

Lessons Learned from Assessments of Emergency Management Programs at U.S. Department of Energy Sites During Fiscal Year 2025

October 2026



**U.S. DEPARTMENT
of ENERGY**

**Office of Enterprise
Assessments**

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Acronyms

AHS	All-hazards Survey
COA	Continuing Ongoing Assessment
COP	Common Operating Picture
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EAL	Emergency Action Level
ENF	Emergency Notification Form
EOC	Emergency Operations Center
EOS	Emergency Operations System
EPHA	Emergency Planning Hazards Assessment
ERO	Emergency Response Organization
FD	Fire Department
FY	Fiscal Year
IC	Incident Commander
LCO	Limiting Condition for Operation
M&O	Management and Operating
NNSA	National Nuclear Security Administration
OE	Operational Emergency
PA	Protective Action
PAC	Protective Action Criteria
PAR	Protective Action Recommendation
SPR	Strategic Petroleum Reserve
TEL	Threshold for Early Lethality
TIA	Timely Initial Assessment

LESSONS LEARNED FROM ASSESSMENTS OF EMERGENCY MANAGEMENT PROGRAMS DEPARTMENT OF ENERGY SITES DURING FISCAL YEAR 2025 .AT U.S

Executive Summary

This lessons learned report summarizes the results of seven independent assessments of emergency management programs conducted by the U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) during fiscal year 2025. This report provides conclusions and recommendations to inform DOE senior management on opportunities to improve emergency management throughout the enterprise. All assessments were conducted using DOE Order 151.1D, *Comprehensive Emergency Management System*, to evaluate the effectiveness of emergency management programs at DOE hazardous material facilities and their associated field office oversight methodologies.

All assessed sites reported in emergency readiness assurance plans that compliant and effective programs were in place based on compliance-focused annual self-assessments and metrics. Assessed sites had well-staffed emergency response organizations (EROs), centralized and well-equipped emergency operations centers, and adequate equipment, capabilities, and interfaces to respond to the identified hazards. Management and operating (M&O) contractors tested and validated their site-level EROs annually as required.

A total of 22 strengths and four best practices were identified at the assessed sites. Notably, strengths in exercise design and control were identified at multiple sites, and three sites were given commendations for developing very challenging exercise scenario packages. Although these strengths are not detailed in this report, each of the four best practices identified by EA are summarized below and more fully described in section 4.0.

- Oak Ridge National Laboratory developed plume modeling casebook forms to enable consequence assessment personnel to efficiently assess the consequences of hazardous material releases.
- West Hackberry Strategic Petroleum Reserve (SPR) site developed an incident management handbook that provides the ERO with easy-to-use emergency information, guidance, and templates.
- West Hackberry SPR site has a well-equipped and organized chemical decontamination trailer that can be rapidly deployed and facilitates efficient operations during emergency response activities.
- Lawrence Livermore National Laboratory developed an emergency response map that is scaled to allow personnel to easily estimate protective action distances using their government badges as a measuring tool.

EA assessments and exercise evaluations identified weaknesses in emergency management program administration and management at multiple sites under DOE Order 151.1D requirements during the assessment period:

- Lack of situational awareness affected emergency decision-making at multiple venues, resulting in protective action errors and inadequate notifications to responders and offsite agencies.
- Personnel were sheltered in areas with potentially lethal doses of radioactive material when evacuation was a more appropriate protective action.
- Some operational emergencies were not declared within the required time limits.
- Corrective actions for some findings were inadequate to effectively prevent recurrence. EA determined that sites focused on consequences or symptoms of issues without addressing the root

causes, and that issues were categorized as low-consequence and therefore did not require effectiveness reviews.

Recommendations

The recommendations identified in this lessons learned report are summarized below and are more fully described in section 5.0.

The National Nuclear Security Administration and DOE Program Secretarial Offices should consider:

Issues Management

- Increasing the rigor of readiness assurance processes by encouraging site field elements and contractors to manage findings identified during emergency exercise assessments as high consequence issues, requiring formal root cause analysis, timely corrective action implementation, and verification (by reviews) and validation (by testing) of closed corrective actions to prevent recurrence of weaknesses.
- Focus line management oversight on performance effectiveness in addition to compliance because compliance has not proven to consistently result in effective response to emergencies.

DOE field element managers and M&O contractors should consider:

Technical Basis

- Ensuring that the all-hazards survey is comprehensive and includes:
 - a complete list of screened chemicals authorized for use on site, to include chemicals authorized to be brought on site by subcontractor personnel for special and infrequent operations.
 - a listing or description of the health, safety, or environmental impacts of potential emergencies, including natural hazards, technological hazards, or human-caused incidents that could occur.
- Ensuring that all source term components from emergency planning hazards assessments (EPHAs) are incorporated into emergency action levels (EALs) when analyzed accidents have multiple release points.

Emergency Operations System

- Addressing common operating picture weaknesses by expanding information management systems to key response venues and establishing clear expectations for responders to monitor event logs and inform decision-makers of critical new information and discrepancies in the operational picture.

Protective Actions

- Ensuring that initial predetermined protective actions and protective action recommendations for postulated incidents are commensurate with the hazards and are implemented and/or revised in a timely manner.
- Ensuring personnel are evacuated from areas with potentially lethal doses of radioactive material, even if ventilation is properly secured, due to the potential for acute radiological dose consequences.
- Ensuring that all pre-determined protective action criteria distances, including the threshold for early lethality, are included in documents used by first responders.

Categorization/Classification

- Reviewing EALs for consistency with DOE requirements, ensuring that general emergencies are based on health effect parameters at the site boundary and that operational emergencies are declared

for serious environmental incidents, health and safety emergencies, and security incidents.

Consequence Assessment

- Ensuring that personnel responsible for consequence assessment have rapid access to information such as emergency notification forms, EALs, and EPHAs so that timely assessments can be completed.

LESSONS LEARNED FROM ASSESSMENTS OF EMERGENCY MANAGEMENT PROGRAMS AT U.S. DEPARTMENT OF ENERGY SITES DURING FISCAL YEAR 2025

1.0 INTRODUCTION

During fiscal year (FY) 2025, the U.S. Department of Energy (DOE) Office of Emergency Management Assessments, within the independent Office of Enterprise Assessments (EA), assessed seven emergency management programs within DOE, including National Nuclear Security Administration (NNSA), Office of Environmental Management, Office of Petroleum Reserves, Office of Science, and Office of Nuclear Energy sites. Six of the assessments measured the ability of site-level emergency response organizations (EROs) to respond to postulated incidents, and the seventh assessed the adequacy of the all-hazards planning basis for transuranic waste operations at one NNSA site. This lessons learned report evaluates the combined results from these assessments and documents best practices, weaknesses, and recommendations to promote organizational learning and improve performance throughout the DOE complex.

2.0 METHODOLOGY

EA implements DOE's independent oversight program. This program is designed to enhance DOE safety and security programs by providing the Secretary and Deputy Secretary of Energy, Under Secretaries of Energy, DOE managers, senior management and operating (M&O) contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements, as well as the effectiveness of DOE and M&O contractor line management performance, risk management in safety and security, and other critical functions as directed by the Secretary. DOE Order 227.1A, *Independent Oversight Program*, describes and governs the DOE independent oversight program. EA implements the program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides.

This report reflects an analysis of the collected results of EA's assessments of various aspects of site emergency management programs completed during FY 2025 using the EA CRADs identified in appendix B. Assessments also considered guidance provided in DOE Guide 151.1-1B, *Comprehensive Emergency Management System Guide*. All assessments were conducted using DOE Order 151.1D, *Comprehensive Emergency Management System*, Chg. 1 (MinChg: Oct 4, 2019), to evaluate the effectiveness of the emergency management programs. At the time of the assessments, none of the reviewed site programs had transitioned to DOE Order 151.1E, *Comprehensive Emergency Management System*, which was approved on October 28, 2024.

Selected elements of the emergency management program were evaluated, including emergency response capabilities, plans and procedures, the technical planning basis, and exercises and issues management under readiness assurance.

The assessment types are described below:

- Emergency management exercise evaluations are performance-based and assess the effectiveness of the ERO's response to hazardous material release exercise scenarios and the site's ability to plan, execute, and evaluate the response, consistent with the emergency management program technical basis, in a manner that identifies weaknesses and leads to program improvements.

- Technical basis assessments evaluate the effectiveness of sites in developing and maintaining the all-hazards planning basis that serves as the basis for the hazardous material program, including transuranic waste operations.

Appendix A lists the contributors to this lessons learned effort, the members of the Quality Review Board, and the EA management responsible for this evaluation. Appendix B lists CRADs referenced during these assessments. A list of the assessed sites and source documents, including electronic links to the assessment reports, is provided in appendix C.

3.0 RESULTS

3.1 Technical Basis

This portion of the lessons learned review addresses the strengths and weaknesses associated with the technical bases.

DOE Order 151.1D requires DOE sites to establish a technical planning basis for all site operations to ensure that all hazards applicable to their operations are properly screened and further analyzed, as needed. The technical planning basis must include the development and maintenance of an all-hazards survey (AHS); emergency planning hazards assessments (EPHAs), as applicable; emergency action levels (EALs) for the full spectrum of potential operational emergencies (OEs), which include appropriate protective actions (PAs) corresponding to each EAL scenario; and a consolidated emergency planning zone for all identified emergency scenarios to facilitate the implementation of PAs during emergencies.

EA assessed the all-hazards planning basis for transuranic waste operations at one NNSA site and evaluated the technical planning basis for each of the scenarios chosen for exercises at the six other DOE/NNSA sites. The assessments determined that all sites had developed either all or most of the documents required to establish a technical planning basis. However, technical planning basis weaknesses were identified at two of the six assessed sites that affected the ability of the ERO to respond effectively to emergencies during the observed exercises.

Strengths

No common strengths were identified.

Weaknesses

Several weaknesses related to the technical planning basis were identified at two of the six assessed sites, as described below:

- At one site, there was incomplete source term information in the EAL for the exercise scenario incident. The facility EPHA listed the source term for the exercise scenario as being two components, a filtered stack release and an unfiltered, ground-level release. However, the EAL only included the portion of the source term for the filtered stack release. Consequences of this error were realized during the exercise and are further discussed in sections 3.2, 3.3, and 3.5.
- At the other site, the AHS did not document the following required elements:
 - Chemicals authorized to be brought on site by subcontractor personnel for special and infrequent operations were mentioned in the AHS but not screened out from further analysis. The hazardous

materials screening process is used to identify specific hazardous materials and quantities that, if released, could produce impacts consistent with the definition of an OE.

- The AHS did not identify a list of screened chemicals authorized for use on site and, therefore, did not document the screening of those materials.
- The AHS did not contain a listing or description of the health, safety, or environmental impacts of potential emergencies, including natural hazards, technological hazards, or human-caused incidents that could occur on the site.

Issues resulting from the absence of required AHS elements are further discussed in section 3.4.

3.2 Emergency Operations Systems

This portion of the lessons learned review addresses the strengths and weaknesses associated with emergency operations systems (EOSs).

DOE Order 151.1D requires DOE sites/facilities/activities to have an EOS to provide centralized collection, validation, analysis, and coordination of information related to an emergency response. The order further states that the EOS must be able to use standard operating procedures and checklists to obtain and maintain situational awareness and disseminate a common operating picture (COP) among response components and external partners.

All assessed sites possessed adequate systems, processes, and procedures to support centralized collection and coordination of emergency information. However, issues related to situational awareness, which have been documented in prior EA assessments and lessons learned reports, were again identified in FY 2025 assessments, indicating that developing, disseminating, and updating a COP among each of the various response elements continues to challenge DOE/NNSA sites.

Strengths

No common strengths were identified.

Weaknesses

At four of the six sites assessed during exercises, EROs demonstrated inadequate situational awareness and lack of a COP. At one site, responders did not fully understand potential radiological consequences and, therefore, did not provide accurate information to offsite agencies. At another site, some responders exited an unplanned limiting condition for operation (LCO) before verifying that the LCO conditions had been resolved. At multiple sites, errors in PA decision-making occurred due to inadequate situational awareness, as described below:

- At one site, responders focused on only one release component (rather than two as identified in the facility EPHA), which led to an inadequate understanding of potential radiological consequences and, subsequently, inadequate protective measures for first responders, as discussed in section 3.3. In addition, offsite agencies and DOE Headquarters were not made aware of the full extent of radiological releases provided in emergency notification forms (ENFs) and were incorrectly informed that conditions were improving.
- At another site, play was paused at all exercise venues due to an unplanned LCO. However, exercise play resumed at most venues before it was verified that LCO conditions had been resolved and before players were able to establish adequate situational awareness. When exercise play resumed, the ERO decision-makers were unaware that: (1) play in the operations center venue was still paused, and (2)

several important response actions had occurred, including the transfer of incident command to the fire department (FD) captain, the recall of off-duty FD personnel, and an unsuccessful attempt by the FD captain to brief the emergency director on incident scene activities.

- At another site, miscommunications, limited access to the site's emergency information management system, and inadequate notifications hindered a COP and caused multiple issues. As discussed in section 3.3, incorrect dose information was communicated to the emergency operations center (EOC), leading decision-makers to believe that projected doses were approximately 1,000 times higher than postulated by the worst-case analysis in the EPHA. However, the EOC did not inform offsite response agencies, the incident command post, or facility control rooms that very high doses had been projected. Offsite agencies were not provided with complete and accurate information in ENFs and, most importantly, were never informed that a General Emergency had been declared. Lack of access to the site information management system by ERO members outside of the EOC contributed to overall inadequacies in situational awareness.
- At one site, during an exercise involving a postulated wildland fire affecting multiple facilities, an integrated concept of operations between the primary M&O contractor and support contractors was not fully maintained, degrading situational awareness and the COP. Contrary to site procedures, the site-level ERO did not perform all notification functions, resulting in facility- and site-level EROs across both contractors issuing multiple unconsolidated ENFs. Consequently, notifications contained conflicting information regarding the fire location, offsite support requirements, and PA decisions (shelter-in-place versus evacuation).

As indicated in the examples above, lack of a common operating picture can lead to inadequate decision-making, resulting in ineffective protective measures for onsite personnel and the public, and hinder effective response and recovery operations.

3.3 Protective Actions

This portion of the lessons learned review addresses the strengths and weaknesses associated with PAs.

DOE Order 151.1D requires DOE sites/facilities/activities to identify PAs commensurate with potential hazards and maintain procedures for prompt issuance of PA instructions to workers. PAs for hazards and threats identified in the all-hazards planning basis must be predetermined and serve to minimize emergency-related consequences and maximize life-safety and health. In addition, DOE sites are required to develop a process to issue PAs promptly; develop procedures and processes to account for employees; and consider whether additional PAs are needed for severe incidents, such as self-help instructions when the site is isolated from outside response assistance.

Overall, all assessed sites had predetermined PAs and processes in place to implement PAs, but some sites' PA decisions did not provide adequate protection of employees, responders, and/or the public.

Strengths

No common strengths were identified.

Weaknesses

At two of the six sites assessed during exercises, emergency responders did not identify PAs commensurate with potential hazards. These weaknesses are described below:

- One site did not identify and communicate the appropriate PAs for the potential hazards identified in the facility EPHA, as described below:
 - Information regarding potentially lethal radiation doses was not provided to first responders during the initial dispatch, or by EOC staff as the incident progressed. While the initial dispatch included information about facility radiation alarms, EPHA potential consequences were omitted from EAL and responder communications. The incident commander (IC) was unaware that the EPHA projected dose was 18,000 rem within 30 meters of adjacent tanks, or that the distance to the threshold for early lethality (TEL) extended to 380 meters. This information is critical to allow the IC to make informed decisions regarding the location of the incident command post, safe distance information for responders, and whether it is safe for first responders to enter the facility.
 - Inadequate knowledge of potential consequences affected PA decision-making for personnel located in the incident area. Although the facility EPHA indicated an ongoing release with doses potentially exceeding TEL at 380 meters for approximately two hours, the predetermined onsite PAs defined in the facility EAL instructed staff in the affected building to evacuate while the remainder of the incident area personnel were to initially shelter-in-place. Consistent with site preplanning, buses were used to quickly relocate evacuated personnel from the impacted building to an area outside the affected area. However, the adequacy of a shelter-in-place PA for the remaining area personnel, most of whom were located inside the distance to the TEL, was not established, and the potential for significant radiological doses to personnel sheltered in the incident area was not considered during the exercise.
- The other site did not consider the adequacy or revision of initially issued PAs during an exercise, as described below:
 - ERO decision-makers did not consider the evacuation of impacted personnel from areas where the potential existed for doses to exceed PAC and TEL, as calculated in the facility EPHA and as provided in the EAL. The potentially high radiological dose consequences projected in the facility EPHA indicated the need to consider evacuation of affected personnel at the facilities, and possibly other nearby areas as well, to a safer location once the release was over and the plume had passed. This need is due to the potential for contaminants to infiltrate buildings, even if ventilation is properly secured and outside air intakes are restricted. Although the IC appropriately used the EAL-listed PAC maximum distance to establish the incident command post at a safe location for responders, the IC did not discuss with the ERO decision-makers whether affected employees within the distance to TEL at the scenes he controlled had either been, or needed to be, evacuated to a safe, upwind location. In addition, other ERO decision-makers, particularly in the EOC, did not discuss or provide any direction on when workers should be required to evacuate the area inside the PAC/TEL maximum distances due to the potential for acute radiological dose consequences.
 - The site EOC received inaccurate dose information resulting in the understanding for 43 minutes that the projected dose at the site boundary was 1.22 rem, which would indicate extremely high doses for personnel located in areas around an incident scene as well as the need for immediate issuance of offsite protective action recommendations (PARs) to protect the public. Although the emergency director and EOC staff considered the inaccurate information to be correct, the emergency director did not act upon the significance of the reported consequences, and there was

no reevaluation or discussion in the EOC concerning the adequacy of the issued onsite PAs, offsite PARs, or the need for ingestion pathway advisories.

Not identifying PAs commensurate with potential hazards impedes the ability of ERO's to minimize the impacts of hazardous material releases, particularly for personnel inside the maximum distances to hazardous material protective action criteria (PAC) and the threshold for early lethality (TEL).

3.4 Categorization and Classification

This portion of the lessons learned review addresses the strengths and weaknesses associated with categorization and classification.

DOE Order 151.1D requires DOE sites and facilities to declare an OE when incidents occur that represent a significant degradation in the level of safety, resulting in potential health and safety hazards to workers or the public. OEs must be categorized as promptly as possible, no later than 15 minutes after identification by the predetermined decision-maker, and no more than 30 minutes from initial discovery. Additionally, DOE sites/facilities/activities with an emergency management hazardous material program are required to also have provisions to classify incidents involving the actual or potential airborne release of (or loss of control over) hazardous materials from an onsite facility/activity as an Alert, Site Area Emergency, or General Emergency based on health effects parameters measured or estimated at 30 meters, 100 meters, and the site boundary and compared with the appropriate PAC.

Overall, all assessed sites had documents and processes in place to categorize and classify OEs, but some sites' categorization/classification processes were not effective.

Strengths

No common strengths were identified.

Weaknesses

Four of the six sites assessed during exercises did not adequately implement categorization/classification processes that were compliant with DOE Order 151.1D, as described below:

- Two sites did not categorize and classify an emergency as promptly as possible and within 15 minutes of identification or within 30 minutes of initial discovery.
- One site incorrectly classified and declared a General Emergency that was not based on measured or estimated health effect parameters at the site boundary. The exercise included two radiological release incidents, one declared an Alert and the other a Site Area Emergency, using facility-specific EALs. The site also made a General Emergency declaration using a general site EAL based on the FD being out of response resources and offsite mutual aid being unavailable, not based on the need for offsite PARs.
- Due to a lack of required information in the AHS, one site did not have documentation, procedures, or processes in place to ensure that all emergency conditions defined in the order as requiring categorization as an OE were addressed, including: (1) any environmental incident with potentially serious consequences; (2) health and safety emergencies, such as incidents resulting in mass casualties; and (3) security incidents, such as terrorist attacks/threats, bomb detonations, and kidnappings.

While documentation and procedures were generally in place to manage OEs, effective implementation was a challenge at several locations.

3.5 Consequence Assessment

This portion of the lessons learned review addresses the strengths and weaknesses associated with consequence assessment.

DOE Order 151.1D requires sites to conduct consequence assessment activities during emergencies, including timely initial assessments (TIAs) to provide a rapid confirmation of initial classification and PA decisions, as well as accurate continuing on-going assessments (COAs) using current incident conditions to support emergency response activities.

Strengths

Consequence assessment activities were evaluated during five exercise assessments. All five assessed sites demonstrated the ability to provide a TIA and COAs using appropriate dispersion modeling tools, as well as the ability to use the National Atmospheric Release Advisory Center (NARAC) dispersion model as part of near real-time consequence assessment.

Weaknesses

At two of the five sites assessed in this area, weaknesses in consequence assessment were identified, as described below:

- At one site, consequence assessment modelers prepared a TIA plume projection using the stack release component of a source term but did not include a second ground-level release component, which was provided in the EPHA for the scenario. In addition, the potential for a ground-level release was not considered during COAs as the exercise progressed. The emergency director's situational awareness of potential consequences was diminished because the consequence assessment team did not confirm that EAL consequences were bounding using real-time meteorological conditions, and the briefing provided by subject matter experts to the emergency director and EOC staff on EPHA scenario did not convey that 99.6% of the release was expected to occur in the first two hours with concurrent releases occurring through ground level collection tank vents and a stack.
- At the other site, consequence assessment modelers calculated an accurate TIA using excellent self-checking and independent verification of user model data inputs; however, its completion was not timely. TIA results were primarily delayed because of an almost one-hour wait after EAL selection to receive ENFs before dispersion modeling could begin. Dispersion modelers finally briefed command staff on the approved TIA results almost two hours after EAL selection. DOE Guide 151.1-1B recommends that TIA results be provided within 30 minutes to 1 hour of EAL selection to provide rapid confirmation of initial classification and PA decisions.

While all assessed sites demonstrated proficiency in using dispersion modeling tools, including the NARAC, two sites exhibited weaknesses, with the identified weaknesses highlighting the need to assess the consequences of all release pathways and streamline processes to ensure prompt and accurate consequence assessments.

3.6 Issues Management

This portion of the lessons learned review addresses the strengths and weaknesses associated with emergency management-related issues management.

DOE Order 151.1D requires DOE sites to identify improvements and then develop corrective actions for findings identified during evaluations, assessments, drills, exercises, and actual emergencies. Corrective action plans for any identified findings from Federally directed or external assessments must be submitted for approval to the field element manager or appropriate Federal manager, and all issues and corrective actions must be tracked on a formal system until completion. DOE Defense Nuclear Facilities must also conduct causal analysis to determine corrective actions for findings identified because of a noncompliance for life safety. Additionally, closure of corrective actions must be evaluated for effectiveness of corrective actions through verification and validations conducted by an independent reviewer.

EA's finding follow-up during assessments determined that sites generally maintain procedures with compliant issues management processes; however, weaknesses were identified in the effectiveness of the issues management processes at several sites in identifying the root causes of issues and in validating the closure of corrective actions for effectiveness to prevent recurrence.

Strengths

No common strengths were identified.

Weaknesses

Weaknesses were identified in the issues management process at three sites despite having documented a compliant issues management process. During EA finding follow-up reviews for 16 total issues at 4 sites, the closure of the corrective actions for 7 of 15 findings (>40%) at 3 sites was inadequate to effectively prevent recurrence. The recurrence of identified issues indicates the lack of effective root cause analysis and/or an inadequate verification and validation process for assessing the effectiveness of completed corrective actions. When developing corrective actions, sites often addressed the consequences or symptoms of the issue by focusing on the details that led to the finding but did not include appropriate corrective actions to address the underlying root causes.

As discussed in previous EA lessons learned reports, sites across the complex use the site's issues management program implementation of DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, attachment 1, as the basis for a DOE Order 151.1D-compliant issues management process. DOE Order 226.1B requires findings to be categorized based on risk and priority; however, many sites do not categorize health and safety issues identified during EA-evaluated exercises as high risk or priority findings because they occurred during a simulated hazardous material release rather than a real incident. As a result, although exercises are required to validate adequate emergency planning and readiness, most sites do not perceive performance weaknesses as indicators of an actual incident response. This results in emergency management findings often being categorized as low risk and low priority per site issues management procedures, leading to the application of less robust causal analysis and closure verification and validation processes. Because of low-risk categorizations, effectiveness reviews of closed corrective actions are often inadequate and do not address the root causes of issues, which ultimately leads to recurrence.

4.0 BEST PRACTICES

A total of 22 strengths and four best practices covering numerous program elements were identified by EA in FY 2025 reports. While this report is focused on best practices, it is notable that a number of sites were commended for developing well designed, safely conducted, adequately controlled, and challenging exercise scenario packages. A best practice is a safety-related practice, technique, process, or program attribute observed during an appraisal that may merit consideration by other DOE and contractor organizations for implementation because it has been demonstrated to substantially improve the safety or security performance of a DOE operation, or it represents or contributes to superior performance (beyond compliance). Additionally, a best practice could be identified because it solves a problem or reduces the risk of a condition or practice that affects multiple DOE sites or programs, or it provides an innovative approach or method to improve effectiveness or efficiency. The following best practices were identified at the time that the individual assessments were conducted and may be valuable to other DOE/NNSA sites:

Consequence Assessment

- The M&O contractor at Oak Ridge National Laboratory developed plume modeling casebook forms for each EPHA scenario to allow consequence assessment personnel to efficiently compute and assess the estimates of onsite and offsite consequences of actual or potential releases of hazardous material. The casebook forms contain detailed information about each incident as identified in the EPHA, including a brief description, the type of material released, the release location and dynamics (e.g., size of release, stack height, plume velocity) and the airborne source term. Each casebook form includes the EPHA scenario number as well as the EAL reference number to allow the consequence assessment team to quickly locate the correct information to complete a TIA.

Emergency Operations System

- Management at the West Hackberry Strategic Petroleum Reserve (SPR) developed a user-friendly incident management handbook for the West Hackberry site that provides emergency operations center leadership and ERO personnel with readily available information and guidance related to EOC operations and incident administration, including templated documents. The handbook also provides a standardized reference to facilitate uniform response, access to critical procedures, checklists, and contact information should computer systems be compromised, as well as a summary of responsibilities for key incident command system positions.

Protective Actions

- The West Hackberry SPR site maintains a well-organized decontamination trailer containing equipment needed for field decontamination, including ground cover, portable containment pools, benches, water pumps, and water hoses, allowing for quick and effective deployment. The decontamination trailer was well organized, with all equipment labeled and stored in designated areas. Further, response teams were well trained in the set-up and operation of the decontamination station. The Fluor Federal Petroleum Operation's decontamination trailer, along with the efficient deployment of the decontamination station, significantly enhances the safety of workers.
- The M&O contractor at Lawrence Livermore National Laboratory developed an emergency response self-help map of Site 200 that is scaled to allow personnel to estimate distances using their government badges (see Figure 1).

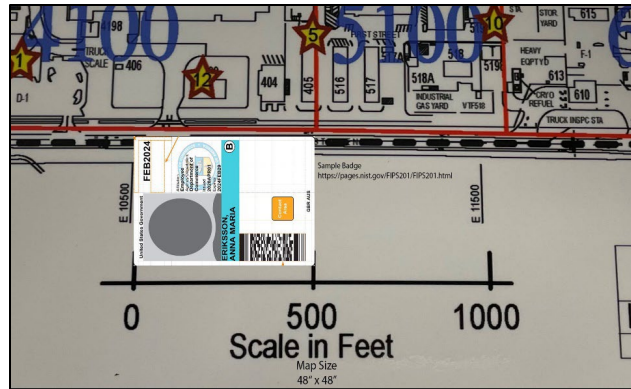


Figure 1. Distance Scale on Site 200 Self Help Map

5.0 RECOMMENDATIONS

The following recommendations are based on the analysis of EA assessments as summarized in section 3.0 of this report. While underlying weaknesses from the individual assessments did not apply to every reviewed site, the recommended actions are intended to provide insights for potential improvements at all DOE/NNSA sites. Consequently, DOE/NNSA organizations and site contractors should evaluate the applicability of the following recommended actions to their respective facilities and/or organizations and consider their use as appropriate in accordance with Headquarters and/or site-specific program objectives.

NNSA and DOE Program Secretarial Offices should consider:

Issues Management

- Increasing the rigor of readiness assurance processes by encouraging site field elements and contractors to:
 - Manage findings identified during emergency exercise assessments as high consequence issues, requiring formal root cause analysis, timely corrective action implementation, and verification (by reviews) and validation (by testing) of closed corrective actions to prevent recurrence of weaknesses.
 - Focus line management oversight on performance effectiveness in addition to compliance because compliance has not proven to consistently result in effective response to emergencies.

DOE Field Element Managers and M&O Contractors should consider:

Technical Basis

- Ensuring that the AHS is comprehensive and includes:
 - a complete list of screened chemicals authorized for use on site, to include chemicals authorized to be brought on site by subcontractor personnel for special and infrequent operations.
 - a listing or description of the health, safety, or environmental impacts of potential emergencies, including natural hazards, technological hazards, or human-caused incidents that could occur.
- Ensuring that all source term components from EPHAs are incorporated into EALs, including PA/PAR guidance, when analyzed accidents have multiple release points (e.g., filtered stack releases and concurrent ground-level releases).

Emergency Operations System

- Making information management systems more widely available to promote information sharing and ensure they are regularly tested and modified as necessary to maximize effectiveness.
- Strengthening site-specific emergency plans, emergency plan implementing procedures, and position checklists by adding responder requirements to continually monitor significant event logs and other information sources and immediately inform decision-makers of important new information and discrepancies in the operational picture.

Protective Actions

- Ensuring that initial predetermined PAs and PARs for postulated incidents are commensurate with the current and anticipated hazards and are implemented and/or revised as needed during the response in a timely manner through prompt discussions between the IC or facility personnel, the duty officer, and EOC as applicable.
- Ensuring personnel are evacuated from areas with potentially lethal doses of radioactive material after determining a safe evacuation route and communicating that route to sheltered personnel, even if ventilation is properly secured and outside air intakes are restricted, due to the potential for acute radiological dose consequences.
- Ensuring that all pre-determined PAC distances, including the TEL, are included in documents referenced by first responders.

Categorization/Classification

- Reviewing EALs to ensure consistency in emergency categorization/classification with defined DOE Order 151.1 guidance. In particular:
 - Ensure that General Emergency EALs are based on measured or estimated health effect parameters at the site boundary.
 - Ensure that OE EALs include triggers for: (1) environmental incidents with potentially serious consequences; (2) health and safety emergencies, such as incidents resulting in mass casualties; and (3) security incidents, such as terrorist attacks/threats, bomb detonations, and kidnappings.

Consequence Assessment

- Ensuring that consequence assessment processes enable rapid access to information, such as ENFs, EALs, and EPHAs, so that the TIA can be completed and briefed to command staff promptly.

Appendix A Supplemental Information

Office of Enterprise Assessments Management

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Appendix B

Criteria and Review Approach Documents

To determine whether policies, procedures, capabilities, and operational performance met U.S. Department of Energy (DOE) objectives for effectiveness in the areas examined, assessments included elements from the following Office of Enterprise Assessments (EA) CRADs:

- EA CRAD 33-05, *Contractor Readiness Assurance and Exercise Program*, Rev. 0, March 2017
- EA CRAD 33-07, *DOE/NNSA Emergency Management Exercise Review*, Rev. 1, October 2017
- EA CRAD 33-09, *DOE O 151.1D Emergency Management Program*, Rev. 0, April 2019
- EA CRAD 33-10, *Federal Line Management Oversight of the Emergency Management Program*, Rev. 0, July 2020.

Numerous objectives, criteria, and programmatic lines of inquiry were reviewed from each of these documents. However, because the assessments were focused on specific emergency management program elements, only selected objectives, criteria, and/or programmatic lines of inquiry were used. Scope and objective details were provided to each site prior to the assessments in planning documents developed specifically for each assessment.

Appendix C

Assessed Sites and Source Documents

- Lawrence Livermore National Laboratory – Assessment of the all-hazards planning basis for transuranic waste operations occurred between June and August 2024. The EA report was published in October 2024: [*Independent Assessment of the Transuranic Waste All-Hazards Planning Basis at the Lawrence Livermore National Laboratory, October 2024*](#)
- Oak Ridge National Laboratory – Assessment of the 2024 full-scale annual exercise occurred between July and September 2024. The EA report was published in December 2024: [*Independent Assessment of the 2024 Full-scale Emergency Management Annual Exercise at the Oak Ridge National Laboratory, December 2024*](#)
- Pantex Plant – Assessment of the 2024 full-scale exercise occurred between October and December 2024. The EA report was published in March 2025: [*Independent Assessment of the 2024 Full-scale Emergency Management Exercise at the Pantex Plant, March 2025*](#)
- Strategic Petroleum Reserve – Assessment of the 2025 full-scale exercise at the West Hackberry site occurred between January and March 2025. The EA report was published in July 2025: [*Independent Assessment of the 2025 Full-scale Emergency Management Exercise at West Hackberry Strategic Petroleum Reserve, July 2025*](#)
- Savannah River Site – Assessment of the 2025 full-scale exercise occurred between June and August 2025. The EA report was published in January 2026: [*Independent Assessment of the 2025 Full-scale Emergency Management Exercise at the Savannah River Site, January 2026*](#)
- Idaho National Laboratory – Assessment of the 2025 full-scale exercise occurred between May and July 2025. The EA report was published in January 2026: [*Independent Assessment of the Idaho National Laboratory Emergency Management 2025 Annual Exercise, January 2026*](#)
- Waste Isolation Pilot Plant – Assessment of the 2025 annual full-participation exercise occurred between August and September 2025. The EA report was published in May 2026: [*Independent Assessment of the 2025 Annual Full-participation Emergency Management Exercise at the Waste Isolation Pilot Plant, May 2026*](#)