

A Review of the Use of Risk Assessment and Risk-Informed Management in the Department of Energy, Office of Environmental Management's Cleanup Program for Former Defense Nuclear Sites

Context

Congressional budget authorization language in 2014 directed the DOE to “retain a respected outside group ... [to] undertake an analysis of how effectively the Department of Energy (DOE) identifies, programs, and executes its plans to address those risks [to public health and safety from the DOE's remaining environmental cleanup liabilities], as well as how effectively the Defense Nuclear Facilities Safety Board (DNFSB) identifies and elevates the nature and consequences of potential threats to public health at safety at the defense environmental cleanup sites.”

In regard to this Congressional mandate, the process of managing defense-nuclear waste has been ongoing for over half a century. As part of its efforts to build nuclear weapons, the US government mined, refined, and transported uranium products among over 1,000 sites across the U.S. The government has spent over \$100 billion managing the defense nuclear legacy at these sites. Currently, the DOE-EM program manages cleanup at 17 sites in 11 states, including large and complex cleanup and decommissioning responsibilities at the Hanford (WA), Savannah River, (SC), Oak Ridge (TN), Idaho, Portsmouth (OH) and Paducah (KY) sites. While small in number these contain amounts of nuclear materials that represent a daunting and expensive waste management challenge.

Much of DOE's cleanup is mandated by environmental laws and their associated regulations and guidance, most notably the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). The purpose of these laws is to reduce the risk of contaminated sites to levels that are protective of human health and the environment. Their implementation by DOE is overseen by the U.S. Environmental Protection Agency (EPA) and state environmental agencies and guided by federal facility agreements and permits with these agencies, and involving mandatory and additional public involvement.

In 1992, recognizing the magnitude of contamination at federal facilities and the significant costs of cleanup, the Federal Facilities Environmental Restoration Dialogue Committee was federally chartered under the U.S. EPA to address setting of priorities regarding where and how to spend available environmental management funds. The goal of the Committee was to develop consensus policy recommendations aimed at improving the process by which federal facility environmental cleanup decisions are made. The Final Report (April 1996) set forth the Committee's consensus recommendations which DOE generally attempts to follow.³

DOE-EM is guided by Risk Principles that were developed by the Office of Management and Budget and Office of Science and Technology Policy⁴ and recommendations from several studies carried out by the National Research Council of The National Academies, and must comply with DOE nuclear safety policies and an array of state and federal regulatory requirements. DOE's cleanup effort also receives nuclear safety oversight from the DNFSB on

nuclear safety and consults with the Nuclear Regulatory Commission and the Nuclear Waste Technical Review Board in several relevant areas.

The primary goal of these regulations, requirements and guidance is the protection of worker and public health and safety and the environment. Risk management, however, depends not only on findings from risk assessment, but also on legal requirements and economic costs. Hence, the DOE must factor in efficiency in risk reduction (i.e., appropriate work sequencing, cost effectiveness), the available capacity to achieve program objectives (i.e., workforce availability, technological limitations, disposition pathways), financial constraints and input from local, state and national stakeholders as well as tribal nations.

Objectives of the Proposed Study

The Consortium for Risk Evaluation with Stakeholder Participation (CRESP) proposes to carry out a review of the use of risk and risk-informed management as directed by Congressional language indicated above to answer the following questions:

1. How do specific federal policies and guidance shape DOE's evaluation and use of human health and safety risk-related information as part of environmental cleanup program decisions?

- 1a. What are the specific federal policies and guidance that provide the basis for evaluation and use of human health and safety risk-related information as part of program decisions? What are the relationships between these policies and guidance? How have these policies and guidance evolved, and DOE application of them, over the last decade? What is the organizational structure that implements these policies and guidance? How does this structure provide checks and balances?
- 1b. Which specific program decisions are impacted and how by these policies and guidance? For example, what role do these policies and guidance impact selection of cleanup approaches and requirements, sequencing and prioritization of specific waste management and clean up needs, research and development investments, annual and longer-term resource allocations?
- 1c. In regard to these policies and guidance, what evidence of their success can be found in exposures and injuries avoided? In reduction of fatal and non-fatal major exposures? In reduction in time lost because of events avoided? In resources that were able to be redeployed to other activities because of these policies and guidelines? Is there a baseline that we can compare recent accomplishments with? Could these results be explained by other actions and events?
- 1d. Can you provide a case study or studies that illustrate your remarks? What policies and mandates have been particularly challenging? Are the challenges associated with science/technology, budgets and staff resources, communities, others?
- 1e. Are there instances where unanticipated health-related consequences resulted from following the requirements?

- 1f. Do the current federal policies and guidelines allow appropriate protection of human health in the short-term (next five years) and the longer term (50+ years)?
- 1g. Are there examples where compliance with other requirements conflict with human health or safety requirements and thereby result in increased risk to worker or non-worker populations?
- 1h. Are there examples of where requirements required cleanup activities beyond that which would be necessary for protection of human health and safety?

2. How does the DNFSB identify and elevate threats to public health and safety, and how does DOE consider DNFSB's concerns as part of DOE program decisions?

- 2a. Can you identify and illustrate the processes that DNFSB uses?
- 2b. How does DNFSB work with DOE in this process? What have been lessons learned from these interactions?
- 2c. Can you provide us with examples of some of the more successful cases? Of those that were less successful? What makes the difference between major and less success? Are there unexpected beneficial or negative outcomes from these interactions? (e.g., changes in policy, practice, ideas, beliefs, and attitudes).

3. How are risks to public health and safety considered as part of state and federal regulatory compliance and priorities at DOE-EM cleanup sites?

- 3a. How do the sites prioritize public health and safety compared to ecological risk and natural resource restoration and protection (e.g., water resources)? Prioritize worker health and safety compared to the health and safety of people currently living off site or may be present in the future as a result of land use changes? Are there specific cases that illustrate how balance is achieved among these?
- 3b. What evidence can we review that shows these priorities (e.g., EIS, program document, other)? Are there unexpected beneficial or negative outcomes from these interactions? (e.g., changes in policy, practice, ideas, beliefs, and attitudes).
- 3c. Do you have a sustainably protective plan for the site? A lesson learned program?
- 3d. What roles do institutional controls, and land use designations play in protection of human health and safety?

4. How does DOE-EM use human health risk and public safety input and information from a broader range of sources as part of program decisions?

- 4a. DOE has access to data from the NRC, EPA, OMB, state and even local government, the National Academies, academic and other institutions, the media, and other sources. How does

DOE-gather, filter, and determine which data sets and sources should be incorporated into its human health risk and public safety actions?

- 4b. Are current efforts adequate? If not, what might make them more valuable to the DOE?
- 4c. Can you provide examples of the value of such data and the priorities for including more of it? Are there some examples to illustrate the value of new data, tools and other information?

5. How does DOE-EM use the range of human health risk and safety information available along with the broader range of input and constraints to balance cleanup priorities within and between cleanup sites?

- 5a. How important are legal mandates (e.g., agreements signed with EPA, state EPAs, and others), community preferences, economic costs and benefits, historical precedent, and other issues in how human health and safety is prioritized by DOE?
- 5b. How does DOE EM prioritize these factors in decision-making? How does DOE make tradeoffs among worker, resident and ecological health in its decision-making processes?
- 5s. What evidence can we review that shows these priorities, or can you discuss case studies with us (e.g., EIS, program document, other)?

Explicitly or implicitly these five questions include four standard elements of program evaluation as follows:

1. Implementation: Were your program objectives created and implemented as originally intended?
2. Effectiveness: Is the program achieving the objectives it was intended to accomplish?
3. Efficiency and cost-effectiveness: Are your resources being used effectively to accomplish the objectives?
4. Attribution: Can progress toward program objectives be attributed to your actions, or can they be attributed to other activities that are going on?

In order to answer these questions, CRESP will constitute a committee of nationally distinguished individuals with diverse experience in risk analysis, public health and safety, nuclear safety, risk management, and public policy. The group will be headed by a senior investigator that serves as the Committee Chair and staffed by two individuals with appropriate experience in risk analysis, environmental protection and public policy. These three individuals will work closely with the larger committee, and the committee as a whole lead by the senior researcher will prepare a report that answers the five questions. The report is outlined below.

The review would be carried out through review of documents and interviews and meetings with current and former managers and senior staff at DOE-EM, DOE-EM sites, state regulators, EPA, DNFSB members, and other individuals as the committee finds appropriate. A final report,

reviewed for factual accuracy by DOE and the DNFSB, is to be completed within 12 months of the date of enactment of the fiscal year 2014 omnibus budget bill, January 16, 2015.

CRESP is a multi-disciplinary consortium of universities led by Vanderbilt University that advances environmental cleanup by finding ways to improve the scientific and technical basis for management decisions, and also to foster public participation in that search. For more than 15 years, CRESP has conducted various studies, reviews, and assessments at DOE-EM sites around the country. Specifically, CRESP has completed risk informed characterization projects involving complex issues at both large and small DOE-EM sites. CRESP receives funding under a cooperative agreement with DOE-EM.

References

1. Consolidated Appropriations Act, 2014. Public Law 113-76.
2. Greenberg M. 2013. Nuclear waste management, nuclear power, and energy choices. NY: Springer.
3. Federal Facilities Environmental Restoration Dialogue Committee. 1996. Consensus Principles and Recommendations for Improving Federal Facilities Cleanup – April. <http://www.epa.gov/swerffrr/fferc.htm>. Accessed May 13, 2014.
4. Office of Management and Budget (2007). OMB/OSTP Memorandum: M-07-24, updated principles for risk analysis (September 19, 2007). <http://www.whitehouse.gov/omb/memorandum/fy2007/m07-24.pdf>. Accessed May 13, 2014.