PANEL SESSION 120: Interagency Community of Practice in Performance and Risk Assessment

Co-Chairs: Ming Zhu, *US DOE*
J. Scott Kirk, *BWXT TSG*

Pane Reporter: Kevin Brown, *Vanderbilt University - CRESP*

Panelists:

1. **Andrew Orrell,** *Section Head, Waste and Environmental Safety, IAEA (Austria)*
2. **Christepher McKenney,** *Chief of the Performance Assessment Branch, US NRC*
3. **Alaa Aly,** *Manager, Risk & Modeling Integration, INTERA (unable to attend)*
4. **Roger Seitz,** *Senior Advisory Scientist, Savannah River National Laboratory*
5. **Paul Black,** *CEO, Neptune and Company, Inc.*

This panel session focused on the Interagency Community of Practice in Performance and Risk Assessment (P&RA CoP). The session opened by **Ming Zhu** (co-chair) introducing the P&RA CoP, including participating from the United States Nuclear Regulatory Commission (US NRC), EPA, US DOE, several State regulatory agencies, US national laboratories, and contract and academic organizations. The P&RA CoP is a very active organization that began in 2009 (as the PA CoP) with support from DOE-EM and a focus on performance assessment. The CoP expanded in 2013 (as the P&RA CoP) to focus on a much larger scope involving CERCLA and RCRA decisions and is now also concerned with what is going on in the commercial area. The P&RA holds periodic webinars and annual technical exchanges to facilitate communication. **Scott Kirk** (co-chair) then provided his opening remarks that focused on the PA that was approved by the state of Texas that authorized the disposal of large quantities of depleted uranium (DU). He also discussed the background, history, and evolution of the site-specific analysis related to the DU PA (Texas) and the near-surface disposal of large quantities of DU as low-level waste. The panelists then each spoke. This was followed by a discussion and then a question and answer session.

Summary of Presentations

Andrew Orrell described the IAEA MODARIA (Modelling and Data for Radiological Impact Assessments) and MODARIA II programs. He began by mentioning the IAEA statute authorizing the agency to 1) establish or adopt safety standards and 2) to provide for the application of the safety standards, including their socialization in the member states. He followed by briefly describing the implementing IAEA standard documents and guides. He then described some particulars, including the three recognized exposure scenarios and radiological impact assessments and protection under the IAEA rubric leading to the discussion of the models to be used and how to appropriately apply the models. He then described the MODARIA and MODARIA II programs (including the path from MODARIA to MODARIA II) to improve the use of modeling for impact assessment for decision making.

Christepher McKenney discussed the history and evolution of the risk-informed performance-based tool rule for decommissioning, including the change to a dose standard, site-specific analysis, the push for understanding uncertainty and sensitivity of assessment using probabilistic or other methods. He then spoke of the history of interactions with the US DOE on Waste Incidental to Reprocessing (WIR), including the Idaho National Laboratory (INL) Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm Facility and Savannah River Site (SRS) Saltstone facility. He then spoke of the new regulatory phase involving monitoring of DOE facilities and performance confirmation, the living nature of performance assessments, and how new data integrate with past uncertainty and sensitivity evaluations (in PAs) and how issues have been closed (at INL and SRS).

Alaa Aly was unable to attend the panel session.

Roger Seitz began by discussing how far the community has come in terms of PAs, including the completeness, inclusivity, completeness of reviews; however, there are still challenges because what is done in PAs is not easy. Decisions must be made in the context of what might happen hundreds or thousands of years in the future, and the PA community must defend all that they do. **Roger** then focused on challenges in defense of PA assumptions and analyses as well as how to effectively manage corresponding uncertainties. He then briefly described three areas of interest:

1. "What-if" cases that are directly tied to PA as a learning process, including how to make stakeholders understand the likelihood of these cases actually occurring.
2. Inadvertent human intrusion scenarios that are fairly unique to the radiological business, including how to make near-surface disposal facilities more robust and how stylized scenarios are used to represent uncertainties in future actions.
3. Probabilistic approaches are where most PA improvements have been made in the last 15-20 years. Hybrid approaches were suggested using multiple lines of evidence to support decision making.

Paul Black described Structured Decision Making (SDM), including definitions of risk and SDM and the benefits of SDM. He then described the nature of decision making as utility versus probability (or values versus uncertainty) or the balancing of values against probability to arrive at the "best" solution. He then described issues concerning conservatism in PAs where he suggested that value judgements should not enter the "science" side of the problem, utility should be separated from probability to avoid entanglement, and conservatism should only be applied to the value side of the decision analysis process. He then described SDM in additional detail: talking to stakeholders, turn results into objectives (value-based), perform an analysis of available options and finally a consequence analysis. He stated that typically the consequence analysis is performed first not last. He finally discussed the benefits of SDM, including technical defensibility, traceability, transparency, and reproducibility.

Discussion and Questions and Answer (Q&A) Session

Ming Zhu (co-chair) began the discussion / Q&A session by describing the most significant challenges to the CoP (DOE perspective), including the development, application, and maintenance of P&RA as well as the impact to the bottom line in supporting D&D, Waste Incidental to Reprocessing (WIR) Determination, remediation, and disposal directions. He wanted to focus attention on those things that might erode public confidence in P&RA model results. He finally asked the panel to focus on what the CoP could do in these areas and to take leadership roles. **Scott Kirk** (co-chair) then provided his different perspective (commercial), including that challenging problems should be solved by applying the best science and pointed to the need for defining relevant exposure pathways and making informed regulatory decisions. **Andrew Orrell** (panelist) indicated that the community is not a single community or entity (from an international perspective) in terms of preparing, communicating, and understanding assessments and then discussed the issue of transparency, including more reliance on physics-based versus empirical models. He then discussed that we should not accept risks to future generations that are not acceptable today (as a guiding principle). **Christepher McKenney** (panelist) then spoke of model/code validation versus using the latest code and how well the code reflects the conceptual model for the site, including over time to supports decision making. **Ming Zhu** suggested that training is essential to support use of codes and models in a consistent and transparent manner, and the CoP is trying to advance the socialization of these techniques to help attract the next generation of the community. **Roger Seitz** (panelist) indicated that the biggest gains that have been made in the DOE system has been the idea of a "body of evidence" reflecting characterization and monitoring data in addition to the codes and models used to support the decision; do not focus too much on the numbers but instead the story they tell. **Paul Black** (panelist) commented on the Waste Control Specialists (WCS) model where a more accurate model may have resulted in less concrete (which may not be doing much for performance) and then mentioned the US GAO and the fact that we are facing an environmental legacy cleanup that is not sustainable. He then discussed the issues related to empirical and models of increasing complexity and parameterization without significantly more data.

The audience was then asked for questions. The first was a comment concerning the nature of decision making involving very low risks and the Linear Non-Threshold (LNT) idea for dose conversion and then he asked a question for the panel about how to characterize uncertainties in these very low doses. **Roger Seitz** responded in terms of the background dose, which is orders of magnitude higher. **Paul Black** then responded in terms of what EPA does for chemical risks, which is similar. **Christepher McKenney** then provided his perspective from a regulatory perspective. **Andrew Orrell** then suggested that the focus should be containment and isolation and not necessarily dose. A follow-up comment was then made by an audience member indicating that the problem was how the performance objective(s) were set (as a hard numerical number). Clarification was provided by an audience member that USEPA does not use 12 mrem as a cleanup standard and indicated cleanup standards tend to be a matter of policy and not science. Risk communication is key.

Another audience member pointed out the likely large costs of achieving an unbiased model (as perhaps suggested by a panel member) versus the benefits of such a model and asked where biases might be accepted in models. **Paul Black** then spoke about how to manage these types of uncertainties and the need for statistical practitioners to support probabilistic model development and communication. An audience member suggested that using a probabilistic model may not be more expensive; QA is a necessary expense to support model development. **Andrew Orrell** suggested there are times when conservatism is reasonable. The final question concerned risk discounting and potential impacts.