

PANEL SESSION 101 - US NRC/US DOE/IAEA LLW Performance Assessment, the Safety Case (PRISM) and Long Term Monitoring Workshop

Co-Chairs: Larry Camper, *US NRC*;
Christine Gelles, *US DOE EM*
Reporter: Christine Gelles, *US DOE EM*

Panelists Included:

- Matthew Kozak, *INTERA, INC.*
- Bobby Abu-Eid, *US NRC*
- David Esh, *US NRC*
- Michael Ryan, *ACRS*
- Christine Gelles, *US DOE*
- G. Bruno, *IAEA*
- Vincent Nys, *IAEA*
- Lisa Edwards and David James, *EPRI*
- Roger Seitz, *SRNL/USDOE*

This panel enjoyed a large attendance throughout the nearly five hour panel period. An average of 95 attendees were present throughout, although attendance peaked at approximately 120. Questions were taken after most panel presentations and are summarized below. Following the panel presentations, there was a brief period for open discussion and continued questions. A reception was held after the panel discussion to facilitate continued discussion among panel members and participants.

Larry Camper and Christine Gelles began the panel with brief opening comments. Larry explained the topic of performance assessment is very timely, given DOE's efforts to update its radioactive waste management order, which – for LLW - is built upon site specific performance assessments. The NRC's ongoing rule-making effort related to site specific performance assessment for disposal of depleted uranium and other unique waste streams on ongoing; along with other pending NRC regulatory efforts. Christine noted that the synthesis of DOE, NRC and IAEA in this panel illustrates that there are many parties vested in this topic, and that the high level of attendance at the symposium's final session provides evidence of high interest in the topic.

Dr. Bobby Abu-Eid provided the first presentation, providing the NRC's recommended approach for performance assessment methodology for LLW disposal. He highlighted that NUREG 1575 as a key reference document. The presentation provided a detailed explanation of the methodology and the technical assumptions underlying it, as well as readily used codes and models.

Questions: Most questions were focused on assumptions related to modeling potential exposures.

- Is drinking contaminated water through a straw a defensible exposure path?
- What is a realistic conservative scenario, and what makes it realistic?

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Dr. Abu-Eid explained that the residential farmer scenario has been the previous reference, but the NRC looks to develop more realism in future reference scenarios. He noted NRC is looking for input to this – such as the comments and questions provided in response to his presentation.

Dr. David Esh provided a presentation on the computational tools, codes and models used by the NRC staff for LLW risk analysis, including several examples. He noted that states have acquired and are using independent models to support their regulatory efforts. His presentation provided a very useful and practical table of “do’s” and “don’ts” for the development and use of models to conduct risk analysis. He emphasized the critical need to provide adequate support to the model chosen for risk analysis. He also cautioned that the use of a sophisticated code when there is limited technical data can provide a false sense of confidence in the risk analysis results. The risk modeling examples he provided included DOE’s West Valley Site and the DOE Savannah River Saltstone vaults.

Question:

- A question was posed whether NRC has confirmed the effectiveness of its models? Dr. Esh explained that they can’t be validated in the purest sense, due to the timescales involved, however they do continually incorporate any feedback regarding changed assumptions, conditions, etc.

Dr. Mike Ryan’s presentation, entitled “Current Issues in Part 61 Waste Classification System – A Proposal to Risk Inform US LLW Classification System”, provided a response, of sorts, to the NRC presentations. He began with a discussion of the main risk metrics associated with LLW: “concentration is best used as a metric of operational risk; quantity is best used as a metric for disposal; and, half-life is best used for evaluating long-term risk, transport and environmental impacts.” He emphasize the concentration does not drive risk. His presentation offered areas for improvement, including risk-informing, eliminating origin considerations, establishing clearance levels and focusing on extended storage considerations.

Questions and comment: This presentation generated a high level of discussion.

- What about piles of unregulated wastes? Dr. Ryan emphasized that questions of waste form, packaging and disposal cover must be addressed to risk inform management strategies for some currently unregulated waste materials.
- It was noted that the approach Dr. Ryan described is similar to DOE’s waste management order, which has a single LLW class. Dr. Ryan responded in agreement, noting “getting rid of waste tables” (in Part 61.55) to have a single LLW class.
- From panel: If the US develops a system that is solely based on science, but States can’t implement – wouldn’t that be worse than the current system? How do you balance and resolve science with practice? Dr. Ryan responded that South Carolina is his only reference for State regulation of LLW, but that they had the needed competencies to implement the current system – and they were one of the first states faced with the challenge.
- How much time should one spend to try to reconcile science with practical matters? Is it time well spent to challenge requirements in Part 61 that were first identified 40 years ago?

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- Comment: We should not lose sight of fundamental questions related to performance assessments and models, in general. Why do we have them and how do we benefit from them? What is their purpose?

Matt Kozak presented the technical basis of 10 CFR Part 61 LLW Classification Scheme. *It should be noted that this was intended to be the first of the panel presentations to provide a context for the more detailed presentations on the NRC framework, however, the agenda had to be rearranged to accommodate the availability of the speakers.* Matt explained that the current scheme was derived from the impacts analysis methodology performed on the disposal concept of that time – trench disposal in the 1970's. He provided numerous insights into the basis of specific aspects of the current classification scheme. For example, intruder scenarios and exposure scenarios were informed by actual technical issues experienced in 1970 disposal systems (such as bathtubting). He noted that those designs “look pretty primitive when compared to the systems engineered today”. He focused on the hazards associated with long-lived radionuclides and offered a concept of having intrusion analysis be basis for identifying waste concentrations appropriate for near surface disposal. He also noted that values for long-lived alpha radiation have been propagated worldwide: the US Class A limit of 10 nCi/g is equivalent to 366 Bq/g, and worldwide, the LLW category is nearly always capped at 400 Bq/g.

Questions: This presentation also generated extensive discussion:

- Comment: Commenter noted that one state tried to use a generic performance assessment model to license a planned facility and it failed. This was offered as evidence that if too much burden is put on states to conduct performance assessments, it will become a resource issue for them.
- Comment: Commenter clarified that large volumes of depleted uranium was analyzed in the draft EIS supporting promulgation of Part 61.
- Comment: Commenter offered that Part 61 is flexible enough to accommodate these questions of when a site-specific performance assessment is necessary; if waste is within the current classification tables, there is no problem; if not, the intrusion scenario for an inadvertent intruder is the key data point.
- Is it possible to do a probabilistic evaluation of the inadvertent intruder – as to what type of exposure path and the degree of exposure?
- Comment: There's a reason each site should have different concentration limits, because each site's features differ from another's.
- One commenter noted we are discussing the prudence of concentrating the volumes of LLW in systems that we know will be destroyed by environmental factors within thousands of years.

Following a coffee break, the international portion of the panel began.

Christine Gelles provided a brief overview of the IAEA's PRISM Project, for which she serves as the Chairperson. PRISM is an interactive project evaluating the Practical Implementation of the Safety Case Methodology in LLW disposal systems. Her presentation emphasized the differences between a safety assessment and the more encompassing safety cases concept. She summarized the scope, structure and estimated schedule of the PRISM project, which currently includes many IAEA member states. It is focused on capturing and sharing practical experience

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and lessons learned related to the use of the safety case to develop, justify and implement near surface/LLW disposal systems.

Gerard Bruno provided a presentation of how IAEA documents define and address the “safety case.” He provided a detailed definition of the safety case as an additional introduction into the details of the PRISM project, and he highlighted that the IAEA has a parallel project “GEOSAF” which focuses on the use of the safety case in geologic disposal systems.

Vincent Nys serves as the task leader of the PRISM task group working to improve the understanding of the safety case. He provided a presentation that summarized the PRISM project’s efforts to date to identify how key arguments or factors of various LLW systems comprise the integrated safety case for near surface disposal systems throughout the world.

Questions: There were no questions regarding the IAEA presentations.

Lisa Edwards’ presentation included an explanation of EPRI’s objectives related to the topic of performance assessment. EPRI’s ongoing research is focused on determining whether more appropriate disposal limits can be developed based on 1) radiation risks; 2) current ICRP dose conversion factors and 3) modern disposal systems. She posited that if current ICRP dose conversion factors were used to update the current waste classification tables – and no other parameters were changed – different concentration limits would result.

Questions:

- Which age group/cohort was used in the data presented? Lisa explained that the adult was the basis for the comparison of various dose scenarios in her presentation.
- The NRC was asked which age group they used in modeling. Dr. Esh explained that the adult is typically the average cohort representative and basis for evaluation. However, if stakeholders raise questions, then they evaluate other cohorts and compare results for extreme differences.
- Dr. Esh provided a comment, cautioning panel members and attendees to avoid generalizing and understating what was done during the development of the current regulations.
- A commenter stated that whether Part 61 is retained or not, the presentations provided show the merit of performance assessment development and use. However, the branch technical evaluations almost make performance assessment the exception to the rule, rather than a requirement.

Roger Seitz’ presentation provided an overview of DOE’s radioactive waste management order (DOE Order 435.1) and its performance assessment methodology. He began by explaining that the DOE system relies on the radioactive waste management basis, which is largely analogous to the safety case terminology discussed in previous presentations. Similarly, DOE’s disposal authorization statements for DOE LLW disposal facilities are generally analogous to the facility licenses issued by the Agreement states for commercial LLW disposal facilities. The presentation highlighted that DOE uses performance assessments to evaluate safety of its LLW disposal systems, as well as HLW tank closure plans (following removal of HLW). He explained DOE’s performance assessment approach to be holistic, using a systems approach, as

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well as being graded and iterative. He also explained that DOE's modeling approach relies on a hybrid approach to agree on a deterministic baseline against which to conduct sensitivity analysis, augmented by a probabilistic approach to evaluate uncertainty. He summarized the advanced simulation effort initiated by DOE's Environmental Management program (ASCEM), noting that DOE wants to be able to better integrate its various models. He also discussed the value of performance assessment maintenance, which involves continued evaluation and updating of models and results, as required.

Comments / Questions:

One commenter stated DOE's hybrid approach appears to indicate a reluctance to "let go of the old process".

In light of time constraints, the panel chair decided to forego the planned technical summary and proceed to open discussion.

- One commenter encouraged the NRC staff to visit the Waste Control Specialists Facility.
- The same commenter also encourage NRC "to rein in the states" highlighting where states attempt to issue requirements more stringent than the NRC requirements.

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