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

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Office of Enterprise Assessments
U.S. Department of Energy

Table of Contents

Acronyms

CNS	Consolidated Nuclear Security, LLC
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	DOE Office of Enterprise Assessments
EMG	Emergency Management Guide
EOC	Emergency Operations Center
EPHA	Emergency Planning Hazards Assessment
ERO	Emergency Response Organization
FBP	Fluor-BWXT Portsmouth, LLC
GIS	Geographic Information System
HAZMAT	Hazardous Material
IC	Incident Commander
ICP	Incident Command Post
KSA	Knowledge, skill, and ability
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
MSTS	Mission Support and Test Services, LLC
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
PA	Protective Action
PAR	Protective Action Recommendation
PORTS	Portsmouth Gaseous Diffusion Plant
SimCell	Simulation Cell
Y-12	Y-12 National Security Complex

Lessons Learned from
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U.S. Department of Energy Sites
June 2019 – August 2020
Summary

Scope:

To continue to evaluate the effectiveness of U.S. Department of Energy (DOE) emergency management programs, the Office of Environment, Safety and Health Assessments, within the Office of Enterprise Assessments (EA), conducted emergency management exercise program assessments at three DOE sites during calendar year 2019 and one site in early calendar year 2020. Three of the assessed sites are under the direction of the National Nuclear Security Administration, and one is under the direction of the Office of Environmental Management. This lessons learned 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. The report documents the lessons learned from these assessments and considers the results of previous EA emergency management lessons-learned reports, which identified several similar weaknesses.

Significant Results for Key Areas of Interest:

During 2019 and early 2020, the assessed sites demonstrated generally well-developed and effectively implemented programs and the exercise observations revealed high levels of proficiency in the implementation of some response elements. Nevertheless, the assessments also identified some areas of weakness. These weaknesses involved the effectiveness of exercises, emergency response organization (ERO) communications, and ERO proficiency.

Effectiveness of Exercises

Although observed exercises demonstrated some noteworthy attributes, common weaknesses include exercises that were not sufficiently complex and challenging to fully test the ERO response capabilities, as well as some weaknesses in design, conduct, and evaluation. Several previous lessons-learned reports also identified weaknesses in planning and conducting sufficiently challenging exercises. Exercises that do not test the full range of potential incidents represent missed opportunities to improve the site emergency management program and to validate the ERO's ability to respond promptly and effectively to these incidents.

ERO Communications

The exercises demonstrated several strengths in communications, but some communication weaknesses contributed to difficulties in achieving situational awareness and a common operating picture among ERO members. Not all sites formally define roles and responsibilities for communications in plans and procedures, and some communications led to the sharing of incomplete or inaccurate information. Several previous lessons-learned reports identified similar weaknesses. Achieving a common operating picture among ERO teams is a continuing challenge and is vital to effective command and control of an incident and protective action decision-making.

ERO Proficiency

Exercise observations revealed high levels of proficiency in implementing some response elements; however, the assessments also revealed weaknesses in emergency response capabilities and ERO

responder proficiency; especially in response tool usage, notifications, and protective actions. These weaknesses had not been observed in previous years. As site EROs lose experienced responders, the training, drill, and exercise programs may not afford the less experienced responders with adequate opportunities to become fully proficient.

The weaknesses in exercise effectiveness and ERO communications are similar to those identified in previous EA lessons-learned reports, which indicate some sites may not be evaluating the applicability of lessons learned to their programs and not taking the opportunity to learn from others.

Best Practices:

The 2019 and 2020 assessments identified several best practices, all observed at the Y-12 National Security Complex (Y-12).

- Consolidated Nuclear Security, LLC (CNS) successfully developed and implemented an automated patient tracking tool to track onsite injured personnel status at Y-12 and the Pantex Plant.
- After benchmarking with Lawrence Livermore National Laboratory (LLNL), CNS successfully implemented an automated damage assessment tool and process.
- CNS personnel worked closely with offsite agencies to design and conduct a full participation exercise, which included exercise objectives for over 70 local, state, and Federal agencies.

Recommendations:

Based on an analysis of these assessments, 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.

<u>DOE Office of Emergency Operations and Program Secretarial Offices</u>

- During routine oversight activities and communications with the Field Element and Site Managers, stress the importance of using exercises to test the ERO and to identify appropriate improvements to response capabilities.
- Develop formal guidance that conveys the expectation that Field Element Managers ensure (through their oversight activities) that sites design and conduct exercises that are sufficiently complex and challenging for the ERO.
- Track the progress sites are making in implementing the five-year exercise plans using the sites' Emergency Readiness Assurance Plans.

<u>DOE Field Element Managers</u>

- During review and approval of exercise plans, ensure that the annual exercises are sufficiently complex to test and verify the ERO's readiness to respond to challenging events.
- Formal track the progress sites are making in implementing the five-year exercise plans using the Emergency Readiness Assurance Plans.
- While implementing oversight responsibilities, critically evaluate the ability of the exercise program to validate ERO readiness and facilitate program improvements.

Site Contractors

- Develop and execute exercise scenarios that are sufficiently complex to verify readiness to respond to challenging incidents and to identify appropriate improvements to response capabilities.
- Schedule and conduct a sufficient number of exercise scenarios to validate all response elements and capabilities at all facilities or groups of facilities.
- Analyze the field and ERO information flow dynamics to define the critical paths of key information and to identify expected actions for achieving and maintaining situational awareness among all teams.
    - Adapt an information flow structure that assigns specific responsibility for each key information set.
    - Incorporate detailed guidance and direction for communications in the emergency plan, implementing procedures, and response checklists.
    - Expand the use of automated information systems.
- Evaluate whether newly qualified personnel need additional training, drill, and exercise opportunities to become fully proficient, and adjust the program requirements accordingly.

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the Office of Enterprise Assessments (EA), conducted emergency management assessments at three DOE sites during calendar year 2019 and one site during early calendar year 2020. The objective of each assessment was to determine the effectiveness of specific elements of the emergency management programs, primarily through observation of performance during exercises.

The lessons learned are based on a collective analysis of assessments at these sites, as well as information from other oversight activities and from previous years' reports. Three of the assessed sites are under the direction of the National Nuclear Security Administration (NNSA) and one is under the direction of the Office of Environmental Management. This 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.

Background

The Department's independent oversight 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, which is implemented through a comprehensive set of internal protocols and assessment guides.

In 2019, EA focused its emergency management assessment efforts on observing exercises at the Nevada National Security Site (NNSS), the Y-12 National Security Complex (hereafter referred to as Y-12) on the Oak Ridge Reservation in Tennessee, and the Portsmouth Gaseous Diffusion Plant (PORTS) in Ohio. The observations included two full-scale exercises (complex exercises that test many aspects of an integrated emergency response), one functional exercise (limited to testing of individual capabilities or multiple areas or activities within an exercise program), and one full-participation exercise (an exercise involving multiple levels of DOE organizations, as well as state and local governments). In early 2020, EA observed a functional exercise at Los Alamos National Laboratory (LANL). The emphasis for these assessments was emergency response organization (ERO) performance.

The members of the EA report preparation team, the Quality Review Board, and EA management responsible for this lessons-learned report are listed in Appendix A. Appendix B describes the scope, methodology, requirements, and guidance associated with this report. For the four sites assessed, Table B-1 shows the key elements reviewed, associated contractors, DOE field elements, and DOE Headquarters program offices. Source documents are listed in Appendix C.

2.0 RESULTS

The assessed sites demonstrated generally well-developed and effectively implemented programs with some strengths and certain areas of weakness. Strengths include one site's full participation exercise that challenged both onsite and offsite participants with its complexity and demonstrated significant effort to effectively communicate a common operating picture. In addition to such strengths, the assessments revealed common weaknesses that are discussed further below.

Previous EA emergency management lessons-learned reports identified several weaknesses that are similar to those identified during the 2019 and 2020 EA exercise assessments. For example, previous lessons-learned reports identified weaknesses in exercise program implementation, including exercise design, conduct, and evaluation. Also, as reported in previous lessons-learned reports, some sites are not fully proficient in communications and have difficulty maintaining a common operating picture among response elements and organizations.

2.1 Exercise Design, Conduct, and Evaluation

The assessed exercises revealed some strengths and weaknesses with exercise design, conduct, and evaluation, as discussed below. Areas of weaknesses include designers and evaluators not detecting incorrect onsite protective actions (PAs), postulated hazardous material (HAZMAT) releases inconsistent with the emergency planning hazards assessment (EPHA) inventory, multiple uncoordinated simulation cells (SimCells), and the simplicity of the scenario.

Strengths

Some exercises displayed noteworthy attributes. For example, the full participation exercise at Y-12 involved numerous onsite and offsite organizations, challenged participants with its complexity, and included significant offsite consequences. Likewise, at NNSS, Mission Support and Test Services, LLC (MSTS) designed an exercise to adequately evaluate their worker evacuation procedures and mine rescue operations. At PORTS, Fluor-BWXT Portsmouth, LLC (FBP) and Mid-America Conversion Services successfully integrated an operational drill with the full-scale exercise. At LANL, Triad successfully integrated their exercise with Newport News Nuclear BWXT Los Alamos, the LANL environmental management contractor, and the Los Alamos Fire Department, a county agency that provides fire services to LANL.

Weaknesses

Some areas of exercise design displayed weaknesses. At one site, exercise designers stated in the exercise package that the acceptable onsite PA for facility workers was to shelter-in-place, but the pre-determined PA in the emergency action level listed in the package was to evacuate workers. At a second site, a simulated HAZMAT inventory included significantly more material than allowed in the facility, resulting in protective action recommendations (PARs) that were significantly greater than the worst-case EPHA analysis. At a third site, the exercise did not lead to a demonstration of some consequence assessment activities as intended by the exercise planners. Finally, three of the observed exercises were not complex and did not fully test the capabilities of the ERO. During these exercises, there were no detectable HAZMAT or radiological consequences outside the immediate area of the scene, resulting in the absence of any need for the consequence assessment teams to evaluate the release using their plume models.

Additionally, the exercises at some sites exhibited weakness in exercise conduct. For example, during one exercise, management of two SimCells, one for the joint information center and one for the remaining venues, adversely impacted exercise execution. The SimCells provided injects without players "earning"

the information and did not coordinate their information releases; resulting in inconsistent or delayed information that confused responders. In another exercise, when offsite PAR distances significantly exceeded the worst-case EPHA distances, controllers curtailed appropriate questioning by players. This action, combined with modeling errors, resulted in the inability to validate some consequence assessment capabilities.

Finally, exercise evaluations at two sites were not fully effective. For example, at one site, evaluators did not immediately identify that sheltering facility workers was not in accordance with approved procedures. Additionally, the exercise package did not include evaluation criteria for validating important procedure instructions that could have been demonstrated during the exercise. At another site, the exercise evaluation criteria did not contain objective measures (objectives were either vague or missing), leading to subjective evaluations that diminished the ability to validate plans and procedures.

EA emergency management lessons-learned reports for calendar years 2016, 2017, and 2018 identified several weaknesses that are similar to those identified during the 2019 and 2020 EA assessments. The 2016 lessons-learned report identified a full-scale exercise that did not validate the integrated emergency response capability or demonstrate PAs. The following year's lessons-learned report identified that exercise scenarios have not always demonstrated that the EROs can effectively respond to the full spectrum of HAZMAT events or use the full set of ERO capabilities. The 2018 lessons-learned report identified that sites are not always conducting the number of exercises necessary to demonstrate the effectiveness of all capabilities of the ERO over a five-year period. When the full range of response procedures and capabilities are not tested periodically, the ERO may not be prepared to respond promptly and effectively to events with potentially adverse impacts to workers and the public. In addition, exercises with restricted scope represent missed opportunities for the site to implement, analyze, and evaluate response plans and procedures, and improve the emergency management program.

2.2 Emergency Response Organization Communications

The assessed sites showed some areas of strength in the communication response element, nevertheless, the DOE enterprise continues to have challenges in establishing overall effective communications during an emergency response. In particular, sites with procedurally well-defined ERO communications, rigor in information collection and dissemination, and proficient use of a geographic information system (GIS) demonstrated effective communications that resulted in shared situational awareness among response teams. Conversely, sites that do not focus on these attributes have difficulty achieving a shared situational awareness.

Strengths

During Y-12's full-participation exercise, Consolidated Nuclear Security, LLC (CNS) demonstrated effective integration of its onsite plans with the *State of Tennessee Multi-Jurisdictional Emergency Response Plan for the DOE Oak Ridge Reservation*, which resulted from the significant effort CNS expended in offsite communication planning. As part of the integration, a state liaison, who was stationed in the emergency operations center (EOC), and the field monitoring team coordinator, who was stationed in the state field monitoring coordination center, ensured continuous and effective communications and coordination between the two organizations. Further, CNS effectively integrated the GIS with the automated information management system to display field monitoring survey results on a real-time basis and used the information to lift worker PAs. Finally, at PORTS, FBP demonstrated rigorous communications by effectively and promptly notifying workers of PAs directed by the crisis manager.

Weaknesses

At two sites, the contractors have not defined ERO communications sufficiently (in plans and procedures) to effectively establish a common operating picture and situational awareness. For example, at one site, the contractor had not fully defined the interface between the 24-hour duty officer and the incident commander (IC) to communicate up-to-date field information after the initial briefing. Subsequently, during the initial briefing to the EOC staff by the duty officer, one hour after the incident initiation, the duty officer provided information that was dated and did not properly describe the existing conditions related to the health and safety of workers. At another site, on-scene responders did not confirm that the duty officer and the 24-hour notification center staff received important incident information needed to correctly classify the incident. This resulted in the selection of an emergency action level that was not based on known entry conditions.

Also, the communications sometimes resulted in sharing incomplete or inaccurate information among response organizations. At one site, the 24-hour duty officer did not inform the IC of a second incident scene, classified as an Alert, until well into the exercise. At another site, the ERO identified incorrect release locations, and EOC staff were not made aware that employees close to the release had not been evacuated as required. Additionally, errors and omissions on a site's offsite notification forms led to providing misinformation to offsite organizations, such as offsite PARs and extent of damage.

Finally, although sites have established GIS as an ERO tool, it is often not always used to its full capability. At one site, the ERO collected field measurements in the vicinity of the incident, but the ERO did not display the monitoring results and locations to assist in the ERO's understanding of the release consequences (with respect to wind direction and potential impacts to worker PAs). At a second site, the ERO denoted an incorrect building for the location of the release, which adversely affected the determination of the PAs.

EA emergency management lessons-learned reports, such as those for the previous three calendar years, identified several weaknesses that are similar to those discussed above. For example, the previous reports concluded that poor communications, inadequate use of information management tools, insufficiently detailed response procedures, and lack of proficiency in interoperability and communications among response teams sometimes contributed to weaknesses in establishing situational awareness and a common operating picture. Obtaining situational awareness and sharing a common operating picture among teams is one of the most difficult yet most important responsibilities of an ERO, and presents a continuing challenge to the DOE complex. The absence of a common operating picture may result in ineffective command and control of an incident, as well as decisions based on incomplete or inaccurate information.

2.3 Emergency Response Organization Proficiency

EA observed high levels of proficiency in some elements of response, but the apparent effects of the loss of knowledge, skills, and abilities (KSAs) within some EROs were evident in some response weaknesses. The loss of experienced, competent, and proficient ERO responders, and their replacement with less experienced employees, can have a profound effect on maintaining effective response capabilities. With the changes in demographics, training, drill, and exercise programs that may have been effective in the past may not be as effective now and in the future.

Although training and drill programs provide responders with information on available response tools and their purposes, less experienced responders may not have adequate opportunities to improve proficiency, acquire information, understand consequences, practice vital tasks, and correct performance issues - by using the tools or receiving critical feedback during drills and exercises. Further, some response procedures do not always contain sufficient details on roles and responsibilities, give clear implementing

instructions, or specify recordkeeping requirements. Lastly, less experienced ERO responders often do not have mentoring and coaching opportunities from retiring ERO responders who have experienced many exercises and, in some cases, real-world events.

Strengths

The four exercises revealed high levels of proficiency in the implementation of some response elements. For example, during the NNSS exercise, MSTS demonstrated an effective response for classifying the emergency, formulating PAs, performing consequence assessment, and acquiring offsite assets to support response at the scene. At Y-12, CNS demonstrated a high level of competency in the use of the GIS to determine PA zones, which are displayed at multiple ERO venues for improved situational awareness. At PORTS, the ERO demonstrated proficiency and timeliness in classifying the emergency and verbally notifying offsite stakeholders. At LANL, Newport News Nuclear BWXT Los Alamos, LLC and the Los Alamos Fire Department quickly initiated appropriate initial PAs at the incident scene.

Weaknesses

The assessments revealed weaknesses in emergency response capabilities and responder proficiency, especially with response tool usage, notifications, and PAs. Some emergency responders did not use the readily available tools or used them incorrectly. In some cases, responders did not know how to enter the data into information management systems or use other means to distribute the information to others; this lack of knowledge affected situational awareness. At one site, unfamiliarity with consequence assessment tools resulted in consequence assessment staff applying incorrect release fractions, which led to an inaccurate plume plot. At a second site, responders did not use available tools, such as an incident command briefing form, which affected situational awareness at the incident command post (ICP).

All sites exhibited weaknesses in developing and disseminating timely, accurate emergency notification form information. Sites struggled to gather and enter accurate information, including the time of discovery, description of the emergency, onsite PAs, and PARs. Some responders were not aware of information sources that provide accurate information for notification forms.

Lastly, most sites were not consistently proficient in developing and implementing PAs. During one exercise, a responder entered an incorrect PA distance into a PA determination tool, which resulted in incorrect PA decision-making. Also, incorrect PA distances resulted from the responder's unfamiliarity with, and misapplication of, procedure steps. During another exercise, responders were not proactive in obtaining emergency director approval of PA announcements. The delay extended completion of employee PA notifications beyond 10 minutes. Consequently, some employees remained in a potentially unsafe location, increasing the risk of adverse health and safety impacts. At a second exercise, decision-makers directed workers to evacuate to an area assumed to be outside the PA area, but the area was actually inside the PA area. During the same exercise, a responder, who did not have the authority to lift PAs, inappropriately relocated the evacuated workers back to the scene area without the senior decision-maker's knowledge. Finally, some responders were not knowledgeable of roles and authorities, and some decision-makers were not familiar with and did not use available tools, such as GIS, to determine safe evacuation areas.

3.0 BEST PRACTICES

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: (1) has been demonstrated to substantially improve safety or security performance of a DOE

operation; (2) represents or contributes to superior performance (beyond compliance); (3) solves a problem or reduces the risk of a condition or practice that affects multiple DOE sites or programs; or (4) provides an innovative approach or method to improve effectiveness or efficiency.

Patient Tracking Tool

CNS successfully developed and implemented an automated process to track the status of onsite injured personnel, including a database interface that supports identifying, tracking, and validating injured personnel information, at both the Y-12 and Pantex sites. The process was validated using 15 onsite injuries during Y-12's robust full-participation exercise. Key factors in the success included: formally documenting the process, assigning a single ERO responder responsibility for validating and maintaining patient status, assigning emergency medical services sector support to collect and provide initial field information, and implementing an automated information status board to maintain and display patient status.

Damage Assessment Tool

By benchmarking with Lawrence Livermore National Laboratory (LLNL), CNS successfully developed and implemented an automated damage assessment process. LLNL shared its damage assessment process and procedures with CNS. LLNL uses the process to assess and track damage to buildings, and assist in prioritizing response. CNS automated and integrated the process into its Emergency Management Information Network System and GIS. The process allows CNS to obtain and maintain situational awareness on multiple Y-12 buildings and provides a response priority for each building based on strategic information, such as damage sustained, building stability, occupancy, and essential functions impacted. Real-time integration with the GIS provides a highly useful, color-coded, interactive graphical status map.

Offsite Relationships and Coordination

At Y-12, CNS worked closely with offsite agencies to design and conduct a full-participation exercise involving numerous local, state, and Federal agencies and including objectives for every agency in the exercise package. Over 70 local, state, and Federal agencies were involved with numerous planning meetings prior to the exercise.

4.0 RECOMMENDATIONS

These recommendations are based on the analysis of EA assessments as summarized in Section 2. While the weaknesses from individual assessments 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 and use of the following recommended actions to their respective facilities and/or organizations.

DOE Office of Emergency Operations and Program Secretarial Offices

- Stress the importance of using exercise scenarios that are sufficiently complex to test and verify the ERO's readiness to respond to challenging incidents and to identify appropriate improvements to response capabilities.
- Track the progress that sites are making in implementing the five-year exercise plans in the sites' Emergency Readiness Assurance Plans.

- Develop guidance for and communicate expectations to Field Element Managers to ensure that sites design and conduct exercises with high-consequence scenarios that result in opportunities for the ERO to:
    - Respond to onsite and, if appropriate, offsite impacts to test multiple response elements and capabilities.
    - Respond to damage at multiple HAZMAT facilities.
    - Use emergency action levels with real-time meteorological conditions to determine initial PAs.
    - Confirm the habitability of primary or alternate command centers following a high-consequence incident involving the airborne release of HAZMAT, if applicable.
    - Analyze consequences using timely initial assessment capabilities and use more sophisticated modeling programs during ongoing continuous assessment activities.
    - Demonstrate onsite field monitoring capabilities by including measurable onsite consequences and, if applicable, offsite monitoring capabilities and integration with national radiological response assets.
- Promote the increased use of training, drills, and exercises to improve situational awareness and a common operating picture within the ERO.

DOE Field Element Managers

While implementing oversight responsibilities, critically evaluate the ability of the exercise program to validate ERO readiness and facilitate program improvements:

- During review and approval of the site's exercise plans, ensure that exercise scenarios are sufficiently complex to test and verify the ERO's readiness to respond to challenging incidents and to identify appropriate improvements to response capabilities.
- Through review of the site's exercise schedule, confirm that a sufficient number of exercise scenarios are planned to adequately validate all response elements and capabilities at all facilities or groups of facilities.
- Through oversight of drill and training programs, ensure that a sufficient number of training activities and drills are conducted to maintain and improve responder proficiency.
- Ensure that new operating contractors maintain continuity with the outgoing contractor's 5-year exercise schedule, in order to validate all response elements and capabilities within a 5-year period.
- In review and submittal of the Emergency Readiness Assurance Plan, formally track the progress that the site is making in implementing the site's five-year exercise plan.

Site Contractors

To improve the ability of the exercise program to validate readiness and facilitate program improvements:

- Develop and execute exercise scenarios that are sufficiently complex to verify the ERO's readiness to respond to challenging incidents and to identify appropriate improvements to response capabilities.
- Schedule and conduct a sufficient number of exercise scenarios to validate all response elements and capabilities at all facilities or groups of facilities.
- Fully implement DOE's Exercise Builder computer-based program for design and evaluation of exercises.
- Use successful exercise programs at other DOE sites, such as those at the Y-12 and the Pantex Plant, as a baseline for improvement opportunities.

To improve exercise design, conduct, and evaluation:

- Work closely with all involved offsite agencies to clearly define exercise objectives for each agency.
- Include site organizations with potential response roles, such as laboratory experiment owners, security, transportation, and explosives handling, in the exercise planning process.
- Conduct detailed, thorough controller and evaluator training and briefings to ensure that controllers and evaluators understand the objectives being evaluated, key behaviors to observe, and acceptable questioning by players.
- Provide exercise injects in a realistic format using normal work processes and operations protocols, and ensure that injects are consistent with consequences and expected response.
- Develop and use exercise evaluation criteria that are based on site-specific plans and procedures to promote objective validation of response elements.

To ensure that the Emergency Operations System provides a complete common operating picture and shared situational awareness during an emergency:

- Analyze the field and ERO information flow dynamics to define the critical paths of key information and to identify expected actions for achieving and maintaining situational awareness among all teams.
- Adapt an information flow structure that assigns specific responsibility for each key information set, including responsibility to verify and validate essential incident information collected in the automated information management system.
- Incorporate detailed guidance and direction for communications in the emergency plan, implementing procedures, and response checklists.

To improve internal ERO communications and promote a common operating picture and shared situational awareness during an emergency:

- Develop a briefing checklist tool that covers response priorities, key incident information, and objectives to ensure that vital and accurate information is communicated during briefings and bridge-line calls among decision-makers.
- Apply conduct-of-operations protocols for written and verbal communications more rigorously.
- Institute periodic bridge-line calls among ERO elements (e.g., ICP, EOC, duty officer, joint information center) to share information simultaneously.
- Institute periodic ICP briefings among the IC and ICP support team leaders to share information simultaneously and ensure a common operating picture.
- Capture and display key incident information in the automated information management system on a real-time basis.

To promote a common operating picture and shared situational awareness during an emergency, expand the use of electronic information systems:

- Install an automated information management system, such as WebEOC or Emergency Management Information System, in all site response facilities, including the high-hazard facility command centers, 24-hour duty officer location, EOC, consequence assessment team, joint information center, and at the ICP to foster interoperability with the field and response centers.
- Integrate an automated information management system for daily automated log keeping (in the 24-hour duty officer and fire and rescue dispatch locations at applicable sites) with the system utilized during an emergency.
- Use an integrated GIS and automated information management system for such functions as tracking responder locations, geographically mapping PA zones, and assessing facility damage.

To improve the proficiency of newly qualified responders in performing emergency response capabilities:

- Assess the collective training, drill, and exercise program for individuals and ERO teams to account for changes in ERO demographics and the different levels of responders' KSAs, and adjust the program requirements accordingly.
    - Conduct additional drills to supplement exercises, with emphasis on demonstration of skills and competency.
    - Conduct additional exercises and evaluated drills (more than the minimum requirement of one exercise or performance drill annually) as a means to validate responder proficiency.
- Establish coaching and mentoring opportunities for less-experienced ERO responders by more experienced ERO responders.

To improve responder proficiency in performing emergency response capabilities, particularly communications:

- Review ERO qualification/requalification requirements and ensure that emphasis is on demonstrating proficiency rather than simple participation.
- Increase the number of short, hands-on training drills focusing on different aspects of communications, and emphasize the importance of clear, concise communications.
- Conduct exercises focused on proficiency in roles and understanding of effective communication pathways.
- Ensure rigorous, critical proficiency assessments for key, high-impact ERO positions.
- Highlight the importance of the effective and proficient use of GIS.

Appendix A
Supplemental Information

Office of Enterprise Assessments (EA) Management

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Appendix B
Scope, Methodology, Requirements, and Guidance

Scope and Methodology

This report reflects an analysis of collected lessons learned from EA emergency management exercise assessments completed during 2019 and early 2020. During that time, EA published four assessment reports that included analysis of two full-scale exercises, two functional exercises, and one full-participation exercise. EA also assessed readiness assurance, including exercise programs, and followed up on some findings from previous assessments. Table B-1 lists the sites, along with the key elements assessed, contractors, local DOE offices, and DOE Headquarters program offices.

Table B-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
Nevada National Security Site (NNSS)	Full-Scale Exercise Exercise Program Exercise Design and Conduct Readiness Assurance (EA finding review)	Mission Support and Test Services, LLC (MSTS)	Nevada Field Office	NNSA
Y-12 National Security Complex	Full-Participation Exercise Functional Exercise Exercise Design and Conduct	Consolidated Nuclear Security, LLC (CNS)	National Nuclear Security Administration Production Office	NNSA
Portsmouth Gaseous Diffusion Plant (PORTS)	Full-scale Exercise Exercise Design, Conduct, and Evaluation 2013 Assessment Finding Follow-up	Fluor-BWXT Portsmouth, LLC (FBP) Mid-America Conversion Services, LLC	Portsmouth/Paducah Project Office	Office of Environmental Management
Los Alamos National Laboratory (LANL)	Functional Exercise Exercise Design, Conduct, and Evaluation	Triad National Security, LLC Newport News Nuclear BWXT Los Alamos, LLC	National Nuclear Security Administration Los Alamos Field Office (NA-LA) Office of Environmental Management Los Alamos Field Office (EM-LA)	NNSA Office of Environmental Management

During 2019, EA also observed the use of social media in emergency pubic information during full-scale exercises at NNSS and Y-12 and as well as a national exercise at Los Alamos National Laboratory. The team also reviewed DOE Headquarters and site strategy, policy, and implementing documents for the use of social media. The results of these observations and reviews will be published in a separate study report.

Section 2 reflects aggregated issues from the three EA-reports published in 2019, and one report in 2020 and 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 may have resulted in corrective actions or enhancements that are not reflected in these discussions.

Requirements and Guidance

NNSS and Y-12 upper tier requirements flow down from DOE Order 151.1D, *Comprehensive Emergency Management System*, and reflect the new order. Upper tier requirements for emergency management programs at the PORTS flow down from Nuclear Regulatory Commission requirements and DOE Order 151.1C, however, PORTS is transitioning to DOE Order 151.1D, *Comprehensive Emergency Management System*. 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*.

The scope of the assessments included elements from several criteria and review approach documents (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 used these criteria to determine whether the policies, procedures, and operational performance met DOE objectives for effectiveness in the areas examined.

Exercise Design, Conduct, and Evaluation

Criterion: EPHA facilities with facility-level EROs must evaluate facility-level emergency response capability and proficiency annually by initiating response to simulated, realistic emergency situations/ conditions in a manner that, as nearly as possible, replicates an integrated emergency response to an actual event. (DOE Order 151.1D, Attachment 3, Paragraph 15)

Exercises are formal, evaluated demonstrations of the integrated capabilities of a site's emergency response resources that are conducted for the purpose of validating multiple elements of an emergency management program and generating program improvements, when needed. Exercises include realistic simulations of emergencies and test response capabilities, such as, command, control, and communications functions, and event-scene activities.

ERO Communications

Criteria: DOE sites/facilities/activities must provide for continuing effective communications among response organizations throughout an emergency; 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. (DOE Order 151.1D, Attachment 3, Paragraph 11.b)

The operator must establish and implement operations practices that ensure accurate, unambiguous communications among operations personnel. (DOE Order 422.1. Attachment 2, Paragraph 2.d)

A common operating picture of the emergency response and shared situational awareness among all teams are vital to the protection of workers and the public while mitigating the incident. Sites must provide for continuing effective communications among all response organizations and teams throughout an emergency. This communication includes: notification forms, emergency status updates, plume projections, significant events data, and field monitoring data. Additionally, sites must establish and implement practices that ensure accurate, unambiguous communications among emergency response personnel.

ERO Proficiency

Criteria: Develop a training and qualification program to establish and maintain specific emergency response capabilities as determined by the all hazards planning basis. Document the training requirements to include the courses, method of instructions, frequency, and intended audience. Assess ERO member's proficiency at least annually. (DOE Order 151.1D, Attachment 3, Paragraph 5.b)

Develop a formal exercise program that includes a method for determining the appropriate number of exercises, and rotation of exercise scenarios among hazardous material facilities over a five-year period, to ensure demonstration of responder proficiency. (DOE Order 151.1D, Paragraph 15.a.(1))

DOE Order 151.1D requires sites to conduct training, drills, and exercises with the goal of establishing and maintaining emergency response capabilities to enable effective response to events identified in the all hazards planning basis. Additionally, DOE Order 151.1D requires sites to determine the appropriate number of exercises to ensure responder proficiency. Conducting appropriate combinations of training, drills, and exercises, based on the unique needs of an ERO, leads to an ERO that is capable to respond to all hazards.

Appendix C
Source Documents

- EA Report, *Emergency Management Exercise Program Assessment at the Nevada National Security Site – June 2019*
- EA Report, *Emergency Management Assessment at the Y-12 National Security Complex – December 2019*
- EA Report, *Office of Enterprise Assessments Emergency Management Exercise Assessment at the Portsmouth Gaseous Diffusion Plant – February 2020*
- EA Report, *Office of Enterprise Assessments Emergency Management Exercise Assessment at the Los Alamos National Laboratory – August 2020*
- EA Report, *Office of Enterprise Assessments, Office of Emergency Management Assessments, 2016 Best Practices and Lessons Learned – June 2017*
- EA Report, *Office of Enterprise Assessments, Lessons Learned from Assessments of Emergency Management Programs at U.S. Department of Energy Sites – March 2018*
- EA Report, *Lessons Learned from Assessments of Emergency Management Programs at U.S. Department of Energy Sites – May 2019*