



# **Lessons Learned from Assessments of Emergency Management Programs at U.S. Department of Energy Sites**

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Office of Enterprise Assessments  
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## Acronyms

CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	DOE Office of Enterprise Assessments
EAL	Emergency Action Level
EMG	Emergency Management Guide
EOC	Emergency Operations Center
EPHA	Emergency Planning Hazards Assessment
ERO	Emergency Response Organization
HAZMAT	Hazardous Material
IC	Incident Commander
IZ	Isolation Zone
NNSA	National Nuclear Security Administration
PA	Protective Action
PPE	Personal Protective Equipment
SNL/NM	Sandia National Laboratories/New Mexico
SRS	Savannah River Site
TEL	Threshold for Early Lethality

## **Lessons Learned from Assessments of Emergency Management Programs at U.S. Department of Energy Sites**

### **EXECUTIVE SUMMARY**

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted emergency management program assessments at three DOE sites during calendar year 2018. The sites, selected based on risk, are under the direction of the National Nuclear Security Administration and the Office of Environmental Management. The objective of each assessment was to determine the effectiveness of emergency management programs. This report focuses on issues affecting multiple sites and identifies strengths and weaknesses, best practices, and recommendations, with the goal of promoting organizational learning and improving performance throughout the DOE complex.

During 2018, EA observed that the assessed sites have generally well-developed and effectively implemented programs with some areas of weakness. Best practices include the implementation of Exercise Builder (a software tool for supporting emergency management exercise planning, development, and evaluation) at two sites, and utilization of a 360-degree isolation zone to determine protective actions for field responders at one site. A notable strength is the development of a robust closeout process for findings at a third site.

Nonetheless, the assessments revealed common weaknesses in the effectiveness of exercise scheduling and conduct, communications, protective actions for responders, and issues management processes. Key weaknesses include exercise scheduling and conduct that do not provide facilities with challenging exercises at the required periodicity and do not periodically validate all emergency response elements, exercise evaluations that do not use objective criteria to measure performance, lack of proficiency in integrated operations and communications among emergency response teams, overreliance on wind direction to determine protective actions for emergency responders, and corrective action processes that do not always ensure that completed actions prevent recurrence of the underlying weaknesses. Previous EA emergency management lessons learned reports, such as those for calendar years 2016 and 2017, identified several weaknesses that are similar to those identified during the 2018 EA assessments.

Based on an analysis of these assessments, a number of recommendations for improving the emergency management programs are provided. Although the underlying deficiencies and weaknesses do not apply to every site, the recommended actions are intended to provide insights for potential improvements at all DOE sites. Recommendations for the exercise program focus on improving exercise planning, scheduling, and evaluation, including the use of Exercise Builder software (or a similar approach) to develop objective, measurable exercise evaluation criteria based on site- or facility-specific procedures. With respect to situational awareness, recommendations address the need to provide adequate opportunities for personnel to develop proficiency in using the procedures, communications equipment, and information management systems. Another recommendation suggests that enhancements to protective actions for field responders should include establishing a 360-degree isolation zone around the event scene where responders may be exposed to dangerous (upwind) or life-threatening (downwind) concentrations of hazardous material. Finally, one recommendation provides the perspective that increased effectiveness in resolving identified issues can be achieved by incorporating rigorous verification and validation processes for corrective actions related to exercises and external assessments.

# Lessons Learned from Assessments of Emergency Management Programs at U.S. Department of Energy Sites

## 1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted emergency management assessments at a number of DOE sites during calendar year 2018. The objective of each assessment was to determine the effectiveness of specific elements of the emergency management programs.

The lessons learned are based on a collective analysis of assessments at three sites, as well as information from other oversight activities and from previous years' reports. Two of the sites are under the direction of the National Nuclear Security Administration (NNSA) and one is under the direction of the Office of Environmental Management. The report focuses on issues affecting multiple sites and/or facilities and identifies commonly observed strengths and weaknesses, best practices, and recommendations, with the goal of promoting organizational learning and improving performance throughout the DOE complex.

### 1.1 Background

EA manages the Department'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, other DOE managers, senior contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements, and the effectiveness of DOE and contractor line management performance and 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 and assessment guides.

EA focused its emergency management assessment efforts in 2018 on the Pantex Plant (hereafter called Pantex), Sandia National Laboratories/New Mexico (SNL/NM), and Savannah River Site (SRS). Two of the sites had significant program changes during the past few years. Pantex continued emergency management program changes in response to Defense Nuclear Facilities Safety Board Recommendation 2015-1, *Emergency Preparedness and Response at the Pantex Plant*, and SNL/NM transitioned to a new contractor one year before the EA assessment.

### 1.2 Scope and Methodology

This report reflects an analysis of collected lessons learned from EA emergency management assessments completed during 2018. During that time, EA published three assessment reports that included observation and analysis of a full-scale exercise, along with reviews of the exercise program, contractor readiness assurance system, and DOE Field Element readiness assurance (see Appendix B). The sites, along with the key elements reviewed, associated contractors, local DOE offices, and DOE Headquarters program offices, are listed in Table 1.

The summary statements in Section 2, below, reflect aggregated issues from the three 2018 EA-published reports, information gained from other oversight activities, and in some cases, insights from previous EA reports. Those reports remain a snapshot of conditions at the facility at the time of the assessment. The issued reports, provided to the assessed organizations, may have resulted in corrective actions or enhancements that are not reflected in these discussions.

**Table 1.**  
**Sites, Key Elements Assessed, Contractors, Local DOE Offices, and DOE Program Offices**

Assessment Site	Key Elements Reviewed	Contractor	DOE Field Element	DOE Headquarters Program Office
Pantex Plant (Pantex)	Readiness Assurance (EA finding review)	Consolidated Nuclear Security, LLC	NNSA Production Office	NNSA
Sandia National Laboratories/New Mexico (SNL/NM)	Full-scale Exercise Exercise Program Readiness Assurance (EA finding review)	National Technology and Engineering Solutions, LLC	Sandia Field Office	NNSA
Savannah River Site (SRS)	Full-scale Exercise Exercise Program Readiness Assurance (EA finding review)	Savannah River Nuclear Solutions, LLC Savannah River Remediation, LLC Ameresco, Inc.	Savannah River Operations Office Savannah River Field Office	Office of Environmental Management NNSA

The scope of the assessments included elements from several criteria and review approach documents (CRADs):

- CRAD 33-02, *Technical Planning Basis*, Rev. 0, 4/8/16
- CRAD 33-003, *2016 Emergency Management Program Review Pantex Plant*, Rev. 0, 10/18/16
- CRAD 33-05, *Contractor Readiness Assurance and Exercise Program*, Rev. 0, 3/22/17
- CRAD 33-07, *DOE/NNSA Emergency Management Exercise Review*, Rev. 1, 10/19/17.

EA used these criteria to determine whether the policies, procedures, and operational performance met DOE objectives for effectiveness in the areas examined.

### 1.3 Requirements and Guidance

Upper tier requirements for emergency management programs at the assessed sites flow down from DOE Order 151.1D, *Comprehensive Emergency Management System*, and reflect the sites' transition to the new order. Additional requirements for contractor assurance systems are included in DOE Order 414.1D, *Quality Assurance*, and DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*. Guidance is also taken from DOE Emergency Management Guide (EMG) 151.1-1A, *Emergency Management Fundamentals and the Operational Emergency Base Program*; EMG 151.1-2, *Technical Planning Basis*; EMG 151.1-3, *Programmatic Elements*; and EMG 151.1-4, *Response Elements*.

## 2.0 OVERALL ASSESSMENT

During 2018, EA observed that the assessed sites have generally well-developed and effectively implemented programs with certain areas of weakness. Notable strengths include:

- SRS and SNL/NM incorporated Exercise Builder (a software tool for developing emergency management exercises and drills, which is sponsored by the Associate Administrator and Deputy Under Secretary for Emergency Operations) to support exercise planning, development, and execution and to improve exercise evaluation. The expanding use of Exercise Builder across the complex promotes more effective readiness assurance activities.
- SNL/NM used an “isolation zone” (IZ) concept for identifying protective actions (PAs) in the emergency action levels (EALs). This concept, which addresses PAs for responders within a specified distance of the event regardless of wind direction, provides all responders with clear situational awareness of the distance where use of personal protective equipment (PPE) is required.
- Pantex developed a robust process for improving the emergency management program by completing independent verification reviews of completed actions and testing corrective actions using performance-based techniques.

Nevertheless, the assessments revealed common weaknesses in the effectiveness of exercise scheduling and conduct, communications, PAs for responders, and issues management processes. Key weaknesses include:

- Exercise scheduling and conduct does not always ensure that all facilities or groups of facilities with emergency planning hazards assessments (EPHAs) are presented with challenging exercises at the required periodicity and all emergency response elements and capabilities are validated over a five-year period.
- Not all sites tailor their exercise evaluation criteria to include specific, attainable, and measurable criteria based on site- or facility-specific procedures and checklists.
- Lack of proficiency in interoperability and communications among response teams sometimes led to weaknesses in establishing situational awareness and a common operating picture, increasing risk to responders.
- First responder reliance on only wind direction to predict potential hazardous material (HAZMAT) exposure does not always provide effective PAs for first responders. Establishing PAs within the 360-degree area for potential HAZMAT exposure near the point of release requires a sophisticated understanding of the local atmospheric transport/dispersion environment or real-time field monitoring beyond simple dependence on wind direction.
- Corrective actions did not fully resolve findings from previous EA assessments, and the issues management process did not include verification and validation to identify shortcomings in the effectiveness of those actions.
- Causal analysis was not always effective in determining a complete set of corrective actions for findings.

Previous EA emergency management lessons learned reports, such as those for calendar years 2016 and 2017, identified several weaknesses that are similar to those identified during the 2018 EA assessments. For example, exercise programs at some sites did not systematically validate all elements of the emergency management program over a five-year period, some sites did not demonstrate effective and accurate communications to establish situational awareness and a common operating picture among response elements and organizations, and corrective actions did not always lead to actions that prevented recurrence of an identified issue.

## 2.1 Exercise Programs

*Criteria: DOE sites/facilities/activities with an emergency management HAZMAT program must establish and maintain a site-level exercise program that validates its emergency response capability to the hazards identified in EPHAs. These DOE sites/facilities/activities must accomplish the following:*

- *Develop a formal exercise program that includes (1) a matrix that identifies planned exercises over the next five years and the elements tested; (2) rotation among scenarios identified in the Technical Planning Basis; (3) exercise scenarios involving radiological HAZMAT, if applicable; (4) a method for determining the appropriate number of exercises, and rotation of exercise scenarios among HAZMAT facilities over a five year period, to ensure demonstration of responder proficiency; (5) invitation of offsite responding agencies and national assets, e.g., Centers for Disease Control, Department of Agriculture, etc., every three years; (6) severe event scenarios every five years; (7) test of design control and/or mitigation features in multiple facilities; (8) demonstration of emergency response organization (ERO) capability; and (9) integration with local, state, and Federal agencies.*
- *Develop challenging exercises based on scenarios identified in the technical planning basis that involve high-consequence scenarios, involve multiple response elements, and result in offsite effects.*
- *In order to test and demonstrate the site/facility/activity integrated emergency response capability, conduct the annual site-level exercise as a full-scale exercise involving site-level ERO elements and resources. Invite some offsite response organizations to participate in a full-scale or full participation exercise every three years. This exercise must use a scenario from the spectrum of potential Operational Emergencies identified in EPHAs (rotated among facilities and type of incident and/or initiator) and include demonstration of PAs. (DOE Order 151.1D, Attachment 4, Paragraph 15)*

Sites conduct exercise programs to validate facility- and site-level emergency management program response elements and capabilities by initiating response to simulated, realistic emergency events/conditions that replicate an integrated emergency response to an actual event. A structured approach in planning and preparation includes documentation of specific objectives, scope, timelines, scenario injects, controller instructions, and evaluation criteria for realistic scenarios. Varying and challenging scenarios provide ERO personnel with sufficient opportunities to develop and demonstrate proficiency in emergency response for all response elements and capabilities across the spectrum of hazards and facilities. Response capabilities requiring validation over a five-year period include the use of alternate response centers, joint information centers, and offsite support organizations.

EA observed that most sites adequately document their exercise program in emergency plans, drill and exercise plans, and implementing procedures, but sites do not always validate all exercise response elements and capabilities over a five-year period. Additionally, not all sites tailor their exercise evaluation criteria to include specific, attainable, and measurable criteria based on site- or facility-specific procedures and checklists.



## Strengths

SNL/NM and SRS improved their exercise programs by implementing the use of Exercise Builder, including the evaluation module, to support exercise planning, development, and execution. The 2018 SNL/NM exercise, which included many attributes of a properly prepared, well-executed exercise, was planned and supported with Exercise Builder. SRS input baseline information for the site and most of its facilities in early 2018, with a goal to conduct a facility-level exercise using all modules in late 2018.

## Weaknesses

Sites do not focus sufficiently on the five-year exercise planning process to ensure that all emergency response elements and capabilities are exercised over a five-year period and demonstrate that the EROs can effectively respond to the full spectrum of events, including severe events. At one site, a facility with classifiable operational emergencies was not evaluated annually and exercise planning did not include all relevant DOE assets, such as DOE/NNSA Office of Secure Transportation. Another site did not schedule some capabilities, such as the alternate emergency operations center (EOC) and joint information center, for validation over the five-year period. Additionally, in previous years' assessments, two sites with multiple contractors did not demonstrate how each contractor's response capabilities are tested and effectively integrated.

Moreover, not all sites rotate scenarios among facilities and choose varied, challenging exercises to determine whether the response to the full spectrum of HAZMAT incidents is effective. At one site, the current five-year exercise schedule, coupled with the previous five-year exercise schedule, did not fully address the analyzed hazards and postulated scenarios identified in the EPHAs. The selected scenarios in the current five-year plan were very similar to the previous five-year period. Another site conducted many exercises throughout the year but did not sufficiently drill and exercise severe incidents that affect multiple facilities and require EROs to consider the effect of conditions at one facility on the response at another facility. At that site, almost all of the drills and exercises affected a single facility or area with little or no consequences to, and interaction with, other adjacent site facilities.

Lastly, as identified in previous lessons learned reports, a number of sites continue to use a generic set of exercise evaluation criteria obtained from DOE EMG 151.1-3 and have not developed criteria tailored to the site. Tailored exercise evaluation criteria include specific, attainable, and measurable objectives based on site procedures and checklists. Without tailored criteria, some critical actions and time requirements necessary for an effective response are not objectively evaluated.

## 2.2 Full-Scale Exercise – Communications

*Criteria: DOE sites/facilities/activities must accomplish the following: (1) provide for continuing effective communications among response organizations throughout an emergency; (2) provide for communication methods among on-scene responders, emergency managers, and response facilities; (3) provide updates to Headquarters based upon the emergency conditions and/or as directed by Headquarters; (4) establish provisions to provide updates to workers during an emergency; (5) initiate communications checks on classified and unclassified communications systems used for initial notification of the Headquarters Watch Office annually or more frequently as necessary for the communications system (e.g., post-maintenance testing, communication system upgrades, etc.); (6) ensure communications among response facilities, field response elements, and offsite command centers by providing a common operating picture of the emergency response and shared situational awareness among all teams. This must be accomplished by enabling access to unclassified emergency response information, such as notification forms, emergency status updates, plume projections, significant events data, and field monitoring data. (DOE Order 151.1D, Attachment 3, Paragraph 11.b)*

DOE Order 151.1D requires that sites provide effective communications among response organizations throughout an emergency and describes effective methods of communication among event scene responders, the ERO, and response facilities. Additionally, DOE Order 151.1D requires sites to develop, implement, and maintain an integrated, coordinated emergency response. Effective communications and interoperability within and between response teams lead to a common operating picture of the emergency response and shared situational awareness among all teams, as well as offsite organizations.

Interoperability between teams is the capability to develop a common operating picture and work seamlessly together to protect responders, workers, and the public while mitigating the effects of the incident. Obtaining situational awareness and sharing a common operating picture among teams is one of the most difficult but important responsibilities of an ERO.

Establishing effective communications and interoperability to support a common operating picture and situational awareness is a continuing challenge to the DOE's emergency management enterprise. Lack of proficiency among emergency response teams, inadequate or no communication implementing procedures, and ineffective use of web-based incident information management system all contribute to this condition.

### **Strengths**

SRS and SNL/NM exhibited some strengths in the area of communications during the observed exercises, particularly with respect to communications within teams and initial dispatching of first responders. For example, at both sites, teams quickly and effectively dispatched the fire department and initial responders, initially recorded information in the computer-aided dispatch system, and answered phone calls during the first minutes of the exercise. SRS control room operators maintained clear concise communications, recorded appropriate events, and conducted effective briefings internal to their team throughout the incident. Additionally, the site operations sector officers maintained adequate communications with the incident commander (IC) by providing routine status reports of patient and response activities. The SNL/NM combined IC established and maintained adequate command and control within the field elements and maintained effective internal field communications throughout the exercise.

### **Weaknesses**

Instances of inadequate proficiency in interoperability and communications among response teams led to weaknesses in establishing situational awareness and a common operating picture. (Note: EA reported similar concerns in each of lessons learned reports for the last four years.) During one exercise involving a HAZMAT gas release at one facility and a nitric acid spill at an adjacent, but separate facility, responders did not communicate and coordinate their actions and placed the nitric acid spill incident operations sector command post within a potentially hazardous sector. During another exercise, the site issued conflicting PAs using unfamiliar terminology and members of the work force did not know whether the PAs applied to them or not. Additionally, the IC provided a minimal number of situational reports and did not provide the Incident Action Plan to the EOC, resulting in the EOC not understanding the priorities and strategy of the IC. At both exercises, limited use of available emergency management information management systems, such as WebEOC, and geographical information capabilities to plot command post locations, plume travel, and survey data led to a reduced common operating picture and situational awareness.

Additionally, some communication weaknesses were due to missing or insufficiently detailed implementing procedures. For example, no communications protocols exist between the EOC and a significant offsite command center at one site. At another site, no procedures supported the increased communications when the incident expanded to multiple incident command sector locations under one IC.

Further, the site did not satisfy all notification information requirements to the DOE Headquarters Watch Office because the offsite notification process did not specify all the required information and actions.

### **2.3 Full-Scale Exercise – Responder Protective Actions**

*Criteria: DOE sites/facilities/activities must identify PAs commensurate for the potential hazards of the site/facility/activity and maintain procedures for prompt issuance of PAs to workers. PAs must be predetermined and serve to minimize emergency-related consequences and maximize life safety and health. (DOE Order 151.1D, Attachment 3, Paragraph 9)*

*An IC qualified at the 29 CFR 1910.120(q)(6)(v) level may use standard industry practices (e.g., DOT/ERG, MSDSs, etc.) in accordance with OSHA 1910.120 for initial immediate PAs. For EPHA facilities, verification that the initial immediate PAs are consistent with the technical planning basis (i.e., EPHA/EALs) for the facility is required within 15 minutes of protective action issuance and implementation. (DOE Order 151.1D, Attachment 4, Paragraph 9.g)*

DOE places a high priority on protecting the health and safety of workers, including first responders, and requires that sites promptly issue predetermined PAs to ensure their protection. DOE guides EMG 151.1-2 and EMG 151.1-4 stress that initial PAs should be independent of wind direction due to the uncertainties of meteorological conditions and the need for a prompt decision process and should be based on the distance/area projected to exceed PA criteria to apply this concept. Furthermore, the order acknowledges use of the Department of Transportation *Emergency Response Guidebook* for initial immediate PAs by a qualified IC, with the constraint that these PAs must be quickly verified as consistent with the technical planning basis. The *Emergency Response Guidebook* uses the term “Initial IZ” to define clear and unambiguous PA information to protect first responders and onsite workers. The Department of Transportation defines the initial IZ as the area surrounding the incident in which persons may be exposed to dangerous (upwind) and life-threatening (downwind) concentrations of material area, and all personnel without appropriate PPE should be evacuated from this area.

Most EPHAs appropriately identify distances to PA criteria and thresholds for early lethality (TELs) for HAZMAT events; nevertheless, these determinations are not always translated into clear and unambiguous PA information for first responders.

#### **Strengths**

Effective implementation and use of predetermined PAs at SNL/NM strongly promote the preplanning suggested by DOE Order 151.1D and the EMG. SNL/NM uses the concept of an IZ in the EALs to provide clear situational awareness of the distance where use of PPE is required to protect against HAZMAT exposure. Once the SNL/NM IC declared the IZ (which equates to the Department of Transportation initial IZ), the responders readily established the incident command post outside the IZ and appropriately conducted habitability monitoring at the command post.

#### **Weaknesses**

Sites have not always minimized emergency-related consequences to responders by establishing a clear, unambiguous IZ. One site ERO did not emphasize the use of PPE or habitability monitoring to responders within the potential exposure area, increasing the potential for exposure of first responders to HAZMAT. During the last two years, the ERO (decisions makers and support staff) at three of four sites where exercises were assessed did not provide guidance to the first responders on the potential area of HAZMAT exposure (related to a microscale meteorological analysis (1 kilometer or less)) near the point of release. An accurate, microscale meteorological analysis requires a sophisticated understanding of the

local atmospheric transport/dispersion environment, as well as accurate information on current meteorological conditions and a high degree of confidence in the forecast. Because most sites in the complex do not have this capability, a 360-degree IZ is appropriate. When a 360-degree IZ is not employed, PA decisionmakers rely solely on wind direction to determine the safe location for first responders. Overall, this approach increases the potential for exposure of first responders to HAZMAT.

## 2.4 Issues Management

*Criteria: DOE sites/facilities/activities must identify improvements that consist of corrective actions and lessons learned.*

- *Develop corrective actions for findings identified during evaluations, assessments, drills, exercises, and actual emergencies.*
- *Use a formal tracking system to track completion of corrective actions. This tracking system may be part of a site/facility/activity action tracking system.*

*(DOE Order 151.1D, Attachment 3, Paragraph 14.b.(1))*

*Defense Nuclear Facilities must perform the following:*

- *Conduct causal analysis to determine corrective actions for findings identified as a result of noncompliance for life safety.*
- *Develop formal corrective action plans for identified findings. The corrective action plan must be approved by the Cognizant Field Element Manager. The Cognizant Field Element Manager must ensure effective corrective actions are tracked, identified, and implemented.*
- *Evaluate the effectiveness of corrective actions through verification and validations conducted by an independent reviewer.*
- *Identify compensatory measures for findings until causal analysis is performed and corrective actions are identified and implemented.*

*(DOE Order 151.1D, Attachment 4, Paragraph 15.(j).(1)-(4))*

The purpose of emergency management issues management is to continually improve the program through reliable implementation of corrective actions for findings from evaluations, including exercises, self-assessments, and external assessments. All sites implement a corrective action program based on DOE Orders 414.1D and 226.1B; however, DOE 151.1D has additional issues management requirements. DOE Order 151.1D requires the implementation of corrective actions and evaluation of their effectiveness. The verification and validation process must confirm that the corrective action has been put in place and has been effective in resolving the original finding. EMG 151.1-3 describes an acceptable methodology for an issues management program and provides guidance on the development of corrective actions, including the need to analyze causal factors.

All DOE sites that EA visited in 2018 showed some improvement in addressing emergency management issues management as part of the site's issues management program for previously identified findings. A rigorous causal analysis process can identify all of the significant causes contributing to the finding and enable the development of corrective actions to prevent recurrence. Implementation of an independent

verification and validation process helps to ensure that the corrective actions are complete and effectively resolve the original findings.

### **Strengths**

Pantex developed a robust process for making emergency management program improvements. Pantex significantly improved its independent verification reviews and included testing using performance-based techniques for completed corrective actions. The effectiveness reviews showed attention to detail on the part of the reviewers and used performance for validation when appropriate and identified additional corrective actions to further improve the emergency management program.

### **Weaknesses**

Corrective actions at two sites did not consistently resolve the original issue or fully address the findings from the assessments or exercises and prevent recurrence. Sites did not develop adequate causal analyses, resulting in ineffective corrective actions, and did not perform adequate verification and validation of the effectiveness of the corrective actions.

Corrective actions at one site did not fully address one finding and did not include validation of the effectiveness of corrective actions in preventing recurrence of the original finding. During the 2018 exercise, several observed performance weaknesses were similar to those documented as findings during a previous full-scale exercise. Similarly, at another site, the corrective actions for two EA findings did not fully address the identified weaknesses. For one finding, the causal analysis did not adequately determine corrective actions for a finding identified during an exercise. The emergency management organization incorrectly determined that the impact of the finding was insignificant and therefore did not require an in-depth causal analysis. The second finding was closed even though the corrective actions did not fully resolve issues in the original finding, and the corrective action plan did not include verification and validation of the effectiveness of the corrective action.

## **3.0 BEST PRACTICES**

During 2018, EA identified one new best practice and noted that SRS and SNL/NM initiated use of Exercise Builder, which was identified as a best practice in previous lessons learned.

SNL/NM utilizes an IZ concept for identifying PAs in the EALs. This concept addresses PAs for responders within a specified distance of the event where, regardless of wind direction, potential exposures may exceed acute exposure guideline levels (AEGl-3) or 100 rem consequences (or TEL). The approach provides all responders with clear situational awareness of the distance where use of PPE is required and habitability monitoring to confirm the HAZMAT exposures is needed.

Exercise Builder effectively supports the site exercise program from the start of initial exercise planning through execution and evaluation of the exercise and completion of the after-action report. Importantly, the pre-loaded Exercise Builder baseline generates the exercise objectives and the exercise evaluation guides, including response steps and evaluation checklists and criteria. This approach ensures that each exercise objective has associated evaluation information, such as the stated objective, the applicable evaluation criteria from the EMG, and an evaluator checklist. Sites can also tie the evaluation criteria to the evaluator's checklist, citing the applicable reference from the site's plans or procedures in the exercise evaluation guide. Overall, this approach can significantly reduce the time required to prepare drill and exercise packages and after-action reports, while also increasing consistency and improving the effectiveness of the drill and exercise process.

## 4.0 RECOMMENDATIONS

These recommendations are based on the analysis of EA assessments as summarized in Section 2. While the underlying deficiencies and weaknesses from individual reviews did not apply to every site reviewed, the recommended actions are intended to provide insights for potential improvements at all DOE sites. Consequently, DOE 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.

### DOE Office of Emergency Operations

- Encourage the consistent protection of first responders by emphasizing the requirements for determining clear and unambiguous PAs for field responders across the complex.
- Promote the increased use of use training, drills, and exercises to improve situational awareness and a common operating picture within the ERO.

### DOE Field Element Managers

- During assessments of the contractor's readiness assurance program, focus on areas of continuing weaknesses that indicate the potential need for improvement. Verify that:
  - Exercise planning and scheduling activities lead to varied and challenging exercises at required periodicity at all facilities or groups of facilities addressed in EPHAs.
  - All emergency response elements and capabilities are validated over a five-year period.
  - Observable, measurable exercise evaluation criteria are used.
  - Causal analysis implemented in the contractor's issues management program is appropriate for the significance of the finding.
  - When implemented, corrective actions will prevent recurrence of findings.
  - Independent verification and validation are thorough and performance-based (e.g., validated in an evaluated drill or exercise).

### Site Contractors

- Use the exercise program not only to ensure that emergency plans, procedures, and resources are adequate, but also to identify opportunities to make timely program improvements and upgrade responder proficiency. Specific actions include ensuring that:
  - Exercise planning and scheduling activities lead to a full spectrum of varied and challenging exercise scenarios at all facilities or groups of facilities addressed in EPHAs.
  - Exercise program plans and schedules address and validate all response elements and capabilities over a five-year period.
  - Specific actions and time requirements are identified and validated by using Exercise Builder software (or a similar approach) to develop observable, measurable exercise evaluation criteria based on site- or facility-specific procedures and checklists.
- Use training, drills, and exercises to emphasize improving situational awareness and a common operating picture within the ERO. Specific actions include:
  - Ensuring that implementing procedures provide detailed guidance and direction for communications.
  - Increasing the number of short, hands-on training drills focusing on different aspects of communications and emphasizing the importance of clear, concise communications.

- Highlighting the importance of the effective and proficient use of information management systems, such as WebEOC.
- Enhance the protection of field responders by using a 360-degree IZ to consistently protect field responders near the event scene, where potential acute exposure guideline levels (AEGL-3) or 100 rem consequences (or TEL) may be exceeded.
- Focus the readiness assurance program on corrective actions that will prevent recurrence of findings. To that end, ensure that:
  - Causal analysis is performed at a level that is appropriate for the significance of the finding.
  - Verification and validation steps are incorporated in the issues management implementing procedure(s) for all exercise performance findings and externally identified programmatic findings.
  - The emergency management program administrator is involved in the closure of all corrective actions originating from exercise findings.

## **Appendix A Supplemental Information**

### **Office of Enterprise Assessments Management**

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**Appendix B**  
**Source Documents**

- EA Report, *Office of Enterprise Assessments Assessment of Sandia National Laboratories/New Mexico Emergency Management Exercise Program*, August 2018
- EA Report, *Office of Enterprise Assessments Assessment of the Savannah River Site Emergency Management Exercise Program*, October 2018
- EA Report, *Office of Enterprise Assessments Assessment of the Pantex Plant Emergency Management Program*, December 2018