SAND2022-15553C

U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Knowledge Management Overview

ANS IHLRWM Conference

Phoenix, AZ November 13, 2022

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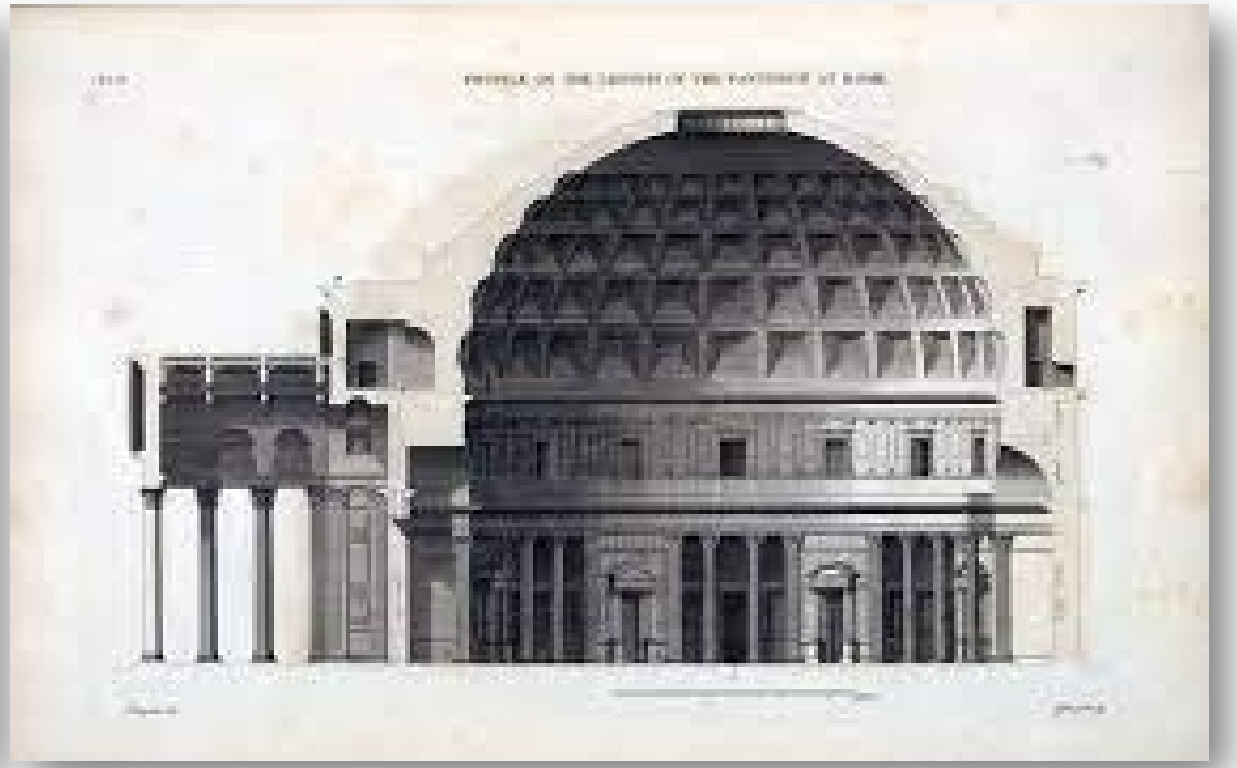
Outline

- Why Knowledge Management (KM) – Two Examples
- What is Knowledge Management?
- The KM Framework
- Spotlight: Critical Knowledge
- Current NE-8 KM Project

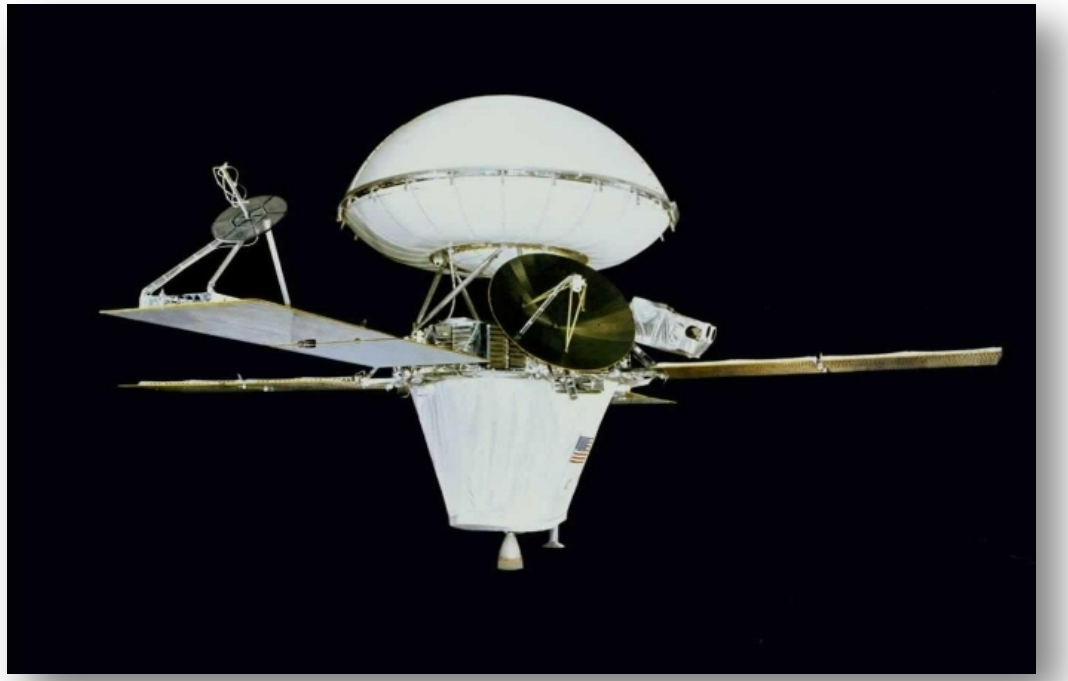
Why Knowledge Management?
Worst Case Example of Losing Critical Knowledge



Scarbrough, Harry & Swan, Jacky. (1999). Case Studies in Knowledge Management.
Images courtesy of Wikipedia

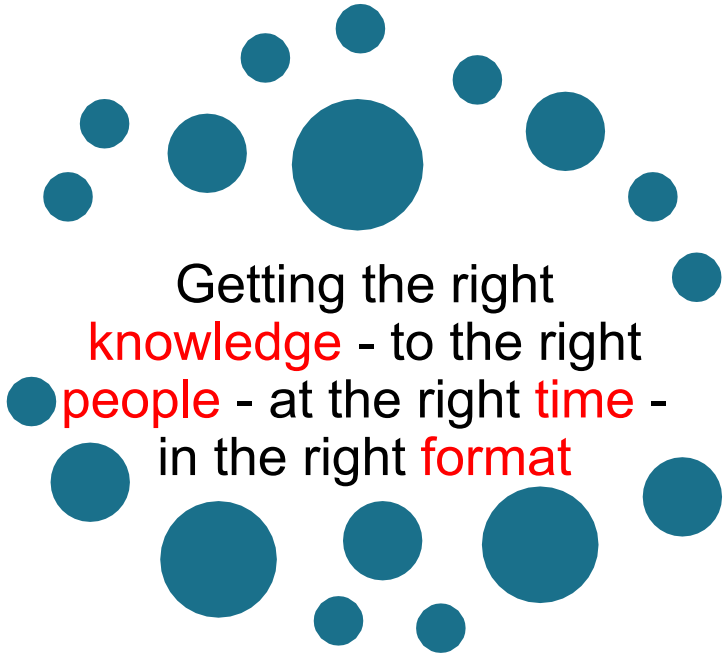
Lost Knowledge – Throttleable Thrusters

Mars Science Laboratory – Launched 2011
Hovering ‘sky crane’ required the recovery of ‘lost’ knowledge that had been used 36 years earlier on the **Mars Viking – Launched in 1975**



David Oberhettinger, JPL Retiree, taken from the IAEA
Methodology to Determine Critical Knowledge in Nuclear Organizations
Images courtesy of Wikipedia

What is Knowledge Management?



Getting the right knowledge - to the right people - at the right time - in the right format

Sharing experience, learnings, and insights in a supportive environment

To maximize staff expertise and improve productivity

Research shows that 27-33% of a worker's day is spent trying to find the data, information, and knowledge needed to do their job (Source: KMI)

Types of Knowledge

- Easily Documented
- Paper, Electronic
- Often relies on technology that must be managed

- Not yet captured as explicit
- Exists in teams or organizations as shared practice

- Found in the human mind and behavior
- Exists as insight, thinking, social skills, experience
- Difficult to capture

Objectives of KM Initiatives

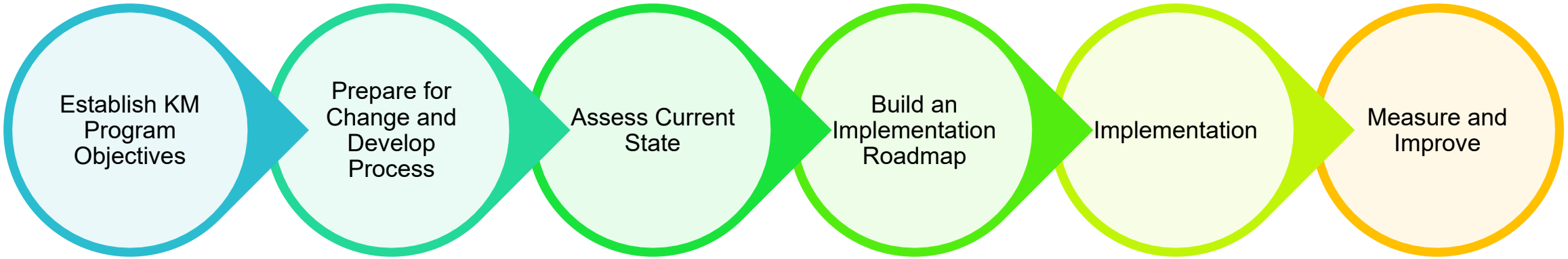
- Improve effectiveness and efficiency
- The right knowledge is available at the right time and right place for those who need it
- Create a knowledge repository
- Support timely acquisition of new knowledge that is relevant for the organization
- Establish, improve, and manage knowledge assets
- Enhance the knowledge sharing environment
- Reduce the risk of losing knowledge due to staff turnover

KM Strategy and Processes

The general objective of most KM strategies is to formalize the KM processes to ensure a sound basis for the long-term sustainability of competencies

- **Typical KM Processes:**
  - Identification of the necessary (critical) knowledge
  - Identification of the risk of knowledge loss
  - Acquisition and/or creation of knowledge
  - Knowledge retention
  - Knowledge utilization
  - Review of the effectiveness of the KM process
  - Identification of opportunities for improving the KM process

Steps in KM Implementation



Step 1
- Identify and document the KM Risks
- Develop strategy and document long-term objectives

Step 2
- Develop high-level process
- Attract champions
- Manage cultural change
- Explore KM best practices

Step 3
- Assess the 3 core KM components: people, processes and technology
- Perform gap analysis

Step 4
- Confirm Leadership support and commitment
- Elaborate on Strategy as a roadmap
- Highlight key milestones

Step 5
- Ensure staff resources and funding
- Realize short-term wins

Step 6
- Measure results
- Analyze and learn from progress to date
- Improve the KM Program

Examples of Knowledge Management Tools

Understand where critical knowledge is held in the organization

Meetings of experts to share knowledge across groups

Professional conferences, trainings, benchmarking

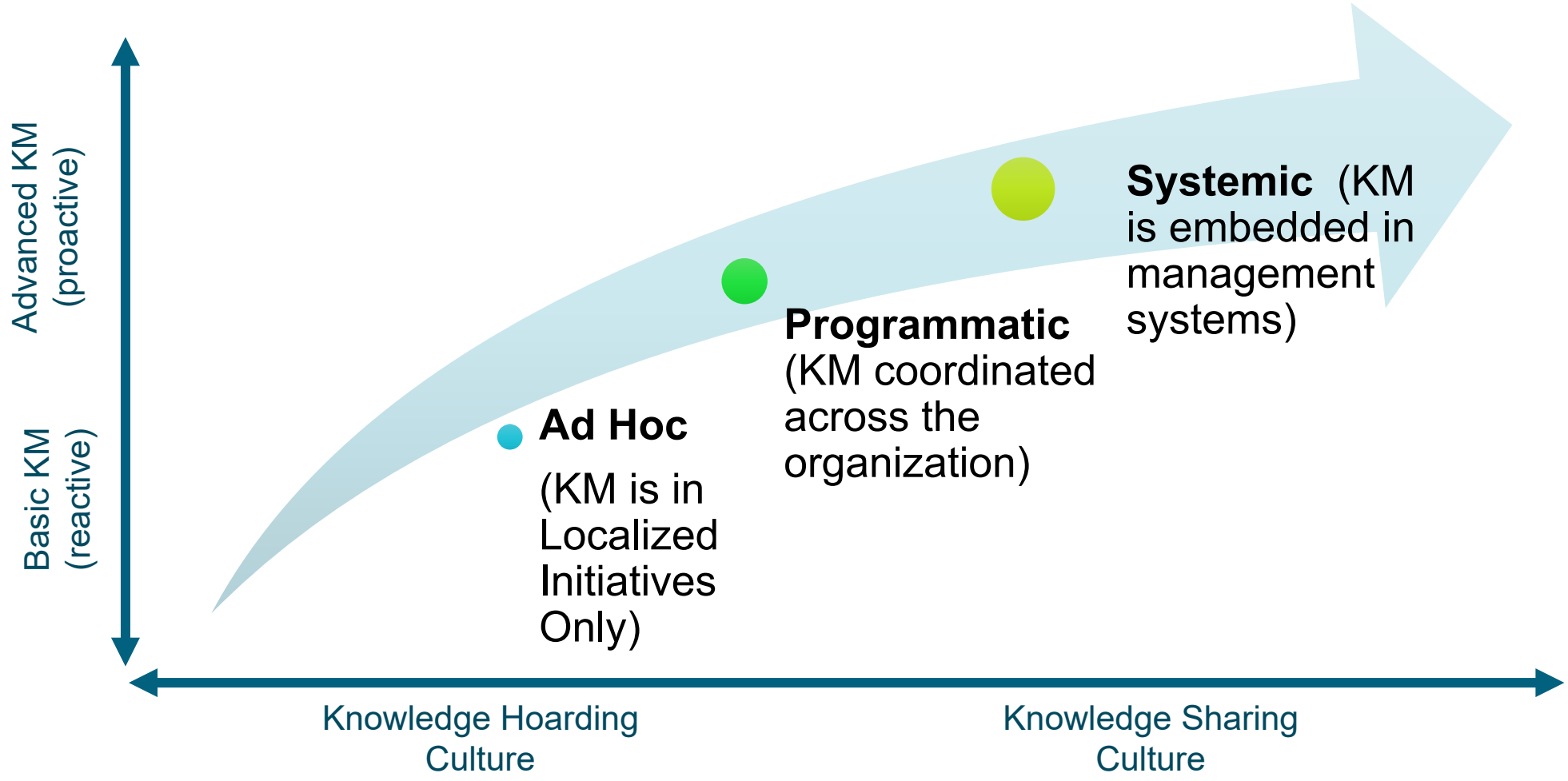
Temporary positions intended to transfer knowledge

Mitigate the risk of key personnel loss and create future staffing pools

Structured interviews and sessions with the holders of knowledge and experience

Ensure knowledge is held by at least two persons on the team

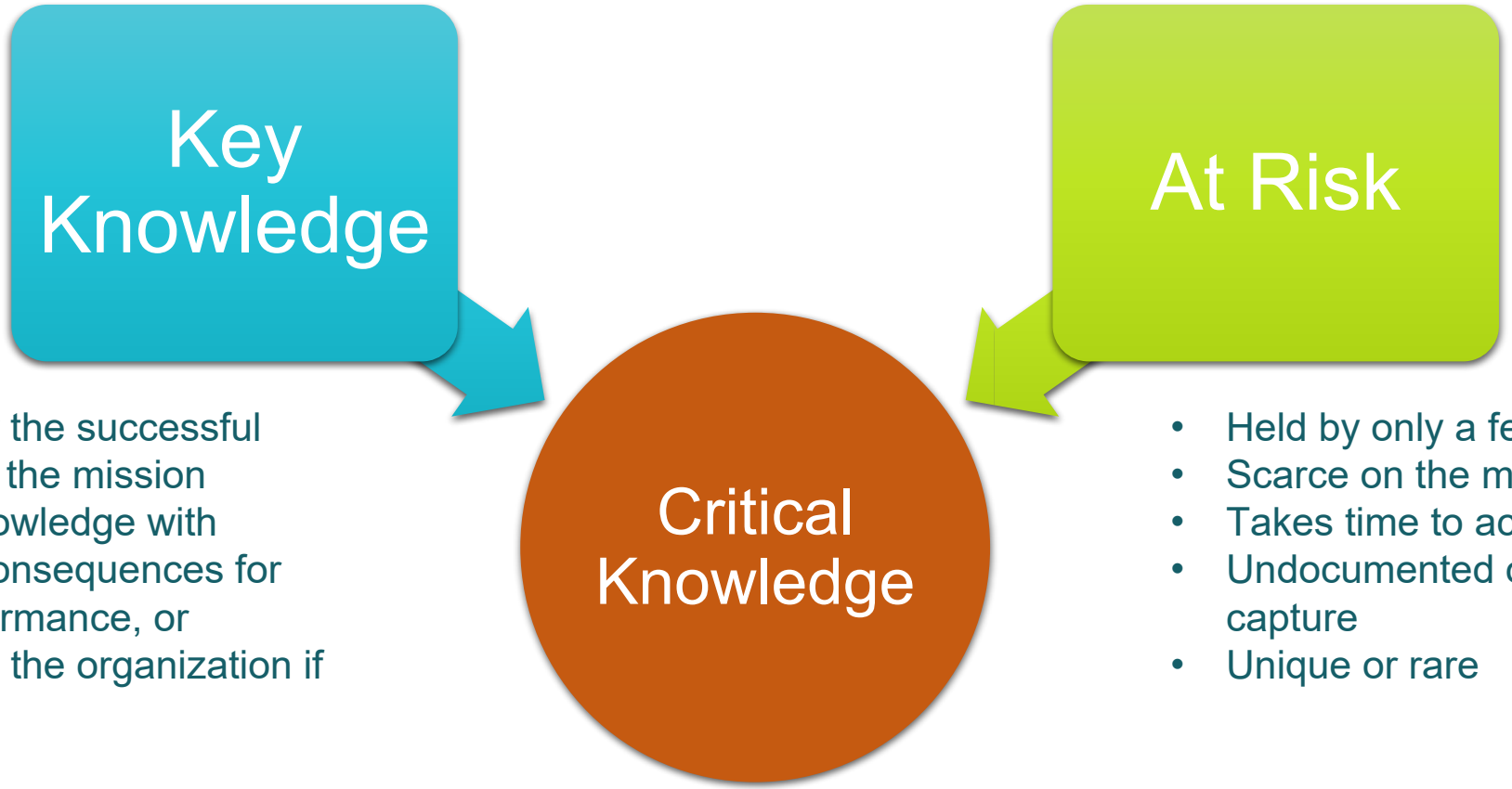
KM Organizational Maturity Level



Spotlight: Critical Knowledge

- **What is Critical Knowledge**
  - Knowledge that is not well known, understood, or easy to define
  - Specialized tacit knowledge evolved from years of experience that is difficult to capture
  - Historical R&D knowledge that supports the technical basis
  - Know-how when all is good v. know-how when things fail
- **Knowledge critical to the organization must be captured, retained, and shared.**

Concept of Critical Knowledge



- Essential for the successful execution of the mission
- Valuable knowledge with significant consequences for safety, performance, or reputation in the organization if lost

- Held by only a few people
- Scarce on the market
- Takes time to acquire
- Undocumented or difficult to capture
- Unique or rare

When Key Knowledge is at Risk, it Becomes Critical

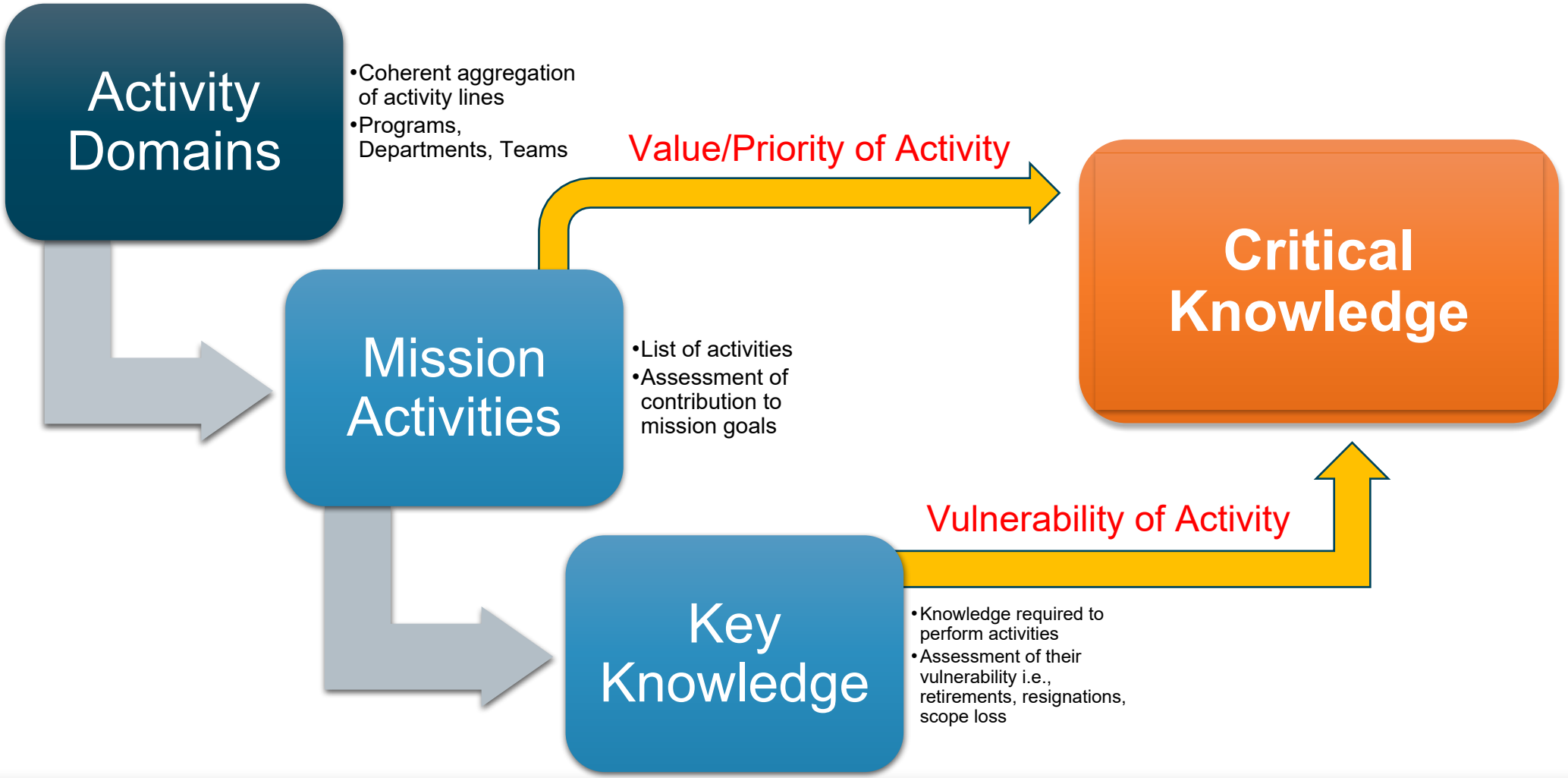
Why Identify Critical Knowledge?

- **It's a major asset**
  - Knowledge is often treated as if it was acquired at no cost, and as if organizational survival does not depend on it
  - It can be scarce, difficult to acquire, hard to reuse if not shared
    - When stored, it may not be easily findable or usable
    - Tacit knowledge is not easily documented and can be lost with staff turnover
  - It's held everywhere throughout an organization, across many domains

Held By:
- Individuals
- Line Organizations
- Project Organizations
- Corporate

Related To:
- Strategic
- Tactical/Operational
- Innovation/Growth
- Emergent R&D
- Historical R&D

Identifying Critical Knowledge



The Analysis Results

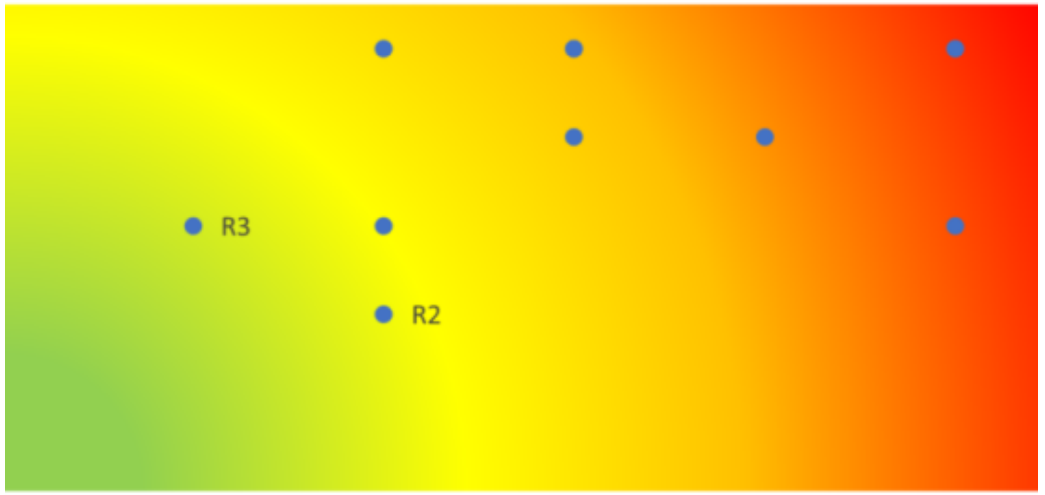
Activities

Questions to Discuss:

- Why is this activity experiencing these vulnerability conditions?
- How long has this been the case?
- What should be done?

Vulnerability of Knowledge Associated with the Activities

Heat Map Showing Criticality of Knowledge



- Always go back to the details and study them with the knowledge owners
- Develop an Action Plan to mitigate the knowledge vulnerability
- Results are Perspectives to adjust work processes

Triggers for Critical Knowledge Assessments

Periodic / Scheduled

- Strategic Planning
- Safety Assessments
- Completing major milestones or phases

Unplanned Events

- Retirement or Resignation of an expert or key staff
- Identification of a pressing safety issue
- Organizational changes

One-Off Opportunities

- Kick-off of a major project – risk analysis
- Introducing a new technology
- Upgrading a quality system
- Launching a performance improvement initiative

Current NE-8 KM Program

- Back to the JPL – Mars Science Laboratory Story
- The Problem We're Working to Solve
- Our Strategy and Framework
- Accomplishments to Date
- How To Join Us

The NE-8 Knowledge Management Project

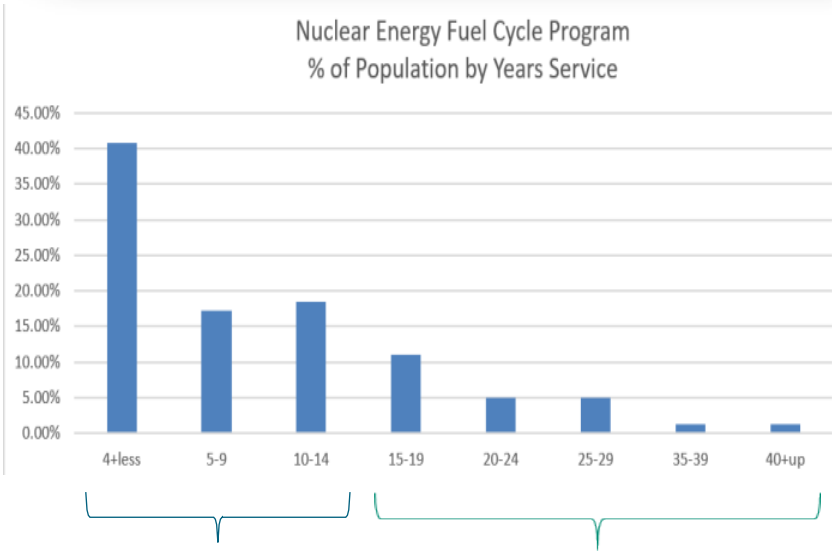
ISSUE: POTENTIAL LOSS OF EXPERTISE

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

KM Strategy – 4 Primary Components

KM COMPONENTS	CONTENT MANAGEMENT	KNOWLEDGE CAPTURE & TRANSFER	COLLABORATION	SUBJECT MATTER EXPERTS
	» Enterprise Content Management » Content Taxonomy and Metadata Schema » Robust Search Capabilities » Document Management	» Knowledge Capture and Transfer - Tacit and Explicit » Knowledge Retention for both 1) Execution and 2) Continuity of Trust » Best Practices » Lessons Learned » Training, Coaching, Mentoring skills transfer on the job	» Communities of Practice » Communities of Interest (blogs/wikis) » Centers of Excellence » Collaboration Workspaces » Workshops/Forums	» Experts - what we know, ask, and share » Skills Documentation » Community Finder » Skills/People Finder

KM Enablers for Program Success

KM ENABLERS

SUPPORTING KM PROCESSES & METHODS

Knowledge Management Transfer Methods

» Critical Knowledge Assessments and Mapping, Process and Skills Mapping
» Peer Assistance, Lessons Learned/After Action Reviews/Storytelling
» Knowledge Capture, Retention and Transfer
» Best Practice Harvest, Lunch & Learns, Knowledge Cafes

GOVERNANCE & OPERATIONS

Operational Support

» KM Governance/ Code of Practice. Performance Management and KPIs
» Staff Engagement - Rewards and Recognition
» Change Management, Communications, Branding, Training

TECHNOLOGY

Technology Enablers

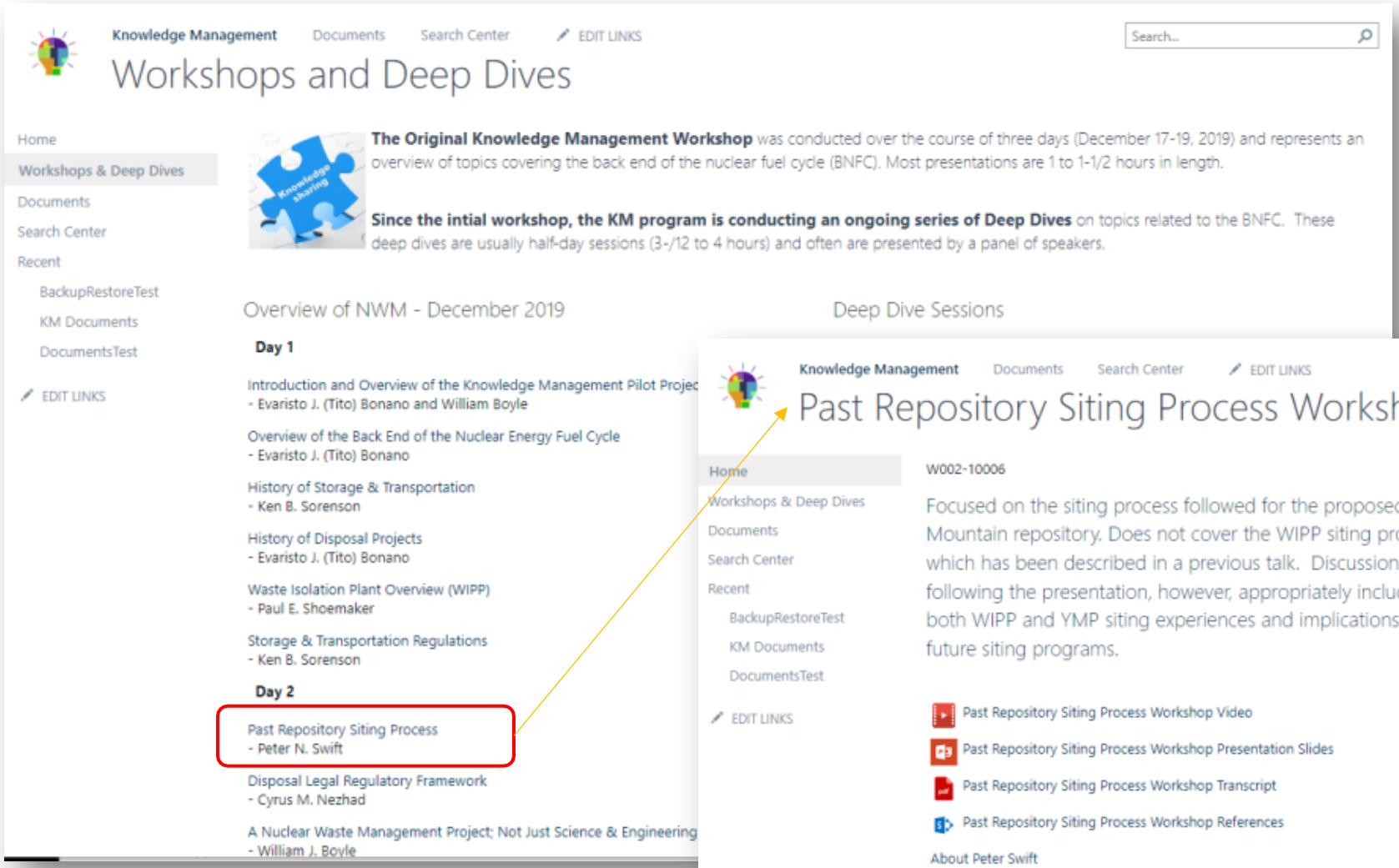
» Information Portal, Collaboration, Team Sites, Document Management
» Content/Social/Search/Video Enabled/Business Intelligence/Analytics
» Enterprise Information & Data

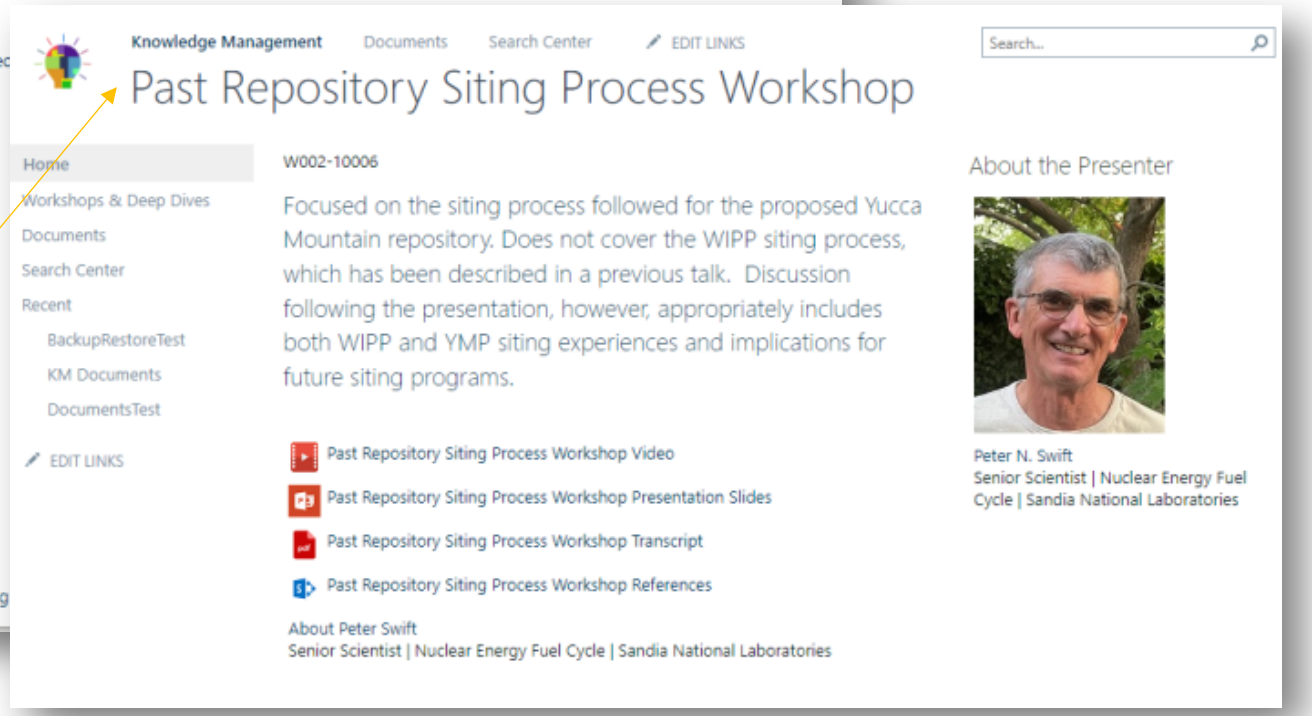
The KM Framework

- **KM Portal**
  - Provides easy, unified and integrated access to program knowledge resources
  - Easy, simple exchange of information
- **NWM Taxonomy**
  - Standardized nuclear waste management vocabulary for efficient search
- **Knowledge Capture Session Sitepages**
  - Location and retrieval of information is quick and easy

KM Repository Development

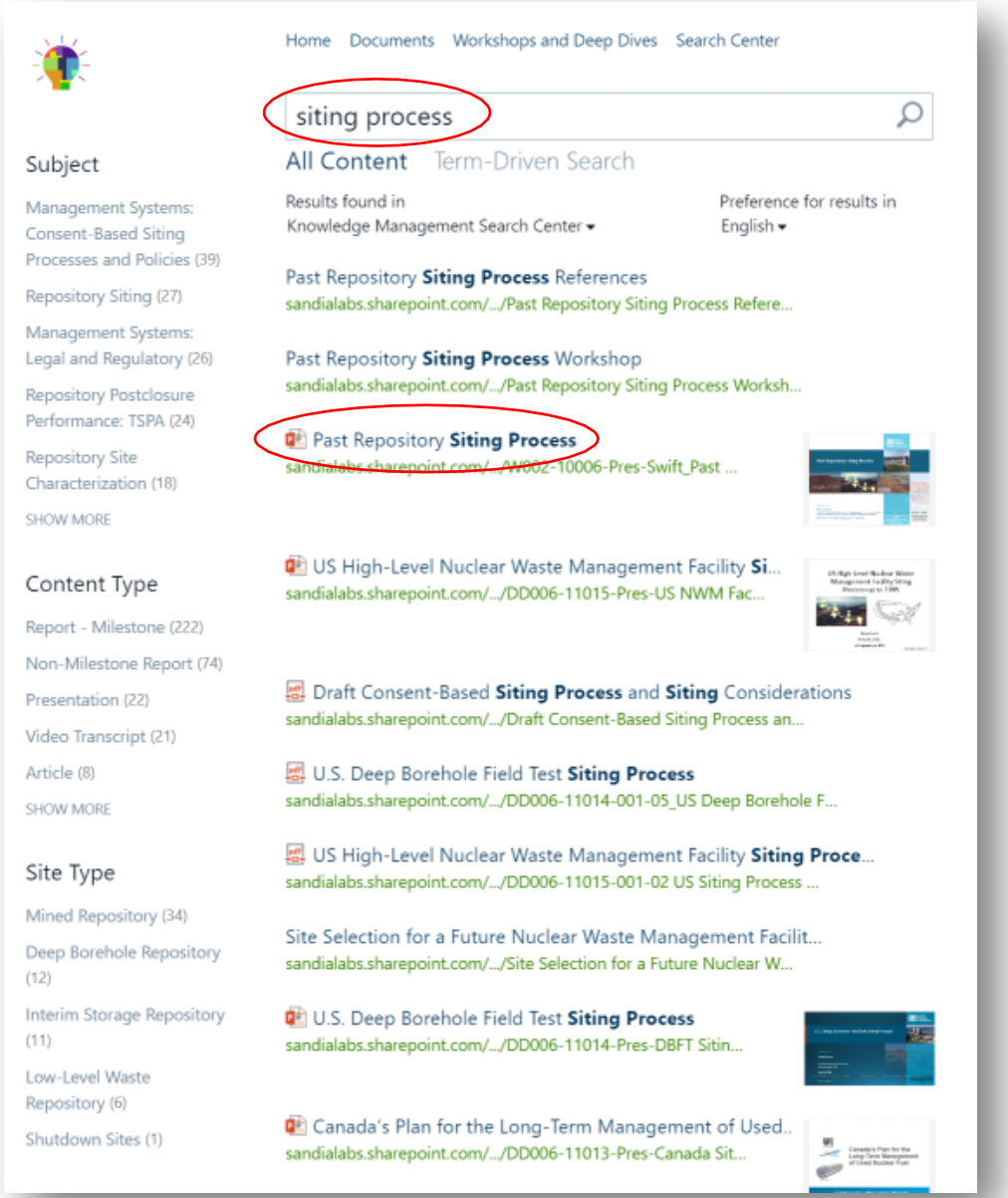
- Speaker Biography
- Video of the Session
- Video Transcript
- Presentation Slides
- Reference Materials cited by Speaker



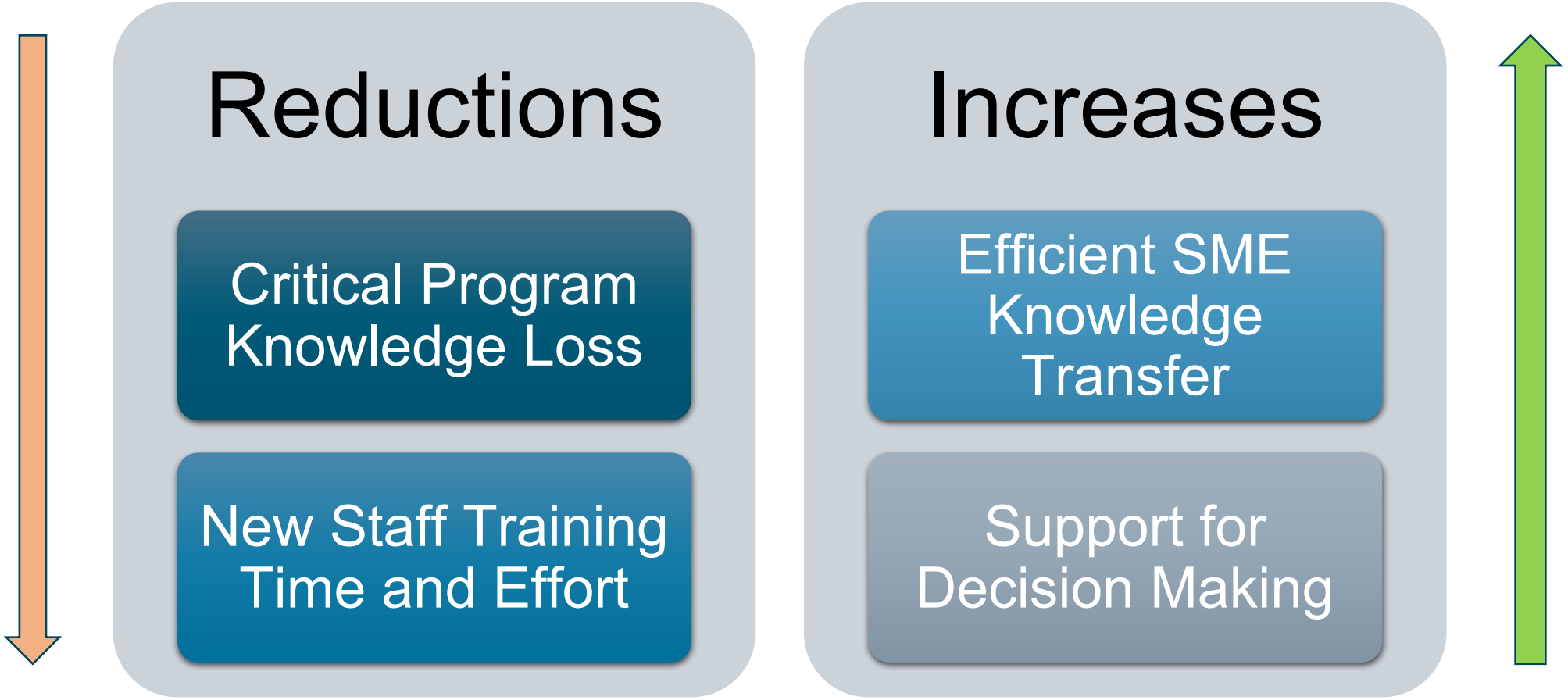


UNIQUE TAXONOMY FOR THE FIELD OF NUCLEAR WASTE MANAGEMENT

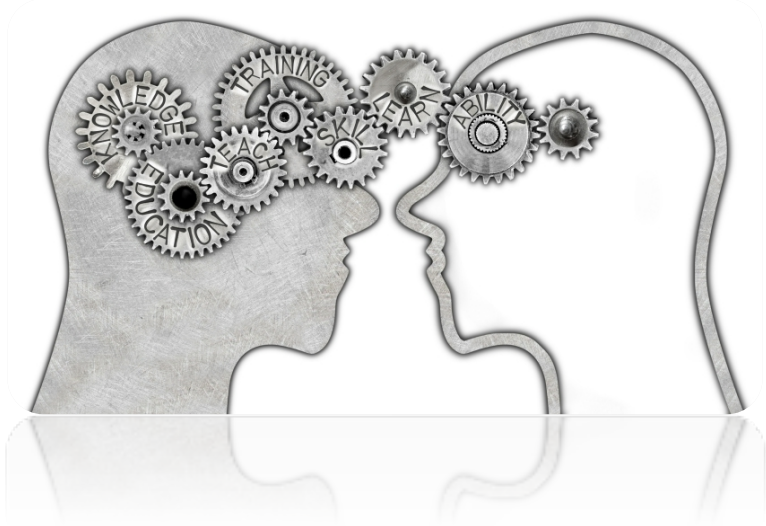
- Early standardization of taxonomy and terminology
- One single metadata model across the program
- Controlled and organized vocabulary used to describe or characterize unambiguous and explicit concepts of nuclear waste management
- Installed in the KM database to enhance capturing, managing and searching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



Some Qualitative Results To Date



Some Lessons Learned



- Get Management Sponsorship
  - Manager work and involvement is inevitable
  - Forget it if you can't enlist a Senior Sponsor
- Combine a central KM change team with willing volunteers in the field
- Master the use of collaborative platforms, text mining technologies and critical knowledge assessments
- Use of KM tools should be dictated by the situation – don't push a tool just because you have it
- Suite of KM tools should change based on the business need
- Make use of the experience of others – Community of Practice

Join Us

If you would like access to the KM Portal and its UUR content, send an email request to:

km-access-request@sandia.gov

All content has been through internal Lab review and is rated as available for public release.

KM NEWS

Knowledge Management (KM) for the NWM Community

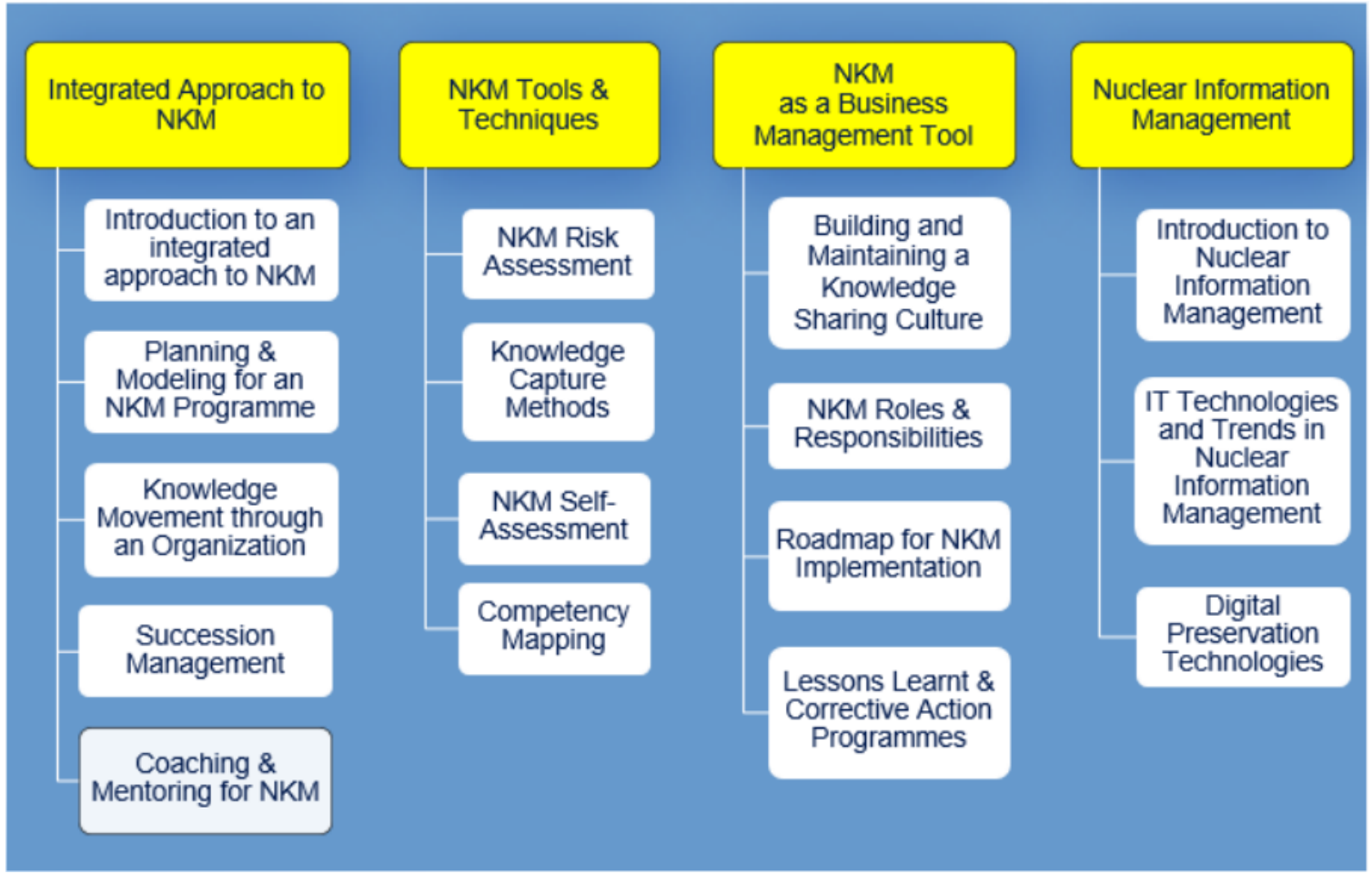
NWM KM Site Update

Now Available to the Laboratory Community

Content from the Nuclear Waste Management (NWM) Knowledge Management (KM) Site that has been categorized as UUR is now available on an external cloud platform. We invite all to get an account and begin exploring this UUR KM content that has been collected over the course of this KM project! Video presentations given by Experts on topics such as the History of Storage & Transportation, Past Repository Siting Process, and Social Perspectives and are archived on the public site and available on demand.

Access can be provided to Lab users with a Microsoft account. Simply make a request by e-mail to: km-access-request@sandia.gov. Once you have an account, the NWM KM Site is Located Here

IAEA Nuclear KM Curriculum



https://www.iaea.org/resources/nucleus-information-resources

QUESTIONS?

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