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**NONPROLIFERATION AND
ARMS CONTROL (NPAC)**

Safeguards Knowledge Management & Retention at U.S. Department of Energy (DOE) National Laboratory Complex¹

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INMM Nuclear Materials Science, Processing, and Signature
Discovery Workshop

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SAFEGUARD NUCLEAR MATERIALS TO PREVENT THEIR DIVERSION OR THEFT



CONTROL THE SPREAD OF WMD-RELATED MATERIAL, EQUIPMENT AND TECHNOLOGY



NEGOTIATE, MONITOR AND **VERIFY** COMPLIANCE WITH INTERNATIONAL NONPROLIFERATION AND ARMS CONTROL TREATIES AND AGREEMENTS



DEVELOP PROGRAMS AND STRATEGIES TO ADDRESS EMERGING NONPROLIFERATION AND ARMS CONTROL THREATS AND CHALLENGES

¹ Haddal, Risa, Jones, Rebecca, Bersell, Bridget, Frazar, Sarah, Burbank, Roberta, Stevens, Rebecca, Cain, Ron, Kirk, Bernadette, and Morell, Sean. 2017. "Safeguards Knowledge Management & Retention at U.S. National Laboratories.". United States. doi:10.2172/1398239. <https://www.osti.gov/servlets/purl/1398239>.



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INTERNATIONAL NUCLEAR SAFEGUARDS

Background

- Absence of knowledge management program
 - Work is only passed on situationally
 - Staff learn knowledge based on who they know and what they ask
 - Valuable information about historic work, processes, procedures, contacts and applications being lost
 - Duplication of effort, time and valuable taxpayer resources
 - New safeguards experts are prone to repeat efforts to gain knowledge
- Consequences:
 - Substantial loss of U.S. safeguards expertise
 - Loss of critical safeguards skills, e.g. material control & accounting, nondestructive assay, containment and surveillance, safeguards approaches.
- Proactive steps needed to retain knowledge of mid-career and senior U.S. safeguards staff before they walk out the door.

Definitions

- Knowledge Management (KM): *“An integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing, and preserving knowledge, relevant to achieving specified objectives.”*²
- Knowledge Retention (KR) Plan: *“identifies critical knowledge and positions in an organization, and methods to be used for addressing potential knowledge loss through attrition, and the process that will ensure that the plan is continually updated to meet changing business needs.”*³
- Two forms of information
 - Tacit (experience-based)
 - Explicit (written, documented)



2. IAEA-TECDOC-1675, “Knowledge Management for Nuclear Research and Development Organizations.” IAEA, Vienna, 2012, pg. 50.

3. Ibid, pg. 51.



Complementary Efforts

- International Atomic Energy Agency (IAEA)
 - Developing methodologies and guidance documents
 - Facilitating nuclear education, networking and experience exchange
 - Assisting Member States
 - Promoting use of KM technologies
- Department of Energy (DOE)
 - DOE knowledge capture and transfer program
 - Phased retirement
- Nuclear Regulatory Commission (NRC)
 - Formalized knowledge management program with release of a Knowledge Management Program Policy (SECY-06-0164) Nuclear Regulatory Commission.⁴
- National Aeronautics and Space Administration (NASA)
 - Establish a Chief Knowledge Officer

4. The NRC Knowledge Management Program Policy (SECY-06-0164). July 25, 2006.

Overview



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INTERNATIONAL NUCLEAR SAFEGUARDS

- FY17 effort to address safeguards Knowledge Management & Retention (KM&R) within DOE/NNSA lab complex.
 - Multi-lab Safeguards KR Survey (SNL)
 - Succession Planning Methodology (ORNL)
 - Workforce Agility Tool (LANL)
 - Workshop
 - Develop a Safeguards KM&R Strategic Roadmap





Multi-lab Safeguards KR Survey

- Survey 9 U.S. National Laboratories⁵: status of safeguards Knowledge Retention
- Inquired about:
 - Attrition
 - Processes/procedures for KM&R activities for outgoing safeguards staff
 - Types of critical information to preserve
 - Challenges/barriers
 - Safeguards KM&R best practices
- Survey Result Recommendations
 - Develop shared platform repository
 - Incentivize to transfer knowledge and engage in mentoring
 - Fund and evaluate training effectiveness
 - I.D. best practices e.g., transition/succession planning, workforce tools, knowledge transfer (tacit and explicit)



⁵ Argonne National Laboratory (ANL), Brookhaven National Laboratory (BNL), Idaho National Laboratory (INL), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), Sandia National Laboratories (SNL), Savannah River National Laboratory (SRNL)



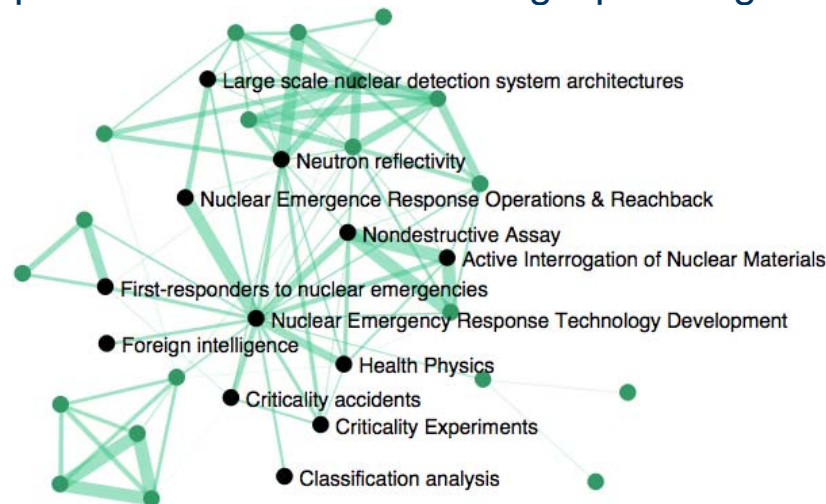
ORNL Succession Planning Methodology

- Developed a draft methodology to identify critical skills/core competencies of technical staff to address loss of expertise. Steps are as follows:
 1. Select a nuclear facility or group of experts at a Department of Energy (DOE) national laboratory
 2. Select candidates
 3. Interview candidates
 4. Analyze interview results
 5. Validate core competencies and level of criticality using a ranking based on IAEA position risk factor⁶
 6. Assess potentially-core competencies
- Pilot tested on 7 Subject Matter Experts (SME) at the High Flux Isotope Reactor (HFIR) and Safeguards organizations
- Field tested on 4 SMEs in nuclear safeguards and security who retired in December 2018
- The draft methodology was updated based upon results/findings from the pilot and field tests.

⁶IAEA. (2006). *Risk Management of Knowledge Loss in Nuclear Industry Organizations IAEA-1248*. Vienna, Austria.

LANL Workforce Agility Tool

- This tool is designed to help managers identify institutional capabilities based on self-identified competencies of the workforce to facilitate an agile workforce that can effectively support programs with similar competency needs.
- The Data-driven model allows for easy mapping of related competencies that can help managers:
 - Identify capabilities across the laboratory
 - Identify good matches for mentoring and cross-organization collaboration
 - Identify related competencies to assist in strategic planning





Safeguards KM&R Workshop

- Held on August 29-30, 2017 at Sandia National Laboratory
- Participants
 - Argonne National Laboratory (ANL), Brookhaven National Laboratory (BNL), Idaho National Laboratory (INL), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), Sandia National Laboratories (SNL), Savannah River National Laboratory (SRNL)
- Purpose: Clearly identify challenges related to safeguards KR at the DOE/NNSA National Laboratory Complex and develop recommendations to mitigate challenges



2017 Safeguards Knowledge Management and Retention Workshop

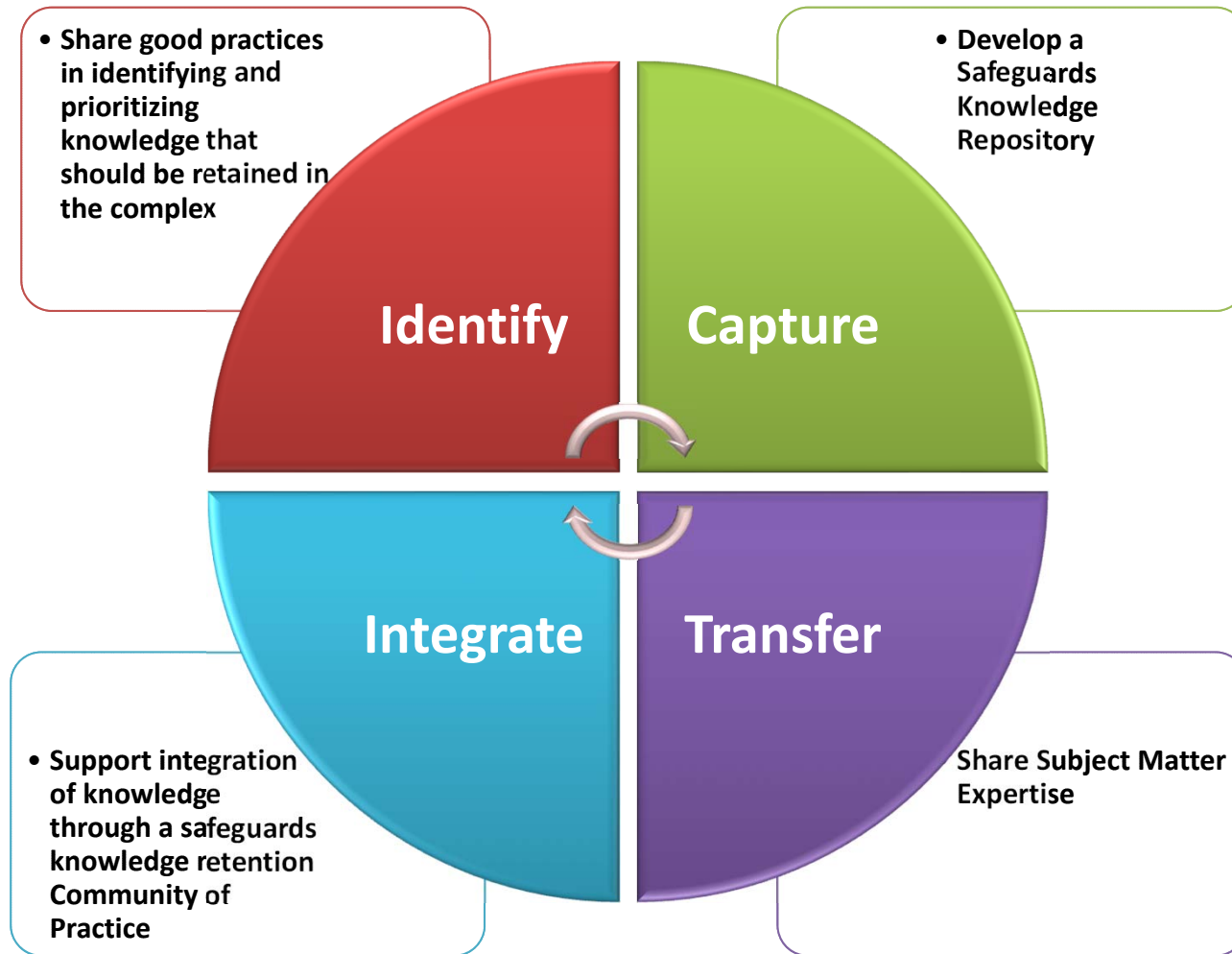


Safeguards KM&R Workshop Results

- Overall goal of program
 - Office of International Nuclear Safeguards goal for knowledge management in the U.S. international safeguards community is to identify and capture knowledge that can be shared and transferred across the community to foster collaboration, break down silos, and ensure the retention of important knowledge in order to ensure sustainability, gain efficiencies, and promote innovation.
- Objectives of program
 - Identify and prioritize what knowledge needs to be learned and retained
 - Capture knowledge so that it is available and accessible
 - Transfer knowledge
 - Encourage the use and integration of knowledge
- ***Each National Laboratory in attendance has been challenged to develop a sustainable knowledge management strategy***



Safeguards KM&R Strategy and Actions





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Conclusion and Next Steps

- Conclusion
 - All Labs face similar challenges to identifying knowledge at risk of being lost and knowing what to do about it
 - Survey highlighted formal and informal available approaches
 - Workshop helped refine the overall KM&R strategy
- Next Steps:
 - Enhance nonproliferationportal.com
 - Further develop the safeguards knowledge management & retention repository
 - Share lab-developed tools such as the workforce planning methodology and the workforce agility database within the Safeguards community
 - Develop a sustainable knowledge management strategy at each lab



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