



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## KM ENABLERS FOR PROGRAM SUCCESS

# Focus Groups



## FOCUS GROUP APPROACH

- Interview Early Career, Mid-Career, and Experienced staff members in cohort groups
- Collect staff opinions and preferences about accessing preserved knowledge

*How they want the content presented and in what formats  
How they like to learn*

- Collect staff views about the existing strengths and weaknesses of the knowledge scope within the program

*What are the knowledge gaps*

- Identify areas of critical knowledge

*Elicit and capture knowledge that has so far remained unacquired, uncodified, and inaccessible*

- Develop content roadmap for upcoming workshops and deep dives



# Tacit Knowledge Capture



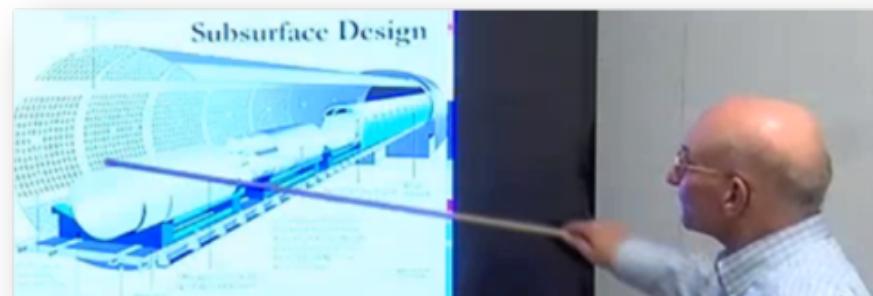
## M U L T I - D A Y W O R K S H O P

- Multi-day workshop led by Subject Matter Experts designed to capture and document critical tacit knowledge within the NWM program
- Topics based on Critical Knowledge Mapping
- SME presentations from DOE-NE, Office of General Council, National Labs, and Industry Experts
- Examples: History of US Disposal Projects, and The Past U.S. Repository Siting Process



## D E E P D I V E S

- Half-Day deep dives into complex topics that would benefit from additional in-depth discussion
- Thematic presentations shared and recorded by Subject Matter Experts
- Designed to inform early- and mid-career staff and be a reference for the workforce of the future



# KM Repository Development



## Workshops and Deep Dives



This **Knowledge Management Workshop Series** was conducted over the course of three days (December 17-19, 2019) and represents an overview of topics on the back end of the nuclear fuel cycle (BNFC). Most presentations are 1 to 1-1/2 hours in length. The initial workshop was followed by an ongoing series of deep dives on topics related to the BNFC, but that required more time. These deep dives are usually half-day sessions (3-1/2 to 4 hours) and often are presented by a panel of speakers.

### Workshop Sessions

[Introduction and Overview of the Knowledge Management Pilot Project Workshop](#)

[Overview of the Back End of the Nuclear Energy Fuel Cycle Workshop](#)

[History of Storage & Transportation Workshop](#)

[History of Disposal Projects Workshop](#)

[Waste Isolation Plant Overview Workshop](#)

[Storage & Transportation Regulations Workshop](#)

[Past Repository Siting Process Workshop](#)

[Disposal Legal Regulatory Framework Workshop](#)

[A Nuclear Waste Management Project; Not Just Science & Engineering](#)

[Licensing Process from Applicant's Perspective Workshop](#)

[Licensing Process from Regulator's Perspective Workshop](#)

[Regulatory Compliance Workshop](#)

[Social Perspectives Workshop](#)

[Budget Process and Congressional Committees with Authority for Nuclear Management Workshop](#)

### Deep Dive Sessions

[Non-Technical Requirements & Processes of a Nuclear Waste Management Project Deep Dive](#)

UUR\_NEFKM   Workshops and Deep Dives   Knowledge Management Document Library   [EDIT LINKS](#)  

## Past Repository Siting Process Workshop

W002-10006

Focused on the siting process followed for the proposed Yucca Mountain repository. Does not cover the WIPP siting process, which has been described in a previous talk. Discussion following the presentation, however, appropriately includes both WIPP and YMP siting experiences and implications for future siting programs.

 [Past Repository Siting Process Workshop Video](#)

 [Past Repository Siting Process Workshop Presentation Slides](#)

 [Past Repository Siting Process Workshop Transcript](#)

 [Past Repository Siting Process Workshop References](#)

[About Peter Swift](#)  
Senior Scientist | Nuclear Energy Fuel Cycle | Sandia National Laboratories

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## ENHANCED SEARCHABILITY FOR ALL WORKSHOP CONTENT

- Speaker Biography
- Video of the Session
- Video Transcript
- Presentation Slides
- Reference Materials cited by Speaker
- Discussion Board for ongoing Staff Collaboration and Questions

# The Nuclear Waste Management Taxonomy



## A UNIQUE TAXONOMY FOR NUCLEAR WASTE MANAGEMENT

- Controlled and organized vocabulary used to describe or characterize unambiguous and explicit concepts of nuclear waste management
- Installed in the KM database to enhance capturing, managing and searching knowledge content
- Developed for tagging content with metadata specific to the field of nuclear waste management
- Informed by the use of machine-learning classifiers

Example of taxonomy-enhanced search

# The Nuclear Waste Management Taxonomy



KM Library Home Page

All Content NEFC Program Content Speaker Series, Deep Dives

Category of Content

Article

Correspondence

License Applications

Poster

**Presentation**

SHOW MORE

Function

Management Systems

Disposal

Storage

Transportation

Nuclear Energy Conversion

Primary Subject Matter

Regulatory Deep...

Steve Wagner - Mana...

Analysis Department

multimission labora...

Technology ...

sharepoint.sandia.gov

Storage And Trans...

Focus is on Spent Fu...

Program Applications

regulations ... SCS LL...

sharepoint.sandia.gov

NRC Licensing, 1...

NRC Licensing, the ap...

Introduction & Over...

Licensee / Burden on

sharepoint.sandia.gov

Repository Siting

Repository Siting

File Type

PDF

PowerPoint

PowerPoint

Site Type

Mined Repository

Deep Borehole Repository

Mined Repository

Deep Borehole Repository

4 results

Preferences Advanced Search

4 results

Preferences Advanced Search

KM Library Home Page SPOTLIGHT: Workshops & Deep-Dives SEARCH the Knowledge Library UPLOAD Content

Past Repository Siting Process

Sandia National Laboratories

**Past Repository Siting Process**

Nuclear Energy Fuel Cycle Knowledge Management Workshop ...

Swift Past Repository siting processNEFC Knowledge management workshop December 17-19 2019SAND2019-14976 PE ...

sharepoint.sandia.gov/.../W002-10006-Pres-Swift\_Past Repo...

Siting, Developing, and Licensing of the Waste...

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of ...

sharepoint.sandia.gov/.../W001-10004-Pres-Shoemaker - WIP ...

U.S. Deep Borehole Field Test Siting Process

Sandia National Laboratories is a multi-mission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of ...

sharepoint.sandia.gov/.../DD006-11014-Pres-DBFT Siting Fi...

US High-Level Nuclear Waste Management Facility...

Recognition of the need to dispose of high-level radioactive waste (HLW), with deep geologic disposal as the preferred option (NAS/NRC 1957 ... Mined repositories selected as a matter ...

sharepoint.sandia.gov/.../DD006-11015-Pres-US NWM Facilit...

PRESENTED BY

Peter Swift

Nuclear Energy Fuel Cycle Knowledge Management Workshop

December 17-19, 2019; Albuquerque, New Mexico

SWIFT PAST REPOSITORY SITING

NEFC KNOWLEDGE MANAGEMENT WORKSHOP

DECEMBER 17-19, 2019

SAND2019-14976 PE

ENERGY NASH

Take a look inside

Outline

Key References for the History of Yucca Mountain

Yucca Mountain under the NWPA

Background

Background (cont.)

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EDIT FOLLOW SEND VIEW LIBRARY

# Maintaining NWM Competence

## ONGOING KM DEVELOPMENT

- KM Library is complete with initial pilot content
- Additional critical KM content is being uploaded and tagged as it is identified
- NWM Taxonomy developed and installed in database
- Validation and testing of that first version is underway
- KM Governance structure developed

## EXPANDED PARTICIPATION

- External access through cloud technology for DOE-NE and the Laboratory community

## INTERNATIONAL COLLABORATION

- Advancing KM through continued collaboration with the NEA, IAEA and ISO



# QUESTIONS?

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