United States General Accounting Office

GAO

Report to the Secretary of Energy

September 1992

DEPARTMENT OF ENERGY

Better Information Resources Management Needed to Accomplish Missions

GAO/IMTEC-92-53

GAO

United States
General Accounting Office
Washington, D.C. 20548

Information Management and
Technology Division

B-248529

September 29, 1992

Admiral James D. Watkins, USN (Retired)
The Secretary of Energy

Dear Mr. Secretary:

This report, which is part of our general management review, presents the results of our review of the Department's information resources management program. We reviewed this program under our legislative authority to evaluate federal agencies and programs.

This report contains recommendations to you in chapter 6. As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement of actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of this letter. A written statement must also be submitted to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of this letter. We would appreciate receiving copies of these statements.

We are providing copies of this report to interested members of the Congress, executive branch agencies, and the public. We will also make copies available to others upon request. This work was performed under the direction of JayEtta Z. Hecker, Director, Resources, Community, and Economic Development Information Systems, who can be reached at (202) 512-6416. Other major contributors are listed in appendix II.

Sincerely yours,

Ralph V. Carlone
Assistant Comptroller General

Executive Summary

Purpose

The Department of Energy (DOE) is responsible for multiple energy and defense missions that are important to economic growth, public health and safety, and the nation's security. DOE also faces complex challenges, such as massive environmental damage and unsafe nuclear weapons production facilities, and management problems, such as weak controls over contractor activities. To successfully accomplish DOE's missions and correct existing problems, the Secretary and departmental and contractor managers need timely, reliable, and relevant information.

GAO examined key aspects of the Department's information resources management (IRM) program, focusing primarily on the environmental restoration, safety and health management, nuclear weapons production, and security mission areas. GAO's objectives were to determine whether (1) information shortfalls impair managers' ability to fulfill their responsibilities, (2) DOE's strategic IRM planning is linked to strategic mission planning, and (3) management control over the acquisition and operation of information systems is adequate to ensure compliance with federal and DOE IRM policies and requirements.

Background

DOE was established in 1977 to consolidate several agencies that had energy- and defense-related missions. Today, DOE has over 30 headquarters program offices, 8 field offices, 2 power marketing administrations, and several other facilities that manage or support its various missions. DOE's fiscal year 1991 budget was over $24 billion. About $1.6 billion, or almost 7 percent of the total budget, was for the acquisition, operation, and maintenance of information resources.

The Department's operations are spread across the country and are largely performed by contractors who operate government-owned research laboratories and manufacturing plants. Until recently, DOE exercised only limited control over day-to-day contractor activities. However, in response to criticism that this approach created a high risk of fraud, waste, or abuse, the Secretary has taken action to strengthen contractor accountability and improve contract management and oversight practices. As a result, DOE has undergone significant organizational and cultural changes in recent years.

The Director, Office of Administration and Human Resources, serves as the designated senior official (DSO) for IRM. The Director, Office of Information Resources Management (OIRM), is the senior full-time IRM manager. In addition, most headquarters program offices, field offices, and

contractors employ IRM support staff to plan and control their respective information resources within a policy framework established by OIRM.

GAO reports dating back to 1978 have identified information problems and a lack of effective processes to plan and control the Department's information resources. Although DOE has recognized that opportunities exist to improve how it manages information, it has not identified the specific changes required.

Results in Brief

Although DOE relies heavily on information to accomplish its missions, managers and staff throughout DOE are not always receiving the information they need. As a result, they are hindered in accomplishing their missions, which may in turn increase the risks that the public will be unnecessarily exposed to dangerous contaminants; the safety and health of workers will not be adequately protected; outdated weapons components will continue to be produced and discarded; and facilities, secrets, and employees will not be properly protected from threats. In addition, DOE is wasting resources developing and operating information systems that overlap or duplicate existing systems.

These problems exist because DOE has not (1) implemented a strategic IRM planning process that focuses information resource investments on achieving strategic mission objectives, and (2) exercised adequate management control to ensure that IRM activities are conducted in accordance with laws and policies. Without a strategic IRM plan, DOE has difficulty identifying the information needed to meet mission needs departmentwide. Without effective control, DOE has difficulty preventing overlapping and duplicate information systems and ensuring that new and existing information systems meet mission needs. DOE's ability to improve IRM planning and strengthen controls is limited, however, because program managers and IRM oversight staff have not been assigned clear responsibility or sufficient authority to do so. Senior OIRM and mission planning officials note that efforts to improve IRM activities are also hindered because of the limited numbers of staff with the required skills.

Underlying DOE's ineffective IRM planning and management control is a lack of top management attention to the importance of managing information. The Department's past emphasis on a "least interference" approach to managing Department activities has led to a lack of emphasis on information needs. The Secretary has generally strengthened management control and accountability for accomplishing Department

missions by assigning headquarters program managers the responsibility and authority to plan and control field office and contractor resources. However, inadequate top management attention to the importance of information continues because the Secretary's reforms have not focused on the need for better IRM to support DOE's missions. As a result, program managers have not assumed responsibility for or improved their control over information resources.

Principal Findings

Lack of Information Impairs Missions and Wastes Resources

DOE spent about $1 billion in 1991 on environmental activities; however, program office, field office, and contractor managers do not always have the information they need to determine the nature and extent of environmental contamination or to set priorities and monitor the progress of clean-up efforts. Similarly, DOE managers struggle to provide a safe and healthful work environment in part because they do not always have reliable information with which to identify and track workplace safety and health violations, set priorities, and assess the effectiveness of corrective actions. The inability to communicate information in a timely and reliable manner among facilities that design and produce nuclear weapons contributes to inefficiency and waste in accomplishing the Department's defense mission. Finally, although security is an essential function—costing nearly $1 billion a year—information deficiencies reduce DOE's ability to ensure the effectiveness of its security program. These information deficiencies include limited capabilities to analyze security weaknesses and incidents, as well as problems keeping an accurate list of active security clearances and tracking foreign visitors to sensitive facilities.

DOE is also wasting money developing and operating systems that perform similar functions. Instances of overlapping or duplicate systems[1] have been documented in all four mission areas included in this evaluation. Although information was not readily available to quantify the waste associated with overlap and duplication, the amount is significant. For instance, the DOE Inspector General found that the Department spent over $8 million at three sites developing and operating overlapping environmental compliance systems. OIRM officials agreed that a significant amount of

[1]An overlapping system is described as one that performs some, but not all, functions of an existing system. A duplicate system is one that performs essentially the same functions as an existing system.

resources is spent on the development and operation of overlapping and duplicate systems.

Strategic IRM Planning Process Is Needed

One reason why managers do not receive the information they need and resources are wasted is that DOE's IRM plans are not focused on achieving the Department's missions. For instance, DOE's long-range information technology plan is a compilation of acquisition projects that were independently planned by over 50 organizational elements to satisfy their individual information needs. As a result, DOE has not analyzed departmentwide information needs or developed information system architectures that describe what information systems are needed and how they should fit together to achieve mission objectives. Although DOE policy requires program managers to develop strategic mission plans that consider financial and human resource needs, the policy does not require managers to assess their information and technology needs. Program managers' and IRM oversight staffs' ability to prepare strategic IRM plans is also hindered by unclear responsibility and limited authority.

Management Control Over Information Resources Is Needed

DOE also does not exercise sufficient management control to ensure that information resources are managed effectively. Management control over the acquisition and use of information resources is essential to (1) ensure that information systems meet mission needs and (2) prevent waste. Inadequate management control contributes to waste associated with developing and operating overlapping and duplicate information systems. DOE has also wasted money developing systems that did not meet users' needs because developers were not required to follow DOE's policy requiring the use of life-cycle system development methodologies. Similarly, many existing information systems do not meet users' information needs because DOE does not have an effective process for evaluating operational systems. Unclear responsibility and limited authority hinder program managers' and IRM oversight staffs' ability to exercise management control. Although the Secretary issued a directive to strengthen headquarters managers' control over field office and contractor activities—including their use of financial and human resources—the directive did not mention information resources. As a result, although program managers have centralized their control over DOE's programs, they have not strengthened their control over IRM resources to improve IRM support to their missions and reduce waste.

Leadership Is Essential for Effective IRM

An effective IRM program requires commitment of the agency's leadership, a clearly articulated vision of how information can contribute to accomplishing mission objectives, and a concrete plan for implementing this vision. Until the Secretary and senior managers identify IRM deficiencies as a departmentwide problem, articulate a clear vision of how information can help accomplish agency missions, and ensure that the vision is implemented, IRM improvement efforts are unlikely to succeed. Implementing such a vision will require the Secretary to ensure that program managers and IRM oversight staff have clearly defined responsibilities, sufficient authority, and adequately trained staff to plan and control information resource activities.

Recommendations

Although the Department is taking steps to improve the management of information resources, GAO believes that DOE can further strengthen its management of these resources. Specifically, the Secretary of Energy should take the following steps:

- Work with senior program managers and the designated senior official to develop a clear vision of how information and information resources can contribute to accomplishing critical missions and commit the Department to making the vision a reality.
- Clarify program managers' and the designated senior official's responsibilities and give them sufficient authority to plan and control information resources departmentwide, ensure that they understand their roles and responsibilities, and ensure that adequate staff with appropriate skills are made available.
- Hold these managers accountable for (1) linking IRM planning with DOE's strategic mission planning process, (2) preparing strategic and tactical plans and information architectures, and (3) strengthening controls over IRM activities.
- Report IRM deficiencies as a material internal control weakness under the Federal Managers' Financial Integrity Act until the Secretary has reasonable assurance that information resources are being applied efficiently and in accordance with laws, regulations, and policies.

Chapter 6 provides additional detail on these recommendations.

Agency Comments

In commenting on a draft of this report, DOE stated that it agreed with GAO's recommendations and identified a number of specific actions it will take to implement them. Although these actions appear to be generally

responsive to the recommendations, they do not fully address them. In particular, DOE still needs to clarify what it will do to ensure that (1) sufficient staff with appropriate technical and management skills are available to strengthen the IRM program and (2) information system architectures are used to identify information needs and determine the best alternative to providing the information.

Although DOE agreed with the recommendations, it disagreed with much of chapter 2, which describes how IRM deficiencies both impair managers' efforts to accomplish their missions and waste resources. After reviewing DOE's comments and the evidence cited in chapter 2, GAO continues to believe that this report fairly and accurately describes the Department's information deficiencies and their effects.

Chapter 7 provides additional details on DOE's comments and GAO's evaluation of the comments. In addition, DOE's written comments are provided in appendix 1.

Contents

Abbreviations

DOE	Department of Energy
DSO	designated senior official
GAO	General Accounting Office
GSA	General Services Administration
IMTEC	Information Management and Technology Division
IRM	information resources management
M&O	management and operating
OIRM	Office of Information Resources Management
OMB	Office of Management and Budget

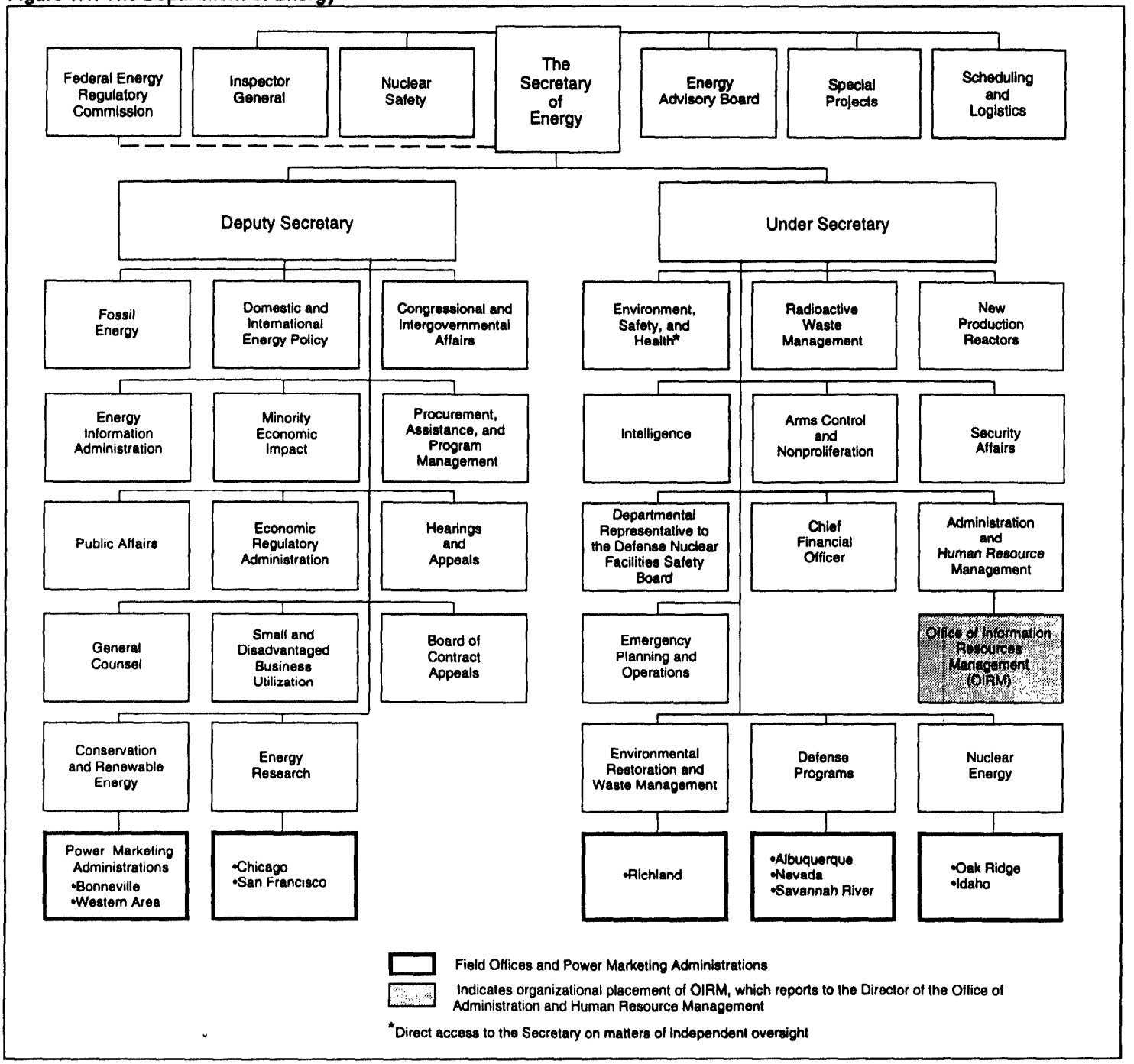
Introduction

The Department of Energy was established in 1977 to consolidate several agencies that had energy- and defense-related responsibilities. DOE's multiple energy and defense missions are important to economic growth, public health and safety, and the security of the nation. Primary DOE missions include (1) securing future energy supplies, (2) increasing energy efficiency, (3) enhancing environmental quality, (4) conducting fundamental scientific research, and (5) meeting national defense needs.

DOE's fiscal year 1991 budget was over $24 billion. About $15.6 billion, or 65 percent, was obligated for contracts to manage and operate government-owned facilities. About $1.6 billion, or almost 7 percent, was used for the acquisition, operation, and maintenance of information resources. Most of the information resources budget was used by DOE's contractors.

Today, DOE has over 30 headquarters offices that either manage or support its missions. The Department also has eight field offices, each of which reports to one of four headquarters program offices—Defense Programs, Environmental Restoration and Waste Management, Nuclear Energy, or Energy Research. The field offices oversee the numerous contractor-operated research laboratories and manufacturing plants that perform most of DOE's work. DOE also has power marketing administrations that generate and distribute electricity to large sections of the country. Figure 1.1 shows DOE's organizational structure.

Figure 1.1: The Department of Energy



DOE Relies Heavily on Contractors

Since the Manhattan Project in the 1940s, DOE and predecessor agencies, the Atomic Energy Commission and the Energy Research and Development Administration, have relied on long-term contracts with management and operating (M&O) contractors to perform most DOE activities. Generally, profit-making industrial corporations operate production facilities while academic and other not-for-profit institutions operate research facilities. This heavy reliance on M&O contractors to operate government-owned facilities makes DOE unique among federal agencies.

Until recently, DOE's operating philosophy was to give M&O contractors wide latitude to fulfill their responsibilities. Under this "least interference" approach, DOE established partnerships with its contractors and indemnified them against most losses. This approach focused on production values rather than oversight and control. As a result, DOE's culture did not emphasize the development of information or information systems to monitor contractor activities. Responding to criticisms by the Office of Management and Budget (OMB) and others that lax contractor oversight practices create a high risk of fraud, waste, or abuse, the Secretary has taken action to strengthen contractor accountability and improve DOE's contract management and oversight practices. These actions include modifying contracting practices and strengthening DOE reviews of M&O contractor performance.

IRM Responsibilities and Organization

The Paperwork Reduction Act of 1980 as amended (44 U.S.C. chap. 35) was enacted to improve the effectiveness of government activities through better management of information. Among the act's requirements are for agencies to periodically review their processes to plan and control information resources, and ensure that their information systems do not overlap or duplicate existing systems. The act also directs each agency to appoint a designated senior official (DSO) to manage agencywide information activities.

The Director, Office of Administration and Human Resource Management, was appointed by the Secretary to serve as the DSO. The Director, Office of Information Resources Management (OIRM), who reports to the DSO, is the full-time senior manager for DOE's information activities. Within OIRM, the Office of IRM Policy, Plans, and Oversight develops departmental IRM policies and procedures, compiles the long-range information technology plan, oversees the acquisition of information technology, and evaluates how well field offices and contractors are implementing DOE's IRM policies

and procedures. OIRM's Office of Information Technology Services and Operations acquires and operates departmentwide and headquarters information systems, and the Office of Scientific and Technical Information catalogs and disseminates scientific and technical information from DOE activities. DOE's headquarters program offices, field offices, and most M&O contractors also have IRM support staff to manage their respective IRM activities. Because these staff report directly to their individual units rather than to OIRM, we describe them as IRM support staff.

Information Deficiencies Have Existed for Years

As far back as 1978, we have reported on information problems and the lack of effective management processes to plan and control the Department's information resources.[1] In 1981 we reported that DOE had wasted millions of dollars on a computer system to regulate the energy industry.[2] In 1982 and 1985 we reported that the system used to track nuclear materials needed to be modernized because its data were not adequate to meet users' needs.[3] More recently, we have identified information deficiencies that hinder DOE's ability to recover oil overcharges; monitor requests for sensitive information from foreign countries; control uranium reprocessing information; account for government property; track nuclear health, safety, and environmental restoration activities; and protect DOE employees and facilities from security threats.[4]

Efforts to Improve IRM

Recognizing opportunities to improve how DOE manages information, the DSO developed and the Under Secretary signed a document in April 1991

[1]Department of Energy's Consolidation of Information Processing Activities Needs More Attention (GAO/EMD-78-60, May 3, 1978).

[2]Millions Wasted Trying to Develop Major Energy Information System (GAO/AFMD 81-40, May 15, 1981).

[3]Obstacles to U.S. Ability to Control and Track Weapons-Grade Uranium Supplied Abroad (GAO/ID-82-21, Aug. 2, 1982), and The U.S. Nuclear Materials Information System Can Improve Services to Its User Agencies (GAO/NSIAD-85-28, Jan. 14, 1985).

[4]Energy Regulation: The Quality of DOE's Oil Overcharge Information (GAO/RCED-89-104, Mar. 15, 1989); Nuclear Nonproliferation: Department of Energy Needs Tighter Controls Over Reprocessing Information (GAO/RCED-87-150, Aug. 17, 1987); Nuclear Nonproliferation: Better Controls Needed Over Weapons-Related Information and Technology (GAO/RCED-89-116, June 16, 1989); Nuclear Security: DOE's Oversight of Livermore's Property Management System is Inadequate (GAO/RCED-90-122, April 18, 1990); Nuclear Health and Safety: Need for Improved Responsiveness to Problems at DOE Sites (GAO/RCED-90-101, Mar. 28, 1990); and Energy Information: DOE Security Program Needs Effective Information Systems (GAO/IMTEC-92-10, Oct. 22, 1991).

calling for changes to DOE's IRM program.[5] The document identifies objectives that, if achieved, will improve how DOE manages information resources. The overall objectives cited in this document were to (1) increase managers' awareness that effective IRM can help them accomplish DOE's missions, (2) improve the ability of IRM professionals to satisfy managers' information needs, (3) shift DOE's emphasis from managing information technology to managing information, and (4) provide state-of-the-art information technology to meet DOE's demanding information requirements. OIRM officials estimated that detailed plans will be issued in late 1992.

Objectives, Scope, and Methodology

As part of our ongoing general management review of DOE, we examined key aspects of the Department's IRM program. Our objectives were to determine whether (1) information shortfalls impair DOE managers' ability to make informed decisions and fulfill their responsibilities, (2) DOE's IRM planning is closely linked with its strategic mission planning and provides a strategic focus on its critical mission objectives, and (3) DOE's management control over systems acquisition and operation prevents overlap and duplication and is sufficient to ensure compliance with federal and DOE policies and requirements. Our work was focused primarily on four critical DOE mission areas—environmental restoration, safety and health management, nuclear weapons production, and security.

To determine whether information shortfalls impair managers' ability to make informed decisions and fulfill their responsibilities, we interviewed headquarters and field office program managers and contractor officials to ascertain their views on (1) the adequacy of the information they receive, (2) the extent to which automated information system capabilities help them meet mission objectives, and (3) the strengths and weaknesses of DOE's IRM program and the need for improvements. In addition, we reviewed DOE reports and documents, related GAO reports, and other external reports addressing information shortfalls in these mission areas.

To determine whether DOE's IRM planning is closely linked with its strategic mission planning, we reviewed federal laws and regulations as well as DOE policies and guidance on IRM planning. We interviewed OIRM planning officials and both headquarters and field office IRM and program officials to ascertain how the IRM planning process operates and their involvement and responsibilities in the process. We also reviewed DOE Five-Year

[5]Vision 21: Information Resources Management Into The 21st Century, A Strategic Planning Program, DOE OIRM, April 1991.

Information Technology Resources Long-Range Plans, IRM plans for seven DOE organizations, and the strategic plans for the four mission areas cited above, to determine whether IRM planning is focused on meeting DOE mission objectives and satisfying managers' key information needs. In addition, we reviewed the Department's plan for improving IRM, and discussed the plan and its implementation status with OIRM officials.

To determine the adequacy of DOE's management control over the acquisition and operation of information systems, we reviewed federal laws and regulations as well as DOE policies and procedures for (1) preventing overlap and duplication, (2) using life-cycle system development methodologies, and (3) evaluating the effectiveness of existing systems. We interviewed OIRM officials to ascertain the processes and controls DOE uses to accomplish each objective. We also reviewed OIRM reports on its assessments of IRM management practices in headquarters, field offices, and M&O contractor locations to determine whether control weaknesses were identified. We also discussed control weaknesses with IRM officials at the three field offices we visited.

In addition, to determine whether DOE's management control over system acquisitions is sufficient to ensure that life-cycle methodologies are used, we reviewed DOE's system development documentation for three departmentwide systems that DOE identified as being mission-critical. The purpose of these reviews was to ascertain the methodologies that were used to develop the systems and compare the methodologies with federal requirements, DOE policy, and accepted systems development methodologies. We discussed the systems development practices with the program managers responsible for developing the three systems. We also reviewed reports on OIRM assessments of the effectiveness of two of the three systems.

We did not evaluate financial or accounting information systems because our Accounting and Financial Management Division is covering these systems in a separate review. In addition, we did not evaluate DOE's management of information resources devoted to scientific computing. These resources include supercomputers and software models used for research purposes.

We performed our work between April 1991 and June 1992, in accordance with generally accepted government auditing standards. Our work was done primarily at DOE headquarters in Washington, D.C., and Germantown, Maryland. We also performed work at the DOE field offices and contractor

facilities in Albuquerque, New Mexico; Idaho Falls, Idaho; and Oak Ridge, Tennessee. We obtained DOE comments on a draft of this report and have incorporated them as appropriate.

Information Shortfalls Continue to Impair DOE Mission Effectiveness and Waste Resources

DOE spends billions of dollars annually to administer critical energy and national defense programs. The Department also spends about $1.6 billion annually to provide its executives, managers, and staff with information to help them accomplish these missions.[1] However, despite the existence of many manual and automated information systems, managers' efforts to accomplish their missions and manage Department activities are still hindered because they do not have access to essential information. This lack of information contributes to environmental restoration managers' not being able to fully define the nature and extent of environmental contamination, safety and health managers' not being able to accurately track and report the status of safety and health violations, nuclear weapons production managers' scrapping millions of dollars of parts, and security managers' not being able to fully analyze security weaknesses. DOE has also wasted resources developing and operating multiple systems to perform the same or similar functions. Although the Secretary and senior managers have cited the need for better information, DOE actions to obtain better information have not always been effective.

Environmental Restoration Mission Impaired

One of the Secretary's highest priorities is to correct the environmental damage caused by decades of inadequate disposal of radioactive and hazardous waste (see fig. 2.1).

[1]This amount reflects all funds used to acquire and maintain information resources, including management and financial systems, telecommunications, personal computers, and supercomputers.

Figure 2.1: Past Waste Disposal Practices Have Contributed to Environmental Hazards

Source: Department of Energy

DOE spent over $1 billion on environmental restoration activities in fiscal year 1991, primarily to identify and characterize the nature and extent of contamination. Although DOE plans to spend billions more over the next 5 years, it has not effectively managed the information it collects. As a result, DOE managers often do not have the information they need to determine the nature and extent of environmental contamination, set priorities for clean-up efforts, and monitor progress.

According to an April 1990 DOE Inspector General report,[2] the local systems that DOE uses to track and report compliance with state and federal environmental laws were developed over the years by various offices and contractors. The report noted that many of these environmental compliance systems did not meet the Department's needs for tracking and reporting compliance and that DOE could not readily determine how many actual and potential violations of environmental laws existed throughout the Department or the status of corrective actions.

The Associate Director for Environmental Restoration and other headquarters program managers confirmed that they do not always receive timely and reliable information to effectively carry out the program. For example, a branch manager told us that the lack of an effective information system contributes to delays in securing or restoring some sites. He explained that because DOE does not have a system that tracks the status of hazardous or contaminated sites, reports from field offices sometimes "fall between the cracks." In one case, a report identifying the need to secure a hazardous site was forgotten in a desk drawer at a field office for almost a year, thereby delaying headquarters' awareness of the danger and allowing the site, which is located on public lands, to remain open to the public. According to field office environmental restoration officials, it is not unusual for reports to be misplaced, thus temporarily losing track of hazardous sites. They also believe that an effective information system would preclude this problem because information about the site could be entered into a computer system and then tracked from the time the M&O contractor first identified the hazard.

Other studies, performed both by DOE and outside sources, have revealed other information problems that adversely affect the accomplishment of

[2]Management Information Systems for Environmental Compliance Activities (DOE/IG-0284, Apr. 23, 1990).

the environmental restoration mission.[3] For example, DOE studies show that field office managers and contractors cannot accurately define the type and extent of contamination at particular sites because data collected to assess the scope of contamination are inaccurate, inconsistent, or inaccessible. According to these studies, data management problems have affected the quality of decisions. The studies also point out that when technical assessment data are not usable, managers compensate by gathering more samples, which in turn increases costs—and sometimes the hazard itself. For example, if new wells must be drilled to gather more sample data, DOE may actually increase the hazard by creating new pathways in which the contaminants can spread.

DOE has been working since 1984 to develop and implement a departmentwide system to support environmental restoration decision-making. However, after 8 years and about $24 million, the system is not yet complete and none of the seven program managers we interviewed said they use the system as a decision-support tool. The Associate Director for Environmental Restoration confirmed that the system does not provide the information he and his staff need to make environmental assessment and restoration decisions. At the conclusion of our review, the DOE manager responsible for the system told us that his office was considering canceling the system and starting again.

Safety and Health Management Mission Impaired

Many DOE facilities are among the most potentially hazardous industrial operations in the country (see fig. 2.2). Literally thousands of safety and health incidents are reported at these facilities each year. Safety and health violations range from improperly lined trash cans for contaminated waste to not having working air monitoring systems with which to detect radioactive leaks. Accordingly, the Secretary made this mission a high priority for managers throughout the Department, and in fiscal year 1992 planned to spend $155 million to identify and correct safety and health conditions that could adversely affect DOE employees, the public, and the environment. Despite this increased attention, DOE managers struggle to achieve their safety and health mission in part because they do not always have access to reliable information.

[3]Complex Clean-up: The Environmental Legacy of Nuclear Weapons Production, Office of Technology Assessment (OTA-0-485, February 1991); Management Information Systems for Environmental Compliance Activities (DOE/IG-0284, Apr. 23, 1990); Development of Consolidated Environmental Data Base (DOE, Feb. 5, 1990); Prototype Electronic Reporting System (U.S. Environmental Protection Agency Region IV and the Agency for Toxic Substances and Disease Registry [undated]).

Figure 2.2: Workers Performing Potentially Hazardous Soil Sampling Operations at a DOE Facility

Source: Department of Energy

A senior safety and health official told us—and studies by safety and health assessment teams confirmed—that many of DOE's offices and sites do not have information systems that are capable of

(1) compiling and updating safety and health regulations and guidance, (2) tracking violations from identification to abatement, and (3) tracking deficiencies that allow these violations to occur. A preliminary analysis by DOE of environmental, safety, and health assessments at its sites disclosed that 83 percent of DOE's offices and sites do not have information systems that can track and report the status of safety and health activities or needed corrective actions.[4]

In March 1990, we reported that DOE's departmentwide system for tracking safety and health activities did not provide enough detailed information to track issues or support decision-making.[5] According to safety and health officials at headquarters and field offices, the lack of a useful departmentwide system continues to preclude the comprehensive analyses they need to manage safety and health activities effectively. For example, the Acting Director of the Performance Assessment Division said he was unable to fully analyze safety incidents at 10 high-risk facilities because data in the departmentwide system were not complete and lacked sufficient detail.

In this regard, a recent DOE evaluation of the departmentwide system confirmed that the system is not meeting the needs of DOE managers. Among many other problems, the evaluation found that data are incomplete, out of date, or not in the proper format for analysis; user training has been inadequate; and system managers have neither identified user information needs nor incorporated modern technology into the system.[6] At the conclusion of our review, the senior program management official responsible for identifying safety and health information requirements said the existing departmentwide system is unable to meet managers' information needs and that his office plans to replace the system.

Nuclear Weapons Production Mission Impaired

Meeting the nation's defense needs, which includes the research, development, production, and decommissioning of nuclear weapons, is DOE's most costly mission—accounting for about $8 billion of the Department's approximately $24-billion budget. Nuclear weapons are designed at three national laboratories, manufactured at seven production

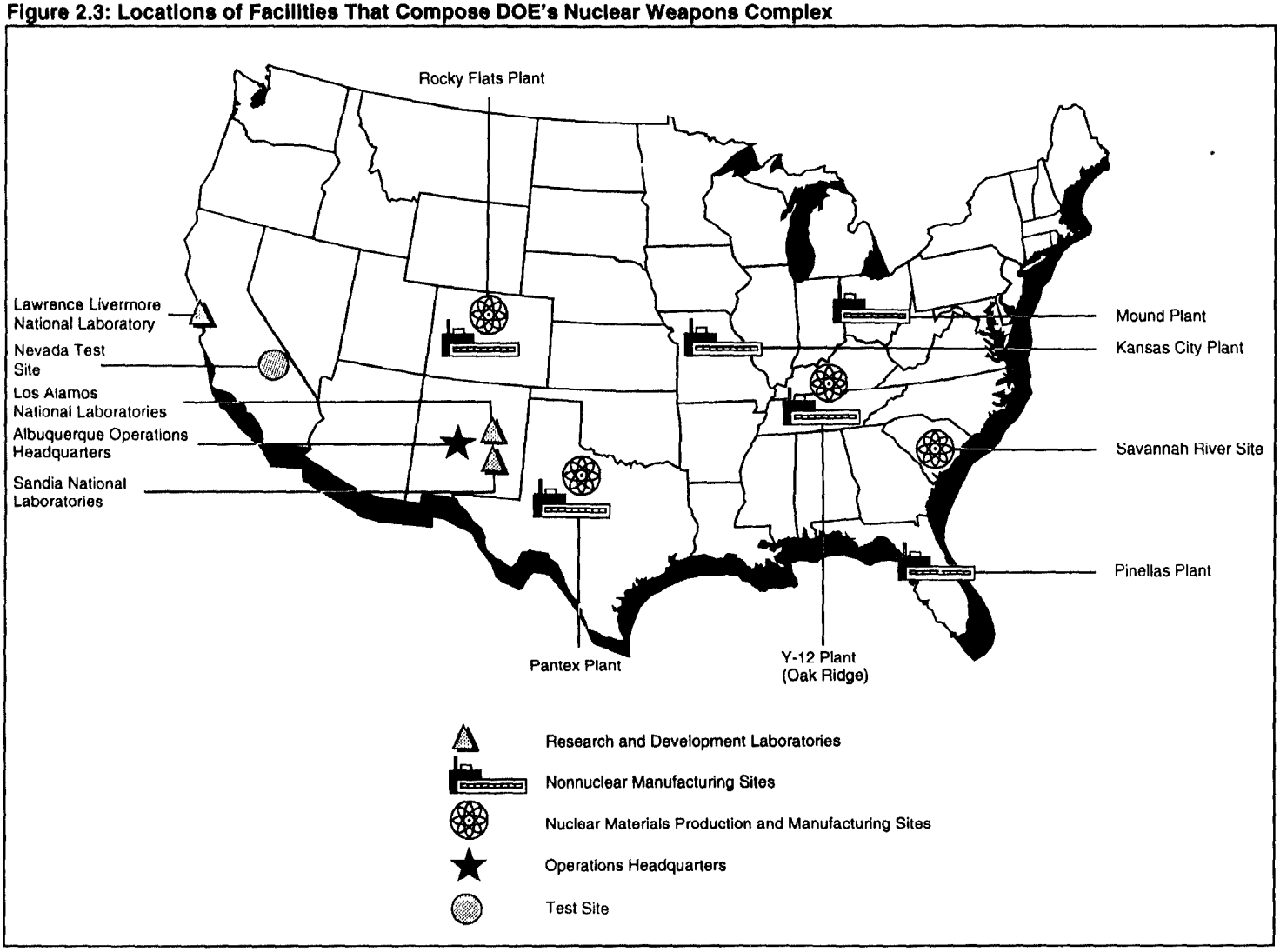
[4]Environmental Restoration and Waste Management Five-Year Plan, Fiscal Years 1992-1996 (DOE/S-0078P, June 1990).

[5]GAO/RCED-90-101, Mar. 28, 1990.

[6]Safety Performance Measurement System Evaluation Project Briefing, Department of Energy (September 1991).

plants, and tested at one test site. The Albuquerque field office provides direction to ensure that nuclear weapons research, development, and production activities are integrated. The facilities are located throughout the country (see fig. 2.3).

Figure 2.3: Locations of Facilities That Compose DOE's Nuclear Weapons Complex



As far back as 1981, DOE recognized that increasing the use of computer technology could significantly improve the efficiency of its manufacturing

and business processes. DOE has also recognized that the inability to exchange information electronically reduces the Department's ability to manage nuclear weapons activities efficiently.[7] Although DOE has not completed a detailed analysis of the potential benefits of using computers in the manufacturing process, a 1986 report estimated that fully automating and integrating computer technology into the manufacturing process could eventually save DOE $80 million a year.[8]

DOE has made significant strides in automating its manufacturing operations; however, it has had less success developing systems that can electronically exchange data among facilities. DOE attributes this problem to the fact that each facility develops its own information systems without any centralized direction. For example, in an August 1989 memorandum, the deputy manager of the Albuquerque field office stated that the nuclear weapons complex needed to move away from "inefficient, time-consuming, and difficult to manage piecemeal systems that are not integrated." He noted that many of the systems cannot share or exchange data electronically because they were developed and managed by different offices, with little or no coordination. The deputy manager also stated that the nuclear weapons complex needed integrated information systems to improve the management and control of weapons production requirements, reduce costs, and increase productivity.

A January 1990 report by the Sandia National Laboratory also concluded that electronic exchange of information is a fundamental requirement for DOE's weapons complex.[9] The report pointed out that during one 10-month period, facilities exchanged over 300,000 development and production documents. However, because the information systems were not able to exchange data, many documents had to be reprinted and mailed to other sites. According to the report, the inability to share information electronically creates waste by (1) slowing the production process, (2) requiring duplicate entry of information into computer systems, and (3) increasing the potential for errors.

[7]Strategic Systems Planning Methodology, Holland Systems Corporation [undated]; Computer Integrated Manufacturing, Accomplishments and Benefits Report, Sandia National Laboratory, September 1986; Interagency Information Study (Final Report), Sandia National Laboratory, December 1988; Computer Integrated Manufacturing: Planning and Assessment Study, Sandia National Laboratory, January 1990; Nuclear Weapons Complex Program Requirement Data Base: Initial Project Document, Albuquerque Operations Office, August 1989.

[8]Computer Integrated Manufacturing, Accomplishments and Benefits Report, Sandia National Laboratory, September 1986.

[9]Computer Integrated Manufacturing: Planning and Assessment Study, Sandia National Laboratory, January 1990.

A 1989 study provides a more detailed description of how DOE's inability to electronically exchange information creates inefficiency and waste.[10] It cited the inability to exchange design information in a timely and accurate way as one example of the problems that exist. The study noted that each manufacturing facility must go through a complex series of manual inputs and conversions to enter design documents into their computers, even though the information is often received in electronic form. The study noted that this process is time-consuming and prone to errors. Although the study did not quantify the benefits that could be achieved, DOE weapons complex quality control and IRM officials estimated that as a result of these communications problems, plants have scrapped millions of dollars worth of parts. They explained that when plants use outdated or inaccurate engineering drawings, the weapons components can be manufactured to an incorrect tolerance and may have to be reworked or scrapped. According to these officials, an integrated information system with electronic interfaces between design and manufacturing plants could reduce or eliminate these losses by ensuring that current and accurate engineering drawings are available at all locations in the nuclear weapons complex.

DOE has made some progress developing computer systems that can exchange data. For example, weapons components now have computer-readable codes that allow each part to be identified and tracked as it moves from plant to plant or from department to department. However, senior IRM officials from the Albuquerque field office said that efforts to develop more integrated information systems have been hindered because various M&O contractors have been unwilling to coordinate their information system developments. During our review the officials agreed to reemphasize the need to implement systems that can share data.

Security Mission Impaired

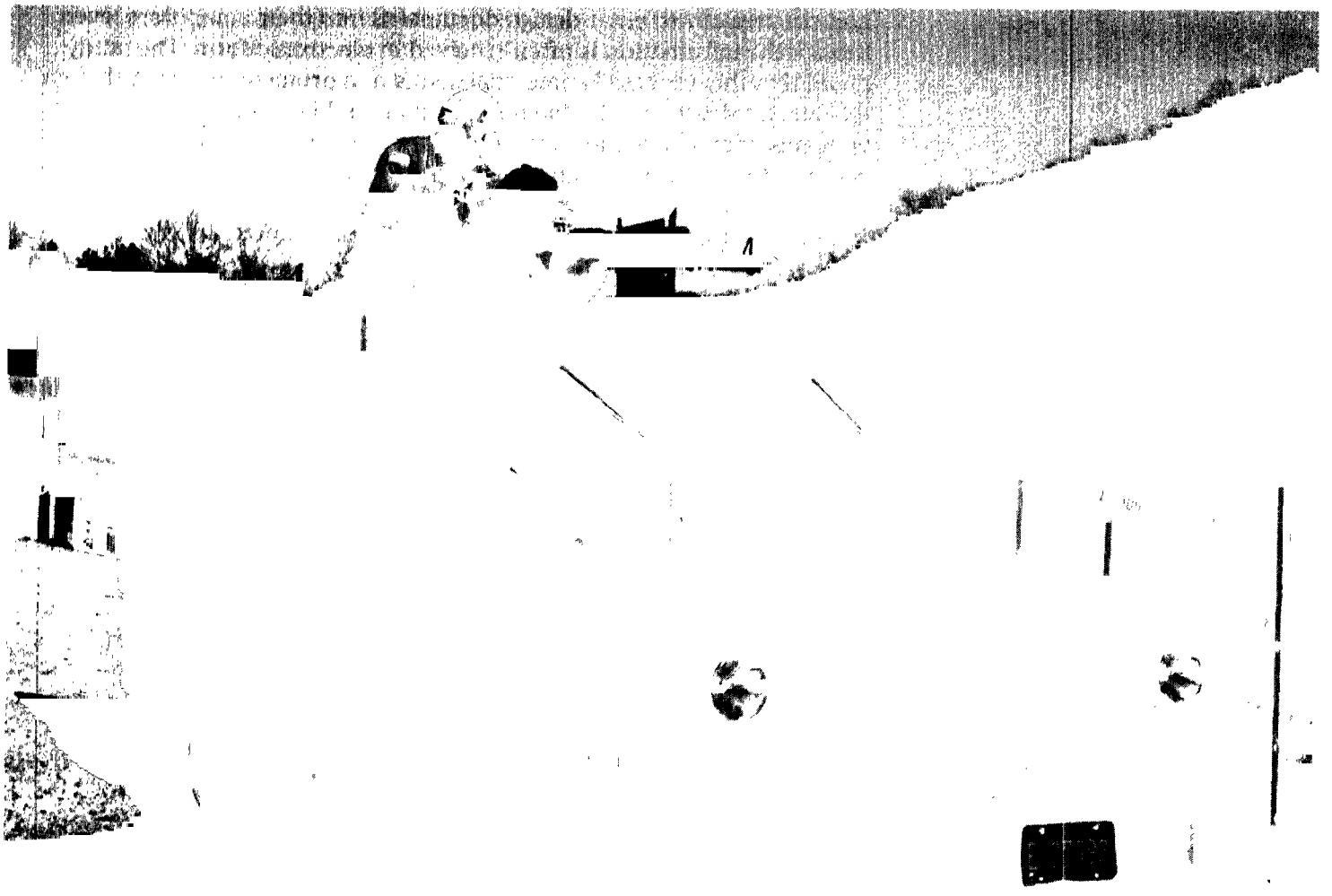
DOE spends almost $1 billion annually to protect against theft, sabotage, espionage, terrorism, and other risks to national security (see fig. 2.4). However, as we recently reported, this important mission area has been impaired because the information systems that contain data on security weaknesses and incidents have limited analytical capabilities and contain unreliable information.[11] As a result, DOE has difficulty identifying patterns

[10]Nuclear Weapons Complex Program Requirements Data Base: Initial Project Document, Albuquerque Operations Office, August 1989.

[11]GAO/IMTEC-92-10, Oct. 22, 1991.

and trends, thereby reducing managers' ability to ensure the effectiveness of the security program.

Figure 2.4: Armored Vehicle Used to Protect DOE Facilities From Attack



Source: Department of Energy

In December 1987, we reported that the departmentwide system used to track personnel with security clearances did not contain accurate data.[12] In many cases active clearances should have been terminated. The inaccurate data made it difficult to manage the clearance program and increased the risk of unauthorized access to secure areas or facilities. We also pointed out that clearance systems at many of the field offices and contractor facilities that could not exchange data were wasting resources and creating problems maintaining accurate data. Although DOE developed a new departmentwide system in response to that report, a February 1992 OIRM study found that the new system has not fully corrected the problems. DOE agreed to implement the study's recommendations.

In October 1988, we reported that managers at headquarters and field offices did not receive the information they needed to evaluate requests by foreigners to visit DOE nuclear weapons laboratories.[13] Deficiencies in the program allowed suspected foreign agents to visit nuclear weapons laboratories without DOE's prior knowledge. The lack of an integrated information system contributed to the problem. At the conclusion of our review, DOE was in the process of implementing a new departmentwide system. Because the system was not fully operational, we did not evaluate whether the problems cited in our earlier report had been resolved.

Resources Wasted on Overlapping or Duplicate Information Systems

DOE has also wasted resources developing and operating systems that overlap or duplicate existing information systems. This practice is wasteful because the agency spends funds over and over to develop and operate systems that perform the same or similar functions. Although information was not readily available to quantify the extent or cost of overlap and duplication, the following examples show that overlapping or duplicate systems are a significant problem in all four mission areas we reviewed. At the conclusion of our review, the Director, OIRM, and other senior OIRM officials agreed that the conditions described below are representative of conditions throughout the Department. The officials also agreed that a significant amount of resources are spent on the development and operation of overlapping and duplicate information systems.

[12]Nuclear Security: DOE Needs a More Accurate and Efficient Security Clearance Program (GAO/RCED-88-28, Dec. 29, 1987).

[13]Nuclear Nonproliferation: Major Weaknesses in Foreign Visitor Controls at Weapons Laboratories (GAO/RCED-89-31, Oct. 11, 1988).

Environmental restoration managers throughout DOE perform similar functions—identifying, assessing, and correcting environmental problems. However, in 1990 the DOE Inspector General concluded that the Department spent substantial resources developing and operating many overlapping environmental compliance systems.[14] The Inspector General found that three sites had over 80 environmental compliance systems, many of which performed the same or similar functions, and that two of these sites spent nearly $8.8 million to develop and operate these overlapping and duplicate systems. In addition, environmental restoration managers said that about $24 million has been spent to develop and operate a system that tracks environmental compliance activities departmentwide. Because all eight DOE field offices and many contractors develop and operate individual systems to perform similar functions, the total amount spent on overlapping and duplicate systems could be significant.

Safety and health managers at sites around the country must track efforts to correct compliance findings identified during safety and health evaluations. To track the status of compliance findings, each site needs to maintain similar information, including the type and severity of the finding, planned corrective action, and the current status of corrective actions. However, according to a safety and health information requirements document, in addition to a departmentwide information system, at least two headquarters offices, two field offices, and one contractor have developed or were developing systems to perform the same function—to track the status of safety and health problems.[15] A September 1991 evaluation of the departmentwide system also found that field offices and contractors were developing their own local systems and databases, even though an integrated database is essential to utilizing information effectively.[16] Because all eight DOE field offices and many large contractors need to maintain this information, the total amount spent on duplicate systems could be significant.

Managers responsible for designing and producing nuclear weapons at laboratories and plants across the country often perform similar functions and need to exchange information. DOE studies have pointed out, however,

[14]Management Information Systems for Environmental Compliance Activities (DOE/IG-0284, Apr. 23, 1990).

[15]DOE's Management Plan and Requirements Document for the Environmental Safety and Health Information Management Network (Jan. 31, 1991).

[16]Safety Performance Measurement System Evaluation Project Briefing, Department of Energy (September 1991).

that because each laboratory and plant develops its own systems, numerous systems perform the same functions.[17] Although the studies do not quantify the benefits derived from preventing overlapping and duplicate systems among the seven plants and two laboratories, significant benefits are expected.

Finally, in our recent report on information systems that support DOE's security program, we said that DOE wasted resources acquiring many tracking systems that could not electronically share or exchange security data because of incompatible hardware, software, or data.[18] This occurred because DOE did not assess its security information needs from a mission-oriented, departmentwide perspective, but rather allowed each security unit to plan, develop, and implement its own systems. A recent DOE evaluation of the Integrated Security System, which was designed to provide timely information about security clearances throughout the Department, also found that field offices and contractors continue to operate—and in some cases develop—new systems to provide information about security clearances because they lack confidence in the departmentwide system. Although the report did not identify the full extent of duplicate clearance systems, DOE estimated that in 1 year the agency spent nearly $500,000 to maintain just five local systems.

[17]Strategic Systems Planning Methodology, Holland Systems Corporation (undated); Computer Integrated Manufacturing, Accomplishments and Benefits Report, Sandia National Laboratory, September 1986; Interagency Information Study (Final Report), Sandia National Laboratory, December 1988; Computer Integrated Manufacturing: Planning and Assessment Study, Sandia National Laboratory, January 1990; Nuclear Weapons Complex Program Requirement Data Base: Initial Project Document, Albuquerque Operations Office, August 1989.

[18]GAO/IMTEC-92-10, Oct. 22, 1991.

IRM Planning Is Not Linked to Strategic Mission Objectives

One reason why information shortfalls continue to impair DOE mission effectiveness and resources are wasted is that information resource investments are not focused on meeting strategic mission objectives. This focus is not achieved because the Department's IRM planning is not linked to its strategic mission planning. Instead, IRM planning is accomplished by IRM staff at individual offices and M&O contractor facilities who are intent on satisfying their local information needs. Because of the fragmented nature of IRM planning, DOE has not conducted departmentwide analyses of the information needed to accomplish its missions or prepared information system architectures[1] that define how information systems should work together to satisfy those needs. Unclear responsibilities and limited authority over IRM planning activities limit both the DSO's and program managers' ability to plan information resources.

Strategic Planning Is a Critical IRM Activity

Federal law and regulations require agencies to implement a strategic IRM planning process that helps managers define what information they need to accomplish mission objectives and helps prevent overlapping and duplicate information systems.[2] Strategic planning helps ensure that information resources are focused on achieving agency missions by directly linking the organization's strategic mission objectives to the information and resources needed to achieve the objectives. A strategic IRM plan also provides the basis for developing both information system architectures and more detailed tactical plans. The architectures and supporting plans are then used to guide and control investments in information technology.

A recently issued GAO staff study highlights the importance of strategic information planning.[3] The study points out that strategic planning is a disciplined, systematic approach to determining the most effective and efficient approach to satisfying organizational information needs. Preparing open and flexible information system architectures is an essential part of this process. The process of preparing architectures provides discipline through its requirements for a top-down structured analysis to identify information needs departmentwide and analyze

[1]An information system architecture is a description of all functional activities to be performed to achieve a desired mission, the system elements needed to perform the functions, and the designation of performance levels of those system elements. An architecture also includes information on the technologies, interfaces, and locations of functions, and is considered an evolving description of an approach to achieving a desired mission.

[2]The Paperwork Reduction Act and OMB Circular A-130.

[3]Strategic Information Planning: Framework for Designing and Developing System Architectures (GAO/IMTEC-92-51, June 1992).

technical alternatives to meet those needs. Overall, a strategic IRM planning process helps organizations achieve their missions by identifying the information and technology needed to meet mission objectives, by setting priorities, and by guiding information technology investments.

IRM Planning Does Not Focus on Mission Objectives

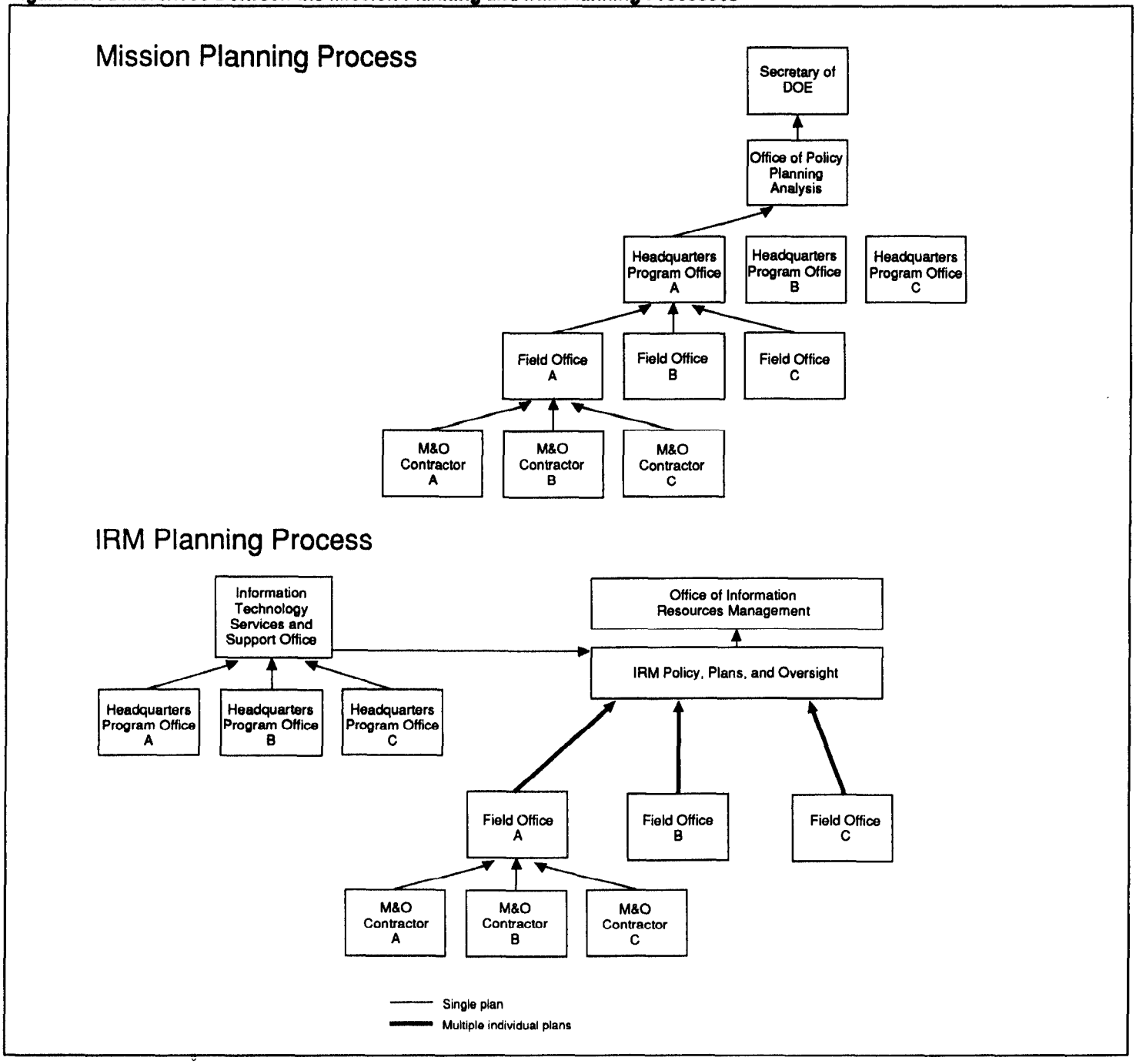
In July 1990, the Secretary initiated a strategic mission planning process by directing program managers to identify mission objectives and strategies for achieving them. DOE developed planning guidance that calls for program managers to assess their strategic mission objectives and to prepare strategic and tactical plans that integrate headquarters, field office, and contractor requirements. However, although information is generally recognized as a resource that should be managed just like financial and human resources, the guidance does not mention the need to assess strategic information requirements and resources. Consequently, the strategic and tactical mission plans from the four program offices we reviewed identified strategic mission objectives and addressed departmentwide financial and human resource needs. However, the plans did not address strategic information requirements or resources needed to accomplish the objectives. Planning officials from the four program offices told us they do not analyze strategic information requirements because IRM planning is done under a separate process.

However, because DOE's separate IRM planning process does not integrate headquarters, field office, and contractor information requirements, it does not closely link information needs to mission objectives. Instead, the process is driven by individual offices and M&O contractors, who are focused on trying to satisfy their own parochial needs for information technology. According to DOE planning documents and senior OIRM planning officials, IRM officials located at over 50 DOE organizational elements—including program offices, field offices, and major M&O contractors—each develop their own long-range information technology plans. These individual plans are then submitted concurrently to OIRM and headquarters program managers for comment. OIRM officials told us they receive few, if any, program office comments on the plans and essentially just compile the individual plans to form DOE's Five-Year Information Technology Resources Long-Range Plan.

Figure 3.1 shows how the integrated DOE mission planning process incorporates contractor and field office requirements into the program offices' mission plans. In contrast, the IRM planning process does not

incorporate field office and contractor information requirements into the program offices' IRM plans.

Figure 3.1: Differences Between the Mission Planning and IRM Planning Processes



We reviewed the IRM plans that were developed by seven organizational elements and found six to be deficient because either they did not address (1) how the planned information technology acquisitions or activities would contribute to meeting mission needs—a fundamental element of strategic IRM planning, or (2) acquisition and development costs for key information systems. We also reviewed DOE's 1990 Five-Year Information Technology Resources Long-Range Plan and found that it too did not clearly link information technology requirements to mission objectives. Instead, the plan focused primarily on planned technology acquisitions by individual offices and key IRM initiatives such as improving software management and meeting future supercomputer needs. Although one section discussed how information technology was being used to support mission objectives, the section included only limited examples of information technology acquisitions planned by individual organizational elements.

Planning Responsibilities Are Unclear and Authority Is Limited

Unclear responsibility and limited authority affect both the DSO's and program managers' ability to improve IRM planning. According to the Paperwork Reduction Act and supporting guidance from the General Services Administration (GSA), the DSO should be responsible for maintaining an effective IRM strategic planning process.[4] Because information is a primary resource needed to accomplish missions, the GSA guidance also calls for program managers to be responsible for planning activities related to their information needs. DOE's IRM orders, however, do not clearly assign to the DSO responsibility for preparing a strategic IRM plan that links information planning to mission planning. Instead, the DSO is responsible for requesting sites to submit long-range information technology plans, consolidating the plans, and publishing the consolidated plans as DOE's Five-Year Information Technology Resources Long-Range Plan.

Senior OIRM officials confirmed that DOE's IRM orders do not clearly define the DSO's responsibility and authority to oversee the IRM planning activities of DOE's offices and sites. One official explained that, historically, DOE's policy allowed field offices and contractors to manage their activities with minimal interference from headquarters. Another explained that the DSO's ability to revise DOE's orders may be limited because any change of responsibility or authority must be coordinated throughout the

[4]The Senior Federal IRM Manager: Major Roles and Responsibilities As We Move into the 1990s, General Services Administration, Information Resource Management Service, November 1987; and The IRM Organization: Concepts and Considerations General Services Administration, Federal IRM Planning Support Center, May 1989.

Department, and other, more powerful DOE organizations could be expected to object to changes that would increase the DSO's control over information resources.

Although DOE's IRM orders assign headquarters program managers responsibility to review and approve site plans, program managers from the four program offices we reviewed stated that they have limited authority to control field office or M&O contractor planning activities. IRM support staff at headquarters program offices, field offices, and contractor sites we visited also told us they do not have the authority to ensure that IRM planning activities are coordinated and focused on meeting mission needs, even at their individual sites.

The Secretary issued a directive in May 1991 that made headquarters program managers responsible for accomplishing missions departmentwide, including the mission planning activities of field offices and M&O contractors. Headquarters program managers are authorized to approve planned field office and M&O contractor human resource budgets—subject to oversight by DOE's Office of Human Resource Management—and planned financial budgets—subject to oversight by DOE's Chief Financial Officer. However, the directive does not mention information resources, leaving unclear program managers' responsibility and authority to plan for information resources.

Although mission plans based on the May 1991 directive have not yet been completed, program office planning officials from the four mission areas said they are still not considering strategic information resource needs in their mission planning.[5] These officials generally recognized the importance of managing IRM planning activities departmentwide, but said their responsibility and authority to control IRM planning activities remains unclear, and IRM planning is still done under a separate process.

[5]One official, responsible for preparing strategic plans for the Office of Safeguards and Security, noted, however, that in February 1992, DOE agreed to develop a strategic information plan linking security information needs to mission requirements. This agreement came in response to our October 1991 report on the need to improve security information (GAO/IMTEC-92-10). DOE's response noted that OIRM will provide the leadership to link security information planning activities with the overall security mission plan until the Office of Safeguards and Security obtains the authority, funding, and personnel to establish an IRM support section.

OIRM and Planning Officials Agree That IRM and Mission Planning Processes Should Be Revised

At the conclusion of our review, we discussed these IRM planning deficiencies with senior OIRM officials, who agreed that DOE's IRM planning is not linked to strategic mission planning and that the IRM planning process should be revised to link mission objectives with information resource needs. They stated that the IRM planning process was designed before the Secretary made program managers responsible for controlling other field office and contractor resources. Although they believe the Secretary's directive was intended to make program managers responsible for planning their information resources, they agreed the directive does not clearly define program managers' IRM planning responsibilities. Similarly, although they believe the DSO should be responsible for coordinating and overseeing IRM planning activities departmentwide, they agreed that DOE's Orders do not clearly define these responsibilities and authority.

The Director of Planning and Analysis—responsible for DOE's strategic mission planning process—also agreed that DOE's IRM planning process does not link information needs to strategic mission objectives and should be revised to do so. He stated that DOE's current IRM planning process does not result in a strategic plan. He noted that private industry has identified the importance of strategic information planning and has developed processes to closely link IRM and mission planning. He cautioned, however, that increasing line managers' involvement in IRM planning would require a significant cultural change because senior program managers often do not recognize the contribution information can make or have been disappointed with information system developments that take too long, cost too much, and ultimately do not meet mission needs. He also pointed out that effective IRM planning is a disciplined, technical process that, to succeed, would require staff to have significantly improved technical and management skills.

Finally, the OIRM officials said that the Department's April 1991 initiative to strengthen DOE's IRM program includes objectives to strengthen the IRM planning process and improve the technical skills of IRM staff. As we pointed out in chapter 1, OIRM officials plan to issue an action plan describing specific changes to implement the Department's objectives in late 1992. The officials indicated that the forthcoming action plan will include steps to reassess the IRM planning process and improve the skills of IRM staff. However, because the action plans have not been completed, the OIRM officials were not able to describe the specific changes that will be made.

Management Control Over IRM Activities Needs Strengthening

DOE does not have adequate management control to ensure that the acquisition and operation of information systems are conducted effectively and in accordance with laws and policies. The lack of management control contributes—as does the lack of strategic planning—to users' not receiving the information they need, and to wasted resources. Management control is achieved through a system of policies, procedures, and practices—also called internal controls—that guide and regulate agency activities. Federal law requires agencies to establish and maintain effective controls. DOE policy generally allows each site to establish and maintain its own controls over IRM activities.[1] However, these controls have not prevented the development of overlapping and duplicate systems, ensured that life-cycle development methodologies are used,[2] or ensured that existing systems continue to meet mission needs.

The reason sites have not implemented effective control is that DOE has not clearly delegated IRM oversight responsibilities or provided sufficient authority to ensure that weaknesses are corrected. Federal internal control standards note that clear lines of authority and responsibility are essential to achieving management control.

Management Control Is Essential

Management control is essential to ensuring that agency activities comply with applicable laws, program objectives are met, and resources are protected against fraud, waste, and abuse. The Federal Managers' Financial Integrity Act, 31 U.S.C. Sec. 3512 (b) and (c), requires the heads of executive agencies to ensure that a system of controls exists to provide reasonable assurance that resources are used in compliance with laws and are protected from fraud, waste, and abuse. Agencies must submit annual reports to the President and Congress identifying material internal control weaknesses that could lead to significant waste or hamper an agency's ability to accomplish its missions. Federal standards state that program managers need to maintain control over the resources—including information resources—entrusted to their care. In addition, because the Paperwork Reduction Act makes the DSO responsible for ensuring that information resources are effectively managed, the DSO needs to ensure that program managers maintain this control.

[1]DOE Orders define a site to be (1) a field element, including field offices, power marketing administrations, and energy technology centers; (2) an M&O contractor; (3) headquarters; or (4) the Energy Information Administration.

[2]Life-cycle methodologies generally include (1) analyzing users' requirements, (2) conducting alternative and cost/benefit analyses, (3) building the system, (4) documenting the developed software, (5) testing system performance, and (6) operating and maintaining the system.

Controls over IRM activities are needed to provide reasonable assurance that (1) information systems satisfy mission needs and (2) resources are protected against fraud, waste, and abuse. For instance, the Paperwork Reduction Act requires agencies to ensure that they do not develop information systems that overlap or duplicate existing systems. Federal Information Processing Standards Publications 38 and 64 encourage agencies to use life-cycle system development methodologies when acquiring new systems. Using life-cycle methodologies helps ensure that systems meet mission needs when they are deployed. Finally, the Paperwork Reduction Act requires agencies to periodically evaluate existing information systems to ensure that they continue to meet mission needs in a cost-effective manner.

DOE's Management Control Over Key IRM Activities Is Not Effective

DOE has not, however, implemented effective control over its IRM activities. Consequently, it is not preventing waste or ensuring that new and existing systems meet mission needs. DOE gives each site the authority to establish and maintain controls. In many cases, however, site controls are not adequate to achieve the control objectives. In addition, DOE relies on management reviews to ensure that field offices' and contractors' IRM activities are effective. Although these reviews have repeatedly identified problems, they often do not lead to corrective action.

As we pointed out in chapter 2, DOE wastes significant resources developing and operating overlapping and duplicate information systems. In all four mission areas we reviewed, many sites had developed information systems to perform the same or similar functions. In addition, newly deployed systems supporting the environmental restoration and safety and health missions did not meet managers' information needs. These systems were developed without following life-cycle methodologies. Finally, existing systems did not provide managers the information they need to accomplish environmental restoration, safety and health maintenance, nuclear weapons production, and security missions.

Controls Are Not Effective

DOE delegates authority for establishing controls to local sites, including program offices, field offices, and contractors. OIRM then conducts management reviews to evaluate how effectively the field offices and headquarters program offices are carrying out their IRM responsibilities. Field offices in turn review contractor IRM activities. These OIRM reviews have repeatedly found that site controls are not effective. We evaluated all OIRM management reviews conducted between May 1987 and February

1992, and found that the reviews identified extensive weaknesses in how sites acquire and operate information systems.

First, the reviews showed that in many cases sites do not have sufficient controls to prevent overlapping and duplicate information systems. Of the 16 sites reviewed, in 8 cases sites were not effectively preventing overlap or duplication at their offices or at contractor facilities under their jurisdiction. In three of the eight cases, sites were not evaluating whether planned systems overlapped or duplicated existing systems, while in the other five cases, sites had only limited success eliminating overlapping and duplicate systems because existing systems used hardware or software that was incompatible with the planned system. Because DOE policy allows each site to establish its own hardware and software standards, DOE does not foster development of compatible or integrated information systems. As a result, the existence of incompatible systems is generally accepted by OIRM as a barrier to preventing overlap and duplication.

The DOE management reviews also found that many sites do not use life-cycle methodologies when developing systems. Of the 16 sites reviewed, in 6 cases sites were not following life-cycle methodologies at their offices or at contractor facilities under their jurisdiction. In one of the six cases, the site had not established software management programs to require the use of life-cycle methodologies, while in the five other cases, sites had developed programs but were not consistently using life-cycle methodologies.

Finally, the management reviews found that many sites have not implemented effective controls to ensure that systems continue to meet mission needs. Of the 16 sites, in 7 cases, sites were not ensuring that their systems continued to operate effectively at their offices or at contractor facilities under their jurisdiction. In three of the seven cases, sites did not have a program to evaluate the continuing effectiveness of their information systems, while in the four other cases, sites had a program to evaluate systems but few evaluations were actually performed. The management reviews noted that the number of systems evaluated varied greatly from site to site, depending on the amount of resources devoted to the task.

Identified Control Deficiencies Are Not Corrected

Although OIRM reviews of site IRM policies and procedures have often detected weak controls, corrective actions are not consistently taken because the recommendations are often not implemented. All three field

offices we visited were cited in management reviews as not having effective controls to achieve one or more of the following objectives: (1) eliminating overlapping and duplicate systems, (2) using life-cycle methodologies, or (3) ensuring that systems meet mission needs. However, none of the three field offices had corrected these problems.

OIRM officials confirmed that findings and recommendations from previous management reviews are often not implemented. For instance, management reviews in 1987 and 1989 cited the Albuquerque field office for (1) not being able to eliminate overlap and duplication, and (2) not having an effective program to evaluate existing systems. Although the 1990 review did not discuss either of these deficiencies, we found—and Albuquerque IRM officials agreed—that both problems still exist.

Control Responsibilities Are Unclear and Authority Is Limited

The reason extensive and longstanding weaknesses exist in DOE's control over IRM activities is that the Department has not clearly delegated IRM oversight responsibility or provided sufficient authority to ensure that control weaknesses are corrected. The resulting unclear lines of responsibility and authority make it difficult to hold managers accountable for correcting deficiencies. This contrasts sharply with the Secretary's efforts to strengthen accountability by clarifying responsibility and authority to control other important resources, including financial and human resources.

Program Managers Exercise Little Control Over IRM Activities

DOE IRM orders do not clearly define program managers' or their IRM support staffs' responsibility or authority to control the activities of subordinate offices or M&O contractors. The result is fragmented lines of responsibility and authority, with each individual office responsible for ensuring that it maintains effective control over IRM activities.

To illustrate the fragmented lines of responsibility and authority, DOE's Computer Software Management Order encourages sites to examine opportunities to use existing software before developing new software, and discourages sites from continuing to use existing software if another site has software that performs the same function. The order makes each site manager responsible for carrying out this policy at that site. Field office managers are also responsible for ensuring that contracts include a provision requiring M&O contractors to comply with the order. However, the order does not define headquarters program managers' authority to ensure that field office managers comply or field office managers'

authority to ensure that M&O contractors comply. Similarly, it does not clearly define program managers' responsibility and authority to ensure that life-cycle methodologies are used and that existing systems continue to meet mission needs.

IRM support staff at four program offices said they did not have adequate authority to control field office or contractor IRM activities. IRM staff at all three field offices we visited also agreed that they do not have enough real authority to control contractor activities. For example, the acting director of the IRM organization at the Albuquerque field office said his office does not have the authority to require contractors to develop integrated information systems for nuclear weapons activities, even though DOE recognizes that significant benefits would occur. He cited one case in which the field office developed a system to allow contractors to share information. However, one contractor refused to implement the system because it preferred to use its own system. This official said that although DOE has the contractual authority to require the contractor to use the system, he—as a staff official—did not.

We also discussed this issue with the Associate Director for Procurement, Assistance, and Property—the organization responsible for administering M&O contracts. He said that although DOE has broad authority to hold contractors accountable for complying with contract terms, in some cases office heads may not have clearly delegated responsibility and authority to individual managers. In addition, he noted that individual managers may have difficulty holding contractors accountable because contractor responsibilities are not always as clearly defined as they could be. He noted that DOE orders often contain broad policy goals rather than specific requirements and do not clearly define DOE's responsibility and authority, versus the M&O contractor's responsibility and authority. As a result, when these orders are incorporated into the contract, they can be difficult to interpret and enforce. He stated that DOE has recognized the need to provide more specific direction to contractors and to incorporate this direction in contracts. DOE has initiated action to revise the orders to clarify DOE and contractor responsibilities.

DSO Has Limited Oversight Authority

The DSO's authority to oversee management controls departmentwide also has not been clearly defined. DOE orders make the DSO responsible for evaluating the effectiveness and efficiency of site IRM activities, but do not describe the DSO's authority to require corrective action. Instead, the DSO's only clear authority, when dealing with field office or contractor control

deficiencies, is to require the field office to submit information system acquisition plans for OIRM review and approval. Similarly, OIRM officials stated that DOE orders do not provide them with clear authority to ensure that DOE offices and M&O contractors correct deficiencies. Lacking clear authority, these officials said the best they can do is to encourage sites to improve control over their IRM activities.

OIRM officials explained that DOE orders do not provide the DSO authority to oversee site IRM activities because, historically, DOE policy has been to allow field offices and M&O contractors to manage their own activities with minimal interference from headquarters. In addition, they said that changes to increase the DSO's authority might be difficult to achieve because it would challenge DOE's traditional power structure. They noted that since any change to authority must be coordinated throughout the Department, other, more powerful DOE organizations could be expected to object to changes that might impose more oversight.

Action to Strengthen Accountability Has Not Been Applied to IRM

Recognizing that unclear lines of responsibility and authority have led to limited accountability and control weaknesses in other important areas, the Secretary issued the May 1991 directive clarifying program managers' oversight responsibilities and authority. The Secretary noted that strengthening line management control and accountability is the linchpin with which he can assure effective and efficient accomplishment of DOE programs, while maximizing the use of resources.

As we pointed out in chapter 3, the directive strengthened accountability by increasing headquarters program managers' control—subject to appropriate oversight—over field office and contractor activities. Although the directive stated that the concept applies to other administrative management activities, including financial and human resources requirements, it did not mention either program managers' responsibility to control information resources or the DSO's responsibility to provide oversight. As a result, accountability continues to be diluted and IRM activities continue to be controlled in the traditional decentralized manner, allowing each site to establish and enforce its own controls with limited oversight by headquarters program offices or the DSO. We believe that citing the need to control financial and human resources, but not mentioning IRM resources, reflects a lack of recognition of the importance of controlling IRM activities.

DOE Officials Recognize the Need for Stricter Controls and Accountability

At the conclusion of our review, we discussed these management control deficiencies with the Director, OIRM, and other senior OIRM officials, who noted that the Secretary's management reforms emphasize the need for stricter control and accountability for field office and contractor activities. They said that the Secretary's initiative to strengthen accountability was intended to cover all resources needed to accomplish missions, including information resources. They agreed, however, that the directive did not mention information resources, and that DOE's IRM oversight process has not changed to conform to the new reporting relationships.

The OIRM officials also agreed that control over IRM activities could be improved and that policies, procedures, and practices should be reassessed. They stated that DOE's practice of relying heavily on field offices and contractors to establish and enforce their own controls was adopted in part because OIRM does not have enough resources, particularly IRM staff, to oversee the large number of sites. This practice also reflects DOE's prior operating philosophy of relying heavily on site officials—primarily contractor officials—to control their own activities.

Finally, the officials said that the Department's April 1991 initiative to improve the effectiveness of IRM activities addresses the need to revise IRM policies and procedures. They indicated that the forthcoming action plan to improve IRM activities will include a reassessment of policies, procedures, and practices for acquiring and operating information systems. However, because the action plan has not been completed, the OIRM officials were not able to describe the specific changes that will be made.

Secretarial Leadership Is Important

An underlying reason why IRM planning and management control deficiencies exist is that top management has not focused its attention on IRM activities. To be effective, an IRM program requires strong leadership by the head of the agency and support by senior program managers and the DSO. Although the Secretary has aggressively attacked other problems facing the Department, he has not identified IRM planning and control deficiencies as material internal control weaknesses under the Federal Managers' Financial Integrity Act.

Leadership Is Essential to an Effective IRM Program

In a 1990 GAO symposium, leaders from industry, the Congress, and executive agencies examined the challenges agencies face in managing information resources, and agreed on several principles that make up a framework to guide the acquisition and management of information technology.[1] The participants agreed that successful automation efforts begin with a top manager who has a clear vision of how the organization can benefit from information technology, and a commitment to making the vision a reality.

After articulating the vision, agency leaders should then ensure that strategic and tactical plans—including information system architectures—are developed to guide the implementation of the vision. Symposium participants concluded that without clear direction and support from the top, IRM initiatives tend to degenerate into loose collections of independent systems. These systems often do not meet the organization's information needs because the developers focus on their individual units' needs rather than the organization's larger missions and goals.

The symposium also pointed out that partnerships between senior program managers and the DSO are needed to define and implement the vision. Senior managers need to help define the vision because they are in the best position to understand how information can help accomplish mission objectives. The DSO should also help define the vision, prepare the agency's technology plans, and ensure that ongoing and proposed system development projects fall logically within the plans. To ensure that the DSO's responsibilities are fulfilled, the symposium participants agreed that agencies need to redefine the role and elevate the authority of the DSO. Participants also reached a consensus that agencies should establish

[1]Meeting the Government's Technology Challenge: Results of a GAO Symposium (GAO/IMTEC-90-23, February 1990).

executive-level boards consisting of top program office and IRM managers to ensure that the vision is realized.

Finally, the symposium pointed out that assembling and retaining a team of highly qualified officials to manage information systems projects is essential. One participant stressed that the quality of people supporting the leaders in the organization will determine whether the vision can be carried out. The symposium recommended that agencies find new ways to maintain the management continuity that is essential to providing consistent direction and clear accountability. The use of advisory committees and individual consultants to provide consistent institutional memory and perspective was one suggested method.

IRM Deficiencies Not Identified as a Departmentwide Problem

Because efforts to accomplish Department missions and correct management deficiencies rely heavily on the availability of timely, relevant, and reliable information, correcting IRM deficiencies should be seen as essential to the Secretary's efforts to improve the Department's effectiveness. Although the Secretary has identified a number of material internal control weaknesses, he has not identified IRM deficiencies as a departmentwide problem, nor has he put forth a vision of how information technology can help accomplish departmental missions.

The limited attention devoted to IRM deficiencies contrasts sharply with the Secretary's actions to correct other problems. In response to complex challenges, such as massive environmental damage and unsafe nuclear weapons production facilities, and management problems, such as weak controls over contractor activities, the Secretary has initiated major reforms and changes to strengthen accountability and improve DOE operations. These reforms include creating new organizations such as Environmental Restoration and Waste Management, new reporting structures to increase line managers' accountability for achieving environmental and safety and health objectives, new mission planning processes, and strengthened contract provisions and contractor oversight practices.

The DSO told us he believes the Secretary has not focused his attention on IRM issues because other, more visible problems have captured his attention. The Department's senior mission planning official agreed, noting that the Secretary has had to deal with controversial policy issues, such as the circumstances under which nuclear material production facilities will

be restarted, and equally controversial management reforms that have required major cultural changes throughout the organization.

Establishing Partnerships Requires Clear Responsibility and Authority

Secretarial leadership is important to ensuring that senior program managers and the DSO work together to help define and implement the vision. Senior OIRM officials and program office IRM staff told us that senior program managers have little involvement in IRM activities because most do not recognize that they have an important role to play in managing information resources. Although executive-level IRM steering committees are an accepted way to ensure that senior program managers focus attention on IRM issues, DOE has not established such a committee.

As part of his April 1991 initiative to improve IRM, the DSO did establish an IRM council to assist in developing changes to the agency's IRM program. Although this council could play an important role in improving IRM, it is made up of mid-level IRM professionals from the program offices and OIRM, rather than top-level managers, as recommended at the symposium. Because neither the DSO nor senior program managers are members of the council, it is questionable whether the council will have the executive-level perspective or authority needed to define an effective IRM vision and ensure its implementation.

It is also questionable whether effective partnerships can be established without more clearly defining the DSO's and program managers' responsibilities and authority. As we noted in chapters 3 and 4, unclear responsibility and limited authority reduce the DSO's and program managers' ability to correct IRM planning deficiencies and control information resource activities. Federal internal control standards point out that agencies should organize in a way that provides clear lines of authority and responsibility. Secretarial leadership is important to clarifying the responsibility and authority of the DSO and program management officials.

Managers' Concerns About the Availability of Qualified Staff Are Important

As we pointed out in chapter 3, the senior DOE mission planning official cited the need for staff to have improved technical and management skills to implement an effective IRM strategic planning process. In chapter 4, we pointed out that OIRM managers cited insufficient IRM staff as contributing to deficient management control. Secretarial support will be important to ensuring that adequate staff with the appropriate technical and management skills are available to manage information resources.

Conclusions and Recommendations

Since being appointed in 1989, the Secretary has instituted major changes to improve DOE's ability to accomplish its missions. These reforms were designed to correct longstanding deficiencies in DOE management practices, deficiencies that have contributed to severe problems, including massive contamination and unsafe nuclear facilities. Although these reforms have resulted in significant organizational and cultural changes within DOE, deficiencies in DOE's management of information resources have not been corrected. Effective management of information resources is especially important, not only because DOE has a multibillion-dollar investment in information technology, but also because information plays a critical role in helping DOE accomplish its vital missions. Because this information is crucial, effective action to correct IRM deficiencies is important to improving DOE's ability to accomplish its missions and reduce waste and inefficiency.

The primary impact of IRM deficiencies is that managers and staff throughout DOE are not receiving the information they need. As a result, they are hindered in accomplishing their missions. This, in turn, may increase the risk that the public will be unnecessarily exposed to dangerous contaminants; the safety and health of workers will not be adequately protected; outdated weapons components will continue to be produced and discarded; and facilities, secrets, and employees will not be properly protected from threats. In addition, DOE is wasting resources developing and operating information systems that overlap or duplicate existing systems.

These problems exist because DOE (1) has not implemented a strategic IRM planning process that focuses information resource investments on achieving strategic mission objectives, and (2) has not exercised adequate management control to ensure that IRM activities are conducted effectively and in accordance with law and policy. Without a strategic IRM plan, DOE cannot identify the information needed to meet mission needs departmentwide. DOE also cannot develop tactical plans and information system architectures, which are needed to ensure that information system investments are cost-effective and meet departmentwide information needs.

Similarly, management controls are essential to ensuring that IRM activities support departmental objectives. Without effective control over the acquisition and operation of information systems, DOE has difficulty ensuring that new and existing information systems meet mission needs.

Management controls also help prevent the development of overlapping and duplicate information systems.

The ability of program managers and IRM oversight staff to improve IRM planning and strengthen controls is limited, however, because neither has been assigned clear responsibility or sufficient authority to do so. In the absence of clear statements of responsibility and authority, DOE managers have not assumed the responsibility for strengthening IRM planning and management controls. According to senior IRM and mission planning officials, the limited number of skilled staff also hinders efforts to improve IRM activities. Although the Secretary has strengthened accountability for accomplishing Department missions by assigning headquarters program managers—subject to appropriate oversight—the responsibility and authority to plan and control field office and contractor financial and human resources, these reforms have not been applied to the management of information resources.

Secretarial and senior management leadership will also be needed to foster changes in DOE's traditional culture of relying on individual headquarters, field office, and M&O contractors to plan and control their own information resource activities. Resistance may be encountered because improved IRM practices will disrupt traditional reporting relationships, provide for more centralized authority and accountability, and require involvement from managers who have traditionally not managed information as a resource. Identifying IRM deficiencies as a departmentwide problem and articulating a clear vision of how information technology can help accomplish DOE missions would help foster the needed change. Secretarial and senior management leadership will also be important to (1) establish effective partnerships among program managers and the DSO and (2) ensure that staff possessing the necessary technical and management skills are available to implement improved IRM practices.

Although the DSO has begun efforts to improve IRM activities, these efforts remain largely undefined and are unlikely to correct problems unless the improvements involve the Secretary and senior program managers. The Department's April 1991 document begins to identify important objectives to improve IRM activities. However, because the document was intended to be a high-level description of opportunities to improve IRM, it does not present a clear vision of how information can be used to help DOE achieve its missions, or identify specific changes that will be made. Thus, we believe this initiative does not lessen the need for Secretarial and senior

management attention to highlight the significance of IRM deficiencies; provide a vision of how information technology can help DOE achieve its missions; and support necessary planning, control, and organizational changes.

Consequently, until the Secretary and senior managers recognize the gravity and extent of information deficiencies and correct the underlying causes, efforts to more effectively accomplish departmental missions and strengthen control over departmental operations will be hindered.

Recommendations

The effective management of information is important to assist managers in accomplishing their missions. Secretarial attention is also essential to ensure that DOE's IRM improvement efforts are successful. Therefore, we recommend that the Secretary take the following actions:

- Work with senior program managers and the DSO to develop a clear vision of how better information and improved IRM can contribute to accomplishing critical missions, and commit the Department to making the vision a reality by, for example, establishing an executive-level committee—consisting of top program managers and the DSO—to oversee IRM improvements.
- Clarify program managers' and the DSO's responsibilities and authority to plan and control information resources throughout the Department, ensure that these managers are knowledgeable about their roles and responsibilities, and ensure that adequate staff with appropriate management and technical skills are available to implement improved IRM practices.
- Hold the DSO and program office managers accountable for (1) linking the IRM planning process to the Department's strategic mission planning process and preparing strategic and tactical plans—including information system architectures—that support the Department's strategic mission objectives; and (2) revising IRM policies, procedures, and processes to strengthen management control over headquarters, field office, and M&O contractor IRM activities.
- Identify IRM deficiencies as a material internal control weakness under the Federal Managers' Financial Integrity Act (31 U.S.C. 3512) and require the DSO and program managers throughout the Department to identify specific internal control weaknesses that hinder their ability to manage information resources. IRM activities should continue to be reported as a material internal control weakness until the Secretary has reasonable

assurance that information resources are being applied efficiently and in accordance with laws, regulations, and policies.

Agency Comments and Our Evaluation

In commenting on a draft of this report, DOE stated that it agreed with our recommendations and identified a number of specific actions it will take to implement them. Although these actions appear to be generally responsive to our recommendations, they do not fully address them. In particular, it is not clear what DOE will do to ensure that (1) sufficient staff with appropriate technical and management skills are available to strengthen the IRM program and (2) information system architectures are prepared to identify information needs and determine the best alternative to providing the information.

Although DOE agreed with our recommendations, it disagreed with much of chapter 2, which describes how IRM deficiencies (1) impair managers' efforts to accomplish their missions and (2) waste resources. After reviewing DOE's comments and the evidence we used to reach our conclusions, we continue to believe that this report fairly and accurately describes the Department's information deficiencies and their effects. DOE's written comments are provided in appendix I.[1]

DOE Agreed to Implement Most Recommendations

DOE commented that it supports our recommendations and stated that, in addition to actions already underway, it will initiate further actions, where appropriate, to ensure that the recommendations are fully addressed. Specifically, the Department stated that it will

- modify its IRM strategic vision statement;
- issue a Secretarial notice to address the importance of IRM in program managers' oversight responsibilities and authority;
- create an executive-level committee to oversee DOE's IRM activities;
- issue a departmental order identifying IRM and program officials' responsibilities and authority to plan, manage, oversee, and control IRM activities;
- modify its strategic planning initiative by describing the relationship between IRM planning and the Department's strategic mission planning; and
- restructure the Department's IRM planning so it is better aligned with program planning.

DOE has not yet agreed to identify IRM deficiencies as a material internal control weakness. In this regard, the Department plans to issue guidance to ensure that all headquarters and field elements consider the issues

[1]In addition, DOE suggested minor corrections and editorial changes, which have been incorporated where appropriate.

raised in our report and, in turn, report any material deficiencies to the Secretary. DOE stated that the Departmental Internal Control and Audit Review Council will review identified weaknesses and, if warranted, recommend that IRM be included as a material weakness in the Secretary's 1992 report to the President and Congress.

Except as discussed below, these actions appear to be responsive to our recommendations and, if effectively implemented, should significantly improve the information available to DOE managers and staff.

Further Action Is Needed to Fully Address Recommendations

In its comments, DOE did not respond to elements of two of our recommendations. First, it did not identify what action it will take to ensure that sufficient staff with appropriate technical and management skills are available to implement improved IRM practices. Second, although DOE agreed to restructure its IRM planning process, it did not specifically agree to prepare information system architectures.

We believe these are important recommendations and that DOE should clarify what action it will take to implement them. Ensuring that sufficient staff with appropriate skills are available is important because limited numbers of staff with the appropriate skills has hampered and will continue to hamper DOE's efforts to improve IRM practices. Similarly, preparing information system architectures is important because the process provides a disciplined, systematic approach for determining the most cost-effective and efficient means of satisfying the agency's information needs. We expanded the discussion of system architectures in the report to emphasize its importance. We also provided OIRM officials with a copy of a recently issued GAO staff study that describes a methodology for developing architectures.[2]

DOE Disagrees That Information Shortfalls Impair Missions and Waste Resources

DOE disagreed with much of chapter 2, which describes how information deficiencies impair managers' efforts to accomplish their missions, and waste resources. DOE also characterized as inflammatory and untrue our conclusion that information shortfalls, in turn, increase the risk that (1) the public will be unnecessarily exposed to dangerous contaminants, (2) the safety and health of workers will not be adequately protected, (3) outdated weapons components will continue to be produced and discarded, and (4) facilities, secrets, and employees will not be adequately protected from threats. DOE also commented that some overlap and

[2]GAO/IMTEC-92-51, June 1992.

duplication of information systems should be expected and that our report does not quantify the extent or cost of overlap and duplication.

We continue to believe that our report fairly and accurately portrays the information deficiencies at DOE and their impact on managers' ability to accomplish their missions. Our findings are based on numerous reports and studies by DOE program offices, OIRM, the Inspector General, GAO, and others, as well as on our discussions with senior program managers and IRM officials in the four mission areas. This evidence, discussed throughout our report, consistently supports our findings. DOE's comments regarding each mission area and our analysis of the comments are presented below.

Environmental Restoration Mission

DOE commented that environmental restoration managers have the information they need to carry out their responsibilities. However, studies by DOE and others, as well as our discussions with senior Environmental Restoration managers from headquarters and field offices, show that this is not the case and that the lack of timely, reliable, and relevant environmental restoration information is a pervasive problem.

For example, according to DOE studies, field office and contractor managers cannot accurately define the type and extent of contamination because data collected to assess the scope of contamination are inaccurate, inconsistent, or inaccessible. An Environmental Protection Agency report pointed out that its analysts responsible for overseeing DOE environmental restoration practices are inundated with lengthy reports from DOE that they are unable to effectively analyze. We believe that these deficiencies, in turn, increase the risk that the public will be unnecessarily exposed to dangerous contaminants. In fact, our report cites one case in which a report identifying the need to secure a hazardous site was misplaced for almost a year, thereby delaying headquarters awareness of the danger and allowing the site to remain open to the public.

Safety and Health Mission

DOE commented that it disagreed with the implication in our draft report that because certain information is not computerized or available in a centralized computer system, managers cannot adequately discharge their safety and health responsibilities. DOE contends that safety and health information is available in numerous automated and manual information systems.

We believe that DOE's response does not accurately describe the serious information deficiencies that exist at headquarters, field office, and contractor facilities. We found, primarily on the basis of discussions with DOE safety and health managers and a DOE study, that the departmentwide safety and health information system[3] does not provide the information managers said they need to carry out their responsibilities. In addition, other DOE studies point out that many of the local manual and automated systems cited by DOE in its comments also do not provide field office and contractor managers with needed information. For example, one DOE report noted that 83 percent of field offices do not have information systems capable of tracking safety and health activities. We believe these are significant information deficiencies that deserve immediate attention.

Weapons Production Mission

DOE disagreed that a lack of information or lack of systems to communicate information causes outdated weapons components to be produced. However, as we discuss in chapter 2, DOE's own studies have consistently identified the inability to exchange information electronically as a problem that reduces the efficiency of its nuclear weapons manufacturing and business processes. For example, a 1989 study noted that the inability of DOE facilities to exchange design information in a timely and reliable way creates inefficiency and waste. Further, a senior DOE weapons complex quality control official and IRM officials confirmed that DOE has scrapped millions of dollars' worth of parts due to continuing difficulties exchanging design information.

Security Mission

DOE commented that its security program adequately protects its employees, facilities, and secrets from threats. We found, however, that longstanding information deficiencies continue to hinder managers' efforts to ensure an effective security program, thus increasing the Department's vulnerability to threats. For example, our report points out that problems tracking security clearances, first identified in 1987, still exist. Similarly, DOE agreed with the findings in our 1991 report on information systems supporting the security mission.[4] That report pointed out that difficulty identifying patterns and trends in security weaknesses and incidents has reduced security managers' ability to ensure the effectiveness of the security program. This report notes that DOE has been taking steps to improve security information in response to problems cited in earlier GAO

[3]We refer to the system as a departmentwide system because DOE identified it as such in its Five-Year Information Technology Resources Long-Range Plan.

[4]GAO/IMTEC-92-10, Oct. 22, 1991.

reports. However, since these actions have not yet been fully implemented or evaluated, the vulnerability to threats still exists.

DOE Believes Some Overlap and Duplication Should Be Expected

With regard to our conclusion that DOE has wasted resources developing and operating overlapping and duplicate information systems, DOE commented that because it is a large and diverse agency that has undergone significant changes in recent years, some overlap and duplication will occur. The Department noted that our report did not quantify the extent or cost of overlap and duplication. The Department also asserted that we had assumed that designing one system to meet the needs of all users is the most cost-effective alternative. DOE pointed out that a single system may not be the best solution to satisfying complex and changing information needs.

As we discuss in chapter 2, we found significant examples of unnecessary overlap or duplication in all four mission areas reviewed. In one case, the DOE Inspector General reported that three sites had over 80 systems to track environmental compliance information. Two of these sites had spent a total of nearly $8.8 million to develop and operate overlapping and duplicate systems. DOE also spent $24 million to develop and operate a departmentwide system to track environmental compliance information. Our report identifies similar examples in the other three mission areas. Although we do not attempt to quantify the amount and cost of overlap and duplication, the evidence in our report convincingly demonstrates that overlap and duplication are pervasive problems and that significant resources are being wasted. At the conclusion of our review, senior OIRM officials agreed that the conditions described in our report are representative of conditions throughout the Department, and that DOE spends a significant amount of resources on overlapping and duplicate systems.

On the issue of a single system, DOE misinterpreted our report. We do not believe that a single system to satisfy all needs is always the most cost-effective solution. On the contrary, we believe a full range of alternative technical solutions should be analyzed to identify the most cost-effective alternative. We also believe that alternatives should be developed on the basis of a full understanding of information needs departmentwide. However, as we point out in chapter 3, DOE does not have an effective strategic planning process to analyze departmentwide needs. Instead, the current DOE practice allows each site to define its own information needs and develop its own systems to meet those needs. Our

recommendation that DOE prepare system architectures is intended, in part, to provide an effective mechanism to identify common information needs and select the most cost-effective alternative to meeting those needs.

Comments From the Department of Energy

Department of Energy
Washington, DC 20585

August 5, 1992

Mr. Victor S. Rezendes
Director, Energy and Science Issues
Resources, Community, and
Economic Development Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rezendes:

The Department of Energy (DOE) appreciates the opportunity to review and comment on the General Accounting Office (GAO) draft report entitled "Department of Energy: Better Information Resources Management Needed to Help Accomplish Missions."

The report recommends that the Secretary of Energy (1) present a clear vision of how information and information resources should contribute to accomplishing critical missions, (2) clarify program managers' and information resources management (IRM) oversight staff responsibilities and give them sufficient authority to plan and control information resources Departmentwide, (3) hold these managers accountable for linking IRM planning with DOE's strategic mission planning process and strengthening controls over IRM activities, and (4) report IRM deficiencies as a material internal control weakness until the Secretary has reasonable assurance that information resources are being applied efficiently and in accordance with laws, regulations, and policies.

The Department supports the recommendations made by GAO to improve the management of IRM in DOE. A number of actions are already underway to address some of these recommendations. Where appropriate, additional action will be initiated to ensure that these recommendations are fully addressed. Specifically, the Department will:

- Modify its IRM vision statement and communicate it to all Departmental Elements.
- Issue a notice, under the Secretary's signature, to specifically address the importance of IRM in program managers' oversight responsibilities and authorities.
- Create an executive level committee, chaired by the Director of Administration and Human Resource Management, to oversee IRM activities.
- Issue a DOE order which delineates the responsibilities and authorities of IRM and program officials for the planning, management, oversight, and control of IRM activities.

- Modify the Strategic Planning Initiative (Secretary of Energy Notice No. 25A, dated October 2, 1991) to include a reference to IRM planning and its relationship to the Department's strategic planning.

- Restructure Departmental IRM planning more along program lines.

The Department will also carefully consider GAO's recommendation to identify and report IRM deficiencies as a material internal control weakness under the Federal Manager's Financial Integrity Act (FMFIA). Guidance will be issued to ensure all Headquarters and Field Elements consider the issues raised by GAO and report any material and significant IRM deficiencies in their FY 1992 FMFIA assurance memorandums to the Secretary. The Departmental Internal Control and Audit Review Council will review any IRM deficiencies reported by Headquarters and Field Elements, and, if warranted, recommend the inclusion of an IRM material weakness in the Secretary's FMFIA report to the President and the Congress.

GAO states that the Department has wasted resources developing and operating systems that overlap or duplicate other existing Departmental systems. Although some examples of overlapping/duplicating were provided in the report, GAO pointed out that they were unable to quantify the extent or cost of such overlap and duplication. In fact, most of the examples of overlap/duplication discussed in the report were identified by the Department. DOE is a very large and diverse organization and has been experiencing a number of organizational and cultural changes in recent years. As a result, some overlapping/duplicate systems will occur. Additionally, the assumption in the report is that designing one system to meet all needs is the most cost-effective alternative. However, this is applicable only when the requirements are very similar, the additional local requirements are easy to incorporate, the integrated system can be developed quickly, and the requirements are stable. On the other hand, overlapping systems can be beneficial by providing tighter coupling to local requirements, clearer local accountability for performance, lower individual system risk, and shorter development time.

As previously discussed, this report offers recommendations to improve the contribution of IRM to the Department's missions. DOE basically accepts these recommendations and will aggressively move to implement them. However, DOE strongly disagrees with GAO's transitional statements of effect. GAO believes that the Department has been hindered in accomplishing its mission due to the lack of information. GAO claims that the public will be unnecessarily exposed to dangerous contaminants; the safety and health of workers will not be adequately protected; outdated weapons assemblies will continue to be produced and discarded; and facilities, secrets, and employees will not be properly protected from threats. We believe these statements to be inflammatory and untrue.

Relative to the Environmental Restoration and Waste Management (EM) program, GAO maintains that lack of information " . . . increases the risks that the public will be unnecessarily exposed to dangerous contaminants;" and GAO has incorrectly attempted to relate this lack of information to inadequate information systems. DOE asserts that information systems do not determine the nature and extent of environmental contamination. This

is determined through Field characterization activities in accordance with a process that is prescribed by the Environmental Protection Agency under provisions of such environmental laws as the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended. DOE managers have the information they need to determine the nature and extent of environmental contamination in CERCLA and RCRA Investigation Reports. These reports are specifically required in enforceable environmental compliance agreements, consent decrees, and permits. They specifically define the types of contamination and locations. DOE managers use these reports both in the Field and at Headquarters to determine any necessary environmental compliance actions. This information is also available to the public in reading rooms located at each DOE facility. Until EM was established, about 3 years ago, no capability existed within DOE to centrally manage its environmental program. EM was established to assess and correct environmental problems caused by decades of nuclear weapons production and low priority to environmental concerns. EM is working closely with DOE Field Offices and contractors to assure that all sites properly characterize contaminants.

Relative to safety and health management, GAO maintains ". . . the safety and health of workers will not be adequately protected. . ." and cites the inadequacies of a Departmentwide system for tracking safety and health activities. This is not accurate since there is no Departmentwide system for safety and health. The Safety Performance Measurement System (SPMS) is an interactive computer system that only provides a collection of independent environment, safety, and health information modules for reference by DOE and its contractors. SPMS provides accident/incident information, aids in developing trend and causal factors analysis, and provides technical information and communications throughout the Department. Its purpose is not to serve all of DOE's safety and health information needs. This report implies that, because DOE does not have certain information computerized or that this information is not on a centralized system, the Department cannot adequately discharge its safety and health responsibilities. This is not true. Many sites keep manual logs or track safety and health through local information systems. Each site has its own unique requirements in tracking safety and health concerns; therefore, each program office must establish and maintain an occupational safety and health program for their contractor employees. Consequently, the Program Secretarial Officers and their contractors are responsible for the management of information to support their safety and health tracking and targeting needs. The Department also recognizes a need for a centralized, comprehensive occupational health surveillance system which would standardize health and workplace exposure data collection, storage, and management and provide a reliable vehicle for tracking workers' health and identifying potential workplace hazards. This system now is under development by the Office of Environment, Safety and Health.

Relative to nuclear weapons production, GAO maintains " . . . outdated weapons assemblies will continue to be produced and discarded." and cites lack of information or the ability to communicate that information through systems as the problem. The term "weapons assemblies" generally refers to

a complete weapon, such as a warhead, bomb, or reentry vehicle. GAO is referring to weapon subassemblies or weapons components, such as electronic component assemblies or mechanical assemblies. Lack of information or lack of systems communicating that information is not the cause of such outdated subassemblies being produced. Changes in weapons production are principally due to design changes being made because problems are discovered from various testing programs or the particular program is terminated or reduced by the Department of Defense. When one of these situations occur, components produced prior to the design change may have to be discarded or the pipeline of parts in excess of the requirement may have to be scrapped if there is no other use for those parts.

Relative to security mission areas, GAO maintains " . . . facilities, secrets, and employees will not be properly protected from threats." and again cites information systems as the problem. We believe that sufficient protection is in place. Further, information systems have been redesigned or are in the process of being implemented in response to previous GAO reports to assure proper protection. DOE improvements were further identified in February 1992 to enhance the effectiveness of these systems via a scheduled information systems review program. Information systems cannot be static due to changing or evolving requirements and must be reviewed to insure they continue to meet mission needs. The Office of Security Affairs will utilize the recommendations of the internal DOE review to improve their systems.

Minor corrections and editorial changes have been presented to GAO under separate cover. DOE hopes that the comments in both letters will be helpful to GAO in their preparation of the final report.

Sincerely,

Elizabeth E. Smedley

Elizabeth E. Smedley
Acting Chief Financial Officer

Major Contributors to This Report

Information Management and Technology Division, Washington, D.C.	David Gill, Assistant Director Theodore Alves, Assignment Manager Margaret Price, Evaluator-in-Charge Alicia Sommers, Staff Evaluator Pamela Williams, Computer Specialist John Finedore, Senior Evaluator Shane Hartzler, Writer-Editor Lynne Goldfarb, Publishing Adviser
Denver Regional Office	Peter Fernandez, Regional Assignment Manager Emmanuel S. Olona, Staff Evaluator

United States
General Accounting Office
Washington, D.C. 20548

Official Business
Penalty for Private Use $300

First-Class Mail
Postage & Fees Paid
GAO
Permit No. G100

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20877

Orders may also be placed by calling (202) 275-6241.