NUCLEAR WASTE

DOE Needs a Comprehensive Strategy and Guidance on Computer Models that Support Environmental Cleanup Decisions

Why GAO Did This Study

The Department of Energy's (DOE) Office of Environmental Management (EM) is responsible for one of the world's largest cleanup programs: treatment and disposal of radioactive and hazardous waste created as a by-product of nuclear weapons production and energy research at sites across the country, such as EM's Hanford Site in Washington State and the Savannah River Site (SRS) in South Carolina. Computer models—which represent physical and biogeochemical processes as mathematical formulas—are one tool EM uses in the cleanups. GAO was asked to (1) describe how EM uses computer models in cleanup decisions; (2) evaluate how EM ensures the quality of its computer models; and (3) assess EM's overall strategy for managing its computer models. GAO analyzed the use of selected models in decisions at Hanford and SRS, reviewed numerous quality assurance documents, and interviewed DOE officials as well as contractors and regulators.

What GAO Recommends

GAO recommends that DOE (1) clarify specific quality assurance requirements for computer models used in environmental cleanup decision making; (2) ensure that the models are assessed for compliance with these requirements; and (3) develop a comprehensive strategy and guidance for managing its models. DOE agreed with our recommendations.

View GAO-11-143 or key components. For more information, contact Gene Aloise at (202) 512-3841 or aloisee@gao.gov

What GAO Found

EM uses computer models to support key cleanup decisions. Because the results of these decisions can cost billions of dollars to implement and take decades to complete, it is crucial that the models are of the highest quality. Computer models provide critical information to EM's cleanup decision-making process, specifically to:

- *Analyze the potential effectiveness of cleanup alternatives.* For example, computer models at SRS simulate the movement of contaminants through soil and groundwater and provide information used to predict the effectiveness of various cleanup strategies in reducing radioactive and hazardous material contamination.
- *Assess the likely performance of selected cleanup activities.* After a particular cleanup strategy is selected, EM uses computer modeling to demonstrate that the selected strategy will be designed, constructed, and operated in a manner that protects workers, the public, and the environment.
- *Assist in planning and budgeting cleanups.* EM also uses computer models to support lifecycle planning, scheduling, and budgeting for its cleanup activities. For example, a Hanford computer model simulates the retrieval and treatment of radioactive waste held in underground tanks and provides information used to project costs and schedules.

EM uses general departmental policies and industry standards for ensuring quality, but they are not specific to computer models used in cleanup decisions. EM has not regularly performed periodic quality assurance assessments, as required by DOE policy, to oversee contractors' development and use of cleanup models and the models' associated software. In our review of eight cleanup decisions at Hanford and SRS that used computer modeling as a critical source of information, GAO found EM conducted required assessments of the quality of computer models in only three cases. In addition, citing flaws in a model EM uses to analyze soil and groundwater contamination, regulators from Washington state have told EM that it will no longer accept the use of this model for chemical exposure analysis at Hanford.

EM does not have an overall strategy for managing its computer models. EM has recently begun some efforts to promote consistency in the use of models. For example, it is developing a set of state-of-the-art computer models to support soil and groundwater cleanup decisions across its sites. However, these efforts are still in early stages and are not part of a comprehensive, coordinated effort. Furthermore, although other federal agencies and DOE offices have recognized the importance of comprehensive guidance on the appropriate procedures for managing computer models, EM does not have such overarching guidance. As a result, EM may miss opportunities to improve the quality of computer models, reduce duplication between DOE sites, and share lessons learned across the nuclear weapons complex.

_____ **United States Government Accountability Office**