Follow-up Review of Emergency Management Programs in the Department of Energy Complex

May 2000

Office of Independent Oversight
and Performance Assurance

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Abbreviations Used in This Report

AL	DOE Albuquerque Operations Office
BNL	Brookhaven National Laboratory
CH	DOE Chicago Operations Office
CSO	Cognizant Secretarial Office
DOE	U.S. Department of Energy
DP	DOE Office of Defense Programs
EAL	Emergency Action Level
EM	DOE Office of Environmental Management
EOC	Emergency Operations Center
ISM	Integrated Safety Management
LLNL	Lawrence Livermore National Laboratory
LPSO	Lead Program Secretarial Office
MEMP	Miamisburg Environmental Management Project
NTS	Nevada Test Site
NV	DOE Nevada Operations Office
OAK	DOE Oakland Operations Office
OA	DOE Office of Independent Oversight and Performance Assurance
OH	DOE Ohio Field Office
OR	DOE Oak Ridge Operations Office
SC	DOE Office of Science
SNL/NM	Sandia National Laboratories/New Mexico
SO	DOE Office of Security and Emergency Operations
TSD	AL Transportation Safeguards Division

OVERSIGHT

PROLOGUE

The Office of Independent Oversight and Performance Assurance (OA) has been performing reviews of emergency management programs at Department of Energy (DOE) sites since it was formed by the Secretary of Energy in May 1999. As discussed in this report, there are longstanding weaknesses in many aspects of both DOE Headquarters and site emergency management programs. While progress has been made in some areas, the results of this OA follow-up review indicate that many weaknesses persist.

The most significant weaknesses involve the ability of emergency response organizations to make decisions and provide effective direction during the first hour of an accident. One of the primary underlying causes is that most sites have not been successful in developing comprehensive hazards assessments and using the results of these assessments to establish the procedures, guides, tools, or job aids needed to make accurate and prompt decisions in the highly stressful and time-urgent conditions of an emergency. Recognizing that most sites have devoted significant resources to developing hazards assessments and job aids, the continued weaknesses indicate that site efforts have not been well focused or coordinated, and have not taken advantage of existing guidance and benchmarking information.

In addition to providing DOE management with a report on the status of previously identified weaknesses at DOE sites, a major objective of this follow-up report is to identify opportunities for near-term performance improvements and longer-term programmatic improvements. Consequently, OA focused much of its attention on identifying specific weaknesses that DOE sites and DOE Headquarters should focus on, as well as their underlying causes. The goal was to identify actions that DOE could take to address the most significant problems, and thus to make the most significant improvements in emergency management and response, while using limited resources efficiently.

OA views this report as a vehicle for communicating constructive suggestions for improvement and a basis for dialog and subsequent action. The report suggests near-term opportunities for improving emergency response performance that should be taken on an expedited basis to improve and verify DOE's capability to respond to an emergency. It also identifies programmatic improvement actions that are needed to ensure that a fully satisfactory and comprehensive system is achieved and maintained, including enhancing feedback systems to ensure continuous improvement.

Executive Summary

Background and Scope

The U.S. Department of Energy (DOE) is required to maintain a comprehensive emergency management system to ensure that DOE is prepared to protect workers, the public, the environment, and national security in the event of an accident or emergency. Following a chemical explosion at DOE's Hanford site in May 1997, an independent oversight evaluation of emergency management programs across the DOE complex was conducted. That evaluation, completed in early 1998, concluded that, despite a series of 1997 Secretarial initiatives on emergency management, the programs at DOE Headquarters and DOE sites were still in need of substantial improvement and management attention.

The Office of Independent Oversight and Performance Assurance (OA) conducted follow-up reviews at selected sites to: (1) provide DOE management with an update on the status of emergency management programs in the DOE complex and (2) identify priority actions for performance and programmatic improvements. Although the information provided in this report is based on a sample of DOE sites and activities, the widespread and recurring nature of many of the weaknesses identified in this report indicates that they may be applicable to the broader spectrum of DOE sites in the complex.

Current Status

DOE sites have made improvements in various aspects of their emergency response capability since 1998. The most significant improvement has been recognition of the need to be able to respond to, categorize, and classify an emergency promptly. In many emergencies involving radioactive materials or hazardous chemicals, it is imperative to initiate actions (e.g., take shelter) to protect workers and the public within a few minutes. The 1998 independent oversight evaluation determined that some DOE sites waited until the Emergency Operations Center was activated, which could take an hour or more, before fully assessing an emergency situation and formulating protective measures. Three DOE sites recently transferred the responsibilities and decision-making authority for emergency classification, notifications, and protective actions to the initial on-scene responder, typically a fire chief or plant shift superintendent, to permit these critical functions to be performed promptly. Another positive trend is the ongoing efforts of many DOE sites to reduce inventories of radiological and chemical hazards. Several sites have achieved significant inventory reductions that, in some cases, have eliminated the potential for offsite hazardous material releases.

Notwithstanding the progress in some areas, improvement in emergency management programs and emergency response capabilities has often been slow and limited in scope. Of the eight DOE elements reviewed for this follow-up effort, none has achieved a satisfactory level of performance. Many of the weaknesses identified in the 1998 complex-wide evaluation report persist at multiple DOE sites and have not yet been effectively addressed by either Headquarters, Operations Office, or contractor corrective actions. In many cases, the weaknesses that are being identified are similar to those that were evident in the response to the Hanford explosion more than two and a half years ago.

The most significant weakness pertains to the proficiency of emergency response organizations to make response decisions and take mitigative actions quickly and/or accurately enough to protect emergency responders, workers, and the public from possible adverse health consequences of a hazardous material release. The underlying causes of this weakness include the inability of DOE and contractor emergency management personnel to: 1) make critical judgments regarding the adequacy of site hazards assessments; and 2) translate the information from the hazards survey and assessment documents into procedures, guides, or job aids that can be readily used in the highly stressful and time-urgent conditions of an emergency.

In general, the feedback and improvement programs at all levels of DOE have not been

sufficient to ensure that weaknesses in emergency response are identified, addressed, tracked, and corrected. For example, the DOE Headquarters corrective action plan for the July 1998 complex-wide evaluation report was not approved by the Deputy Secretary of Energy until March 2000—20 months after the report was issued. The historical absence of strong and effective DOE Headquarters functions to provide technical support, accurate self-assessment feedback, and guidance on program improvement priorities is a significant contributor to the protracted nature of the weaknesses in site emergency management programs.

Recent changes in the DOE organizational structure have the potential to stimulate the actions necessary to improve emergency management at all levels of the Department. In May 1999, the Secretary of Energy created the Office of Security and Emergency Operations (SO), which consolidated the responsibility for all DOE emergency management system policy, guidance, and technical support into a single organization reporting directly to the Secretary. While other Headquarters offices retain responsibility for providing programmatic direction to the sites and for certain activities (e.g., the Assistant Secretary for Environmental Management in the case of the DOE Transportation Emergency Preparedness Program), SO can provide a central point of leadership for emergency management and is in a position within DOE where it can effect change across all DOE programs. Cross-cutting program plans and initiatives for the Office of Emergency Operations within SO are in development and the early stages of implementation. SO has established an aggressive multi-year plan for training, technical assistance visits, and exercise evaluations to improve the DOE emergency management system. The establishment of a new Departmental emergency management training academy is a notable initiative with the potential to enhance individual proficiency and site training programs.

Opportunities for Improvement

Although there have been improvements and progress is ongoing, DOE has not yet established a clear path forward for improving key elements of emergency management systems across DOE. OA has identified three actions related to responder and initial decision-maker performance that should be considered on an expedited basis to improve DOE's capability to respond to an emergency, particularly in the first critical hour after an accident or event:

- Develop reference information, tools, and decision-making aids needed by those individuals with initial decision-making authority to implement protective actions promptly and effectively (e.g., accurate hazards information, emergency action levels, and notification processes)

- Train and drill the individuals vested with initial decision-making authority in the full scope of their required duties

- Improve and maintain the competency of initial decision-makers in executing time-urgent response decisions as demonstrated through an ongoing program of performance-based, objectively evaluated, tabletop exercises.

OA has also identified three high-priority programmatic actions that need to be taken to ensure that a fully effective and comprehensive DOE emergency management system is achieved and maintained:

- Improve assessment and feedback systems to ensure effective corrective actions and continuous improvement

- Ensure that all emergency responders and program elements are effectively integrated into a comprehensive emergency management system that is supported by an appropriate level of management attention and program resources

- Improve Headquarters' coordination and support to field emergency management programs.

To facilitate these actions, OA plans to closely coordinate with lead program secretarial offices, cognizant secretarial offices, and SO. These coordination activities will focus on establishing a common set of performance expectations, communicating lessons learned from the follow-up reviews, and helping to establish recommended priorities and opportunities for improvement.

1.0 Introduction

The Office of Independent Oversight and Performance Assurance (OA) conducted this follow-up review to determine the status of emergency management programs in the Department of Energy (DOE) complex and the degree of progress that has been made since the complex-wide review conducted in early 1998.[1]

Purpose

This Independent Oversight report has two purposes:

- To provide DOE management with an update on the status of emergency management programs in the DOE complex, including underlying factors that have hindered progress in certain aspects of emergency management
- To identify priority actions that need to be taken to improve DOE's capability to respond to an emergency and to establish and maintain a comprehensive emergency management system.

Background

The U.S. Department of Energy is required to maintain a comprehensive emergency management system to ensure that the Department is prepared to respond promptly, efficiently, and effectively to any emergency involving DOE facilities, sites, activities, or operations, and to protect workers, the public, the environment, and national security from adverse consequences. DOE Order 151.1, *Comprehensive Emergency Management System*, establishes Departmental requirements for emergency planning, preparedness, and response. The order is complemented by a comprehensive Emergency Management Guide, which provides acceptable approaches for implementing the order requirements. Following a chemical explosion at DOE's Hanford site in May 1997, the Secretary of Energy issued a series of directives requiring DOE sites to re-evaluate their existing emergency management programs and to take corrective actions in response to lessons learned from the Hanford event.

As part of these directives, an independent oversight evaluation of emergency management programs across the DOE complex was conducted in early 1998. That evaluation concluded that, despite the Secretarial initiatives, DOE emergency management programs at both DOE Headquarters and DOE sites were still in need of substantial improvement and management attention. The evaluation report identified weaknesses that were observed at multiple DOE sites and that significantly diminished the ability of site emergency response organizations to carry out an effective emergency response.

Since the 1998 complex-wide review, the Secretary of Energy has made significant changes to the DOE organizational structure to clarify and modify Headquarters' roles and responsibilities for emergency management policy and independent oversight. In April 1999, the Secretary of Energy established the lead program secretarial offices (LPSOs) to clarify line management accountability for DOE programs and site performance in all areas, including safety-related disciplines such as emergency management. In May 1999, the Secretary of Energy created OA and the Office of Security and Emergency Operations (SO). OA established the Office of Emergency Management Oversight (OA-30) to perform independent oversight of the DOE's emergency management programs and identify needed improvements at DOE Headquarters and individual sites. SO subsequently established the Office of Emergency Operations (SO-40) as the lead Headquarters office for emergency management policy, requirements, and guidance (previously the responsibility of the Office of Nonproliferation and National Security).

Scope

The information provided in this report is based on follow-up reviews conducted by OA at five DOE sites and the DOE Transportation Safeguards Division (TSD, which is the DOE program that

[1] *Independent Oversight Evaluation of Emergency Management Programs Across the DOE Complex* (Volumes 1 and 2), July 1998

transports special nuclear materials). This report also incorporates the results of two integrated safety management (ISM) evaluations performed by the Office of Oversight within the Office of Environment, Safety and Health. Table 1 lists the types of evaluations that were conducted and the sites and activities that were evaluated. The six sites/activities selected for a follow-up review were chosen because one or more emergency management program elements had been previously identified as a significant weakness. Further, the OA teams focused their site/activity reviews on the emergency management elements that were identified as weaknesses during the 1998 reviews. The information in this report is based on the status of the site programs at the time they were evaluated. Many sites have already implemented or initiated corrective actions to rectify the weaknesses discussed in this report.

Table 1. Sites and Activities Reviewed

Site/Activity	CSO/ Field Office*	Type and Date of Review	Previous Independent Oversight Evaluation of Emergency Management
Nevada Test Site	DP/ NV	Emergency Response Exercise Evaluation, June 1999	Program Review, February 1998
Sandia National Laboratories/New Mexico	DP/ AL	Follow-up Emergency Response Exercise Evaluation, September 1999	Emergency Response Exercise Evaluation, April 1998
Oak Ridge National Laboratory	SC/ OR	Follow-up Program Review, October 1999	Program Review and Emergency Response Exercise Evaluation, May 1998
Miamisburg Environmental Management Project	EM/ OH	Follow-up Program Review, October 1999	Integrated Safety Management Evaluation, July 1998
Transportation Safeguards Division	DP/ AL	Follow-up Program Review, November 1999	Program Review, May 1998
Lawrence Livermore National Laboratory	DP/ OAK	Follow-up Program Review, December 1999	Integrated Safety Management Evaluation, November 1997; Follow-up Visit, April 1998
Brookhaven National Laboratory	SC/ CH	Focused Integrated Safety Management Evaluation, June 1999	Not Applicable
Oak Ridge Y-12 Plant	DP/ OR	Integrated Safety Management Evaluation, December 1998	Not Applicable

* Cognizant secretarial offices (CSOs): DP = DOE Office of Defense Programs
SC = DOE Office of Science
EM = DOE Office of Environmental Management

Field offices: NV = DOE Nevada Operations Office
AL = DOE Albuquerque Operations Office
OR = DOE Oak Ridge Operations Office
OH = DOE Ohio Field Office
OAK = DOE Oakland Operations Office
CH = DOE Chicago Operations Office

2.0 Status of DOE Emergency Management Programs

Overall Assessment

As discussed throughout this section, some improvements have been made at the DOE sites reviewed by OA since the 1998 complex-wide evaluation report was issued. However, progress has been limited in several important areas, including the development of effective decision-making aids and response tools and protocols that are needed to make correct decisions to mitigate an incident and to protect personnel under the time-urgent and highly stressful conditions of an emergency. Significant work remains to establish and maintain effective emergency management programs at all of the DOE elements included in this report.

Of the eight DOE sites and activities that are included in this follow-up report, two sites have made significant improvement in their response capability, two have made important improvements in certain areas but still have weaknesses that have not been addressed, and four have made only minor improvements since mid-1998. Despite the improvements at some of the sites, none of these eight sites had achieved a fully satisfactory level of performance at the time of the site-specific review. In many cases, the weaknesses that are being repeatedly identified during OA evaluations are similar to those that were evident in the response to the Hanford explosion more than two and a half years ago.

A few DOE field elements have taken the initiative to ensure improvement at their sites, but most DOE field elements have not provided sufficient direction and line management oversight to ensure that problems are corrected. Further, DOE Headquarters direction and support from the LPSOs, cognizant secretarial offices (CSOs), and SO have not yet been sufficient to provide a clear path forward for attaining complete program implementation, addressing previously identified weaknesses, and ensuring an adequate emergency response capability. The recent changes in the Headquarters organizations, however, provide a framework and opportunity for improved Headquarters leadership and support to the field.

Improvements to Emergency Management Programs at DOE Sites Since 1998

Most of the sites/activities addressed in this report have devoted significant resources to improving their emergency management programs since the 1998 evaluation report was issued. Although the effectiveness of those improvement efforts varied considerably among the sites, there have been notable improvements in a few key areas.

A significant positive trend is the recognition by several sites of the need to make organizational changes to enable a prompt and effective response to an emergency. In many emergencies involving radioactive materials or hazardous chemicals, it is important to initiate actions promptly, such as directing personnel to take shelter or to evacuate an area, to protect workers and the public. For most DOE sites and activities, these directions must be communicated rapidly in order to be effective in reducing exposures to an airborne "plume" of hazardous materials. Previously, some DOE sites did not have a viable mechanism to promptly classify an emergency and formulate protective measures because these decisions were

Several sites have recognized the need to quickly respond to emergencies involving hazardous materials.

not made until the emergency operations center was activated, which could take an hour or more. Three DOE sites—Nevada Test Site (NTS), Miamisburg Environmental Management Project (MEMP), and Lawrence Livermore National Laboratory (LLNL)—recently transferred the responsibilities for emergency classification, notifications, and protective actions to the initial on-scene responder, typically a fire chief or plant shift superintendent. Although these changes make it possible for these critical response functions to be performed promptly, the changes have not necessarily resulted in improved response performance due to the weaknesses in decision-making resources and responder proficiency that are described later in this report.

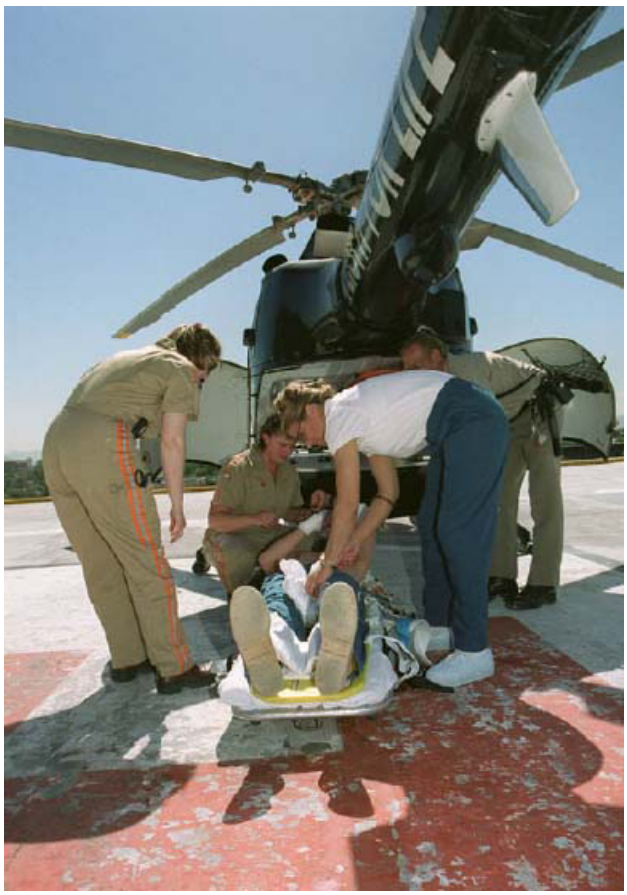
Other important progress has been achieved through the ongoing efforts of many DOE sites to reduce inventories of radiological and chemical hazards. For example, the hazard-reduction activities conducted at Brookhaven National Laboratory (BNL), MEMP, and LLNL over the past few years have dramatically reduced the potential for an offsite release of hazardous materials.

Further programmatic improvements have been particularly notable at MEMP, which had significant deficiencies when reviewed in 1998. The MEMP site operating contractor developed a very comprehensive program improvement plan and is the only organization that took the initiative to re-evaluate the 1997 Secretarial directives on emergency management and previous internal assessments of the MEMP program in developing this plan. The site also established the position of Emergency Services Manager to put management control at the same level as that for other safety and health support organizations and staffed the position with an experienced emergency manager. At MEMP, the emergency services staff presents hypothetical scenarios to incident commanders to test their decision-making capabilities during tabletop training sessions.

NTS demonstrated a significantly improved response capability during its 1999 emergency response exercise. The emergency management program was noted to have senior management support and was making major progress in establishing a comprehensive emergency management system. NTS also recognized that much work remains to be accomplished to complete this system and to ensure that its effectiveness can be sustained.

Some positive efforts in preparing emergency responders were also identified during the follow-up evaluations. For example, LLNL has conducted its last two annual emergency response exercises during non-working hours. This practice provides the site an opportunity to test its capability to staff and activate emergency response centers during times when responders are least apt to be available, and demonstrates, in real time, the length of time necessary to muster a fully staffed emergency response organization. Both Sandia National Laboratories/New Mexico (SNL/NM) and MEMP have significantly increased the number of performance-based drill activities for emergency responders in the previous year. These activities provide increased opportunities to interface and coordinate with non-DOE emergency responders. In the area of training, LLNL has implemented a much-improved training curriculum for laboratory emergency duty officers and TSD has developed a series of computer-based training modules that represent a significant improvement over the required reading packages that they replaced.

Some of the sites evaluated since July 1998 have completed new hazards assessments or revisions to existing hazards assessments. Although these efforts



NTS demonstrated a significantly improved response capability during its 1999 emergency response exercise.

Individual initiatives by senior managers have helped improve the emergency management program.

have improved the quality of the assessments, the hazards survey and assessments documents at all of the sites still exhibited important weaknesses in their content and applicability to other program elements. Despite the longstanding order requirements, other sites are in various stages of developing and completing site and facility-specific hazards assessments.

For the sites that have made the most progress (MEMP and NTS), the improvement is largely attributable to the individual initiative and personal attention of the senior managers at the DOE field element. Senior DOE field element managers at MEMP and NTS committed the necessary resources to establish expectations, monitor contractor activities, establish formal accountability mechanisms, and ensure that contractors made adequate progress. For example, after the 1998 evaluation at MEMP, the Ohio Field Office (OH) Manager assigned the OH emergency management specialist to the DOE-MEMP office for an extended period to establish expectations and monitor the development of corrective actions and program improvement plans. This action ensured that an appropriate level of DOE expertise in emergency management was available and supported by senior field management. OH has also conducted comprehensive assessments of the MEMP program more frequently than required by the DOE order; these assessments and corresponding corrective actions have resulted in substantial improvement in many areas of the program. OH and the Nevada Operations Office established contract performance measures with financial incentives to drive needed improvements and to ensure that DOE contractors would be held accountable for corrective action commitments.

The increased efforts within the past several months to improve the emergency management programs for sites within the Oak Ridge Reservation is also attributable to direct engagement of senior DOE management in the field. In May 1998, the Oak Ridge Operations Office (OR) was committed to implementing a common reservation-wide emergency management program. However, a December 1998 Independent Oversight evaluation found that very little progress had been made in developing and implementing this program. With a new Operations Office Manager in place, OR has refocused reservation-wide actions for improving emergency management, accelerated existing schedules for implementing corrective actions at all of the OR sites, and created an OR Emergency Management Working Group with access to the OR Manager.

Continuing Weaknesses

Notwithstanding the progress in some areas and at some sites, improvement in emergency management programs and emergency response capabilities across DOE has been slow and limited in scope at most of the sites reviewed. In some cases, the actions that have been taken toward program improvement have not been fully effective in correcting previously identified weaknesses and, in other cases, the completed actions have not fulfilled the intent of the DOE order requirements or the expectations conveyed by the 1997 Secretarial directives on emergency management. As a result, most of the weaknesses identified in this report are the same as those that have been reported in previous reports on DOE emergency management programs. For example:

- Although effort has been devoted to hazards assessments and some progress has been made, none of the sites reviewed has yet developed a comprehensive hazards assessment that reflects current site hazards and operations or the full range of potential emergency initiators. Three sites had developed only a few of many planned hazards assessments and many of these assessments were still in draft form.

- None of the sites has established an effective mechanism to communicate significant changes in hazardous material inventories or operational activities to ensure that the hazards assessment and emergency plan implementing procedures remain commensurate with site hazards.

- Many sites have not established predetermined protective actions as required by the order. In cases where preplanned protective actions have been established, the actions and associated instructions typically lack sufficient specificity to be readily implemented or to be clearly understood by an offsite entity.

- As a result of the weaknesses in hazards assessments, none of the sites has established a complete set of emergency action levels (EALs). The EALs that have been established are sometimes inconsistent with the hazards assessments, conflict with other EALs, or cannot be readily implemented as written. Many sites lack discretionary EALs for classifying events that are not specifically addressed by existing facility or sitewide EALs and can be used to classify an emergency based on a subjective evaluation of event conditions.

- In several cases, emergency notification processes, procedures, and forms are not designed to transmit and confirm receipt of critical worker and public safety information.

- In some cases, roles, responsibilities, and decision-making authorities have not been adequately or unambiguously defined in emergency plans and procedures, and decision-makers did not demonstrate the ability to effectively implement their responsibilities in the initial stages of an emergency.

- Emergency responders with initial decision-making authority have not been provided sufficient training and drill opportunities, exacerbating the weaknesses in EALs, procedures, and decision-making aids.

- Training, drill, and exercise programs are not ensuring that emergency responders are proficient. This weakness applies to essentially all of the response elements, including incident command, emergency management teams, technical operations cadres, consequence assessment teams, and public affairs organizations.

- Minimum training and drill participation requirements have not been defined for all emergency response organization members.

- Many emergency responders and decision-makers have not recognized and accepted the need to consult procedures or guides in an emergency, and thus failed to implement some critical response functions in tabletop and full-participation exercises.

The importance of these weaknesses was manifested in the serious performance deficiencies exhibited by emergency responders and decision-makers at all eight of the sites during performance tests and response exercises. Examples of performance weaknesses in simulated emergencies included decisions to send firefighters into a burning facility without a backup rescue team as required by site procedures and DOE Order 151.1; approach leaking containers of hazardous material without adequate protective clothing or chemical detection equipment; place response personnel and equipment downwind of a postulated hazardous material release; and traverse the path of a hazardous material plume without personal protective equipment in responding to an incident scene. During emergency response exercises, personnel downwind were not promptly accounted for or notified to take protective measures. At several sites, incident commanders did not promptly formulate and communicate protective action recommendations to offsite authorities following declaration of a General Emergency.

Collectively, these weaknesses impact the effectiveness of the emergency management programs to ensure prompt and effective response actions to protect workers and the public. Most significantly, initial decision-makers do not have sufficient tools and training to make the prompt, consistent, and accurate decisions needed to protect responders, workers, and the public in an emergency involving hazardous materials.

Several performance weaknesses were identified during performance tests and response exercises.

Underlying Causes

Many of the weaknesses in emergency management program implementation are symptoms of the longstanding failure of DOE to develop and maintain a strong and effective infrastructure to support the three-tiered comprehensive emergency management system. Weaknesses in the emergency management system were evident at all levels of the DOE organization—DOE contractors, DOE field elements, and DOE Headquarters. Most importantly within this system, the DOE and contractor field elements lack a complete understanding of the intent of the emergency management program requirements promulgated by DOE Order 151.1 and the expected goals and outcomes of emergency planning and preparedness activities.

Compounding this weakness, neither the DOE Headquarters line organizations nor the emergency management policy and support organization have been providing consistent and routine feedback and guidance to these field elements to aid them in program implementation. For example, the two committees mandated by DOE Order 151.1 that were established to identify and resolve Department-wide emergency management issues had not formally convened for several years and have only recently been revitalized as a forum for discussing and addressing issues on a complex-wide basis.

As a result of these weaknesses at all three organization levels, the emergency management assessment and corrective action management programs are not functioning effectively. Assessments have not been sufficiently comprehensive, rigorous, or frequent to identify program and performance weaknesses. Site corrective action management programs are not rigorous, do not analyze root causes, and do not include provisions to verify the effectiveness of corrective actions. In general, line management at all levels has not demonstrated a self-critical attitude or a proactive approach to identifying and correcting problems.

Contractors. At the contractor level, program and performance weaknesses are attributable to a number of factors. The most important factor is that sites continue to rely too much on expert-based emergency response organizations, wherein it is assumed that individuals will make prompt and correct decisions under time-urgent and high-stress conditions based on the expertise gained in performing their day-to-day activities. However, this expert-based approach is not supported by the rigorous, comprehensive, and self-critical training and drill programs that are needed to prepare individuals for emergency response decision-making and to compensate for the lack of established response protocols. Sites need to implement a standards-based approach to emergency management systems, consistent with the ISM approach to other safety programs. The principles and tenets of ISM, such as line management ownership, worker involvement, and continuous improvement, have not been embraced by the emergency management organizations at most DOE sites. Specific manifestations of this general problem include:

- **Failure to implement a program that meets the intent of the DOE requirements and expectations.** Many contractors have not established comprehensive and coordinated programs that address all of the required emergency management program elements established by DOE Order 151.1 and further described in the supplementary Emergency Management Guide. In order to allow flexibility in the design of emergency management programs to meet site-specific needs, the DOE order intentionally contains general objectives but few prescriptive requirements. DOE has developed a detailed guide to complement the order and to provide important conceptual information about the intended function of each program element and the expected outcome of planning and preparedness actions. However, several sites do not use the guide in developing their programs or in verifying that their programs meet the intent of the order requirements and, thus, have not adequately addressed important elements and interfaces. Some sites attempt to justify their current practices as compliant based on a liberal interpretation of the general order provisions, without using the guide as a standard for program performance. For example, many sites have not adequately considered or analyzed transportation scenarios since transportation is not explicitly called out as an element of the order. Consequently, some elements have been missed and others are not functioning as intended.

- **Inadequate definition of program scope and response capability.** In many cases, line managers have not adequately defined the scope of the emergency management program based on objective analysis of possible accident scenarios and have not graded or tailored emergency planning and

preparedness activities in accordance with the results of that analysis. Managers at many sites have assumed that initial emergency responders, such as firefighters and security personnel, have received sufficient training and/or have adequate expertise to respond effectively to an emergency involving hazardous materials. However, DOE requirements do not adequately specify emergency response training requirements to ensure that responders are capable and qualified to perform their assigned duties. Many initial decision-makers are not accustomed to making the types of decisions that must be made for an Operational Emergency that involves hazardous materials. For example, most on-scene responders with initial decision-making authority are not accustomed to having to make rapid response decisions for personnel and areas beyond the immediate incident scene, and neither emergency responders nor DOE and contractor managers typically have an appreciation for how quickly response decisions have to be made in order to protect people from harm when a hazardous material is released.

- **Insufficient coordination among program elements.** In many cases, individuals and organizations at a site are working to implement individual program elements without adequate consideration of needed system interactions or the needs of the end users. For example, scientists and engineers who conduct risk assessments or nuclear facility safety analyses may be tasked with developing emergency preparedness hazards assessments and then using the results to develop EALs and other decision-making aids. However, these tools are often formatted or written in a way that is difficult to readily understand and apply to decision-making, particularly for the individuals who are the end users, such as facility managers, incident commanders, and crisis managers. The end users often have little or no involvement in the development of the EALs or decision-making aids. Contractors have not usually applied ISM tenets, such as worker involvement and a multidisciplinary team approach, to developing products for the end user. Without such involvement, the end users also typically have difficulty applying the action levels to an accident scenario that does not closely match an existing action level. To be effective, an emergency management program must be an integrated system where many different site organizations function in a coordinated manner to respond to and mitigate an emergency. Senior management involvement, support, and direction are essential to achieve such coordination and cooperation across all site organizations.

DOE field elements. There continues to be a wide variation in the level of DOE field element attention to and involvement in monitoring contractor emergency management programs and tests of response performance. This is due, in part, to the varying degrees of emergency management expertise available in the field and the fact that most field elements have insufficient expertise in emergency management to evaluate the adequacy of contractor programs and response capabilities. In general, DOE field managers have limited familiarity with their specific performance responsibilities related to an emergency management system and do not fully understand that DOE must be an integral part of site emergency planning, preparedness, and response activities and not only an overseer of these activities.

While the initiatives of some individual senior managers (at MEMP, NTS, and more recently OR) are notable in driving or facilitating emergency management program improvements, other DOE field elements have not been proactive. Line managers in the Oakland and Albuquerque Operations Offices, who include the field managers for LLNL and SNL/NM, have not adequately monitored the status of site emergency management programs. As a result, the corrective action plans for these sites and for TSD did not address some of the fundamental weaknesses identified during the 1998 evaluations and/or were not effective in addressing the root causes of the identified weaknesses. With a few exceptions, field element assessments have not been comprehensive or rigorous, and corrective action tracking and verification processes were inadequate. Failure to hold individuals or organizations accountable for correcting program weaknesses is a significant contributing factor.

DOE Headquarters line management. DOE Headquarters line management (i.e., LPSOs and CSOs) has not been active in providing the needed leadership, support, and direction to correct identified weaknesses. The 1998 complex-wide evaluation found that the weaknesses in Headquarters line management accountability and involvement in emergency management was contributing to the failure to correct program deficiencies in the field. Headquarters line managers continue to have little involvement in

monitoring field activities related to emergency management and have not been sufficiently engaged in reviewing and approving corrective action plans as intended by the direction issued by the Deputy Secretary (i.e., "Protocols for Responding to Office of Independent Oversight and Performance Assurance Appraisal Reports," August 1999). The organizational and individual roles and responsibilities for review, approval, and tracking of corrective action plans have not been formally defined. In addition, the process by which corrective actions will be verified and validated has not been established.

DOE Headquarters policy and technical support. The historical absence of strong and effective DOE Headquarters functions to provide technical support, accurate self-assessment feedback, and guidance for program improvement priorities is a significant contributor to the protracted nature of the weaknesses in site emergency management programs. A corrective action plan responding to the weaknesses identified in the July 1998 complex-wide evaluation report took more than 20 months to complete and was not approved by the Deputy Secretary of Energy until March 2000. It is recognized that significant and needed changes in organizational roles and responsibilities have occurred at DOE Headquarters since 1998 and that these changes contributed to the delay. However, the pace of developing this corrective action plan indicates the historical absence of necessary coordination and support needed to drive improvements.

As noted in 1998, specific Departmental cross-cutting committees, mandated by DOE Order 151.1, were established to identify and resolve Department-wide emergency management issues. The Emergency Management Coordinating Committee has not been formally convened in the past several years, and the Emergency Management Advisory Committee held its first meeting in many years in January 1999.

Under SO leadership these committees are beginning to play a more significant role in identifying needed improvements, such as the Headquarters corrective action plan. Although many of the corrective actions identified in the Headquarters plan are appropriate, SO recognizes that similar order revisions, assistance visits, and training initiatives have not been successful in the past. In addition, the plan relies extensively on the same type of field self-reporting methods that were inadequate in the past (e.g., following issuance of the 1997 Secretarial directives, self-reporting generally indicated that problems were solved, which was demonstrably inaccurate). Finally, the corrective action plan does not identify any short-term actions or initiatives for providing consistent and definitive direction and performance improvement guidance to the field.

Recent changes in the DOE organizational structure at Headquarters have the potential to stimulate the actions necessary to improve emergency management at all levels of the Department. Most notably, the Secretary of Energy's creation of SO consolidates the responsibility for all DOE emergency management system policy, guidance, and operational activities into a single organization reporting directly to the Secretary. Although other Headquarters offices retain responsibility for programmatic direction to the sites and for certain activities (e.g., the Assistant Secretary of Environmental Management in the case of transportation emergency preparedness), SO can provide a central point of leadership for emergency management direction and is in a position within DOE to effect change across all DOE line management programs and support functions.

SO has established an aggressive long-term plan for training, staff assistance visits, and exercise evaluations to improve the DOE emergency management system. However, the plan does not recognize documented weaknesses in performance or establish related improvement priorities. One part of the plan—the establishment of a new Departmental emergency management training academy—is a notable initiative. The academy could provide a forum for sharing methods and tools and for developing improved training program modules that can be used in the field. Similar to the corrective action plan, improvements in training programs rely upon SO re-evaluating the status and needs of field programs and redesigning historic approaches to improve program performance. As discussed in Sections 3 and 4, many aspects of the opportunities for improvement identified in this follow-up review relate to training. Some of those opportunities for improvement should be considered by SO as they establish and implement the emergency management training academy.

3.0 Priority Actions for Performance Improvement

As discussed in Section 2, the most significant weaknesses involve the ability to make decisions promptly and accurately in order to provide effective direction to mitigate an incident and to formulate worker and public protective measures during the initial response. In most cases, DOE sites rely appropriately on the initial responders—typically facility managers, plant shift superintendents, fire department chiefs, or security force supervisors—to make these decisions until the Emergency Operations Center (EOC) is activated. The process of assembling the management and technical resources needed for EOC activation can vary considerably depending on the time and day of an emergency and could take more than an hour. The availability of preplanned and preapproved protocols for protecting workers and the public are of utmost importance given the need to make decisions promptly and accurately under the highly stressful conditions of an emergency. These initial decision-makers must be thoroughly trained and capable of interpreting data, making timely decisions, and performing the required actions.

Improvement in initial decision-making capability is the highest near-term priority for DOE sites in the area of emergency management. In view of the slow progress to date in developing response procedures and tools and improving initial decision-making proficiency, increased management attention is needed to make improvements on an expedited basis.

To accomplish the needed improvements in decision-making, OA has identified three opportunities for improvement and specific actions related to each. While some sites may already have effective practices in some of these areas, the opportunities for improvement identified below are generally applicable to all eight sites included in this OA follow-up review, as well as to many other DOE sites.

Develop reference information, tools, and decision-making aids needed by those individuals with initial decision-making authority to implement protective actions promptly and effectively (e.g., accurate hazards information, EALS, and notification processes).

Rationale for needed improvement. Although requirements have been in place since 1991, hazards assessments still do not reflect current hazards or operations, and none of the sites has developed a hazards assessment that addresses all readily recognizable event initiators. Considering the longstanding requirement for completing these assessments, progress has not been sufficient. The weaknesses in the activity- and facility-specific hazards assessments undermine the quality and accuracy of the decision-making resources available to emergency responders, including EALs and predetermined protective actions. As a result of these weaknesses, the information and tools available to individuals responsible for categorizing and classifying an emergency and formulating and issuing protective actions are incomplete and, in many cases, inaccurate. Consequently, the likelihood of an error or non-conservative action by the initial decision-makers is significantly increased.

Actions. Increased management attention is needed to ensure that the information, tools, and decision-making aids available to the emergency response organization members, and in particular those individuals with initial decision-making authority in the areas of categorization, classification, notifications, and formulation of protective actions, are accurate and complete. Specific actions that should be considered include:

- Establish line responsibility and accountability (e.g., facility/operations managers) for maintaining the facility and activity-specific hazard and operations information needed for emergency planning and preparedness purposes.

- Consult the Emergency Management Guide to ensure that hazards assessments and EALs cover the full range of accident scenarios or event initiators.

- Clearly define and establish the correlation between the hazards assessments and EALs, and between EALs and predetermined protective actions.

- Validate EALs and predetermined protective actions with both onsite and offsite decision-making authorities to determine whether they are unambiguous and can be implemented as written.

- In response procedures, clearly distinguish between actions that warrant immediate implementation to protect human health and safety, and actions that can be delayed until a complete assessment of ambient conditions has been conducted and analyzed.

- Establish and implement effective mechanisms to communicate changes in hazardous material inventories and site/facility operations before such changes occur to ensure that such changes have been adequately analyzed and are encompassed by emergency response plans and procedures.

- Define clear and unambiguous roles, responsibilities, and authorities of individual emergency responders

Train and drill the individuals vested with initial decision-making authority in the full scope of their required duties.

Rationale for needed improvement. Many decision-makers were unable to make prompt and accurate decisions in the early phases of a response. As a result of these weaknesses, most emergency response organizations in DOE are not sufficiently prepared to take the immediate actions necessary to mitigate the consequences of a hazardous material release and to protect personnel from unnecessary exposure to hazardous materials. Inadequate training and drill programs are root causes of many performance deficiencies.

Actions. Significant and timely action is needed to improve training and drill programs to ensure that emergency response organization members can perform the full range of their assigned duties proficiently. Initial efforts to improve training and drills should focus on the initial decision-makers, but the efforts should be expanded to encompass all personnel with emergency management duties using a phased approach. Specific actions that should be considered to improve the training and drill program include:

- Establish the responsibility and accountability for ensuring the proficiency and preparedness of all emergency responders at a management level with the authority to implement training, drill, and exercise requirements across the wide variety of organizations that contribute to a comprehensive emergency response organization.

- Perform a comprehensive analysis of functions and responsibilities of each emergency response organization position, using emergency plans and implementing procedures, to facilitate the identification of appropriate training and drill objectives and evaluation criteria that will demonstrate responder proficiency.

- Conduct performance-based training activities that compare decision-making response times to the time of plume arrival at various receptors.

- Train emergency response decision-makers on the effects of meteorological conditions on hazardous materials dispersion so that they understand the basis for predetermined protective actions and are capable of making decisions using discretionary EALs and developing protective actions under conditions where event information is limited or ambiguous.

- Train and drill critical emergency support functions, such as consequence assessment and public affairs, to ensure that all responders are prepared to execute their response duties in high-stress, time-urgent conditions and clearly understand the roles and responsibilities of other response elements.

Improve and maintain the competency of initial decision-makers in executing time-urgent response decisions as demonstrated through an ongoing program of performance-based, objectively evaluated, tabletop exercises.

Rationale for needed improvement. Training and drills are essential but not sufficient to ensure that initial decision-makers can perform effectively. Sites must also verify capabilities through exercises, such as full-participation exercises. A common misperception at DOE sites is that exercises are simply another training mechanism, although exercises have a different purpose than training and drills. In the case of training and drills, the objective is to communicate expectations and develop skills. Conversely, the purpose of exercises is to verify through a realistic simulation that individuals and systems can perform their assigned duties effectively and can meet performance objectives (e.g., correctly

classify an emergency within a defined time limit). For example, if an individual makes an error in a training exercise or a drill, the instructor may stop to correct the error and provide coaching and explanations. In an exercise, however, the individual would fail and would be evaluated as not meeting the performance requirement (and thus would have to be retrained and retested until he/she demonstrated the ability to meet the performance objective). Some sites treat exercises as a "learning experience" and do not have a mechanism for verifying effective performance through exercises in which individual performance is objectively evaluated against stringent performance objectives. In short, training/drills and exercises are complementary activities and both are needed to ensure an effective program, but sites have focused primarily on training without using exercises or exercise-like conditions to verify performance.

Periodic full-participation exercises are effective means for verifying that personnel can perform satisfactorily in a situation designed to mimic a real emergency. However, full-participation exercises are resource-intensive and complex activities; sites rarely conduct more than one per year. Further, only a fraction of the individuals who perform important functions (e.g., decision-makers) will participate in any single full-participation exercise. As such, full-participation exercises provide only a limited opportunity to test and evaluate individual performance.

Actions. The establishment of a comprehensive program of performance-based, tabletop exercises designed to test and evaluate critical emergency response functions can provide an inexpensive and effective mechanism to periodically verify each individual's capability to perform effectively. Specific actions that should be considered to set up a tabletop exercise program include:

- Establish a comprehensive program that tests and critically evaluates the performance of all potential emergency responders at regular intervals and requires that remedial measures be taken to address unsatisfactory performance.

- Develop hypothetical accident scenarios using site-specific hazard information to ensure realism and use the tabletop exercises to verify that responders and decision-makers are familiar with site hazards, indicators of a release, potential health effects, and dispersion characteristics.

- Set up realistic tests that require the use of the actual reference information, tools, and decision-making aids (e.g., EALs and preformulated response actions) available to the responder and use the results of these activities to solicit and implement improvements.

- Develop accident scenarios that encompass the expected variations in response conditions (e.g., after normal working hours, under adverse weather conditions, offsite or leased DOE facility hazardous material releases that impact site personnel), including time-urgent testing based on the time of plume arrival at various receptors.

- Establish performance objectives and evaluation criteria based on the functions of each individual responder that are sufficiently specific to identify whether all response functions (e.g., classify the emergency) have been executed promptly, consistently, and effectively in accordance with established expectations.

Corrective actions in these three areas provide the greatest opportunity to address the most pressing problems in the emergency management programs. More specifically, effective corrective actions in these areas could significantly improve the capability of the initial decision-makers to take prompt and effective action in the first critical hour of an accident.

4.0 Priority Actions for Program Improvement

In addition to the initial decision-making and response capability, there are other areas that require improvement, as identified in the 1998 Oversight report, various OA field reports, and Section 2 of this report. However, problems in other areas are likely to persist or recur unless improvements are made in the emergency management program infrastructure (i.e., the management systems for establishing policies, providing guidance and technical support, establishing an organization that is capable of preparing for and responding to an emergency, performing assessments, and ensuring corrective actions).

Based on an analysis of the current weaknesses in site programs and their underlying causes, the following three opportunities for improvement were identified for consideration by DOE Headquarters and sites.

Improve assessment and feedback systems to ensure effective corrective actions and continuous improvement.

Rationale for needed improvement. The 1998 complex-wide report identified that both DOE Headquarters and individual sites generally lacked effective assessment and feedback programs and did not routinely share lessons learned in developing their emergency management programs. The feedback and improvement programs within DOE Headquarters, DOE field elements, and site contractors continue to exhibit major weaknesses. The similarities between the findings identified during the 1998 complex-wide review and the 1999 follow-up evaluations are clear indicators of this weakness. All of the sites and activities that were evaluated in 1998 developed corrective action plans in response to those evaluations. However, most corrective action plans did not fully capture the weaknesses identified in the Oversight evaluation reports. In addition, several sites reported that some or all of their corrective actions were complete, but follow-up evaluations found that many of these actions were not effective in correcting the documented weaknesses.

Actions. Timely and sustained action is needed to improve assessments and corrective action programs to ensure that managers receive valid feedback and make needed improvements. Such actions are needed by contractors and DOE field elements. Specific actions that should be considered to improve performance assessments and feedback and improvement systems include:

- Use the comprehensive Emergency Management Guide and draft Volume VI, Emergency Management Evaluations, as a template for developing assessment plans for the site emergency management programs and program elements.
- Use the July 1998 complex-wide evaluation of emergency management programs to focus assessment efforts on generic weaknesses and to identify benchmarking information.
- Use a formal tracking system to capture deficiencies, identify corrective actions, and assign responsibility for implementing those actions to individuals who will be held accountable for their completion.
- Implement processes for verifying both the completion and effectiveness of corrective actions, including a detailed re-evaluation of the weakness.
- Establish processes for using the results of assessments and exercise findings to focus training and drill programs.

Ensure that all emergency responders and program elements are effectively integrated into a comprehensive emergency management system that is supported by an appropriate level of management attention and program resources.

Rationale for needed improvement. OA assessments indicate that emergency management

programs are often viewed as a stand-alone function of the emergency response professionals. However, an effective emergency management program must be an integrated system where many different site organizations function in a coordinated manner to respond to and mitigate an emergency. OA appraisals indicate that inadequate coordination and integration and insufficient senior management involvement are contributing factors to some of the identified weaknesses in program implementation. In addition, DOE line managers lack familiarity with their specific responsibilities related to emergency management and do not fully understand that DOE must be an integral part of site emergency planning, preparedness, and response activities.

Actions. DOE and senior contractor management attention is needed to ensure that emergency management elements are integrated and coordinated to form a comprehensive emergency management program. Specific actions that should be considered to ensure effective program integration include:

- Formally define all members of the emergency response organization and establish full responsibility and authority for the emergency management program at a management level that is in a position to direct program implementation, monitor performance, and hold individuals and organizations accountable for corrective actions across the many different site organizations that comprise the emergency response organization.

- Review DOE responsibilities and authorities for emergency management program implementation and oversight to ensure consistency with DOE Order 151.1 and the Emergency Management Guide.

- Senior DOE and contractor managers should increase their involvement in and attention to the development of accurate and detailed Emergency Readiness Assurance Plans as an effective tool for identifying, allocating, and committing the necessary resources to develop and sustain a comprehensive emergency management program.

- Establish effective communication processes to keep senior DOE and contractor managers informed of the status of emergency management program implementation and improvement initiatives.

- Use multidisciplinary teams consisting of emergency professionals and planners, personnel who perform hazards assessments, facility operations personnel, and decision-makers (such as incident commanders and crisis managers) to address program and performance weaknesses and to develop and assign responsibility for corrective actions.

- Review emergency management programs using the guiding principles and core functions of ISM to help achieve appropriate program integration and incorporate emergency management requirements into ISM system descriptions to institutionalize integrated program management.

Improve Headquarters' coordination and support to field emergency management programs.

Rationale for needed improvement. The success of the organizations that have made significant improvement is due primarily to individual initiatives at the DOE field elements rather than a common DOE-wide understanding of effective performance. Although the recent actions and initiatives by SO provide a framework for improvement, DOE Headquarters line managers and SO have not yet been proactive in ensuring that site emergency management programs are effective and that corrective actions are timely.

Actions. CSOs and LPSOs need to take a more proactive role in establishing expectations and ensuring results. SO needs to improve certain aspects of policy and guidance and enhance support to the field. Specific actions that should be considered include:

- LPSOs and CSOs should formally review the 1997 Secretarial directives and line self-assessments and independent assessments of emergency management programs for sites under their cognizance to determine whether corrective action plans and improvement initiatives satisfy DOE emergency management program and performance expectations.

- LPSOs and CSOs should query field elements for sites under their cognizance to identify barriers to emergency management program implementation and to request assistance or clarification from SO to eliminate those barriers.

- LPSOs and CSOs need to develop corrective action plans in coordination with the DOE field elements as

defined by the "Protocols for Responding to Office of Independent Oversight and Performance Assurance Appraisal Reports," August 1999. LPSOs and CSOs need to formally define the individual and organizational roles and responsibilities for review, approval, tracking, and validation of corrective actions.

- SO should formally review and respond to OA evaluation reports and site corrective action plans to clarify DOE policy and requirements where necessary.

- SO should formally clarify the required scope of hazards assessments and types of initiating events and operations that should be considered in developing the assessments.

- SO should consider implementing a formal interpretation process to facilitate approved responses to policy and program inquiries from DOE Headquarters and field elements similar to the Internet-based system established by the DOE Office of Worker Safety and Health for resolution of worker safety inquiries.

- OA should establish a process for requesting SO interpretation of DOE emergency management policy or requirements as issues arise during OA reviews.

Improvements in the three areas above are fundamental to correcting the underlying cases of longstanding and persistent weaknesses in emergency management program implementation. Further, improvements in these areas can provide the management framework for ensuring that weaknesses do not persist or recur.

APPENDIX A
REVIEW PROCESS AND TEAM COMPOSITION

The review was conducted according to formal protocols and procedures, including an Appraisal Process Guide, which provides the general procedures used by the Independent Oversight program for conducting reviews. The review was conducted under the direction of the Secretary of Energy's Office of Independent Oversight and Performance Assurance.

The team membership, composition, and responsibilities are as indicated below:

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