

Effectiveness and Efficiency of Defense Environmental Cleanup Activities of the Department of Energy's Office of Environmental Management: Report 2

The U.S. Department of Energy's Office of Environmental Management (DOE-EM) was established by Congress in 1989 to remediate waste and environmental contamination that have resulted from nuclear weapons production and related activities. It has expended almost \$200 billion on cleanup and related activities since its establishment and completed cleanup at all but 15 of the more than 100 sites. Despite this notable progress, the estimated financial liabilities for completing cleanup of the remaining sites continue to outpace the rate of cleanup, particularly for cleanup at the Hanford site in Washington State. The overall cleanup program is expected to last at least another 50 years with total costs exceeding \$600 billion, not accounting for future inflation or schedule delays.

At the request of Congress, per the National Defense Authorization Act of Fiscal Year 2019, the National Academies of Sciences, Engineering, and Medicine formed a committee to provide advice on enhancing the effectiveness and efficiency of DOE-EM cleanup activities, particularly with respect to project management, contracting, and oversight practices. The committee examined these practices, benchmarked them against practices in other organizations, and offered recommendations for improvements. These recommendations were provided in two reports. The first report, *Review of Effectiveness and Efficiency of Defense Environmental Cleanup Activities of DOE's Office of Environmental Management: Report 1*, considered overall project management practices, project management metrics and outcomes, and contract structures and performance measures. This report focuses on specific DOE-EM sites to assess how effective the management of the numerous projects at the sites is contributing to the wider programmatic objectives of DOE-EM.

The study committee conducted virtual visits at several large DOE sites to gather information for this report. The committee obtained no additional information or insights from these visits that would lead it to change or amend any findings or recommendations from its first report, but the visits prompted the committee to formulate additional recommendations to improve DOE-EM's practices, which are captured in the second report.

IMPROVING CLEANUP EFFECTIVENESS AND EFFICIENCY

DOE-EM's capacity to improve the efficiency and effectiveness of the cleanup program and reduce cleanup liabilities is limited by the following factors: (1) cleanup technical challenges; (2) requirements and preferences of multiple federal, state, and local stakeholders, including inflexible and outdated regulatory agreements; (3) lack of clearly defined strategic goals, objectives, and outcomes for completing the cleanup mission and assessing progress; (4) DOE-EM's short-term, risk-averse focus on planning and implementing cleanup absent a portfolio-management framework; (5) cleanup program funding uncertainties and restrictions; and (6) frequent gaps and changes in top-level DOE-EM management and reporting relationships.

The committee recommends that **Congress, the Secretary of Energy, and others should take several actions to improve the efficiency and effectiveness of the cleanup program and reduce cleanup liabilities: Congress should (1) authorize clearly defined strategic goals, objectives, and outcomes for the cleanup program; (2) authorize and require DOE-EM to implement the committee recommended portfolio-management framework for site cleanup; (3) provide flexibility in spending levels across cleanup sites; and (4) require DOE-EM to provide regular reports on progress in implementing this framework and estimating its impacts on future cleanup liabilities. The Secretary of Energy, working with the administration and Congress, should (1) establish more predictable multi-year funding levels for the cleanup program; and (2) improve the continuity of DOE-EM leadership and reporting relationships within DOE. The Secretary of Energy, working with federal and state regulators and with the support of the administration and Congress, should review,**

update, and restructure outdated site-level regulatory agreements. The long-standing consent agreements between DOE, the U.S. Environmental Protection Agency, and states that host DOE-EM cleanup sites contribute to liability growth. Many of the requirements in these agreements are outcomes-based rather than performance-based, which can drive DOE-EM toward costly and inefficient cleanup actions with no risk reduction benefit.

PROGRAM MANAGEMENT, CONTRACTING, AND TECHNOLOGY DEVELOPMENT

DOE-EM has made notable improvements to its project management and contracting practices in response to previous external and internal reviews. The study examined one such improvement, the End State Contracting Model, intended to establish clear scopes of work for achieving specific cleanup objectives, or "end states," carried out by cleanup contractors. Although in early stages of implementation, the end state model appears to lack the features needed to improve cleanup program and project management effectiveness.

The committee recommends that **DOE-EM should develop and implement additional requirements to improve the effectiveness of end state contracts and strengthen its contractor oversight process, and the Office of Management and Budget should conduct a comprehensive evaluation of this contracting model, report on its effectiveness, and recommend further improvements to the Secretary of Energy and Congress.**

DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, establishes procedures for developing, managing, and tracking DOE projects. DOE-EM does not apply Order 413.3B to cleanup projects conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because many of its steps are duplicative of the CERCLA process. However, the CERCLA process does not contain the strong project management tools found in Order 413.3B. **DOE should work with DOE-EM, the U.S. Environmental Protection Agency, and state regulators, as appropriate, to incorporate procedural requirements for compliance with CERCLA into the DOE Order 413.3B process.**

Previous studies by the National Academies and other organizations have highlighted the importance of technological innovation for completing the cleanup mission. The committee saw evidence for technological innovation at individual DOE-EM sites, largely driven by contractors, to meet near-term cleanup project needs, but saw no evidence of a formal headquarters-driven strategic process for identifying, developing, or introducing technological innovations across the DOE complex. **DOE-EM should implement the recommendations from the 2019 National Academies report *Independent Assessment of Science and Technology for the Department of Energy's Defense Environmental Cleanup Program* for improving technology development and transfer processes across the cleanup program, with an initial focus on reducing costs and schedules for cleaning up Hanford's tank waste.**

PROJECT OUTCOMES

Many of the metrics used by DOE-EM to manage projects measure procedural outputs such as schedule, cost, and percent of project completion. While such metrics are important for managing individual cleanup projects, they do not measure absolute progress toward completing the cleanup mission. Tracking absolute cleanup progress requires the use of “outcomes-based” performance measures. To correct this, **DOE-EM should develop outcomes-based performance measures to enable the linkage of budget expenditures and milestones as well as changes in near-term funding and schedule execution to site end state achievement and liability extinguishment.** Two such outcomes-based performance measures include (1) achievement of site end states, expressed, for example, in years or percentage of cleanup effort remaining; and (2) risk reduction, expressed in terms of reduction in pollutant or contaminant levels at site boundaries, increases in areas released for productive reuse, or reduction in occupational exposures or risks.

DOE-EM currently lacks performance measures to track and document schedule slippages in cleanup projects. For example, the Salt Waste Processing Facility project at the Savannah River Site had schedule slippages of almost 7 years, but the schedule metric used to track this project indicated that the project schedule was on target.

DOE-EM should incorporate schedule performance measures into project baselines and periodically review baseline schedule slippages to understand their causes and identify and implement fixes.

DOE-EM's Program Management Protocol, issued in 2020, establishes criteria for prioritizing cleanup activities, referred to as “schema,” intended for strategic planning, life-cycle cost and schedule estimating, and budget requests. However, there is no indication that these activities are being effectively quantified, linked to performance-based cleanup outcomes, or used to prioritize and integrate cleanup activities across sites. **DOE-EM should develop and apply performance-based measures to quantify the schema and apply them across its sites to optimize end state achievement and liability extinguishment.**

PORTFOLIO MANAGEMENT AND CONTRACTOR OVERSIGHT

DOE-EM's Program Management Protocol does not mention “portfolio management” or differentiate it from “program management.” The lack of differentiation is reflected in the lack of attention to priority setting and prioritization across DOE-EM sites. **DOE-EM should modify its Program Management Protocol to adopt a clear and consistent set of definitions of portfolio, programs, and projects, consistent with the Office of Management and Budget's Program Management Improvement and Accountability Act guidelines, and consistently use these definitions in training, communications, contracts, and policy development. DOE-EM should also clarify its management framework to distinguish strategic objectives among portfolio, program and project management, and expand its definition of “projects” to include all capital asset projects as defined in Office of Management and Budget Circular A-11, and it should manage these projects using DOE Order 413.3B.**

The cleanup program is being managed as a collection of projects and activities defined, prioritized, and executed by individual sites. DOE-EM headquarters has little or no role in establishing priorities and funding among sites to optimize the overall success of cleanup. **DOE-EM should develop and implement a portfolio-based strategy**

for program and planning that integrates site-by-site programs and projects into a portfolio-management framework reflecting the national priorities of the cleanup mission. The Secretary of Energy should establish a formal oversight process for DOE-EM's portfolio-management strategy.

DOE-EM relies heavily on the technical and operational expertise of the major contractors at every site. This reliance is increasing with the transition to multiple task orders, often led by sole-source contractors, under the new End State Contracting Model. The committee was unable to establish how documentation on contractor progress was conducted or how conflicts were resolved.

DOE-EM should strengthen its contractor oversight system under the End State Contracting Model.

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FOR MORE INFORMATION

This Consensus Study Report Highlights was prepared by the National Academies' Board on Infrastructure and the Constructed Environment based on the report *Effectiveness and Efficiency of Defense Environmental Cleanup Activities of the Department of Energy's Office of Environmental Management: Report 2* (2022).

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