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Report to the Chairman, Committee on Governmental Affairs, U.S. Senate

November 1996

DEPARTMENT OF ENERGY

Opportunity to Improve Management of Major System Acquisitions

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Resources, Community, and
Economic Development Division

B-274876

November 26, 1996

The Honorable Ted Stevens
Chairman, Committee on Governmental Affairs
United States Senate

Dear Mr. Chairman:

As requested by the former Chairman, this report addresses key factors affecting the Department of Energy's ability to complete its major system acquisitions within originally estimated cost and time schedules.

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 contact me on (202) 512-3841 if you or your staff have any questions. Major contributors to this report are listed in appendix V.

Sincerely yours,

Victor S. Rezendes
Director, Energy, Resources,
and Science Issues

Executive Summary

Purpose

Over the past decade and a half, the Department of Energy (DOE) has spent tens of billions of dollars on projects, many of which experienced significant cost overruns[1] and schedule delays, and some have never been completed. Concerned about this, the Chairman, Senate Committee on Governmental Affairs, asked GAO to review DOE's ability to complete its largest and most significant projects, called major system acquisitions. Specifically, GAO was asked to (1) assess DOE's performance in completing its major system acquisitions; (2) identify any key factors that hinder the timely, cost-effective completion of the acquisitions; and (3) determine what DOE is doing to improve its performance.

Background

Over the years, DOE has conducted technically complex activities for the federal government at government-owned, contractor-operated facilities across the country. These activities have included developing and producing nuclear weapons; operating nuclear reactors, uranium enrichment plants, and plutonium production plants; performing research and development on both military and civilian uses of nuclear energy; promoting and funding nuclear and other sciences; fostering energy conservation and efficiency; managing federal petroleum reserves; and, more recently, cleaning up environmental contamination resulting from its past operations.

These activities have involved large-scale, first-of-a-kind projects requiring substantial construction and other expenses. DOE often designates such projects as major system acquisitions because of their high estimated costs (ranging from about $100 million to many billions of dollars) and their perceived importance to fulfilling DOE's missions.

Results in Brief

From 1980 through 1996, DOE conducted 80 projects that it designated as major system acquisitions. DOE has completed 15 of these projects, and most of them were finished behind schedule and with cost overruns. Three of the completed projects have not yet been used for their intended purpose. Thirty-one other projects were terminated prior to completion, after expenditures of over $10 billion. The remaining 34 projects are ongoing. Cost overruns and "schedule slippages" have occurred and continue to occur on many of the ongoing projects.

GAO believes that there are four key factors underlying the cost overruns, schedule slippages, and terminations—unclear or changing missions;

[1]Cost overruns are increases in a project's original cost estimate.

incremental funding of projects; a flawed system of incentives both for DOE's employees and contractors; and a lack of sufficient DOE personnel with the appropriate skills to effectively oversee contractor operations.

In recent years, DOE has implemented several initiatives that are helping to improve the agency's overall management. While not all of these initiatives may improve DOE's management of its major system acquisitions, GAO believes that their implementation offers DOE an excellent opportunity to address the key factors.

Principal Findings

Few Projects Completed as Planned

From 1980 through 1996, 31 of the 80 major system acquisitions DOE conducted were terminated prior to completion, after expenditures of over $10 billion. Of the 15 projects completed, 3 have not yet been used for their intended purpose. For example, the Fuels and Materials Examination Facility at DOE's Hanford Plant in Washington State was to fabricate and examine a full range of breeder reactor fuels. However, the facility has never been operated for its intended purpose because DOE's breeder reactor program was terminated in the early 1980s when the Congress cut off funding. The facility is now being used for storage and office space. DOE spent $234 million on this project.

The terminated projects were canceled for a number of reasons. In some cases, changing circumstances and/or world events simply caught up with the projects and they were no longer needed. Some were canceled due to changes in administration policy. In other cases, however, management problems and/or ineffective oversight by DOE led to large cost overruns and schedule slippages and eventual terminations. As an example of changing circumstances, due to reduced demand for uranium enrichment services to fuel commercial nuclear power plants, DOE canceled the Gas Centrifuge Enrichment Plant in Ohio after spending $2.8 billion. Other projects were terminated by the Congress. For example, GAO reported to the Congress that DOE's original cost estimate of $5.9 billion for the Superconducting Super Collider in Texas (a project intended to conduct high-energy physics experiments) had grown to $8.3 billion; yet GAO identified additional known cost increases showing that the total cost would exceed $11 billion. The Congress cut off funding for the project after a total expenditure of over $2 billion.

As of June 1996, at least half of the 34 ongoing projects were experiencing cost overruns and/or schedule slippages.[2] Most of the completed projects also experienced cost overruns and schedule slippages. For example, the total cost for the West Valley Demonstration Project in New York (to solidify high-level radioactive waste for long-term storage) grew from about $446 million to over $1 billion, and the project was more than 7 years behind schedule when completed.

Four Key Factors Affect DOE's Major System Acquisitions

GAO believes the high rate of cost overruns, schedule slippages, and terminations on DOE's major acquisitions can be traced to four key factors:

- The constantly changing missions for DOE that often make it difficult to maintain departmental and congressional support for these long-term, high-cost projects.
- The funding of projects incrementally, from year to year rather than up front, which subjects the projects to potential delays or terminations in funding each year.
- A flawed system of incentives that does not always reward individuals and organizations for doing "the right thing" and has often rewarded contractors despite poor performance.
- The difficulty in hiring, training, and retaining enough people with the requisite skills to provide effective oversight and/or management of contractors' operations.

DOE's missions have continued to evolve to where the Department bears little resemblance to the agency created in 1977. DOE is no longer focused primarily on developing alternative sources of energy, developing nuclear weapons, or modernizing the nuclear weapons complex. Today, DOE's focus has turned more to maintaining the nation's scientific and technological leadership, cleaning up the environmental contamination resulting from the past 50 years of operation, and providing stewardship for the nation's nuclear weapons stockpile. With changing missions, it is very difficult for DOE to maintain congressional and stakeholder support for projects that take years to complete and often cost billions of dollars. For example, in the early 1980s, DOE terminated five coal demonstration projects on which it had spent $459 million because the new administration did not believe that funding demonstration projects was an appropriate mission for DOE.

[2]Complete original cost estimates and current cost estimates were available for 22 of the 34 ongoing projects. Of the 22 projects, 17 were experiencing cost overruns, and 16 were experiencing schedule slippages.

DOE has historically received incremental funding for its projects. One problem with incremental funding is that budget authority for the total cost of the project is not provided at the time the project is approved. Furthermore, for many projects, particularly in their first years of development and construction, the funding received is considerably below the amount requested. This causes project schedules to slip and costs to rise, because certain contractor expenses and administrative costs (e.g., for heat, lights, water, security, etc.) will still accrue. For example, the Fermilab Main Injector Project in Illinois (to be used in high-energy physics experiments) received only 40 percent of its first 3 years of planned funding, and the Security Enhancements at the Pantex Plant in Texas (where nuclear weapons are assembled and disassembled) received only 43 percent of its first 3 years of planned funding. As a result, according to DOE officials, both of these projects are now over their originally estimated costs and years behind schedule.

Inappropriate incentives have also contributed to late and costly projects. Past Secretaries of Energy have commented on the need to change the production-oriented atmosphere in DOE to focus less on quotas for nuclear weapons and more on other important issues, such as environmental health and safety and management efficiency. DOE managers view themselves as advocates for their projects, which provides an incentive to not surface potential problems that could result in the project's being canceled. For example, participants in the Superconducting Super Collider were focused on continuing the project in order to maintain U.S. preeminence in high-energy physics despite repeated reports of chronic management problems and enormous cost overruns.

Most DOE contracts have built-in incentives—such as bonuses or penalties—to prompt satisfactory contractor performance. However, GAO found that in some instances, DOE contracting officers did not use the penalty clauses and sometimes gave contractors substantial bonuses despite subpar performance. For example, during fiscal years 1986 through 1988, many safety and health deficiencies at DOE's Rocky Flats Plant in Colorado were repeatedly raised by DOE safety staff. These included problems in the plant's radiological protection program and a lack of commitment by plant management to improve overall safety and health conditions. Despite this poor performance, the contractor received over $26 million in bonuses during this period. The plant was eventually shut down for, among other things, safety problems.

DOE continues to lack a sufficient number of employees in some areas with the necessary technical expertise to oversee the design, construction, and operation of its major system acquisitions. A 1981 DOE task force and a 1987 report by the National Research Council noted DOE's lack of technical capabilities and expertise. A March 1996 report by the Defense Nuclear Facilities Safety Board echoed those same concerns. Throughout a series of management reviews of DOE that GAO began in 1991, many DOE managers have told GAO that the lack of skilled staff in program, project, and contracting oversight positions is one of the most fundamental problems in the Department.

Resolving the Acquisition Problems Will Be Difficult

There are no quick, easy solutions to DOE's problems in keeping its major system acquisitions on schedule and within budget. However, several governmentwide initiatives could help. Recent changes to federal procurement laws, including the Federal Acquisition Streamlining Act of 1994 and the Federal Acquisition Reform Act of 1996, provide impetus to agencies to, among other things, improve the technical capabilities and performance of their acquisition management staffs. This could help resolve a long-standing problem at DOE. In addition, the Office of Management and Budget, as of July 1996, requires all federal agencies to request full funding for fixed assets (including major system acquisitions). If a project or separable segment[3] of a project is approved, the agency will receive budget authority for the full amount of the project's or segment's estimated cost and will not have to return to the Congress for additional budget authority each year. The full-funding provision could have a significant impact on DOE's management of its major system acquisitions. The agency and other stakeholders, such as the Congress, need to reach a consensus on which of DOE's major system acquisitions are most mission-critical. Then, by knowing that the funding will be available when needed, DOE and its contractors should be better able to stay within cost estimates and keep the projects on schedule.

Furthermore, beginning in 1994, DOE has implemented management initiatives in the areas of contract reform, strategic systems and life-cycle asset management, strategic planning, information resources management planning, and financial planning. GAO believes that these initiatives have the potential to help improve DOE's management of its major system acquisitions. However, it is important to note that DOE may need help in addressing some of the key factors. For example, GAO believes that this is

[3]The guidance from the Office of Management and Budget allows the full funding of economically or programmatically separable segments of projects.

an ideal time to reevaluate DOE's missions. DOE cannot do this alone because the Congress plays a key role in setting the agency's priorities. Nevertheless, GAO believes that DOE's management initiatives offer the opportunity for the agency to begin addressing some of the key factors affecting the Department's management of its major system acquisitions.

Recommendations

This report does not contain recommendations.

Agency Comments

GAO provided a draft of this report to DOE for its review and comment. DOE agreed that many of its major system acquisitions have experienced cost growth, delays, and terminations. DOE pointed out the many new management initiatives it has under way that it believes will help improve the management of all of its programs, including its major system acquisitions.

DOE raised three issues regarding the draft report, the first of these being GAO's use of the term "cost overrun." DOE believes this term leaves an unfair impression of mismanagement. GAO does not mean to leave this impression and uses the term simply to describe those situations where project costs have increased above the original cost estimates. The second issue relates to GAO's discussion of DOE's commitment to competition under its contract reform efforts. DOE defends its decision to extend certain contracts without competition. GAO remains concerned that DOE's public announcement to extend these contracts before negotiations had taken place may compromise the Department's ability to effectively negotiate the terms of the extensions. The third issue relates to GAO's discussion of DOE's ability to hire, train, and retain qualified employees to oversee its contractors. DOE lists a series of initiatives to address these concerns. DOE's initiatives are recognized in this report, and GAO believes that, if fully implemented, they can help resolve long-standing departmental problems. DOE also suggested several changes to clarify information in the report, and GAO incorporated those comments where appropriate. The full text of DOE's comments and GAO's response are included as appendix IV.

Contents

Abbreviations

DOE	Department of Energy
GAO	General Accounting Office
MSA	major system acquisitions
OMB	Office of Management and Budget

Introduction

The Department of Energy (DOE) is one of the most complex, multifaceted departments within the federal government. Established in 1977 in response to the global energy crisis that disrupted U.S. and world markets and economies, DOE is an amalgam of various federal agencies that had energy and science responsibilities. The roots of the Department came from the Atomic Energy Commission that was established in 1947 to assume the responsibilities of the Manhattan Engineer District, which had developed the first atomic bombs. The Commission was responsible for developing and producing nuclear weapons; operating nuclear reactors, uranium enrichment plants and plutonium production plants; performing research and development on both military and civilian uses of nuclear energy; and promoting and funding nuclear and other sciences. DOE assumed these as well as other responsibilities, including energy technology research, development, and demonstration; fostering energy conservation and efficiency; managing federal petroleum reserves; and, more recently, cleaning up environmental contamination resulting from its past operations.

To carry out these responsibilities, DOE continues a highly decentralized structure that began under the Atomic Energy Commission. This structure relies heavily on private contractors, either corporations or universities, to manage most of its operations and activities. DOE owns the facilities needed to conduct the work, but the private contractors manage and operate the facilities. DOE's work force is composed primarily of contractors. As of mid-1996, DOE had about 12,500 federal employees and about 120,000 contract workers located at its headquarters and field facilities throughout the country. To support these facilities and workers, DOE receives substantial funding, which ranged from $19.0 billion in 1986 to $23.7 billion in 1990. For fiscal year 1996, DOE was authorized to spend $19.7 billion.

DOE Conducts Many Large-Scale, High-Risk Projects

More than most federal agencies, DOE's activities involve projects that are usually long term and high cost. In many cases, the projects are first-of-a-kind and thus involve substantial risk. These projects generally involve substantial funding for construction, are conducted to address a specific mission need, and are often separate line items in DOE's budget. For example:

- DOE's science programs in high-energy physics and nuclear physics require the construction of accelerators, which are large machines that propel atomic particles near the speed of light. The collisions of these particles

are studied to explore the properties of matter. These accelerators can range in cost from several hundred million dollars to several billion dollars, or more. For example, the Continuous Electron Beam Accelerator Facility in Virginia (recently renamed the Thomas Jefferson National Accelerator Facility), shown in figure 1.1, cost over $500 million.[1]

- DOE's nuclear weapons programs required the construction of nuclear reactors to produce the materials needed for nuclear weapons. Additionally, other large and specialized facilities are needed to process the materials and manufacture, assemble, and test nuclear weapons components. Any of these facilities can easily cost over a billion dollars. For example, just the design work and close-out costs for a nuclear reactor to produce tritium, a key component of nuclear weapons, were more than $1.2 billion.
- DOE's environmental management programs require facilities and technologies to process nuclear waste into forms suitable for longer-term or permanent disposal. These programs also need technologies and equipment to remove nuclear and hazardous material contamination from existing facilities and sites. Some facilities at major DOE field sites will cost many billions of dollars. For example, the Defense Waste Processing Facility in South Carolina (to process high-level radioactive waste into a stable form for long-term storage), and the support facilities to prepare the waste for processing, shown in figure 1.2, cost over $4 billion.

[1]All photographs in this report were provided courtesy of the U.S. Department of Energy.

Figure 1.1: Continuous Electron Beam Accelerator Facility

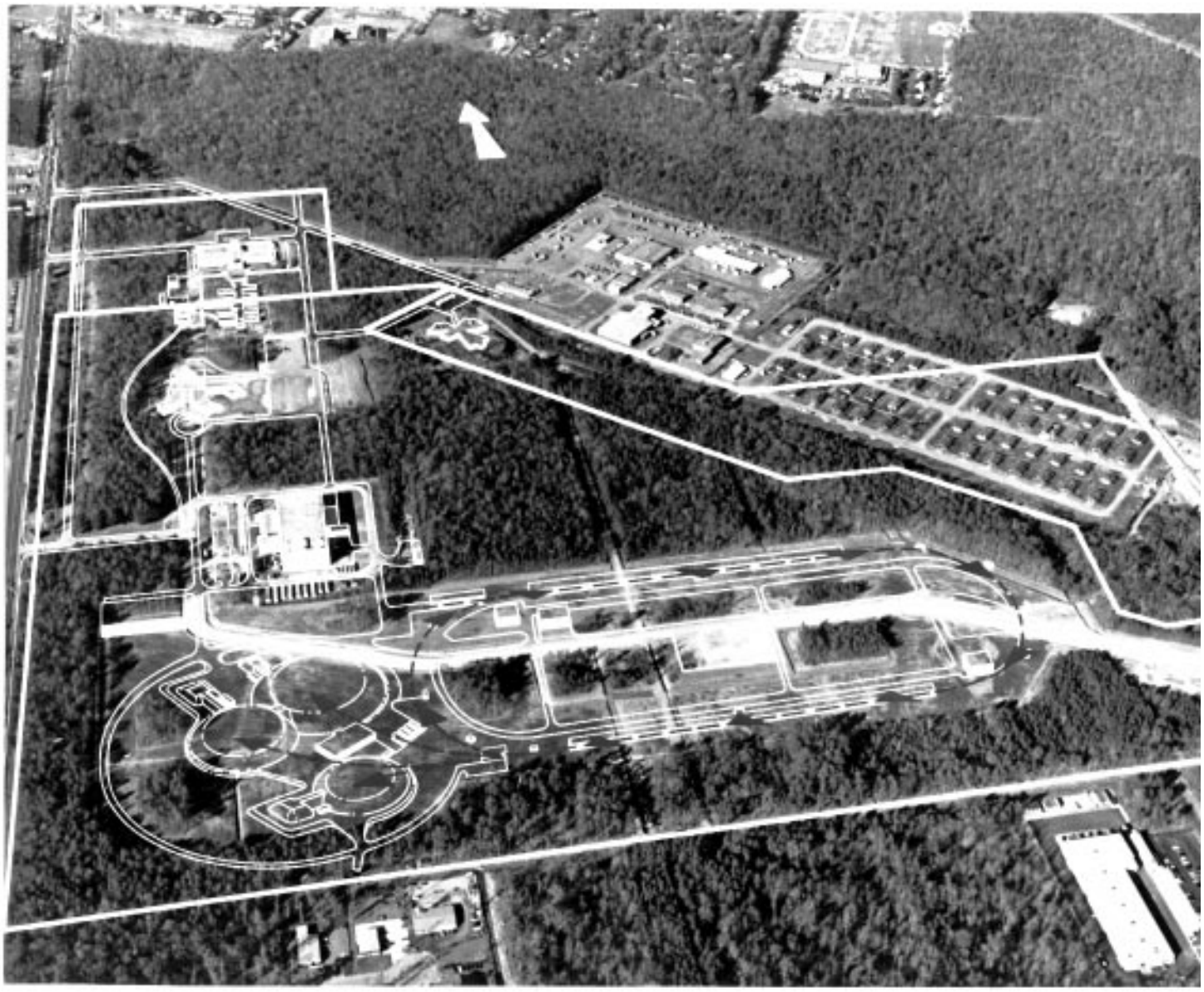


Figure 1.2: Defense Waste Processing Facility

These large-scale projects account for a significant portion of DOE's budget. Funds for many of the projects are requested by DOE as specific construction line items, and funding for such projects is identified in

congressional committee reports. However, from a total budget standpoint, considerably more operating funds than construction funds are provided for DOE projects, and the operating funds provided for some projects cannot be as easily determined, particularly for older projects. Funds needed for conceptual design, management, start up, and other nonconstruction activities—which can be as much as 40 percent of a project's total cost—are included as part of DOE's operating funds. Furthermore, some projects are funded entirely with operating funds. For example, over $1 billion of the operating funds appropriated annually for DOE's environmental restoration activities are used for large-scale clean-up projects.

Major System Acquisitions

Office of Management and Budget (OMB) Circular A-109, dated April 5, 1976, recognized that certain projects and/or activities are crucial to an agency accomplishing its missions. The circular defined projects that are critical to fulfilling an agency mission, entail the allocation of relatively large amounts of resources, and warrant special management attention as major system acquisitions (MSA). The circular (1) required early communication with the Congress that relates MSAs to agency mission needs and goals, (2) focuses top-level management attention on the determination of these mission needs and goals, and (3) requires an integrated approach to budgeting, contracting, and managing these projects. However, the specific criteria and dollar thresholds for determining which activities will be considered MSAs were left to the discretion of the individual agencies.

In response to the OMB circular, DOE initially defined MSAs as systems or projects that had a total project cost in excess of $250 million and were specifically identified as mission critical. In 1990, DOE changed the cost threshold to $100 million. During the period 1980 through 1996, DOE conducted 80 different MSAs. These projects addressed many different program areas and activities, including the Superconducting Super Collider; nuclear reactors; uranium enrichment processes and facilities; fossil fuel demonstration plants; nuclear waste disposal facilities; and environmental cleanup efforts. According to current cost estimates, DOE has spent or plans to spend over $65 billion on these 80 MSAs.[2]

Successfully completing MSAs on time and within estimated dollar targets has proven difficult. Over the past few years, we have issued a number of

[2]DOE does not have complete cost estimates for all of its MSAs. Five of the ongoing MSAs without costs estimates are major environmental management projects that will cost many billions of dollars.

reports that have discussed overall acquisition issues and problems in other federal agencies, as well as problems with individual projects. In a December 1992 report, we discussed problems with the Department of Defense's major weapons acquisitions resulting in substantial cost overruns, delays in completing and fielding these acquisitions, and performance problems.[3] Similarly, in an August 1996 report, we discussed the Federal Aviation Administration's problems in acquiring new air traffic control system equipment within cost, schedule, and performance parameters.[4] Both reports identified fundamental problems that inhibit the successful completion of these agencies' major acquisitions. For example, we reported that Federal Aviation Administration officials acted in ways that did not reflect a strong commitment to the agency's acquisition mission. They performed little or no mission needs analysis, set unrealistic cost and schedule estimates, and started production on the systems before having completed their development.

Furthermore, in July 1995, we reported on governmentwide federal information technology acquisitions that cost more than anticipated, did not meet schedules, and did not meet mission needs.[5] All of these acquisitions have suffered from a lack of advance planning and ineffective management oversight that has led to cost overruns and schedule slippages. Currently, 11 federal agencies have problems with information management or systems development that are serious enough that they have been listed by GAO, OMB, and/or the General Services Administration as high-risk programs.

We have also discussed problems with specific DOE MSAs in many reports over the years.[6] These reports address MSAs that range from the multibillion dollar Yucca Mountain Site Characterization Project in Nevada (a proposed repository for high-level radioactive waste), shown in figure 1.3, to the approximately $140 million Central Receiver Solar Thermal Power Plant in California, shown in figure 1.4. We have also reported on generic MSA management problems facing DOE, such as the agency's frequent failure to ensure that critical management control documents for

[3]Weapons Acquisition: A Rare Opportunity for Lasting Change (GAO/NSIAD-93-15, Dec. 1992).

[4]Aviation Acquisition: A Comprehensive Strategy Is Needed for Cultural Change at FAA (GAO/RCED-96-159, Aug. 22, 1996).

[5]Information Technology Investment: A Governmentwide Overview (GAO/AIMD-95-208, July 31, 1995).

[6]See "Related GAO Products" at the end of this report.

MSAs are prepared before projects are allowed to proceed beyond the conceptual design phase.[7]

Figure 1.3: Yucca Mountain Site Characterization Project

[7]Department of Energy: Status of Reporting Compliance for DOE's Major System Acquisitions (GAO/RCED-92-204FS, Aug. 24, 1992).

Figure 1.4: Central Receiver Solar Thermal Power Plant

Objectives, Scope, and Methodology

The Chairman, Senate Committee on Governmental Affairs, asked us to review DOE's acquisition management program and the past problems that have occurred. As agreed with the Chairman's office, this report (1) assesses DOE's performance in completing its MSAs, (2) identifies key factors that hinder the timely, cost-effective completion of the acquisitions; and (3) determines what DOE is doing to improve its performance.

To respond to the Chairman's request, we interviewed and obtained documents from DOE officials responsible for the Department's overall MSA program and from DOE officials responsible for managing specific MSAs. We also obtained documents from officials of the National Academy of Sciences and the Defense Nuclear Facilities Board, which had experience reviewing DOE's management of its MSAs. We also surveyed our managers who had prior experience in auditing specific DOE MSAs and reviewed the reports and other documents resulting from those audits. (See "Related GAO Products.")

We obtained listings identifying 80 MSAs conducted during the period 1980 through 1996 from DOE's Office of Project and Fixed Asset Management under the Deputy Associate Secretary for Field Management.[8] DOE has not retained a comprehensive cost and schedule history of its MSAs. As a result, the data used in this report had to be reconstructed from budget submissions, internal documents, and from officials of DOE's Office of Project and Fixed Asset Management. We did not verify the data obtained from DOE. However, we did examine the reasonableness of these data based on information in prior GAO reports and audits. For this report, we used, wherever possible, the MSA's "Total Project Cost," which includes construction and operating funds. Where these costs were not available, we used the "Total Estimated Cost," which includes construction costs. We have footnoted the latter. (See app. I, II, and III.)

We provided a draft of this report to DOE for its review and comment. DOE's comments and our response are included as appendix IV and are discussed in the chapters where appropriate. We conducted our work from August 1995 through October 1996. Our work was conducted in accordance with generally accepted government auditing standards.

[8]There may be other projects conducted by DOE that meet the definition of an MSA, but they were not identified as MSAs to us by DOE during our review.

DOE's Limited Success With Its MSAs

Since 1980, DOE has conducted 80 projects that it designated as MSAs. As of June 1996, 34 were ongoing. Our analysis of DOE's success in completing its MSAs shows that during the period 1980 through 1996:

- DOE completed 15 of 80 MSAs, while more than twice as many projects (31) were terminated prior to completion.
- Cost overruns occurred on most completed projects and at least half of the ongoing projects, in some cases more than doubling the original estimates.
- Most of the completed projects were not finished on schedule, and many of the ongoing MSAs were behind schedule.
- Three of the completed projects either have not achieved their expected results or have not yet been used for their intended purposes.

High Rate of Project Terminations

Since 1980, 31 MSAs were terminated prior to completion. These projects had incurred substantial expenditures when they were terminated, totaling more than $10 billion.[1] These terminated projects include:

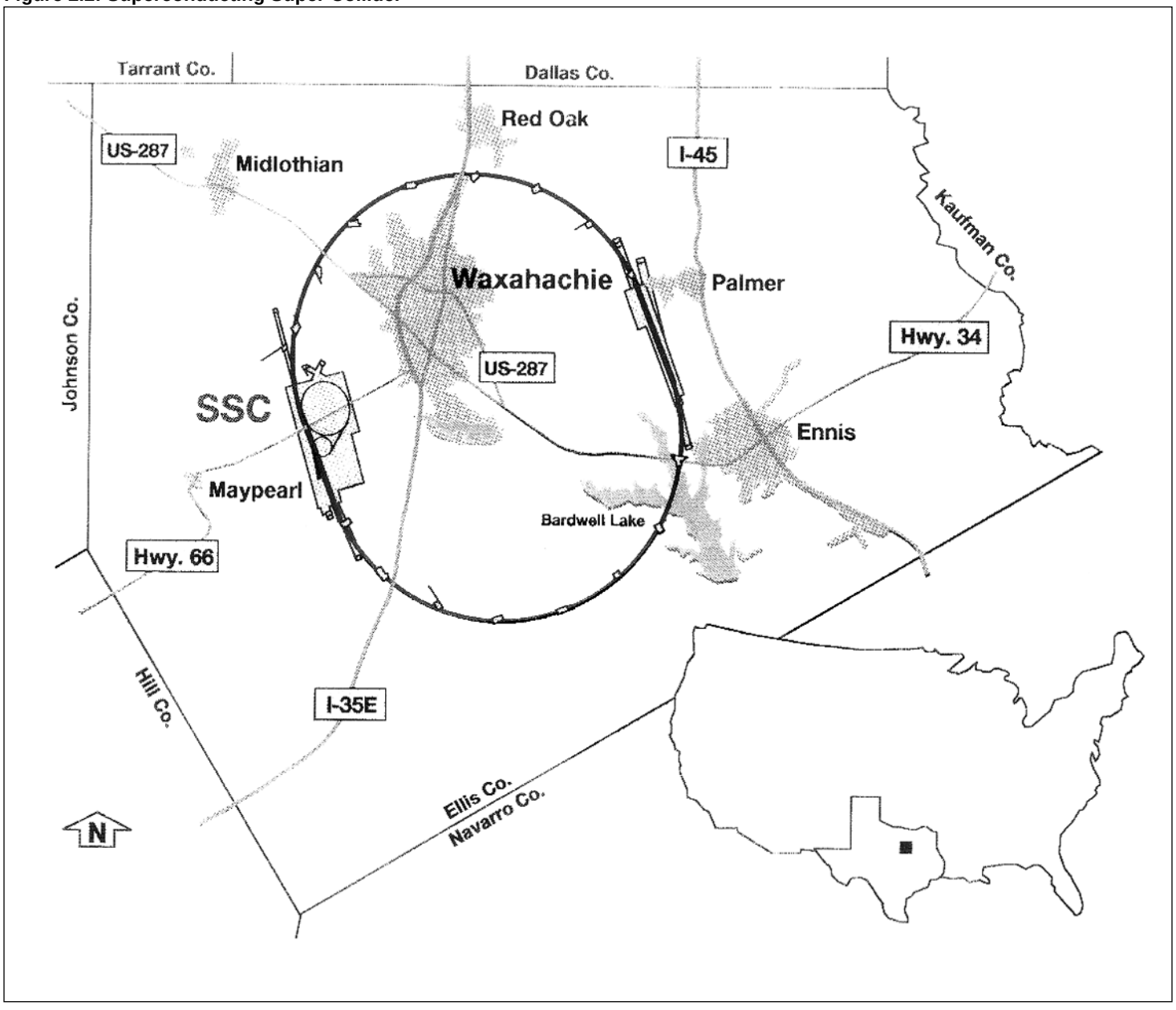
- The New Production Reactor program to produce tritium, a key ingredient in nuclear weapons, was canceled in 1992 after the expenditure of over $1.2 billion, primarily for design work and close-out costs. No final technology or site was selected.
- The Clinch River Breeder Reactor Project in Tennessee was intended to demonstrate a reactor that could create more fuel than it used. Authorized in 1970 at an estimated total cost of $700 million, the project was terminated in 1983 after an expenditure of about $1.6 billion.
- The Gas Centrifuge Enrichment Plant in Ohio, shown in figure 2.1, authorized in 1975 at an estimated total cost of $5.1 billion, was terminated in 1985 after an expenditure of $2.8 billion.
- The Superconducting Super Collider in Texas, shown in figure 2.2, was designed to conduct high-energy physics experiments. The collider would have required an oval tunnel 54 miles in circumference at an average depth of 150 feet below ground level. Originally funded as a construction project in fiscal year 1990 at an estimated total cost of $5.9 billion, the project was terminated in 1993 after an expenditure of over $2 billion.
- The Fuel Processing Restoration Project in Idaho (to increase naval nuclear propulsion fuel processing capacity) was begun in 1985. About $306 million had been spent for construction when the project was terminated in 1992.
- The Uranium Solidification Facility in South Carolina (to recycle enriched uranium and provide material for reactor fuel), begun in the late 1980s,

[1]Dollars in year expended.

had an original construction cost estimate of $85 million. When the project was terminated in 1994, about $116 million had been spent for construction.

Figure 2.1: Gas Centrifuge Enrichment Plant

Figure 2.2: Superconducting Super Collider



There are many reasons for these terminations, some of which were outside of DOE's control. In some cases, changing circumstances and/or world events simply caught up with the projects, and they were no longer

needed. In others, the necessary technologies to make the projects work could not be perfected in time. Some were canceled due to changes in administration policy. However, in other cases, as pointed out in DOE Inspector General and our reports, management problems and/or ineffective oversight by DOE led to enormous schedule slippages and cost overruns, and the Congress eventually cut off funding. Appendix I lists the terminated projects, their original cost estimates, and the amount spent on each prior to termination.

Cost Overruns

Increases in projects' costs beyond original cost estimates, or cost overruns, can result in program disruption and a lack of confidence in project management, and can divert funds needed by other programs. Cost overruns on DOE projects were common occurrences during the 1980 through 1996 period. Complete original cost estimates and final/current cost estimates were available for 35 of the 49 completed or ongoing projects. Of these 35 projects, 4 were completed and 4 were expected to be completed at or below their originally budgeted cost. The remaining 27 projects had or were projected to have cost overruns averaging over 70 percent.[2] Table 2.1 provides examples of projects that were experiencing substantial cost overruns.

[2]For some projects, DOE does not have original and/or current estimates for the Total Project Costs, so these projects are not included in this average. For example, according to DOE, some environmental restoration projects were initiated as immediate responses to certain legal and regulatory requirements. As a result, DOE did not have sufficient opportunity to completely define the scope of the projects and develop Total Project Cost estimates.

Table 2.1: Examples of Ongoing and Completed Projects Experiencing Cost Overruns (as of June 1996)

Dollars in millions

Project name	Status	Original cost estimate	Final/current cost estimate	Percent over original estimate
Mirror Fusion Test Facility	Completed	$132.5	$363.8	175
Ebullated Bed (H-Coal) Pilot Plant	Completed	$110.2	$277.9	152
West Valley Demonstration Project	Completed	$446.0	$1,008.5	126
Defense Waste Processing Facility	Ongoing	$1,529.5	$2,470.7	62
Weldon Spring Remedial Action Project	Ongoing	$357.7	$865.0	142
High-Level Waste Removal from Filled Waste Tanks	Ongoing	$88.6	$828.2	835
Replacement High-Level Waste Evaporator	Ongoing	$46.7	$154.1	230

A list of the original and final/current cost estimates for all completed and ongoing projects are contained in appendixes II and III, respectively.

Cost overruns also occurred in terminated projects and, in some cases, were the contributing factor to their termination. For example, DOE's estimate of the total cost to build the Superconducting Super Collider grew from $5.9 billion in 1990 to $8.25 billion in 1991. In May 1993, we reported that additional known costs showed that the project's total costs would exceed $11 billion and could go higher.[3] The project was terminated by the Congress in October 1993, because of concerns over the escalating costs and the federal budget deficit.

Over the years, we and DOE's Inspector General have reported that cost overruns on DOE's MSAs have occurred for a number of reasons, including technical problems, some of which were beyond the agency's control; poor initial cost estimates; and ineffective oversight of contractor operations. For example, in 1992, we reported that technical problems

[3]Federal Research: Super Collider—National Security Benefits, Similar Projects, and Cost (GAO/RCED-93-158, May 14, 1993).

were important factors causing the cost of the Defense Waste Processing Facility to increase.[4] This facility, at DOE's Savannah River Plant in South Carolina, was designed to turn high-level radioactive waste into a glass-like form for long-term storage. The technical problems included the generation of benzene during the pretreatment process and the buildup of highly explosive gases during the vitrification process.

In 1993, we reported that poor estimating of project costs contributed to cost overruns with DOE's environmental projects.[5] In 1995, the Inspector General reported on problems with the High Level Waste Evaporator at Savannah River.[6] The evaporator is designed to evaporate water added to the high-level radioactive waste processing stream, thereby reducing the total volume of waste. The estimated cost of the project had more than doubled, and the estimated completion date had slipped by more than 4 years. The Inspector General found that many of the cost increases and schedule delays could have been avoided if DOE had adequately planned, contracted, funded, and maintained management continuity. A major factor was DOE's failure to ensure that the contractor followed the project management guidance in DOE's orders.

Project cost overruns have occurred for other reasons. On some projects, according to DOE officials, changing legal and regulatory requirements have increased the scope of the projects resulting in higher costs than were originally estimated. For example, DOE officials point out that the number of sites to be cleaned up under DOE's Formerly Utilized Site Remedial Action Program increased, due in part to legislation. Furthermore, DOE officials told us that some program offices were not consistently following guidance on which costs are to be included as part of Total Project Cost, and this resulted in understating those costs. Consequently, the Total Project Cost for some MSAs increased when these program offices began to adhere to the cost guidance.

Schedule Slippages

Schedule slippages can have serious implications for DOE projects. Slippages can adversely impact DOE's ability to produce or maintain nuclear weapons components, achieve timely cleanup of contaminated

[4]Nuclear Waste: Defense Waste Processing Facility—Cost, Schedule, and Technical Issues (GAO/RCED-92-183, June 17, 1992).

[5]Nuclear Health and Safety: More Can be Done to Better Control Environmental Restoration Costs (GAO/RCED-92-71, Apr. 20, 1992).

[6]The Audit of the Replacement High Level Waste Evaporator at the Savannah River Site, Office of the Inspector General, U.S. DOE (ER-B-95-04, June 26, 1995).

sites, or be the first to make new scientific breakthroughs. Schedule slippages also generally equate to additional project costs. Many administrative or overhead costs—such as security, heat, water, etc.—will be incurred throughout the life of the project and increase as the length of the project increases. Contractors' costs, which are passed on to DOE, will also rise as the schedule slips.

Schedule delays and slippages were prevalent on DOE projects during the period 1980 through 1996. Most of the 15 completed MSAs did not meet their originally scheduled completion dates. Of the 34 ongoing projects, only a few originally scheduled for completion in this century are on time. Examples of projects that experienced some large schedule slippages are shown in table 2.2.

Table 2.2: Projects With Significant Schedule Slippage (as of June 1996)

Project name	Status	Original completion date	Final/current completion date	Years behind schedule
Tritium Loading Facility Replacement	Completed	September 1989	December 1993	4.25
West Valley Demonstration Project	Completed	March 1988	August 1995	7.4
Non-Radioactive Hazardous Waste Management	Ongoing	June 1986	June 1997	11.0
Defense Waste Processing Facility	Ongoing	March 1990	November 1996	6.75
Yucca Mountain Site Characterization Project[a]	Ongoing	May 1991	March 2002	10.8
Security Enhancements, Pantex Plant	Ongoing	June 1994	September 1997	3.25

[a]The original completion date is from a 1985 DOE estimate. The current completion date is derived from the MSA approved in January 1992 and from more recent project progress data.

The reasons for schedule slippage are similar to those for cost overruns, and they are very much intertwined. Any event that causes schedule slippage is likely to cause cost increases. For example, the schedule for the West Valley Demonstration Project in New York State (to solidify

high-level radioactive waste for long-term storage), shown in figure 2.3, slipped by over 7 years and costs more than doubled.

Figure 2.3: West Valley Demonstration Project

Some Completed Projects Have Not Operated as Intended

Once completed, an MSA must operate as intended in order to fulfill a program need. Of the 15 MSAs that DOE considered to be completed as of June 1996, 3 have not performed as expected or otherwise have not achieved their expected results.

- The Mirror Fusion Test Facility in California, shown in figure 2.4, was to perform experiments to provide an alternative approach for achieving fusion energy. The project is listed by DOE as being completed at a final cost of $364 million; however, the facility never became operational because programmatic funding was reduced by the Congress, and the remaining funds were used by DOE for higher priority projects. The facility has remained shut down since 1986.
- The Waste Isolation Pilot Plant in New Mexico, shown in figure 2.5, was to demonstrate the feasibility of underground storage of certain types of government-generated radioactive waste. DOE declared the plant operational in 1991. However, due to additional environmental, regulatory, and technical requirements that were imposed by legislation, the facility has not yet received the necessary certificates and permits to operate and has not yet received any radioactive waste. DOE currently expects this facility to begin operations in fiscal year 1998. To date, DOE has spent $710 million on this project.
- The Fuels and Materials Examination Facility at DOE's Hanford Plant in Washington State, shown in figure 2.6, was to fabricate and examine a full range of breeder reactor fuels. This project, although listed by DOE as being completed, has never operated for its intended purpose because DOE's breeder reactor program was terminated in the early 1980s when the Congress cut off funding. The facility is now being used for storage and office space. DOE spent $234 million on this project.

Figure 2.4: Mirror Fusion Test Facility

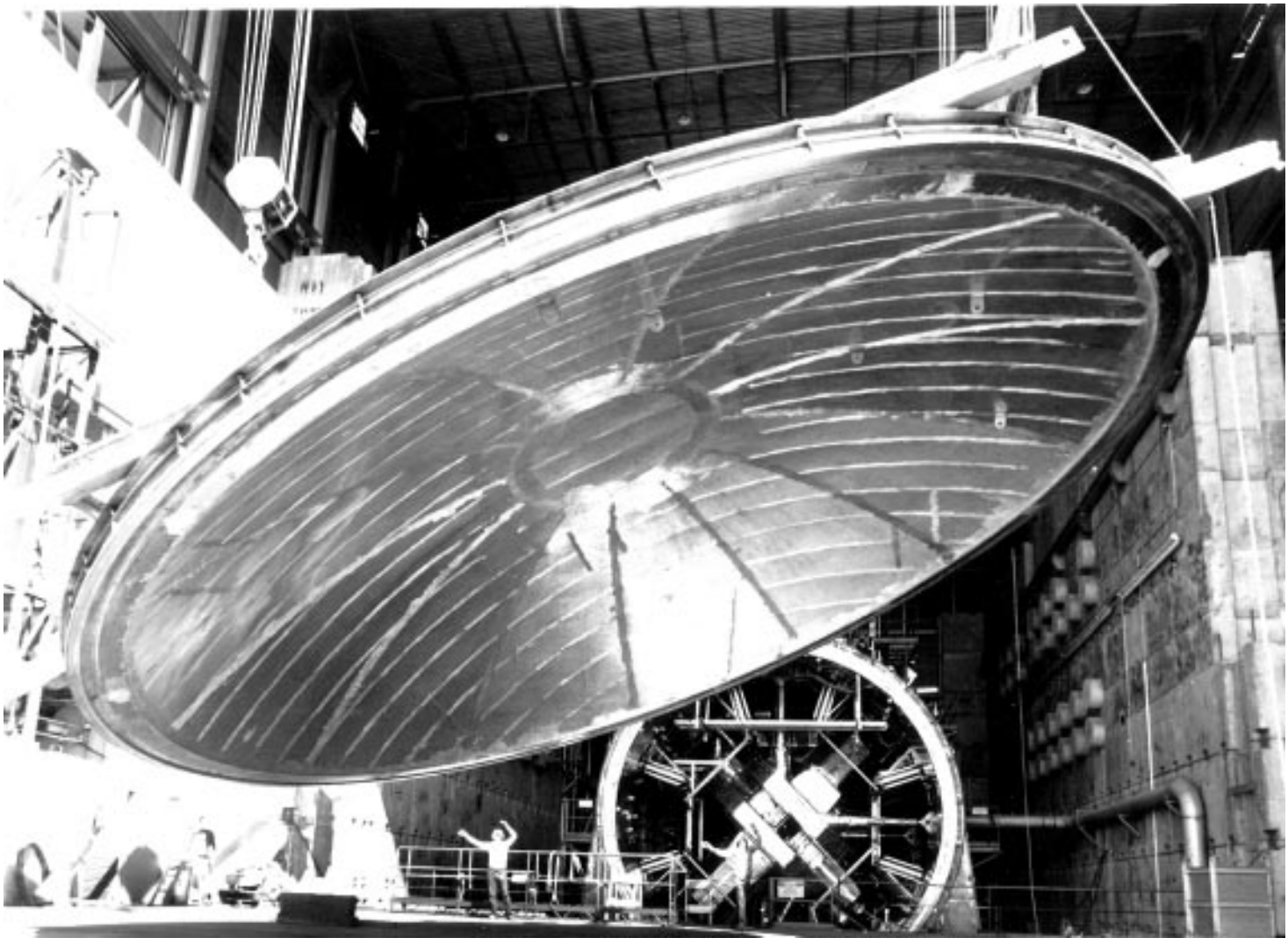


Figure 2.5: Waste Isolation Pilot Plant

Figure 2.6: Fuels and Materials Examination Facility

Key Factors Inhibiting the Successful Completion of MSAs

Our work over the years and that of others, including DOE's Inspector General, has identified a wide variety of specific problems leading to schedule slippages and cost overruns for MSAs. When looked at individually, there appears to be logical explanations of why specific MSAs experienced delays and cost increases. However, when looked at collectively over an extended time (e.g., 80 MSAs from 1980 through 1996), other more fundamental reasons or factors can be seen. We believe that there are four key factors underlying the increasing project costs, schedule slippages, and high number of terminations. The factors include

- constantly changing missions for DOE that often make it difficult to maintain departmental and congressional support for these long-term, high-cost projects;
- the funding of projects incrementally, from year to year rather than up front, which subjects those projects to potential delays or terminations in funding each year;
- a flawed system of incentives that does not always reward individuals and organizations for doing the right thing and has often rewarded contractors despite poor contract performance; and
- difficulty in hiring, training, and retaining enough people with the requisite skills to provide effective oversight and/or management of contractor operations.

Changing DOE Missions and Inconsistent Support

Since its creation, DOE's missions have continued to change, and the DOE of today bears little resemblance to the agency created in 1977. The relative priority of DOE's responsibilities has also changed greatly over the years. As a result, DOE no longer has major efforts underway or has substantially cut back its efforts to

- develop alternative sources of energy to help promote energy independence (a key activity in the late 1970s);
- further develop commercial nuclear power (a major DOE activity in the late 1970s);
- build new nuclear weapons (a major buildup in the 1980s);
- rebuild the nuclear weapons complex (a principal agency concern in the late 1980s); or
- provide commercial uranium enrichment services (which the Congress transferred out of DOE in 1993 to a government corporation, the U.S. Uranium Enrichment Corporation).

At the same time, other missions have become a greater focus of the agency's efforts. These include cleaning up years of contamination resulting from DOE's nuclear and other activities, improving the nation's scientific and industrial competitiveness, and providing stewardship for the nation's nuclear weapons stockpile. Accordingly, many projects have been terminated, either by DOE or the Congress, because they were no longer considered critical or important to DOE's mission. Examples include the following.

- The Clinch River Breeder Reactor project was begun in 1970 as a high-priority project to demonstrate a nuclear reactor that could "breed" or produce more fuel than it consumed. However, the fuel that it would produce is plutonium, a key material for nuclear weapons, and this raised concerns about the proliferation of nuclear weapons. Coupled with reduced expectations for the future use of nuclear energy, the development of a breeder reactor was no longer a priority. The project was terminated by the Congress in 1983 after the expenditure of about $1.6 billion.
- The Atomic Vapor Laser Isotope Separation Project in California, shown in figure 3.1, was begun in 1973 to develop a more efficient process to enrich uranium for use as fuel in commercial nuclear power plants. In the early 1990s, however, DOE's mission of providing uranium enrichment services to public utilities and other non-DOE customers ended. Consequently, DOE terminated its efforts on this project in 1993 after a total expenditure of $1.3 billion.[1]
- The Fuel Processing Restoration Project was begun in 1985 to build improved facilities to process naval nuclear propulsion fuels for reuse in DOE's production reactors. With the end of the cold war, however, this mission changed and the production reactors closed, thereby negating the need for this project. The project was terminated by DOE in 1992 after a total expenditure of $306 million for construction.

[1]DOE transferred this project to the U.S. Uranium Enrichment Corporation, and DOE officials believe the Corporation will continue work on the technology and eventually use it in commercial applications.

Figure 3.1: Atomic Vapor Laser Isotope Separation Project

Projects have also been terminated when a change in administration policy occurred. In the early 1980s, DOE terminated five coal demonstration plants, on which it had spent $459 million. These projects were looking at more efficient and/or environmentally safe ways to burn coal. The projects were canceled because the new administration did not believe that

funding demonstration projects was an appropriate mission for DOE. Other terminations resulted from changing world conditions. For example, after spending over $1.2 billion, DOE terminated plans to develop the New Production Reactor to produce tritium, a vital material for nuclear weapons. The project was terminated because of anticipated reductions in the nuclear weapons arsenal resulting from arms reduction agreements and the end of the Cold War. Also, because of reductions in nuclear weapons, DOE terminated upgrades on its existing production reactor at its Savannah River Plant after spending about $1.7 billion. Finally, DOE terminated the Uranium Solidification Facility when it was 90 percent complete, because the products from the facility—materials for nuclear fuel—were no longer needed with the shut down of the Savannah River reactors.

Incremental Funding of Projects

Having funds available to keep a project on schedule is critical to achieving project objectives. DOE has historically received incremental funding for its projects. With incremental funding, the Congress provides funds for one fiscal year for a project based on the obligations estimated to be incurred within that fiscal year. Funds to continue the project must be requested from the Congress each year. DOE, in its annual budget submissions, develops and provides the Congress with a profile or schedule of the funding it will need each year to complete each project.

However, when funds are provided incrementally, they often do not keep pace with the agency's estimated needs. For many projects, particularly in their first years of development and construction, the funding received is considerably below the amount requested. This causes project schedules to slip and costs to rise. Contractors continue to charge, and certain administrative costs (e.g., heat, water, electricity, security, etc.) are incurred each month no matter what the progress. For example, the Continuous Electron Beam Accelerator Facility was designed to conduct nuclear physics experiments. The project's funding request called for it to receive a total of $236 million for construction during fiscal years 1987 through 1991. However, in its first 3 years the project received only $94 million, or about 60 percent, of the $155 million scheduled. According to DOE officials, largely because of this funding delay, the project's construction schedule was extended 3 years, and the construction costs increased by $77 million to $313 million.[2]

[2]The Total Project Cost for this project was $513 million.

Similarly, the Fermilab Main Injector Project in Illinois (to construct a new particle accelerator for use in high-energy physics experiments) received only 40 percent of its first 3 years planned funding and the Security Enhancements at the Pantex Plant in Texas (where nuclear weapons components are assembled into final weapons), shown in figures 3.2 and 3.3, were funded at only 43 percent of the first 3 years schedule. According to DOE officials, both of these projects are now over cost and years behind schedule as a result of the reduced funding levels.

Figure 3.2: Guard Observation Tower at Pantex Plant

Figure 3.3: Disassembled Nuclear Weapon at Pantex Plant

On the other hand, DOE has had better results with projects when year-to-year funding was not a concern. In May 1994, we reported that under DOE's clean coal technology program, the Congress appropriated $2.75 billion to fully fund the federal share of this joint federal/nonfederal program.[3] Nonfederal contributions eventually reached more than $4.5 billion. According to DOE, this advance commitment of federal funds

[3]Fossil Fuels: Lessons Learned in DOE's Clean Coal Technology Program (GAO/RCED-94-174, May 26, 1994).

was an important reason for the industry's significant response to the program, in terms of both the quantity and quality of the proposals received as well as the nonfederal cost-sharing achieved. Virtually all of the DOE officials, project sponsors, and other program participants we spoke with perceived the government's advance financial commitment as a very big advantage for multiyear projects, because it indicated that the government would be involved in cost-sharing throughout the life of the projects. The industry participants told us that they would not want to commit significant funds in the early years of projects if they perceived that the government might stop sharing costs before the projects were completed.[4]

An additional problem with incremental funding is that it may allow some projects to be started that would not be funded if the Congress had to provide budget authority for their full estimated costs at the time the project was approved. (This concept of full funding is discussed in ch. 4.) In this regard, it is easier for DOE to start a project by requesting $100 million for 1 year, rather than to request the full cost of the project, which may be over a billion dollars.

Lack of Effective Incentives

Most organizations have available to them incentives that can be used to affect the performance of their employees and contractors. These incentives normally consist of rewards for good performance and penalties for performance that does not meet agreed-to standards. To the extent that these incentives are properly applied, they can be effective in helping achieve agency goals. On the other hand, if not properly applied, incentives can impede successful completion of projects such as MSAs. DOE has incentives for its own employees and for its contractors.

DOE Employees

Incentives for DOE employees include salaries, promotions, and bonuses. Other incentives include job satisfaction, recognition for good work, working for a prestigious agency or organization within an agency, being part of a highly effective team, etc. To the extent that an organization uses these incentives to keep its employees focused on the organizations goals, it will more likely achieve those goals.

However, goals can sometimes become unclear. Parochial interests can take over, and the real goal can become simply keeping the project going.

[4]Advance federal funding did not solve all of the problems. As we reported, DOE still experienced some problems under the clean coal program, particularly project delays and cost increases resulting from compliance with environmental review requirements and project site changes.

Many DOE managers view themselves as advocates for their projects, which provides an incentive to not surface problems that could result in the project being terminated. For example:

- DOE and its contractors maintained efforts to build the $5.1 billion Gas Centrifuge Enrichment Plant for 3 years after it was pointed out that the demand for enrichment services was declining and that the costs of the plant would not be recovered.[5] DOE eventually agreed that the project was no longer needed and terminated it after spending $2.8 billion. The delay in stopping this project occurred largely because of DOE's desire to maintain its historical mission of being the major world supplier of enrichment services.
- Participants in DOE's Superconducting Super Collider saw this project as allowing the United States to maintain preeminence in high-energy physics. Project managers originally expected that it would cost $5.9 billion and that large amounts of foreign contributions to the project would be forthcoming. However, the foreign contributions never reached expected levels, and project costs escalated greatly. Project participants and other supporters continued to try to keep the project going despite evidence that the total cost would exceed $11 billion.[6] The Congress finally cut off funding for the project in 1993 after a total expenditure of over $2 billion.

Upon taking office in 1989, the Secretary of Energy addressed this concern and called for a changed "culture" within the Department. The Secretary indicated that an atmosphere, or culture, had been created whereby the incentive for employees and contractors was to push ahead and complete whatever project they were working on—there was no incentive for anyone to question whether a project should be continued.

DOE's Contractors

DOE builds incentives into its contracts that can include bonuses for work that meets or exceeds expectations or penalties for poor performance. As we have previously reported, however, DOE contract managers seemed reluctant to use the penalties and sometimes used the financial rewards inappropriately. In some cases, DOE rewarded contractors with award fees, or bonuses, even though their performance was poor. In October 1989, we reported that during fiscal years 1986 through 1988, many safety and

[5]Issues Concerning The Department of Energy's Justification For Building The Gas Centrifuge Enrichment Plant (GAO/EMD-82-88, May 25, 1982); and Supplement (GAO/EMD-82-88S, June 24, 1983).

[6]Federal Research: Super Collider—National Security Benefits, Similar Projects, and Cost (GAO/RCED-93-158, May 14, 1993).

health deficiencies at DOE's Rocky Flats Plant in Colorado had been repeatedly raised by DOE safety staff, including problems in the plant's radiological protection program and a lack of commitment by plant management to improve overall safety and health conditions.[7] Despite this poor performance, the contractor received over $26 million in bonuses during this period. In late 1989, the plant was shut down for, among other things, safety problems. About 2 years later, we reported that bonuses were again paid at Rocky Flats despite evidence of poor performance.[8]

These DOE practices run counter to those in private industry. A recent study of projects under DOE's environmental management program pointed out that among the best industry practices for successful projects is to have incentives that reward participants based on their performance.[9] The study pointed out that DOE lacked such incentives.

Inadequate Technical and Managerial Expertise to Oversee MSAs

DOE's lack of adequate technical expertise to oversee the design, construction, and operation of these large, complex projects is a long-standing problem. A 1981 DOE internal task force and a 1987 report by the National Research Council noted DOE's lack of technical capabilities and expertise. We have issued several reports that pointed out the difficulties that DOE had in addressing technical problems on DOE construction projects that led to large schedule slippages and cost overruns.[10] The Defense Nuclear Facilities Safety Board, in its annual reports to the Congress, has repeatedly stated that the lack of appropriate technical expertise in DOE is a significant problem.[11] Through a series of management reviews of DOE that we began in 1991, managers throughout DOE have told us that the lack of skilled staff in program, project, and contracting oversight positions is one of the most fundamental problems in the Department.

In a June 1992 report, we pointed out that an internal DOE assessment of its Defense Waste Processing Facility in South Carolina faulted project managers for their lack of experience with large-scale, first-of-a-kind

[7]Nuclear Health and Safety: DOE's Award Fees at Rocky Flats Do Not Adequately Reflect ES&H Problems (GAO/RCED-90-47, Oct. 23, 1989).

[8]Nuclear Health and Safety: Increased Rating Results in Award Fee to Rocky Flats Contractor (GAO/RCED-92-162, Mar. 24, 1992).

[9]The Department of Energy, Office of Environmental Restoration & Waste Management: Project Performance Study (Nov. 30, 1993); Prepared by Independent Project Analysis, Inc., Reston, VA.

[10]See "Related GAO Products" at end of report.

[11]An Assessment Concerning Safety at Defense Nuclear Facilities: The DOE Technical Personnel Problem, DNFSB/TECH-10 (Mar. 1996), Defense Nuclear Facilities Safety Board.

technology projects.[12] DOE's assessment also criticized the project's management for not focusing sufficient attention on technical, institutional, or management issues. This project is for a large, first-of-a-kind plant using a process called vitrification to convert high-level radioactive waste into a glass-like form for permanent underground storage. The facility itself has experienced more than $900 million in cost increases, and the Total Project Cost—including other buildings and processes needed to prepare waste for vitrification—is over $4 billion. When it began operations in March 1996, the project was about 6 years behind schedule. Technical problems such as equipment failures, design deficiencies, poor component integration, and problems in obtaining permits were important causes of the cost increases and schedule slippage.

There have also been dramatic cost increases in DOE's overall environmental restoration program. A 1993 study of the causes of these cost increases found that the reasons included (1) inexperienced project teams unfamiliar with environmental regulations, such as permitting requirements; (2) design errors and resulting changes; (3) poor project definition, for example little knowledge of essential geotechnical information; (4) project team turnover; and (5) contracting issues.[13]

[12]Nuclear Waste: Defense Waste Processing Facility—Cost, Schedule, and Technical Issues (GAO/RCED-92-183, June 17, 1992).

[13]The Department of Energy, Office of Environmental Restoration & Waste Management: Project Performance Study (Nov. 30, 1993); Prepared by Independent Project Analysis, Inc., Reston, VA.

Actions That May Help Improve DOE's Acquisition Process

The need for reform of the federal acquisition process has led to several governmental actions. Legislative changes have been enacted to, among other things, streamline the acquisition process and open the system to more participation from the commercial market. Furthermore, OMB requires that agencies now request full funding for their acquisitions rather than the incremental annual funding previously requested. Also, DOE has begun new management initiatives to improve the way it does business. These actions could help DOE address some of the key factors leading to major cost overruns and schedule slippages for its MSAs.

Changes in Federal Procurement Law

Over the past several years, there have been several changes to procurement law and regulations. In 1994, the Congress passed the Federal Acquisition Streamlining Act of 1994.[1] The act contains more than 200 sections changing the laws that govern how federal agencies acquire almost $200 billion of goods and services annually. In 1996, the Congress passed the National Defense Authorization Act for Fiscal Year 1996.[2] Division D of this act, referred to as the Federal Acquisition Reform Act of 1996, also contains provisions for improving federal acquisitions.

Included in this major contracting reform legislation are provisions that could help DOE improve its management of its MSAs. Title V of the Federal Acquisition Streamlining Act of 1994 is designed to foster the development of (1) measurable cost, schedule, and performance goals, and (2) incentives for acquisition personnel to reach these goals. Subtitle B, which applies to civilian agencies, provides that agency heads are to establish cost, schedule, and performance goals for acquisition programs and annually report on the progress in meeting those goals. These goals are to include achieving, on average, 90 percent of the established cost and schedule goals without reducing the performance or capabilities of the items being acquired. Subtitle B also requires that agency heads are to manage employees in acquisition positions (including their education, training, and career development) by relating employees' evaluations, pay, and promotions to their performance in helping achieve cost, schedule, and performance goals.

The Federal Acquisition Reform Act of 1996 provides for the establishment of policies and procedures for the management, education, and training of the civilian acquisition work force. Career development of the work force is to include the identification of appropriate career paths, mandatory

[1]Public Law 103-355, enacted Oct. 13, 1994.

[2]Public Law 104-106, enacted Feb. 10, 1996.

education and training in the critical duties and tasks of these career paths, and an enhanced system of performance incentives to encourage excellence in the acquisition work force. In addition, the act requires agencies to specify in their budget justification documents the funding levels requested for educating and training the acquisition work force and provides that funds appropriated for this purpose may not be used for any other purpose. We believe that these changes in procurement law could help the Department in recruiting additional contracting staff and in improving the technical capabilities of existing staff, and thus address a long-standing departmental problem.

Agencies Must Request Full Funding for Major Acquisitions

Recent OMB actions concerning federal agency acquisition of fixed assets could impact on how DOE manages its MSAs. Revisions to OMB guidance[3] now require that federal agencies (1) report by September 9, 1996, on the cost of full funding of fixed assets previously funded incrementally and (2) provide a fixed asset plan and justification for major system acquisitions. Full funding means that when an asset or any programmatically or economically separable segment of an asset is approved by the Congress, the requesting agency is given budget authority for the full estimated cost of that asset or segment. For example, if an agency was undertaking a project that required the construction of a building first, and then the subsequent installation of equipment to perform a task, the agency would request the full cost of constructing the building in one fiscal year. If approved, the agency would be given budget authority for the full amount and would not have to return to the Congress each year for additional budget authority for the building.

The full-funding provision could have significant impact on DOE's management of its MSAs. The agency and other stakeholders, such as the Congress, would need to reach a consensus on which of DOE's MSAs are most mission-critical. Also, having full funding could help improve DOE's management of its MSAs. By knowing that the funding would be available when needed, DOE and its contractors should be better able to stay within cost estimates and keep the projects on schedule.

DOE Management Initiatives

We believe that DOE's difficulties in completing MSA projects, or of completing them on time and within original cost estimates, are a result of the key factors that we discuss in chapter 3—constantly changing missions, incremental funding of MSAs, lack of effective incentives, and

[3]OMB Circular A-11, Part 3, "Planning, Budgeting, and Acquisition of Fixed Assets," (July 16, 1996).

shortages of employees with contracting and oversight skills. The problems resulting from these factors—cost overruns, schedule slippages, and project terminations—continue to exist despite many attempts at reform, and this underscores the difficulty facing DOE. As a practical matter, it is unlikely that schedule slippages and cost overruns can ever be completely eliminated given the inherent risk associated with many of DOE's projects. However, the slippages and overruns can be reduced with continual effort. DOE currently has undertaken several initiatives to improve the management of its operations. Some of these initiatives can affect the agency's management of its MSAs, and DOE can use them to begin addressing the key factors.

Contract Reform

Typically, most of DOE's budget goes to contractors, including those who manage and operate its sites and facilities. For example, in fiscal year 1995, more than 91 percent of DOE's obligations went to contractors. In recent years, both we and DOE's Inspector General have reported on many problems with DOE's contracting. These problems include poor administration of contracts, inadequate monitoring of contractor performance, and weak financial and accounting controls.

In February 1994, DOE issued a report containing initiatives to reform its contracting practices.[4] The report details plans to encourage competition wherever possible and develop specific contract performance measurements and incentives. The reform initiatives will require DOE to develop definitive work scopes and objective performance measurement criteria to replace the requirements now contained in most traditional cost-reimbursement contracts used by the Department. Once specific performance criteria are established, the contracts must provide incentives and/or disincentives to motivate the contractors to meet expectations. To accomplish this, DOE should have a central role in overseeing and evaluating contractor performance. The contract reform report recommended more than 40 specific actions that DOE began implementing in early 1994.

We believe that the contract reform initiatives could improve many aspects of DOE's contracting. More competition and better control over the contractors should lead to cost savings and quality improvements. These initiatives could also benefit DOE's MSAs. Some of the key factors we previously identified, such as lack of effective incentives, could be

[4]Making Contracting Work Better and Cost Less: Report of the Contract Reform Team (DOE/S-0107), U.S. DOE (Feb. 1994).

addressed by contract reform, depending on how performance objectives are established. If these objectives focus on successful outcomes, cost control, and timeliness, they could improve the MSA process. Nevertheless, as we concluded in a 1989 report, contracting deficiencies generally resulted from people failing to carry out their responsibilities, rather than from a need for more rules and regulations.[5] Realizing this, the full benefits of contract reform will require that DOE have enough properly trained staff to oversee the implementation of the reforms.

Furthermore, recent DOE actions raise questions about the agency's commitment to fully implementing the contract reforms.[6] Two basic tenets of DOE's philosophy of contract reform are that contracts will be competed except in unusual circumstances, and, if current contracts are to be extended, the terms of the extended contracts will be negotiated before DOE makes its decision to extend them. However, in May 1996, DOE extended the University of California's three laboratory contracts (currently valued at about $3 billion) rather than compete them. These large contracts have been held by the university continuously for 50 years. DOE justified its decision on the basis of its long-term relationship with the university. This decision was made despite DOE's Contract Reform Team's conclusion that the agency's contracting suffered from a lack of competition, which was caused, in part, by several long-term relationships with particular contractors. Our primary concern was that both the President and the Secretary of Energy publicly announced that the contracts would be extended before any negotiations had taken place on the terms of the contract extensions.

Strategic Systems and Life-Cycle Asset Management

In November 1994, DOE announced its intention to improve existing policies and procedures for MSAs. DOE decided to decentralize decision making and empower lower levels of management and integrate the decision process with the strategic and annual budget planning process. DOE also decided to designate selected MSAs as "Strategic Systems," based on the criteria of national urgency, risk factors, international implications, estimated costs totaling over $400 million, or visibility. As of July 1996, 12 of the ongoing MSAs had been designated as Strategic Systems, and they will come under the oversight of the Secretary of Energy. The remaining MSAs will receive management oversight from cognizant DOE officers, such

[5]Civilian Agency Procurement: Improvements Needed in Contracting and Contract Administration (GAO/GGD-89-109, Sept. 5, 1989).

[6]Department of Energy: Observations on the Future of the Department (GAO/T-RCED-96-224, Sept. 4, 1996).

as the Assistant Secretary for Defense Programs, Assistant Secretary for Environmental Management, etc.

To implement these changes, DOE issued a directive, "Life-Cycle Asset Management" (DOE Order 430.1, Aug. 4, 1995), which provides minimum performance requirements for building and managing its assets—including MSAs. Under the order, DOE headquarters' oversight offices and program offices, along with DOE field offices, will develop specific objectives, criteria, and measures governing the conduct of operations at specific DOE sites. The field offices are to be assessed each year on the extent to which they meet their objectives.

DOE's Office of Project and Fixed Asset Management is responsible for developing objectives and criteria for life-cycle asset management implementation. One overall objective is to assist DOE project managers in completing more projects on schedule and within budget. More specific objectives can include how best industry practices are used, the quality of cost and schedule estimates, and the completion of safety and environmental documents. The performance objectives are to be adjusted annually.

This initiative could improve performance by DOE's field offices in managing MSAs or Strategic Systems. As pointed out in chapter 3, lack of effective incentives has been a problem associated with DOE's performance in completing its MSAs. Setting specific objectives and criteria and holding managers accountable to those criteria will put DOE in a more business-like situation. DOE has only just begun a pilot of this initiative, and it is too early to gauge its effectiveness.

Other DOE Management Initiatives

DOE has implemented several other management improvement initiatives that may indirectly help it to better manage its MSAs. These initiatives include strategic planning, information resources management planning, and financial planning. As with the Strategic Systems Initiative, most of these initiatives are just being implemented, and it is too early to assess their impact.

A strategic plan can be useful in setting forth an agency's overall goals, strategies to meet those goals, and guidance for its employees as to what the agency's priorities are. In April 1994, DOE issued its Strategic Plan that recognized the many changes taking place in the World, such as the end of

the Cold War, and set forth a restructuring of DOE's missions.[7] The plan sets goals, strategies, and success indicators for each mission. The plan also recognizes the importance of meeting the needs of DOE's numerous customers, from the taxpayer to the Congress, and recognizes many of their concerns. The specific details of how the agency will achieve its goals are not described in the plan but rather in the budget and operational plans of individual offices. DOE has revised its strategic plan to address four core missions: (1) protecting national security and reducing the nuclear danger; (2) weapons site cleanup and environmental management; (3) science and technology; and (4) enhancing energy security. The key to the successful implementation of DOE's Strategic Plan, and also what the plan is now missing, is how a consensus will be reached to carry out these missions. Such a consensus should involve departmental leadership, the Congress, and other stakeholders and will be crucial in the successful completion of these long-term, high-cost MSAs.

DOE is also revising its management information systems. Over the years, DOE has implemented numerous management information systems and has been criticized by us and others because (1) different contractors were allowed to operate different systems that were not compatible, (2) there was considerable overlap among the systems, and (3) many of the systems produced incorrect data. In July 1994, DOE issued an information management plan[8] to support the objectives in its Strategic Plan. Lack of reliable information has been a long-standing problem with DOE's MSAs. We recently found that DOE lacks comprehensive historical data on many of the MSAs. To the extent that DOE's information management initiative can improve its ability to develop and deliver accurate management information, the initiative could also help improve the management of MSAs.

DOE has also been criticized over the years for its inability to develop uniform, accurate, cost and budget data. In a May 1995 report, DOE's Financial Information Team recommended a number of actions to address the agency's financial and business information needs.[9] For example, the report pointed out that DOE's budget information came from a myriad of budget documents and in various formats. Because of this, the budget process did not provide the accurate and timely data managers needed. Among other things, the report recommended that DOE adopt a consistent

[7]Fueling a Competitive Economy: Strategic Plan, U.S. DOE, DOE/S-0108 (Apr. 1994).

[8]Information Management Strategic Plan, U.S. DOE, DOE/HR-0099 (July 1994).

[9]Financial Management Excellence, Report of the Financial Information Team, U.S. DOE (May 1995).

budget format for the agency; adopt standard, electronically integrated budget software; and centralize budget preparation with the Chief Financial Officer. Better identification and reporting of cost data is a necessary step toward better DOE oversight and management of all of its activities, including MSAs. Having accurate and timely cost data is critical to management for early identification of problems and the prevention of cost overruns.

Observations

There are no quick, easy solutions for DOE to keep its major system acquisitions on schedule and within budget. However, a number of recent federal and DOE initiatives could help. Recent changes to federal procurement laws could help contracting officers, including DOE's, do their jobs better. In addition, the new requirement that all federal agencies request full funding for major projects could force DOE to reduce the number of MSAs it has ongoing and could improve project management by ensuring that project funds are available when needed. DOE's management initiatives in the areas of contract reform, strategic systems and life-cycle asset management, strategic planning, information resources management planning, and financial planning could improve the management of its MSAs. To attain meaningful change through its initiatives, DOE will need to carry them through to completion. Another current issue that could impact DOE's MSAs is the need, in our opinion and that of others, to reassess DOE's missions. As we have pointed out in testimonies before the Congress, such reassessment would require the involvement of the Congress and would necessitate examining which MSAs really are key to the agency's missions.[10] Nevertheless, we believe that the management initiatives that DOE currently has under way offer an excellent opportunity for the agency to begin addressing some of the key factors affecting the management of its MSAs.

[10]Department of Energy: Need to Reevaluate Its Role and Missions (GAO/T-RCED-95-85, Jan. 18, 1995). Department of Energy: Observations on the Future of the Department (GAO/T-RCED-96-224, Sept. 4, 1996).

MSAs Terminated During 1980 Through 1996

Dollars in millions

Project name and construction line item number[a]	Original cost estimate	Cost at termination	Schedule: Original completion date	Schedule: Termination date
50 MWe Geothermal Demonstration Power Plant (80-G-001)	$70.0	$28.0	March 1982	January 1982
Advanced Isotope Separation Program	N/A	$275.3	N/A	May 1982
Clinch River Breeder Reactor	$699.0	$1,600.0	1979	December 1983
Compact Ignition Tokamak (88-R-902)	$444.5	$107.1	September 1993	1992
Electric Vehicle Project	N/A	$180.0	N/A	1983
Elmo Bumpy Torus Proof-of-Principle (80-MF-3)	$173.9	$28.1	June 1982	1984
Fuel Processing Restoration (85-D-139)	$270.0[b]	$305.8[b]	September 1992	April 1992
Fusion Materials Irradiation Test Facility (78-3-b)	$134.4	$105.9	September 1983	1985
Gas Centrifuge Enrichment Plant (76-8-g)	$5,100.0	$2,814.1	June 1993	June 1985
Hanford Waste Vitrification Plant (88-D-173)	$1,010.2	$418.3	September 1996	August 1996
High BTU Synthetic Pipeline Gas Demonstration Plant (CONOCO)	$198.8	$53.7	March 1981	July 1981
High BTU Synthetic Pipeline Gas Demonstration Plant (ICGG)	$156.8	$77.8	March 1981	July 1981
Intersecting Storage Accelerator (78-10-b)	$398.6	$201.3	June 1986	1983
Low-Level Waste Disposal Facilities (94-D-406)	$141.8	$7.0	September 2004	September 1996
Medium BTU Industrial Fuel Gas Demonstration Plant	$93.0	$65.6	September 1981	July 1981
Monitored Retrievable Storage Project (93-D-406)[c]	N/A	$35.7	N/A	N/A
Multi-Tank Waste Storage Facility (93-D-183)	$240.0	$56.1	June 1999	December 1995
New Production Reactor Capacity (92-D-300)	N/A	$1,257.0	2000	October 1992
Plutonium Recovery Modification Project (89-D-125)	$370.8[b]	$24.3[b]	September 1997	October 1990
Process Facility Modification (84-D-135)	$140.0[b]	$57.9[b]	N/A	June 1988

(continued)

Dollars in millions

Project name and construction line item number[a]	Original cost estimate	Cost at termination	Schedule: Original completion date	Schedule: Termination date
Reactor Safety Assurance (90-D-150)	$109.1[b]	$15.6[b]	September 1994	June 1994
Reactor Seismic Improvements (92-D-141)	$103.4	N/A	September 1996	August 1993
Solvent Refined Coal Demon. Plant (SRC-2)	N/A	$70.8	September 1984	July 1981
Solvent Refined Coal Demon. Plant (SRC-1)	N/A	$190.7	June 1984	August 1984
Space Nuclear Reactor Power System (86-N-105)	$22.7[b]	$36.3[b]	December 1988	1992
Special Nuclear Materials Research and Development Laboratory Replacement (88-D-105)	$210.0[b]	$37.0[b]	March 1994	February 1991
Special Isotope Separation Project (86-D-148)	$530.0[b]	$85.0[b]	March 1995	N/A
Strategic Petroleum Reserve Expansion	$1,460.0	$6.0	N/A	December 1993
Superconducting Super Collider (90-R-106)	$5,893.6	$2,201.9[d]	March 1998	October 1993
Tokamak Physics Experiment (94-E-200)	$694.0	$73.7	September 2000	1995
Uranium Solidification Facility (formerly Fuel Production Facility) (85-D-145)	$85.0[b]	$116.3[b]	March 1988	February 1994

[a]Projects that are not funded as construction line items do not have project numbers. All costs, unless otherwise specified, are "Total Project Costs." The cost data were obtained from initial budget submissions, final cost reports, and other DOE-provided data. The term "N/A" means cost or schedule information is not available or not yet developed.

[b]These amounts represent the project's "Total Estimated Cost," which includes costs such as land, engineering, design, and construction. Other costs, such as research and development, conceptual design, startup, and initial training, are not available.

[c]The Monitored Retrievable Storage Project was terminated; however, portions of the project were continued and have now been combined with other activities into the Civilian Radioactive Waste Management Strategic System.

[d]The termination activities for the Superconducting Super Collider are not yet complete. The cost at termination for this project is based on data through fiscal year 1996.

MSAs Completed During 1980 Through 1996

Dollars in millions

Project name and construction line item number[a]	Original cost estimate	Final cost	Schedule	
			Original completion date	Actual completion date
10 MWe Central Receiver Solar Thermal Power Plant (76-2-b)	$108.0	$139.6	N/A	July 1987
1-2 GeV Synchrotron Radiation Source (Advanced Light Source) (87-R-406)	$145.3	$146.0	March 1992	March 1993
6-7 GeV Synchrotron Radiation Source (Advanced Photon Source) (89-R-402)	$626.9	$798.8	March 1996	February 1996
Continuous Electron Beam Accelerator Facility (87-R-203)	$262.6	$513.1	March 1992	March 1995
Ebullated Bed (H-Coal) Pilot Plant	$110.2	$277.9	March 1980	September 1982
Fuels and Materials Examination Facility (78-6-f)	$167.6	$233.8	June 1983	August 1984
Hanford Environmental Compliance (89-D-172)	$262.3	$242.4	March 1996	December 1995
High Energy Laser Facility (NOVA) (78-4-a)	$195.0[b]	$177.7[b]	September 1983	December 1985
Mirror Fusion Test Facility (78-3-a)	$132.5	$363.8	September 1981	February 1986
Stirling Engine Systems Development	N/A	$130.0	N/A	December 1989
Strategic Petroleum Reserves	$2,499.0	$2,461.0	June 1991	September 1991
Tokamak Fusion Test Reactor (76-5-a)	$390.6	$497.5	June 1981	December 1982
Tritium Loading Facility Replacement (88-D-130)	$125.4	$409.2	September 1989	December 1993
Waste Isolation Pilot Plant (77-13-f)	$737.0	$709.9	June 1988	March 1991
West Valley Demonstration Project	$446.0	$1,008.5	March 1988	August 1995

[a]Projects that are not funded as construction line items do not have project numbers. All costs, unless otherwise specified, are "Total Project Costs." The cost data were obtained from initial budget submissions, final cost reports, and other DOE-provided data. The term "N/A" means cost or schedule information is not available or not yet developed.

[b]These amounts represent the project's "Total Estimated Cost," which includes costs such as land, engineering, design, and construction. Other costs, such as research and development, conceptual design, startup, and initial training, are not available.

MSAs Ongoing as of June 1996

Dollars in millions

Project name and construction line item number[a]	Original cost estimate	Current cost estimate	Schedule: Original completion date	Schedule: Current completion date
Albuquerque Laboratory Environmental Restoration Project (AL-1)	[b]	$1,348.0	N/A	2010
Albuquerque Production Environmental Restoration Project (AL-2)	[b]	$254.0	September 2019	2014
Albuquerque Environmental Restoration Project GJPR, MRAP (AL-5)	[b]	[b]	September 2004	September 2004
AVLIS R&D Project[c]	N/A	$1,304.9	N/A	October 1993
B-Factory (94-G-304)	$293.2	$293.2	March 1998	September 1998
Chemistry and Metallurgy Research Upgrade (95-D-102)	$204.0	$223.6	September 2003	September 2002
Defense Waste Processing Facility (81-T-105)	$1,529.5	$2,470.7	March 1990	November 1996
Environmental, Safety, and Health Enhancements (90-D-126)	$26.8	$95.5	June 1994	September 1996
Environmental Molecular Sciences Laboratory (91-E-100)	$217.8	$229.9	September 1995	September 1997
Facilities Capability Assurance Program (88-D-122)[d]	N/A	$447.7	N/A	N/A
Fermilab Main Injector (92-G-302)	$197.0	$259.3	September 1996	June 1999
Fernald Environmental Management Program	[b]	[b]	September 2023	September 2020
Formerly Utilized Sites Remedial Action Project	$706.0	$2,500.0	2001	2016
High-Level Waste Removal from Filled Waste Tanks (93-D-187)	$88.6	$828.2	September 1999	September 2008
High-Level Waste Tank Farm Replacement (91-D-172)	$296.2	$91.2	September 1998	June 1996
Idaho National Engineering Laboratory Environmental Restoration Project	[b]	$3,365.0	September 2019	2023
Initial Tank Retrieval System (94-D-407)	$245.0	$358.2	March 2010	March 2010
Non-Radioactive Hazardous Waste Management (83-D-148)	$20.7	$165.7	June 1986	June 1997
Nonnuclear Reconfiguration, Complex-21 (93-D-123)	$26.0	$198.1	N/A	June 1998

(continued)

Dollars in millions

Project name and construction line item number[a]	Original cost estimate	Current cost estimate	Schedule: Original completion date	Schedule: Current completion date
Nuclear Weapons Research, Development, and Testing Facilities Revitalization				
Phase II (88-D-106)	$361.4	$306.6[e]	September 1993	June 1998
Phase III (90-D-102)	$70.1	$106.3	September 1993	June 1998
Phase IV (92-D-102)	$96.4	$95.8	September 1996	September 1997
Phase V (94-D-102)	$82.0	$37.4	December 1997	March 1998
Oak Ridge Operations Office (Environmental Restoration Project)	[b]	[b]	N/A	N/A
Plantwide Fire Protection Phases I and II (90-D-149)[f]	$321.2	$159.7	June 1997	December 1999
Radioactive Waste Management Complex Transuranic Waste Treatment and Storage Facility (90-D-177)	$146.5	$154.9	September 1994	April 1999
Relativistic Heavy Ion Collider (91-G-300)	$497.1	$616.5	June 1997	June 1999
Replacement High-Level Waste Evaporator (89-D-174)	$46.7	$154.1	March 1993	December 1997
Richland Environmental Restoration Project	[b]	$21,860.0	September 2018	September 2047
Rocky Flats Environmental Technology Site Environmental Restoration Project	[b]	[b]	June 2011	N/A
Savannah River Site Environmental Restoration Project	[b]	[b]	September 2019	September 2019
Security Enhancement, Pantex Plant (88-D-123)	$110.0	$130.0	June 1994	September 1997
Solid Waste Operations Complex (94-D-411)[g]	$290.3	N/A	September 1998	N/A
Uranium Mill Tailings Remedial Action—Ground Water Restoration	$777.0	$574.0	N/A	September 2014
Uranium Mill Tailings Remedial Action—Surface Project	$992.5	$1,349.0	September 1992	September 1998
Weldon Spring Remedial Action Project	$357.7	$865.0	September 1995	2001
Yucca Mountain Site Characterization Project[h]	$3,200.0	$4,300.0	May 1991	March 2002

(Table notes on next page)

[a]Projects that are not funded as construction line items do not have project numbers. All costs, unless otherwise specified, are "Total Project Costs." The cost data were obtained from initial budget submissions, current cost reports, and other DOE-provided data. The term "N/A" means cost or schedule information is not available or not yet developed.

[b]DOE's original and/or current cost estimates for these environmental restoration projects do not estimate costs through project completion.

[c]DOE is no longer involved in this project; however, the U.S. Enrichment Corporation has funding responsibility for AVLIS development, and its directors may take action to further develop and commercialize this technology.

[d]The Facilities Capability Assurance Program consists of a number of different subprograms intended to upgrade and maintain DOE's nuclear weapons production facilities. The project was expected to be funded at a level of $150 million annually until the deficiencies at the DOE facilities are identified and corrected. Consequently, the project does not have an original cost estimate or ending date.

[e]The current cost estimate for Phase II, Nuclear Weapons Research, Development, and Testing Facilities Revitalization was reduced because one subproject—the Dual Axis Radiographic Hydrotest Facility—was established as a separate project. The estimated cost of this facility is $85.6 million.

[f]The current cost estimate for Plantwide Fire Protection Phases I and II reflects a planned reduction in this project's scope.

[g]This project is being divided into three separate subprojects, of which one is currently under construction, one is on hold, and one may be included in a privatization contract. For these reasons, DOE is not maintaining cost and schedule data for this project.

[h]The Yucca Mountain project involves only site characterization and not the actual construction of a waste repository. Accordingly, the project is considered complete with the submission of an application to the Nuclear Regulatory Commission for authorization to construct a nuclear waste repository. The original cost and schedule reflect a 1985 DOE estimate. In January 1992, the Secretary of Energy's Energy Systems Acquisition Advisory Board approved a $6.3 billion estimate for the Yucca Mountain project. Officials from DOE's Office of Civilian Radioactive Waste Management consider this estimate to be the project's original cost estimate.

Comments From the Department of Energy

Department of Energy
Washington, DC 20585

October 31, 1996

Victor S. Rezendes, Director
Energy, Natural Resources, and Science Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rezendes:

Thank you for the opportunity to comment on the General Accounting Office draft report entitled Opportunity to Improve Management of Major System Acquisitions. We are in general agreement that many Department of Energy (DOE) Major Systems Acquisitions (MSAs) have experienced cost growth, schedule slippage and terminations over the years, primarily as the result of changing missions and incremental funding from Congress.

I would like to comment on three issues and then briefly reiterate what we are doing to improve our management of MSAs. The first issue is the use of the term "cost overrun" throughout this report; my concern being that it leaves an unfair impression of carelessness or mismanagement. DOE has required that any changes to original project baselines be approved at specific organizational levels of management. Usually, baseline changes are due to scope changes, or funding cuts imposed by Congress, or changing priorities within the Department, and do not equate to cost overruns. DOE Order 430.1, Life Cycle Asset Management, issued in August 1995, requires change controls on all line item projects. That Order is supplemented by a Good Practice Guide providing instruction on implementing a change control process and suggested levels of authority, and by the Joint Program Office Directive on Project Management, which provides specific change thresholds and authorities.

The second issue relates to contract reform. The draft raises a question regarding DOE's commitment to competition, one of the basic tenets of contract reform. The Secretary of Energy explained her decision to extend the University of California contracts to manage three DOE laboratories in a May 14, 1996, Secretarial Decision Document. The basis of the decision to extend the contract is that the national interest is best served by retaining the longstanding experience and world class scientific research capability of the University of California.

Further, the University of California is uniquely capable of implementing the Science-Based Stockpile Stewardship Program, whereby the safety and reliability of the nuclear arsenal will be maintained through scientific means without resorting to physical testing. The conditions for contract negotiations set forth in the Secretarial Decision Document reflect the principles of contract reform.

The third issue has to do with the qualifications of our employees. As the report indicates, we have acknowledged difficulty in the past in hiring, training and retaining enough qualified people for our nuclear facility sites, a problem exacerbated by the forces of the marketplace (in which private industry can offer higher pay to qualified people). A Defense Nuclear Facilities Safety Board study in 1993 recommended a way to improve the qualifications of our people at nuclear sites and throughout the Department. We initiated a host of activities that will yield improvements in the qualifications and capabilities of the Federal staff, particularly those involved in project management. For example, the DNFSB called for a Technical Qualifications Program (TQP) under which a Project Management Qualification Standard would be established. We implemented the TQP Standard in April 1995. It applies to all Project Managers at nuclear facility sites (employees at other sites have the option to follow the TQP Standard) and requires each Project Manager to demonstrate his or her ability to satisfy required technical, regulatory, management, and assessment/oversight competencies. Additionally, our Project Management Training curriculum was updated in 1995 to better reflect the growing amount of work in environmental restoration and waste management, and further improve the capabilities of our employees. Three new courses were added and delivered. Another curriculum update began in April 1996 to incorporate the performance based principles of the Life Cycle Asset Management (LCAM) Order. The new curriculum will be available for delivery by January 1997. Also, since issuance of LCAM, DOE has developed and published 28 Good Practice Guides covering virtually every aspect of project management.

The Secretary of Energy has recognized the need to improve project management throughout the Department and has started many initiatives that will further strengthen our ability to control MSA costs and schedules. One of these is the strategic planning initiative. Your report acknowledges the merits of the DOE Strategic Plan. Our Program Offices are furthering the initiative by integrating their programmatic strategic plans, site operating plans and budgets with the management of their MSAs and other construction projects. Other initiatives include the contract reform initiative, identification of Strategic Systems, the life-cycle asset management initiative, and the information management initiative, which are addressed in this report. A revamping of the Energy Systems Acquisition Advisory Board process is also underway. We require cost-benefit certifications for new construction projects. Before a new project is included in the budget, program officials must certify that a cost-benefit analysis has been performed considering the use of existing facilities. We have also instituted an annual reevaluation of the mission need for every DOE project, supplementing the initial Justification of Mission Need. This new requirement should help ensure that any future project terminations occur at an early stage.

I believe that our Program Offices have been aggressively seeking out the root causes of past cost increases, schedule slippages, technical disappointments, and mission fluctuations and that changes have been made with favorable results where the problems were within our control. While there is still much that needs to be done, I believe the above mentioned initiatives will do much to ensure that all our MSAs are successful in the future. As your report reveals, DOE has been successful in completing some projects on schedule and below their original cost estimates. We plan to review these successful projects for best practices and lessons learned, and

incorporate them into our training curriculum. We are also committed to implementing the Office of Management and Budget (OMB) full-funding initiative as required by OMB Circular A-11, Part 3, which will help us manage our MSAs in a cost-effective manner.
Again, thank you for the opportunity to comment on this draft report. If I can be of further assistance, please do not hesitate to call.

Sincerely,

Donald W. Pearman, Jr.
Associate Deputy Secretary
for Field Management

The following are GAO's comments on DOE's letter dated October 31, 1996.

1. The first issue DOE raises concerns our use of the term "cost overrun." We define this term to mean increases in cost above the original project cost estimate. DOE is concerned that this term leaves an unfair impression of carelessness or mismanagement on the part of DOE. Giving that impression is not our intention. Nevertheless, it is important to note that all of the original cost estimates contained in this report were provided by DOE to the Congress as the total cost necessary to complete the projects. As pointed out in this report, for many projects the final costs exceeded the original cost estimates, and we consider these to be cost overruns. We have added a footnote to explicitly define cost overruns. Also, as pointed out in this report, in some cases the overruns were beyond DOE's control, and in some cases the overruns should have been controlled by DOE.

2. DOE's second issue involves our comments concerning the extent of its commitment to implement the contract reforms that it has proposed. DOE defends its decision to extend its contracts with the University of California to manage three of its laboratories. As stated in this report, two basic tenets of DOE's contract reforms are that contracts will be competed except in unusual circumstances, and, if current contracts are to be extended, the terms of the extensions will be negotiated before DOE makes its decision to extend them. Our primary concern is that the President and the Secretary of Energy publicly announced that the contracts with the University of California would be extended before any negotiations had taken place. As pointed out in our report, we believe that the announcements could compromise the Department's ability to effectively negotiate the terms of the extensions.

3. DOE's final issue addresses our concerns and those of others about its ability to hire, train, and retain enough employees with the requisite skills to effectively oversee the work of DOE's contractors. DOE lists a series of initiatives that have recently or will soon be implemented to help address these concerns. We agree and so note in our report that these initiatives, and those mandated in the Federal Acquisition Streamlining Act of 1994 and the Federal Acquisition Reform Act of 1996, if fully implemented, can help resolve this long-standing departmental problem.

Major Contributors to This Report

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Related GAO Products

1980

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Further Improvements Needed in the Department of Energy for Estimating and Reporting Project Costs (GAO/MASAD-82-37, May 26, 1982).

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1983

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Private Financing for the Clinch River Breeder Reactor (GAO/T-RCED-83-151, Sept. 20, 1983).

1984

The Impact of International Cooperation in DOE's Magnetic Confinement Fusion Program (GAO/RCED-84-74, Feb. 17, 1984).

1985

DOE's Physics Accelerators: Their Costs and Benefits (GAO/RCED-85-96, Apr. 1, 1985).

DOE's Plutonium-Processing Facility at Rocky Flats—Operational Problems, Costly Resolutions, and Future Uncertainties (GAO/C-RCED-85-3, Sept. 11, 1985).

1986

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Nuclear Health and Safety: DOE's Award Fees at Rocky Flats Do Not Adequately Reflect ES&H Problems (GAO/RCED-90-47, Oct. 23, 1989).

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1990

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1991

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Federal Research: Concerns About Developing and Producing Magnets for the Superconducting Super Collider (GAO/T-RCED-91-51, May 9, 1991).

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