

# Nuclear Energy Fuel Cycle (NEFC) Knowledge Management Project

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

Janette Meacham, NWM Licensing & Knowledge Management Lead  
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

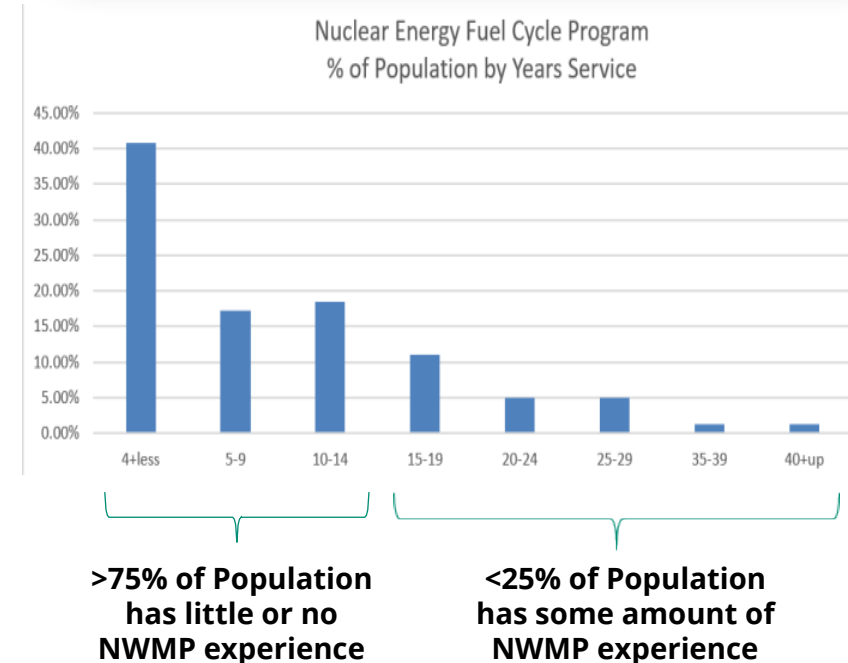
Risk recognized by DOE-NE and Sandia Leadership

- 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



NWPM: Nuclear Waste Management Project



# 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



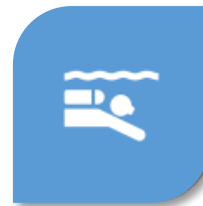
KM PROGRAM  
STRATEGY  
DEVELOPMENT



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

KM ENABLERS	 <p><b>SUPPORTING KM PROCESSES &amp; METHODS</b></p>	<p><b>Knowledge Management Transfer Methods</b></p> <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>
	 <p><b>GOVERNANCE &amp; OPERATIONS</b></p>	<p><b>Operational Support</b></p> <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>
	 <p><b>TECHNOLOGY</b></p>	<p><b>Technology Enablers</b></p> <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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# 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*

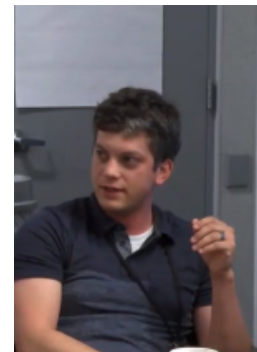
- Collect staff views about the existing strengths and weaknesses of the knowledge scope within the program

*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



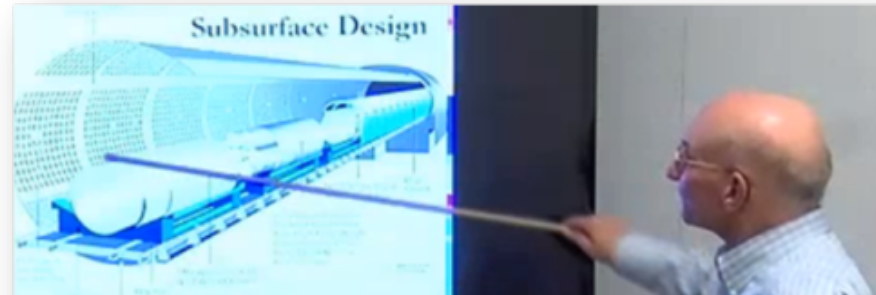
## M U L T I - D A Y   W O R K S H O P

- 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-/12 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 Waste Management Workshop

### Deep Dive Sessions

Non-Technical Requirements & Processes of a Nuclear Waste Management Project  
Deep Dive

UUR\_NEFCKM

Workshops and Deep Dives

Knowledge Management Document Library

EDIT LINKS

Search...

## 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.

### About the Presenter



Peter N. Swift  
Senior Scientist | Nuclear Energy Fuel Cycle | Sandia National Laboratories

- 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

## 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



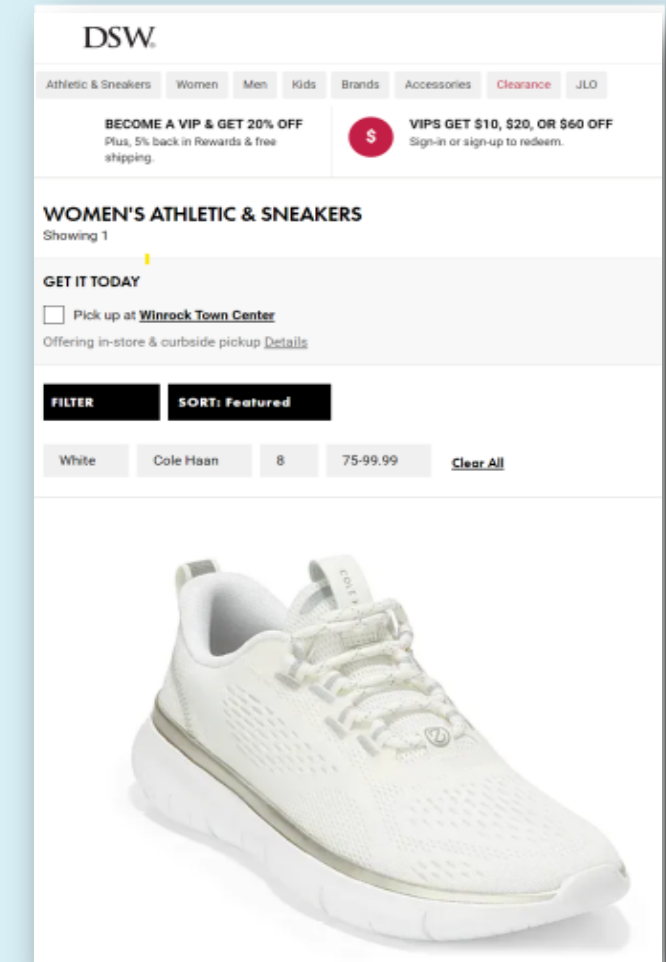
# The Nuclear Waste Management Taxonomy



## 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





Category of Content

Article

[Correspondence](#)

License Applications

Poster

**Presentation**

SHOW MORE

Function

Management Systems

Disposal

Storage

Transportation

Nuclear Energy Conversion

Primary Subject Matter

Career Summary

Management Systems: Le...

**Repository Siting**

Repository Disposal Requi...

Management Systems: Kn...

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File Type

PDF


PowerPoint


Web page


Word


KM Library Home Page


[All Content](#)


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 Knowledge Management  
Beckman & Associates  
PA 15012 ♦ (724) 497-1000  
established under the authority of the Pennsylvania Public Utility Code  
<https://sharepoint.sandia.gov/.../W001-10004-Pres-Shoemaker - WIP...>


 Regulatory Deep Dive  
Steve Wagner - Manager  
Analysis Department  
multimission laboratory  
Technology ...  
<https://sharepoint.sandia.gov/.../DD006-11014-Pres-DBFT Siting Fi...>

 Storage And Transportation  
Focus is on Spent Fuel  
Program Applications  
regulations ... SCS LLC  
<https://sharepoint.sandia.gov/.../DD006-11015-Pres-US NWM Facilit...>

 NRC Licensing, Training and Outreach  
NRC Licensing, the application  
Introduction & Overview  
Licensee / Burden on the  
public  
<https://sharepoint.sandia.gov/.../DD002-10002-Pres-Deep Borehole Repository...>

 Federal Budget and Finance  
<https://sharepoint.sandia.gov/.../DD003-10003-Pres-Deep Borehole Repository...>

 Safety Case for Deep Borehole Repository  
Peter N. Swift; S. David  
<https://sharepoint.sandia.gov/.../DD002-10002-Pres-Deep Borehole Repository...>



Category of Content

All

**Presentation**

Primary Subject Matter

All

**Repository Siting**

File Type

PDF

PowerPoint

Site Type

Mined Repository

Deep Borehole Repository

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SPOTLIGHT: Workshops & Deep-Dives


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[Speaker Series, Deep Dives](#)

 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 ...  
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 U.S. Deep Borehole Field Test Siting Process  
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 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 ...  
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Past Repository Siting Process

 Sandia National Laboratories


Past Repository Siting Process

PRESENTED BY  
Peter Swift

Nuclear Energy Fuel Cycle Knowledge Management Workshop  
December 17-19, 2019, Albuquerque, New Mexico

SWIFT PAST REPOSITORY SITING PROCESS  
NEFC KNOWLEDGE MANAGEMENT WORKSHOP DECEMBER 17-19 2019  
SAND2019-14976 PE

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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# Maintaining NWM Competence

## ONGOING KM DEVELOPMENT

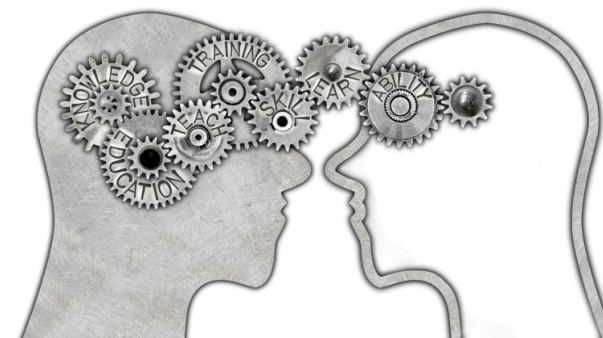
- KM Library is complete with initial pilot content
- Additional critical KM content is being uploaded and tagged as it is identified
- NWM Taxonomy developed and installed in database
- Validation and testing of that first version is underway
- KM Governance structure developed

## EXPANDED PARTICIPATION

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

## INTERNATIONAL COLLABORATION

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





# QUESTIONS?

Janette Meacham  
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