PANEL SESSION 103: Recent Developments and Trends in Integrated Risk Assessment Methods, Tools and Decision Analysis Support

Co-Chairs: **Mr. William Levitan**, *US Department of Energy*
Mr. Kurt Gerdes, *US Department of Energy*

Panel Reporter: Dr. Ming Zhu, *US Department of Energy*

Panelists:

1. **Mr. William Levitan**, *US Department of Energy*
2. **Dr. Rateb (Boby) Abu Eid**, *US Nuclear Regulatory Commission*
3. **Mr. Stuart Walker**, *US Environmental Protection Agency*
4. **Mr. Magnus Vesterlind**, *International Atomic Energy Agency (Vienna, Austria)*
5. **Dr. Paul Black**, *Neptune*

A total of approximately 35 people attended this panel session which featured presentations and discussions from the US and non-US communities on: 1) New approaches for performance assessments, multimedia risk assessments and multi-attribute decisional analyses in support of remedy selection for environmental cleanup and closure projects; 2) Developments in methodologies and tools for multimedia environmental modeling, particularly data management and visualization (conceptual model and data) uncertainty quantification, and dose calculations; 3) Integration of performance/risk assessment models into life cycle cost analyses; and 4) Integration of monitoring and modeling approaches for the purpose of validating multimedia environmental models and optimizing environmental monitoring.

Summary of Presentations

William Levitan opened the session with a presentation on risk-informed decision making in support of the US Department of Energy's cleanup and closure activities. He pointed out the common goal is to protect human health and the environment, and summarized the DOE Office of Environmental Management (EM)'s priorities, and EM's FY2013 budget request to address each of these priorities. He explained that environmental compliance is one of the top drivers for the EM program, and existing framework provides the framework for risk prioritization, and risk-informed decisions for cleanup provide a balanced approach. This approach is based on earlier work that dates back to 1996 that was developed by federal and state agencies, tribal nations, and stakeholder groups. A recent (2011) study by the National Academy of Sciences for the US Environmental Protection Agency recommends the incorporation of sustainability into EPA's decisions and actions. In another 2012 study of complex Department of the Army sites of groundwater contamination, NAS recommends the consideration of monitored natural attenuation or other cost-effective management approaches if the site remediation has reached a point of diminishing returns. NAS is working to hold workshops in FY2013 to discuss risk-informed cleanup and closure for EM. EM's Advisory Board (EMAB) is also evaluating process and tools that can be used to make risk informed decision making more transparent to stakeholders.

Boby Abu Eid presented the NRC integrated Risk Assessment approaches, methods, and tools, and discussed their applications to NRC Decommissioning and LLW Programs. He summarized

the NRC risk management regulatory framework and recommendations (NUREG-2150). He described the goal was to provide risk-informed and performance-based defense-in-depth protection, using a disciplined process to achieve the risk management goal through issue identification, analyses, deliberation, implementation, and monitoring. The NRC goal is to ensure that the risk resulting from the failure of some or all of the established barriers and controls, including human errors, are maintained acceptably low. This helps provide protection to the maximum extent practical. He discussed the NRC staff approach to risk-informed, performance-based approaches to decommissioning and LLW assessment. He also covered other topics including NRC decommissioning and LLW risk/dose based regulations; NRC risk/dose assessment guidance, methods, tools for LLW and decommissioning and Performance Assessment (PA) and Risk/Dose Assessment Issues.

In a presentation that followed, **Stuart Walker** described draft revisions to the EPA Preliminary Remediation Goal (PRG) calculator and Dose Compliance Concentration (DCC) calculator. He explained that both the PRG and DCC are used for assessing radiological impacts to human health, with the PRG for 1×10^{-6} cancer risk, and the DCC for doses in mrem/yr. He discussed the use of PRG and DCC for several exposure scenarios. He also discussed an upcoming new product: Counts per Minute (CPM) calculator. The CPM calculator is intended to facilitate use of Real-Time measurement techniques to supplement sampling for γ emitters.

Magnus Vesterlind presented the IAEA approach for safety case and risk management in decommissioning. He gave the IAEA definition for safety case, and described general applications of the safety case in disposal, decommissioning, and remediation activities. He then introduced DRiMa- the International Project on Decommissioning Risk Management. DRiMa can be used to illustrate the relation between the output of a risk management process and the decision making on both the strategic level and the operational level. He also mentioned IAEA Working Groups on risk management.

In his presentation, **Paul Black** pointed out that Structured Decision Analysis (SDA) for Performance Assessments can provide a different approach for evaluation, and that some other environmental programs (e.g., EPA sustainability and land use programs) are ahead in this regard. He argued that optimized decision making without excessive conservatism is needed to ensure survival of the nuclear industry and maximize returns to stakeholders. He reasoned that the ALARA provided the regulatory basis for this approach (including a precedent in NUREG/BR 0058, Rev 2, 1995 and NUREG 1757, 2003), and reviewed the evolution in this thinking including the OMB (Circular A-4, 2003), SMARTe – Brownfields revitalization (www.smarte.org), and DASEES – Decision Analysis for a Sustainable Environment, Economy, and Society (www.dasees.org). He advocated an SDA approach that is sustainable, transparent, defensible, and adaptive. He also suggested PA as an example of SDA, and offered a perspective in which SDA provides the appropriate paradigm for evaluating cost-benefit of alternative options, based on a case study. He concluded that the approach is achievable with current technology for PA-related decisions, and has been implemented for other complex environmental decision problems.

Questions and Answers

In response to a question raised by **William Levitan** on how do we as a regulated entity apply concepts such as ALARA and decision analyses, **Boby Abu Eid** mentioned that the NRC has adopted the risk-informed, performance-based approach for its regulatory decisions. NRC has funded the RESRAD code update to incorporate probabilistic performance assessments, changes in parameters to match site conditions, and adjust land use for the intruder scenario. **Stuart Walker** added that EPA uses the RME (reasonably maximally exposed) individual concept. **Paul Black** stressed that a decision analysis is ultimately an idealization, and conservatism may not reduce risk, but will increase cost for disposal operations.

The success of risk informed decision making depends largely on how well the uncertainty is understood and quantified. In a complex system where multiple codes are used to simulate processes of several subsystems, the ability to integrate multiple software and properly propagate uncertainties is also critical. **Kim Auclair**, a Co-Chair for Track 9, offered to plan for a technical session to discuss these topics of uncertainty analyses at WM2014.

There was also discussion of how to communicate uncertainty to a wide range of audiences. **Stuart Walker** mentioned that one has to put uncertainty in the context. In discussing conservatism vs. realism of models, he pointed out that performance/risk assessment models should be developed to support the specific needs and made more realistic to the extent practical. It was also commented that in a graded approach, conservative models have a role in screening, and can transition to more realistic models to assist in making the final decision. **Boby Abu Eid** added that one cannot make decisions based solely on conservatism.

Finally, in response to **William Levitan**'s question on how do we get these concepts to the stakeholders, **Ming Zhu** mentioned that DOE EM plans to engage the community of practice to get the message out. As Chair of the Federal Interagency Steering Committee for Multimedia Environmental Modeling (ISCMEM), he also encouraged the audience to get involved in similar modeling activities that are led by ISCMEM Working Groups.