WM2016 Conference Panel Report

PANEL SESSION 19: **US DOE EM Risk-Informed Performance Based Decision Making**

Session Co-Chairs: **Skip Chamberlain**, *US DOE*
Leonel Lagos, *Applied Research Center, FIU*

Panel Reporter: **Karen Skubal**, *US DOE*

Panelists:

1. **Carol Eddy-Dilek**, *Scientist, Savannah River National Laboratory*
2. **Hope Lee**, *Senior Scientist, Pacific Northwest National Laboratory*
3. **Tim Johnson**, *Research Scientist, Pacific Northwest National Laboratory*
4. **Miles Denham**, *Fellow Scientist, Savannah River National Laboratory*

Summary of Presentations

Remediation of environmental contamination is at the core of the mission of the U.S. Department of Energy (DOE) Office of Environmental Management (EM). Contaminants at EM sites include radionuclides, metals, organics, and liquid wastes from a variety of sources. Past practices allowed contamination to reach surface soil, the vadose zone, surface water, and groundwater at sites across the country.

Significant progress has been made toward the remediation and closure of EM sites, but important environmental challenges remain. It is increasingly being recognized that conventional engineered remedies will not achieve regulatory requirements at a number of sites, and that alternative approaches to remediation and long-term monitoring are needed. EM is responding by investing in applied science and technology development to improve best practices at DOE sites and to enhance holistic understanding of contaminated environmental systems. Improvements are focused on enhancing the efficiency and effectiveness of existing cleanup processes and transitioning sub-optimal remediation approaches to those that are less energy-intensive and more sustainable. EM also recognizes the importance of collaborating with federal agencies and technical experts to leverage resources and knowledge to achieve results more economically and on an accelerated schedule.

The session started with a presentation by **Ms. Eddy-Dilek**, who was also representing **Dr. Denham**. She reported on research being performed at Savannah River National Laboratory that focuses on enhanced attenuation of radionuclides. Enhanced attenuation is an in situ remedy that reduces the mobility of contaminants to achieve long-term sustainable goals. Demonstration of contaminant immobilization carries a high burden of proof, and therefore the environmental system and its responses to externally-imposed changes (waste inputs, remediation amendments, dynamic hydrological conditions) must be adequately understood to ensure long-term protectiveness. The F-Area site at DOE's Savannah River Site in Aiken, South Carolina was given as an example of enhanced attenuation in practice. A costly pump and treat system operated at the site from 1997-2004, after which remediation was transitioned to a base-injection system with a funnel-and-gate barrier to channel and adjust groundwater pH, reducing the solubility of certain radionuclides of interest.

Other field studies at the F-Area groundwater plumes are assessing organic amendments for sorption of uranium and the use of silver chloride to precipitate iodine-129 in situ. At the same time, a new, more economical paradigm for long-term monitoring is being developed that focuses on characterizing boundary conditions and measuring a reduced set of "master" variables.

Dr. Lee spoke about remediation of the deep vadose zone and groundwater at the Central Plateau of the DOE Hanford Site in Richland, Washington. She focused specifically on iodine-129, an important risk driver at Hanford and elsewhere in the DOE complex. Current studies are focusing on iodine speciation and microbial community diversity in plumes with comingled contaminants. Bioremediation may offer opportunities to support in situ immobilization of radioiodine in complex plumes that are currently contained hydraulically.

Dr. Johnson spoke about advancements in geophysical characterization and monitoring. Geophysical approaches can be used to answer questions regarding the location and behavior of groundwater plumes and the performance of remediation actions. They also offer advantages over the low spatial coverage, high uncertainty, and high sampling costs associated with point measurements. For example, geophysical imaging can provide three dimensional coverage, autonomous operation, time lapse data collection, and sensitivity to many important processes and properties at relatively low cost. However, geophysical techniques do possess limitations, among them limited resolution and high computational requirements. Dr. Johnson gave examples of geophysical characterization performed at the DOE Hanford Site, focusing on the cribs and trenches used for disposal of certain wastes and on the monitoring of reactive amendments used for in situ sequestration of uranium.

Conclusions

This panel highlighted the progress that has been made in the development of tools for remediation and monitoring of sites throughout the DOE complex. Topics included chemical, physical and biological approaches to in situ sequestration of contaminants and methods to monitor performance and long-term effectiveness to ensure reduction of risk to human health and the environment.