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Report to the Chairman and Ranking Minority Member, Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives

July 2005

NUCLEAR WASTE

Better Performance Reporting Needed to Assess DOE's Ability to Achieve the Goals of the Accelerated Cleanup Program

GAO-05-764

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GAO Accountability·Integrity·Reliability

Highlights

Highlights of GAO-05-764, a report to Chairman Hobson and Ranking Minority Member Visclosky, Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives

Why GAO Did This Study

In February 2002, following years of rising costs to its nuclear waste cleanup program, the Department of Energy (DOE) announced a new initiative—the accelerated cleanup plan—and committed to reduce costs of cleanup by $50 billion, shorten the cleanup schedule by 35 years, and reduce risks to human health and the environment.

GAO reviewed (1) the progress DOE has made under its accelerated cleanup plan, (2) the likelihood DOE will achieve its estimated $50 billion in cost reductions, and (3) whether DOE's performance reporting allows for a full understanding of progress toward achieving the accelerated plan goals.

What GAO Recommends

GAO recommends that DOE (1) improve the linkage between performance measures so that there is a clearer, discernable relationship between how much cleanup has been accomplished and costs incurred in doing the work and (2) identify and highlight in its progress reports to the Congress and others those performance measures that are the most critical to assessing overall progress toward meeting accelerated cleanup plan goals. In commenting on the report, DOE agreed with our recommendations.

www.gao.gov/cgi-bin/getrpt?GAO-05-764.

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

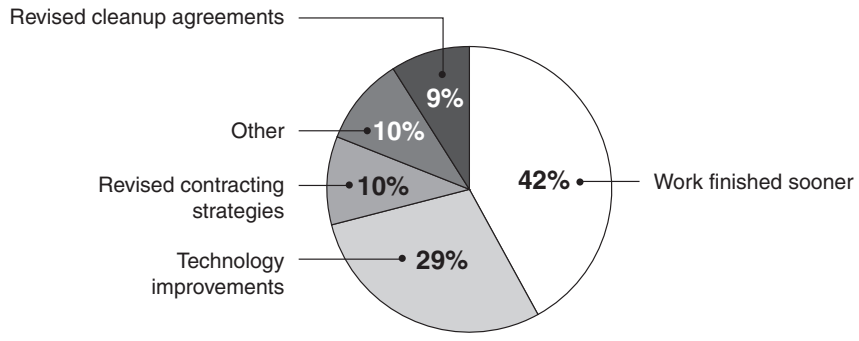
What GAO Found

Since implementing its accelerated cleanup plan, DOE's progress in reducing environmental risks has been mixed. By March 2005, DOE was on track or ahead of schedule for many of the 16 cleanup activities it measures, including packaging nuclear materials for disposition, disposing of low-level waste, and removing buildings. In contrast, DOE was behind its accelerated schedule for 3 challenging and costly activities--disposing of transuranic and radioactive tank wastes and closing tanks that had contained radioactive wastes. These three cleanup activities had technical problems, such as developing waste separation technology, or regulatory issues, such as determining when a storage tank is clean enough to close. Furthermore, DOE has had problems with other treatment and disposal activities not reflected in its performance measures, such as delays in shipping plutonium from sites, resulting in additional costs to secure and store the material.

DOE is not likely to achieve the full $50 billion estimated cost reduction, a key goal of the accelerated cleanup plan. First, DOE's method of calculating its $50 billion cost reduction likely overstated the potential reductions. Second, DOE based estimated cost reductions on assumed improvements that are highly uncertain, such as technology development, revised contracting strategies, and regulatory requirements. Third, while DOE expected cost reductions to come from most of its sites, key sites are already experiencing delays and, by the end of fiscal year 2004, had incurred cost increases. Recognizing these problems, DOE no longer cites its $50 billion estimate but still expects to achieve some cost reductions.

DOE performance reporting does not allow for an adequate understanding of its progress toward achieving overall cleanup goals because of limitations in how DOE uses its performance measures. First, in its performance reporting, DOE does not clearly link accomplishments with the incurred costs. Second, DOE does not clearly highlight critical activities, such as preparing radioactive tank waste for disposal, that have the greatest impact on progress toward meeting overarching cleanup goals.

Key Assumptions Contributing to DOE's $50 Billion Estimated Cost Reduction



Source: GAO analysis of DOE data.

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United States Government Accountability Office
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July 29, 2005

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

The Department of Energy (DOE) is responsible for one of the world's largest environmental cleanup programs. Decades of nuclear weapons production have left a legacy of chemical, hazardous, and radioactive wastes, including high-level and transuranic wastes[1] to be cleaned up at sites across the United States. In 1989, DOE established the Office of Environmental Remediation and Waste Management (now the Office of Environmental Management) to address the cleanup of these wastes. In carrying out the cleanup program, DOE receives regulatory oversight from various federal agencies, including the Environmental Protection Agency, the Nuclear Regulatory Commission, and the Department of Transportation, and the states where DOE's sites are located.

During the 1990s, we and others criticized DOE's nuclear waste cleanup program for being expensive, slow, and lacking in commitment and accountability. In response, DOE implemented or attempted to implement a number of management initiatives to improve its performance and address uncontrolled cost and schedule growth. These initiatives included launching a major reform to its contracting practices in 1994, establishing an initiative to privatize certain projects in 1995, and developing an approach to close sites on a compressed schedule in 1996. These initiatives affected how DOE approached the cleanup work, the agency's

[1]Radioactive waste includes liquid, sludge, and solid waste. Radioactive tank waste—which DOE manages as high-level waste—is largely liquid waste and sludge resulting from the reprocessing of spent nuclear fuel and containing highly radioactive fission products, long-lived isotopes, hazardous chemicals, and heavy metals. DOE intends to dispose of the high-level constituents of this waste in a geologic repository now under development at Yucca Mountain in Nevada. DOE intends to dispose of the remaining waste constituents at its sites. Transuranic waste includes equipment, tools, and clothing contaminated with plutonium or other elements with atomic numbers higher than uranium. DOE disposes of its transuranic waste in a geologic repository in New Mexico.

relationship with its contractors, and in some cases, the schedule for completing cleanup work.

Despite these initiatives, DOE's cleanup program continued to experience cost and schedule growth. By 2001, DOE's estimates of the total cost and timeframes for completing its cleanup program had climbed to about $192 billion[2] and up to 70 years to complete. DOE reported that after having spent over $60 billion (current dollars) on nuclear waste cleanup since 1989, little progress had been made toward reducing risks to the public and the environment. DOE concluded that without significant reform the cleanup program would continue to experience uncontrolled cost and schedule growth.[3]

To address this cost and schedule growth, the Assistant Secretary for Environmental Management announced a new initiative in February 2002, to improve management of the program. This initiative—known as the accelerated cleanup plan—had three main goals: rapidly reducing environmental risks, decreasing the projected time to clean up sites, and reducing the overall cost of the cleanup program. To implement the new initiative, DOE took a number of steps including realigning the program to focus on rapid reduction of environmental risks; improving contract management; and restructuring how DOE managed the cleanup program to better support an accelerated, risk-based approach. Other changes included implementing procedures that require more discipline in controlling costs and cleanup schedules and holding DOE managers more accountable for achieving results.

DOE began implementing the accelerated cleanup plan late in 2002. In a March 2003 congressional testimony before a House Appropriations subcommittee, the department declared that its new strategy would

[2]DOE reports cost estimates that add actual (current) dollars for pre-2001 values, and constant 2003 dollars for values reported past 2001, which DOE calls "2003 constant dollars." Unless otherwise noted, the numbers are reported in DOE's 2003 constant dollars and without any adjustments.

[3]U.S. Department of Energy, *A Review of the Environmental Management Program* (Washington, D.C.: Feb. 4, 2002).

reduce the total cost of the program by an estimated $50 billion.[4] DOE also committed to a strict schedule for timely completion of its cleanup activities by 2035, 35 years earlier than called for in previous plans. To expedite the acceleration of activities under this new plan, DOE said it would need increased funding for its cleanup program in the first 3 years of the accelerated approach—from fiscal years 2003 through 2005—after which funding would begin to decline. DOE estimated that by fiscal year 2008, it will have reduced its annual funding requirements by one-third, to approximately $4.5 billion per year (constant 2003 dollars), although the actual amounts requested in the budget would differ due to inflation.

To improve performance monitoring and reporting on its cleanup activities, DOE developed and began reporting on progress toward reducing environmental risks primarily through 16 risk reduction measures that DOE refers to as "gold chart metrics." These measures track progress toward completing cleanup activities, such as the quantities of waste disposed of and the number of buildings demolished at each DOE site.[5] DOE also uses an earned value management system to monitor progress of about 60 large cleanup projects. Earned value provides DOE managers with information about whether budgeted work was performed within cost and schedule parameters. Following findings by the Office of Management and Budget (OMB) in a performance review during fiscal year 2005 stating that DOE had not developed adequate annual cost and schedule performance measures to monitor progress towards completing the cleanup program, DOE has been working to more fully implement its

[4]According to DOE, the department's adjusted cost estimates of both cleanup and long-term stewardship work in 2001 and 2003, were $192 billion (before accelerated strategy) and $142 billion (under its accelerated strategy), in DOE's "2003 constant dollars," respectively, and resulted in the $50 billion cost reduction. Although DOE's $50 billion estimate was not adjusted for the time value of money, it is the cost reduction estimate that DOE has cited publicly, such as in a November 2002 public meeting of the Environmental Management Advisory Board in Washington, D.C., and a March 2003 congressional testimony before the House Appropriations Committee, Subcommittee on Energy and Water Development, so it is used throughout this report. When it implemented its accelerated strategy, DOE was managing to a $129 billion lifecycle cost, which is the 2003 estimate of $142 billion without long-term stewardship costs.

[5]DOE's risk reduction measures address the following 16 cleanup activities: packaging plutonium, packaging enriched uranium, packaging plutonium and uranium residues, packaging depleted uranium, packaging high-level solid wastes, packaging spent nuclear fuels, eliminating liquid tank wastes, closing waste tanks, disposing of transuranic wastes, disposing of low-level and low-level mixed wastes, remediating release sites, eliminating material access areas, removing nuclear facilities, removing radioactive facilities, removing industrial facilities, and closing geographic sites.

earned value management system. This work includes ensuring all mission-related projects are covered by earned value management and monitoring these projects against their long-term costs, rather than the contract period, as DOE currently does.

Given the significant cost of cleaning up DOE's wastes and the importance of effectively managing the cleanup effort, you asked us to review the progress DOE has made under its accelerated cleanup plan. Specifically, our report examines (1) the progress DOE has made in accelerating cleanup at its sites, (2) the likelihood that DOE will achieve its estimated $50 billion in cost reductions, and (3) whether DOE's performance reporting allows for a full understanding of progress toward achieving the accelerated cleanup plan goals.

To determine what progress DOE has achieved under its accelerated cleanup plan, we obtained and analyzed DOE's cost, schedule, and earned value data for each site and each project. In addition, we determined how DOE developed its performance measures. We also obtained cost, schedule, and performance information on selected projects from five DOE sites chosen on the basis of location, cost, and type of waste—the Hanford Site in Washington state; the Savannah River Site in South Carolina; the Idaho National Laboratory in Idaho; the Miamisburg Closure Project in Ohio, and the West Valley Demonstration Project in New York state. To determine the basis of DOE's estimated $50 billion in cost reductions, we obtained and evaluated information regarding the changes that DOE made to its cleanup program and DOE's plan to implement those changes. We also obtained and analyzed DOE's cost estimates to determine how, where, and when DOE expects to reduce the cost and schedule for the cleanup work. We did not adjust the cost estimates to correct for the time value of money or the effect of inflation. To evaluate DOE's performance measures, we reviewed reports and studies on performance measurement and discussed with DOE officials how the department develops and uses its performance measures. We also reviewed and analyzed DOE's most recent performance reports and compared that information to the actual progress documented at various DOE sites. To assess the reliability of the data provided by DOE, we obtained and analyzed information about the methods for compiling cost, schedule and performance data, and steps taken to ensure its accuracy and completeness from the sites we included in our analysis. A more detailed description of our scope and methodology is presented in appendix I. We performed our work between June 2004 and July 2005 in accordance with generally accepted government auditing standards, including an assessment of data reliability.

Results in Brief

DOE has made progress in the 2 years since it implemented the accelerated cleanup plan, but the most difficult cleanup challenges remain. Specifically, by March 2005, 13 of the 16 risk reduction measures—including packaging nuclear materials for disposition, removing buildings, and disposing of low-level and low-level mixed waste—had met, nearly met, or were ahead of the accelerated cleanup schedule. In contrast, DOE was behind its accelerated schedule for 3 challenging and costly activities—disposing of transuranic waste, disposing of radioactive tank waste, and closing tanks that had contained radioactive wastes. These 3 cleanup activities often had technical problems, such as developing waste separation technology, or regulatory issues such as determining when a storage tank is clean enough to close. Furthermore, DOE has had problems with other treatment and disposal activities not reflected in its performance measures, such as delays in shipping plutonium from sites, resulting in additional costs to continue storing and securing the material until long-term storage issues are resolved.

DOE will likely not fully achieve its projected $50 billion in cost reductions, a key goal of the accelerated cleanup plan, for three main reasons. First, DOE's method for calculating cost reductions does not take into account the time value of money. Considering the time value of money, the actual cost reduction from the accelerated plan, if implemented as intended, would likely be much lower. For example, in 2004, we recalculated DOE's estimated cost reduction for the Hanford waste treatment plant, which DOE estimated to be $20 billion, not considering the time value of money. However, considering the time value of money, the estimated cost reduction was reduced by about 40 percent to about $12 billion. Second, DOE based the estimated cost reductions on the assumption that there would be improvements in cleanup technology, revisions to contracting strategies, and changes in regulatory requirements that govern the level of required cleanup. However, evidence is mounting that some of the improvements and regulatory changes may not be realized. For example, some of the technologies, such as new methods for treating a portion of the tank waste at Hanford, are not fully tested and the costs to operate the technology are not known. Although ultimately these technologies may be effective in treating waste, it is uncertain whether anticipated cost reductions will be realized. Additionally, regulators—such as the state of New Mexico and the Environmental Protection Agency—have not yet approved some of DOE's proposed regulatory revisions, such as its plan to send certain types of tank waste now located at the Idaho National Laboratory to the Waste Isolation Pilot Plant in New Mexico. Third, DOE expected nearly all of the total cost reductions to come from accelerating cleanup at three major sites—Hanford in Washington state,

Savannah River in South Carolina, and the Idaho National Laboratory. However, DOE is behind schedule in some of its cleanup activities at these sites and cost estimates for completing the work are rising. In addition, DOE's planned high-level waste repository at Yucca Mountain in Nevada is expected to be delayed at least 2 years, which could also increase cleanup costs. Recognizing the uncertainty of achieving the full $50 billion cost reduction it committed to achieving with its accelerated plan, DOE has recently stopped citing a specific estimate of potential cost reductions it believes it can achieve; however, the department still believes it will achieve some cost reductions with its accelerated strategy.

DOE's performance reporting does not clearly reflect progress made toward the overall cleanup plan goals of a $129 billion total program cost and a 2035 completion date, because of two main shortcomings.

- First, in reporting on its progress, DOE does not establish how accomplishments made in addressing wastes, which DOE measures through its risk reduction measures, are associated with the costs incurred, which DOE measures through its cost performance measures. This makes it difficult to clearly understand whether cleanup activities, such as the amount of waste disposed of, were accomplished within projected costs. For example, as of March 2005, DOE's Idaho National Laboratory was more than one year—or more than 1,000 shipments—behind the planned number of shipments of transuranic waste to a repository. However, DOE had no corresponding indicator to show how this delay has affected estimated costs.

- Second, DOE's performance reporting does not clearly highlight that certain performance measures are more important than others in indicating whether DOE is on track toward achieving its overall performance goals. For example, DOE expects a significant portion of its cost reductions to result from improvements in addressing radioactive tank wastes and transuranic wastes. Radioactive tank wastes alone account for almost $30 billion of DOE's estimated $50 billion cost reductions—or 60 percent—under the accelerated plan. Although DOE's performance measures show that DOE has fallen behind in both transuranic and radioactive tank waste cleanup activities, its performance reporting does not highlight the relative significance that these critical measures have in providing a full understanding of overall progress toward the goals of the accelerated cleanup plan. Falling behind in these activities could significantly add to overall cleanup costs and, therefore, make it difficult for DOE to achieve its $129 billion overall cost target.

We are recommending that the Secretary of Energy ensure that DOE's performance reporting (1) includes a clearer, discernible relationship between cleanup accomplishments and cost and (2) highlights the status of performance measures that are the most critical to achieving cost and schedule goals. DOE agreed with our recommendations to ensure its performance reporting provides a clearer linkage between cleanup accomplishments and costs incurred, and highlights performance measures most critical to achieving its accelerated goals.

Background

The Department of Energy's Office of Environmental Management is responsible for addressing nuclear and hazardous wastes, including some of the most dangerously radioactive wastes in the world, and special nuclear materials, such as plutonium, resulting from more than 50 years of nuclear weapons production. DOE has planned or implemented a variety of treatment and disposal approaches, depending on the nature and extent of the waste (see table 1).

Table 1: Types, Estimated Quantities, and Planned Treatment and Disposal Approach for DOE's Surplus Special Nuclear Materials and Waste Materials

Description	Estimate	Planned treatment and disposal approach
Special nuclear materials		
Enriched uranium	8,428 containers	Blend high quality material into reactor fuel.
Plutonium Plutonium/uranium residues	5,850 containers 107,782 kilograms	Stabilize, package, and dispose in either the transuranic or high-level waste repositories.
Depleted uranium and uranium	685,161 metric tons	Convert to a stable form, package, and dispose as low-level waste or reuse.
Radioactive tank waste[a]		
Liquid, saltcake, and sludges stored in tanks	88 million gallons	Separate waste into high-level and low-activity portions. Stabilize the high-level portion in a glasslike material (vitrification) and package in canisters and then dispose in planned high-level waste repository. Treat low-activity portion and bury in near surface burial grounds, generally at sites where it is currently located.
Sodium-bearing tank waste	900,000 gallons	Treat, package, and dispose in a geologic repository.
Vitrified waste	18,735 canisters	Dispose of vitrified waste at planned high-level waste repository.
Solidified low-activity waste	About 1,000,000 cubic meters[b]	Dispose in near surface burial grounds at sites where it is currently located.
Dried high-level waste called calcine	4,400 cubic meters	Treat, if necessary, repackage and dispose in planned repository.
Transuranic waste		
Various types of materials contaminated with plutonium and other man-made elements and may also contain hazardous waste	141,892 cubic meters	Treat and repackage, as necessary, and dispose in transuranic waste repository.

Description	Estimate	Planned treatment and disposal approach
Low-level and low-level mixed waste		
Various waste material including soil, building debris, operational by-products	1,190,463 cubic meters	Treat, repackage and bury in DOE or commercial near surface disposal facilities. Actual techniques to be used depend on the material.
Hazardous waste		
Chemicals, heavy metals and other materials	No comprehensive measure	Recycle, incinerate, or use other treatment approach and dispose at DOE or commercial facilities.
Spent nuclear fuel		
Fuel rods stored in pools and dry storage casks	2,420 metric tons	Prepare fuel, package, and dispose in planned high-level waste repository.
Facilities		
Nuclear facilities such as reactors, processing facilities and storage buildings	515 facilities	Decontaminate and decommission followed by demolition or reuse.
Radioactive facilities such as labs, shops, and warehouses	822 facilities	
Industrial facilities of many different types	3,103 facilities	
Underground radioactive waste tanks	241 tanks	Empty tanks and fill with grout or other material to prevent collapse.
Waste site		
Burial grounds, dried ponds, spills and leaks, and many other types of sites	10,416 sites	Depending on the nature and extent of contamination, approach varies from removal and disposal of waste material to release of site for reuse.

Source: Compiled by GAO from DOE data.

[a]DOE has traditionally managed all of the wastes in its tanks as high-level waste because the waste resulted primarily from the reprocessing of spent nuclear fuel and contains significant amounts of radioactivity. However, DOE based its approach to treatment and disposal of this waste on separating the high-activity portion from the low-activity portion, allowing DOE to use less costly treatment approaches for the majority of what is now managed as high-level waste. In this report, we refer to the tank waste—which DOE manages as high-level waste—as "radioactive tank waste."

[b]DOE's lifecycle estimate of solidified low-activity waste is based on anticipated separation efficiencies and treatment processes.

Numerous legal and regulatory requirements govern various aspects of DOE's cleanup effort. Many of the cleanup activities are governed by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, and the Resource Conservation and Recovery Act of 1976, as amended, through various agreements with regulators. Additional laws affecting high-level waste and transuranic wastes are the Nuclear Waste Policy Act of 1982, as amended, which establishes the program to develop a geologic repository for storing high-level waste and spent nuclear fuel, and the Waste Isolation Pilot Plant Land Withdrawal Act, which establishes the requirements for operation of a repository for transuranic wastes. In addition, under the Federal Facility Compliance Act of 1992, DOE has entered into agreements with federal and state regulators that establish milestones for accomplishing specified cleanup activities and a mechanism to obtain approval to change priorities and approaches. For example, under the agreement at Hanford, 10 percent of the tank waste is to be processed by 2018 and a report on the plans for the remaining 90 percent was due to regulators in January 2005, but now has been extended to June 30, 2006.

DOE, under the direction of the Secretary of Energy, carries out its environmental cleanup program under the leadership of the Assistant Secretary for Environmental Management and in consultation with a variety of stakeholders. In addition to U.S. Environmental Protection Agency and state environmental and health agencies that have regulatory authority in states where the sites are located, stakeholders include county and local governmental agencies, DOE community advisory groups, and Native American tribes. DOE's Office of Environmental Management is primarily responsible for cleaning up the wastes, largely through the use of contractors overseen by DOE staff. In addition, DOE's Office of Civilian Radioactive Waste Management is responsible for the high-level waste repository being developed at Yucca Mountain in Nevada, which is the repository where DOE plans to dispose of spent nuclear fuel and high-level waste. DOE's Office of Legacy Management, created in 2003, is responsible for managing DOE's postclosure responsibilities at its former nuclear weapons production sites to ensure the continued protection of human health and the environment.

Progress in Accelerating Cleanup at DOE's Sites Has Been Mixed

Over 2 years after implementing the accelerated cleanup plan, DOE has made progress in a number of areas, but the most difficult cleanup challenges remain. By March 2005, DOE was ahead or on its planned schedule in 13 of 16 risk reduction activities.[6] Activities that had met or were ahead of the accelerated schedule included packaging nuclear materials for disposition, disposing of low-level and low-level mixed waste, and removing buildings. In some cases where DOE was meeting or exceeding current risk reduction targets, only a small percentage of the overall work had been accomplished. In contrast, DOE was behind its schedule for key activities that will have a major impact on DOE's overall cleanup goals. These activities involve some of the more complex cleanup activities, including disposing of transuranic waste, treating high-level liquid waste, and closing tanks that had contained radioactive wastes. These activities account for at least 30 percent of the total expenditures DOE expects on cleanup and more than half of the cost reductions it hopes to achieve under the accelerated cleanup plan. Finally, DOE has had problems with other treatment and disposal activities not reflected in its performance measures, such as significant delays in shipping plutonium from sites to final storage locations, and delays in design and construction of key facilities. Taken together, these results suggest that DOE may already be at risk of not achieving its accelerated cleanup goals.

[6]As previously noted, DOE also uses an earned value management system to monitor large projects' progress toward cost and schedule goals. An earned value system, when fully implemented, is intended to provide managers the ability to examine cost, schedule and performance accomplishments on a project. We do not discuss DOE's earned value as a measure of progress in this report for two reasons. First, DOE has not fully implemented its earned value management system to measure all of its mission-related projects against a lifecycle cost estimate. In response to OMB recommendations noted above, DOE is currently working toward this goal. Second, we and others have raised concerns about the reliability of DOE's earned value data. For example, the National Research Council reported in 2004 that the Department's earned value management information may not be completely accurate. See National Academy of Sciences, *Progress in Improving Project Management at the Department of Energy: 2003 Assessment (2004)* (Washington, D.C.: 2004). In addition, we reported in March 2005 that for several major projects, earned value management principles had not been properly implemented to measure cost and schedule performance. See U.S. Government Accountability Office, *Department of Energy: Further Actions Are Needed to Strengthen Contract Management for Major Projects*, GA0-05-123 (Washington, D.C.: Mar. 18, 2005).

Progress Has Been Made on Several Cleanup Activities, Such as Disposing of Low-Level Waste and Removing Buildings

DOE's cleanup was ahead of its planned accelerated schedule for several activities, and other activities appeared to be on track. As of March 2005, DOE was ahead of schedule in 9 risk reduction measures that fell into the following cleanup categories[7]—(1) tearing down and disposing of facilities, (2) packaging and disposing of special nuclear materials, (3) cleaning up low-level and low-level mixed waste, and (4) completing cleanup of specific locations where releases of contamination occurred. For example, in disposing of low-level and low-level mixed waste, DOE was more than 181,000 cubic meters—or 35 percent—ahead of its accelerated target goal. Table 2 shows the progress DOE has made in four categories, as of March 2005.

Table 2: Cleanup Activities for Which DOE Was Ahead of Schedule as of March 2005

Risk reduction measure (unit measured)	Lifecycle total[a]	Cumulative units planned as of March 2005	Cumulative units completed as of March 2005	Cumulative units ahead as of March 2005
Tearing down and disposing of facilities				
Industrial facilities (number complete)	3,103	734	985	251
Nuclear facilities (number complete)	515	27	44	17
Radioactive facilities (number complete)	822	180	219	39
Special nuclear materials				
Plutonium packaged (number of containers)	5,850	5,724	6,314	590
Enriched uranium packaged (number of containers)	8,428	3,373	4,508	1,135
Plutonium/uranium residues packaged (kilograms packaged)	107,782	107,744	107,752	8[b]
Depleted uranium and uranium packaged (metric tons)	685,161	4,915	9,293	4,378[c]
Low-level/low-level mixed waste				
Low-level/low-level mixed waste disposed (cubic meters)	1,190,463	524,981	706,587	181,606

[7]For purposes of this report, we grouped DOE's 16 risk reduction measures into eight broad categories.

Risk reduction measure (unit measured)	Lifecycle total[a]	Cumulative units planned as of March 2005	Cumulative units completed as of March 2005	Cumulative units ahead as of March 2005
Areas of Contamination				
Remediation complete (number of contamination areas[d])	10,416	5,425	5,605	180

Source: Compiled by GAO from DOE data.

[a]DOE's lifecycle totals are based on estimates of the total amount of material required to be cleaned up. In 2003, these estimates were placed under DOE's configuration control system—that is, the estimates cannot be changed unless approved by a DOE Environmental Management review board.

[b]This measure was slightly ahead of schedule and nearly complete.

[c]As of March 2005, DOE had packaged less than 2 percent of the lifecycle inventory for depleted uranium. A rapid increase in packaging is planned in 2009.

[d]Contaminated areas include burial grounds, dried ponds, and spills.

These risk reduction measures show that DOE has made progress at an accelerated pace for a variety of cleanup activities that often require more readily available technology or standard treatment processes. For example, facility disposal primarily involves decontaminating and tearing down a building, and disposing of the rubble at established disposal sites. In addition, DOE's measures show that it had nearly completed its activity to package plutonium and uranium residues, a highly dangerous activity due to the potential for a nuclear accident or worker exposure.

While DOE has made progress in several areas, a significant part of the progress was due to accelerated activities at relatively few sites and reflects completion of only a small percentage of the overall work to be performed. For example, DOE's Rocky Flats site alone accounted for more than 180,000 of the total 181,600 cubic meters of low-level and low-level mixed waste that DOE disposed of ahead of schedule. Similarly, more than half of the progress made ahead of schedule in remediating potential contamination areas was due to work performed at Rocky Flats. And although DOE made progress on many of its risk reduction measures, some individual sites did not make progress at an accelerated pace. For example, although DOE was ahead of schedule in disposing of low-level and low-level mixed waste, both the Oak Ridge site and the Lawrence Livermore National Laboratory were slightly behind their site targets on this measure. In addition, DOE's progress in a few areas reflected achieving only a small portion of the overall work to be completed. The most extreme example shows that DOE was ahead in packaging depleted uranium; however, this reflects about 1 percent of the nearly 700,000

metric tons to be packaged. In tearing down and disposing of nuclear facilities, DOE had completed about 9 percent of the 515 facilities it has to clean up.

In addition to areas in which DOE was ahead of schedule, cleanup progress was on track or nearly on track for four risk reduction measures in the following cleanup categories: (1) packaging high-level waste for disposal, (2) cleaning up special nuclear materials, (3) packaging spent nuclear fuel for disposal, and (4) eliminating geographic sites (see table 3). These cleanup activities involve difficult and hazardous work.

Table 3: Cleanup Activities for Which DOE Was Generally on Schedule as of March 2005

Risk reduction measure (unit measured)	Lifecycle total[a]	Cumulative units planned as of March 2005	Cumulative units completed as of March 2005	Status of cumulative units as of March 2005
Radioactive tank waste				
High-level waste packaged for disposition (number of containers)[b]	18,735	2,118	2,116	-2
Special nuclear materials				
Material access areas[c] eliminated (areas eliminated)	14	7	8	1
Spent nuclear fuel				
Spent nuclear fuel packaged for disposition (metric tons of heavy metal)	2,420	2,129	2,125	-4
Site closures				
Geographic sites eliminated (entire site complete)	114	76	75	-1[d]

Source: Compiled by GAO from DOE data.

[a]DOE's lifecycle totals are based on estimates of the total amount of material required to be cleaned up. In 2003, these estimates were placed under DOE's configuration control system—that is, the estimates cannot be changed unless approved by a DOE Environmental Management review board.

[b]Work accomplished under this cleanup activity reflects the processing, vitrifying, and packaging of high-level waste sludge primarily at the Savannah River Site.

[c]A material access area is a secure area that offers protection and control for a variety of special nuclear materials.

[d]DOE was behind in closing the Salmon, Mississippi, site scheduled for 2003. Completion is expected in fiscal year 2005.

Making progress on cleanup activities is an important step in reducing environmental risks and annual operating costs, and in demonstrating results under the accelerated cleanup plan. DOE officials told us that achieving cleanup results for these waste activities helps reduce future mortgage costs such as surveillance and maintenance of unneeded facilities, avoids potentially higher remediation costs in the future, and demonstrates actual cleanup progress. To achieve such progress in reaching its risk reduction goals, DOE took a number of steps including changing the sequence of some cleanup activities to complete tasks earlier than originally scheduled and reducing work scope where warranted for other activities. Site officials credited the achievements to remediating targeted areas such as contaminated burial grounds, waste sites, facilities, and plutonium production reactors along the Columbia River at Hanford and a variety of obsolete buildings at Idaho and Savannah River. According to DOE officials at these sites, many of these areas were scheduled for decommissioning and disposal in the future, but because they were no longer needed, they were disposed of earlier than originally planned. In addition, making progress in certain areas can free up funding for use on other, more complex projects. For example, at DOE's Idaho National Laboratory, officials told us that completing disposal of most of its low-level and low-level mixed waste 2 years ahead of schedule has allowed them to apply the funds originally planned for managing this waste to other cleanup activities at the site.

Problems Have Occurred on Major Activities, Including Disposing of Transuranic Waste and Radioactive Tank Waste and Shipping Plutonium to Storage Locations

In contrast to progress on cleanup activities for which DOE is ahead of or on schedule, DOE is having difficulty with other cleanup work that could have a major impact on its accelerated cleanup goals. As of March 2005, DOE was falling behind in three risk reduction measures under two cleanup categories that account for a significant portion of the potential cost reductions DOE was expecting—radioactive tank waste and transuranic waste. See table 4 for a list of cleanup activities for the two waste types on which DOE has fallen behind since implementing the accelerated cleanup plan.

Table 4: Cleanup Activities for Which DOE Is Behind the Accelerated Schedule as of March 2005

Risk reduction measure (unit measured)	Lifecycle total[a]	Cumulative units planned as of March 2005	Cumulative units completed as of March 2005	Cumulative units behind as of March 2005
Radioactive tank waste				
Liquid waste eliminated (gallons)[b]	88,000,000	2,960,000	0	-2,960,000
Liquid waste tanks closed (number of tanks)	241	13	2	-11
Transuranic waste				
Transuranic waste disposed (number of cubic meters)	141,892	30,926	24,461	-6,465

Source: Compiled by GAO from DOE data.

[a]DOE's lifecycle totals are based on estimates of the total amount of material required to be cleaned up. In 2003, these estimates were placed under DOE's configuration control system—that is, the estimates cannot be changed unless approved by a DOE Environmental Management review board.

[b]While this cleanup activity is active at DOE's Savannah River Site, no liquid waste has yet been eliminated, primarily because technology has not been fully developed and regulatory issues have not been fully resolved.

DOE efforts to treat and dispose of radioactive waste from its tanks are primarily at three DOE sites—Hanford, Idaho, and Savannah River.[8] However, because the Hanford and Idaho sites have not yet begun to treat their liquid radioactive tank waste, the measure for eliminating liquid waste from underground tanks applies to the Savannah River Site. Although Savannah River has been processing radioactive tank waste sludge since 1996, it was behind in processing and eliminating from its tanks nearly 3 million gallons of liquid primarily because the site was still developing waste separation technology and lacked operational treatment facilities for disposing of liquid tank waste.[9] While all three of DOE's sites had performance goals for closing radioactive waste tanks through March

[8]DOE's West Valley site completed treatment of its high-level tank waste in 2002.

[9]As part of its radioactive tank waste treatment and disposal strategy, DOE plans to eliminate a large volume of low-activity waste in the tanks in its Salt Stone Facility where the waste is permanently immobilized on site using a concrete material called grout. However, efforts to operate this facility have been delayed.

2005, no tanks have been closed since 1997.[10] Plans to close tanks at the three sites have been delayed because DOE continues to work with regulators to reach agreement on closure requirements and due to a legal challenge to DOE's tank closure strategy. DOE's authority to proceed with its tank closure plans at its Savannah River Site and the Idaho National Laboratory was resolved by federal legislation enacted in 2004; however, the law excluded the Hanford Site.[11] Even so, Savannah River and the Idaho National Laboratory are still behind schedule in preparing waste removal facilities and obtaining regulatory approval to close the tanks. Although DOE is preparing 12 of its 241 radioactive waste tanks for closure, no tanks have actually been closed since the accelerated cleanup plan was implemented in 2003.

Transuranic waste is present at several DOE sites, but lagging performance is due primarily to the Idaho National Laboratory. Disposing of transuranic waste involves specialized characterization and treatment, packaging, and shipping in specially designed containers to a repository in New Mexico. As of March 2005, DOE had fallen behind its accelerated schedule by about 6,500 cubic meters, achieving about 80 percent of the goal. Delays in Idaho's transuranic waste disposal were primarily due to contractor performance problems in preparing the waste for shipment and difficulties in implementing a specially designed treatment technology.

The activities and projects for which DOE was falling behind the accelerated schedule involve technically complex and costly cleanup activities, and usually require specialized treatment technologies. Radioactive tank waste, for example, involves treating highly radioactive waste generated from the reprocessing of reactor fuel that contains a mix of hazardous and radioactive constituents, and requires relatively complex treatment technologies such as waste separation and vitrification. Cleaning up radioactive tank waste accounts for about 30 percent—or almost $40 billion—of DOE's estimated total cleanup costs. To date, key facilities DOE needs to use to treat and dispose of this waste are still being

[10]The Savannah River Site closed two tanks in 1997. DOE planned to close 11 additional tanks through March 2005. However, this has been delayed due to legal and regulatory issues, discussed in this paragraph.

[11]Pub. L. No. 108-375, § 3116 authorizes DOE to pursue activities that would allow tank closure at its Savannah River Site and the Idaho National Laboratory, subject to certain criteria, existing cleanup orders and agreements, and monitoring by the Nuclear Regulatory Commission. Section 3116 states that the authority does not apply to sites in the state of Washington, where the Hanford Site is located.

designed and built, and waste treatment technologies continue to be developed and tested. Similarly, some of the greatest risks, cleanup costs, and technical challenges involve the disposal of transuranic waste. This waste often requires an extensive retrieval, characterization, and treatment process as well as repackaging in containers before it can be shipped to and disposed of in the designated geologic repository for transuranic waste in New Mexico. Transuranic waste disposal is behind schedule and DOE will have difficulties catching up if this activity continues to fall behind.

In addition to the cleanup activities that DOE measures, other cleanup activities not included in DOE's risk reduction measures are experiencing problems further impacting overall cleanup progress. Although no comprehensive list of these cleanup activities was available from DOE, we found several examples, some of which are listed below, that involve constructing facilities critical to DOE's cleanup mission and relocating certain wastes or nuclear materials (see table 5).

Table 5: Selected Cleanup Activities Experiencing Problems That Are Not Included in DOE's Risk Reduction Measures

Sites	Project or activity	Problem or uncertainty	Potential impact on future progress
Hanford	Shipment of plutonium to offsite location	Planned shipping of plutonium to designated site has been deferred while long-term storage issues are resolved	Increased costs for extended onsite storage and security requirements
Hanford	Construction of waste treatment plant	Delays primarily due to contractor performance problems and design changes to comply with seismic requirements	Increased construction costs, extension of facility startup beyond 2011
Idaho National Laboratory	Storage of spent nuclear fuel	Construction of storage facility is behind schedule	At least a 3-year schedule delay in facility construction and operation and potential cost increases. Delays may be offset by delay in opening the planned disposal repository

Sites	Project or activity	Problem or uncertainty	Potential impact on future progress
Miamisburg	Cleanup of landfill	Disagreement with local community over further cleanup of landfill	Increased cleanup costs
West Valley	Decommissioning of contaminated process facility	Dispute over who is responsible	Increased costs and extension of schedule beyond 2012

Source: Compiled by GAO from DOE data.

These cleanup activities can involve significant technical and operational problems. Even though DOE does not track the status of these problems in its risk reduction measures, DOE officials are aware of these problems and are working to resolve them. However, because these problems remain unresolved and their potential impact on the accelerated cleanup plan is uncertain, DOE may already be at risk of not achieving the kind of progress it predicted under its accelerated cleanup plan. For example, the Hanford Site must construct key facilities and test complex technologies before it can treat 55 million gallons of radioactive tank waste. Recently, work on this project has been delayed due to engineering and contractor performance problems, leading DOE to reevaluate its ability to complete the project under current cost and schedule constraints. DOE expects to revise project cost and schedule goals in fiscal year 2006. Despite these problems, DOE does not have a risk reduction measure that shows the progress of these activities or their potential impact on overall cleanup progress. Consequently, DOE will not be able to quantify progress in treating radioactive tank waste at Hanford until facilities are operational—now planned for 2011, or later. Similarly, DOE's strategy under the accelerated cleanup plan to consolidate Hanford's plutonium offsite has been deferred while long-term storage issues are being resolved. DOE Hanford officials estimate that if the plutonium remains on-site, the additional costs to continue storing and securing the material may amount to more than $2 billion. Despite this problem, DOE's plutonium risk reduction measure, which focuses on completing stabilization and packaging of the material, shows that this cleanup activity was ahead of schedule.

When considered together, the results of DOE's risk reduction measures for two main types of cleanup activities—radioactive tank waste and transuranic waste, which are behind schedule and require additional cleanup activities—suggest that DOE may already be at risk of not achieving its overall risk reduction goals. Each of these problems represents a significant obstacle to DOE successfully completing cleanup activities under its accelerated plan. Success hinges on DOE's ability to

continue reducing risks by making cleanup progress and keeping costs and schedules within the constraints of DOE's plan.

DOE Is Unlikely to Achieve Its Estimated $50 Billion in Cost Reductions

DOE's accelerated plan is unlikely to achieve the $50 billion cost reduction goal for three main reasons. First, DOE's method for calculating cost reductions has limitations that raise questions about its reliability. The actual cost reduction from the accelerated cleanup plan, if implemented as intended, would likely be much lower. Second, the accelerated plan is based on a number of key assumptions about improvements to the cleanup approach—such as shortened schedules and technology improvements—that may not occur as planned. Third, the three sites that account for most of the cost reduction are already facing challenges and have either increased their cost estimates or plan to increase their funding requests, raising doubts about DOE's ability to achieve its full expected cost reductions. While DOE believes the accelerated cleanup plan will reduce costs, the actual amount of those cost reductions is uncertain.

DOE Estimates Overstated Potential Cost Reductions

DOE calculated its estimated $50 billion in cost reductions by comparing its fiscal year 2001 cost estimate for the program—the last cost estimate before DOE implemented its accelerated strategy—with its fiscal year 2003 cost estimate for the program—the first complete cost estimate under the new accelerated strategy.[12] DOE's 2001 cost estimate for the program was $192 billion, reflecting its prior approach to cleaning up its radioactive and hazardous wastes by 2070.[13] The 2001 estimate represented forecasts generated by DOE's field staff at each of its sites and for each of its activities. Aggregating these site-developed estimates, DOE arrived at its 2001 cost estimate for the program. In contrast, to develop its 2003 estimate—reflecting an accelerated approach—DOE provided several of the sites with target costs that the sites were to work towards meeting.[14] These target costs were based on assumptions from the headquarters officials about how and when the work should be completed. Under this

[12]DOE began implementing the accelerated plan in 2002, but the accelerated cost estimates were not in place until fiscal year 2003.

[13]In 2001, when the estimate was developed, the scope of work included both waste cleanup activities and postcleanup stewardship activities at the sites once the cleanup work is complete.

[14]According to DOE officials, sites were allowed to request a higher target cost estimate, but had to have this approved by the Assistant Secretary. Four sites did make this request for their 2003 cost estimate.

new strategy, DOE's 2003 estimate for completing the cleanup work was $142 billion. DOE subtracted the 2003 estimate for the new strategy ($142 billion) from the 2001 estimate under the original strategy ($192 billion) to arrive at its $50 billion cost reduction estimate.[15]

However, DOE's estimated $50 billion in cost reductions from accelerating cleanup at its sites may not be fully reliable for several reasons:

- *Pre-acceleration baseline cost estimate may be unreliable.* In a February 2002 review of the cleanup program, DOE specifically acknowledged that its cost estimate of the program did not provide a reliable estimate of project costs. DOE officials explained that the site-level estimates of cleanup work were based on calculations that were highly uncertain beyond the life of the contracts. We and others have previously raised concerns that DOE's cleanup cost estimates may not be fully reliable. In our prior work, we noted that in preparing baseline cost estimates, DOE lacked a standard methodology for sites to use.[16] Further, in the past, DOE's Office of Inspector General and the National Research Council have raised similar concerns about DOE's estimates being incomplete and unreliable.[17]

- *Estimates did not include contingency costs*. Because of the high uncertainty surrounding the cleanup work, DOE computes additional uncertainty costs—called contingency estimates[18]—which are added to the

[15]To make these figures comparable, DOE made some adjustments. For example, DOE subtracted approximately $10 billion from its 2001 cleanup estimate of $202 billion to account for work that was included in its pre-accelerated scope but had not yet been included in 2003, and added approximately $13 billion of long-term stewardship work to its 2003 cleanup estimate of $129 billion. DOE currently manages to the $129 billion cost estimate. For comparison purposes, the adjusted estimates of both cleanup and long-term stewardship work in 2001 and 2003 were $192 billion and $142 billion, in DOE's stated "2003 constant dollars," respectively. See also footnote 2.

[16]U.S. General Accounting Office, *Nuclear Waste: Challenges to Achieving Potential Savings in DOE's High-Level Waste Cleanup Program*, GAO-03-593 (Washington, D.C.: June 17, 2003).

[17]U.S. Department of Energy Office of Inspector General, *Audit of the U.S. Department of Energy's Consolidated Financial Statements for Fiscal Year 1998*, IG-FS-99-01 (Germantown, Md: Feb. 25, 1999). See also National Research Council, *Improving Project Management in the Department of Energy* (Washington, D.C.: June 1999).

[18]As defined in DOE's fiscal year 2004 financial statements, contingency estimates are intended to account for the uncertainties associated with the technical cleanup scope of the program.

overall cleanup estimates in its annual financial statements. These costs are intended to cover any underestimated or unforeseen cleanup work. In 2001, DOE estimated that because of uncertainty related to the cleanup, it would add a contingency estimate equal to an additional 17 percent of its cleanup cost estimate. In contrast, following implementation of the accelerated plan, DOE estimated in 2003 that increased uncertainty called for nearly doubling the contingency estimate to 29 percent of the cleanup cost estimate. However, when calculating its expected cost reduction under the accelerated plan, DOE did not include either of these contingency estimates in its comparison of the two estimates. Doing so would likely have lowered the estimated cost reductions to below $50 billion.

- *No present value analysis was performed.* DOE's estimate of potential cost reductions did not consider the time value of money. As we noted in our previous report,[19] according to standard economic analysis and guidance developed by OMB,[20] cost-comparison analyses should be based on lifecycle costs of competing alternatives with future costs discounted to present value; that is, adjusted both for inflation and the time value of money.[21] According to OMB's cost-estimating guidance, DOE should have first converted the annual expected costs of cleanup for both its 2001 and its 2003 estimates to their present value in 2003, and then compared the two present-value costs. While DOE's comparison of its estimates is based on values that are expressed in constant 2003 dollars (to account for inflation), DOE did not adjust its figures to account for the time value of future costs.[22] Had DOE compared present value estimates for 2001 and 2003, the resulting cost reduction would likely have been much lower. For example, when we adjusted DOE's estimated $20 billion cost reduction for

[19]U.S. General Accounting Office, *Nuclear Waste: Absence of Key Management Reforms on Hanford's Cleanup Project Adds to Challenges of Achieving Cost and Schedule Goals*, GAO-04-611 (Washington, D.C.: June 9, 2004).

[20]OMB Circular No. A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (Washington, D.C.: Oct. 29, 1992).

[21]DOE's own guidance requires a present value analysis to discount future dollars to reflect the time value of money. Present value analysis is a method used to evaluate alternative expenditures that occur at different times and put them on a common basis for comparison. It goes beyond adjusting the values for inflation, which is a correction for changes in the purchasing power of the dollar. Therefore, conducting a present value analysis goes beyond computing cost estimates in constant year dollars.

[22]In addition, DOE's cost estimate includes actual (current) dollars for pre-2001 values, rather than calculating these in constant 2003. As a result, DOE's 2001 and 2003 baselines do not fully reflect constant 2003 dollars.

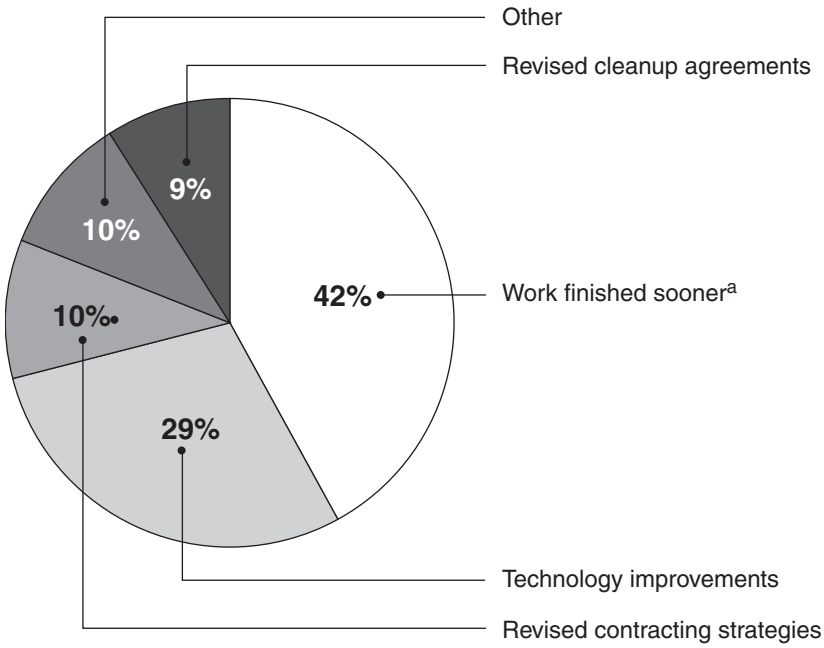
the Hanford waste treatment project to consider the time value of money, the potential cost reduction decreased by about 40 percent—to about $12 billion.

Cost Reductions Were Based on Assumed Performance Improvements That May Not Occur

As part of its plan to reduce the expected cost of the cleanup and eliminate risks more quickly, DOE made several assumptions about ways to improve the cleanup work. These assumptions included (1) developing new technologies, such as a technology to allow more efficient vitrification of some wastes; (2) implementing new acquisition strategies that encourage and reward contractor efficiencies, such as performance-based contracts; (3) revising site cleanup agreements to simplify treatment and disposal requirements, such as reclassifying some wastes allowing for disposal on site rather than remotely; and (4) completing work sooner than planned thereby eliminating out-year costs.

Assumed improvements in DOE's cleanup approach resulted in DOE's estimated $50 billion in cost reductions (see figure 1).

Figure 1: Contributions of Key Assumptions to DOE's Estimated $50 Billion in Cost Reductions



Source: GAO analysis of DOE data.

[a]When DOE collected its cost reduction data from each site, some of the improvements related to finishing cleanup work sooner were also closely tied to the other assumed improvements resulting in some overlap among the categories.

The assumptions enabled DOE to develop revised cleanup cost estimates at most sites that reflected cost reductions (see figure 2).

Figure 2: DOE's Expected Cost Reduction by Office

Dollars in Thousands (2003 constant)		
Hanford[a]	-$22,406,163	Most of DOE's cost reductions
Savannah River	-$14,089,347	
Idaho	-$10,936,713	
Carlsbad	-$3,697,077	
Oak Ridge	-$1,503,154	
Albuquerque	-$484,958	
Rocky Flats[b]	-$223,022	
Ohio	-$104,079	
Nevada	-$54,657	
Oakland	$3,298	Offices with cost increases under the accelerated plan
Chicago	$92,182	
Paducah	$3,827,024	
Portsmouth	$7,539,895	
Environmental Management office-wide costs[c]	-$6,545,128	
Costs transferred out in 2003	-$723,818	
Sites closed before 2003[d]	$701,188	
Total	**-$50,006,905**	

Source: DOE.

[a]Includes both the Office of River Protection and the Richland Operations office.

[b]DOE did not estimate large cost reductions from Rocky Flats because that site had already implemented many of the accelerated strategies and reduced its cost estimate before 2001.

[c]Includes Headquarters and Program Direction costs.

[d]Because of work transfers within the Office of Environmental Management, some costs changed in 2003 at sites that closed before 2003.

Although these assumed improvements may have the potential to reduce cleanup costs, many of them are still uncertain and may not occur. For example,

- *Technology improvements*. DOE assumed that significant cost reductions would result from improved technologies that would allow treatment and disposal of waste faster and at lower costs. Nearly all of the estimated cost reduction pertains to improvements in the technologies at the Idaho National Laboratory and Hanford sites. For example, DOE expected a $4.7 billion cost reduction at the Idaho National Laboratory by using a technology for separating a portion of the tank waste, but that technology has still not been successfully tested and implemented on DOE tank waste. Similarly, at the Hanford site, DOE is testing a technology that officials estimated would speed up the stabilization of some low-activity wastes reducing costs by an estimated $8.9 billion. However, the technology has

not been fully implemented or tested on Hanford's unique waste, and costs of operating the new technology are not yet known, so the extent of cost reductions DOE assumed could be incorrect. For example, an official for the contractor developing the pilot plant to test this technology said the project is already projecting cost increases and is currently estimated to begin operating about 6 months late.

- *Contract reform*. DOE estimated that revised contracting strategies would also result in significant cost reductions. However, at two of DOE's largest sites—Savannah River and Hanford—DOE will not award some major new contracts until 2006. Until then, the final price of DOE's new contracts and any potential cost reductions associated with them are uncertain. For example, DOE has assumed it will reduce overall costs by more than 20 percent under its new Savannah River Site contract. However, the details and final cost of the contract will not be finalized until the contract is awarded. External auditors acknowledged this uncertainty at Hanford in their assessment of DOE's fiscal year 2004 environmental liabilities estimate, noting that it was "not appropriate" to assume cost reductions from future contracts since those reductions are "neither probable nor susceptible of reasonable estimation."

- *Revisions to cleanup agreements*. DOE estimated additional cost reductions would result from revising site-specific waste cleanup agreements with federal and state regulators. However, regulators have not agreed to or are resisting revisions to agreements that accounted for most (at least 75 percent) of these expected cost reductions. For example, DOE expected to be able to determine that some radioactive tank waste is not high-level waste but transuranic waste, thereby allowing DOE to ship the treated waste to the Waste Isolation Pilot Plant for permanent disposal and reducing costs by $1.5 billion. However, in late 2004, the head of New Mexico's Environment Department—the state regulator for the repository—said the state would refuse to accept DOE's tank waste for disposal at the repository because New Mexico considers that waste to be high-level, not transuranic, waste. In addition, because of the uncertainty about the disposal path for this radioactive tank waste, the state of Idaho—which has a regulatory agreement with DOE to treat and dispose of the waste out of the state—prefers that DOE apply more extensive high-level waste treatment technologies.

- *Work completed sooner*. DOE also expected cost reductions resulting from completing work sooner through improvements that, in many cases, also depend on the assumptions discussed above. Because of the uncertainty surrounding assumed improvements in its cleanup operations, DOE's anticipated cost reductions from completing work sooner are also in

jeopardy. For example, DOE estimated approximately $2.8 billion in cost reductions at its Savannah River Site from accelerating the cleanup of radioactive tank waste. However, that reduction depends on implementing a new waste treatment technology that has not yet been fully tested outside a laboratory. As a result, the uncertainties surrounding technological improvements raise doubts about DOE's ability to accelerate its schedule. In addition, several of the projects that DOE expects to complete in less time are already experiencing problems. For example, DOE estimated that an approximately $2.8 billion cost reduction would result, in part, from revising its schedule for shipping transuranic waste to the repository in New Mexico. However, as we noted above, transuranic waste packaging and shipping is already behind schedule.

Nearly All of the Cost Reductions Were to Occur at Three Sites Where DOE Is Having Significant Technical, Regulatory, or Management Challenges

DOE expected cost reductions to occur at nearly all of its cleanup sites, but most of the total estimated cost reduction was expected from 3 sites that account for the largest portion of DOE's overall cleanup costs—Hanford, Savannah River, and Idaho National Laboratory. However, these sites are already facing challenges to their cleanup efforts which may jeopardize DOE's ability to achieve its estimated $50 billion cost reduction. Although it is impossible to precisely predict the impact that these challenges will have on DOE's overall cleanup costs, any cost increases at these sites could offset cost reductions at other sites and lower the potential for overall cost reductions from the accelerated plan.

The types of challenges that could increase cleanup costs at these three DOE sites include the following:

- *Delays in disposing of highly radioactive wastes.* In early 2005, DOE reported that a slip in the scheduled opening of DOE's planned repository at Yucca Mountain, Nevada would delay shipment of waste by at least 2 years—and possibly for as long as 7 years—due to technical and regulatory issues. As a result, sites now storing high-level waste and spent nuclear fuel have been reevaluating their waste disposal plans and associated cost and schedule estimates. The sites potentially affected include Hanford, Idaho National Laboratory, Savannah River, and West Valley. Most sites expect costs to increase as disposal schedules slip. In its fiscal year 2006 budget request, DOE estimated that a five year delay in opening the Yucca Mountain repository could increase costs by as much as $720 million at its three largest sites. This includes building additional storage buildings and added operating costs.

- *Legal obstacles preventing DOE from implementing aspects of its cleanup approach.* DOE faces challenges to its planned treatment strategy

at the Hanford Site that could potentially increase costs. A 2002 lawsuit challenged DOE's plans to separate and determine that a portion of its waste could be treated and disposed of as other than high-level waste, and to DOE's plans to close tanks leaving some radioactive residual in the tanks. In October 2004, a federal appeals court overturned a district court ruling against DOE and held that it was premature to rule on the matter until DOE implemented its strategy.[23] Federal legislation passed in October 2004 provided authority for DOE to carry out its acceleration completion strategy at its Savannah River Site and Idaho National Laboratory. However, the law excluded the Hanford Site.[24] If similar authority is not provided for the Hanford Site, costs at the site could increase significantly—up to $67 billion, according to DOE's estimate. Similarly, uncertainty surrounds Hanford's ability to accept waste from other DOE sites as the result of two ongoing lawsuits: one involving a challenge by the state of Washington to DOE's plan to ship low-level, low-level mixed, and transuranic waste into the state,[25] and one concerning a recent Washington state citizens' initiative that could prohibit Hanford from accepting additional waste until existing waste is cleaned up.[26] Although DOE believes it will ultimately prevail in these lawsuits, some cleanup activities at the other sites may face delays and increased storage costs until the issue is resolved.

- *Other pressures increasing costs at key sites.* By the end of fiscal year 2004, the total cost estimate of the cleanup work at two of DOE's largest sites had already increased above cost targets established in 2003. At the Savannah River Site and Idaho National Laboratory overall cleanup estimates in 2004 were over $2.0 billion higher than in 2003. Similarly, officials at DOE's Hanford Site indicated in recent public meetings that they are requesting cleanup funding above previously established funding targets for fiscal year 2007, which, if approved, will also add to the plan's total cost. According to the site officials, the additional funds are being

[23]*Natural Resources Defense Council v. Abraham*, 388 F.3d 701 (9th Cir. 2004).

[24]Pub. L. No. 108-375, § 3116 (2004).

[25]*State of Washington v. Bodman*, No. CV-03-5018-AAM (E.D. Wash.).

[26]Washington state voters passed Initiative 297, the Cleanup Priority Act, now codified in chapter 70.105E of the Revised Code of Washington (RCW), in November 2004. Its scope and constitutionality are currently being litigated in the federal district court and in the Supreme Court of Washington. *United States v. Hoffman*, No. CV-04-5128-AAM (E.D. Wash., filed Dec. 1, 2004), certified to Washington state to address interpretation of state law, *United States v. Hoffman*, No. 76629-1 (Wash. Feb 8, 2005).

requested primarily to address higher than expected waste management and treatment costs.

Because of the limitations and uncertainties discussed above, DOE's $50 billion cost reduction goal is unlikely to occur. Recognizing that achieving the full $50 billion in cost reductions may be in jeopardy, DOE officials recently stopped citing any specific estimate in connection with the accelerated plan. However, DOE continues to believe it will achieve some cost reductions with its accelerated strategy.

DOE's Performance Reporting Does Not Clearly Reflect Progress Made toward Achieving the Overarching Goals of the Accelerated Cleanup Plan

DOE's performance reporting does not present a clear understanding of progress toward meeting the $129 billion cost target and 2035 completion date of the accelerated cleanup plan. While DOE performance measures, as discussed earlier in this report, provide useful information about the current status of cleanup activities, there are two main shortcomings in the way DOE uses these measures to report its progress toward meeting the overarching goals of the accelerated plan. First, in reporting on its performance, DOE does not clearly relate cleanup accomplishments with their associated costs. Second, DOE reports its performance in a way that does not highlight key cleanup activities or events that have significant implications for achieving overall cleanup goals. These shortcomings make it difficult for the Congress and the public to fully understand how likely DOE will be able to achieve its accelerated cleanup cost target and completion date.

Performance Reporting Practices Make It Difficult to Clearly Understand the Relationship Between Cleanup Progress and Cost Performance

We and others have emphasized the importance of ensuring that reporting on program performance allows a clear understanding of how well a program is meeting goals; that is, linking performance goals with program costs. In a February 2005 study, we noted that federal accountability laws—the Government Performance and Results Act of 1993 (GPRA) and the Chief Financial Officers Act of 1990—emphasize the importance of linking program performance information with financial information as a key feature of sound management and an important element in presenting to the public a useful and informative perspective on federal spending.[27] Additionally, OMB indicated to federal agencies that annual performance

[27]U.S. Government Accountability Office, *Performance Budgeting: Efforts to Restructure Budgets to Better Align Resources with Performance*, GAO-05-117SP (Washington, D.C.: Feb. 2005).

budgets should clearly link performance goals with costs for achieving those goals, both long-term and annual performance goals.[28]

DOE's performance reporting does not provide for a clear understanding of how well the cleanup program is performing. In reporting on its progress, DOE does not establish how accomplishments made in addressing wastes—which DOE measures through its risk reduction measures—are associated with the costs incurred—which DOE measures through its cost performance measures. Rather, DOE reports separately on the waste treatment and disposal goals it has achieved using one measure and reports on whether cleanup activities are being performed within cost parameters using another measure. These separate measures are organized around different categories and have different units of measure, making it difficult to link the information the two measures provide (see table 6).

[28]Executive Office of the President, Office of Management and Budget, OMB Circular No. A-11 (2004), Part 6, *Section 220-1—Preparing and Submitting Performance Budgets* (Washington, D.C.: July 2004).

Table 6: Comparative Features of DOE's Risk Reduction Measures and Cost Performance Measures

Comparative features	Risk reduction measures	Cost performance measures
Organization of measure	Organized around 16 specific categories or outcomes	Organized around 7 project categories
Information included	May have more than one measure for the same waste type, for example, radioactive tank waste has 3 risk reduction outcomes	May include costs associated with more than one cleanup activity, such as packaging transuranic waste and disposing of low-level waste
Time period measured	Measures progress against the lifecycle plan	Measures against costs in contract period
Type of measurement	Scored as a positive or negative variance, indicating number of units ahead/behind the target	An overall score indexed to 1.0, where greater than 1 is on or ahead of schedule and below 1 is behind schedule
Scope limitations	Does not cover all activities associated with a waste group, for example radioactive tank waste measures do not include shipping activities	Does not cover all costs related to specific waste activities, for example, does not cover security costs

Source: GAO analysis.

The difficulty of understanding the relationship between cleanup accomplishments and cost performance can be illustrated by comparing the performance information available on transuranic waste. DOE's risk reduction measure provides useful information about how much transuranic waste was processed and disposed of, but DOE does not separately report cost information related to transuranic waste accomplishments. Instead, DOE includes costs associated with transuranic waste activities as part of a larger project category titled "solid waste stabilization and disposition." Therefore, DOE and others generally do not have a complete picture of performance for this activity, such as the impact on cost and schedule of falling behind in processing and disposing of the waste. For example, as of March 2005, DOE's Idaho National Laboratory was more than one year—or more than 1,000 shipments—behind its planned number of shipments of transuranic waste to the federal repository. However, DOE reports no corresponding cost performance measure to indicate the impact of this delay on cost and schedule (see table 7). During the same time period, Idaho's solid waste stabilization and disposition cost performance score indicated the project category was "green," or remaining within cost and schedule goals.

However, because of the delays in transuranic waste shipments, DOE is significantly behind schedule, has recently ended the contract, and is now in the process of determining the cost impact of these delays.

Table 7: Performance Information on Idaho National Laboratory Transuranic Waste Shipments as of March 2005

Risk reduction performance		Cost performance	
Total units to ship overall	66,139 cubic meters	Total lifecycle cost	Not separately reported
Planned units shipped to date	14,581 cubic meters	Planned cost to date	Not separately reported
Actual units shipped to date	4,160 cubic meters	Actual cost to date	Not separately reported
Variance	-10,421 cubic meters	Variance	Not separately reported

Source: DOE.

The importance of directly linking progress on cleanup with cost performance has been recognized by OMB. In a fiscal year 2005 program review of DOE, OMB found that DOE's cleanup program had not developed annual cost and schedule performance measures to monitor progress towards completing the cleanup mission. OMB officials said that better linking cleanup progress and cost performance in DOE's performance reporting would allow for tracking DOE's performance against its long term goals.

DOE acknowledged that its performance reporting practices currently do not directly link progress on cleanup with performance against cost and schedule targets. According to a senior DOE adviser to the Principal Deputy Assistant Secretary for Environmental Management, the Department's earned value management system could eventually provide this linkage, but DOE is still working to fully implement the system and to ensure that it provides reliable data. He said that DOE's earned value management system will eventually produce information on the cost, schedule, and work completed over the lifecycle of all projects related to its cleanup mission, and may eventually provide an aggregate earned value score for the entire cleanup program.

While these steps may be useful, for DOE's performance reporting using earned value to provide for a full understanding of cleanup performance, DOE will need to also report on the linkage between cost, schedule, and performance data by (1) generating comparable cost, schedule, and performance data at an activity level, such as processing and disposing of transuranic waste and (2) ensuring that the cost data is reported in relation to lifecycle cost targets, not just for a specific year or contract period. While DOE is working toward including lifecycle cost targets and performance in its earned value data, it is not taking steps to directly link risk reduction measures with cost performance at the activity level. According to a senior adviser to the Principal Deputy Assistant Secretary for Environmental Management, the department has been focused on ensuring that site cost estimates are reliable and that all mission-related projects are covered under the earned value system. However, unless this linkage is established, DOE performance reporting will not provide for a full understanding of progress being made by individual cleanup activities or whether it is on track with its overall $129 billion cost target for completing the cleanup program.

Performance Reporting Does Not Highlight Critical Activities that Are Best Indicative of Overall Performance

Performance reporting should provide for a clear understanding by the Congress and the public of how an agency is progressing in achieving its program goals. In assessing how various government agencies reported on their progress, we noted in a 2004 report that agencies need to consider the needs of the information's user and best tailor performance information so that a clear picture of the agency's progress is presented. We found that an agency's performance data can have real value only if the data are used to highlight actual performance against an agency's planned goals.[29]

DOE publicly reports on its progress toward achieving accelerated cleanup plan goals through various means, including providing information to the Congress in annual budget submissions, reporting progress against selected annual goals in the agency's annual performance and accountability report, and making information accessible on the department's Web site. In all three cases, DOE primarily relies on the risk reduction measures as the indicator of cleanup progress. For example, in

[29]U.S. Government Accountability Office, *Results-Oriented Government: GPRA Has Established a Solid Foundation for Achieving Greater Results*, GAO-04-38 (Washington, D.C.: Mar. 10, 2004).

its fiscal year 2006 budget request to the Congress, DOE provided information on all 16 risk reduction measures, including the amount of work estimated to be completed through fiscal year 2006, such as number of buildings torn down, and the estimated total amount of work to accomplish. In the budget request, DOE also included a variety of other program information, such as general cleanup achievements to date, and identified 7 risk reduction measures it would use to assess progress at the end of the fiscal year. Similarly, in accordance with federal reporting requirements, DOE provides performance information each year in its annual performance and accountability report that accompanies the department's annual financial statement. In the performance and accountability report, DOE describes the general goals of the cleanup program, external factors that could affect DOE's ability to achieve those goals, and its progress against selected performance goals for the year. Finally, on its Web site, DOE provides descriptive information for its 16 risk reduction measures, including how much work has been accomplished to date for each measure and the estimated total amount of work to accomplish for each measure.

Although this information is useful, DOE's performance reporting does not present a complete picture of progress toward accelerated cleanup plan goals. For example, DOE has, up to now, reported on its progress as measured against annual goals, rather than its progress in meeting its overall $129 billion cost target and 2035 completion date. By doing so, DOE provided a different picture of the department's progress than if progress was compared with longer term goals. Two examples from the agency's performance reporting in its 2004 Performance and Accountability Report illustrate this point. In its 2004 report, DOE reported it met less than 80 percent of its annual goal of closing 9 liquid waste tanks in fiscal year 2004. In fact, DOE met 0 percent of its goal, has closed no tanks since 1997, and is currently significantly behind its estimated lifecycle target for this activity. To regain its performance schedule, DOE would need to complete the regulatory process and close 19 waste tanks by the end of fiscal year 2005. However, this is an unlikely achievement given the length of time of remediation and regulatory work that is required before the tanks can be closed. In a second example, DOE reported it had met less than 80 percent of its annual planned target for packaging plutonium and uranium residues because it was 175 kilograms behind its accelerated schedule. However, calculating DOE's performance for this activity against the estimated lifecycle target indicates that DOE was actually 33 kilograms ahead of its cumulative goal by the end of 2004. According to a senior DOE adviser to the Principal Deputy Assistant Secretary in the Office of Environmental Management, DOE plans to begin

reporting its progress against lifecycle goals in the department's fiscal year 2005 performance and accountability report.

Another area of concern is that DOE's performance reporting does not highlight performance on critical cleanup activities that could best provide information about whether the department is on track to meet its $129 billion cost target. Among DOE's various performance measures, certain ones are more important for indicating whether DOE is on track with its overall accelerated cost and schedule goals, and may provide a different picture of progress than DOE is currently reporting. In the longer term, to provide an indication of progress toward overall accelerated goals, projects that account for a large portion of DOE's spending—and correspondingly contribute the most towards cost reductions—can serve as key indicators of progress. For example, DOE expects a significant portion of accelerated plan cost and schedule reductions to be achieved from two waste types that are the most difficult to address—radioactive tank waste and transuranic waste. DOE's radioactive tank waste program alone accounts for nearly 60 percent—almost $30 billion—of DOE's estimated cost reductions under the accelerated plan. Highlighting performance in these areas would provide a better indication of how well DOE is progressing toward its longer term accelerated cleanup goals. As previously discussed, both radioactive tank waste and transuranic waste are the two areas where DOE's progress has fallen behind. In three of four risk reduction measures the department uses to track progress of its radioactive tank waste and transuranic waste activities, DOE has experienced delays that could impact cost. Furthermore, work on DOE's $5.7 billion waste treatment construction project at Hanford—an activity not tracked by a risk reduction measure—has been delayed, creating potentially significant cost and schedule increases. While DOE includes radioactive tank waste and transuranic waste in its performance reporting, the department does not identify the significance of these cleanup activities for meeting overall cleanup cost and schedule goals.

In the short term, closure sites and key activities that are contributing to planned budget declines over the next few years may provide a good indication of whether DOE is currently on track to meet its planned accelerated cost target. DOE's accelerated plan calls for a decrease in annual funding requirements between 2005 and 2008. That is, DOE's annual funding requirement is planned to drop from about $7.3 billion in fiscal year 2005, to about $4.5 billion by 2008—or a decline of about $2.8 billion. Almost 90 percent of this decline is attributable to 10 sites scheduled to be closed in 2006, and progress on eight key projects. Currently, the indicators for these sites and projects show that at least half

are behind in some or all cleanup activities. For example, DOE's Miamisburg, Fernald, and Lawrence Livermore Laboratory sites—all scheduled to complete cleanup by 2006—are behind in at least one risk reduction activity. Similarly, DOE's spent nuclear fuel project at Hanford was in danger of exceeding its cost target as of April 2005. Providing aggregate information on the potential cost increases or schedule delays in this group of sites could help gauge DOE's ability to achieve a funding decline over the next few years.

It is not clear what impact the challenges DOE faces will have on its overall ability to achieve near-term or longer-term cost reduction goals. However, DOE's performance reporting does not highlight this information nor does DOE report which activities are the most significant to achieving its overall cost and schedule goals. DOE officials said that, in their view, the department's current reporting of its performance in the annual performance and accountability report and in its budget submission is sufficient to provide an understanding of progress towards the program's long-term goals. DOE officials also noted that, internally, senior DOE managers use a variety of performance measures to monitor more critical elements of the program that are not included in any public reporting of accelerated cleanup progress. Nevertheless, because DOE reporting methods do not identify critical indicators such as progress on key cleanup activities, the department is not providing the Congress and the public the basis for a full understanding of its progress toward achieving the goals of the accelerated cleanup plan.

Conclusions

DOE expected that its accelerated cleanup plan would allow it to clean up contaminated sites faster and at significantly lower cost than previously planned. While DOE has made progress toward its cleanup goals, important challenges remain and DOE is not likely to achieve its original goal of $50 billion in estimated cost reductions. While DOE's performance reporting provides information on some aspects of cleanup progress, it does not provide for a full understanding of how the many uncertainties DOE faces could affect achieving cleanup goals and does not include a meaningful analysis of the significance of the data. Furthermore, because DOE's reporting methods do not directly correlate cleanup results with the associated costs and fail to identify critical indicators, such as progress on key cleanup activities, DOE is not providing an adequate picture of its overall progress toward staying within the $129 billion total program cost and 2035 completion date goals. We believe that improving DOE's performance reporting to address these limitations would provide more

complete information and allow for a more accurate assessment of DOE's progress toward achieving accelerated cleanup plan goals.

Recommendations for Executive Action

To help DOE and the Congress monitor progress toward meeting DOE's accelerated cleanup plan cost and schedule goals, we recommend that the Secretary of Energy take the following two actions:

- Improve DOE's performance reporting so that there is a clearer, discernable relationship at the activity level between cleanup accomplishments and the costs incurred in doing the work and
- Identify in DOE's performance reporting to the Congress and others those performance measures that are the most critical to achieving cost and schedule goals, and summarize the progress on these measures and the potential impact of any problems that could affect achieving accelerated cleanup plan goals.

Agency Comments and Our Evaluation

We provided a draft of this report to DOE for review and comment. In written comments, DOE's Principal Deputy Assistant Secretary for Environmental Management agreed with the report's recommendations. The Principal Deputy Assistant Secretary also provided technical comments as an enclosure to the letter. We have incorporated these comments as appropriate. DOE's written comments on our draft report are included in appendix III.

Regarding the report's two recommendations, DOE agreed to improve its performance reporting so that there is a clearer, discernable relationship between cleanup accomplishments and the costs incurred in doing the work. DOE also agreed to identify and highlight in its progress reports to the Congress and others those performance measures that are the most critical to achieving cost and schedule goals, and summarize the progress on those measures and the potential impact of any problems that could affect achieving the goals. To aid in implementing these recommendations, DOE said it will continue to improve its earned value management system to serve as a link between performance measures and cost.

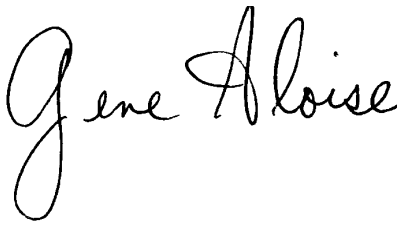
In technical comments to us accompanying the letter, DOE disagreed with our discussion in the report that it should use present value analysis in calculating the estimated cost reduction it expects to achieve under its accelerated cleanup plan. DOE stated that we have misinterpreted OMB Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis*

of Federal Programs, regarding the use of present value analysis. DOE said that present value calculations are more applicable to cost-benefit analyses, particularly when attempting to analyze the costs and benefits to various options or alternatives. DOE emphasized that its cost estimating methodology was developed solely for the purpose of estimating the program's environmental liability, and its cost reduction estimate is simply the difference between fiscal year 2001 and fiscal year 2003 environmental liability estimates. DOE believes that since it was not attempting to calculate benefits, a present value analysis is not appropriate.

In our view, our interpretation of the OMB circular is correct and, in fact, is supported by DOE's own guidance, which recommends using present value analysis as a standard methodology for cost comparisons of different alternatives. OMB Circular A-94 (revised October 29, 1992), standard economic analysis, and DOE's guidance (Report to Congress, July 2002, Appendix A–Lifecycle Cost Analysis) recommend present value analysis as the appropriate technique for analysis of alternative options even if the benefits from different approaches are the same or a comparison of the benefits is not possible. As we previously reported, although using current dollar estimates may be appropriate for budget purposes, present value analysis is the standard methodology to be used for comparing costs of different alternatives that occur at different times, such as comparing DOE's accelerated and baseline cleanup alternatives.

We are sending copies to other interested congressional committees and to the Secretary of Energy. We will also make copies available to others upon request. In addition the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions on this report, please call me on (202) 512-3841. Contacts points for our Office of Congressional Relations and Public Affairs may be found on the last page of this report. Other staff contributing to this report are listed in Appendix IV.



Gene Aloise
Director, Natural Resources
and Environment

Appendix I: Scope and Methodology

To determine what progress DOE has achieved under its accelerated cleanup plan, we identified the measures DOE uses to monitor and report its performance. We found that DOE uses two primary measures to monitor progress: its "Gold Chart" metrics (risk reduction measures) and earned value metrics. For DOE's risk reduction measures, we discussed with DOE officials—both at headquarters and at specific sites—how these measures were developed. We also discussed how these measures are used by DOE—both internally and for external reporting. We obtained and analyzed DOE's current risk reduction measures to determine both current status and implications of out year requirements for the overall cleanup. In reviewing DOE's efforts to develop earned value data, we reviewed various reports on DOE's earned value system, including a recent GAO report discussing the data and a 2004 National Academy of Sciences report.[1] We reported in March 2005, that for several major projects, earned value management principles had not been properly implemented at the department to measure cost and schedule performance. In addition, the National Research Council reported in 2004 that the quality of earned value management in the department was inconsistent and may not be completely accurate. We also discussed DOE's earned value measures with DOE officials in its Environmental Management, Office of Performance Assessment and with DOE officials in the Office of Engineering and Construction Management. In part due to the concerns raised by GAO and others about the reliability of information from DOE's earned value system and in part because DOE had not completed addressing these concerns by more fully implementing its earned value management system, we did not report on earned value data as a measure of DOE's progress in achieving its accelerated goals.

To determine how DOE implemented its accelerated strategy, we reviewed several documents at DOE headquarters providing the status of 10 restructuring initiatives implemented when the accelerated initiative was started. We reviewed DOE policy and procedure documents, and discussed DOE's strategy to implement its accelerated plan with DOE headquarters officials in its Office of Environmental Management. We further reviewed site performance management plans—a document laying out each site's strategy for implementing the accelerated initiative.

[1]U.S. Government Accountability Office, *Department of Energy: Further Actions Are Needed to Strengthen Contract Management for Major Projects*, GAO-05-123 (Washington, D.C.: Mar. 18, 2005), and National Academy of Sciences, *Progress in Improving Project Management at the Department of Energy: 2003 Assessment (2004)* (Washington, D.C.: 2004).

To understand how the accelerated cleanup plan was being implemented at the site level and progress made, we selected a nonprobability sample of 5 sites to review, based on several criteria.[2] We started with a list given to us by DOE that contained all DOE cleanup sites, each site's expected completion date, each site's 2003 estimated lifecycle target, and each site's contribution to cost reductions under the accelerated initiative. We eliminated from consideration any site that (1) had completed cleanup by 2004; (2) had a 2003 estimated lifecycle target less than $1 billion, and (3) contributed less than $100,000 in cost reductions to DOE's overall $50 billion estimated cost reductions from implementing its accelerated initiative. This gave us a list of sites, which we placed into three categories, based on DOE's budget accounts: (1) sites expected to close by 2006, (2) sites expected to close by 2012, and (3) sites expected to close by 2035. We selected a minimum of one site from each category. In making our selection, we considered the following factors: geographic dispersion of the sites, the site's estimated contribution to DOE's annual budget, the diversity of waste types represented at the site, and contribution to DOE's estimated $50 billion cost reduction from acceleration. Applying these criteria, we selected the following five sites: Hanford Site—both DOE's Office of River Protection and Richland Operations Office; Savannah River Site; Idaho National Laboratory; the West Valley Demonstration Project, and DOE's Miamisburg Closure Project. For each site we selected, we reviewed and obtained information regarding cost, schedule, and performance under DOE's risk reduction measures. We independently verified, to the extent possible, the dollar figures and waste cleanup performance data provided to us by DOE, by taking various steps. For example, we analyzed budget formulation documents, documented waste cleanup assumptions, and obtained information on cost validation procedures. We determined that these data were sufficiently reliable for purposes of this report. In addition, at each site, we discussed with site officials implementation of the accelerated cleanup plan, progress toward meeting cost and performance goals, and any obstacles to meeting those goals.

To develop information on the key assumptions underlying the Department of Energy's accelerated cleanup plan, we analyzed information and documents provided by DOE officials and contractors at

[2]Results from nonprobability samples cannot be used to make inferences about a population, because in a nonprobability sample some elements of the population being studied have no chance or an unknown chance of being selected as part of the sample.

DOE headquarters and various sites. For many of the sites, we reviewed the performance management plans to assess how their approach to site cleanup would change under the accelerated plan. To determine how those assumptions affected achieving the accelerated cleanup goals, we evaluated site estimates of how the proposed changes under acceleration would impact site cleanup activities. Analyzing the reports provided by DOE, we determined the key contributors to the planned cost reductions. We then assessed through review of various reports and interviews with responsible officials the status of the key initiatives. We also discussed the progress of the plan with state regulators and Environmental Protection Agency officials, DOE headquarters officials, including the acting Assistant Secretary for Environmental Management, and officials from other headquarters offices.

In order to assess the reliability of the gold chart metrics and the cost and schedule data provided to us by DOE, we took several steps. First, we obtained and reviewed selected site baselines. These included reviews by DOE's Office of Engineering and Construction Management, as well as DOE's Office of Environmental Management. We also obtained and examined the review of DOE's fiscal year 2004 environmental liability estimate by DOE's independent auditor, KPMG. KPMG audits DOE's environmental liability estimate as part of its annual audit of DOE's financial statements. In addition to these steps, for the sites we visited, we obtained information on data reliability procedures from site and contractor officials to determine internal controls used to ensure accurate, complete, and timely data. Finally, we developed and administered a data reliability form to each site we reviewed, obtaining information including what types of tests are administered in database systems to ensure the accuracy and completeness of data entered into the system, if and how frequently data are reviewed by independent parties, and how DOE ensures risk reduction measures are independently verified. The forms were completed by DOE and contractor officials. We asked follow-up questions whenever necessary. Based on the information we obtained and our analysis of the information provided, we determined that the reliability of the data provided was adequate for the purposes of this report. As we noted throughout the report, we found methodological problems with DOE's reporting of cost data and estimation of cost reductions. In reporting its cost data, DOE incorrectly added cost numbers in actual (current) dollars for years prior to 2001 to cost numbers in constant 2003 dollars for years post-2001. DOE also incorrectly estimated cost reductions of $50 billion without adjusting for the time value of money. Since in our previous work we demonstrated the effect of these problems by correcting and re-estimating DOE's cost reductions, we did not do so again in this

report.[3] Therefore, we used DOE's estimates throughout as reported by DOE with no further correction. We conducted our review from June 2004 through July 2005 in accordance with generally accepted government auditing standards.

[3]U.S. General Accounting Office, *Nuclear Waste: Absence of Key Management Reforms on Hanford's Cleanup Project Adds to Challenges of Achieving Cost and Schedule Goals*, GAO-04-611 (Washington, D.C.: June 9, 2004).

Appendix II: DOE's Estimated Cost Reductions under the Accelerated Cleanup Plan

Table 8: Accelerated Cleanup Estimates

Dollars in thousands (2003 constant)

Office	Site/Program	Closure date change from FY01	Cost change from FY01(includes long-term stewardship)[a]	FY03 Lifecycle Cost (does not include long-term stewardship)[b]
Albuquerque	Kansas City Plant	-1 year	$1,440	$28,199
	Los Alamos Laboratory	0	-$726,528	$1,436,564
	Operations	–	$256,797	$437,280
	Pantex	-9	$23,220	$186,539
	Sandia National Laboratory	-3	-$39,887	$228,846
Carlsbad	Waste Isolation Pilot Plant	-4	-$3,697,077	$4,967,519
Chicago	Argonne National Laboratory	6	-$28,120	$62,239
	Brookhaven National Laboratory	3	$83,469	$362,166
	Operations	–	$36,833	$97,649
Idaho[c]	Idaho National Laboratory	-35	-$10,936,713	$11,599,306
Nevada[c]	Nevada Test Site	-2	-$54,657	$1,940,373
Oak Ridge	Oak Ridge Reservation	2	-$1,503,154	$6,883,568
Oakland	Energy Technology Engineering Center	0	-$2,044	$198,982
	Lawrence Berkeley National Laboratory	2	-$24,611	$33,165
	Laboratory Energy-related Health Research	-1	-$846	$40,464
	Lawrence Livermore National Laboratory	-1	$30,473	$504,405
	Operations	–	-$2,066	$49,461
	Stanford Linear Accelerator Center	2	$7,477	$20,139
	Separations Process Research Unit	0	-$5,085	$207,881
Ohio	Ashtabula Environmental Management Project	0	-$44,921	$154,977
	Columbus Environmental Management Project	0	-$2,504	$161,095
	Fernald Environmental Management Project	-4	-$55,294	$3,329,720
	Miamisburg Environmental Management Project	0	-$128,648	$1,304,317
	Operations	–	$453,820	$453,820

Dollars in thousands (2003 constant)

Office	Site/Program	Closure date change from FY01	Cost change from FY01(includes long-term stewardship)[a]	FY03 Lifecycle Cost (does not include long-term stewardship)[b]
	West Valley Demonstration Project	-29	-$326,532	$1,109,463
Paducah	Paducah Gaseous Diffusion Plant	20	$3,827,024	$3,476,147
Portsmouth	Portsmouth Gaseous Diffusion Plant	6	$7,539,895	$4,469,936
Richland	Hanford Site	-15	-$5,695,324	$20,380,244
River Protection	Office of River Protection	-18	-$16,710,839	$24,309,630
Rocky Flats	Rocky Flats Environmental Technology Site	0	-$223,022	$6,949,013
Savannah River	Savannah River Site	-13	-$14,089,347	$23,725,375
Other				
Sites closed before 2003[d]			-$701,188	$203,757
Environmental Management-wide costs[e]			-$6,545,128	$9,655,527
Costs transferred out in 2003			-$723,818	$0
Total			**-$50,006,905**	**$128,967,766**

Source: DOE.

[a]Because of the difficulty in separating long-term stewardship and cleanup activities from the pre-accelerated cost estimates, DOE included both when calculating the cost change under the new plan.

[b]The FY03 lifecycle cost estimate includes cleanup costs only since most long-term stewardship costs were transferred to other offices under the accelerated plan.

[c]Includes operations office costs.

[d]Because of work transfers within Environmental Management, some costs changed in 2003 at sites that closed before 2003.

[e]Includes Headquarters and Program Direction costs.

Appendix III: Comments from the Department of Energy

Department of Energy
Washington, DC 20585

July 18, 2005

Mr. Gene Aloise
Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, D.C. 20548

Dear Mr. Aloise:

Thank you for your June 30, 2005, letter to the Secretary of Energy providing the draft report, *Better Performance Reporting Needed to Assess DOE's Ability to Achieve the Goals of the Accelerated Cleanup Program*, and requesting written comments from the Department of Energy (DOE). Your draft report contains two recommendations that DOE: (1) improve the linkage between performance measures so that there is a clearer, discernable relationship between how much cleanup has been accomplished and costs incurred in doing the work, and (2) identify and highlight in its progress reports to Congress and others those performance measures that are the most critical to assessing overall progress toward meeting accelerated cleanup plan goals.

The Department agrees with the overall conclusion and accepts the recommendations. We provided comments to your staff on the draft Statement of Findings and appreciate the fact that many of our comments were incorporated into the draft report. However, we believe the draft still contains some inaccuracies and statements that could be misinterpreted. Enclosed are detailed comments that we respectfully request be considered as you finalize your report.

As discussed in the report, the Office of Environmental Management's (EM) earned value management system (EVMS) is an important tool in measuring and monitoring scope, schedule, and cost. To aid in implementing the Government Accountability Office's (GAO) recommendations and to address the observations in the report, EM will continue to improve its implementation of EVMS to serve as a link between performance measures (risk reduction scope and schedule) and cost. In addition, EM will be emphasizing project risk management as a method to better manage the uncertainties associated with achieving mission goals.

If you have any further questions, please contact me at (202) 586-7709 or Mr. Mark W. Frei, Deputy Assistant Secretary for Business Operations at (202) 586-8754.

Charles E. Anderson
Principal Deputy Assistant Secretary for
Environmental Management

Enclosure

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Gene Aloise (202) 512-3841

Staff Acknowledgments

In addition to the individual named above, Chris Abraham, John Delicath, Doreen Eng, Doreen Feldman, Nancy Kintner-Meyer, Jeffrey Larson, Gregory Marchand, Mehrzad Nadji, Judy Pagano, Thomas Perry, and Bill Swick made key contributions to this report.

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