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Report to the Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives

September 2008

NUCLEAR WASTE

Action Needed to Improve Accountability and Management of DOE's Major Cleanup Projects

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Highlights

Highlights of GAO-08-1081, a report to the Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives

NUCLEAR WASTE

Action Needed to Improve Accountability and Management of DOE's Major Cleanup Projects

Why GAO Did This Study

The Department of Energy (DOE) spends billions of dollars annually to clean up nuclear wastes at sites that produced nuclear weapons. Cleanup projects decontaminate and demolish buildings, remove and dispose of contaminated soil, treat contaminated groundwater, and stabilize and dispose of solid and liquid radioactive wastes. Ten of these projects meet or nearly meet DOE's definition of major: costs exceeding $1 billion in the near term—usually a 5-year window of the project's total estimated life cycle.

GAO was asked to determine the (1) extent to which the cost and schedule for DOE's major cleanup projects have changed and key reasons for changes, and (2) factors that may hinder DOE's ability to effectively manage these projects. GAO met with project directors and reviewed project documents for 10 major cleanup projects: 9 above the near-term $1 billion threshold, and 1 estimated to cost between $900 million and $1 billion over the near term.

What GAO Recommends

GAO is making a number of recommendations, such as expanding the content of performance reports provided to DOE senior managers and information provided to Congress to better reflect current status of near-term and life cycle baseline cost and schedules and reasons for significant changes; and strengthening DOE guidance and baseline reviews, among other things. In commenting on a draft of this report, DOE agreed with GAO's recommendations.

To view the full product, including the scope and methodology, click on GAO-08-1081. For more information, contact Gene Aloise at (202) 512-3841 or aloisee@gao.gov.

What GAO Found

Nine of the 10 cleanup projects GAO reviewed had life cycle baseline cost increases, from a low of $139 million for one project to a high of nearly $9 billion for another, and life cycle baseline schedule delays from 2 to 15 years. These changes occurred primarily because the baselines we reviewed included schedule assumptions that were not linked to technical or budget realities, and the scope of work included other assumptions that did not prove true. Specifically, the schedules for 8 of the 10 projects were established in response to DOE's 2002 effort to complete cleanup work, which in some cases moved up project completion dates by 15 years or more. For example, to meet the 2012 accelerated completion date for its solid waste disposition project, DOE's Idaho National Laboratory assumed it would process waste at a rate that was more than 50 percent higher than the rate demonstrated at the time it established the baseline. When the laboratory could not meet that processing rate, DOE revised its baseline, adding 4 years and about $450 million to the project. Also, most of the 10 projects had cost increases and schedule delays because the previous baselines (1) had not fully foreseen the type and extent of cleanup needed, (2) assumed that construction projects needed to carry out the cleanup work would be completed on time, or (3) had not expected substantial additional work scope.

DOE has not effectively used management tools—including independent project baseline reviews, performance information systems, guidance, and performance goals—to help oversee major cleanup projects' scope of work, costs, and schedule. For example, DOE's independent reviews meant to provide reasonable assurance that a project's work can be completed within the baseline's stated cost and schedule, have not done so for 4 of 10 projects. For one project, the baseline was significantly modified as little as 7 months after it had been revised and validated by the independent review, while other projects have experienced life cycle cost increases of as much as $9 billion and delays of up to 10 years, within 1 to 2 years after these reviews. In addition, although DOE uses several types of reporting methods for overseeing cleanup projects, these methods do not always provide managers with the information needed to effectively oversee the projects or keep Congress informed on the projects' status. For example, sites' proposals for changes to projects' cost and schedule baselines do not always identify possible root causes, and DOE does not systematically analyze the proposals for common problems across its projects. Therefore, DOE may be missing opportunities to improve management across projects. In addition, guidance for key management and oversight functions are spread across many different types of documents and are unclear and contradictory. As a result, project managers do not consistently implement this guidance, which may lead, for example, to problems in effectively managing risks across projects. Finally, DOE recently changed its goals for "successful" cleanup projects, reducing the amount of work and raising the allowable cost increases against the near-term baseline. DOE has initiated several actions to improve project management, but it is too early to determine whether these efforts will be effective.

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Abbreviations

Army Corps	Army Corps of Engineers
DOE	Department of Energy
EM	Office of Environmental Management
EVM	earned value management
OECM	Office of Engineering and Construction Management
OMB	Office of Management and Budget
QPR	quarterly project review
WTP	Waste Treatment Plant

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United States Government Accountability Office
Washington, DC 20548

September 26, 2008

The Honorable Peter J. Visclosky
Chairman
The Honorable David L. Hobson
Ranking Member
Subcommittee on Energy and Water Development
Committee on Appropriations
House of Representatives

The Department of Energy (DOE) spends billions of dollars annually to clean up nuclear wastes at sites across the nation that produced nuclear weapons. Cleanup projects decontaminate and demolish buildings, remove and dispose of contaminated soil, treat contaminated groundwater, and stabilize and dispose of solid and liquid radioactive wastes, among other things. DOE's Office of Environmental Management (EM) currently oversees more than 80 of these cleanup projects, primarily at government-owned, contractor-operated sites throughout the nation. Some of these highly complex projects have completion dates beyond 2050. Ten of these projects meet or nearly meet DOE's definition of "major": projects whose costs exceed $1 billion in the near-term—usually a 5-year window of the project's total estimated life cycle.[1],[2] These 10 projects have combined estimated near-term costs of almost $19 billion and combined life cycle costs estimated to range between $115 billion and $143 billion, and they account for almost half of EM's $5.5 billion fiscal year 2009 budget request.[3] These 10 projects are described in detail in appendix II and include the remediation, decontamination, and decommissioning, or the stabilization and disposition of:

[1]For this review, we lowered the threshold to $900 million out of concern that some projects not now considered major would become major because of increases in costs, which resulted in the addition of one project to our review (the solid waste stabilization and disposition project at the Hanford Site, near Richland, Washington).

[2]We did not review one major project still in the early stages of development (the nuclear facility decontamination and decommissioning project in Portsmouth, Ohio).

[3]DOE defines life cycle costs as the sum total cost of the direct, indirect, and other related costs incurred or estimated to be incurred in the design, development, production, operation, maintenance, support, and final disposition of a major system over its anticipated useful life span.

- solid waste at Idaho National Laboratory, Idaho;
- nuclear facilities at the East Tennessee Technology Park, Oak Ridge Reservation, Tennessee;
- nuclear materials at the Savannah River Site, South Carolina;
- radioactive liquid tank waste at the Savannah River Site, South Carolina;
- soil and water at Los Alamos National Laboratory, New Mexico;
- nuclear materials at the Hanford Site, Washington;
- solid waste at the Hanford Site, Washington;
- soil and water at the Hanford Site, Washington;
- nuclear facilities at the River Corridor Closure Project, Hanford Site, Washington; and
- radioactive liquid tank waste at the Office of River Protection, Hanford Site, Washington.[4]

DOE established Order 413 in 2000 to provide project management guidance for construction projects—projects that build large complexes often housing unique equipment and technologies that process waste or other radioactive material—and nuclear waste cleanup projects.[5],[6] In 2005 and 2007, EM, in conjunction with DOE's Office of Engineering and Construction Management (OECM), issued further guidance to better tailor the order's requirements to the cleanup projects. This guidance lays out protocols directing DOE project managers to establish a life cycle

[4]Hanford's radioactive liquid tank waste stabilization and disposition project is administered by the Office of River Protection, while the other four major cleanup projects at Hanford are administered by DOE's Richland office.

[5]Order 413.3 was issued in 2000 and amended in 2006, and is now referred to as 413.3A. For this report, we use DOE Order 413 to refer to the order in effect, unless otherwise specified.

[6]We have reported on DOE's management of these construction projects. See GAO, *Department of Energy: Major Construction Projects Need a Consistent Approach for Assessing Technology Readiness to Help Avoid Cost Increases and Delays*, GAO-07-336 (Washington, D.C.: Mar. 27, 2007).

baseline for cleanup projects that includes three key parts: (1) prior year actual costs; (2) a near-term estimate of the scope of the cleanup work (the cleanup activities needed to achieve project goals), cost, and schedule of the cleanup activities (the near-term is generally for 5 years, or the duration of the contract, whichever is longer); and (3) out-year estimates through project completion for those projects that extend beyond the near term.[7] The near-term and out-year estimates also identify the amount of contingency monies that could be needed to cover potential project risks.[8]

Major cleanup projects take years to complete, and often involve unique challenges and a high degree of complexity; therefore, it is critically important that EM develop and implement a rigorous, disciplined approach for developing and managing the baselines. Such an approach includes planning and managing work activities, cost, and schedule to achieve project goals in a stable, controlled manner over the near term and the entire life of the project. DOE has taken several steps to establish such an approach, including the following:

- EM must formally approve changes to the near-term and life cycle baseline.
- Project managers must provide formal and informal reports to DOE headquarters staff, including data entries into databases and quarterly performance reports. These reports contain, among other things, earned value management (EVM) data—a measure of progress against a cost and schedule baseline. Widely used in industry, earned value data makes it possible for managers and others to determine how a project has been performing and to predict future performance trends. Furthermore, both the Office of Management and Budget (OMB) and DOE Order 413 require

[7]In previous years, DOE presented out-year estimates as a single point estimate based on the most probable cost and schedule of its projects. In 2007, DOE developed out-year estimates with cost and schedule ranges to account for the uncertainty associated with long-term projects. The low end of the range is based on the amount of funding needed with a 50 percent level of confidence that the project will be successfully completed, while the high end of the range is based on an 80 percent level of confidence. As discussed elsewhere in this report, DOE does not fund its contingency accounts for these projects.

[8]Contingency funds are funds that may be needed to cover potential cost increases stemming from a variety of project risks, including technical complexities, regulatory issues, and funding shortfalls.

the use of EVM data, and GAO has developed best practices on how to use the data.[9]

- As stipulated in DOE Order 413, OECM must independently review project baselines at critical project stages; OECM conducts these reviews largely with the help of external technical experts. Specifically, for cleanup projects that cost $100 million or more, OECM must review a project's proposed baseline to provide reasonable assurance that the project can be successfully executed. OECM also examines technical scope, cost, schedule, and avoidance and mitigation plans for possible cost and schedule overruns, as well as proposed project management.

Overall, we and others have reported over the past two decades that project management weaknesses have impaired DOE's major projects. In 1990, we designated DOE's contract management (which includes project management) as a high-risk area for fraud, waste, abuse, and mismanagement. In addition, in 1999, the National Academies' National Research Council developed recommendations to address weaknesses in DOE's project management. Recently, in 2007, we reported that DOE had improved its approach to project management but that performance on DOE's projects had not substantially improved.[10] Also in 2007, the National Academy of Public Administration reported specifically on EM's management of nuclear waste and complimented EM on its improvements in project management, but also raised questions about EM's ability to follow through on them. Furthermore, reviews by DOE's Office of Inspector General, the Department of Defense's Army Corps of Engineers (Army Corps), and the National Research Council, among others, have advised DOE on how to better manage its major projects.

In this context, you asked us to determine the (1) extent to which the cost and schedule for DOE's major cleanup projects have changed and the key reasons for these changes, and (2) factors that may hinder DOE's ability to effectively manage these cleanup projects.

To determine the extent to which DOE cleanup projects are experiencing cost or schedule changes and key reasons contributing to these changes,

[9]GAO, *Cost Assessment Guide: Best Practices for Estimating and Managing Program Costs*, GAO-07-1134SP (Washington D.C.: July 2007).

[10]GAO, *Department of Energy: Consistent Application of Requirements Needed to Improve Project Management*, GAO-07-518 (Washington, D.C.: May 11, 2007).

we spoke with DOE project directors and reviewed project management documents for 10 of EM's major cleanup projects—9 projects above the near-term $1 billion threshold, and 1 estimated to cost between $900 million and $1 billion over the near term. For our analysis, we examined the life cycle baseline reported as of the most recent contract awards or major contract modifications—which occurred between 2004 and 2007—and compared these baselines with the updated baselines at the time of our review (dollar amounts used in calculating cost increases are in fiscal year constant 2008 dollars). We conducted site visits and analyzed project documentation, such as project plans, independent reviews, contractor performance data, plans to avoid or mitigate project risks, and documents prepared to guide and control formal changes to the baseline. We also identified factors that may hinder DOE's ability to effectively manage projects in accordance with approved life cycle baselines primarily through a review of project documents and interviews with project officials. Because we and others have previously expressed concern about the data reliability of a key DOE project management tracking database—the Project Assessment and Reporting System—we did not develop conclusions or findings based on information generated through that system.[11] Instead, we collected information directly from project site offices and contractors. In addition, we spoke with officials from EM and OECM in Washington, D.C. We provided an interim briefing to the Subcommittee on the status of our work on April 3, 2008.

We conducted this performance audit from March 2007 to September 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Appendix I contains a detailed description of our scope and methodology.

Results in Brief

Nine of the 10 cleanup projects we reviewed have experienced cost increases and schedule delays in their life cycle baseline, ranging from

[11]See, for example, GAO, *Department of Energy: Further Actions Are Needed to Strengthen Contract Management for Major Projects*, GAO-05-123 (Mar. 18, 2005); and Civil Engineering Research Foundation, *Independent Research Assessment of Project Management Factors Affecting Department of Energy Project Success* (Washington, D.C., July 12, 2004).

$139 million for one project to more than $9 billion for another, and schedule delays ranging from 2 years to 15 years. These changes arose primarily because the initial baselines made schedule assumptions that were not linked to technical or budget realities, and the scope of work included other assumptions that did not prove true. Specifically:

- *Baselines were not linked to technical or funding realities*. The schedules for 8 of the 10 projects we reviewed were established in response to EM's 2002 effort to accelerate cleanup work, which in some cases moved up project completion dates by 15 years or more. EM wanted to complete cleanups earlier to better safeguard public health and the environment, among other things. However, these dates were not always tied to technical capabilities or likely funding realities. For example, to meet the 2012 accelerated completion date for its solid waste disposition project, DOE's Idaho National Laboratory assumed its waste treatment plant could process waste at a rate that was more than 50 percent higher than the rate demonstrated at the time EM established the baseline. When the waste treatment plant did not meet that processing rate, EM revised its baseline, deferring 4 years of cleanup work, which added about $450 million to the project. In addition, before April 2007, according to several EM officials, project managers were directed to establish cost baselines to meet the accelerated schedules without considering likely funding for the projects. As a result, most projects did not receive funding as planned for in the baselines, hindering their ability to complete the work on time. In April 2007, EM changed its strategy: It limited its funding for all sites and directed that future baselines be based on the expected budget for each site. In part because of this change, some completion dates were extended by as much as 15 years.

- *Baselines' scope of work included optimistic assumptions that did not prove true*. Most of the projects we reviewed also experienced cost increases and schedule delays because the initial baselines had (1) not fully anticipated the type and extent of cleanup that would be needed, (2) assumed that construction projects needed to carry out the cleanup work would be completed on time, or (3) assumed the scope of work activities needed to finish the project would not increase. For example, at a 1940s-era building being demolished at Oak Ridge as part of the nuclear facility decontamination and decommissioning project, the contractor found that the building was far more contaminated and deteriorated than first estimated and had to reinforce the structure in order to safely remove contaminated equipment before demolishing the building. Primarily because these activities had not been adequately anticipated in the baseline, project costs rose by $1.2 billion and completion was extended by 9 years, to 2017. Similarly, the baselines for four of the major cleanup

projects assumed that a related, major construction project would be completed on schedule and available for the cleanup project to use. For example, a 5-year delay in the completion of Hanford's major construction project—the Waste Treatment Plant (WTP)—was the most significant factor behind extending the radioactive liquid tank waste project's schedule by 10 years, and increasing its life cycle costs by $4.8 billion. The delay in WTP's startup date resulted in additional years required to store the waste in the tanks and then to operate the treatment plant.

DOE has not always effectively used management tools—including independent project baseline reviews, performance information systems, guidance, and performance goals—to help oversee major cleanup projects' scope of work, costs, and schedule. Specifically:

- DOE's independent reviews of project baseline estimates, meant to, among other things, provide reasonable assurance that a project's work activities can be accomplished within the baseline's stated cost and schedule, have not done so for 4 of the 10 projects we reviewed. The baselines for these 4 projects were significantly modified shortly after review, revision, and validation. For one project, the baseline was significantly modified as little as 7 months after it had been revised and validated based on the independent review, while other projects had experienced additional life cycle cost increases of as much as $9 billion and delays of up to 10 years, within 1 to 2 years after the baseline reviews. As a result, the usefulness of the independent baseline reviews is questionable when significant baseline changes occur very shortly after the reviews are completed.

- EM managers do not always receive the information needed to effectively manage major cleanup projects or provide detailed reports to Congress on the projects' status. First, sites' proposals for changes to cost and schedule baselines do not consistently identify reasons for the changes or possible root causes, and EM does not systematically analyze the proposals for common problems across its projects. As a result, EM may be missing opportunities to apply lessons learned across projects. Second, in certain cases, the use of EVM data did not conform to industry standards or best practices identified by GAO, in part because the data contained anomalies that skewed analyses or lacked important information on future staffing needs. Third, EM's quarterly performance reports neither consistently provide accurate information about a project's performance against the near-term baseline, nor do they include information about how current performance may affect the life cycle baseline. Finally, DOE's reports to Congress do not include important information that would aid oversight, such as the extent of and reasons for significant changes to near-term and life cycle baseline estimates. In contrast, Department of Defense reports to

Congress on acquisitions for major systems provide detailed information on significant cost and schedule changes and the reasons for those changes.

- Guidance for key management and oversight functions—such as project baseline development, risk management, and contingency funding—is not consolidated, and is contradictory and unclear. Consequently, project managers do not consistently implement this guidance. For example, DOE headquarters officials found that project managers are calculating contingency funding to cover project risks in their baselines in a variety of ways, leading to uncertainty regarding the total contingency funds needed to cover all cleanup projects.

- DOE recently changed its goals for the performance of cleanup projects. Before 2008, a major cleanup project was expected to achieve 100 percent of the scope of work in its life cycle baseline with less than a 10 percent cost increase in the project's life cycle baseline. However, according to EM's current cleanup project performance goal, the projects are successful if they achieve at least 80 percent of the scope of work in their near-term baselines with less than a 25 percent cost increase. The new performance goal permits up to 20 percent of the scope of work to be deferred from the near term to out years, creating a substantially greater risk that life cycle costs will continue to increase and that completion dates will be delayed. According to DOE officials, the agency adjusted performance goals primarily to account for the greater level of uncertainty inherent in cleanup projects. However, by lowering expectations for adhering to near-term baselines, DOE may inadvertently be creating an environment in which large increases to life cycle costs become not only more common, but accepted and tolerated.

- Over the past 2 years, EM has begun a series of efforts to better manage its projects and address long-standing problems. For example, under its "Best-in-Class" Project Management Initiative, EM senior managers have expressed a strong commitment to improving project performance, and under this initiative, EM contracted with the Army Corps to assess project management, and then identified 18 priority actions to correct known problems. Although these efforts are ongoing, EM has yet to combine them into a formal plan, and it is too early to tell whether these efforts will prove effective.

We are making a number of recommendations to the Secretary of Energy to improve management of major cleanup projects, including to report more complete information to senior DOE management and Congress so that they can be fully informed about project status and make informed

decisions about these projects; consolidate, clarify, and update guidance for managing cleanup projects; consolidate all planned and ongoing EM improvements into a comprehensive corrective action plan; and develop the independent baseline reviews to better assure that project work scope can be completed within the baselines' stated cost and schedule.

We provided a draft of this report to the Department of Energy for its review and comment. DOE agreed with our recommendations but provided some suggested changes to them, and provided specific comments on the overall report, which we incorporated as appropriate. We discuss DOE's comments in detail at the end of this letter. DOE also provided some technical comments, which we incorporated as appropriate. DOE's comments are provided in appendix IV.

Background

DOE oversees and implements its major cleanup projects through agreements with contractors who operate the nuclear weapons research and production sites and the cleanup projects at those sites. Some of EM's cleanup projects are located at DOE sites administered by the National Nuclear Security Administration, a separately organized agency within DOE.

EM's major cleanup projects involve efforts to clean up sites where nuclear weapons were produced and production waste stored.[12] EM's cleanup projects handle a wide array of waste types and levels of radioactivity and hazardous constituents, and can involve multiple activities to, among other things, retrieve, characterize, treat, package, store, transport, and dispose of the waste, as well as disassemble, treat, package, store, transport, and dispose of the contaminated containers or processing lines/equipment used for weapons production or for storing or treating the waste. Multiple EM cleanup projects can occur at a single DOE site responsible for a multitude of other noncleanup-related activities. The cleanup projects are organized generally around similar waste types and activities. For example, the soil and water remediation activities at each site are organized under one umbrella, as are the nuclear facility decontamination and decommissioning projects, and the radioactive liquid tank waste projects, among others. EM generally

[12]DOE defines a project as a unique effort that supports a program mission and that has defined points for starting and ending; is undertaken to create a product, facility, or system; and contains interdependent activities planned to meet a common objective or mission.

manages these similar work activities, grouped into a category known as a Project Baseline Summary, through numerical designations; for example, all activities for soil and water remediation are grouped under Project Baseline Summary 30. (See app. II for additional information on the 10 DOE major cleanup projects reviewed.)

Funding for and Costs of DOE's Major Cleanup Projects

Unlike construction projects, which are funded on a line item basis, cleanup projects receive funding through operating funds designated for each DOE site. In 2003, EM began applying project management principles contained in DOE Order 413 to these cleanup projects in order to apply more discipline and rigor in planning and expending these project funds, among other things.

A cleanup project can cost several billion dollars and its life cycle can span several decades. EM divides the life cycle baselines for its major cleanup projects into three distinct parts—prior year costs, near term (usually a 5-year period), and out year (through project completion). Life cycle costs for each project range from a low of almost $1.7 billion to over $44 billion, and some projects might not be completed until after 2050.[13] (See app. III for detailed information on the life cycle baseline costs for the 10 projects we reviewed.)

EM applies different approaches to managing these wastes, depending on the type and extent of contamination and the state or federal regulatory guidelines and milestones it needs to comply with. DOE has agreements with state and federal regulators to clean up sites, and the agreements lay out a framework for determining the cleanup standards to be met. Furthermore, because all projects have a certain degree of uncertainty, such as not fully knowing the condition of buried waste containers, EM needs to plan for this uncertainty and identify ways to prevent serious disruption to projects should problems arise. To address this uncertainty, DOE Order 413 requires project managers to identify contingency funds that may be needed to cover potential cost increases stemming from a variety of project risks, including technical complexities, regulatory issues, and funding shortfalls. Although EM project managers build contingency funding into their near-term and out-year estimates, EM management does not generally include funding in its budget requests to cover contingency for cleanup projects until after it is actually needed to address a problem;

[13]In current year dollars, and excluding EM contingency funding.

therefore, EM contingency for cleanup projects has been referred to as "unfunded contingency."

Earned Value Management for Tracking Work Progress

To be effective, program managers need information on program deliverables and on the progress made in meeting them. One method that can help program managers track this progress is EVM data. These data include, for example, detailed information on budgeted costs and actual costs for work scheduled and work performed, as well as forecasted costs at project completion. Among other things, EVM data can be used to compare (1) budgeted costs to actual costs and (2) the value of work accomplished during a given period with the value of work scheduled for that period. By using the value of work completed as a basis for estimating the cost and time to complete a project, EVM data should alert program managers to potential problems sooner than expenditures alone can.

As a key management tool, EVM has evolved from an industrial engineering concept to a government and industry best practice to better oversee programs. Both OMB and DOE Order 413 require the use of EVM. OMB Circular A-11, part 7, requires the use of an integrated EVM system across an entire program to measure how well the government and its contractors are meeting a program's approved cost, schedule, and performance goals. The American National Standards Institute and the Electronic Industries Alliance have jointly established a national standard for EVM systems.[14] Recognizing the benefits of having these national standards, OMB states in its 2006 Capital Programming Guide that major acquisitions that require product development are to require that contractors use an EVM system that meets the American National Standards Institute guidelines.[15] In addition, DOE Order 413 requires that projects with total cleanup costs of $50 million or more use an EVM system that complies with industry standards and is certified by DOE's OECM to comply with these standards.

[14]See, for example, ANSI/EIA 748 32 Industry Guidelines (American National Standards Institute/Electronic Industries Alliance Standard, Earned Value Management Systems, ANSI/EIA-748-A-1998 (R2002), approved May 19, 1998, revised January 2002).

[15]See OMB, Capital Programming Guide, II.2.4, Establishing an Earned Value Management System. The OMB requirements also are reflected in the Federal Acquisition Regulation at 48 C.F.R. subpart 34.2.

GAO also has developed EVM best practices that, when followed, can help project managers consistently develop and analyze EVM data to gain a complete and accurate understanding of project status. Among other things, our guidance on EVM states that (1) EVM data should not have data errors and anomalies that may skew and distort the EVM analysis, and (2) information such as staffing levels and the root causes of and corrective actions for cost and schedule variances should be reported through the EVM system.

Major Cleanup Projects Experienced Billions of Dollars in Additional Costs and Schedule Delays, Primarily because Initial Baselines Were Overly Optimistic

Nearly all the cleanup projects we reviewed have had cost increases and schedule delays in the life cycle baseline, as much as $9 billion for one project, and schedule delays of as much as 15 years for two projects. These cost increases and schedule delays occurred primarily because the previous baselines for these projects had schedule assumptions that were not linked to technical or budget realities, and other assumptions also proved to be overly optimistic.

Major Cleanup Projects' Costs Have Increased by Billions and Schedules Have Been Delayed by As Much As 15 Years

The estimated costs of the 9 of the 10 DOE major cleanup projects we reviewed have significantly exceeded original estimates, as table 1 shows.

Table 1: Changes in the Estimated Life Cycle Costs for DOE Major Cleanup Projects

Dollars in billions

Project	Previous life cycle cost estimate (year of estimate)[a]	Current life cycle cost estimate range[b]	Life cycle cost increase range[b]	Percentage increase range[b,c]
Solid waste stabilization and disposition, Idaho National Laboratory	$2.851 (2006)	$3.301 – $3.940	$.450 – $1.089	16% – 38%
Nuclear facility decontamination and decommissioning, Oak Ridge Reservation	1.907 (2004)	3.126 – 3.290	1.219 – 1.383	64 – 73
Nuclear material stabilization and disposition, Savannah River Site	7.487 (2004)	10.802 – 11.248	3.315 – 3.761	44 – 50
Radioactive liquid tank stabilization and disposition, Savannah River Site	11.909 (2004)	18.622 – 24.003	6.714 – 12.094	56 – 102
Soil and water remediation, Los Alamos National Laboratory	1.521 (2006)	1.660 – 2.425	.139 – .904	9 – 59
Nuclear material stabilization and disposition, Hanford Site	2.990 (2006)	3.387 – 3.412	.397 – .422	13 – 14
Solid waste stabilization and disposition, Hanford Site	8.219 (2007)	9.596 – 10.639	1.377 – 2.420	17 – 29
Soil and water remediation, Hanford Site	3.902 (2007)	5.623 – 5.759	1.721 – 1.857	44 – 48
Nuclear facility decontamination and decommissioning, Hanford Site[d]	4.762 (2006)	4.762 – 4.892	0	0
Radioactive liquid tank stabilization and disposition, Hanford Site	21.647 (2004)	31.048 – 39.694	9.401 – 18.048	43 – 83

Source: GAO analysis of DOE data.

[a]For purposes of this report, previous cost estimates are the life cycle cost estimates created at the beginning of the most recent contract period for operation of the DOE site or the most recent major contract modification or extension, which in many cases coincided with the beginning of the project's previous near-term baseline. Current life cycle cost estimates are based on the most recently approved near-term baseline, out-year planning estimate ranges, or both.

[b]EM recently began using cost estimate ranges rather than point estimates. According to EM officials, costs at the lower end of the ranges were estimated at the 50 percent level of confidence, while costs at the upper end of the ranges represent the 80 percent level of confidence. For this report, our analysis of cost change uses the lower end of the range, which excludes contingency, because contingency amounts can vary widely between projects and are not typically funded before they are needed.

[c]We calculated the percentage of cost increase on the basis of constant 2008 dollars to make them comparable across projects and to show real increases in cost while excluding increases due to inflation.

[d]As of August 2008, this project has not registered a cost increase. However, project officials told us that they expect to file a baseline change proposal increasing the life cycle cost by at least several hundred million dollars by the end of December 2008.

As the table shows, estimated costs increased from a minimum of $139 million for one project to more than $9 billion for another project. The smallest dollar and percentage increase—$139 million, or 9 percent—occurred at Los Alamos' soil and water remediation project, which is focused on cleaning up known or suspected chemical and radiological contamination in addition to treating soil and groundwater that was contaminated by this waste. This project, however, is expected to further increase its life cycle cost estimate. The largest dollar increase among the 10 major projects—more than $9 billion—was for Hanford's radioactive liquid tank waste project, which is expected to remove, treat, and dispose of more than 56 million gallons of high-level radioactive waste in 177 underground storage tanks. In fact, the other radioactive liquid tank waste project, at Savannah River, registered the second largest dollar increase—almost $7 billion. However, the largest percentage increase—about 64 percent—occurred at Oak Ridge's nuclear facilities decontamination and decommissioning project.

Table 2 shows that 8 of the 10 projects we reviewed experienced delays in scheduled project completion, ranging from 2 years to 15 years.[16]

Table 2: Changes in Estimated Project Schedules for DOE Major Cleanup Projects

Project	Previous completion date estimate[a]	Current completion date estimate[a]	Schedule change (years)
Solid waste stabilization and disposition, Idaho National Laboratory	2012	2016 – 2020	4 – 8
Nuclear facility decontamination and decommissioning, Oak Ridge Reservation	2008	2017	9
Nuclear material stabilization and disposition, Savannah River Site	2015	2024 – 2026	9 – 11
Radioactive liquid tank stabilization and disposition, Savannah River Site	2019	2032 – 2034	13 – 15
Soil and water remediation, Los Alamos National Laboratory[b]	2015	2015	0
Nuclear material stabilization and disposition, Hanford site	2016	2018 – 2019	2 – 3

[16]EM recently began using schedule estimate ranges rather than point estimates. According to EM officials, scheduled completion dates at the lower end of the ranges were estimated at the 50 percent level of confidence, while dates at the upper end of the ranges represent the 80 percent level of confidence. For this report, our analysis of schedule change uses the lower end of the range.

Project	Previous completion date estimate[a]	Current completion date estimate[a]	Schedule change (years)
Solid waste stabilization and disposition, Hanford site	2035	2050 – 2058	15 – 23
Soil and water remediation, Hanford site	2035	2050 – 2059	15 – 24
Nuclear facility decontamination and decommissioning, Hanford site	2019	2019	0
Radioactive liquid tank stabilization and disposition, Hanford site	2032	2042 – 2050	10 – 18

Source: GAO analysis of DOE data.

[a]For purposes of this report, previous project completion dates represent the estimates at the beginning of the new contract period for operation of the DOE site or the major contract modification or extension, which typically coincided with the beginning of the projects' current or previous near-term baseline. Current completion date estimates represent the most recently approved near-term baseline or out-year planning estimate ranges calculated at the 50 percent confidence level at the lower end of the range, to the 80 percent level of confidence at the higher end of the range. EM recently began using schedule estimate ranges rather than point estimates. For this report, our analysis of schedule change uses the lower end of the range.

[b]The June 2008 Baseline Change Proposal shows proposed costs associated with this project at the 80 percent confidence level would extend through fiscal year 2020.

As table 2 shows, the shortest delay is at Hanford's nuclear material stabilization and disposition project, while the longest delays—15 years—also are at Hanford: the soil and water remediation and the solid waste stabilization and disposition projects.

Overly Optimistic Baselines Contributed to Significant Changes in Projects' Life Cycle

The changes in schedule and costs occurred primarily for two reasons. First, initial project baselines were built on accelerated schedules that were not always linked to technical capabilities or available budgets, although EM has begun to tie its new baselines to anticipated funding. Second, the initial baselines included other assumptions that did not hold true, including conditions on the ground at the sites, expected completion dates for related construction projects, and activities that would be included in projects' scopes of work.

Baseline Schedules Were Not Linked to Technical or Funding Realities

The initial baselines for 8 of the 10 major projects we reviewed contained schedules that were influenced by an EM-wide effort to accelerate the office's cleanup work. In 2002, EM management worked with its sites and regulators to create new, earlier milestones for completing key cleanup projects and for closing entire sites to reduce the public health and environmental risks posed by the waste at these sites. Before this effort, some of the major cleanup projects were not estimated to complete work until the 2030s and 2040s. Under the accelerated schedules, four projects'

completion dates were moved up by 15 years or more, as was the case for the radioactive liquid tank waste stabilization and disposition project at the Hanford site; its completion date was moved from 2048 to 2028. The baselines containing the accelerated schedules—those generally created between 2003 and 2006—tied their work scope and funding assumptions to the completion dates and not necessarily to available cleanup technologies. For example:

- *Solid waste stabilization and disposition project at Idaho*. To meet its accelerated completion date of 2012—down from 2018—DOE's Idaho National Laboratory assumed its Advanced Mixed Waste Treatment Plant could process nuclear waste at a rate of about 8,500 cubic meters per year—more than 50 percent faster than the rate of about 5,400 cubic meters per year demonstrated when DOE established the baseline. At the time, because the plant had only recently begun operating, project staff lacked confidence that they could meet the processing rate. Moreover, the independent team reviewing the baseline reported that the rate was optimistically high. Nevertheless, DOE proceeded with the initial baseline, increasing the amount of unfunded contingency in its baseline and attempting to meet the optimistic rate by providing the contractor with performance incentives. Still, the processing rate has fallen short of baseline assumptions—it is currently roughly 6,000 cubic meters per year. To reflect this more realistic rate, DOE subsequently revised its baseline, adding 4 years to the project schedule and increasing costs by about $450 million.

- *Radioactive liquid tank waste stabilization and disposition project at Savannah River*. This project, in part, combines high-level radioactive waste stored in tanks at the Savannah River Site with melted glass and places it in canisters ultimately to be sent to a federal repository for disposal. DOE directed that the project's completion date be accelerated, from 2035 in its early planning documents to 2019 in the initial baseline. In order to make that date, according to project officials, they included some assumptions in the initial baseline they knew at the time would be difficult to realize. Specifically, they assumed that the project's waste processing facility could produce canisters consisting of up to 49 percent high-level waste—with the remaining space filled with melted glass—when at the time it had not been able to produce a canister containing more than 42 percent high-level waste with an existing technology while remaining within the acceptance criteria for the federal repository. Those criteria dictate specific characteristics, including durability and leachability for the glass-waste mixtures in the canisters. DOE has since adjusted these assumptions—the current waste processing plan assumes the canisters will contain 34 percent to 38 percent high-level waste using the existing

technology—contributing to the overall cost increase and schedule delay for this project.

These early baselines also were not tied to expected funding. According to several senior EM officials, before April 2007, project directors were instructed to create cost baselines to meet the accelerated schedules and their regulatory milestones without regard for the likely funding the projects could expect to receive. Consequently, the funding assumptions in the projects' baselines were higher than the amount of funding DOE requested each year. According to a senior EM budget official, these shortfalls required project managers to continually adjust cost and schedule baselines as projects moved work activities into the out years to accommodate the lower funding levels. For example, according to site officials at Oak Ridge, when DOE did not request the full amount of funding in the nuclear facility's decontamination and decommission project's initial baseline, the project could not complete all the work as planned. Project managers responded by pushing work activities into the out years, which contributed, in part, to the project's overall cost increase and schedule delay. Similarly, as noted in a recent DOE internal audit, according to Los Alamos officials, funding has not been sufficient to meet the site's regulatory commitments, and has been a concern since 2003, when the site manager said he was concerned that appropriate resources had not been identified to conduct the necessary environmental restoration activities.[17]

According to EM managers, they have implemented changes to the way baselines are created that address these problems. In April 2007, EM changed its policy for creating project baselines. Instead of tying baselines to the accelerated schedules and regulatory commitments with unconstrained funding, EM limited funding for its sites, directing that all future baselines be based on expected budget numbers generated for each site.

For three of the projects we reviewed, this change in direction resulted in deferral of work and schedule delays because the new funding levels represented significant reductions in what projects were planning on

[17]U.S. Department of Energy, Office of Inspector General, Office of Audit Services, *Audit Report: The Department's Progress in Meeting Los Alamos National Laboratory Consent Order Milestones*, DOE/IG-0793, April 2008.

receiving, and these projects were low on EM's priority list.[18] For example, Hanford's solid waste stabilization and disposition project's funding was reduced to the point where it will receive minimal funding for the next 4 years in order to allow full funding of Hanford's decontamination and decommissioning project at River Corridor, a higher priority. During this period, to comply with the funding levels provided, the project will maintain minimum activities to safeguard materials and will not advance its waste processing goals. As a result, according to project officials, life cycle costs for this project increased in some part to reflect a longer schedule and the additional costs of having to hire and train new workers in the future to complete a job that already was underway.

Not all sites have implemented these changes, however. EM's direction to all sites to create their baselines tied to the funding profile outlined in the June 2007 policy memo has not been applied to two of the major cleanup projects. The Hanford radioactive liquid tank waste stabilization and disposition project—the most expensive cleanup project—and the Los Alamos soil and water remediation project have not aligned their baselines with the funding targets. The Hanford project's baseline was validated just before the policy change took place and, for the period between 2009 and 2030, the baseline contains about $2.6 billion more than the funding targets.[19] Similarly, EM approved the baseline for the Los Alamos project even though it was not aligned with the funding targets. The baseline identifies a projected funding shortfall each year through 2012 that peaks at a cumulative $236 million in 2010. This shortfall does not include an additional $947 million in unfunded contingency. At the same time EM approved the baseline, it directed project managers at the site to change the baseline to bring its costs in line with the targets.

Another likely contributing factor to the cleanup projects' cost increases and extended schedules is DOE's practice of not including contingency funding in its annual budget requests for EM's cleanup projects. Specifically, EM has requested enough funding for its cleanup projects to ensure a 50 percent likelihood of completing the projects within the total estimated project costs. However, the requested amount generally has not

[18]EM's priority list is based on maximizing risk reduction. As such, it has ranked its activities in priority order, from highest to lowest, from stabilizing radioactive tank waste in preparation for treatment down to decontaminating and decommissioning excess facilities.

[19]Figures in this paragraph are in current year dollars.

included contingency funding, which project managers may have to use in order to complete a project on time by addressing risks that materialize during cleanup. For example, in 2007, the radioactive liquid tank waste project at Hanford had an unexpected spill of 85 gallons of radioactive material from one of its storage tanks; this spill required shutting down waste retrieval operations for 11 months in order to clean up the spill. Even though the retrieval operations represent a small percentage of the overall work scope ongoing at the project, the accident added at least $8 million to the retrieval cost for that one tank. Furthermore, in accordance with EM policy, projects are expected to account for the costs of such potential risks by increasing the amount of unfunded contingency in their near-term and life cycle baselines. Because funding for that contingency is not included in the budget request, however, increasing the amount of contingency funding in the near-term baseline is largely a paperwork exercise that has no active impact on preventing or solving problems or anticipating actions that could offset demonstrated slow progress.

According to a December 2007 report by the National Academy of Public Administration, EM's practice of not funding contingency for its cleanup projects has meant that EM has not had additional funding available to address emergency problems when they arise and therefore has either taken money from another project or extended the schedule of the work into future fiscal years to manage them. Furthermore, according to EM officials, by providing enough funding for its projects to ensure that they have a 50 percent chance of meeting their project cost and schedule baselines, EM recognizes that 5 of the 10 major projects are likely to miss their cost and schedule goals. In contrast, DOE funds its construction projects at a level that reflects a greater probability of success—80 percent—an amount that reflects the industry standard for such projects. According to senior EM officials, EM does not fund contingency for its cleanup projects because allotting enough funds to cover the costs of risks that may not materialize would constrain the amount of work EM could perform for the money it receives each year. However, in accordance with a recommendation from the National Academy of Public Administration, EM is evaluating its practice of not including contingency funding in its budget requests for cleanup projects.

Baselines Included Assumptions about the Scope of Work and Technical Challenges That Did Not Hold True

For most of the projects we reviewed, EM included assumptions in its baselines that (1) did not represent the conditions at some of the major projects, (2) did not sufficiently anticipate delays in the completion of related construction projects, and (3) the scope of work activities to be accomplished would not increase. Correcting these assumptions often led to changes in the scope of work, higher costs, and extended schedules.

First, for four of the projects we reviewed—Oak Ridge's nuclear facility decontamination and decommissioning project, Idaho's solid waste stabilization and disposition project, and Savannah River and Hanford's radioactive liquid tank waste stabilization and disposition projects—site conditions were worse than project staff originally estimated, leading to significant changes to the life cycle baseline.[20] For example, at the Oak Ridge project, because a 1940s-era building was far more contaminated and deteriorated than first estimated, DOE changed its cleanup plan and implemented a more extensive—and therefore more expensive—approach to tearing down the building. After a worker fell through a weakened floor, the contractor had to first reinforce the building's structure so that contaminated equipment could be removed safely. Primarily because project officials did not accurately anticipate the site conditions or the types of work activities necessary to safely conduct the work—despite multiple estimates generated by the contractor, DOE, and the Army Corps—this project's costs increased by $1.2 billion and significant amounts of work were delayed, extending the completion date by 9 years, to 2017.

Similarly, the initial baseline for the radioactive liquid tank waste stabilization and disposition project at Hanford assumed that 99 percent of the waste contained in the 177 storage tanks could be removed by using only one type of technology to retrieve the tank waste. However, DOE subsequently determined that almost half of the tanks contained a hardened layer of waste that could not be removed with the chosen technology and therefore a second technology was needed to remove this waste. Correcting the optimistic assumptions—adding the second technology and re-estimating the costs of retrieving waste from the tanks based on field experience gained—increased the baseline by more than $2 billion.

Second, delays in completing related construction projects directly contributed to schedule delays—and corresponding cost increases—for four of the cleanup projects we reviewed. Three of these projects are at the Hanford site in Richland, Washington. The initial baselines for these projects included assumptions that the major construction project there—the Waste Treatment Plant (WTP)—would be ready to begin operations in

[20]According to project officials, site conditions also were worse than estimated at Hanford's nuclear facilities decontamination and decommissioning project at River Corridor, although a baseline change proposal for the cost increase for this project had not been filed with EM headquarters at time of our review.

2011. In 2006, DOE extended the WTP construction completion date by 5 years, resulting in schedule extensions for three cleanup projects.[21] The major cleanup project that will run the WTP—the radioactive liquid tank waste stabilization and disposition project—had to increase its life cycle cost estimate by about $4.8 billion and extend its schedule by 10 years in order to safely maintain the waste storage tanks while the treatment plant is being built and to operate the plant for additional years, among other things. Similarly, in response to the WTP delay, the schedules for the solid waste stabilization and disposition project and the soil and water remediation project were extended by 15 years—increasing costs by more than $4 billion combined. These projects cannot complete their missions until the WTP has finished processing all of the liquid waste in the storage tanks. According to the currently approved baselines, the liquid tank waste project will complete its operations in 2042, and activities under the latter two projects are not expected to be completed until 2050.[22] However, as we recently reported, DOE has acknowledged that the start of waste treatment operations will be delayed by at least 8 years (from 2011 to 2019), not 5 years, which will likely affect further these projects' costs and schedules.[23]

Third, for three of the projects we reviewed, increases in work scope—the activities required to complete the project—contributed to cost increases and schedule delays. For example, a major contributor to the more than $3 billion cost increase and at least 9-year schedule delay at the nuclear materials stabilization and disposition project at Savannah River was DOE's approval of a new initiative in 2006 that added additional amounts of nuclear materials for the project's facilities to disposition, including materials from other DOE sites. Those facilities were originally scheduled to complete their mission in 2007—the new scope extended the mission

[21]In 2006 we reported on the primary causes of the cost and schedule increases at the WTP, some of which echo the issues we found relative to the major cleanup projects: shortcomings in the contractor's performance, DOE management and oversight problems, and technical challenges that were more difficult to address than anticipated. GAO, *Hanford Waste Treatment Plant: Contractor and DOE Management Problems Have Lead to Higher Costs, Construction Delays, and Safety Concerns*, GAO-06-602T (Washington, D.C.: Apr. 6, 2006).

[22]These dates are based on a 50 percent confidence level. With 80 percent confidence, the liquid tank waste is estimated to extend until 2050, the solid waste project is estimated to complete in 2058, and the soil and water project is estimated to extend until 2059.

[23]GAO, *Nuclear Waste: DOE Lacks Critical Information Needed to Assess its Tank Management Strategy at Hanford*, GAO-08-793 (Washington, D.C.: June 30, 2008.)

until 2019.[24] Similarly, Savannah River's other major cleanup project—radioactive liquid tank waste stabilization and disposition—also had significant scope added. Under a law passed in 2004,[25] DOE determined that the salt waste in its tanks is not high-level waste and therefore can be disposed of at the site instead of in a geologic repository. The law required DOE to consult with the Nuclear Regulatory Commission when making this determination. According to DOE, this consultation and the resulting changes to the cleanup process added significant scope to the project, causing DOE to lengthen the estimated time to close the 49 tanks at the site.

According to EM, most of the cost increases and schedule delays experienced by the major cleanup projects were the direct result of unrealized aggressive planning assumptions. EM has since recognized that project baselines must be based on realistic technical and regulatory assumptions and be planned on the basis of realistic out year budget profiles. However, it appears that the practice of incorporating optimistic assumptions into project baselines has not yet been eliminated. As we recently reported, some of the underlying assumptions in the baseline for the Hanford radioactive liquid tank waste project may be overly optimistic.[26] For example, DOE assumes that the tanks will remain viable throughout what has become a protracted waste treatment process, with some tanks expected to remain in service more than 60 years longer than originally anticipated. This extended operation raises the risk of tank failure and leaks to the environment. The baseline also assumes that emptying single-shell tanks will proceed significantly faster than it has to date. Hanford project management officials have since acknowledged that the ambitious retrieval schedule might not be achievable and are adjusting their planning estimates.

[24]As we recently reported, DOE may identify additional nuclear materials to process through these facilities, which could delay the planned 2019 shutdown and increase operational costs. GAO, *Nuclear Material: DOE Needs to Take Action to Reduce Risks Before Processing Additional Nuclear Material at the Savannah River Site's H-Canyon*, GAO-08-840 (Washington, D.C.: July 25, 2008).

[25]Ronald Reagan National Defense Authorization Act for Fiscal Year 2005, Pub. L. No. 108-375 § 3116. This law resolved a lawsuit in which an environmental group alleged that DOE lacked authority to determine that particular wastes were not high-level waste.

[26]GAO-08-793.

DOE Has Not Effectively Used Available Management Tools to Help Control Major Cleanup Projects' Scope of Work, Costs, and Schedule

While DOE has several mechanisms in place to help manage cleanup projects, including independent reviews, performance information systems, guidance, and performance goals, it has not always used them to effectively manage major cleanup projects' scopes, costs, and schedules.

DOE's Baseline Reviews Highlight Problems but Have Not Succeeded in Ensuring Work Can Be Accomplished within Stated Cost and Schedule

OECM's independent reviews of the baselines, meant, among other things, to provide reasonable assurance that the project's work activities can be accomplished within the stated cost and schedule, have not done so for four of the projects we reviewed. Instead, these baselines were significantly modified shortly after approval. As a result, the usefulness of the independent baseline reviews is questionable when significant baseline changes occur very shortly after the reviews are completed, as the following discussion illustrates.

The advanced mixed waste treatment project under Idaho's solid waste stabilization and disposition project. OECM's 2006 independent review accurately noted that the project baseline submitted for validation for the treatment plant included an unrealistic rate for processing waste—more than 50 percent faster than the rate demonstrated at the time the baseline was established. In response, project officials proposed correcting the problem primarily by increasing the amount of unfunded contingency in the baseline, a move that reflected common practice within EM, and OECM officials approved this action and validated the baseline. As the panel predicted, the project's actual processing rate after its baseline was validated was slower than expected. Within 7 months of OECM's validation of the near-term baseline, project officials proposed modifying it. DOE had to defer the activities that the contractor was not able to accomplish in the near term, extending the project life cycle by about 4 years and increasing costs by about $450 million. We believe that DOE's approval of increasing unfunded contingency as a corrective action for an

unrealistic processing rate was ineffective.[27] Although DOE also attempted to increase the processing rates through contractor performance incentives, we believe DOE should have revised the baseline using a more realistic processing rate to calculate baseline cost and schedule before validating it.

Oak Ridge's nuclear facility decontamination and decommissioning project. Significant cost increases began 2 years before OECM's independent validation of the project in 2006, and have continued to increase. Specifically, life cycle costs for the project were estimated at $1.8 billion in 2004—the beginning of the project's previous near-term baseline—with expected project completion by fiscal year 2008. By August 2006, when OECM completed its review of the baseline and issued its validation recommendation, life cycle costs for the project had grown to about $2.2 billion and project completion was extended by about 1 year. However, roughly 1 year after OECM validated the baseline, EM revised it again, adding about $800 million in costs and delaying project completion by an additional 8 years. EM justified the change because, among other things, it wanted to adjust the baseline to conform to new funding targets as directed by DOE in June 2007 and to account for other changes it needed to make in its approach to decontaminating the building.

Los Alamos soil and water remediation project. In March 2008, EM approved an independent review of this project and the associated baseline although it expected that the baseline would change. According to the EM memorandum approving the baseline, changes in EM's priorities and funding plans were likely to necessitate changes to the Los Alamos project's baseline, and the project was directed to submit a baseline change that would align the baseline with funding targets. OECM officials also acknowledged that their independent review of the baseline was based on assumptions that would likely not prove to be true. Specifically, OECM's review assumed that the project would receive the full funding needed even though DOE's funding targets at the time were below the funding levels needed to comply with the state cleanup agreement. As a result, project officials expect that the estimated life cycle costs of nearly $1.7 billion will increase substantially during 2008 but could not tell us the

[27]DOE included $180 million (representing an additional 18 months of work) in its unfunded contingency for this project , which would have covered only part of the $450 million cost increase or the 4-year schedule delay experienced by the project.

extent of the cost and schedule change until they receive DOE's new funding commitments for the project.

Hanford's radioactive liquid tank waste stabilization and disposition project. The most significant cost increase—more than $9 billion—occurred about 2 years after DOE's initial independent review and approval of this project. The project's baseline was first approved in 2004, with life cycle costs expected to be about $22 billion and completion scheduled for 2032. However, in 2006, life cycle costs increased to about $31 billion—not including an additional $8.6 billion in unfunded contingency—and the completion date was extended by 10 years, to 2042. Project officials expect the baseline will require another update and independent review in 2009 to reflect anticipated changes as a result of the project's new contractor and because of changes resulting from ongoing negotiations with state regulators over regulatory agreement milestones.

In addition to changes to the baselines soon after the independent reviews, DOE has recently relaxed standards used for conducting these reviews. In 2003, DOE issued standard operating procedures for conducting independent reviews—primarily of construction projects. These procedures stated that baselines should be considered, once approved, as set in concrete. The EM-OECM 2005 protocol—and its 2007 update—for cleanup projects replaced the standard operating procedures and directed OECM to validate only the near-term baseline for cleanup projects while reviewing the life cycle estimate "for reasonableness." In this way, EM and OECM sought to acknowledge what they believe are the greater uncertainties present in the out-years of a cleanup project compared with a typical construction project. However, within a year of the 2007 protocol, OECM had changed its approach for EM cleanup projects from validating baselines to "certifying" them, which is a more limited statement of assurance than validation. Specifically, according to OECM officials, certification means that the near-term baselines are reasonable if near-term baseline costs are funded as outlined in the baseline and contingency funds are provided as needed. The change is intended to reflect OECM's belief that, because funding for cleanup projects is more uncertain than for construction projects, the same confidence level cannot, nor should, be applied to reviews of EM cleanup project baselines as it is applied to construction projects. Since EM headquarters does not consistently provide contingency funds for its cleanup projects, and half of the major projects have significant contingencies in their near-term baselines, the most likely result for projects experiencing problems is to extend schedules and increase life cycle costs. In commenting on a draft of this report, OECM stated it intends to go back to validating near-term baselines

for cleanup projects, assuming, in part, that funding becomes more stable and EM gains greater experience managing near-term baselines.

DOE Lacks Reliable and Consistent Performance Information

DOE managers depend on data about the performance of EM's major cleanup projects to make informed decisions about how best to handle unexpected events and manage shifting priorities. DOE site and headquarters staff generate a number of regular reports to update senior managers on the status of these projects, both to justify making significant changes to project baselines and to request funding from Congress. Although these reports provide valuable information to managers on the progress of work at cleanup sites around the country, they do not consistently provide the key information needed to make fully informed management decisions about EM's major cleanup projects. Specifically, (1) proposals for baseline changes do not consistently identify reasons for proposed changes or possible root causes that contributed to problems, (2) use of EVM data does not consistently conform to industry standards or GAO's best practices, (3) quarterly reports do not always describe the impact of contractor performance on near-term or life cycle costs and schedules, and (4) reports to Congress on the status of and changes to major cleanup projects are limited to a small snapshot in time and do not provide information necessary for effective oversight.

EM Baseline Change Reports Do Not Consistently Include Needed Information

When a project reaches a point at which it is likely to miss the goals in its baseline, project managers are required to propose changes to the project's cost, schedule, or scope baseline, a process that is akin to hitting the reset button. EM project managers request such a change by, among other things, documenting certain information in a Baseline Change Proposal report, including current approved costs and new proposed costs, proposed project start and end dates, and a justification for the changes. For the key change proposals we reviewed for the major cleanup projects, the information provided describing the changes and their impacts varied widely, with some projects providing little to no explanatory information about what led to the change and others explaining the causes of the changes in detail. For example, a change proposal for Hanford's nuclear material stabilization and disposition project simply described the project's scope of work and did not provide any explanation for why the project's schedule was being delayed by 3 years, while a proposal from Savannah River's radioactive liquid tank waste stabilization and disposition project included information on the causes for its cost and schedule changes, as well as the specific cost and schedule impacts of each cause. However, the change proposals we reviewed generally did not address the root causes that resulted in the changes to the baseline. For example, the Savannah River change proposal

explained that almost $500 million of the total proposed cost increase was due to revising the strategy for finishing the project. However, the proposal did not explain why this strategy needed revision. In investigating the reason for this proposed revision, we determined that a robust strategy for finishing the project was not included in the original baseline because the project was directed to meet a completion date of 2025 and could not do so if it included the thorough closure strategy. Without including this kind of information in the proposals, it would be difficult for EM managers to effectively identify the true causes of the baseline changes, take steps to address them, and transfer any lessons learned to other projects.

In addition, EM does not centrally gather and systematically analyze the narrative information in the baseline change proposals. We recognize that such information is not easily analyzed to identify common causes across projects. However, without such analysis, EM senior managers are potentially hindered in addressing problems collectively. One EM project management official agreed that having the ability to analyze the information in the change proposals across projects would be beneficial, but that his office had not yet made it a priority to collect this information because it was still addressing reliability issues with the data in the change proposals.

EM has made some effort to identify root causes of its project management problems. It recently participated in a DOE-wide effort to identify root causes of project and contract management problems in response to GAO's inclusion of DOE's contract management on its high-risk list.[28] However, DOE's analysis was focused more on construction projects than EM cleanup projects. The report notes that the emphasis of the effort was on the capital line item—construction—projects, but that several of the issues identified also are applicable to other projects, including EM cleanup projects.[29] According to one project participant from OECM, the participants discussed how some of the issues raised related to cleanup projects but they did not examine those projects as extensively as the construction projects. In commenting on a draft of this report, DOE explained that its analysis was based more on data from construction projects than EM cleanup projects because more data exist documenting DOE's past project management deficiencies for construction projects

[28]GAO, *High-Risk Series: An Update*, GAO-07-310 (Washington, D.C.: January 2007).

[29]DOE, *Root Cause Analysis: Contract and Project Management* (Washington, D.C., April 2008).

since those projects have a longer history of a structured, disciplined management process.

Use of Earned Value Data Does Not Always Conform to Industry Standards or GAO-Identified Best Practices

At three of the major cleanup projects—nuclear facilities cleanup at the Hanford Site's river corridor cleanup project, solid waste stabilization and disposition at Idaho National Laboratory, and soil and water remediation at Los Alamos National Laboratory—we found several instances in which the use of EVM data did not conform to industry standards or our best practices.[30] As a result, EM and site project managers using the data may be less able to make informed decisions to effectively manage these projects.

Data anomalies. For all three projects, the EVM systems we assessed contained data errors or anomalies that could potentially distort the analysis of EVM data. Anomalies included, for example, reporting negative actual costs or reporting costs that are not tied to work scheduled or performed. The Los Alamos EVM data contained both types of these anomalies, which may have distorted the results of data analyses by as much as $34 million, preventing managers from understanding the true status of project performance. According to project officials, the anomalies occurred primarily because Los Alamos had initially assigned costs to a general account, and waited up to several months before assigning these costs to the correct specific work activities. In another case, in a significant number of instances the contractor at Hanford's river corridor closure project reported costs incurred for work activities performed that had not been scheduled to start until future years, skewing the reported performance results.[31] The contractor explained that these data anomalies occurred because it had performed work sooner than originally expected—and therefore the work was not incorporated into the project's EVM planned schedule in the periods for which it was actually performed. Project officials at the site stated that they believe the EVM information, as reported, correctly represents the project's status. As such, the summary-level EVM data seem to depict a favorable schedule

[30]We conducted limited assessments of EVM data reliability, compliance with industry standards or our best practices, and other analyses at three of the five EM sites we visited, including data from the Hanford site's river corridor cleanup project, Washington; Idaho National Laboratory's advanced mixed waste treatment plant subproject (within the solid waste stabilization and disposition project), Idaho; and Los Alamos National Laboratory's soil and water remediation project, New Mexico.

[31]Specifically, we found elements where the contractor reported budgeted and actual costs of work performed without a corresponding work schedule.

performance in April 2008; however, our independent analysis of this data shows that when we removed the value of the work that was started and completed ahead of schedule, the remainder of the originally scheduled work was actually behind schedule in April 2008, and trends indicated that the variance was worsening.

Data on the availability of staff to perform future work was not always developed. For one of the projects we reviewed, the EVM system lacked important information on staffing, contrary to GAO-identified best practices. DOE officials at Los Alamos' soil and water remediation project told us they plan to begin asking for staffing information from the contractor, and contractor officials stated they are setting up a staffing report within their EVM system. Without this information, project managers lack important information necessary for ensuring that they have, or will have, an adequate number and type of staff to perform the upcoming scheduled work.

Reliability of earned value systems is questionable. OECM has certified that the earned value system used to report performance for only one of the three systems we assessed meets the required industry standards.[32] The EVM system used by the contractor operating the advanced mixed waste treatment project—a significant portion of the solid waste stabilization and disposition project at the Idaho National Laboratory—has not been reviewed by OECM to determine whether it is compliant with industry standards, and contractor officials stated they believed their system does not meet the standards. In addition, OECM was in the process of reviewing the system used by the contractor responsible for the soil and water remediation project at Los Alamos National Laboratory at the time of our review. As a result, these projects lack the necessary assurances that the EVM data were free of errors and anomalies that could skew and distort the EVM analyses.

Once a system is certified as meeting the standards, regular surveillance is needed in order to ensure its continued compliance. Surveillance allows managers to focus on how well a contractor is using its EVM system to manage cost, schedule, and technical performance, and is important

[32]OECM has certified that all of the EVM systems used by the contractors working on the 10 major cleanup projects are in compliance with the American National Standards Institute/Electronic Industries Alliance standard except that of the Advanced Mixed Waste Treatment Project contractor at Idaho and the major project at the Los Alamos National Laboratory.

because it monitors problems with performance and the EVM data. If these kinds of problems go undetected, EVM data may be distorted and not meaningful for decision making. OECM's surveillance program is under development: it recently hired one staff person to lead its surveillance efforts, and is developing a guide to better define its surveillance protocol. DOE also requires its sites to perform surveillance of EVM monthly contractor performance data, which includes developing EVM surveillance plans and conducting random EVM surveillance.

Furthermore, EM managers do not appear to consistently gather or analyze EVM data to maximize the data's benefits for project management. GAO best practices recommend that EVM system reports include thorough narrative explanations of any root causes of, or proposed corrective actions, for reported cost and schedule variances shown in the data. For the soil and water remediation project at Los Alamos, for example, EM did not require that this information be reported by its contractor. As a result, EM project managers at Los Alamos have not always received the information necessary for ensuring that effective corrective actions are implemented to prevent additional changes to the cost and schedule baselines. According to contractor officials, they reported information on root causes and corrective actions to EM routinely before fiscal year 2008, but DOE asked them to stop providing it. According to the project director for the soil and water remediation project at Los Alamos, the Los Alamos Site Office Assistant Manager had directed the contractor to not provide the variance reports as part of its project status reviews because the contractor's explanation of these variance reports during scheduled meetings was taking several hours to review and wanted instead to use the available time to focus more on risk management and other project issues. However, according to this site official, the site office's direction was not intended to discontinue all variance analysis reporting. Although the contractor discontinued including the variance analyses reports in its project status reviews, the project director stated that DOE continues to obtain information from the contractor by other means, such as cost performance reports and weekly contractor meetings at which DOE and the contractor discuss the root causes of variances that resulted in risks to meeting milestone compliance agreements. However, contractor cost performance reports we reviewed did not provide any narrative information on causes or corrective actions. Furthermore, the weekly contractor meetings discuss only certain root causes of the variances that resulted in risks to milestone compliance agreements and therefore are neither comprehensive nor documented. Because verbal information can easily be forgotten, lost, or misinterpreted, among other things, we believe that a written report would be a best practice.

In addition, EM projects report their EVM data to headquarters managers at the project summary level, which can mask problems occurring in the project that more detailed reporting could reveal. At Idaho, in early 2008, EVM data showed the solid waste stabilization and disposition project was performing ahead of schedule and under cost, although major problems had occurred at the advanced mixed waste treatment project—the primary subproject. Without EVM reports that contain more specific detail, project managers at headquarters may not recognize that a problem is occurring until it becomes large enough to recognize at the summary project level of reporting. In addition, greater detailed information provided to managers earlier in the project potentially could allow for early intervention.

Beyond more detailed reports, some project managers in the field and at headquarters have not always systematically reviewed or independently analyzed the EVM data they received, which also would help improve their understanding, as well as mitigate potential problems occurring within a project. At one site we visited, the DOE official receiving the data said he did not analyze the information before entering it into the EM headquarters database. In turn, headquarters EM project managers told us they also do not analyze the EVM data the projects report. One oversight official indicated he would prefer to analyze the information he receives from the projects but he did not have the time required to do so. A senior EM project management official told us that he recognizes this deficiency and is working to address it: EM intends to pilot a new software package that will allow managers to analyze EVM data. According to EM, the software will enable EM managers to drill down into the EVM data received from the contractors, thus improving their oversight capabilities. In addition, according to EM project management officials, EM has insufficient federal staff to conduct oversight, which is being addressed as part of an ongoing effort to improve project management. In commenting on a draft of this report, EM stated it also intends to provide additional EVM training for its analysts.

Quarterly Reports Do Not Present a Comprehensive Picture of Performance against Near-Term or Life Cycle Commitments

In accordance with Order 413, EM senior managers, including the Assistant Secretary, receive quarterly updates on the status of the major cleanup projects. Two key reports are the quarterly project reviews (QPR), generated by EM project managers, and a quarterly project status report created by OECM. These reports contain contractor performance data and information about new or ongoing issues that need addressing at the sites, but do not always describe how contractor performance affects performance against the near-term or life cycle baselines. Without this information, managers cannot develop a comprehensive assessment of progress against agreed-upon goals.

The QPRs and OECM quarterly reports we reviewed largely use EVM data to assess project performance, but these data only reflect performance against the current contract period. Current contract period start and end dates do not line up with the start and end dates of the near-term baselines for any of the major cleanup projects we reviewed, and contract goals have not always been tied to what would be necessary to meet near-term baseline goals.[33] For example, we found the EVM data for Idaho's solid waste stabilization and disposition project—including the advanced mixed waste treatment subproject—that was reported in the QPRs and OECM quarterly reports from early 2008 did not line up with the near-term baseline because the advanced mixed waste treatment project's contract period was not the same as the near-term baseline period, which ends in 2012. EVM data for this project are reported as a combination of work done by two contractors: disposal of low-level and mixed-low-level waste, among other things, by the major site contractor, whose contract runs through 2012, and the advanced mixed waste treatment project operations contractor, who, in early 2008, was operating under a contract extension that expired in April 2008, 4 years shy of the end of the near-term baseline. In addition, according to project officials, the goal of processing 15,500 cubic meters of waste contained in that contract extension was not based on what was necessary to meet the near-term baseline goal of processing 65,000 cubic meters of waste by 2012, which was DOE's commitment at the time of the extension. Since the advanced mixed waste treatment project's activities make up about 75 percent of the cost baseline for the overall project, EVM data for this project as reported in the QPRs and OECM quarterly reports were not an accurate indicator of how the project was performing against the approved near-term baseline. DOE has further extended the advanced mixed waste treatment project contract through September 2009, and project officials explained the current extension is better linked to the current baseline, meaning EVM data reported should represent a better indication of performance against that baseline.

In addition, although the QPRs we reviewed include data on current life cycle cost and schedule estimates, they do not always include information about changes to the schedule or scope, nor do they explicitly mention when a change to the baseline has been proposed. Instead, the QPRs generally present information on life cycle cost increases and provide

[33]Contract start and end dates for the major cleanup projects do not match near-term baseline start and end dates. Furthermore, EVM data at Los Alamos is reported only against the current fiscal year, not against the full contract period or the near-term baseline.

comparisons to original baselines. QPRs also contain a schedule for each project detailing key milestones and expected end dates. However, when a change to a project completion date is made, the schedule shown in the QPR in most cases does not preserve the original completion date as a point of comparison. Similarly, there does not appear to be any mechanism in the QPR to present a change in a project's scope of work, for example, a move of some work activities from the near term into the out years. As a result, the reports tell only that life cycle costs have increased, but corresponding changes to schedule and scope are not apparent. Furthermore, there is no clear place in a QPR for a project manager to mention that a baseline change proposal has been submitted to headquarters if the results of that proposal are not yet presented in the life cycle cost or schedule information in the report. Including mentions of pending change proposals may help ensure senior managers clearly understand the true state of a project's performance.

A key performance indicator used in OECM's quarterly reports also may create the impression that a project is performing well overall when it is in fact encountering problems. As directed in the 2007 protocol for cleanup projects, OECM uses a traffic light indicator—red-yellow-green—as an at-a-glance way to highlight developing problems for DOE managers. This indicator is intended to represent expected performance against the approved near-term baseline and is based largely on EVM data. However, since projects encountering problems tend to manage those problems by moving work scope into the out years, the effects of problems occurring today show up as increases to out-year cost and schedule estimates and not as increases or delays in a near-term baseline.[34] Therefore, a project rated "green" by OECM may simultaneously be experiencing increases in overall life cycle costs and delays in project completion. OECM officials agreed that it would be beneficial to present projected impacts of current performance on life cycle estimates wherever practical in its reports.

EM Does Not Report Information about Significant Changes to Near-Term and Life Cycle Baselines to Congress

DOE's reports to Congress do not include key information that would aid oversight efforts, including the extent of and reasons for significant changes to near-term and life cycle baseline estimates, and the status of estimated life cycle costs. DOE's annual budget request to Congress for fiscal year 2009 for EM included funding requests for each site and each project, as well as the funding appropriated in fiscal years 2007 and 2008.

[34]In commenting on a draft of this report, EM indicated that scope deferrals or changes to the near-term baseline must now be formally approved by EM management.

The budget request also contains, among other things, descriptive information about the sites and projects, including EM's major cleanup projects, and about cleanup goals, regulatory frameworks, and key uncertainties. However, the request did not provide any project-specific life cycle costs or completion dates.[35] In the previous three budget requests, EM had provided life cycle costs and planned completion dates for each project. Without this information, Congress cannot know what progress each project has made and the extent of work still needed, cannot understand how the project may be changing and has changed over time, and cannot know whether the project experienced problems since the previous budget request and the reasons for these problems. The absence of this information makes it more challenging to effectively oversee the department and its major cleanup projects.

DOE has not been directed to provide such information about its major cleanup projects to Congress. In contrast, Congress has required the Department of Defense to report annually on its major defense acquisition programs—those costing $2 billion or more and typically consisting of a weapons system, such as Navy ships or fighter planes—or report quarterly when programs are experiencing significant cost increases or schedule delays.[36] Congress established the reporting requirement to improve oversight of these defense programs by providing visibility and accountability for any growth in cost that may occur. Known as Selected Acquisition Reports, each annual report includes information on full life cycle program costs, unit costs—the cost per plane or ship—and the history of those costs. A quarterly report also includes reasons for any change in unit cost or program schedule since the previous report, information about major contracts under the program and reasons for any cost or schedule variances, and program highlights. In addition, the Department of Defense includes development and procurement schedules, with estimated costs through program completion, in its annual budget justification submissions to Congress.

[35]DOE's fiscal year 2009 request for EM includes ranges of life cycle costs and completion dates at the site level.

[36]Major defense acquisition programs are those identified by the Department of Defense that require eventual total research, development, test, and evaluation expenditures of more than $365 million or $2.19 billion for procurement in fiscal year 2000 constant dollars.

DOE Guidance for Management and Oversight Functions Is Unclear and Not Implemented Uniformly across Sites

EM's key policies for managing its cleanup projects—including developing project baselines, managing risk, and planning for contingency funding—are not consolidated but spread across various guidance documents and memos and provide contradictory and confusing information. Although Order 413 serves as the overarching policy document for project management, according to EM, the order contains requirements that are unnecessary or expensive and awkward to implement for cleanup projects. EM thus has issued numerous memos outlining the way in which its project managers should implement the order. See table 3 for a list of key memos we identified that contribute to project management guidance and policy for EM cleanup projects.

Table 3: Key Policy Memos for EM Cleanup Projects

Date	Title	Source	Guidance provided
February 3, 2005	EM Contingency Policy	EM	Policy on funding contingency and preferred method for establishing contingency
June 23, 2005	Project Management for the Acquisition of Capital Assets—DOE Manual 413.3-1	DOE Office of Management, Budget and Evaluation	Requirements and guidance on implementing Order 413
July 10, 2006	Policies for EM Operating Project Performance Baselines, Contingency and Federal Risk Management Plans, and Configuration Control[a]	EM	Additional clarification and guidance on process and requirements to identify, develop, control, and validate EM baselines
July 28, 2006	Program and Project Management for the Acquisition of Capital Assets—DOE Order 413.3A	DOE	Project management guidance on acquisition of capital assets and environmental restoration projects
March 2, 2007	Risk Management Policy	EM	Statement of EM risk management policy
April 24, 2007	Protocol for EM Cleanup Project Performance Baselines and Conducting the External Independent Review or the EM Independent Project Review	EM and OECM	Governs review and validation of cleanup projects
June 25, 2007	Guidance for Implementing Baseline Changes to Reflect Funding Targets for Fiscal Year 2008 through the Out-Years	EM	Directed sites to develop baselines tied to specific funding targets provided
February 13, 2008	Configuration Control Process for Project Baselines	EM	Update on EM effort to put baseline under configuration control

Source: GAO's analysis of DOE information.

[a]Configuration control refers to efforts to manage and track any changes to work activities, costs, and schedules.

As the table shows, rather than having a consolidated source for guidance, EM project managers must consult multiple sources to determine how to correctly create a baseline or calculate contingency funding for a project. Furthermore, some of EM's guidance includes vague language and various exceptions to rules, which are likely to contribute to a project manager's difficulty in determining how to implement EM policy. For example, according to the April 2007 protocol for cleanup projects, once a contract is awarded and a detailed near-term baseline is developed, a follow-up independent review will be required if the baseline (1) exceeds the previously validated near-term baseline costs by 15 percent or more, (2) increases the schedule by a year, or (3) modifies scope significantly. The first two conditions for requiring a follow-up review are tied to fairly precise numbers—15 percent and 1 year—although there could be some question as to whether these numbers are to be applied to the original or reset baseline calculations, especially for projects that have been extended multiple times. However, the protocol provides no parameters for determining when the third condition, a "significant" scope modification, has occurred.

In addition, agency officials were not able to provide us with formal documentation of a significant shift in policy. As explained earlier, OECM recently shifted from validation to certification of the cleanup projects' near-term baselines. In response to our request for documentation of the switch to certification, OECM provided us with an e-mail from an OECM official to a DOE Inspector General auditor that defined certification and explained the reasons for the change. According to this e-mail, the change was made to acknowledge OECM's belief that EM cleanup projects should not be reviewed under the same standard as construction projects. The OECM official also directed us to DOE's fiscal year 2009 budget request for an explanation of the new approach. While the budget request includes a description of baseline certification, it neither mentions that the certification is a departure from the previous policy, nor does the request serve as an adequate means of communicating a significant policy change.

Furthermore, different guidance documents appear to be in conflict with one another. Specifically, EM's 2006 memo outlining its policy on contingency funding explained that DOE's risks associated with implementing a project are covered through contingency that is part of the "unfunded" portion of the baseline; that is, its funding is not requested or budgeted in advance of when it may be needed. However, a 2008 EM memo primarily concerned with explaining a new process for entering baseline changes into a database contains a description of the elements of a near-term baseline that includes a line for "other funded contingency,"

which has been interpreted by some EM officials as including DOE contingency. If, according to the 2008 memo, some DOE contingency should be funded—requested in advance—that memo directly contradicts the guidance provided in the 2006 memo. However, although the 2008 memo states it is updating the baseline change process, it does not specifically state that it replaces any part of the 2006 memo.

In part because of this confusion, project managers at cleanup sites have been implementing EM's contingency policy differently. According to EM officials, recent independent reviews have alerted senior EM officials to this inconsistent implementation of the policy guidance. The review teams found that the project managers were using a variety of methodologies to calculate the contingency for their projects. As a result, according to one EM official with expertise in contingency, managers were likely underestimating the amount of contingency needed for their projects. To address this problem, EM senior managers directed the creation of a contingency implementation guide to provide a definitive interpretation of existing EM policy on contingency, and this guide is expected to be issued in September 2008.

Furthermore, at least one of DOE's policies—on independent reviews of cost estimates—is not being implemented at all. According to Order 413 and the April 2007 protocol, an independent cost estimate—a top-to-bottom, independent estimate that serves to cross-check a cost estimate developed by project officials—should be developed as part of the OECM review process for major projects when "complexity, risk, cost, or other factors create a significant cost exposure for the Department." We believe that a review of a major cleanup project, given its level of expected spending over the near term, would meet the criteria for requiring an independent cost estimate. According to an OECM official, OECM has not performed an independent cost estimate for any of EM's major cleanup projects, primarily because OECM lacks the resources required to perform this type of rigorous estimate for the projects. Instead, OECM has taken a less rigorous and less expensive approach in its reviews—examining cost estimates generated by the projects but not producing a separate estimate for comparison.

According to DOE officials, it is addressing some of these guidance issues. By the end of September 2008, officials told us, DOE plans to replace its manual directing implementation of Order 413 with a series of 16 guides. The guides are expected to cover a range of project management issues, including risk management and contingency funding, with one guide providing direction on the management of EM cleanup projects. In

addition to the guides, as part of an EM-wide effort to improve project performance, EM has issued 18 recommended priority actions that contain additional EM-specific requirements for cleanup projects. It is unclear whether the guides and priority actions are expected to supplant all other guidance, or whether they will adequately address the challenge project managers face in determining the most up-to-date, comprehensive guidance to be followed.

DOE Recently Changed Expectations for Cleanup Projects' Performance

According to EM senior managers, EM cleanup projects are significantly different from DOE's construction projects in a number of ways. That is, it is harder in many instances to clearly define up-front requirements for cleanup projects, and there are more unknowns, especially since some of these projects are the first of their kind, with undefined scopes of work and significant risks scheduled many years into the future. Because of these differences and because it has said changing budget priorities may affect funding over time, DOE recently changed its performance goal—the amount of work to be accomplished and the cost margin for accomplishing that work—for EM cleanup projects to reflect a much larger margin of error than the performance goal set for construction projects.

Before 2008, a major cleanup project was measured against the same goal as a construction project: achieve at least 100 percent of the scope of work in its baseline with less than a 10 percent cost increase over the life of the project.[37] However, EM's current cleanup project performance goal applies only to the near-term baseline, and the projects now are considered to be successful if they achieve at least 80 percent of the scope of work in their near-term baselines with less than a 25 percent cost increase. The new performance goal permits up to 20 percent of the scope of work to be deferred from the near term to out years, which creates a substantially greater risk that life cycle costs will continue to increase and that completion dates will be delayed. As a result, for example, under this goal the four major projects each expected to cost more than $2 billion in the near term could increase their costs by $500 million each over that period and be considered successful. Furthermore, because a directed change—defined as a change caused by DOE policy, or regulatory or statutory

[37]As previously reported in GAO-07-518, in 2004 DOE began reporting performance information for EM cleanup projects against the same goal as the line-item construction projects. In late 2005, however, DOE switched to reporting performance only for those projects with validated cost and schedule baselines.

actions—already exempts projects from meeting the performance goals, creating a less stringent goal for EM cleanup projects further waters down the impact of having a performance goal in the first place. By lowering expectations for adhering to near-term baselines, DOE inadvertently may be creating an environment in which large increases to project costs become not only more common, but accepted and tolerated.

DOE Is Undertaking Efforts to Implement Project Management Improvements

EM is undertaking a number of efforts to improve its project performance and address long-standing problems. One such effort is EM's "Best-in-Class" Project Management Initiative through which EM leadership has committed to improving project performance. Under the initiative, EM contracted with the Army Corps to assess the current status of project management at EM headquarters and its offices. Using the Army Corps' analysis, EM identified a set of challenges it faced in executing its mission, which resulted in the creation of the 18 priority actions for it to undertake to address the challenges and implement its initiative. Those priority actions include, among others, completing DOE's project management guide, which is expected to bring all project management guidance documents under one umbrella document; establishing standard reporting formats for project updates produced by project managers, including QPRs; implementing new project management software packages, including those for EVM analysis; and better integrating its project and contract management activities. EM has developed a set of implementing steps and a summary of expected benefits for each priority action. According to EM, 10 of the priority actions are being implemented in fiscal year 2008, and 5 of those are scheduled to be completed by the end of that fiscal year. It appears that execution of the priority actions would create new tools and potentially enhance existing ones in EM's effort to improve its cleanup projects' performance. According to EM, full implementation of the priority actions will address many EM project management problems and deficiencies. However, since the actions are still being implemented, it is too soon to determine their effectiveness.

In addition, EM officials acknowledged that the actions they are implementing to improve the management of EM's overall cleanup efforts, including their Best-in-Class initiative and actions being taken in response to the 2007 National Academy of Public Administration report have not been formally documented into a specific, corrective action plan that includes performance metrics and completion milestones. These officials agreed that such a comprehensive plan would demonstrate a more integrated and transparent commitment to improving the management of EM's cleanup projects.

Conclusions

Cleaning up the nuclear weapons complex is a technically challenging and risky business. Even as DOE works to gain control of and better manage its major nuclear waste cleanup projects, cost increases and project delays continue to mount. Specifically, life cycle costs for EM's major cleanup projects have increased by cumulative $25 billion over the past few years and schedules have been extended by a combined total of more than 75 years, primarily because DOE had to adjust the optimistic baselines it created to accommodate the realities it has encountered at its cleanup projects.

Given the cost and complexity of the major nuclear cleanup projects, it is critically important that DOE fully use the tools it has developed—independent reviews, performance information systems, guidance, and performance goals—to better ensure that projects stay within established parameters for scope of work, costs, and schedule. Independent baseline reviews to ensure that the work promised can be completed on time and for the estimated cost appear to be a useful planning tool, but the significant changes that have occurred within years or even months of the baseline reviews and validations indicate that implementation of these reviews has fallen short. Furthermore, EM's site proposals for changes to cost and schedule baselines, quarterly performance reports, earned value data analysis and reports, and reports to Congress do not consistently provide accurate and comprehensive information on the status of projects, which undermines managers' and Congress's ability to effectively oversee projects and make timely decisions, such as targeting resources to particular projects or renegotiating cleanup milestones and other contract conditions. These problems are compounded by the lack of comprehensive and clear guidance for DOE project managers so that they consistently implement DOE management policies across the projects and EM's recently relaxed performance goals establishing the acceptable baseline change parameters for major cleanup projects. Although DOE has identified a number of improvements it intends to make to its project management approach, it is still in the early stages of implementing these improvements, making it too soon to assess the effort's full effect, and it has not yet formally documented all the improvements in a comprehensive corrective action plan.

Recommendations for Executive Action

So that DOE can better manage its major cleanup projects and more fully inform Congress on the status of these projects, we recommend that the Secretary of Energy direct the Assistant Secretary for Environmental Management to take the following five actions:

- Include in its budget request to Congress life cycle baseline cost estimate information for each cleanup project, including prior year costs, estimated near-term costs, and estimated out-year costs.

- Develop an approach to regularly inform Congress of progress and significant changes in order to improve EM's accountability for managing the near-term baseline and tracking life cycle costs. Similar to the Department of Defense's Selected Acquisition Reports, which include annual information on full life cycle program costs, among other things, EM's report, at a minimum should compare estimated near-term and life cycle scope, cost, and schedules with the original and subsequently updated baselines, and provide a summary analysis of root causes for any significant baseline changes.

- Expand the content of EM performance reports to describe the implications of current performance for the project's overall life cycle baseline, including the near-term baseline cost and out-year cost estimate, using, when appropriate, valid earned value data that conform to industry standards and GAO-identified best practices.

- Consolidate, clarify, and update its guidance for managing cleanup projects to reflect (1) current policy regarding independent baseline reviews and (2) the results of DOE's determination of the appropriate means for calculating and budgeting for contingency so that project managers can consistently apply it across nuclear waste cleanup sites.

- Consolidate all planned and ongoing program improvements, including those stemming from the Secretary's contract and project management root cause analysis corrective action plan, the Best-in-Class initiative, and the 2007 National Academy of Public Administration report, into a comprehensive corrective action plan that includes performance metrics and completion milestones.

Because independent baseline reviews have not always provided reasonable assurance of the stability of projects' near-term baselines or the reasonableness of the life cycle baselines, we recommend that the Secretary of Energy direct the Director of the Office of Management to take the following action:

- Assess the Office of Engineering and Construction Management's current approach and process for conducting baseline reviews of EM cleanup projects to identify and implement improvements that will better provide reasonable assurance that project work scope can be completed within the baselines' stated cost and schedule. Consider including in the

assessment process an analysis of past lessons learned and reasons for baseline changes, and an assessment of project affordability when conducting baseline reviews.

Agency Comments and Our Evaluation

We provided a draft of this report to DOE for its review and comment. DOE agreed with our recommendations but provided some suggested changes to them, which we incorporated as appropriate.

In addition, DOE provided some specific comments on our draft report. First, DOE stated that the report should provide a more balanced and accurate portrayal of EM's cleanup projects by including descriptions of ongoing initiatives, a number of which EM launched in recognition of the need for improvement, as well as providing better context of the challenges and constraints the department's cleanup program faces. The draft report included a brief description of EM's ongoing initiatives, including its Best-in-Class effort, and acknowledged many of the key challenges DOE faces while illustrating the factors contributing to changes in scope, cost, and schedule for its cleanup projects. We also acknowledged DOE's ongoing initiatives and progress in a 2007 report on project management.[38] In addition, DOE cited its successes in the cleanup of Rocky Flats and Fernald as evidence of its project management accomplishments. We commend DOE on its past performance in successfully cleaning up these sites, which has resulted in some lessons learned that DOE can apply to other cleanup efforts, as we reported in 2006.[39] Nevertheless, we found in this review that DOE has not always effectively used its management tools to help oversee the scopes of work, costs, and schedules for its present major cleanup projects.

Second, DOE stated that our draft report appears to confuse the term "baseline." It noted that there is only one project baseline—the near-term baseline approved by EM senior management—for which DOE should be held accountable. Our use of the term "baseline" in this report conforms to EM's guidance documents indicating a project's "lifecycle baseline" is composed of its prior year, near-term, and out-year costs. In addition, we disagree with DOE's assertion that it should be held accountable only for a project's near-term baseline. As we state in this report, since projects encountering problems have tended to manage those problems by moving work scope into the out years, the effects of problems occurring today

[38] GAO-07-518.

[39] GAO, *Nuclear Cleanup of Rocky Flats: DOE Can Use Lessons Learned to Improve Oversight of Other Sites' Cleanup Activities*, GAO-06-352 (Washington, D.C.: July 10, 2006).

show up as increases to out-year cost and schedule estimates and not as increases or delays in a near-term baseline. Therefore, if DOE's performance is measured solely on the basis of the near-term baseline, potentially significant cost and schedule increases would not be accounted for or transparent.

Third, DOE stated that one of our recommendations—to consolidate, clarify, and update its guidance for managing cleanup projects to reflect the results of DOE's determination of the appropriate means for calculating and budgeting for project contingency—could be more specific, and it outlined three contingency options. These options include (1) increasing the amount of contingency funding for cleanup projects to an 80 percent confidence level, the level budgeted for construction projects; (2) creating a general contingency fund available for project managers at DOE headquarters to dispense as needed to manage project risks; and (3) continuing with the current approach of not including contingency funding for cleanup projects in its budget requests—funding cleanup projects at the 50 percent confidence level—and changing its recently established performance goal. We recognize that managing project contingency is an important issue, and in fact note in our report that DOE's current approach is a likely contributing factor to cost increases and schedule delays for EM's major cleanup projects. While we did not specifically assess these three options in our report, DOE should continue to study the lessons learned from managing and budgeting contingency and select the option that would provide contingency funds in an expedient manner to better mitigate the impacts of cleanup project changes while minimizing the amount of unused contingency funding left over at the end of the fiscal year.

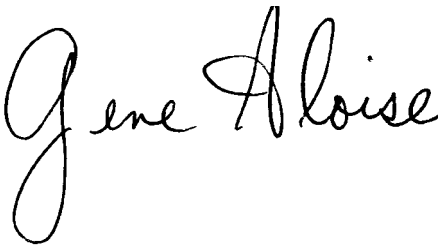
Finally, as part of the explanation of its third option for funding project contingency, DOE stated that GAO has agreed to its recently established performance goal—to accomplish at least 80 percent of the scope of work in the near-term baselines with less than a 25 percent cost increase. GAO has not agreed to this goal. As we state in this report, we are concerned with DOE's new goal given that it is lower than the previous goal for cleanup projects and that DOE may inadvertently be creating an environment in which large increases to project costs become not only more common, but accepted and tolerated.

DOE also provided detailed technical comments, which we have incorporated into our report as appropriate. DOE's comments are reproduced in appendix IV.

We are sending copies of the report to interested congressional committees, the Secretary of Energy, and the Director of the Office of Management and Budget. We will make copies available to others on

request. In addition, the report will also be available at no charge on the GAO web site at http://www.gao.gov.

If you or your staffs have any questions about this report, please contact me at (202) 512-3841 or aloisee@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Other staff contributing to the report are listed in appendix V.



Gene Aloise
Director, Natural Resources
and Environment

Appendix I: Scope and Methodology

To determine the extent to which the cost, schedule, and scope baseline estimates for the Department of Energy (DOE) Office of Environmental Management's (EM) cleanup projects have changed and the key reasons for these changes, we identified 10 major cleanup projects at 5 DOE sites. We first identified 9 major cleanup projects with current near-term cost estimates (usually a 5-year period) above $1 billion, the DOE threshold for major cleanup projects. In addition, to include those projects that could potentially become major projects because of cost growth, we reduced the threshold to $900 million and identified another project, the Richland nuclear material stabilization and disposition project, which is estimated to cost between $900 million and $1 billion over the near term. We focused on these 10 major cleanup projects because of their significant cost—combined estimated near-term costs of about $19 billion and combined life cycle costs estimated at more than $100 billion—and because they account for almost half of EM's $5.5 billion fiscal year 2009 budget request. (See app. II for information on these projects.)

To identify the factors that may hinder DOE's ability to effectively manage these cleanup projects, we spoke with DOE project directors and contractor officials and reviewed project management documents for the 10 major cleanup projects we had identified. We conducted site visits to Idaho National Laboratory, Los Alamos National Laboratory, Oak Ridge Reservation, Savannah River, and Hanford, and analyzed project documentation—contracts, policy directives and memoranda, project management plans, DOE's Office of Inspector General reports, independent reviews, project execution plans, risk management plans, quarterly project reviews, monthly project status reports, earned value management (EVM) surveillance plans, and project control documents prepared to guide and control formal changes to the baselines. For our analysis of projects' scope, cost, and schedule data, we examined the initial baselines reported as of the most recent contract award or major contract modification (which occurred between 2004 and 2007) and compared these baselines with the updated baselines at the time of our review. Initial cost baselines are the estimated life cycle costs at the beginning of the new contract period for operation of the DOE site or associated projects or the major contract modification or extension, which typically coincided with the beginning of the projects' current or previous near-term baseline. We also calculated the percentages of cost increases on the basis of constant 2008 dollars to make them comparable across projects and to show real increases in cost while excluding increases due to inflation. In addition, because EM now is reporting its life cycle cost and schedule estimates as ranges, we included these ranges in the report. However, because the upper ends of these ranges include unfunded

contingency and EM does not include funding in its budget requests for this contingency, we report cost increases and schedule delays based on the lower ends of the ranges.

We also analyzed contractor performance data to determine whether DOE major cleanup projects are consistently developing and analyzing accurate earned value data according to industry standards and best practices. We gathered and analyzed data produced by the EVM system used for one project at each of the following sites: Idaho National Laboratory, Los Alamos National Laboratory, and Hanford.[1] Often, EVM systems differ depending on how the contractor chooses to implement the EVM approach. Because of these differences, we gathered and analyzed information on each EVM system on a case-by-case basis, according to the structure, reporting format, content, and level of detail, among other things, unique to each EVM system. We also considered the best practices developed by GAO for estimating and managing project costs to analyze the contractor EVM data.[2]

In addition, we spoke with DOE officials from EM and the Office of Engineering and Construction Management in Washington, D.C., and with representatives from LMI Government Consulting, which conducts external independent reviews of the projects for DOE, to obtain their perspective on how these projects are managed.

Because we and others previously have expressed concern about the data reliability of a key DOE project management tracking database—the Project Assessment and Reporting System—we did not develop conclusions or findings based on information generated through that system.[3] Instead, we collected information directly from project site offices and the contractors.

[1]We did not analyze the EVM data for the Oak Ridge or Savannah River projects.

[2]GAO, *Cost Assessment Guide: Best Practices for Estimating and Managing Program Costs*, GAO-07-1134SP (Washington D.C.: July 2007).

[3]GAO, *Department of Energy: Further Actions Are Needed to Strengthen Contract Management of Major Projects*, GAO-05-123 (Washington, D.C: Mar. 18, 2005); and Civil Engineering Research Foundation, *Independent Research Assessment of Project Management Factors Affecting Department of Energy Project Success* (Washington, D.C.: July 12, 2004).

We provided an interim briefing to the Subcommittee on Energy and Water Development, House Committee on Appropriations, on the status of our work on April 3, 2008.

We conducted this performance audit from March 2007 to September 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Information on the 10 Department of Energy Major Cleanup Projects Reviewed

Project	Project purpose and objective
Solid Waste Stabilization and Disposition, Idaho National Laboratory, Idaho (PBS 13)	This project will characterize, treat, and ship approximately 64,000 cubic meters of transuranic waste that will ultimately be stored in the Waste Isolation Pilot Plant in New Mexico. Transuranic waste is radioactive waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste with half-lives greater than 20 years, except for high-level radioactive waste. The transuranic waste that must be handled remotely through protective shielding, because it emits penetrating radiation, will be treated at the Radioactive Waste Management Complex. The project also will treat and dispose of a mixed low-level waste backlog and handle on-site low-level waste for disposal at the complex.
Nuclear Facility Decontamination and Decommissioning, Oak Ridge Reservation Tennessee (PBS 40)	The project will decontaminate and decommission approximately 500 facilities and remediate 160 sites in the East Tennessee Technology Park. This project includes the park's two major buildings—the K-25 and K-27 gaseous process buildings—and requires the contractor to remove processing equipment and excess materials stored in the buildings, demolish building structures, and dispose of all associated wastes.
Nuclear Material Stabilization and Disposition, Savannah River Site, South Carolina (PBS 11)	The project will stabilize and dispose of enriched uranium materials and current and projected inventories of aluminum-clad spent nuclear fuel in H-Area facilities. It also will stabilize and dispose of highly enriched uranium solutions, miscellaneous fuels, plutonium residues, enriched uranium residues, and other materials DOE identifies that remain from the production of nuclear weapons. The project also will deactivate F-Area and H-Area facilities; and dispose of special nuclear materials in the K-Area Complex.
Radioactive Liquid Tank Waste Stabilization and Disposition, Savannah River Site, South Carolina (PBS 14C)	The project will remove, treat, and dispose of 49 underground storage tanks holding a total of 37 million gallons of highly contaminated legacy waste This effort includes pretreating radioactive waste such as sludge and salt waste, vitrifying sludge and high-level waste at the Savannah River Site's Defense Waste Processing Facility, and treating and disposing of low-level saltstone waste.
Soil and Water Remediation, Los Alamos National Laboratory, New Mexico (PBS 30)	The project will identify, investigate, and remediate, when necessary, areas with known or suspected chemical and radiological contamination attributable to past Laboratory operations. It will investigate and clean up (as needed) approximately 860 solid waste management units and areas of concern remaining from the original 2,129 sites spread over approximately 39 square miles. The protection of surface water and groundwater resources that may be impacted by these management units and past Laboratory operations also are within the scope of this project.
Nuclear Material Stabilization and Disposition, Hanford, Washington (PBS 11)	The project will stabilize, package, and ship (to the Savannah River Site) nuclear materials and fuels used for the production of plutonium nitrates, oxides, and metal from 1950 through 1989 and now stored primarily in vaults in several facilities. The project will then clean and demolish the facilities.
Solid Waste Stabilization and Disposition, Hanford, Washington (PBS 13C)	The project will treat and store spent nuclear fuel, transuranic waste, mixed low-level waste, and low-level waste generated at the Hanford site and other DOE and Department of Defense facilities. It eventually will transfer and ship spent nuclear fuel elements and 1,936 cesium and strontium capsules to the proposed geologic repository in Nevada. The project also will operate, among other things, the (1) Waste Receiving and Processing Facility to process transuranic waste and low-level waste and (2) Central Waste Complex to store low-level and mixed-low-level waste and transuranic waste pending final disposition.

Project	Project purpose and objective
Soil and Water Remediation, Hanford, Washington (PBS 30)	The project will remediate contaminated groundwater. This effort involves characterizing the movement of radionuclides and chemicals (carbon tetrachloride, chromium, technetium-99, strontium, and uranium plumes); assessing the soil and groundwater characterization results; groundwater and risk assessment modeling; and operation of groundwater remediation systems among other related actions.
Nuclear Facility Decontamination and Decommissioning at River Corridor Closure Project, Hanford, Washington (PBS 41)	Also known as the River Corridor Closure Project, this project will remediate 761 contaminated waste sites at the Hanford site near Richland, Washington, and decontaminate, decommission and demolish 379 surplus facilities that are adjacent to the Columbia River. This project also will dispose of material in the Environmental Restoration Disposal Facility.
Radioactive Liquid Tank Waste Stabilization and Disposition, Office of River Protection, Hanford, Washington (PBS 14)	The project will retrieve, stabilize, treat, and dispose of 53 million gallons of radioactive mixed waste stored in 177 underground tanks at the Hanford site. The project also involves testing and implementing supplemental waste treatment methods; operating the Waste Treatment Plant; providing interim storage of immobilized waste planned for disposal in an offsite repository; receiving and disposing of immobilized low-activity waste on-site in near-surface disposal facilities; and closing tanks and tank farm facilities.

Source: DOE and EM information.

Appendix III: Current Life Cycle Baselines for 10 DOE Cleanup Projects

Dollars in millions (current year dollars)

Project	Prior years' costs	Near term[a] Cost	Near term[a] Years	Out years[b] Cost	Out years[b] Completion date	Total life cycle cost range
Solid waste stabilization and disposition, Idaho National Laboratory, Idaho	$1,398	$1,304	2006 – 2012	$530 – $900	2016 – 2020	**$3,231 – $3,954**
Nuclear facility decontamination and decommissioning, Oak Ridge Reservation, Tennessee	$1,546	$1,518	2008 – 2017	NA	NA	**$3,064 – $3,244**
Nuclear material stabilization and disposition, Savannah River Site, South Carolina	$3,631	$2,468	2008 – 2014	$3,728 – $4,358	2024 – 2025	**$9,827 – $10,457**
Radioactive liquid tank waste stabilization and disposition, Savannah River Site, South Carolina	$4,746	$4,394	2008 – 2014	$11,856 – $20,347	2032 – 2034	**$20,996 – $29,488**
Soil and water remediation, Los Alamos National Laboratory, New Mexico	$579	$1,051	2007 – 2015	NA	NA	**$1,630 – $2,489**
Nuclear material stabilization and disposition, Hanford site, Washington	$1281	$1,143	2008 – 2013	$1,030 – $1,060	2018 – 2019	**$3,453 – $3,490**
Solid waste stabilization and disposition, Hanford site, Washington	$1,163	$918	2008 – 2013	$11,200 – $12,500	2050 – 2058	**$13,281 – $14,594**
Soil and water remediation, Hanford site, Washington	$532	$1.128	2008 – 2013	$6,400 – $6,600	2050 – 2059	**$8,059 – $8,276**
Nuclear facility decontamination and decommissioning at River Corridor, Hanford site, Washington	$1,000	$3,751	2005 – 2019	NA	NA	**$4,751 – $4,910**
Radioactive liquid tank waste stabilization and disposition, Hanford site, Washington	$3,474	$2,330	2007 – 2012	$38,414 – 5$6,227	2042 – 2050	**$44,218 – $62,155**

Source: Office of Environmental Management.

[a]Near-term costs represent DOE's estimated costs based on a 50 percent level of confidence, defined as the amount of funding needed to provide a 50 percent likelihood that the project will be completed successfully.

[b]Out-year values represent DOE's estimated cost and schedule ranges—the cost range covers the full out-year period, while the schedule range represents the time during which the project is estimated to be completed. Costs and schedules at the lower end of the ranges were estimated at the 50 percent level of confidence, while costs and schedules at the upper end of the ranges represent the 80 percent level of confidence.

Appendix IV: Comments from the Department of Energy

Department of Energy
Washington, DC 20585

September 19, 2008

Mr. Gene Aloise
Director of Natural Resources and Environmental
U.S. Government Accountability Office
441 G Street NW
Washington, D.C. 20548

Dear Mr. Aloise:

Thank you for the opportunity to review the draft report on accountability and management of the Department's major cleanup projects managed by the Department of Energy's Office of Environmental Management (EM). We are in agreement with the recommendations you have provided, with some suggested changes, and look forward to reporting in the future on the progress being made. Detailed comments to the draft report are enclosed. Major comments are summarized below.

We believe the report should provide a more balanced and accurate portrayal of EM's cleanup projects by including descriptions of ongoing initiatives and actions, a number of which were launched by EM in recognition of the need for improvement. Additionally, the report should provide better context of the incredible challenges and constraints the Department's cleanup program faces and the difficulties associated with accurate predictions of project cost and schedule for the EM cleanup projects.

For instance, the Government Accountability Office's (GAO) conclusion in 2001 (GAO-01-284, *Nuclear Cleanup: Progress Made at Rocky Flats, but Closure by 2006 Is Unlikely, and Costs May Increase)* states that "Kaiser-Hill and DOE are unlikely to meet the December 2006 target closure date" for Rocky Flats and yet this closure date was indeed met by DOE and the Rocky Flats cleanup contractor Kaiser-Hill. As recommended by the GAO in 2006 (GAO-06-352, *Nuclear Cleanup of Rocky Flats: DOE Can Use Lessons Learned to Improve Oversight of Other Sites' Cleanup Activities),* EM used the lessons learned from Rocky Flats for other cleanup efforts across the complex to accomplish extremely successful cleanups. We won the Project Management Institute award for our prowess in project management in 2006 and 2007 for the Rocky Flats and Fernald cleanup projects, respectively.

There appears to be some confusion over the term "baseline". There is only one project baseline, the near-term baseline that has Critical Decision-2 approval by the Acquisition Executive, for which DOE should be held accountable. The

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Decision-1 type range) which is expected to change, often by significant amounts. For this very reason, DOE no longer expresses lifecycle information on cleanup projects as a point estimate.

Finally, the issue of how we fund and manage project contingency is critical to our long-term success and our ability to mitigate impacts of these changes. We recognize full well that we cannot continue to extend schedules and increase costs every time risks that have been identified and anticipated in advance occur. Your fourth recommendation, with regard to contingency, could be more specific. There are three primary or bounding contingency options as we see it, discussed further in the attachment:

1. **Fund operating cleanup project contingency at 80% confidence level instead of the current 50%.**
   If provided over and above current target levels, approximately $500 million (M) to $700M additional funding annually would be required. However, if risks did not materialize during the budget year, there would be higher uncosted year-end carryover. However, to plan for this level of contingency without additional funding would require deferral of lower priority project scope. To compensate, EM would need to renegotiate compliance milestones or possibly subject the federal government to fines, penalties, and lawsuits; renegotiate and possibly terminate contracts, thus affecting employment; and reprioritize its projects.
2. **Request appropriation of a smaller general contingency fund.**
   The fund (perhaps $100M to $200M annually) would be held, managed, and distributed by the Assistant Secretary for Environmental Management. This option would allow more flexibility and expediency in applying funds where they are needed as risks are realized, and would allow for multi-year business case decision-making. However, controls would need to be put in place on EM's allocation authority during execution so as not to usurp Congressional authority in appropriations.
3. **Continue the current approach of funding 50% confidence levels and changing the corporate metric for the EM cleanup projects agreed to by DOE, the Office of Management and Budget (OMB), and GAO.**
   This approach budgets for contingency at a 50% confidence level for cleanup projects. When risks not covered at this level materialize, work scope is shifted to the outyears when funds can be requested in light of overall program priorities. A 50% confidence level across the EM portfolio connotes that based on statistical analysis half the projects would be expected to be completed within the cost and schedule and half would not. Thus, this current approach appears to be inconsistent with achieving success in the corporate metric that DOE has agreed to with GAO and OMB for cleanup projects (established through DOE's Root Cause Analysis Corrective Action Plan, July 18, 2008). The metric requires that 90% of the projects in EM's portfolio at the end of the approved near-term

baseline period have 80% of the scope completed within 25% of the original cost.

Any GAO recommendations regarding new strategies are welcomed, given the regulatory-driven nature and complexity of this work, the sensitivity of life-cycle costs to relatively small slippages in scope (due to large "hotel" costs), and the need to deliver on commitments made to our regulators, the Congress, and other stakeholders.

Again, thank you for your assistance as we seek to improve our management of cleanup projects. We welcome direct dialogue with you on these issues prior to finalizing your report. We would also appreciate you including the attached comments in the final report. If you have any questions with regard to these comments, please contact me on (202)586-7709, Jack Surash on (202) 586-6382, or Paul Bosco on (202) 586-3524

Sincerely,

James A. Rispoli
Assistant Secretary for
Environmental Management

Enclosure

cc: I. Triay, EM-2
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Appendix V: GAO Contact and Staff Acknowledgments

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Staff Acknowledgments

In addition to the individual named above, Rudy Chatlos, Jennifer Echard, James Espinoza, Daniel Feehan (Assistant Director), Mike Gallo, Diane Lund, Mehrzad Nadji, Omari Norman, Brian Octeau, Christopher Pacheco, Leslie Pollock, Karen Richey, and Carol Herrnstadt Shulman made key contributions to this report.

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