



Emergency Management Exercise Program Assessment at the Nevada National Security Site

June 2019

Office of Enterprise Assessments
U.S. Department of Energy

Table of Contents

Acronyms.....	ii
Summary.....	iii
1.0 Purpose.....	1
2.0 Scope.....	1
3.0 Background.....	1
4.0 Methodology.....	1
5.0 Results.....	2
5.1 Emergency Operations System.....	3
5.2 Notifications and Communications.....	5
5.3 Emergency Classification.....	5
5.4 Protective Actions.....	6
5.5 Consequence Assessment.....	7
5.6 Offsite Interface.....	8
5.7 Readiness Assurance.....	8
5.8 Exercise Program.....	9
5.9 Exercise MAKO-19 Design and Conduct.....	10
5.10 Finding Follow-up.....	10
6.0 Findings.....	11
7.0 Opportunities for Improvement.....	11
Appendix A: Supplemental Information.....	A-1
Appendix B: Key Documents Reviewed, Interviews, and Observations.....	B-1
Appendix C: Deficiencies.....	C-1

Acronyms

CAT	Consequence Assessment Team
CRAD	Criteria and Review Approach Document
DM	Duty Manager
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	Office of Enterprise Assessments
EAL	Emergency Action Level
EAT	Emergency Action Team
EEG	Exercise Evaluation Guide
EMA	Emergency Manager Advisor
EOC	Emergency Operations Center
EOS	Emergency Operations System
EPHA	Emergency Planning Hazards Assessment
ERO	Emergency Response Organization
FSE	Full-Scale Exercise
F&R	Fire and Rescue
GIS	Geographical Information System
HAZMAT	Hazardous Material
HE	High Explosives
IC	Incident Commander
IRG	Incident Response Guide
JIC	Joint Information Center
km	Kilometer
LED	Local Emergency Director
MRT	Mine Rescue Team
MSTS	Mission Support and Test Services, LLC
NARAC	National Atmospheric Release Advisory Center
NCSO	Nye County Sheriff's Office
NFO	Nevada Field Office
NFPA	National Fire Protection Association
NNSS	Nevada National Security Site
OCC	Operations Command Center
OFI	Opportunity for Improvement
PA	Protective Action
PAZ	Protective Action Zone
SAE	Site Area Emergency
SimCell	Simulation Cell
U1a	U1a Complex

Emergency Management Exercise Program Assessment at the Nevada National Security Site February 12 – March 21, 2019

Summary

Scope:

The assessment team observed an exercise and reviewed portions of the readiness assurance and exercise programs and resolutions for two 2016 Office of Enterprise Assessment findings to ascertain the effectiveness of the Nevada National Security Site's (NNSS's) response to an emergency and ability to identify program weaknesses and make improvements.

Significant Results for Key Areas of Interest:

Emergency Response Performance

NNSS demonstrated an effective response for classifying the emergency, formulating protective actions, performing consequence assessment, and acquiring offsite assets to support response at the scene.

Although most notifications and communications were adequate, protective measures were not effectively implemented. Evacuees never left the protective action zone and responders did not protect themselves from all hazards. The emergency operations system did not help keep personnel safe from scenario hazards due to a lack of situational awareness.

Readiness Assurance Program

Adequate plans and procedures for an effective readiness assurance program are in place for programmatic assessments. Program implementation is effective at identifying needed improvements. However, the issues management process is not effective in resolving all findings.

Exercise Program

Adequate plans and procedures for an effective exercise program are in place to test most response elements and capabilities. However, going forward, some response elements and capabilities are not identified in the five-year exercise schedule.

Exercise Planning and Conduct

The 2019 NNSS full-participation exercise was appropriately designed to test the response of the emergency response organization to an incident analyzed in the U1a Complex emergency planning hazard assessment. The exercise was appropriately designed and staffed to evaluate the NNSS and offsite response, at the site- and facility-levels, to a hazardous material facility emergency. However, exercise planning did not benefit from participation of subject matter experts to provide realism and better testing.

Resolution of Previous Findings

A 2016 finding related to the backup power system for the emergency operations center is resolved.

A 2016 finding related to issuing protective actions recommendations to offsite authorities for dose projections exceeding protective action criteria beyond the emergency planning zone is not resolved. The site office directed the contractor to reopen the finding.

Best Practices and Findings

There were no Best Practices identified as part of this assessment.

The assessment team identified three findings as part of this assessment. First, the communication between response facilities and responders was ineffective and did not establish a complete common operating picture and shared situational awareness of the emergency response. Second, the evacuation of personnel was not effectively implemented. Third, pre-incident planning with protective actions to minimize on-scene field responder's emergency-related consequences for potential hazards is not adequate.

Follow-up Actions:

No follow-up activities are planned.

Emergency Management Exercise Program Assessment at the Nevada National Security Site

1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Emergency Management Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the emergency management exercise program, a subcomponent of the readiness assurance program, at the Nevada National Security Site (NNSS). The assessment appraised the effectiveness of the NNSS emergency management program by evaluating its readiness to respond to emergencies and to effectively identify and correct program weaknesses. This assessment was conducted within the broader context of a series of assessments of emergency management exercise programs at DOE complex sites.

2.0 SCOPE

This assessment was conducted in accordance with its *Plan for the Office of Enterprise Assessments Assessment of Emergency Management at the Nevada National Security Site, February-April 2019*. As a means to independently assess the health of the emergency management program, the assessment focused on observing demonstrations of emergency response elements during the 2019 NNSS full-scale exercise (FSE) on February 27, 2019. Additionally, the assessment team appraised some programmatic areas of the readiness assurance program and the resolution of two findings identified in EA's 2016 assessment of the emergency management exercise program.

3.0 BACKGROUND

NNSS and its related facilities help ensure the security of the United States and its allies by: supporting the stewardship of the nation's nuclear deterrent; providing nuclear and radiological emergency response capabilities and training; contributing to key nonproliferation and arms control initiatives; executing national-level experiments in support of the National Laboratories; working with national security customers and other Federal agencies on important national security activities; and providing long-term environmental stewardship of NNSS's Cold War legacy. NNSS is required by DOE Order 151.1D, *Comprehensive Emergency Management System*, to have a hazardous material (HAZMAT) program because of the quantities of radiological material and hazardous chemicals used and stored on site. A HAZMAT program consists of 15 elements under DOE Order 151.1D.

The National Nuclear Security Administration Nevada Field Office (NFO) is responsible for the Federal oversight of the NNSS. Mission Support and Test Services, LLC (MSTS) has been the management and operations contractor at NNSS and affiliated facilities since December 2017. The NNSS emergency response organization (ERO) consists of Federal and contractor staff under one consolidated plan.

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In

this report, EA uses the terms “deficiencies, findings, and “opportunities for improvement [OFIs]” as defined in DOE Order 227.1A.

This assessment considered requirements related to DOE Order 151.1C and was adjusted to include portions of DOE Order 151.1D, per the status of local implementation. The criteria that were used to guide this assessment were based on specific objectives and criteria from Section 4.0 of EA’s Criteria and Review Approach Document (CRAD) 33-05, *Contractor Readiness Assurance and Exercise Program*; CRAD 33-07, *DOE/NNSA Emergency Management Exercise Review*; and portions of DOE Order 151.1.D, while the assessment team validated a draft DOE Order 151.D CRAD.

This assessment was based on a sample of data and was not intended to represent a full programmatic assessment of the emergency management program. The assessment team observed the NNS 2019 FSE, called MAKO-19, through the completion of hot washes and exercise evaluation guides (EEGs), but did not evaluate the exercise after-action report because it was not issued during the data collection period. During the exercise, assessment team members made observations at the incident scene, the operations command center (OCC), the emergency operations center (EOC), and the consequence assessment team (CAT) room. The site’s response to the postulated scenario provided the basis for conclusions regarding the effectiveness of NNS’s implementation of DOE Order 151.1D, using methodologies described in NNS plans and procedures. The assessment team examined key documents, such as the emergency plan, implementing procedures, and checklists. The assessment team also conducted interviews with key personnel responsible for developing and executing the associated programs and personnel participating in the exercise.

EA conducted a previous assessment of the emergency management exercise program from February to March 2016, and this 2019 assessment examined the completion and effectiveness of corrective actions implemented to resolve two findings described in the previous report. Results of the corrective action assessments are included in Section 5.10 of this report.

The members of the assessment team, the Quality Review Board, and management responsible for this assessment are listed in Appendix A. A detailed list of the documents reviewed, personnel interviewed, and observations made during this assessment, which are relevant to the findings and conclusions of this report, is provided in Appendix B. Deficiencies are summarized in Appendix C.

5.0 RESULTS

The following results are derived from assessment team observations of the NNS ERO response to its 2019 FSE. The exercise enabled the assessment team to evaluate the effectiveness of the emergency operations system (EOS), notifications and communications, emergency classification, protective actions (PAs), consequence assessment, and offsite interface response elements.

The exercise scenario involved a small plane crashing into a container that was set outside, on the ground, and that represented an intra-site shipment of radioactive material mated with high explosives (HE) to support a National Laboratories experiment at the NNS U1a Complex (U1a). U1a is an underground test facility with access structures and trailers used as work stations at ground level. The exercise postulated that the plane crash resulted in worker injuries and fatalities and a fire. Emergency classification as a Site Area Emergency (SAE) and PAs were required because of the potential for an explosion and the resultant radioactive material dispersion onsite beyond U1a, but the scenario did not present an explosion or radioactive material release.

This report uses terminology specific to NNSS and to present NNSS activities in generic terms. For example:

- MSTs decision-makers use a locally developed *Incident Response Guide* (IRG) for classifying the emergency, identifying the appropriate PAZ, formulating initial PAs, and providing the emergency action level (EAL) function.
- MSTs uses a VESTA Communicator that serves as a site reverse 911 call system.
- MSTs refers to conference calls as “meet-me-calls.”
- The fire department uses emergency planning documents known as “run sheets” that include HAZMAT information about each building for pre-planning the response.
- The mockup shipment representing a National Laboratories experiment is called the HAZMAT container.
- A protective action zone (PAZ) is a circular area with a specified radius.

5.1 Emergency Operations System

Criteria:

DOE sites must have an EOS to provide centralized collection, validation, analysis, and coordination of information related to an emergency. (DOE Order 151.1D, Attachment 3, Paragraph 4)

The EOS must be able to perform the following capabilities: Use standard operating procedures and checklists to establish communications and coordination with incident command; obtain and maintain situational awareness; and disseminate a common operating picture among response components and external partners, as applicable. (DOE Order 151.1D, Attachment 3, Paragraph 4)

MSTs activated its EOS to provide centralized collection, validation, analysis, and coordination of U1a incident information, which took place initially at the OCC and then the EOC. The EOS relies on implementing procedures and response checklists to obtain and maintain situational awareness and to disseminate a common operating picture among response components. Although implementing procedures in some areas of the ERO, such as the consequence assessment, adequately support situational awareness, other procedures did not require consolidated incident updates between the incident commander (IC) and duty manager (DM).

Prior to declaring the EOC operational, the emergency manager advisor (EMA) provided a situational awareness briefing to the EOC cadre with incident information provided earlier by the OCC DM. The EOC effectively used the EOS to support the on-scene command by taking responsibility for site-level and external communications and for obtaining additional response resources. Additionally, the exercise demonstrated adequate functionality of the EOC concept: a single organization with the flexibility to become operational using either or both EOC locations at the North Las Vegas Facility and the NNSS Mercury area. Importantly, the EOC cadre followed the emergency plan, implementing procedures, and response checklists to obtain and maintain situational awareness and disseminate a common operating picture among response components. Once the EOC became operational, meet-me-calls were used effectively for situational awareness among the IC, local emergency director (LED), EOC, and OCC. These frequent calls significantly improved ERO incident awareness, and the IC and LED interfaced well with the EOC.

Although situational awareness was improved after EOC activation, a common operating picture was not established beforehand. Procedures, prior to EOC activation, do not require consolidated incident updates between the IC and DM. Also, both the U1a LED and the IC did not effectively communicate information to the DM and the fire and rescue (F&R) dispatch to support periodic situational awareness updates to the rest of the ERO. The inadequate communication resulted in the incident command post and the OCC having significantly different understandings of important incident information (such as the HAZMAT container integrity, location, and involvement in fire; location of U1a evacuees, and status of PA implementation) at the time the DM briefed the EMA. Situational awareness was also diminished by the DM's untimely initial briefing to the EMA, which occurred one hour after the plane crashed and provided only initial information called-in by witnesses and responders. Consequently, ERO members at remote locations did not know that U1a evacuees never left the PAZ, and first responders did not recognize the need for personal HE protective measures (see Section 5.4). In addition, ERO member discussions about the involvement of HE did not occur until two hours after the plane crash. Further, as the incident evolved, reports by on-scene responders caused confusion about the status of the fire and the integrity of the HAZMAT container. F&R responders reported early on that the fire was out, the container was not breached, and no HAZMAT was released; however, the DM did not confirm this information with the IC. Twenty minutes after the fire was reported extinguished, F&R reported it was still firefighting, and changes in the status of the fire continued over the next hour until the EOC became operational and verified the status of the response. (See **Finding-MSTS-1** and **OFI-MSTS-1**.)

Additionally, collection and coordination of emergency information was not always effective. MSTS relied on WebEOC, a web-based emergency management system, to provide ERO access to real-time emergency incident information, including ERO personnel at the EOC, OCC, and joint information center (JIC), but this system was not populated with information in a timely manner. Minimal incident information was entered into WebEOC before the EOC became operational, which occurred approximately 90 minutes after the plane crash. Further, most of the information from the DM and F&R dispatch was entered into WebEOC hours after the significant events occurred. Although it is important to record this information for recreating an incident timeline, the late entries did not support real-time situational awareness by the ERO. Significantly, F&R did not have a computer-aided dispatch system, which could have eliminated the need to recreate handwritten notes hours after the incident.

Although MSTS has a geographical information system (GIS), minimal use was made of the GIS to correlate event-specific geospatial information, such as event location, with emergency planning (e.g., security barricade locations), response, and logistical information (e.g., incident command post locations, staging areas, PAZ, and evacuation assembly locations) to improve situational awareness, particularly with regard to proximity of evacuees and responders to the scene. (See **OFI-MSTS-2**.)

Overall, communications among ERO locations were not effective until the EOC was activated. During the initial phase of the incident, the EOS's effectiveness was limited to relieving the on-scene command of site-level and external communications and for obtaining additional response resources. Shortly thereafter, the ERO did not have adequate situational awareness as incident information was not updated in real-time. Significantly, MSTS did not effectively use WebEOC, the primary EOS tool, to capture, validate, and share some important emergency information among response facilities and field response personnel. Consequently, inadequate communications and an ineffective emergency information system led to different understandings of the evolution of the U1a incident, and workers and responders were not adequately protected from the hazards. The ERO's situational awareness improved once the EOC was activated, primarily through frequent meet-me-calls.

5.2 Notifications and Communications

Criteria:

Initial notifications must be made promptly, accurately, and effectively to all appropriate stakeholders, within 15 minutes of categorization. (DOE Order 151.1D, Attachment 3, Paragraph 11 and Attachment 4, Paragraph 12)

Provide for continuing effective communications among response organizations throughout an emergency. (DOE Order 151.1D, Attachment 3, Paragraph 11.b.(1))

MSTS demonstrated effective means to provide initial notifications to most onsite response organizations using several mechanisms. The DM successfully used a ring-down line to simultaneously notify occupational medicine, the protective force central alarm station, the Nye County Sheriff's Office (NCSO) in the Mercury area, and the EOC of the U1a incident. The DM immediately followed with an all-networks radio notification to other onsite workers while concurrently dispatching F&R Stations 1 and 2 to respond to the plane crash. After incident classification, the DM resumed onsite and offsite notifications, using a VESTA Communicator as the primary communications system for notifying and activating ERO teams to staff the EOC and the JIC, the mine rescue team (MRT), the industrial hygiene emergency response team, and the radiological emergency response team.

Although most notifications were timely, some ERO notifications were delayed because OCC staffers were overwhelmed with multiple tasks at the beginning of the U1a incident. Additionally, the DM did not have an effective method to track assigned tasks to completion among the OCC, which contributed to the delay in EOC and MRT activation. Further, the ERO did not complete transmittal and confirmation of the initial offsite notification message (NFO-149 Message 1) to all recipients within 15 minutes. MSTS self-identified these issues during a hot wash.

Once the EOC became operational, notifications to Federal and contractor senior managers and offsite organizations effectively devolved to Federal and contractor positions within the EOC cadre. The ERO provided an updated notification form to required recipients within an hour of the EOC becoming operational. ERO members also developed and issued a timely initial situation report containing known incident information, with appropriate MSTS and Federal reviews, which was approved by the emergency manager and Senior Federal Official.

Overall, MSTS demonstrated adequate emergency notifications to emergency response personnel and response organizations. However, some ERO and offsite notifications were delayed because the OCC staff was overwhelmed with multiple tasks. MSTS self-identified these issues during the OCC hot wash.

5.3 Emergency Classification

Criterion:

Operational Emergencies must be classified as promptly as possible, but no later than 15 minutes after identification by the predetermined decision-maker for the categorization, in accordance with the emergency management plan. (DOE Order 151.1D, Attachment 3, Paragraph 8.b)

The OCC DM demonstrated an effective incident classification process. The DM completed incident classification of the U1a incident within 15 minutes using EPIP-OCC.001, *OCC DM Emergency Operations*, based on accurate incident information provided by the U1a LED. The DM and assistant DM independently arrived at the correct EAL, using IRG 2120.002, *IRG*, to declare an SAE. Once the CAT was operational, the CAT confirmed an accurate SAE classification.

5.4 Protective Actions

Criteria:

DOE sites must identify PAs commensurate for the potential hazards of the 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)

DOE sites will provide immediate notification and PAs to affected employees no later than 10 minutes after the PAs have been identified in accordance with the emergency management plans and related procedures. (DOE Order 151.1D, Attachment 3, Paragraph 11.a (3))

Identify authorities for the lifting or adjustment of PAs, once PAs have been taken. An IC may use standard industry practices (e.g., U.S. Department of Transportation (DOT) emergency response guide) in accordance with OSHA 1910.120 for initial immediate PAs. (DOE Order 151.1D, Attachment 4, Paragraph 9)

The DM effectively identified the PAZ and formulated appropriate PAs for non-essential workers for the radioactive material hazard presented in the scenario. The DM quickly established a 6.77 kilometer (km) PAZ using the pre-planned PA guidance linked to the selected EAL in the IRG. The DM issued timely evacuation instructions to the U1a LED. In turn, the LED directed the emergency action team (EAT) leader to evacuate workers to the Mercury area cafeteria, which was outside the PAZ, and then notified workers over a U1a public address system. Meanwhile, the arriving F&R IC effectively used a response decision tool (HAZMAT IQ) for conducting the “line-of-sight” rescue of injured personnel from the vicinity of the fire and HAZMAT container.

The ERO conducted adequate personnel accountability actions to support search and rescue decision-making using EPIP-U1a.001, *U1a Complex Emergency Response Actions*, and FRM-2871, *Shelter-in-place and Evacuation EAT Checklist*. The EAT initiated the accountability process in conjunction with the LED’s order to evacuate U1a and routinely provided the IC with updates of unaccounted personnel. Also, the EAT quickly determined the names of personnel missing underground, which prompted activation of the MRT. Notably, the MRT maintained stringent PA protocols, such as blood gas monitoring and turn-back requirements, during preparation and entry activities.

Although timely pre-planned PAs were ordered, the ERO did not effectively implement the evacuation of U1a personnel as instructed. After directing that evacuees assemble in the Mercury area cafeteria, the LED redirected the EAT leader to evacuate personnel to building 6-900 but was unaware that the building was within the PAZ. The EAT implemented the evacuation to building 6-900, which is only 4.2 km from the incident scene. Then, after the fire was extinguished and before the EMA lifted the PAs—the EMA is the authority for lifting PAs per EPIP-EOC.001, *EOC Emergency Response Actions*—the assistant LED inappropriately relocated evacuees at U1a without the consent of the IC, LED, or EMA. The EOC cadre did not change the 6.77 km PAZ throughout the exercise, even after a reduction was supported by the CAT’s analysis. The assessment team’s limited causal analysis identified procedures and responder proficiency as contributing causes to the inadequate implementation of PAs, such as:

- Procedures do not require the ERO to track PAs to completion.
- Procedures with different units of measure (miles and kms) for the PAZ contributed to the error in relocating evacuees to building 6-900.

- Procedures do not require the DM to use the GIS emergency response mapping application to provide a visual display of the PAZ and the location of responders and evacuees.

(See **Finding F-MSTS-2** and **OFI-MSTS-3**.)

The ERO members also did not adequately protect on-scene responders from the HE hazard by implementing a safe standoff distance. The HAZMAT container was placarded as DOT explosive HAZMAT for application of the *DOT Emergency Response Guidebook*. The emergency response guidebook, which was available at the scene, recommends no firefighting if explosives are involved in a fire and provides a safe standoff distance of 1,200 feet. Additionally, the LED checklist and, later, the CAT provided safe standoff distances. The F&R commanders permitted both firefighters and radiation control technicians to continually perform response duties within 300 feet of the HAZMAT container for the duration of the exercise. The assessment team's limited causal analysis identified that the lack of F&R pre-incident planning forms (run sheets) for the HAZMAT container at U1a and F&R organization not being involved in planning and execution of onsite HAZMAT container movements contributed to not adequately preplanning the F&R response which impacted the protection of on-scene responders. (See **Finding F-MSTS-3** and **OFI-MSTS-4**.)

Overall, MSTS accurately selected the PAZ and ordered appropriate evacuation PAs for the hazards presented in the exercise; PA instructions were provided to U1a workers in a timely manner and the MRT demonstrated stringent PA protocols. Additionally, personnel accountability procedures were adequately implemented to support search and rescue decision-making. However, MSTS did not effectively implement the DM's evacuation orders and lifted PAs without proper authorization. Most significantly, protective measures for on-scene responders were not implemented.

5.5 Consequence Assessment

Criteria:

Establish provisions to conduct a consequence assessment that is integrated with emergency classification and PA decision-making; (DOE Order 151.1D, Attachment 4, Paragraph 10.a)

Establish provisions to conduct a timely initial assessment with the worst-case source term from the EAL using current meteorological conditions. (DOE Order 151.1D, Attachment 4, Paragraph 10.b)

Maintain the capability to use the National Atmospheric Release Advisory Center (NARAC) as part of near real-time consequence assessment activities for corroborating earlier consequence assessment results. (DOE Order 151.1D, Attachment 4, Paragraph 10.c)

The CAT effectively demonstrated its ability to conduct consequence assessment activities that are integrated with emergency classification and PA decision-making. After consulting with the DM, the CAT verified that correct emergency classification and PAs were formulated. The CAT accurately modeled an explosive distribution of plutonium equivalents to confirm the correct emergency classification and that the pre-planned PAZ was implemented. Once finalized, the CAT notified key EOC cadre members of the results, per procedure EPIP-CAT.001, *Consequence Assessment*.

The CAT successfully conducted a timely initial assessment using the worst-case source term, which is the basis for the implemented EAL, and current meteorological conditions, as modified by a controller inject. The Hotspot dispersion modeling program results projected a PAZ of 1.6 km and established a 900-foot standoff distance to keep outdoors personnel safe from a potential HE blast. The CAT notified key EOC cadre members of the results and posted the plume plot on WebEOC.

The CAT effectively performed a corroborating consequence assessment using the NARAC dispersion modeling program. The CAT telephoned NARAC personnel during plume plot development to determine assumptions used in the NARAC program and make modeling adjustments to reflect site-specific usage. The CAT then posted the NARAC plume plot on WebEOC and notified designated EOC cadre members of the results.

At the request of the emergency manager to support a “what if” scenario, the CAT provided an accurate projection to identify the area where a 500 millirem hourly dose could be exceeded and hourly dose projections at building 6-900, where U1a evacuees had relocated. The CAT and the EOC GIS operator provided the results on a site map in the EOC, and a CAT member adequately briefed the EOC cadre of the analysis.

Overall, the CAT was proficient in performing its tasks, verifying incident classification and PAs, performing a timely initial assessment, performing corroborating assessments using the NARAC modeling program, and performing assessments requested by the emergency manager. The assessments were properly integrated into the emergency classification and PA decision-making process through voice and WebEOC mechanisms.

5.6 Offsite Interface

Criteria:

An FSE is designed to test the interface with offsite mutual-aid partners and other organizations that supplement or support response efforts. (DOE Order 151.1D, Attachment 2)

Coordinate agreements with local, state, tribal, and Federal organizations. (DOE Order 151.1D, Attachment 4, Paragraph 7)

Actions during the exercise adequately demonstrated implementation of agreements with NCSO, American Medical Response, and Mercy Air Services and simulated monitoring using Remote Sensing Laboratory - Aerial Measuring System personnel and equipment. Additionally, the initial and updated emergency notifications for the declared SAE adequately demonstrated the interfaces with designated offsite points-of-contact.

Nevertheless, agreements to effectively make notifications about on-scene personnel casualties were not clearly understood by ERO members, and there was significant disagreement among the NFO, MSTs, and NCSO concerning how to verify NNSS fatalities and perform next-of-kin notifications. Senior EOC management disagreed with the emergency plan concept that stated, “Fatalities are verified by law enforcement or the County Coroner (NCSO for the NNSS) and notifications of next of kin are coordinated in accordance with state law, which requires notifications to be done by law enforcement. The applicable Human Resources can coordinate with law enforcement to support the notification process and provide family support.” This policy was not effectively implemented during the exercise. (See **OFI-MSTS-5**.)

5.7 Readiness Assurance

Criteria:

DOE sites must participate in a formal readiness assurance program that establishes a framework and associated mechanisms for assuring that emergency plans and procedures and resources are adequate by ensuring that they are sufficiently maintained, exercised, and evaluated, and that appropriate and timely improvements are made when identified. (DOE Order 151.1D, Attachment 3, Paragraph 14)

DOE sites with Defense Nuclear Facilities must (1) conduct causal analysis to determine corrective actions for findings identified as a result of noncompliance for life safety; (2) develop formal corrective action plans for identified findings; and (3) evaluate the effectiveness of corrective actions through verification and validations conducted by an independent reviewer. (DOE Order 151.1D, Attachment 4, Paragraph 15.j)

For Defense Nuclear Facilities: The corrective action plan must be approved by the Field Element Manager. (DOE Order 151.1D, Attachment 4, Paragraph 15.j (2))

NNSS NFO-EOC-PLN-101, *Consolidated Emergency Management Plan*; PD-EMSS.001, *Emergency Management, Safeguards and Security Assurance Program*; and associated documents provide adequate guidance for an effective readiness assurance program. MSTS tracks a comprehensive set of evaluation criteria based on the DOE *Emergency Management Guide* to easily enable MSTS to identify unreviewed and untested areas that need to be added to its five-year assessment schedule. MSTS also maintains an effective system to track issues identified during its assessments and exercises using an intranet-based electronic system called caWeb. At the end of the fiscal year, MSTS adequately reports the health of its emergency management program, using results from the readiness assurance program, to DOE Headquarters in its emergency readiness assurance plan.

Although the exercise program is effective at identifying findings, MSTS's issues management process is not resolving all findings. For example, similar to issues observed during the 2019 FSE (Section 5.4), MSTS identified that first responders travelled through the explosive blast zone during the NPTEC-18 exercise and MSTS personnel observed that two similar occurrences took place in two other exercises. Additionally, incomplete exercise planning is a recurring problem (Section 5.8). CD-1000.200, *Issue Resolution and Improvement System*, requires "objective evidence of closure consistent with the stated action description and deliverable(s) for each action(s)," but most corrective actions are closed by emails from the issue owner that provide no explanation of the completed actions. The Emergency Management Readiness Assurance Program does not include an adequate effectiveness review through verification and validation by an independent reviewer for findings at Defense Nuclear Facilities. (See **Deficiency and OFI-MSTS-6.**)

5.8 Exercise Program

Criterion:

Sites 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 emergency planning hazards assessments (EPHAs) over a five-year period. (DOE Order 151.1D, Attachment 3, Paragraph 15)

NFO-EOC-PLN-101, *Consolidated Emergency Management Plan*; PD-EMSS.001, *Emergency Management, Safeguards and Security Assurance Program*; CD-2120.020, *Readiness Assurance Program*; and OP-2120.088, *Readiness Assurance Activities*, provide adequate guidance for an effective exercise program. Additionally, the *NNSS Emergency Management Exercise Schedule FY19- FY23* provides a five-year exercise schedule to test most response elements and capabilities, including national assets and severe events. MSTS has also developed EEGs that are based on NNSS procedures and performance criteria, providing an effective means to validate its response concepts.

Nevertheless, going forward, some response elements and capabilities are not identified for validation in the exercise five-year schedule. Specifically, the EOS, emergency facilities and equipment, and termination response elements are not included in the five-year exercise schedule. Moreover, NFO-EOC-PLN-101 identifies an incomplete mix of response elements and capabilities and excludes responses to

mass casualty and criticality incidents. The exercise schedule does not identify tests of communication systems used for offsite agency communications; employee notifications and ERO activations; tests of the alternate OCC; and scenarios for testing site capabilities such as responses to mass casualties, inadvertent criticality, HAZMAT releases from more than one facility, and major infrastructure disruptions. (See **OFI-MSTS-7**.)

5.9 Exercise MAKO-19 Design and Conduct

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)

MSTS appropriately designed an FSE to test its response to an incident analyzed in the EPHA. The scenario tested both the U1a facility-level and site-level EROs and included offsite response assets. The scenario enabled MSTS to evaluate the response capabilities of the F&R, LED, MRT, OCC, EOC, CAT, JIC and offsite support from NCSO, Remote Sensing Laboratory - Aerial Measuring System, and American Medical Response transport. MSTS accomplished this with an adequately staffed controller/evaluator network that was prepared to evaluate using venue-specific EEGs at the observed venues.

Nevertheless, exercise design and planning did not include some important elements that would have provided a more realistic presentation, less confusion to the responders, and a better all-around assessment of the response. For example, the scenario and initiating inject did not accurately reflect the HAZMAT container, exercise design and planning did not account adequately for the security component of the scenario, the ambulance at the site gate was significantly delayed, and the extent-of-player participation was not clearly established. These weaknesses are primarily attributed to not fully incorporating input from subject matter experts during exercise planning. (See **OFI-MSTS-8**.)

Additionally, weaknesses in the management of the two simulation cells (SimCells), one for the JIC and one for the remaining venues, impacted exercise execution because they were not fully coordinated. For example, the SimCell provided injects without players “earning” the information, SimCells did not coordinate information release, and SimCells did not have WebEOC access. Inadequate coordination resulted in participants receiving inconsistent or delayed information that confused responders. (See **OFI-MSTS-9**.)

5.10 Finding Follow-up

In 2016, after the NSF backup power system test and maintenance program was updated to resolve a finding, deviations from the National Fire Protection Association (NFPA)-110, *Standard for Emergency and Standby Power Systems*, remained for the class, type, and test level assigned to a backup system that is the sole source of backup power for emergency lighting. Since then, the deviations were corrected by:

- Establishing the backup power system as an NFPA Class 2 type-10 device
- Revising the test and maintenance program to meet NFPA level-1 requirements
- Performing tests and maintenance activities using the revised program requirements.

During the initial full-load test, the backup power system overheated, leading to the replacement of its cooling system. Load testing following replacement of the cooling system was successful and the contractor closed the finding. These actions resolve the concerns reported in 2016.

In 2016, a second finding was issued because offsite officials were not advised about the potential to expand PAs beyond the NNSS emergency planning zone for some extreme and highly unlikely cases. The operating contractor at the time closed this issue based on its conclusions that NNSS systems and programs had evolved to a point that the substandard conditions cited no longer exist. However, the results of this 2019 assessment do not support the previous operating contractor's conclusion. Subsequently, NFO senior management instructed MSTS to reopen a finding for this issue in its issues management program and fully address the referenced issues stated in *EA Assessment of the NNSS 2016 Full-Scale Exercise DORSET-16 – July 2016*.

6.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and implement corrective action plans for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1A to manage these corrective action plans and track them to completion. In addition to the findings, deficiencies that did not meet the criteria for a finding are listed in Appendix C, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

Mission Support and Test Services, LLC

Finding F-MSTS-1: MSTS did not effectively communicate with NNSS response facilities and responders to establish a complete common operating picture and shared situational awareness of the emergency response. (DOE Order 151.1D, Attachment 3, Paragraph 11.b.(6))

Finding F-MSTS-2: MSTS did not effectively implement the evacuation of U1a personnel. (DOE Order 151.1D, Attachment 3, Paragraph 9.b)

Finding F-MSTS-3: MSTS has not developed adequate pre-incident planning with protective actions to minimize on-scene field responder's emergency-related consequences and maximize responder life safety and health for the hazards they may encounter at the U1a Complex. (DOE Order 151.1D, Attachment 3, Paragraph 9.a)

7.0 OPPORTUNITIES FOR IMPROVEMENT

The assessment team identified some OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may also address other conditions observed during the appraisal process. EA offers these OFIs only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

Mission Support and Test Services, LLC

OFI-MSTS-1: To improve communications among the LED, IC, and DM and promote situational

awareness and a common operating picture among response components, consider revising the emergency plan, implementing procedures, and response checklists to require a timely initial conference call, followed by necessary updates, until the EOC meet-me-calls are implemented.

OFI-MSTS-2: To improve communications among the MSTS response facilities and to provide a complete common operating picture and shared situational awareness during an emergency, consider:

- Acquiring and implementing the DOE-owned EMInS from the NNSA Production Office as the site's primary incident management tool to replace WebEOC
- Installing EMInS in all site response facilities, including the high hazard facility command centers, OCC, EOC, CAT, JIC, and at the incident command post to foster interoperability with the field and response centers
- Using EMInS for daily automated log keeping in the OCC (DM and F&R dispatch)
- Integrating EMInS with the NNSS web-based GIS to provide the ERO with maps, data, and analysis tools for the site, the surrounding area, and interiors of many onsite buildings
- Adapting the information flow structure, which assigns specific responsibility for and ensures verification and validation of essential incident information, into a similar structure for the high hazard facility command centers, OCC, EOC, and CAT
- Integrating EMInS into the incident command post in order to permit access to key response information, such as maps with all responder locations, isolation zones, and plume projections.

OFI-MSTS-3: In order to improve the execution of evacuation PAs, consider:

- Revising the LED checklist to use kms as units of measurement, consistent with the IRG and dispersion modeling programs
- Transferring responsibility for ongoing PAs from the LED to DM or EOC once evacuees are outside of the PAZ
- Revising implementing procedures to fully define the responsibilities of the DM and LED for evacuees outside the facility boundaries
- Revising implementing procedures so that an EOC cadre member is responsible for ensuring ordered PAs are properly implemented
- Revising appropriate ERO checklists (incorporated into EMInS) and procedures to ensure PAs issued by the DM are effectively implemented to completion.

OFI-MSTS-4: To better protect on-scene responders, consider improving the response process, procedures, and checklists by:

- Implementing the isolation zone concept for identifying PAs in EALs, which was noted as a best practice in *Lessons Learned from Assessments of Emergency Management Programs at U.S. Department of Energy Sites*, April 2019

- Applying a 360-degree isolation zone around the incident scene where responders may be exposed to dangerous (upwind) or life-threatening (downwind) concentrations of HAZMAT, a building collapse zone, and/or explosive material requiring a standoff distance
- Defining an isolation zone for field responders within the IRG and pre-incident planning forms based on plausible hazards at high hazard facilities
- Revising U1a pre-incident planning forms with all possible HAZMAT which may be located at U1a
- Including the F&R organization in planning and execution of onsite HAZMAT container movements, such as the movements postulated in the exercise scenario.

OFI-MSTS-5: Consider additional training for ERO personnel on the implementation of the MSTS policy for the authority and process for executing next-of-kin notifications.

OFI-MSTS-6: In order to improve the readiness assurance program, consider:

- Revising CD-2120.020 to identify requirements for performing independent verification and validation activities to measure the effectiveness of resolutions for findings associated with Defense Nuclear Facilities
- Enforcing the requirement from CD-2120.020 that findings identified in the Emergency Management program be assigned priority levels of significant or adverse condition as appropriate
- Enforcing the requirement from CD-1000.200 that objective evidence (e.g., revised procedures, attendance records) be provided within the caWeb system for supporting the closure of findings
- Developing an implementing procedure for the MSTS process for incorporating lessons learned from drills, training, exercises, and external reports.

OFI-MSTS-7: To improve the exercise program, consider:

- Revising exercise program documents to address all 10 emergency management response elements and all response capabilities cited in the NNSS emergency plan
- Developing a matrix that clearly delineates periodicity for and validation of response elements and response capabilities over a five-year period.

OFI-MSTS-8: To improve exercise design and planning, consider:

- Providing a more realistic presentation of exercise data to participants by presenting it in a format that is typical of how information would be available and received using normal work process and operations protocols (transportation plans specifying DOT container types, experimental package data including HE, security plans, plan-of-the day, work packages, etc.)
- Including organizations in the exercise planning process with potential response roles, such as laboratory experiment owners, security, transportation, and explosives
- Ensuring extent-of play is communicated and understood by all participants during pre-exercise briefings

- Briefing exercise controller and responders beforehand on the role of controller and evaluators and how to account for them during the exercise
- Including expedited site access methodologies (the same as those planned for real events) for offsite response assets during exercises.

OFI-MSTS-9: To improve exercise conduct, consider:

- Ensuring that SimCells have the same information available (including WebEOC access)
- Ensuring that information release is coordinated and timed through direct communications between SimCell coordinators
- Ensuring that a complete list of simulation data is available in all SimCells to properly execute the exercise and test player performance
- Ensuring that controllers proactively drive key scenario timing elements, such as when a fire is extinguished
- Ensuring that the timing and conduct of the hot washes do not impact play at other venues.

Appendix A Supplemental Information

Dates of Assessment

February 12 – March 21, 2019

Office of Enterprise Assessments (EA) Management

Nathan H. Martin, Director, Office of Enterprise Assessments
April G. Stephenson, Deputy Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
C.E. (Gene) Carpenter, Jr., Director, Office of Nuclear Safety and Environmental Assessments
Kevin G. Kilp, Director, Office of Worker Safety and Health Assessments
Gerald M. McAteer, Director, Office of Emergency Management Assessments

Quality Review Board

Steven C. Simonson
Michael A. Kilpatrick

EA Site Lead for NNSS

Greg Schoenebeck

EA Assessors

Anthony Parsons – Lead
John Bolling
Jim Colson
Dirk Foster
Tom Rogers
Bill Scheib

Appendix B

Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- CD-1000.200, *Issue Resolution and Improvement System*, Rev. 0, 4/16/2019
- CD-2120.019, *Emergency Management*, Rev. 5, 9/27/2018
- CD-2120.020, *Readiness Assurance Program*, Rev. 6, 9/27/2018
- CD-2120.029, *Personnel Accountability*, Rev. 0, 7/12/2018
- *Department of Transportation 2016 Emergency Response Guidebook*
- EPIP-CAT.001, *Consequence Assessment*, Rev. 0, 9/27/2018
- EPIP-EOC.001, *EOC Emergency Response Actions*, Rev. 0, 9/17/2018
- EPIP-MRT.001, *Underground Rescue and Emergency Response Actions*, Rev. 1, 10/11/2018
- EPIP-OCC.001, *OCC Duty Manager Emergency Operations*, Rev. 2, 9/27/2018
- EPIP-U1a.001, *U1a Complex Emergency Response Actions*, Rev. 3, 10/24/2018
- Exercise Number 19-14-0005, *MAKO-19 Area: 1 U1a Complex Exercise Plan*, Rev. 0, 2/27/2019
- *Fiscal Year 2019 Emergency Readiness Assurance Plan*, 11/5/2018
- FRM-2871, *Shelter-in-place and Evacuation EAT Checklist*, Rev. 1, 12/5/2017
- FRM-2912, *U1a LED Emergency Action Checklist*, Rev. 2, 12/18/2018
- *Integrated 5-year Assessment Matrix, 2017-2021*, Rev. 2
- *NNSS Emergency Management Exercise Schedule FY19- FY23*
- NFO-EOC-PLN-101, *Consolidated Emergency Plan*, Rev. 3, 7/24/2018
- *NNSS EEGs, MAKO-19 (U1a)*, 2/27/2019
- OAA-18-AMSO-TJD-06-25-18, *NSF Emergency Power Supply System Testing and Maintenance*, Rev. 2, 6/25/2018
- OP-NOPS.008, *Preparations and Planning of Onsite Non-Equivalent HAZMAT Transfers (SBI)*, Rev. 8, 10/18/2018
- OP-NOPS/009, *Execution of Onsite Non-Equivalent Transfers of HAZMAT (SBI)*, Rev. 8, 10/18/2018
- OP-1000.201, *Operating Experience Program*, Rev. 2, 12/6/2018
- OP-1000.401, *Corrective Action Effectiveness Validation*, Rev. 1, 11/19/2018
- IRG-2120.002, *Initial Response Guide*, Rev. 7, 1/17/2019
- OP-2120.049, *Incident Command System*, Rev. 4, 9/17/2018
- OP-2120.061, *Operation Section Chief*, Rev. 4, 8/28/2018
- OP-2120.072, *Incident Size-up*, Rev. 4, 10/9/2018
- OP-2120.088, *Readiness Assurance Activities*, Rev. 0, 9/17/2018
- PD-EMSS.001, *Emergency Management, Safeguards and Security Assurance Program*, Rev. 0, 6/20/2018

Interviews

- Assistant U1a LED
- EOC CAT Member
- Controller/Evaluators (6)
- OCC DM
- U1a EAT Team Leader
- EMA
- EOC Emergency Manager

- EOC Offsite Liaison
- Emergency Planning and Preparedness Readiness Assurance Coordinator

- F&R Assistant Chief
- F&R Chief
- U1a LED
- EOC Medical Advisor
- MSTS Emergency Planning and Preparedness Exercise Coordinator
- MSTS Manager, Emergency Planning and Preparedness
- Onsite Transportation Coordinator
- EOC Operational Group Lead

Observations

- NNSS 2019 FSE
- Emergency Planning and Preparedness Readiness Corrective Action Review Team meeting, 2/14/2019

Appendix C Deficiencies

A deficiency that did not meet the criteria for a finding is stated below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- MSTS does not perform independent verification and validation steps to ensure that completed corrective action plans are effective in resolving findings associated with NNSS Defense Nuclear Facilities. (DOE Order 151.1D, Attachment 4, Paragraph 15j.(3)). (See Section 5.7)