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DEPARTMENT OF ENERGY

Alternative Financing and Contracting Strategies for Cleanup Projects

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The Honorable Joseph M. McDade
Chairman
The Honorable Vic Fazio
Ranking Minority Member
Subcommittee on Energy and Water Development
Committee on Appropriations
House of Representatives

As requested, this report addresses the use of fixed-price contracting and alternative financing strategies for the Department of Energy's (DOE) Environmental Management program's approach for privatizing cleanup projects. The report also examines how alternative financing methods might affect budget scoring.

As arranged, unless you publicly announce its contents earlier, we plan no further distribution of this report until 15 days after the date of this letter. At that time, we will provide copies of the report to the Secretary of Energy; the Director, Office of Management and Budget; and other interested parties. We will also make copies available to others upon request.

Please call me at (202) 512-3841 if you or your staff have any questions. Major contributors to this report are listed in appendix IV.

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Executive Summary

The Department of Energy's (DOE) Environmental Management program faces the monumental task of cleaning up the environmental problems created by nearly a half century of nuclear weapons production. This effort is being performed primarily under cost-reimbursement contracts. The Office of Environmental Management, however, has found this approach to be very expensive and slow. In an effort to reduce costs and improve timeliness, the Office proposed a "privatization" approach with two key elements: fixed-price contracts and private financing of the construction of waste treatment facilities. Concerned about whether privatization will achieve the goals expected by the Department, the Chairman and Ranking Minority Member of the Subcommittee on Energy and Water Development, House Committee on Appropriations, asked GAO to determine (1) what conditions need to be present in order to successfully use fixed-price contracting for Environmental Management's privatized cleanup projects, (2) what alternative financing approaches could be used for Environmental Management's privatization contracts, and (3) how alternative financing methods for Environmental Management's privatization projects might affect budget scoring.

Background

DOE has recognized that widespread weaknesses exist in its control of its contractors' costs and activities and, in 1994, began a Department-wide contract reform effort. The Office of Environmental Management's privatization program is one aspect of that effort. In fiscal years 1997 and 1998 combined, the Office requested about $2 billion for this program. GAO's previous reviews of those first two privatization budget requests found that (1) some projects were not needed, (2) the cost estimates for other projects were not complete or reliable, and (3) some projects were not required by compliance agreements and could be postponed.[1] Because of concerns about this new program, the Congress appropriated only about $232 million of the $1.006 billion requested for privatization in fiscal year 1998 and, at the Secretary of Energy's suggestion, required the Office of Environmental Management to submit detailed reports on privatization contracts for a 30-day congressional review. The Office requested $517 million for privatization in fiscal year 1999.

[1]The Office of Environmental Management is responsible for complying with numerous federal and state environmental requirements, including the Comprehensive Environmental Response, Compensation, and Liability Act; Resource Conservation and Recovery Act; and Clean Water Act. DOE has signed agreements with federal and state regulators to correct violations at its sites. These agreements identify activities—generally called milestones—and schedules for achieving compliance, many of which are legally binding and enforceable.

Results in Brief

Fixed-price contracting, one key aspect of Environmental Management's privatization program, can successfully be used for environmental cleanup projects when certain conditions in the Federal Acquisition Regulation are met. For example, the regulation finds that fixed-price contracts are appropriate when projects are well-defined, uncertainties can be allocated between the parties, and sufficient price information and/or multiple competing bidders are available to help determine a fair and reasonable price for the work. When these conditions exist, GAO found that the Office of Environmental Management has successfully used fixed-price contracts for a variety of activities ranging from cleaning up contaminated soils to decontaminating workers' uniforms. However, when these conditions do not exist, GAO found instances in which cleanup projects being performed under fixed-price contracts encountered cost increases and schedule delays. In addition, risks and issues that could affect the eventual performance of the contract—such as changes in environmental regulations and the sufficiency of the existing data on waste characterization to support the selection of a treatment technology—must be identified and addressed so that each party's responsibilities are clearly defined. Finally, as the Office of Environmental Management has acknowledged, managing fixed-price contracts takes managerial and procurement skills that are different from those required for managing cost-reimbursement contracts.

Total private financing, the second key aspect of Environmental Management's privatization program, represents one end of a continuum of construction financing options. Private financing transfers performance risk from the government to the private contractor, but costs for this approach are significant because of the increased risk assumed by the contractor. Total government financing represents the other end of the continuum of options. With government financing, financing costs are minimized, but performance risk, which has also proven to be costly, remains with the government. In between these two extremes, other financing options exist that attempt to strike a balance between performance risk and financing costs. These options include the government's guarantee of private debt financing, performance payments, and progress payments. In weighing the risk and financing costs of the options, consideration also needs to be given to the options' impact on the ownership of waste treatment facilities, government oversight, and the terms of contractors' performance.

How Environmental Management's privatization projects are scored for budget purposes depends on the way certain key aspects of the scoring

rules are interpreted. Although scoring determines the amount and timing of budget authority and budget outlays and how they are counted against the discretionary spending caps in the 1990 Budget Enforcement Act (as amended), it does not affect the total cost of projects. Environmental Management's privatization projects are currently scored as service contracts, allowing the Office to defer outlays until after the construction of facilities and equipment is completed. However, the use of alternative financing methods may change the interpretation of the scoring guidelines for these projects. As a result, under all of the alternative financing options that GAO analyzed, the Office of Environmental Management would need more budget authority earlier in the projects and would also incur outlays sooner than under the Office of Management and Budget's (OMB) current method of scoring privatization projects. Two key factors—facility ownership and assessment of government risk—will drive how different financing methods could be scored.

A complex matrix of decision factors needs to be considered when deciding how to contract for and finance a cleanup project. Among the factors that need to be weighed are the following: (1) What waste needs to be cleaned up, and how well is the waste characterized? (2) How much competition is there among firms with the necessary cleanup expertise? (3) What financing options are available? (4) What risks are associated with the cleanup, and who is best prepared to bear them? (5) How well equipped is DOE's staff to design and oversee a cleanup contract? Once a contract type and financing method are chosen, DOE and the contractor would need to carefully develop a contract that clearly defines each party's roles and accountability through provisions that allocate the project's risks between parties; to define DOE's oversight role; and to identify appropriate measures against which the contractor's performance will be judged.

Principal Findings

Key Conditions Needed for Fixed-Price Contracting

Fixed-price contracting, one key aspect of Environmental Management's privatization program, can successfully be used for environmental cleanup projects when certain conditions in the Federal Acquisition Regulation are met. For example, the regulation finds that fixed-price contracts are appropriate when projects are well-defined, uncertainties can be allocated between the parties, and sufficient price information and/or multiple

competing bidders are available to help determine a fair and reasonable price for the work. While fixed-price contracts are not suitable for every cleanup project, this type of contract generally provides the most incentive for the contractor to perform efficiently and to exercise cost control. The risk of cost overruns from poor performance is generally borne by the contractor, which helps to protect the government's interest. In addition, most fixed-price contracts are awarded through an open competition process that helps the government determine a fair price for the work. When these conditions have been present, the Office of Environmental Management has used fixed-price contracts to help ensure cost-effective cleanup.

Previous studies of the Office of Environmental Management's handling of environmental projects have found that when the scope of work has not been clearly defined or the technology is not readily available, the use of fixed-price contracts will not prevent significant cost overruns and schedule delays. A 1996 study commissioned by the Office of Environmental Management found that while cost and schedule performance had improved since 1993, cost overruns on Environmental Management's projects still ranged from 30 percent to 50 percent beyond the original estimates.[2]

However, when contracting for cleanup, the Office of Environmental Management must also consider additional factors, such as the availability of personnel to properly manage fixed-price contracts and whether existing waste characterization data are sufficient to support the selection or design of cleanup technology. Risks arising from the unique characteristics of each project, such as the specific type of waste to be treated, and more general risks, such as the possibility of changes in environmental regulations or of funding shortfalls, must be identified and allocated between the contractor and DOE. Finally, the Office of Environmental Management has recognized that its staff will need new and improved skills in the areas of finance, procurement, and project management to effectively implement the privatization program.

Alternatives to Total Private Financing Exist

The Office of Environmental Management's privatization program relies on private financing, in lieu of government financing, for the construction of needed waste treatment facilities. The contractor is expected to finance these construction costs until the facilities are completed and operations

[2]The Department of Energy, Office of Environmental Restoration and Waste Management, Project Performance Study Update, Independent Project Analysis, Inc. (Reston, Va.; Apr. 1996).

begin. Financing costs include the costs of raising money, taxes, and profit. The contractor is expected to provide the financing through some combination of its own funds (owners' equity) and borrowed funds (debt). Private financing transfers performance risk from the government to the contractor and has the potential to reduce a project's overall cost because it encourages the contractor, who has its own money at risk, to be more efficient. However, private financing increases the performance risk borne by the contractor, and as a result, private financing costs can be significant. Although other financing options exist that can lower financing costs by increasing the use of government financing, these options increase the risk to the government because the contractor's performance incentive may be reduced. Any added performance risk facing the government under these options can result in significant costs that may more than offset the benefit of lower government financing costs.

Other financing strategies include options such as a government guarantee of private-sector debt financing, partial payments to the contractor during construction with final payment contingent on successful waste treatment, and progress payments during construction. GAO analyzed the impact of financing alternatives, using the financing schedule from the existing privatization contract for the Advanced Mixed Waste Treatment Project at the Idaho National Engineering and Environmental Laboratory. GAO found that financing costs varied from $137.9 million for full private financing to $47.1 million for the progress payment option. Finally, with total government financing, no private financing costs are incurred because contractors are paid as costs are incurred.

While government financing of construction costs appears to be less costly than private financing, the government assumes a much greater performance risk, that is, the chance that the facility the government has financed will not be successfully completed or will experience significant cost growth. The potential costs associated with these risks could offset—or more than offset—any apparent advantage gained by using lower-cost government financing. According to DOE's past experience with major government-financed projects, these risks are real. For example, GAO found that from 1980 through 1996, 31 of DOE's 80 major systems acquisitions were terminated before completion after the government had expended over $10 billion. For 15 projects that were completed, final costs exceeded the original estimates by an average of 63 percent.[3] The cost of additional performance risk is difficult to quantify but must be considered

[3]Department of Energy: Opportunity to Improve Management of Major System Acquisitions (GAO/RCED-97-17, Nov. 26, 1996).

in any decision to reduce private-sector risk and lower financing costs by using full or partial government financing.

In addition, as the proportion of government financing increases, the government may want to assume more of an ownership role and have to exercise more oversight. Government ownership of a treatment facility could place the government in a better negotiating position for future cleanup services—especially if private ownership creates a monopoly for the private sector because the facility is the only one capable of providing the required treatment services. This potential benefit of government ownership must be weighed against the negative consequences of inadequate oversight by DOE. Finally, in considering the impact of financing options on performance risk, it is important to note that the actual terms of performance in the contract will determine the nature of the performance risk borne by the government and the private contractor.

How Projects Are Structured May Change Their Budgetary Impact

Under the Budget Enforcement Act of 1990 (as amended), discretionary spending is constrained by caps or dollar limits on budget authority and outlays.[4] When federal agencies enter into agreements to acquire or use capital assets such as waste treatment facilities, budget scoring determines when and how much budget authority and outlays will be counted against the caps. Depending on the way scorekeeping guidelines are interpreted, GAO found that changing the way Environmental Management's privatization projects are financed could result in more budget authority and outlays being scored, or budget authority and outlays being scored sooner, than under the Office of Environmental Management's current privatization approach. Under the guidelines, how Environmental Management's privatization projects are scored depends on two key factors—whether the contractor or the government will own the facility being constructed and, if the government will have ownership, what degree of risk the government assumes.

As Environmental Management's privatization program is currently structured, the private contractor will own the facilities, and OMB is scoring the projects as service contracts. This scoring allows the Office of Environmental Management to defer outlays until after the construction of facilities and equipment is completed. In general, if the government will ultimately own the facility, budget authority and outlays would most likely be scored earlier than if the private contractor retains ownership. In

[4]Budget authority is the authority provided by law to enter into financial obligations that will result in immediate or future outlays of federal funds. Outlays are the actual issuance of checks, disbursement of cash, or electronic transfers of funds made to liquidate a federal obligation.

addition, use of a loan guarantee would require the estimation of a subsidy cost (primarily an estimate of the risk of default), which could add significantly to the amounts of budget authority and outlays that would be needed during the construction period. Under all of the alternative financing options that GAO analyzed, the Office of Environmental Management would need more budget authority earlier in the projects and would also incur outlays sooner than under OMB's current method of scoring privatization projects. However, GAO has found that when decisions on capital asset acquisition are driven by budget scoring constraints, the government may pay more for the asset in the long run than necessary.[5]

Recommendations

This report does not contain recommendations.

Agency Comments

GAO provided a draft of this report to DOE for its review and comment. Overall, DOE stated that GAO's report represented a constructive attempt to clarify some of the important issues involved in alternative financing for DOE's cleanup projects. DOE also agreed with GAO's statement that while government financing appears less costly, the greater performance risk the government assumes when it finances a project, and the potential costs associated with this greater risk, could offset any apparent advantage gained by using lower-cost government financing. However, DOE believed that GAO should have attempted to compensate for these potential increases in costs in the model it used to estimate the impact of financing alternatives. GAO did not perform the adjustment DOE suggested because GAO did not have a factual basis for assigning levels of cost growth to all of the various financing alternatives it analyzed. Instead, GAO emphasized throughout the report that cost growth was a possibility as the government took on more performance risk and cited available evidence from independent studies and GAO reports to indicate how large this growth had been under DOE's existing contracts. Where appropriate, GAO made changes to the report in response to DOE's specific comments. DOE's comments are included as appendix III.

[5]Budget Issues: Budgeting for Federal Capital (GAO/AIMD-97-5, Nov. 12, 1996).

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Abbreviations

DOE	Department of Energy
EM	Environmental Management
FY	fiscal year
GAO	General Accounting Office
LMAES	Lockheed Martin Advanced Environmental Systems
OMB	Office of Management and Budget

Background

Since its inception in 1989, the Environmental Management (EM) program has used management contractors to perform cleanup projects and operate its major sites. While EM contracts authorize fees (i.e., profits) to motivate management contractors to high-quality performance, subpar performance in the areas of controlling costs and meeting schedules has repeatedly occurred. For example, a 1996 study commissioned by EM found that while cost and schedule performance had improved since 1993, cost overruns on EM projects still ranged from 30 percent to 50 percent.[1] More broadly, in November 1996, we found that, of 15 major system acquisitions completed by the Department of Energy (DOE) from 1980 through 1996,[2] the projects cost an average of 63 percent more than the original cost estimates and were completed an average of 71 months late.[3] More recently, DOE's Inspector General found a number of problems with the implementation of performance incentives in management contracts, including DOE having paid incentives for work that was not completed by the required performance date, for work done before performance measures were established, and for work that was not done at all.[4]

EM's privatization program is one aspect of DOE's Department-wide effort that began in 1994 to reform the Department's contracting practices, including an increased emphasis on the use of performance incentives and fixed-price contracts. EM's privatization approach currently has two key elements. First, privatization uses fixed-price contracts under which the contractor is paid a fixed amount for acceptable goods and services regardless of the costs the contractor incurs. Second, privatization contractors are expected to provide private financing for the construction of facilities, if needed, to produce the final product EM is buying. The privatization program receives a separate appropriation to cover the capital investment portion of these contracts. However, in the event the contract is terminated by the government before completion, the privatization funding will be used to reimburse the contractor for its capital investment. If the contract is continued through completion, the privatization funding will be used to repay the capital investment as acceptable goods or services are provided. Although this is the current

[1]The Department of Energy, Office of Environmental Restoration & Waste Management, Project Performance Study Update, Independent Project Analysis, Inc. (Reston, Va., Apr. 1996).

[2]A major system acquisition is defined as a project critical to fulfilling an agency's mission, entailing the allocation of relatively large amounts of resources and warranting special management attention.

[3]Department of Energy: Opportunity to Improve Management of Major System Acquisitions (GAO/RCED-97-17, Nov. 26, 1996).

[4]According to DOE officials, DOE has recovered $2.8 million in questioned fees following the 1997 Inspector General's review.

approach to privatization, according to DOE officials, EM's privatization program will continue to evolve over time as DOE learns more through evaluating actual business proposals.

The privatization program was first funded in fiscal year (FY) 1997, when the Congress appropriated $330 million to support five projects, including the Tank Waste Remediation System at Hanford (see table 1 below). In FY 1998, the Congress provided an additional $200 million for one existing project and four new projects, including Spent Nuclear Fuel projects at Savannah River and at Idaho, a transportation project at Carlsbad, and a waste disposal project at Oak Ridge. In addition, the Congress provided $31.7 million in FY 1998 through the Defense Facilities Closure Projects account for two smaller privatization projects at EM's Fernald Environmental Management Project in Ohio. The FY 1999 budget request includes about $517 million to continue work on ongoing privatization projects at Hanford, Idaho, and Oak Ridge, and one new transportation project administered by the Carlsbad Area Office.

Table 1.1: Status of EM's Proposed Privatization Projects, FYs 1997 Through 1999

Dollars in millions

		Appropriations		
		Actual		Requested
Project (location)	Current status	FY 1997	FY 1998[a]	FY 1999
Tank Waste Remediation System (Hanford)	Phase I contract awarded, Part A complete, Part B under review	$170.0	$115.0	$330.0
Broad Spectrum Low-Level Mixed Waste Treatment (Oak Ridge)	Canceled from privatization funding; continuing from operating funding	15.0	0.0	[b]
Advanced Mixed Waste Treatment Project (Idaho)	Ongoing; contract awarded December 1996	70.0	0.0	87.0
Waste Water Treatment Plant (Rocky Flats)	Canceled from privatization program	10.0	0.0	[b]
Transuranic Waste Treatment (Oak Ridge)	Procurement process ongoing	65.0	0.0	[c]

(continued)

Dollars in millions

Project (location)	Current status	Appropriations		
		Actual		Requested
		FY 1997	FY 1998[a]	FY 1999
Contact Handled Transuranic Waste Transportation (Carlsbad)	Ongoing project	[d]	21.0	[c]
Spent Nuclear Fuel Dry Storage (Idaho)	Procurement ongoing	[d]	27.0	30.0
Environmental Management Waste Management Disposal (Oak Ridge)	Procurement ongoing	[d]	5.0	50.0
Spent Nuclear Fuel Transfer and Storage (Savannah River)	Ongoing project[e]	[d]	25.0	[c]
Remote Handled Transuranic Waste Transportation (Carlsbad)	New FY 1999 project	[d]	[d]	19.6
Waste Pits Remedial Action (Fernald)	Project transferred to Defense Facilities Closure Projects account	[d]	0.0	[b]
Silo 3 Residue Waste Treatment (Fernald)	Project transferred to Defense Facilities Closure Projects account	[d]	0.0	[b]

[a]An additional $7 million in non-project-specific funds was appropriated.

[b]Project will not be funded through the privatization account.

[c]No funding requested in this fiscal year.

[d]Project was not proposed for privatization funding until the following fiscal year budget.

[e]This project has limited funding to date and is in the preconceptual design stage.

Source: Compiled by GAO from DOE's data.

In 1997, we reported problems with DOE's FY 1997 and FY 1998 privatization budget requests.[5] These included estimated costs for projects that did not always include all relevant costs, such as those that would be incurred by the sites' management contractors to support privatized projects. In addition, funding for some projects was not needed when requested. For example, although funds were requested for FY 1998, we found that the Power Burst Facility at Idaho would not be ready for deactivation until FY 1999. In addition, in computing cost savings, EM did not always compare projects of comparable scope, as in the case of the Savannah River M-Area Mixed Waste Tank Remediation project. Finally, in its fiscal year 1997 budget request, EM cited the Idaho Pit 9 project as a successful privatization on the basis of its placement of a fixed-price contract. However, we found that, since the contract was let, the project has fallen significantly behind schedule and that EM and its management contractor are involved in a disagreement with the fixed-price subcontractor over a number of performance issues. The future course, including the ultimate cost, of this project is uncertain until these disagreements have been formally resolved.[6]

These early problems with implementing the privatization program have led to concern in the Congress about whether privatization, as defined by EM, is appropriate for large, capital-intensive projects. These concerns led the Congress to deny a substantial portion of EM's FY 1998 privatization budget request and to require EM to submit detailed reports analyzing privatization contracts for a 30-day congressional review before incurring any additional contractual obligations. Specifically, DOE cannot (1) enter into a new privatization contract, (2) exercise authorization to proceed with a privatization contract, or (3) extend a privatization contract by more than 1 year without providing the Congress an opportunity to review the proposed action.

Objectives, Scope, and Methodology

The Chairman and Ranking Minority Member of the House Committee on Appropriations, Subcommittee on Energy and Water Development, asked us to review EM's privatization program. Specifically, we determined (1) what conditions need to be present in order to successfully use fixed-price contracting for EM privatization cleanup projects, (2) what

[5]See Nuclear Waste: DOE's Estimates of Potential Savings From Privatizing Cleanup Projects (GAO/RCED-97-49R, Jan. 31, 1997) and DOE's Fiscal Year 1998 Budget Request (GAO/RCED-97-171R, July 21, 1997).

[6]See Nuclear Waste: Department of Energy's Project to Clean UP Pit 9 At Idaho Falls is Experiencing Problems (GAO/RCED-97-180, July 28, 1997) and Nuclear Waste: Department of Energy's Pit 9 Cleanup Project Is Experiencing Problems (GAO/T-RCED-97-221, July 28, 1997).

alternative financing approaches could be used for EM privatization contracts, and (3) how alternative financing methods for EM privatization projects might affect budget scoring.

To determine the elements needed to successfully use fixed-price contracts for cleanup projects, we visited three Department of Energy sites with active privatization programs—Hanford, Idaho, and Oak Ridge. During our site visits, we gathered information on cleanup projects formally proposed for privatization. We also reviewed a judgmentally selected group of cleanup projects that used an alternative to the traditional method of having the management contractor perform the work on a cost-reimbursement basis, such as the use of various forms of fixed-price and cost-reimbursement incentive contracts. In addition, to determine what factors DOE considers in selecting the type of contract for cleanup projects, we interviewed the privatization coordinators, contracting staff, and project management staff at each of the sites. At DOE headquarters, we also interviewed officials from (1) EM's Office of Program Integration, (2) DOE's Contract Reform and Privatization Project Office, and (3) DOE's Office of Procurement and Assistance Management. We researched the Federal Acquisition Regulation for information on the various types of contracts, their major features, and criteria for selecting which type of contract to use. Finally, we interviewed officials from the Army Corps of Engineers' Environmental Division.

To identify alternative financing approaches for EM's privatization contracts, we interviewed officials of companies currently participating in privatization projects and representatives of financial consulting firms that help clients secure capital for environmental and construction projects. We also discussed project financing issues with the DOE headquarters and field staff listed above and searched relevant financial literature to gather background on issues such as private firms' capital structures and estimation of financing costs. Finally, we constructed a model using actual data from the contract for the Idaho Advanced Mixed Waste Treatment Project. We used the model to determine the comparative costs of financing under several scenarios. We received assistance in the modeling effort from our Office of the Chief Economist.

To evaluate how alternative financing and contracting approaches might affect budget scoring of EM's privatization projects, we analyzed the scoring guidelines in the Office of Management and Budget's (OMB) Circular A-11. We also discussed budget scoring issues with officials of

OMB and the Congressional Budget Office. We received assistance in this effort from our Accounting and Information Management Division.

We provided a draft of this report to DOE for its review and comment. DOE's comments and our response are included as appendix III and are discussed in the chapters where appropriate. We performed our review from July 1997 through May 1998 in accordance with generally accepted government auditing standards.

Certain Key Conditions Need to Be Present in Order to Use Fixed-Price Contracting

Fixed-price contracts can be used for cleanup projects, including privatization projects, when certain conditions in the Federal Acquisition Regulation are met. For example, the regulation finds that fixed-price contracts are appropriate when projects are well-defined, uncertainties can be allocated between the parties, and sufficient price information and/or multiple competing bidders are available to help determine a fair and reasonable price for the work. In addition, EM's projects place special demands on both EM and the contractor which must be considered when selecting the contracting strategy that will be most cost-effective. For example, contracts for EM's projects must consider the need to indemnify contractors for accidents involving nuclear materials. Over the past few years, EM has had some success with fixed-price cleanup contracts; however, experiences in Idaho and Oak Ridge illustrate that fixed-price contracting is not appropriate for every cleanup project.

Factors to Consider When Selecting Fixed-Price Contracts

The Federal Acquisition Regulation finds that fixed-price contracting is the preferred type of contract for government acquisitions when certain conditions are met. In general, a fixed-price contract provides the most incentive for the contractor to perform efficiently and to exercise cost control. The risk of cost overruns from poor performance is generally borne by the contractor, which helps to protect the government's interest. In addition, most fixed-price contracts are awarded through an open competition process that helps the government determine a fair price for the work. The conditions most conducive to using fixed-price contracts include the following:

- a clearly defined scope of work;
- low probability of major changes to work scope or conditions to avoid costly renegotiation of price;
- existence of proven technologies that can be applied with no more than limited modifications;
- sufficient price information and/or multiple competing bidders to aid in determining a fair price for the work, that is, a price that minimizes the cost to the government while providing a fair profit to the contractor;
- easily verifiable performance measures to facilitate monitoring progress toward project completion; and
- thorough analysis of risks and appropriate allocation or sharing of risks so that the party best able to manage each risk is responsible for addressing it.

EM Has Used Fixed-Price Contracts Successfully

When the conditions discussed above have been present, EM has used several varieties of fixed-price contracts to help ensure cost-effective cleanup. For example, Idaho and Hanford have used fixed-price contracts for laundry services for items such as contaminated workers' uniforms. DOE has estimated the savings from the Idaho contract at $3 million to $8 million over the next 10 years, and savings from the Hanford contract are estimated to be about $4.5 million per year. Hanford also contracted for the treatment of 24,000 to 26,000 gallons of tri-butyl phosphate wastes on a fixed-price contract at a total savings of about $1.5 million. At Savannah River, the M-Area Mixed Waste Tank Remediation project was privatized in 1993. While the contractor has experienced some technical problems, the contractor expects to successfully complete waste treatment operations under the terms of the original contract. EM estimates this contract will save a total of $19 million to 28 million. Finally, at Idaho the fixed-price contract for low-level waste treatment has a unit cost of about one-half that of the on-site facility that formerly performed this work.

While EM's focus in pursuing fixed-price contracts has been on saving money, fixed-price contracts can incorporate incentives that accommodate other goals. For example, Oak Ridge used an incentive to reduce the amount of waste created in its contract for the cleanup of the St. Louis North County site of the Formerly Utilized Sites Remedial Action Program. If the contractor shipped less waste, primarily soil, to the designated disposal site than estimated in the contract, DOE avoided the costs of waste disposal. As an incentive for the contractor to minimize waste shipments, DOE split the value of those savings with the contractor. Similarly, the contracts for the Oak Ridge Broad Spectrum Low-Level Mixed Waste Treatment are planned to include incentives for minimizing the volume of waste to be disposed of or stored after treatment.

If a fixed-price contract does not appear to be cost-effective, other contracting methods may offer similar benefits. One such alternative is the use of incentives in cost-reimbursement contracts to motivate the contractor to achieve better cost control and performance. For example, Oak Ridge and its management contractor agreed to cost-plus-incentive-fee contracts for several cleanup projects. While the contractor's costs were covered, the only way for the contractor to earn a fee or profit on the work was to meet or improve on cost and schedule targets. Under this contract, if the contractor missed the targets by specified amounts, the fee earned could be a negative amount, that is, a loss. The first of these incentive projects was for the demolition of a

powerhouse complex on the K-25 site. The project was completed 6 months ahead of schedule and $5 million under target cost.[1] Under another cost-plus-incentive-fee contract for the demolition of cooling towers on the K-25 site, the contractor completed the project 2 months ahead of schedule and more than $5 million under target cost, partly by finding an innovative way to dispose of contaminated water that had accumulated in the basins under the cooling towers. (See app. I for further discussion of alternative contract types and illustrative examples of EM's cleanup contracts using them.)

Additional Factors Beyond the Contract Type Need to Be Considered

When contracting for cleanup, EM must also consider additional factors that occur because of the unique characteristics of cleanup projects and the special conditions pertaining to working in the DOE complex. These factors include several types of risks that must be shared or allocated between EM and the contractor, the unique aspects of each project, and the availability of personnel to properly manage fixed-price procurements and projects.

Risks must be identified and addressed in the contract so that each party's responsibilities are clearly defined. Some risks, such as the possibility of changes in environmental regulations during a project's lifetime, third-party liability and insurance, environmental indemnification, construction cost and schedule changes, interest rate fluctuations, material cost escalation, lack of sufficient appropriations to support the original schedule, and termination for convenience of the government, are not unique to EM's cleanup projects but must still be considered in estimating the contract price. Other risks, such as indemnification for accidents involving nuclear materials, working with EM's stakeholders, and addressing the concerns of unionized workers at EM sites, generally are not found outside of the DOE complex. There are also risks inherent in cleanup projects, such as determining whether the existing waste characterization data are sufficient to support technology selection or design, and how new or existing treatment technologies will perform on a specific waste stream. EM also faces risks such as pre-existing site conditions and paying contractors for idle facilities if, for example, EM or the management contractor fails to deliver waste for treatment as specified in the contract.

[1]However, Oak Ridge officials stated that the contractor had earned the bulk of its cost incentive fee by awarding fixed-price subcontracts for less than the estimated amounts included in its bid. Subsequently, DOE officials limited the amount of cost incentive fee that the contractor could earn on the basis of subcontract awards. See Department of Energy: Contract Reform Is Progressing, but Full Implementation Will Take Years (GAO/RCED-97-18, Dec. 10, 1996) for a fuller discussion of this contract.

EM's 1997 Privatization Project Team Staffing Report states that "[i]mplementing privatization will require the modification of the Department's traditional project management practices."[2] When compared to starting cleanup projects using management contractors, EM officials acknowledge that using fixed-price contracts requires additional project definition and planning before and during the procurement process. Under management contracts, EM managers could make changes as the project progressed without explicit recognition of the costs of those changes. While fixed-price contracts can help to reduce costs and improve performance when used properly, the cost of any changes to work scope must be negotiated with the contractor, potentially raising the price of the contract. In recognition of that fact, EM's Privatization Management Plan[3] requires that privatization contracts contain a clause limiting who can direct the contractor to make changes that could affect the scope (and, implicitly, the price) of the contract. Not all EM managers are comfortable using fixed-price contracts because of this limited flexibility to make changes after the contract is awarded.

Using fixed-price contracts requires that employees have a different skill mix than EM has needed in the past to manage cleanup projects through its management contracts. The Project Team Staffing report also highlighted some areas in which EM managers will need new or strengthened skills to effectively implement the program. For example, the report notes that privatization procurements require more effort in the early stages of procurement development and more staffing in contract administration and monitoring. The report also recognizes that EM project teams have not traditionally had all of the skills—such as those associated with corporate budgeting, capital market analysis, financing of employee benefit programs, and hands-on experience developing complex schedules and project management plans—needed to ensure that privatization procurements and contracts are fully executable. Consequently, some project managers and procurement staff may need additional training to use fixed-price contracts to full advantage. One step DOE has taken to address these new demands on its staff is to require that all privatization procurement requests for proposals and contracts be sent to headquarters for review and concurrence by functional experts, staff in the Office of Procurement and Assistance Management, and other key officials before they are issued. In addition, EM management is working with the field

[2]Department of Energy, Report to the Assistant Secretary for Environmental Management: Privatization Project Team Staffing (Aug. 24, 1997).

[3]Department of Energy, Environmental Management Privatization Program Management Plan (Sept. 1997.)

offices to develop a new training curriculum to provide project managers and procurement staff with additional skills so that they can better recognize when to use fixed-price contracts.

Our work has repeatedly highlighted continuing problems with DOE's management of projects and contracts. In November 1996, we reported that lack of sufficient DOE personnel with the appropriate skills to oversee contractors' operations was one of the key factors underlying the cost overruns and schedule slippages DOE has experienced in major systems acquisitions.[4] In March 1997, we reported that a key cleanup project at EM's Fernald, Ohio, site has experienced significant delay and cost growth because DOE did not assign a sufficient number of staff with the proper skills to the project.[5] Finally, as we discuss in detail in the next section, Idaho has experienced problems with the Pit 9 cleanup, which DOE chose to privatize, in part, because of the lack of in-house expertise in large remediation projects.[6]

Using Fixed Price Contracts DOEs Not Guarantee That EM Will Achieve the Cost Reduction and Performance Anticipated

Without careful attention to devising the right type of contract, the unique aspects of cleanup projects, and proper management oversight, EM may not get the cost reduction and performance it anticipates from using fixed-price contracts. As we noted in our recent report on DOE's estimates of potential savings from privatizing cleanup projects,[7] DOE's use of fixed-price contracts has not always been an effective method to minimize cost growth on projects. EM contracted with a consulting firm, which issued a report in November 1993[8] and an update in April 1996,[9] to review EM's performance on cleanup projects performed under both cost-reimbursement and fixed-price contracts. The report found that EM's

[4]See Department of Energy: Opportunity to Improve Management of Major System Acquisitions (GAO/RCED-97-17, Nov. 26, 1996).

[5]See Department of Energy: Management and Oversight of Cleanup Activities at Fernald (GAO/RCED-97-63, Mar. 14, 1997).

[6]See Nuclear Waste: Department of Energy's Project to Clean Up Pit 9 at Idaho Falls Is Experiencing Problems (GAO/RCED-97-180, July 28, 1997).

[7]See Nuclear Waste: DOE's Estimates of Potential Savings From Privatizing Cleanup Projects (GAO/RCED-97-49R, Jan. 31, 1997).

[8]The Department of Energy, Office of Environmental Restoration and Waste Management, Project Performance Study, Independent Project Analysis, Inc. (Reston, VA., Nov. 30, 1993). Because the study included both completed and ongoing projects, some of the costs were estimated.

[9]The Department of Energy, Office of Environmental Restoration & Waste Management, Project Performance Study Update, Independent Project Analysis, Inc. (Reston, Va., Apr. 1996). The study did not update EM's performance on fixed-price contracts.

costs for environmental work were substantially higher than private industry's. In 1993, it found that growth from estimated to actual costs on a sample of 65 projects with fixed-price contracts was almost 75 percent. In the 1996 update, it reported that EM's projects typically cost 25 percent to 40 percent more than similar projects in the private sector. While it found that EM's cost performance had improved since the 1993 review, EM was still experiencing cost growth in the range of 30 percent to 50 percent over original estimates. It concluded that this cost growth has occurred primarily because projects were poorly defined, leading to change orders after the contracts were signed.

In 1994, Lockheed Martin Idaho Technologies Company, the management contractor at Idaho, awarded a fixed-price subcontract to Lockheed Martin Advanced Environmental Systems (LMAES) for the cleanup of Pit 9.[10] Pit 9 is about one acre in size and contains various wastes ranging from contaminated rags to plutonium-contaminated sludge. The cleanup was expected to cost about $200 million[11] and to be completed in 1999. DOE chose a fixed-price approach for the Pit 9 project because Department officials believed a fixed price would help limit the project's total cost and provide an incentive for contractors to use efficient practices in carrying out the project by shifting the risk of nonperformance to the contractors. During the early stages of the procurement process, concerns arose about the appropriateness of a fixed-price approach given the uncertainty about the contents of the pit. Nevertheless, senior DOE officials decided that this approach was warranted, given the high costs and the inefficient performance the Department had experienced with cost-reimbursement contracts, private industry's expressed interest in performing the cleanup using a fixed-price arrangement, and the potential benefits of the approach.

However, in March 1997, when the subcontractor estimated that project completion would be 26 months behind schedule, LMAES requested an equitable adjustment and conversion of the contract type to cost reimbursement. LMAES claims that DOE failed to properly describe the contents of the pit and that DOE and its management contractor have interfered with the contractor's operations, preventing it from meeting its contractual commitments. DOE and the management contractor at Idaho

[10]The procurement and project evaluation was performed primarily by EG&G, the predecessor management contractor.

[11]GAO estimated the total cost of this contract to be about $200 million, including $179 million for the cleanup and a $21 million deferred payment for equipment that will be due to the contractor if it does not receive additional contracts during which the equipment can be reused.

disagree with LMAES' claims and claim, in their turn, that the contractor failed to properly manage the project. LMAES has requested a total of $257 million for costs through June 1997, $78 million more than the project was expected to cost, but the waste retrieval and processing facilities are not ready and no wastes have been retrieved or processed. As of May 1998, these issues remain unresolved and the project remains stalled.

In Oak Ridge, a multiphase cleanup project was discontinued after the first phase because the treatment system proposed by the contractor was too expensive and treatment was determined not to be necessary. The management contractor, Lockheed Martin Energy Systems, attempted to contract with multiple firms for the first phase of the West End Treatment Facility project to design a treatment process for a fixed payment. However, they discovered that because the project required each contractor to be able to perform several different types of activities—such as removing sludge from storage tanks, transferring the waste to a treatment facility, and treating the waste—only one firm submitted a responsive bid. Ultimately, the management contractor recommended to EM that the second phase procurement for waste treatment be canceled, but because only one contract had been let, and that contractor had invested more than the fixed amount, EM ended up paying a negotiated equitable adjustment that more than doubled the cost of the first phase contract from $400,000 to about $900,000. In retrospect, EM and management contractor officials told us that they should have reconsidered the project when only one responsive bid was received and determined why they did not receive the level of competition they were expecting. The lack of competition in the procurement for the first phase of this project ultimately led to increased costs when the later phases of the project were canceled.

Another project at Idaho for the long-term storage of damaged fuel from the Three Mile Island reactor has been delayed and the fixed-price contract has been modified 12 times. The Idaho project managers stated that a fixed-price contract would probably not have been chosen for this project if they had known that a change from DOE regulation to Nuclear Regulatory Commission regulation would be made and that the condition of temporarily stored fuel was different from what was expected at the time the contract was awarded. In this instance, the delays and contract modifications have added about $4 million (or 33 percent) to the cost of the project, raising the cost from $12 million to $16 million.

Alternative Financing Approaches Exist for EM's Privatization Program

EM's privatization program relies on private financing of construction costs to create a performance incentive for the contractor to construct a successful facility. However, private financing increases the performance risk borne by the contractor, and as a result, private financing costs can be significant. Other financing options exist that would leave some performance risk with the government by increasing the use of government financing. However, the risk associated with these options could result in significant costs to the government that may offset—or more than offset—the benefit of lower financing costs. In weighing the financing and risk costs, consideration should also be given to the impact of the option selected on ownership of facilities, government oversight, and the terms of contractors' performance.

EM's Privatization Program Relies on Private Financing

EM's privatization program relies on private financing for the acquisition of needed cleanup facilities and equipment. Under EM's approach, the contractor will own all facilities required to deliver the desired cleanup services. The contractor is responsible for all construction costs, including the development of technologies, procurement of equipment, and new-facility construction. In addition, the contractor is expected to finance these construction costs until the facilities are completed and operations begin. Financing cost includes the costs of raising money, taxes, and profit. The contractor is expected to provide the financing for these costs through some combination of its own funds (owners' equity) and borrowed funds (debt). As the contractor begins to deliver cleanup services, the contractor is paid for its operating costs. In addition, each year the contractor is paid a portion of the construction and financing costs it has incurred until these costs are eventually recouped. These payments for the contractor's construction and financing costs are directly tied to the amount of cleanup services it provides.

EM Expects Private Financing to Create Performance Incentive for Contractors

EM expects that its private financing approach will ensure that contractors are properly motivated to perform successfully in two ways. First, because a contractor's recoupment of its investment is dependent on performance, it will have a greater incentive to perform. Second, because the contractor is financing construction through the use of debt, EM believes that the lenders will provide third-party oversight to ensure that their investment is sound. They are likely to hire various consultants to review all aspects of the contractor's plans to ensure that the project is feasible, which provides assurance that the likelihood of contractor failure is minimized. In addition, if the contractor does fail to complete the project for some

reason, this oversight provides further assurance to the lenders that they could take over the project, bring in another contractor to complete it, and recoup their investment.

While fixed-price contracting is believed to provide some greater control over price, EM believes that private financing is key to ensuring that the project is successful. With only a fixed-price contract and no private financing at stake, EM is concerned that it will have little recourse against a contractor that does not deliver as promised. EM's concern stems from the fact that contractors that have expressed an interest in large cleanup projects have indicated that they will form separate subsidiaries to perform the contract, using a commonly employed approach known as limited liability companies, that are heavily debt-financed and have few assets of their own. Without appropriate warranties from the parent company, the use of these limited liability companies can financially and legally isolate the project from the parent companies and limit the parent companies' liability for contract performance. However, under such an arrangement, EM is concerned that if the contractor fails to meet the terms of the contract, the contractor could shut down, leaving EM with an inoperable facility and little hope for recourse against a heavily debt-financed company with few assets.

Cost of Private Financing Can Be Significant

The total capital cost of a facility consists of the construction costs (including design, construction, and equipment procurement costs) and the financing costs. Private financing costs can be high and can significantly increase the total capital costs. For example, under DOE's contract with British Nuclear Fuels Limited, Inc., to build the Advanced Mixed Waste Treatment Project in Idaho, EM will pay construction costs of $244.6 million in 1998 dollars.[1] Private financing of these costs will add another $137.9 million, more than half of the construction costs. As larger cleanup projects are considered by EM, such as Hanford's Tank Waste Remediation System project, which is expected to have construction costs of more than $1 billion, concerns have been raised about whether private financing is a realistic alternative.

[1]In order to make a proper comparison between the different financing options, which have different timing of payments, we valued the construction and financing costs in present value 1998 dollars. Consistent with GAO's policy, we used a discount rate of 6 percent, which is the interest rate on marketable Treasury debt with maturity comparable to that of the projects being evaluated.

Other Construction Financing Options Are Available

Total private financing represents only one end of a continuum of construction financing options. Total government financing, as traditionally used in EM's cost-reimbursement management contracts, represents the opposite end of the continuum. Under total government financing, contractors are paid as costs are incurred, eliminating the need to arrange private financing to carry these costs. The performance risk faced by the contractor is also low because the payment is based on costs incurred, not for performance of cleanup services.[2] The government, through EM, bears the bulk of the performance risk.

In between these two extremes, other financing options exist that attempt to strike a balance between financing cost and performance risk. On the basis of reviews of literature and discussions with government and private-sector officials involved with privatization financing, we identified several other financing options. These options are by no means inclusive of all of the possible financing options available to EM, but they reflect a range of options that might be considered and the trade-off between financing costs and performance risk borne by the government. These options include government guarantee of private-sector debt, a performance-based partial-payment plan, and progress payments.

Government Guarantee of Debt

A contractor's construction financing will likely include a great deal of private debt financing. The total amount of debt financing is expected to account for about 70 percent or more of the total financing required. Lenders will charge an interest rate on the debt on the basis of their perceived risk of losing the money loaned to the contractor for construction. The higher the perceived risk that the contractor will not be successful and default on the loan repayment, the higher the interest rate charged for the debt financing, assuming private debt financing is available at all. However, if the government were to guarantee the lenders that they would not lose their money through default, then the interest rate charged and the contractor's financing costs would be lowered. The government could choose to guarantee all or some portion of the total private debt, which could significantly lower the contractor's financing costs.

Even with a government guarantee of debt, the contractor would still face a performance risk; that is, the contractor would not get paid unless it delivered cleanup services. However, with government involvement in the

[2]Total government-financed contracts—such as DOE's traditional cost-reimbursement contracts—may include an award fee that is dependent on the performance of the contractor. However, typical award fees in DOE's cost-reimbursement contracts represent a small percentage of the total value of any single contract. According to DOE officials, the total award fees paid by DOE each year amount to tens of millions of dollars.

financing, the government would also bear a performance risk it did not face under total private financing. The government guarantee of debt would put the government in a position in which it would have to reimburse lenders for any defaults on debt financing for the project. If the amount of debt is significant, a 100-percent government guarantee could result in high costs to the government in case of default. Because of the default risk faced by the government, EM would be required to estimate a subsidy cost of providing any debt guarantee.[3] This cost must be considered in addition to the contractor's financing costs when considering this type of financing option.

Performance-Based Partial-Payment Plan

Another option that may be available to EM is a partial-payment plan that is tied to the contractor's performance. Under this option, the government would pay for a portion of the construction costs as they are incurred, while the contractor would be required to finance the balance until it began operations. Then, as in the private financing option, the government would make payments based on the performance of cleanup services—such as the amount of waste processed—that would allow the contractor to recoup its construction costs plus its financing costs. For example, the government could pay 80 percent of construction costs as they are incurred while the contractor would be required to finance 20 percent of the construction costs. With the government providing an increasing portion of construction costs, the amount of private financing required would drop and financing costs could be lowered significantly.

With the performance-based partial-payment plan, the contractor would still face performance risk to the extent that recouping its portion of the construction and financing costs still would be dependent on successful performance. However, as the amount of government financing increases, the amount of performance risk assumed by the government also increases. Many variations of this option may be considered that either increase or decrease the amount of funding the government provides.

Progress Payments

Progress payments are used throughout the federal government for the procurement of various types of assets, including capital assets. Generally, the government uses progress payments to assist a contractor who will incur significant expenditures prior to the delivery of products that it will not be able to finance itself. The government may provide up to 80 percent of the costs as they are incurred under a contract. The balance is generally paid upon successful completion of the contract.

[3]Federal loan guarantees made on or after October 1, 1991, are subject to the requirements of the Federal Credit Reform Act, which includes a requirement to estimate subsidy cost. See chapter 4 for further discussion of this issue.

EM's privatization projects with large construction costs will cause contractors to incur significant expenditures prior to the completion of facilities and the delivery of cleanup services. Under a progress payment option, the government could pay for a portion of the costs as they are incurred while the contractor would be required to finance the balance of its costs. This option is similar to the performance-based partial-payment plan; however, under the progress payment option, the contractor would recoup its construction costs plus its financing costs as the cleanup facility (the asset) was successfully completed. Payment to the contractor for construction would not be based on performance over an initial operations period. Financing costs would be lower because the contractor would not carry its construction costs over a period of operations.

With the progress payment option, the contractor would still face performance risk for the delivery of a completed facility that works as designed. Many variations of this option could be considered that either increase or decrease the amount of funding the government provides. Once again, as the amount of government financing increases, the amount of government funding at risk to performance increases.

Advanced Mixed Waste Treatment Project Serves as Model for Analyzing Construction Financing Options

In order to evaluate the impact of other construction financing options on financing costs, we reviewed the financing schedule of EM's privatization contract with British Nuclear Fuels Limited, Inc., to build the Advanced Mixed Waste Treatment Project in Idaho. The contract, signed in December 1996, is one of the few privatization contracts that has been signed whose construction costs are financed by the private sector. Assuming that construction costs of $244.6 million, in 1998 dollars, would be the same for each financing option, we analyzed the difference in financing costs for the five financing options. (For further detail and discussion of the analysis conducted and the impact on results of using different assumptions, see app. II.)

Government Financing Involves a Trade-Off Between Lower Financing Costs and Increased Performance Risk to the Government

Using the Advanced Mixed Waste Treatment Project as a model, total private financing represents the highest financing cost—$137.9 million—for construction financing. As the amount of government involvement in financing increases, the financing costs of the options decrease. With a 100-percent government guarantee of debt, the contractor's financing costs are $104.1 million. Under a performance-based partial-payment plan that assumes government financing of 80 percent of costs and payment of the balance over the first 5 years of operations, financing costs are $62.7 million. Under a progress payment option with

the government financing 80 percent of costs until construction is completed, financing costs are $47.1 million. Finally, with total government financing, no private financing costs are incurred because contractors are paid as costs are incurred.[4]

While government financing of construction costs would appear to be the most attractive option, under this approach the government is assuming a much greater level of performance risk than it would face under a private financing option. This risk includes the risk that the facility the government finances will not be completed successfully or that the facility will experience significant cost growth. The potential costs associated with these risks could offset—or more than offset—any potential benefits of lower-cost government financing. On the basis of DOE's past experience with major government financed projects, including EM's projects, these risks are real. For example, we found that between 1980 and 1996, 31 of DOE's 80 major system acquisitions were terminated prior to completion after the government had expended over $10 billion, in part, as the result of weaknesses in DOE's contractor management. In addition, for the 15 projects that were completed, final costs exceeded original estimates by an average of 63 percent. However, it is difficult to determine how much of the costs attributable to these risks could have been reduced through the use of more private financing.

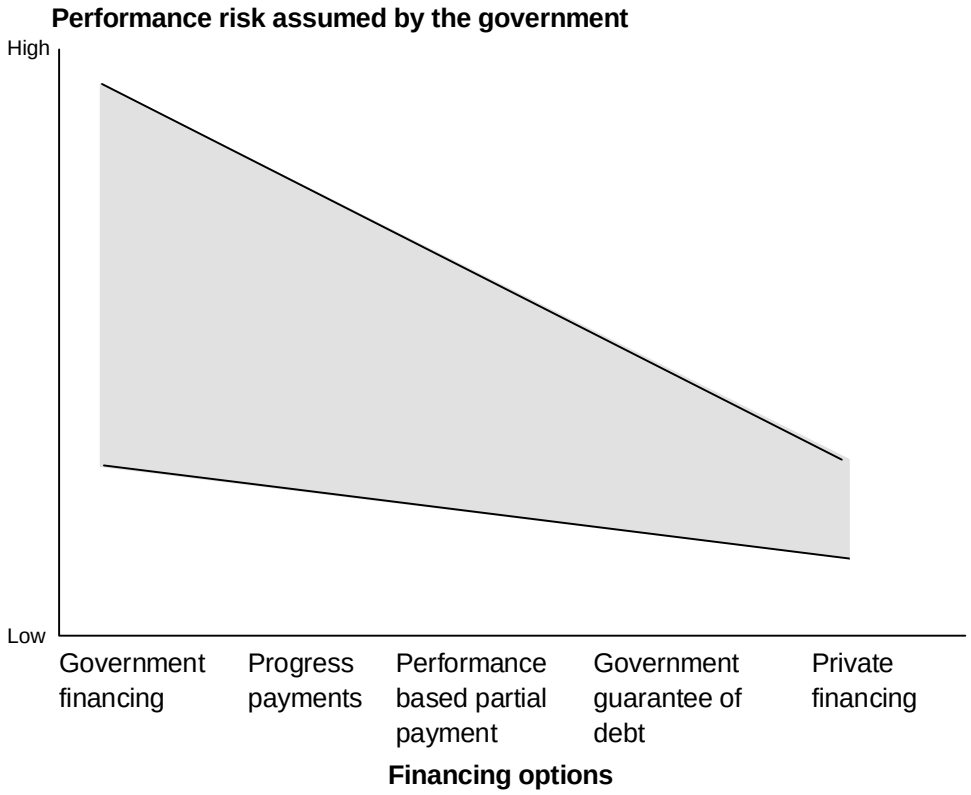
We found that termination and/or cost growth of projects is the result of a variety of factors—some of which may be affected by the choice of financing.[5] For example, the risk of cost growth because of a flawed system of incentives for contractors may be reduced by private financing that provides better incentives to perform. However, other factors contributing to risk may not be dependent on the financing choice. For example, changes in work scope could result in terminations or cost growth under any financing approach. As a result, it is difficult to quantify the degree of performance risk borne by the government as government involvement in financing increases. This uncertainty is represented in

[4]Although there is no financing cost under the total government financing scenario we examined, a cost-reimbursement contract typically has a fee or profit component of less than 5 percent of the total costs covered in the contract. Hence, these contracts are often referred to as "cost plus" contracts. If the Advanced Mixed Waste Treatment Project were constructed under this type of contract, the government could expect to pay fees of about 1.41 percent, or $3.5 million in 1998 dollars.

[5]In our report on major system acquisitions, we found that four key factors underlie cost growth: unclear or changing missions, incremental funding of projects, a flawed system of incentives for both DOE's employees and contractors, and a lack of sufficient DOE personnel with the appropriate skills to effectively oversee contractors' operations. Department of Energy: Opportunity to Improve Management of Major System Acquisitions (GAO/RCED-97-17, Nov. 26, 1996).

figure 3.1 by a potential range of additional performance risk assumed by the government with increased levels of government financing.

Figure 3.1: Relationship Between Financing Approaches and the Amount of Performance Risk Assumed by the Federal Government



Consideration of the Cost of Performance Risk for Other Financing Options

The options that lie between total private financing and total government financing attempt to strike a balance in the trade-off between the cost of financing and the cost of added performance risk. The cost of added performance risk to the government is difficult to quantify, but it must be considered in weighing any decision to reduce private-sector risk (thereby increasing government risk) by lowering financing costs.

The consideration of added risk costs has been recognized in the government's policy on the guarantee of debt. If EM were to pursue an option whereby it would guarantee debt, EM would have to estimate and

obtain funding for the subsidy cost of providing that debt guarantee. Thus, assuming a 100-percent debt guarantee, costs would include construction costs ($244.6 million), contractor financing costs ($104.1 million), and an estimated subsidy cost. That subsidy cost would largely consist of an estimate of the risk that a contractor might default on its debt obligations. While the estimate of the subsidy cost is difficult, the risk of default could be high for a complex facility that typifies some of EM's cleanup projects. If the subsidy cost estimate is higher than $33.8 million, then according to our model, this option would be more expensive than total private financing.

The consideration of added risk costs must also be recognized for other financing alternatives to private financing. Using our model, under a performance-based partial-payment plan whereby EM pays 80 percent of construction costs, EM has placed at risk $195.7 million in payments (80 percent of the $244.6 million in construction costs) over the 5 years of construction. This risk must be weighed against the 20 percent of construction costs plus the financing costs that the private contractor has at stake over the construction period and an initial period of operations. If the private contractor does not perform, it will lose its $48.9 million in construction costs (20 percent of the $244.6 million in construction costs) plus as much as $62.7 million in finance costs. In weighing this type of option, EM will have to consider whether the amount of private-sector investment at risk is enough to ensure that the contractor is motivated to deliver a facility that works as designed without significant cost growth.

The consideration of the cost of added risk under a progress payment option is similar to the partial payment aspect of the option discussed above. If the facility does not work, EM may not regain its $195.7 million. However, under a progress payment option, the contractor would be paid for its construction costs and financing costs after the facility is successfully completed, thereby avoiding financing costs over the operations period. Thus, the government is assuming some added risk that the facility may not operate as promised over the first 5 years of operations. Unlike the performance-based option, the contractor will have no investment at stake whose recoupment is dependent upon successful operations. In considering this type of option, EM will have to consider whether the payback (or amortization) of the contractor's costs over the first 5 years of operations is necessary to ensure that the contractor has delivered an effective plant. An initial testing phase after construction may be sufficient, depending on the size and complexity of the project.

Other Factors Affect Financing Decisions

The choice of financing options is affected by other factors that affect total costs and financing decisions. As government involvement in financing increases, the government assumes more of an ownership role and has to exercise more oversight, an area in which DOE has not enjoyed success. More importantly, the actual terms of performance in the contract will dictate what performance risk is eventually assumed by the contractor and the government.

Increasing Use of Government Financing May Affect Ownership and Oversight

With an increased use of government financing, the issues of government ownership and oversight become important considerations. As the government provides more financing of construction costs, it becomes more likely that EM will be the owner of the facility instead of the contractor. However, along with the benefits of government ownership, EM must consider the negative consequences of ownership, particularly the demands of an increased oversight role.

Financing construction costs could put the government in a position of ownership, especially if it is providing the majority of the funding. This ownership is a positive benefit of government financing that addresses monopoly concerns about private ownership of cleanup facilities. For example, if the private sector owns a facility whose construction costs are paid for after an initial period of operations, it could place the private sector in a monopolistic position for the remainder of the potential operating period. The government may be at a disadvantage in negotiating prices for waste treatment in the future because there will be no other facilities available to compete. However, the government may be able to alleviate monopoly concerns by negotiating long-term operating agreements or having the contract option to take title to the facility.

Given EM's acknowledged poor history of oversight, government ownership could also be viewed as a negative consequence of government financing. If EM begins to make payments prior to performance, it will need to assure itself that the contractor is making satisfactory progress. However, EM does not have a history of successful contractor oversight. The private sector views increased government oversight as meddlesome, inefficient, costly, and directly counter to the concept of allowing the private sector to decide how to best provide cleanup services.

Terms of Performance Are an Important Consideration That Affects Risks and Costs

Our discussion of construction financing options has focused on the level of risk that is transferred between the government and the private sector as the level of financing provided by each party changes. However, it is important to point out that the mix of financing provided by the

government and the private sector has no bearing on the actual terms of performance that are agreed to in a contract. As noted earlier in our discussion of contracting, risks must be identified and addressed in the contract so that each party's responsibilities are clearly defined. The government could face more risk and incur more costs from a contract that is totally privately financed if the terms of the contract give the contractor less responsibility for risks compared to another contract that may have government financing.

Agency Comments and Our Evaluation

DOE agreed with our statement that while government financing appears less costly, the greater performance risk the government assumes when it finances a project, and the potential costs associated with this greater risk, could offset any apparent advantage gained by using lower-cost government financing. However, DOE felt that we should have attempted to compensate for these potential increases in costs in the model we used to estimate the impact of financing alternatives. In earlier meetings with DOE officials, they had suggested performing a sensitivity analysis that would vary the construction costs to reflect various levels of cost growth, specifically 20, 40 and 60 percent.

We considered performing the sensitivity analysis DOE suggested; however, we decided not to do so because we did not have a factual basis for assigning levels of cost growth to all of the various financing alternatives we analyzed. If not properly managed, each of the alternatives we analyzed, including the private finance option, could experience cost growth. However, we could not locate any data that would identify how much cost growth might be associated with one financing option versus another. Applying the same cost growth to all of the options would not change the relative results, only the total costs. To compensate, we emphasized throughout the report that cost growth was a possibility as the government took on more performance risk and cited what evidence we had in terms of independent studies and GAO reports to indicate how large this growth had been under DOE's existing contracts.

Use of Alternative Financing Structures Could Change How EM's Privatization Projects Are Scored in the Federal Budget

Because of budget limitations or "caps" instituted to help balance the federal budget, all budget appropriations and spending for discretionary programs,[1] such as EM's privatization program, must be measured or "scored" to ensure that the caps are not exceeded. Federal agencies may acquire or use long-term assets constructed to meet the government's needs, such as the waste treatment facilities EM needs, in several ways. Each of those arrangements may be scored differently. Which arrangement and, hence, which method of scoring is most appropriate may change depending on how the asset is financed, whether the government takes ownership of the asset, and how much risk the government assumes for the cost of construction.

Budget Scoring Could Determine What Projects Can Be Pursued

Under the Budget Enforcement Act of 1990, as amended, discretionary spending is constrained by caps or strict dollar limits both on new budget authority and budget outlays.[2] To ensure that caps are not exceeded, the scoring rules contained in the conference report accompanying the Budget Enforcement Act of 1990, as amended, and published in the Office of Management and Budget's (OMB) Circular A-11 are used to determine when budget authority and budget outlays are scored for discretionary spending proposals—including spending for capital assets. To stay within the caps, budget authority and the resulting outlays are limited for all programs. The way transactions between EM and its privatization contractors are structured affects how they are scored and, because of the budget caps, has consequences not only for EM but also for all the other programs and activities funded by the committees that provide EM's appropriations.

There Are Several Different Options for Scoring the Acquisition or Use of Capital Assets

There are several ways the federal government can acquire capital assets or the use of capital assets, such as an office building or waste treatment facility, that are being constructed for its use. The most direct way is to simply purchase the asset outright, taking full ownership of it. In that case, budget authority for the full cost of the purchase would be scored in the year the budget authority is first made available, and budget outlays would be scored as payments are made to the contractor during construction. Alternatively, agencies may choose not to purchase the asset itself (for example, a waste treatment plant) but merely the services connected with

[1]Discretionary programs receive budgetary resources provided in annual appropriations acts, as opposed to mandatory spending authority (such as that for entitlements and the food stamp program), which is provided by other laws.

[2]Budget authority is the authority provided by law to enter into financial obligations that will result in immediate or future outlays of federal funds. Outlays are the actual issuance of checks, disbursements of cash, or electronic transfers of funds made to liquidate a federal obligation.

the asset (for example, waste treatment services). For such a service contract, the agency would need budget authority in each year equal to its legal obligations under the contract, including cancellation costs. In a case in which services will not be delivered until the construction of a facility is complete, outlays would not be scored during the construction period; instead, they would be scored as services are delivered.

In addition to outright purchase of an asset or purchase of services, the agency may choose to lease the asset from the private contractor. Under the budget scoring guidelines, the government may enter into three types of leases with private vendors—operating leases, lease-purchases, and capital leases. Operating leases may be used to contract for assets such as general-purpose office space. In an operating lease, the facility or equipment is not built to unique government specifications, there is a private-sector market for the asset, and the present value of the government's lease payments does not exceed 90 percent of the asset's fair market value at the beginning of the lease, among other criteria. For an operating lease, the agency would need budget authority and have outlays in each year equal to the payments due to the contractor under the lease.

Transactions that do not meet all of the criteria of an operating lease are considered either lease-purchases or capital leases. In a lease-purchase transaction, ownership of the facility or other assets transfers to the government at or shortly after the end of the lease. If ownership does not transfer, the transaction is a capital lease.

For a lease-purchase arrangement, the government's risk[3] is assessed against criteria that indicate the government's acceptance of risk such as whether (1) the government provides financing, (2) the government guarantees third-party financing, (3) there is no private-sector market for the assets, (4) the asset is built to unique specifications, (5) the risks of ownership do not remain with the contractor, and (6) the project is constructed on government land. For a lease-purchase without substantial government risk, the agency would need budget authority in the first year equal to the present value of its obligations under the lease, and outlays would be scored over the lease term. The government's obligations would include the contractor's capital investment and termination or cancellation costs. If the government does have substantial risk, budget authority would be scored the same way as noted above, but outlays would be scored during the construction period in the same proportion as the

[3]Although Circular A-11 is written from the perspective of private risk, this report focuses on the government's risk and is written from that perspective.

contractor's costs are incurred. Capital leases are scored in the same way as a lease-purchase without substantial government risk.

Finally, if an agency were to offer a federal government guarantee of some or all of a contractor's debt financing, the subsidy cost of the guarantee would be scored. The agency would need specific legislative authority to offer a government loan guarantee. If the authority were granted, the agency would have to estimate the subsidy cost of the loan guarantee, which would be based on the risk of default or nonpayment of the loans, among other factors. Estimating the subsidy cost is a very complex process and is subject to review by OMB and the Congressional Budget Office. The agency would need budget authority for the full net present value of the subsidy cost before it could make the guarantee. Outlays of the subsidy cost would occur over the same period and in the same proportion as the lender disbursed the loan to the contractor. That is, if all of the loan money were disbursed in the first year, all of the subsidy cost would be outlayed in the first year as well. If the loan were disbursed over a period of several years, the outlays would be spread over the same period.[4]

Changing How EM's Privatization Projects Are Financed Could Affect the Interpretation of the Scoring Guidelines

Currently, OMB scores EM's privatization projects as service contracts. Under this practice, EM must have enough budget authority each year during the life of the contract to (1) pay off its liability to the contractor if, for example, the project is canceled, and (2) pay for treated waste once facilities begin operations. The contractor is to provide all of the financing for constructing the necessary facilities and equipment to treat EM waste. EM does not intend to acquire title to the facilities that would be constructed by its privatization contractors, even when those facilities are built on federal land and are constructed to provide services strictly for the government. Under OMB's current scoring, no outlays would be scored until construction of a project is completed and waste processing begins. Outlays would then be scored from the privatization account as the capital cost of the project is amortized or repaid over the first few years of operations.[5] Therefore, while the impact on outlays in the budget is minimized in the early years of the privatization program under this

[4]See Credit Reform: Greater Effort Needed to Overcome Persistent Cost Estimation Problems (GAO/AIMD-98-14, Mar. 30, 1998), pp. 36-42, for a fuller discussion of loan guarantees under the Credit Reform Act.

[5]Under the current scoring method and all of the options we analyzed, EM would need budget authority and would have outlays from its annual operating funding to pay for the amounts of waste treated to contract specifications.

option, it will increase outlays dramatically in later years as these projects come on-line.

Loan Guarantee Scenario

Government loan guarantees are usually offered only when the borrower or the project is too risky for private lenders. Because many of the projects proposed for privatization are technically risky—that is, they involve the use of innovative technologies that must be modified to meet EM's needs—the subsidy cost of a loan guarantee for privatization projects could be substantial. For this option, EM also would need additional budget authority upfront for the subsidy cost. Outlays of the subsidy cost would occur over the construction period as the loan is disbursed by the private lender to the contractor.

If EM were given authority to provide a loan guarantee for the construction of a contractor-owned facility, OMB may decide to continue to score the project's total capital costs as a service contract. Alternatively, the capital costs might be scored as a capital lease. In that case, budget authority and outlays would occur sooner than under the current service contract scoring method.

Performance-Based Partial-Payment Scenario

If EM used a performance-based partial-payment plan, scorekeeping guidelines could be interpreted to require EM to have budget authority up front for the net present value of the government's share of costs.[6] Outlays would occur during the construction period equal to the amount of incurred costs for which EM reimburses the contractor and during the initial period of performance for the remainder of the construction costs. For this option, which might be scored as a capital lease or a lease-purchase (if it is judged that EM has effective ownership), the timing of budget authority and outlays would change, occurring sooner than under the current service contract scoring scenario.

Under this scenario, the greater degree of financial investment and risk that EM would incur could make government ownership of the facility more attractive than only contracting for the services of the completed facility. In that event, EM could choose to structure the contract so that it would acquire ownership of the facility at or near the end of the initial performance period. The initial performance period would provide EM assurance that the facility works and would give the contractor time to recoup all of its investment. However, in that case, the transaction could

[6]As described in the previous section, EM would only be providing a portion of the capital financing during construction. Thus, the government's share of costs would most likely include interest to be paid on the portion of construction costs being financed by the contractor, even if recovery of the contractor's financing costs would only be earned through satisfactory performance.

be deemed a lease-purchase with substantial government risk under the budget scoring guidelines. As a result, the timing of budget authority and outlays would change, occurring sooner than under the current service contract scoring scenario.

Progress Payment Scenario

If the construction were financed using progress payments, the transaction might be scored as a capital lease or a lease-purchase (if it is judged that EM has effective ownership). In that event, EM would need budget authority equal to the net present value of the government's share of the costs plus a rate of return earned on the held-back portion. Outlays would occur during construction equal to EM's share of the portion of costs incurred by the contractor and for the lump-sum payment of the held-back portion of the construction costs once the contractor's work had been accepted.[7] For this financing option, the timing of budget authority and outlays would change, occurring sooner than under the current service contract scoring scenario.

In this scenario, EM would again be making a substantial financial investment in the facility and incurring a greater degree of risk than it would if the contractor privately financed the construction of the facility. In that case, EM might decide to include an option in the contract allowing it to take title to the completed facility, and the transaction might be considered a lease-purchase under the budget scoring guidelines. In that case, EM would need budget authority equal to the full net present value of the project, regardless of what proportion of the costs were paid to the contractor in progress payments and what proportion are held back for lump-sum payment when the contractor's work has been accepted.

Full-Government-Financing Scenario

Finally, if EM fully finances the projects, it would need budget authority to cover the full amount of costs and fee or profit owed to the contractor for the construction of the facility.[8] Outlays would be incurred for the amount of costs incurred by the contractor and any fee or profit earned in each fiscal year. In that case, the government would bear the financial risk and, logically, may want to have ownership of the facility. The contractor would be reimbursed for all allowable costs, including costs for the design and testing of the facility and equipment, during the construction period. For this option, budget authority needs could be larger in the first years of

[7]The criteria for acceptance of the facility by the government would be negotiated in the contract and could allow for an initial period of performance sufficient to ensure that the facility will operate as promised.

[8]Although OMB's guidance requires agencies to request full funding before beginning a construction project, the Congress has historically provided only incremental funding (that is, an amount to meet a project's estimated needs for only 1 fiscal year) for DOE's projects.

the project than under EM's current privatization approach, and once again, outlays would occur sooner.

Ownership and Degree of Government Risk Are Key Factors for Scoring

Under the budget scoring guidelines, how EM's privatization projects are scored depends on two key factors: who owns the facility and, if the government will have ownership, what degree of risk the government assumes. However, several factors may cause EM to decide to own the facility itself. Some projects may require EM to make a large investment of government funding in the construction of a facility. In addition, privatization contracts are expected to contain clauses, such as termination for convenience and idle facility payments, to protect the contractor from loss if the project is canceled or delayed by the government. For example, a termination for convenience clause provides the government the option of canceling the project if EM cannot get sufficient funding to proceed in any fiscal year. The government may also be liable for payments for idle facilities if the contractor's facility is ready to operate and EM fails to deliver waste to be treated.

In such circumstances, EM may have to outlay a large proportion of the construction costs whether or not it receives waste treatment services, and it may be in the government's interest to also take ownership of the facility. In that case, the scoring rules pertaining to outright ownership or lease-purchases would apply. Under other circumstances, such as if total private financing has the hoped-for effect of lowering the total cost and risk, pursuing service contracts may be the best decision. These factors, in addition to scoring implications, will need to be considered in deciding whether ownership of a capital asset is in the best interest of the government.

Budget Scoring Pressures May Cause Federal Agencies to Make Inefficient Asset Acquisition Decisions

In general, as the financial commitment of the government decreases (that is, moves further away from purchase), the amount of budget authority and outlays that must be scored up front also decreases. We found that this situation may tempt agencies to move away from ownership when caps are very restrictive and to choose arrangements in which budget authority and outlays are not scored all at once or as soon.[9] In some cases, we found that these decisions resulted in agencies spending more than they would have if they had purchased the assets outright. Budget scoring does not affect the total cost of the projects but does change when budget authority is needed and when outlays occur. Under all of the alternative

[9]Budget Issues: Budgeting for Federal Capital (GAO/AIMD-97-5, Nov. 12, 1996).

financing scenarios we analyzed, except possibly full-government financing, scorekeeping guidelines could result in EM needing more budget authority earlier in the projects and incurring outlays sooner than under OMB's current method of scoring privatization projects as service contracts. EM officials have noted that one advantage of privately financing projects is that it allows EM to defer budget outlays to future time periods. While this may be true, EM's decisions on how to structure privatization contracts need to consider the other factors we have discussed previously—contract type, financing method, risk allocation, and long-term cost—as well as the budget scoring implications of the contracts.

Agency Comments and Our Evaluation

DOE expressed the view that individual projects have different financing requirements that are not directly addressed by the current budget scoring guidelines of OMB Circular A-11. They also expressed the view that there is considerable flexibility in the scoring rules. We agree that the scoring guidelines do not directly address the unique projects that DOE is considering. We specifically state in all of our discussions of scoring that the scoring rules have to be interpreted for DOE's projects.

Conclusions

Unsatisfied with its management contractors, EM has attempted to improve the cost and schedule performance of the cleanup program through the adoption of its privatization approach. In theory, EM's privatization contractors have a greater incentive to perform under a fixed-price contract than in the traditional cost-reimbursement environment, under which most cleanups have been performed. While we did find examples when the use of fixed-price contracting produced positive results, simply entering into a fixed-price contract is no guarantee of success. If fixed-price contracts are used in situations when they are not appropriate—for example, where waste is inadequately characterized—the cost and schedule performance of the contractor can be worse than under a cost-reimbursement contract.

Private contractor financing, which has the potential to improve cost and schedule performance, comes at a significant increase in financing costs. However, it would be incorrect to look at this difference and simply conclude that traditional cost-reimbursement government financing is cheaper. The apparent difference in cost reflects the different amount of risk the government is bearing. Moreover, if the performance under the cost-reimbursement type of financing is as poor as past history would suggest, the difference, or "savings," observed in our analysis could easily be consumed by cost overruns.

With respect to scoring, how these projects are scored will depend on how certain key aspects of the scoring rules are interpreted. For example, if ownership is viewed as the critical variable and the government does not own the final facility, any approach we have analyzed could be scored as a capital lease. However, if the government assumes ownership upon completion of an initial performance period, then a lease-purchase would appear more appropriate. Use of a government loan guarantee would require the estimation of the subsidy cost, for which additional budget authority would be needed, and could add significantly to the total budget authority required for privatization projects.

In the end, it is not simply a choice between traditional cost-reimbursement contracting and EM's new privatization approach. As our analysis shows, a complex matrix of decision factors needs to be considered when deciding how to contract for and finance a cleanup. Among the factors that need to be weighed are the following: (1) What waste needs to be cleaned up and how well is the waste characterized? (2) How much competition is there is among firms with the necessary cleanup expertise? (3) What financing options are available in the private

sector? (4) What risks are associated with the cleanup and who is best prepared to bear them? (5) How well equipped is DOE's staff to design and oversee a cleanup contract? Once a contract type and financing method are chosen, DOE and the contractor would need to carefully develop a contract that clearly defines each party's roles and accountability through provisions that allocate project risk between the parties, define DOE's oversight role, and identify appropriate measures against which the contractor's performance will be judged. Ideally, selection of the appropriate type of contract and method of financing for each project would be made on the basis of what will provide EM with the best chance of successfully completing its cleanup goals at the lowest total cost.

Alternative Contract Types Used by DOE's Environmental Management Program for Cleanup Projects

Although the Department of Energy (DOE) has traditionally performed its work through management contractors using cost-reimbursement contracts, the Office of Environmental Management (EM) has used a variety of contract types for purchasing cleanup services, including fixed-price and cost-reimbursement variants. In general, fixed-price contracts provide a fixed payment regardless of the actual costs incurred by the vendor. Cost-reimbursement contracts, on the other hand, generally repay the vendor for all allowable costs incurred regardless of what is accomplished. The following table provides some of the key features of the various contract types used by EM, defines the circumstances under which they are used, and identifies the cleanup projects we reviewed that employ each contract type or combination of contract types.

Table I.1: Major Features and Types of Contracts That EM Has Used for Environmental Cleanup Projects

Type of contract	Major features of contract type	Circumstances when contract type is generally used	EM projects using contract type (location)
Fixed-price contracts			
Firm fixed-price	Price is set at contract award by competitive prices or negotiation Price is not adjusted based on contractor's costs during performance Low flexibility for government because changes must be negotiated Low cost risk for government as long as scope does not change; high cost risk for vendor Low performance risk for government as long as scope does not change; high performance risk for vendor	Work scope is well-defined and no major changes are expected Uncertainties are quantifiable Best for purchase of commercial products	M-Area Mixed Waste Tank Remediation (Savannah River) Environmental Management/Waste Management Disposal Cell (Oak Ridge)[a] Scintillation Cocktail Bulking (Oak Ridge) West End Treatment Facility—Phase I, original contract (Oak Ridge) TMI-2 Turnkey Interim Storage System Facility (Idaho)[b] Advanced Mixed Waste Treatment Project—Phase I licensing, permitting, and preliminary design (Idaho) Tank Waste Remediation System—Phase I conceptual design (Hanford)

(continued)

Type of contract	Major features of contract type	Circumstances when contract type is generally used	EM projects using contract type (location)
Fixed-price with fixed per-unit pricing	Price quoted on a per-unit basis in this variant of firm-fixed-price Allows government some flexibility by stating work in units, usually with minimum and maximum amounts guaranteed during a set contract period Low cost risk for government but must pay for minimum quantity; high cost risk for vendor Low performance risk for government; high performance risk for vendor	Work scope can be adjusted within stated limits to fit government priorities and funding availability Minimum units of work are known (e.g., X barrels of waste are in storage ready to be processed) If vendor cannot use facilities for other clients, contract may provide for idle facility payments	Low-Level Mixed Waste Thermal and Non-Thermal Treatment (Hanford) Tri-Butyl Phosphate Treatment (Hanford) Tank Waste Remediation System—waste treatment phase (Hanford) Laundry Services (Hanford) Contaminated Laundry Services (Idaho) Low Level Waste Treatment (Idaho) Transuranic Waste Treatment Project (Oak Ridge)[a] Broad Spectrum Low-Level Mixed Waste Treatment (Oak Ridge)[a] Spent Nuclear Fuel Dry Transfer and Storage (Idaho)[a] Low-Level Radioactive Waste Treatment (Oak Ridge)

(continued)

Type of contract	Major features of contract type	Circumstances when contract type is generally used	EM projects using contract type (location)
Fixed-price with economic price adjustment	Price adjusted up or down using agreed-upon criteria such as a labor or material cost index Low flexibility for government without renegotiating work scope and cost Low cost risk for government; high cost risk for vendor except for cost component(s) covered in the adjustment provision Low performance risk for government; high performance risk for vendor	Work scope is well-defined and no major changes are expected or likely There is serious doubt about market conditions, e.g., large potential fluctuations in the costs of key components such as materials or labor Component costs covered in the price adjustment provision are not under the vendor's control but changes cannot be estimated with a high degree of accuracy Contract covers an extended performance period, e.g., several years	East Tennessee Technology Park Three Building Decontamination and Decommissioning (D&D) Project (Oak Ridge) Advanced Mixed Waste Treatment Project—Phase III operations and D&D—treatment of first 25,000 cubic meters of waste (Idaho)
Fixed-price with incentives and firm target price	Pricing arrangement negotiated places an appropriate share of risk on vendor Low flexibility for government because price and targets must be renegotiated if work scope changes More cost risk for government than under firm-fixed-price; vendor assumes some cost risk because fee is tied to cost control More performance risk for government than under firm-fixed-price because government shares in cost overruns; less performance risk for vendor	Work scope is well-defined Objectives in addition to cost control are deemed important, e.g., workplace safety, waste minimization, etc. Relates incentive fee (profit) to cost control and may include incentives for performance on critical aspects of work Cost control incentives required when performance incentives are used to preclude reward for performance if cost outweighs its value Contractor must have an acceptable accounting system	St. Louis North County Site, Formerly Utilized Sites Remedial Action Program

(continued)

Type of contract	Major features of contract type	Circumstances when contract type is generally used	EM projects using contract type (location)
Fixed-price with prospective price redetermination	Price for initial performance period is fixed when contract is negotiated Price is subsequently adjusted at stated periods during the life of the contract in anticipation of future conditions affecting the cost of performance Other features are the same as firm-fixed-price except the government bears more cost risk because the final cost is not set at contract award	A fair firm-fixed price can be negotiated for an initial period but not for the entire contract period A relatively brief period of performance will provide the pricing information needed to set price for the remainder of the contract Suitable for a contract with a lengthy performance period (e.g., 10 to 20 years)	Advanced Mixed Waste Treatment Project—Phase III operations and D&D—treatment after first 25,000 cubic meters of waste is complete and every 5 years thereafter on a 20-year contract (Idaho)
Fixed-price using a fixed unit rate	Price for a unit of work is known but total price of work is not known More flexible for government than fixed-price with per-unit pricing, but vendor has no incentive to minimize the amount of work done Higher cost risk for government than other forms of fixed-price contracts; lower cost risk for vendor Low performance risk for government; higher performance risk for vendor	Work scope in terms of the number of units to be done is not known with certainty Not enough information is known to set minimum and maximum levels of work scope	Maywood Site Cleanup, Formerly Utilized Sites Remedial Action Program New Brunswick Soil Sorting Demonstration, Formerly Utilized Sites Remedial Action Program

(continued)

Type of contract	Major features of contract type	Circumstances when contract type is generally used	EM projects using contract type (location)
Cost-reimbursement contracts			
Cost and cost-sharing contracts	Cost contract includes no fee (profit) portion, but the vendor is reimbursed for all allowable costs incurred A cost-sharing contract includes no fee (profit) portion, but vendor is reimbursed for only negotiated portion of costs incurred Increases government flexibility Increases cost risk for government; lessens vendor's cost risk Increases performance risk for government; minimal performance risk for vendor	Work scope cannot be precisely defined Cost contracts are usually used for research and development work done by nonprofit organizations such as universities Cost-sharing contracts can be used any time, but the vendor expects other compensating benefits from participation (e.g., follow-on contracts, patentable process, etc.) Contractor must have an acceptable accounting system	West End Treatment Facility Phase I—actual results after equitable adjustment (Oak Ridge)[c]
Cost-plus-incentive-fee	Target cost and incentive fees are negotiated for a specific scope of work; incentive is adjusted based on relationship between total target cost and total actual cost Low flexibility for government because changes to work scope require renegotiation of target cost and incentive fees High cost risk for government; some cost risk for vendor because vendor shares in cost overruns High performance risk for government; low performance risk for vendor Cost control incentive required but additional incentives can be added	Work scope can be reasonably well-defined, but significant uncertainties remain Performance features subject to incentives can be objectively measured Used for development and testing programs and to motivate vendor to manage projects more effectively When incentive fee includes a "negative" portion, vendor may not recover all costs incurred Fee pool for fixed and performance incentives is negotiated; performance incentives are assigned a negotiated value from the relevant fee pool Contractor must have an acceptable accounting system	Management and Integrating contracts for EM site management K-25 Powerhouse Demolition (Oak Ridge) K-25 Cooling Towers Demolition (Oak Ridge) Lower East Fork Poplar Creek Operable Unit Cleanup (Oak Ridge)

(continued)

Type of contract	Major features of contract type	Circumstances when contract type is generally used	EM projects using contract type (location)
Cost-plus-award-fee	All allowable costs are reimbursed	Work scope cannot be precisely defined and/or is subject to significant, frequent changes[d]	Management and Operating contract for DOE sites
	Maximum flexibility for government to respond to funding and/or priority changes during performance period	Changes to work scope may require renegotiation if they will impact the vendor's ability to meet criteria for earning award fee	Kerr Hollow Quarry Cleanup (Oak Ridge)
	High cost risk for government; low for vendor	Conditions beyond the control of the vendor are expected to have a major impact on the vendor's ability to perform	
	High performance risk for government; low for vendor	Performance cannot be objectively measured and/or noncost considerations are of high priority (e.g., safety in nuclear operations)	
	Award fee is subjectively determined by government and is intended to motivate the vendor for excellent performance	Contractor must have an acceptable accounting system	

[a]Procurement is in progress but final contract award has not yet been made. Categorization reflects current plans.

[b]Contract provides for progress payments.

[c]The West End Treatment Facility project was planned as a phased project. Phase I set a fixed-price payment for each awardee to design and test a waste treatment system and was intended to result in multiple contract awards. Under the plan, vendors that successfully completed Phase I would compete for the Phase II treatment contract. However, only one contract was awarded in Phase I, and the vendor winning that contract invested significantly more money in its treatment process than the amount the contract would reimburse. According to EM and management contractor officials, because the vendor had a reasonable expectation that it would also win the Phase II contract, EM agreed to pay the vendor an equitable adjustment covering the additional costs the vendor had incurred, when the second phase procurement was canceled.

[d]Some proportion of the tasks covered by a management and operating contract may be precisely defined and measured.

Source: GAO's analysis of the Federal Acquisition Regulation and Department of Energy contracts.

A Model for Analyzing Construction Financing Options

Background on the Advanced Mixed Waste Treatment Project

We used the Advanced Mixed Waste Treatment Project to assess the relative impact of different construction financing options on financing costs. The Advanced Mixed Waste Treatment Project involves the construction and operation of a waste treatment facility that will treat laboratory and processing wastes from DOE's various facilities. The waste contains hazardous waste constituents and radioactivity and is therefore classified as "mixed waste." According to the contract schedule, construction costs will be incurred over 5 years, from 1998 to 2002, with operations beginning in 2003. The current contract covers operations through the year 2015 and has an option to extend the contract to process more waste beyond 2015.

The Advanced Mixed Waste Treatment Project will incur $270 million (in actual dollars) in construction costs over 5 years. Accounting for the fact that these costs will be incurred over 5 different years, the present value of these costs is $244.6 million. A discount rate of 6 percent was used to calculate the present value (1998 dollars) of the construction costs. Table II.1 shows the contractor's construction costs in actual dollars for 5 years and the present value of those costs. Then, for each of the different financing options we analyzed, the table outlines the yearly and total government payments (in actual dollars) to reimburse the contractor's construction and financing costs. Also, the table shows the total present value (1998 dollars) of these payments for each option.

Table II.1: Advanced Mixed Waste Treatment Project Construction and Financing Costs

Dollars in millions

Present value (PV) 1998 dollars, totals	Contractor construction costs	Private finance option	Government debt guarantee option[a]	Performance-based partial payment option	Progress payment option	Total government financing option
Financing (PV)	N/A[b]	137.9	104.1	62.7	47.1	0.0
Construction (PV)	244.6	244.6	244.6	244.6	244.6	244.6
Actual dollars (not adjusted for inflation) by year						
1998	13.7	0.0	0.0	10.9	10.9	13.7
1999	109.0	0.0	0.0	87.2	87.2	109.0
2000	96.8	0.0	0.0	77.4	77.4	96.8
2001	41.0	0.0	0.0	32.8	32.8	41.0
2002	9.5	0.0	0.0	7.6	7.6	9.5
2003	0.0	100.8	91.9	29.4	128.5	0.0
2004	0.0	134.5	122.6	39.3	0.0	0.0
2005	0.0	134.6	122.7	39.3	0.0	0.0
2006	0.0	134.6	122.7	39.3	0.0	0.0
2007	0.0	64.9	59.2	18.9	0.0	0.0
Actual dollars,totals						
Financing	**N/A**	**299.4**	**249.1**	**112.1**	**74.4**	**0.0**
Construction	**270.0**	**270.0**	**270.0**	**270.0**	**270.0**	**270.0**

[a]Subsidy costs not shown for this option. N/A = not applicable.

The comparison of financing costs for different options assumes that the construction costs are the same under all options. It also assumes that the contracts are openly competed, fixed-price except for the total government financing option, which is assumed to be a cost-reimbursement contract. This comparison of financing costs does not attempt to quantify the increased risk faced by the government as its involvement in financing increases. Following is a discussion of each financing option and the assumptions made to estimate the financing costs.

Total Private Financing

The Advanced Mixed Waste Treatment Project contract uses total private financing of construction, as envisioned under EM's privatization program. Under this option, construction costs are incurred and carried by the contractor until construction is complete and acceptable waste treatment services are provided. After construction is completed in 2002 and

operations begin in 2003, the government begins to reimburse the contractor for its construction costs incurred and the financing costs that have accrued. These payments are fixed and directly tied to the contracted amount of cleanup services to be provided during the first 5 years of operations. The contractor will recoup its construction and financing costs in proportion to the amount of waste it successfully treats during the first 5 years of operations. The contractor's expected rate of return for financing construction is 15.76 percent per year on the balance of the construction costs it carries.[1] The total financing costs under this option are $299.4 million in actual dollars and $137.9 million in 1998 dollars.

The costs presented in table II.1 for this option use the information on timing and amounts of payments given in the Advanced Mixed Waste Treatment Project contract and assume that the contractor is successful in treating the amounts of waste in the contract that are required to pay off its costs in 5 years. However, if the contractor is behind on its delivery of services, it will take longer for the contractor to recoup its costs. Moreover, because the contractor will only be paid a fixed rate for cleanup services, the contractor's effective rate of return for financing construction will be less than 15.76 percent if it does not deliver the contracted amount of cleanup services.

Government Guarantee of Debt

A government guarantee of debt option is designed to lower private financing costs by lowering the interest rate on the debt financing. Under this option, we assumed the same payment process for the total private financed option. However, to quantify the impact of a government guarantee of debt, we assumed, on the basis of the reviews of finance studies and interviews with financiers for these types of projects, that the contractor's financing of the Advanced Mixed Waste Treatment Project would consist of 70 percent debt financing at a 10 percent rate of return and 30 percent equity financing with an expected return of 29.2 percent. Under these assumptions, the total rate of return is equal to 15.76 percent, the same rate of return provided for in the actual Advanced Mixed Waste Treatment Project contract. On the basis of reviews of finance studies and interviews with financiers, we assumed that a government guarantee of debt would provide enough assurance to private lenders to lower their required rate of return on debt by 3 percentage points—from 10 percent to 7 percent. This represents a rate that is close to the government's cost of borrowing with some allowance for administration of the debt. The lower

[1]The financing cost includes all contractor costs above construction costs, including the contractor's cost of raising money, taxes, and profit.

required rate of return on the 70 percent portion of debt financing would have the effect of lowering the overall rate of return to 13.66 percent.

Under this set of assumptions, the cost of financing the construction would be $249.1 million in actual dollars and $104.1 million in 1998 dollars.[2] In 1998 dollars, this is a reduction of $33.8 million compared to the financing costs of $137.9 million for total private financing. Different assumptions about some of the key factors influencing costs could present some different scenarios that could be considered. For example, if the percentage of debt financing was greater than 70 percent and other factors remained constant, the government guarantee of debt would have a larger financing cost reduction than $33.8 million. Conversely, if the government guarantee of debt does not reduce the cost of private debt as much (that is, less than 3 percent) then financing costs will be reduced by less than $33.8 million.

Performance-Based Partial-Payment Plan

Under the performance-based partial-payment plan, we assumed the government would pay 80 percent of the construction costs as they are incurred while the contractor is responsible for financing the balance. We assumed that the government would pay for 80 percent of the construction costs because that percentage represents the maximum amount of government payments generally allowed for progress payments. To create a performance incentive similar to the total private financed option, we assumed for this option that the contractor would recoup its construction costs plus its finance costs over the first 5 years of operations using the same payback schedule outlined in the total private financing option. On the basis of the reduced amount of contractor financing needed, we assumed that the contractor would not seek debt financing for the 20 percent in costs it had to finance. Rather, the contractor would finance the costs itself with equity and would expect a return comparable to the expected rate of return on equity for the total private financing option (29.2 percent). Thus, the contractor's share of construction costs would grow by 29.2 percent during the 5-year construction cost period as well as during the 5-year operation period. Under this set of assumptions, the financing costs would be $112.1 in actual dollars and $62.7 million in 1998 dollars.

Several variables could affect the total financing cost for this type of option. For example, the method by which the contractor finances the

[2]These amounts reflect only those financing costs incurred by the contractor. The government would face additional subsidy costs in a debt guarantee financing option.

construction costs it is carrying would affect the total financing costs associated with this option. If the contractor were to finance some portion of its construction costs with debt, as opposed to all equity financing, then the financing costs would be lower. The costs would be lower because the expected rate of return would be based on a mixture of debt at 10 percent and equity at 29.2 percent instead of all equity at 29.2 percent. In addition, the portion of construction costs paid by the government will also affect the financing costs under this option. As the government provides for a lesser portion of the construction costs (that is, less than 80 percent), the amount of construction costs the contractor has to finance increases. This scenario could raise total financing costs because more of the higher-cost contractor financing is required.

Progress Payments

Under a progress payment financing option, the government would pay 80 percent of the construction costs as they are incurred while the contractor is responsible for financing the balance. We assumed that the government would pay for 80 percent of the construction costs because it represents the maximum amount of government payments generally allowed for progress payments. The sequence of government payments over the 5-year construction cost period would be the same as the performance-based partial-payment plan. However, unlike the performance-based partial-payment option, the balance financed by the contractor would then be recouped when a working facility was successfully constructed—not during an initial operation period. Thus, the balance of cost carried by the contractor, plus its financing cost, would be paid off in one sum once the facility was completed.

Like the performance-based option discussed above, we assumed that the contractor would finance the costs through its own equity and would expect a rate of return for equity of 29.2 percent. Under this option's assumptions, construction financing costs would decrease to $74.4 in actual dollars and $47.1 million in 1998 dollars. Like the performance-based option, other variables—namely, the method by which the contractor finances the costs it carries and the portion of costs financed by the government—could affect the financing costs under this type of option.

Total Government Financing

Total government financing of the Advanced Mixed Waste Treatment Project would present the type of financing provided for in DOE's traditional cost-reimbursement type of contract. Under a

cost-reimbursement contract, the government would issue a letter of credit and the contractor would be immediately reimbursed so that the contractor would not have to carry any of the construction costs. Thus, the government would not have to pay any financing costs to the contractor.

The financing costs presented in the other options all contain the contractor's profit. A cost-reimbursement contractor would receive some negotiated fee for work. According to DOE's guidelines, the contractor could receive a maximum fee of 1.41 percent of the price of a construction contract of this size. Contracts of different sizes will incur different fee levels. Thus, assuming a construction contract for $244.6 million, the government could pay the contractor a fee of up to $3.5 million in 1998 dollars.

This financing option differs from the other options in that it involves a cost-reimbursement type of contract instead of a fixed-price contract. Construction costs under a cost-reimbursement contract may not behave in the same way as under a fixed-price contract. A greater risk exists that construction costs will grow at a faster rate than costs under the discipline of a fixed-price contract. Moreover, that original construction cost estimate may be higher to begin with because of the lack of openly competed fixed-price contracts.

Comments From the Department of Energy

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

Department of Energy
Washington, DC 20585

May 27, 1998

Ms. Gary L. Jones
Associate Director
Energy, Resources, and Science Issues
General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Ms. Jones:

Thank you for the opportunity to comment on your draft report entitled *DOE: Alternative Financing and Contracting Strategies for Clean-up Projects (GAO/RCED-98-169), May 1998.* In general, your report represents a constructive attempt to clarify some of the important issues involved in alternative financing for Department of Energy (DOE) cleanup projects. We agree with your finding that "While government financing of construction costs appears to be less costly than private financing, the government assumes a much greater performance risk . . . and [t]he potential costs associated with these risks could offset--or more than offset-- any apparent advantage gained by using lower-cost financing." (p. 7) However, while you state this finding several times in the narrative of your report, we are concerned that the analytical model in Appendix II (p. 66) does not reflect this important complexity. Furthermore, we believe that this gap skews the numerical results of the model presented in Appendix II of your report because the history of cost overruns on cost reimbursement contracts is not reflected.

Now on p. 6.
Now on p. 54.

The current analytical model inappropriately assumes that construction costs and the resultant financing costs do not change when substantial risk is allocated to the government through progress payments, milestone payments or loan guarantees. In fact, progress payments and milestone payments could increase DOE's life cycle costs significantly because of large shifts in risk allocation. Adding these costs to the quantitative assessment of project costs for the various government financing options presented in Appendix II would explicitly recognize the added costs of the changed risk allocation. This perspective was discussed previously with GAO representatives. We discussed the fact that a sensitivity analysis for 20, 40, and 60 percent of possible cost growth for the progress payment option would enhance the quality of the GAO analysis.

See comment 1.

The financing needs of each project must be approached on a case-by-case basis. Government participation in a specific transaction can include a broad range of options to bridge a gap in the project's financial structure. As a general rule, the method and magnitude of government participation should depend on the unique requirements of the transaction and should serve to enhance the ability to raise private financing and lower overall project costs to the government. In order to properly evaluate the available options, it is important to define the government's objectives in the transaction. The government needs to analyze and determine the risk allocation structure, including the appropriate mix of private and government financing. This approach maximizes the project's efficiency.

See comment 2.

The Department's other major concern is related to budget scoring. Individual projects have different financing requirements which are not directly addressed by the current budget scoring guidelines of OMB Circular A-11. This Circular does not focus specifically on the scoring requirements for a contract where there exists a mixture of both public and private financing. Consequently, it should be emphasized that there is considerable flexibility in the scoring rules.

The area of hybrid finance or public/private joint capitalization is complex and evolving. The GAO's work in studying this form of contracting is helpful. There are several outstanding issues which have the potential to shift optimal structural choices (such as OMB interpretations on subsidy costs, scoring, definition of debt support, OMB Circular A-11, etc.). Thus, we would like to view this work by GAO as a useful first step, and strongly recommend that we jointly revisit this issue on a regular basis to share lessons learned and to update the analysis.

Representatives of my office and the Contract Reform and Privatization Project Office are available for any necessary additional meetings to discuss our comments.

Sincerely,

James M. Owendoff
Acting Assistant Secretary for
Environmental Management

Enclosure

Additional Comments on GAO Draft Report
DOE: Alternative Financing and Contracting Strategies for Clean-Up Projects (GAO/RCED-98-169)

Additional comments and suggestions on the report are as follows:

See comment 3.
Now on pp. 3, 5, 11, and 24.

1. Pages 3, 6, 14, 30: The GAO report addresses the EM Privatization Program as if it were a static concept. In fact, the concept is evolving as DOE evaluates actual business proposals and learns more. This problem can be addressed by referring to "EM privatization, to date."

See comment 3.
Now on p. 12.

2. Page 14, under BACKGROUND, last paragraph, last sentence, ". . . transportation project at Carlsbad." In fact, the projects are not at Carlsbad. Rather, they involve transportation from various sites to WIPP, a project administered by the Carlsbad Area Office of the DOE.

See comment 3.
Now on p. 13 and 14.

3. Page 15, Table 1.1, Spent Nuclear Fuel Transfer and Storage (Savannah River). Under "Current Status," the project has limited funding to date and is strictly in the pre-conceptual design stage.

See comment 3.
Now on p. 21.

4. Page 25, second paragraph, last sentence, states that DOE chose to privatize Pit 9, in part, "to evaluate bidders' technical proposals." This is incorrect. DOE's concerns related to a lack of in-house expertise in large remediation projects not a lack of expertise in evaluating bidders' technical proposals.

See comment 3.
Now on pp. 21 and 22.

5. Pages 26 and 27: The referenced IPA study did NOT measure contract cost growth. It measured cost growth from when the initial pre-authorization estimate was performed. Also, the IPA sample of a fixed-price contract was NOT "representative." It was based on a handful of primarily environmental restoration and Uranium Mill Tailings Remedial Action (UMTRA) contracts. Suggest changing the word "representative" to "limited."

See comment 3.
Now on p. 22.

6. Page 27, first paragraph, first sentence: The procurement and project evaluation was performed primarily by EG&G, the predecessor to LMITCO.

See comment 3.
Now on p. 25.

7. Page 31- last paragraph- The discussion of limited liability companies implies that such companies are inherently flawed. This paragraph should make clear that limited liability companies are frequently used in the private sector and that such companies can be structured to provide increased protection to DOE against default by ensuring appropriate guaranties from the parent company, insurance, or other mechanisms.

See comment 3.
Now on p. 26.

8. Page 33, under Government Guarantee of Debt. Add a statement that if there was a high likelihood of default, it is likely debt financing will not be available.

See comment 3. Now on p. 26.

9. Page 33, Footnote 2, indicating that award fees represent a small percentage of the total value of a contract. While this is a true statement, it is misleading; total award fees paid by DOE each year amount to tens of millions of dollars.

See comment 4. Now on p. 31.

10. Page 40, under Consideration of the Cost of Performance Risk for Other Financing Options, first paragraph, after the last sentence suggest adding: "Outlays are also a significant consideration. One lump sum payment of $569 million on AMWTP is an enormous draw on EM Budget Outlays in a one year period."

See comment 3. Now on p. 32.

11. Page 41, second paragraph. AMWTP is an inappropriate example. The AMWTP has a clause that allows DOE to take title to the facility under a variety of conditions.

See comment 5. Now on p. 35.

12. Page 45, under There are Several Different Options for Scoring the Acquisition or Use of Capital, last paragraph. An example would help the reader grasp these differences.

See comment 6. Now on p. 38.

13. Page 49, under Progress Payment Scenario: A table illustrating these concepts would be helpful.

See comment 3. Now on p. 45 and 46.

14. Appendix I, page 56. The Laundry Services in Idaho should be added to this list of examples, rather than shown on page 57. The contract is fixed price with fixed per unit pricing (fixed rate increases), rather than economic price adjustment.

See comment 3. Now on p. 48.

15. Page 59, Appendix I, "Fixed Price with Prospective Price Redetermination," "Major Features of Contract Type" column.

The description in the first sentence of this column is misleading. "Adjusts fee (profit) and final price" is inaccurate because in a fixed price contract, fee and/or profit are buried in the total price, not identified as a separate item. If this were a cost type contract, fee would be identified and negotiated as an identifiable component within the price.

Also, although the "type of contract" column on this page uses the words "prospective price redetermination," the first sentence in the "major features" column would lead the reader to believe that negotiations occur based on a retrospective look at the actual cost of performance. While past costs of services may be considered, redetermination of the price is a forward look, in anticipation of future conditions. This is important, because if the cost negotiated was based on the "final actual cost of performance," one would have effectively turned a fixed price contract into a cost type contract.

In the column, "Circumstances when Contract Type is Generally Used," to the first sentence we suggest adding an example: "This may be suitable for a contract with a lengthy performance period (e.g., 10 to 20 years)."

In the column, "EM Projects Using Contract Type," we suggest adding the statement: "This is a 20 year contract."

See comment 3
Now on p. 52 and 53.

16. Page 63, Appendix I. The M&O could be better characterized. For example, there are a number of tasks and projects assigned to the M&O and subcontractors that can be precisely defined and measured. It is true that there is greater latitude on changes to the scope of work and/or governing DOE orders and directives.

The following are GAO's comments on DOE's letter dated May 27, 1998.

GAO's Comments

1. Our reply to DOE's concern about our analytical model appears at the end of chapter 3.

2. Our reply to DOE's concern about the flexibility contained in OMB Circular A-11 appears at the end of Chapter 4.

3. We concur with this comment and changes have been made to the text where appropriate.

4. The issue of the ways in which budget outlays may affect decisions on how to pay for the purchase or use of capital assets is addressed later in chapter 4.

5. Examples of the various scoring scenarios are given later in the chapter when we discuss the ways that each of the model's financing options might be scored for budget purposes.

6. The variables that affect budget scoring are too numerous and complex for clear presentation in a table.

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