Emergency Management Assessment at the Portsmouth Gaseous Diffusion Plant

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Acronyms

ALOHA	Areal Locations of Hazardous Atmospheres
CM	Crisis Manager
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
DUF6	Depleted Uranium Hexafluoride Conversion Facility
EA	Office of Enterprise Assessments
EAL	Emergency Action Level
EOC	Emergency Operations Center
EPHA	Emergency Planning Hazards Assessment
EPICode	Emergency Prediction Information Code
ERO	Emergency Response Organization
FBP	Fluor-BWXT Portsmouth, LLC
FMT	Field Monitoring Team
FSE	Full-Scale Exercise
HAZMAT	Hazardous Material
HF	Hydrogen Fluoride
IC	Incident Commander
ICP	Incident Command Post
IEZ	Immediate Evacuation Zone
JIC	Joint Information Center
MCS	Mid-America Conversion Services, LLC
NARAC	National Atmospheric Release Advisory Center
NRC	U.S. Nuclear Regulatory Commission
OFI	Opportunity for Improvement
PA	Protective Action
PORTS	Portsmouth Gaseous Diffusion Plant
PSS	Plant Shift Superintendent
SIP	Shelter-in-Place
TSR	Technical Support Room
UF6	Uranium Hexafluoride
WebEOC	Web-Based Emergency Operating Center Software

Emergency Management Assessment
at the Portsmouth Gaseous Diffusion Plant
August 27 to October 31, 2019

Summary

Scope

This U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) assessment evaluated a full-scale exercise to ascertain the effectiveness of the Portsmouth Gaseous Diffusion Plant (PORTS) response to an emergency. The assessment team observed decision-making and task execution during the exercise and analyzed the observed performance strengths and weaknesses. The assessment team also followed up on a 2013 EA assessment finding to evaluate the effectiveness of the corrective actions.

Fluor-BWXT Portsmouth, LLC (FBP) is transitioning the PORTS emergency management program from one based on U.S. Nuclear Regulatory Commission and DOE Order 151.1C, *Comprehensive Emergency Management System* requirements, to one based on DOE Order 151.1D, *Comprehensive Emergency Management System*, while also consolidating two emergency planning hazards assessments into one. FBP has not yet implemented response documents based on these changes, so the assessment team assessed the effectiveness of the emergency response organization (ERO) performance using existing plans and procedures.

Significant Results for Key Areas of Interest

Overall, FBP has generally established response procedures to support an adequate response to the postulated airborne release. Nevertheless, the assessment team noted weaknesses in procedural adherence that adversely affected the response. Most important, FBP did not implement appropriate protective actions for workers closest to the release. The assessment team identified one finding and one deficiency; the team also identified nine opportunities for improvement that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

Emergency Response Performance

The full-scale exercise involved two site contractor organizations, FBP and Mid-America Conversion Services, LLC (MCS); site-level and facility-level EROs; full field response; several local emergency medical services (mutual aid partners); and limited participation of state and local jurisdictions and the DOE Headquarters Watch Office.

FBP completed several aspects of the response effectively. FBP quickly staffed the ERO and classified the incident, completed timely initial offsite verbal notifications, and conservatively expanded the down-wind onsite protective action area. Additionally, the ERO communicated onsite protective actions to the affected site workers promptly. Finally, FBP integrated an operational drill at an MCS facility into the site-level response.

However, the assessment team identified weaknesses in four of the five assessed response elements: notifications and communications, protective actions, ERO, and consequence assessment. In the first three elements, the primary contributing factor related to the observed performance weaknesses was the lack of the collective training, drill, and exercise programs effectiveness for establishing and maintaining ERO members' proficiency.

Additionally, in the fourth response element (consequence assessment), the ERO did not produce a corroborative dispersion model of the postulated release of hydrogen fluoride gas or projections of the radioactive uranyl fluoride particulate to support the field surveys. This programmatic weakness exists because these modeling capabilities are currently not part of the PORTS emergency plans, procedures, or training program, as required by DOE Order 151.1C/D.

Finally, the FBP response was affected by technical planning differences between FBP and MCS planned responses to a breached solid uranium hexafluoride cylinder, demonstrating a lack of integration of the two programs.

Exercise Design, Conduct, and Evaluation

FBP designed and conducted a full-scale exercise in conjunction with a facility-level operational upset condition drill. However, the scenario did not test many response capabilities because the scenario had low consequences and the postulated release was terminated by natural causes or responder actions shortly after the emergency operations center became operational. Additional rigor and complexity in the exercise would allow more complete validation and demonstration of the site's emergency response capabilities.

2013 EA Assessment Finding Follow-up

The primary intent of the 2013 EA assessment finding was to highlight the need to plan the integration and coordination of response activities with offsite agencies and to document agreements in response plans. Because the previous corrective actions did not resolve the issue, FBP reopened the finding.

Best Practices and Findings

There were no best practices identified as part of this assessment.

The assessment team identified one finding that encompasses the first three response element weaknesses. FBP has not ensured that the training, drill, and exercise programs collectively establish and maintain PORTS-specific emergency response capabilities and responder proficiency.

Follow-up Actions

Portsmouth/Paducah Project Office and FBP have invested much effort with notable progress toward the final goal of transitioning the PORTS emergency management program to the requirements of DOE Order 151.1D and the integration of the two site contractors' emergency management programs. Nevertheless, FBP has not completed the transition, as demonstrated in the observed exercise. EA will continue to follow the transition to the new programmatic requirements, as well as the issues management process and implementation of corrective actions resulting from this and previous EA assessments.

Emergency Management Assessment
at the Portsmouth Gaseous Diffusion Plant

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Emergency Management Assessments, within the independent Office of Enterprise Assessments (EA), assessed the emergency management program at the Portsmouth Gaseous Diffusion Plant (PORTS). The assessment evaluated the effectiveness of the PORTS emergency management program in responding to emergencies. The assessment team used the October 2019 full-scale exercise (FSE) to determine the effectiveness of the PORTS emergency response organization's (ERO's) response to an emergency at key decision-making venues and follow up on a 2013 EA assessment finding. This assessment is part of a series of assessments of emergency management exercise programs at sites throughout the DOE complex and was conducted in accordance with the *Plan for the Office of Enterprise Assessments Assessment of the Emergency Management Program at the Portsmouth Gaseous Diffusion Plant, August-October 2019.*

Three principal entities are responsible for the development and execution of the PORTS emergency response to the exercise scenario. The Portsmouth/Paducah Project Office is responsible for Federal oversight of all activities at PORTS. Fluor-BWXT Portsmouth, LLC (FBP) is the site contractor responsible for developing and implementing the site-level hazardous material (HAZMAT) program. Mid-America Conversion Services, LLC (MCS) operates the depleted uranium hexafluoride (UF6) conversion project, which includes the UF6 cylinder storage yards and depleted uranium hexafluoride conversion facility (DUF6), and implements the facility-level emergency response at DUF6, where the postulated release occurred.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms "best practices, deficiencies, findings, and opportunities for improvement (OFIs)" as defined in DOE Order 227.1A.

As identified in the assessment plan, this assessment is based on the requirements of DOE Order 151.1C, *Comprehensive Emergency Management System.* The assessment team used performance-based lines of inquiry from Section 4.0 of EA Criteria and Review Approach Document (CRAD) 33-05, *Contractor Readiness Assurance and Exercise Program*, and EA CRAD 33-07, *DOE/NNSA Emergency Management Exercise Review*, to observe and evaluate specific decision-making venues during the FSE. In addition, the assessment team integrated cross-cutting performance observations for five response elements: notifications and communications, emergency classification, protective actions (PAs), consequence assessment, and the ERO. The assessment team also examined exercise design, conduct, and evaluation; developed a cross-cutting analysis of the response; and followed up on the 2013 finding.

FBP continues to transition the PORTS emergency management program from one based on U.S. Nuclear Regulatory Commission (NRC) and DOE Order 151.1C requirements to a DOE Order 151.1D, *Comprehensive Emergency Management System*, compliant program. Essential to this transition is the update of the site emergency planning hazards assessment (EPHA), which is concurrently being revised to form a single FBP-developed EPHA from two existing EPHAs developed by different contractors. FBP plans to update emergency action levels (EALs) and response procedures after the revised EPHA is

approved. In the October 2019 FSE, PORTS used the existing plans and procedures based on DOE Order 151.1C requirements and exemptions to guide its response.

The FSE tested the ERO's ability to respond to a postulated emergency incident resulting in onsite consequences consistent with an NRC Alert. An Alert under NRC is equivalent to a Site Area Emergency under DOE requirements. The FSE required a response to an Operational Emergency that originated at a single HAZMAT facility, which was an outside cylinder yard (X1745A) at DUF6 used for staging full cylinders containing solid depleted UF6.

The assessment team examined key documents, such as emergency plans and implementing procedures, the FSE package, manuals, job aids, and policies, as well as all relevant programmatic documentation supporting the assessment of response elements. The assessment team interviewed key personnel responsible for developing and executing the associated programs and observed the FSE conduct and initial evaluation activities, focusing on response processes and capabilities. The assessment team further investigated causes of unexpected responses, such as insufficient training, ambiguous procedural guidance, or a lack of practice during drills. The members of the assessment team, the Quality Review Board, and management responsible for this assessment are listed in Appendix A.

EA's previous assessment of the emergency management exercise program during July and August 2013 was reported in *Independent Oversight Review of Preparedness for Severe Natural Phenomena Events at the Portsmouth Gaseous Diffusion Plant – November 2013*. This 2019 assessment examined the completion and effectiveness of corrective actions implemented to resolve one finding described in the 2013 report. Results of the corrective action assessment are included in Section 3.8 of this report.

3.0 RESULTS

The FSE was designed to validate plans and procedures for responding to a HAZMAT incident that resulted in onsite airborne consequences. FBP and MCS chose a plausible scenario bounded by a loss-of-confinement scenario in the DUF6 EAL for this purpose. The scenario simulated a 12 square-inch breach of a 14-ton solid UF6 cylinder at the DUF6. The scenario accurately depicted the transport of a cylinder with a straddle carrier and presented technically accurate initiating conditions that artificially correlated to the bounding EAL, which stated that the UF6 PA criterion would extend to 1,017 feet and provided a PA distance of 1,000 feet. Additionally, the scenario postulated that four employees were exposed to the HAZMAT release and required offsite medical attention.

This section discusses UF6, hydrogen fluoride (HF), and uranyl fluoride because the postulated solid UF6 cylinder breach would result in a UF6 chemical reaction (upon contact with water in the atmosphere) and create HF gas and solid uranyl fluoride. Uranyl fluoride would encrust the UF6 surface areas exposed to air and would naturally terminate the release in approximately one hour under the postulated conditions.

3.1 Notifications and Communications

The objective of this portion of the assessment was to determine whether FBP made initial notifications promptly, accurately, and effectively to all appropriate stakeholders, including the ERO activation and employee PAs, and maintained effective communications throughout the emergency response.

3.1.1 Notifications

FBP responders adequately completed many notifications, using plans and procedures that satisfactorily define processes for notifying stakeholders during emergencies. The plant shift superintendent (PSS) in

building X-300 completed timely initial verbal emergency notifications to offsite authorities – the Pike County Sheriff's Office, the Ohio Emergency Management Agency, and the DOE Headquarters Watch Office (Watch Office) – and effectively activated the emergency operations center (EOC). Additionally, MCS and FBP completed timely onsite PA notifications to workers.

Nevertheless, FBP did not effectively complete all notifications in accordance with procedures. The PSS, required to immediately notify the Ohio Valley Electric Corporation (a tenant organization) of PAs, did not complete the notification for over 40 minutes after the release began. Additionally, the PSS initially overlooked the need to activate the field monitoring teams (FMTs). Subsequently, when the delayed activation was completed, the PSS did not communicate to the incident commander (IC) that the test pager located in building X-300 did not activate to confirm successful FMT activation. Furthermore, the IC had to be prompted by an exercise controller to activate the joint information center (JIC). Finally, FBP did not send the Watch Office an electronic initial notification form to complete the notification process.

In addition, FBP responders did not fully ensure that notifications were effective in providing situational awareness. For example, the Watch Office stated: "Initial telephone call to the Watch Office includes codes/names/jargon that was not clearly identified to the Watch Office." The notification update forms contained errors in such areas as offsite PA recommendations and the incident description. Additionally, the Occupational Safety and Health Administration reporting form contained inaccurate information, including the location and time of the incident, and provided an incident description different from that in the emergency notification form. The FBP ERO is not fully proficient in executing notification processes and procedures and does not have an effective process for verifying the accuracy of information before releasing it to offsite authorities. (See **Finding F-FBP-1**, **OFI-FBP-1**, and **OFI-FBP-2**.)

3.1.2 Communications

FBP and MCS responders, including personnel located at the EOC, in building X-300, on scene, and in the JIC, appropriately relied on radios, pagers, telephones, and Web-based Emergency Operating Center software (WebEOC), which together adequately provide the ERO access to real-time incident information. Communication systems operated effectively, but some ERO voice communications were not fully effective (or in accordance with procedures) in transmitting all known information accurately, and some inaccurate or incomplete information was entered into WebEOC and distributed along with accurate information. For example:

- The incident description inaccurately changed from an initial statement that it involved a "breached DUF6 cylinder" to "a catastrophic failure of a 14-ton cylinder."
- The ERO incorrectly reported the incident location as the X-745 yard and building X-1300 in the voice communications and records.
- The time of the incident was inaccurately (and differently) reported on the crisis manager (CM) briefing form, the notification forms, and the Occupational Safety and Health Administration reporting notification.
- The ERO used two significantly different times for when the release stopped.

Because of these variations, FBP responders did not consistently communicate an accurate common operating picture among onsite and offsite response facilities. (See **Finding F-FBP-1**, **OFI-FBP-1**, and **OFI-FBP-3**.)

Other communication practices contributed to difficulties in establishing accurate situational awareness. For example, the IC did not collectively brief or consult with the incident command post (ICP) support

staff but instead shared on-scene information with individual support staff members. The IC also did not use the incident action plan form to capture relevant information and used individual communications for PSS and CM interfaces. Furthermore, instead of using the bridge line for offsite notification, the PSS called agencies individually. These practices adversely affected situational awareness because ERO elements received information at different times, and the content of the information such as incident location and number of cylinders involved changed over time. (See **Finding F-FBP-1**, **OFI-FBP-1**, and **OFI-FBP-4**.)

Overall, FBP and MCS have established adequate processes and systems for notifications and communications, but responders did not always communicate effectively. FBP responders promptly made verbal notifications to offsite authorities, completed timely PA notifications to MCS and FBP workers, and activated the EOC. However, the ERO was not fully proficient in executing processes for notifying stakeholders and did not ensure the accuracy of all the information released to all the offsite authorities. Additionally, some ERO voice communications were not fully effective and did not ensure that the same information was passed to each of the individuals or venues.

3.2 Emergency Classification

The objective of this portion of the assessment was to determine whether FBP responders correctly classified the Operational Emergency as promptly as possible, but no later than 15 minutes after identification by the pre-determined decision maker.

The IC effectively and accurately classified the incident as an Alert (NRC basis). The IC completed incident classification within 15 minutes, using FBP-EM-PRO-00020, *Emergency Classification*, EAL 68.0, based on incident information provided by fire department dispatch and radio calls and by the on-scene DUF6 local emergency director. The reports provided the information concerning the breached UF6 cylinder and the personnel with HAZMAT exposure, which was the initial information needed to apply the EAL. While en route, at a location that would allow a view of the incident scene, an exercise controller provided the IC with simulated photos of a white plume visible downwind at a distance of over 100 feet, thereby completing the EAL entry conditions. Shortly after the IC had the incident indicators, the IC classified the incident as an Alert. Subsequently, after the IC transferred command to the EOC CM, the technical support room (TSR) coordinator briefed the CM that the TSR had reviewed the incident information and validated that the correct EAL was in use, and that the Alert classification was correct.

3.3 Protective Actions

The objective of this portion of the assessment was to evaluate the responders' capability to identify and implement pre-determined onsite PAs for the Alert classification.

FBP has developed processes and implementing procedures to provide an appropriate combination of PAs to protect workers for the postulated incident in FBP-EM-PRO-00020. EAL 68.0 requires the IC to implement an immediate evacuation of the DUF6 area and to consider precautionary evacuation or shelter-in-place (SIP) for areas or buildings downwind to 1,000 feet, which was the maximum distance that may exceed the UF6 PA criterion.

FBP responders appropriately monitored habitability at the ICP to protect first responders and adjusted PAs for workers downwind of the incident. Field responders measured for safe habitability conditions when they first arrived at the entrance to DUF6 and again immediately after establishment of the ICP just outside the west vehicle gate and upwind of the incident. Thereafter, support personnel continually monitored the ICP for HF. In addition, following the transfer of command and control to the EOC, the

CM conservatively expanded the SIP order for downwind facilities well beyond the 1,000 feet stated in the EAL for a single cylinder release. The CM based his decision on a recommendation by the TSR coordinator, because, at the time, the TSR thought that as many as two cylinders could be releasing HAZMAT.

However, the IC briefly referred to the EAL after establishing the ICP but did not order evacuation of DUF6 in accordance with the EAL. The IC ordered SIP for all personnel at DUF6 14 minutes after identification of the incident. Importantly, when briefing the CM, the IC informed the CM only that he had ordered SIP and not the prescribed PAs of evacuation contained in the EAL. The IC and CM did not recognize that their actions were inconsistent with the EAL and potentially risked the health and safety of workers. Likewise, the DUF6 local emergency director did not recognize this deviation from the procedure. Additionally, FBP has not developed a PA procedure defining the required actions associated with the immediate evacuation zone (IEZ) and isolation zone. (See **Finding F-FBP-1**, **OFI-FBP-1**, and **OFI-FBP-5**.)

In conclusion, FBP protected first responders by quickly and continuously monitoring for safe habitability conditions at the ICP and conservatively expanded the SIP order in downwind facilities when the extent of the incident was unknown. However, FBP responders did not follow all the pre-determined onsite PAs associated with the EAL and thereby potentially risked the health and safety of workers.

3.4 Consequence Assessment

The objective of this portion of the assessment was to determine whether FBP consequence assessment activities provide a conservative, timely initial assessment; accurate projections using incident conditions; and supportive assessments throughout an emergency.

The TSR coordinator provided effective leadership to the TSR, resulting in conservative and timely assessments. The TSR coordinator appropriately tasked the modeler, radiation protection personnel, and TSR engineer and reported the status of activities to the CM. The TSR coordinator's initial response ascertained the location and number of leaking cylinders and concurred that the correct EAL, for the known conditions, was in use for the Alert declaration. The TSR coordinator then conservatively recommended that the CM expand the area under PAs beyond those linked to the EAL because the EAL was based on one breached cylinder and it was not clear whether one cylinder or two were leaking. Upon completion of the HF dispersion model, the TSR coordinator's report to the CM indicated that the PA criterion was not exceeded. The TSR coordinator's report was coincident with the CM receiving a field report that HF readings were below the threshold of concern and that the cylinder breach was patched. Afterward, the TSR coordinator appropriately monitored reports from the FMTs for use in adjusting PAs.

The modeler provided an adequate projection of HF gas dispersion using the Areal Locations of Hazardous Atmospheres (ALOHA) model. The modeler used input data that was consistent with known information in the TSR regarding the release location and exercise-injected weather conditions, using a source term and leak duration specified by FBP-EM-PRO-00004, *Computer Generation of ALOHA Plume Models*. While the modeler was developing the plume plot, the TSR staff knew that no HF was detected at the ICP and knew of no HF detectors in alarm in the DUF6 buildings that were being used as shelters. (Stationary HF detectors are installed in or outside of some DUF6 buildings, and portable HF detectors are kept in all DUF6 buildings used for SIP for habitability confirmation.) Before the dispersion model was finalized, the TSR received both confirmation that only one cylinder was leaking and a more accurate location of the breached cylinder. The results of the dispersion model plume plot concluded that the HF PA criterion was not exceeded. This conclusion was consistent with FMT measurements (discussed below), making the difference between the actual and modeled release location (a few hundred

feet) inconsequential; therefore, the plume plot location was not corrected and the ERO considered that the PAs ordered were conservative.

FMTs provided adequate HF and radiation survey results to the TSR through continuous telephonic contact with TSR radiation protection personnel, who posted the HF results on a site map in the TSR. All HF survey results, which included upwind, downwind, and crosswind locations, were less than minimum detectable except the HF reading near the breached cylinder; that reading was below the threshold of concern. FMTs performed radiation surveys at the ICP, on the victims, and along the victim's pathway from the decontamination area to the ambulance. The FMTs did not have a radioactive material deposition plot to use for survey planning, so their strategy was to survey for radiation elsewhere, starting where HF was detected and then surveying for radiation toward the cylinder, but no HF was detected. Radiation surveys were also planned for re-entry activities around the breached cylinder location, but the FSE ended first.

The HF plume plot was of limited help in planning FMT activities and was not used. The TSR staff was initially unaware of the exact location of the release (but knew it was outside near the DUF6 processing building), so the plume plot was developed from an incorrect location. There was no attempt to use a plume plot to demonstrate the use of dispersion modeling results for planning initial field monitoring activities, as required by FBP-EM-PDD-00002. Although the initial response could not wait for the dispersion model results to plan the rescue of victims from a potentially hazardous atmosphere, and entry personnel used proper personal protective equipment, the lack of capabilities for integrating plume plots with FMT planning was not discussed during the exercise. (See **OFI-FBP-6**.)

Although the overall consequence assessment activities supported the response effectively, the assessment team observed some program weaknesses. The most significant is that the TSR staff did not produce a corroborative dispersion model of HF or projections of the radioactive uranyl fluoride deposition because additional models, such as the Emergency Prediction Information Code (EPICode) and HotSpot dispersion modeling programs (for chemical and radioactive material dispersion modeling, respectively) are not available in the TSR, as required by DOE Order 151.1C, Attachment 2, Paragraph 13. (See **Deficiency D-FBP-1**.) Notably, the EPHA analyses for developing the new EALs under DOE Order 151.1D requirements are mostly calculated using EPICode and HotSpot and the TSR staff has only the ALOHA program. The draft DOE Guide 151.1-1X, *Comprehensive Emergency Management System*, which supports DOE Order 151.1D, advocates using the same dispersion models for planning and response activities when performing timely initial assessments. Similarly, although FBP-EM-PDD-00002, *Emergency Management Program*, states that the National Atmospheric Release Advisory Center (NARAC) dispersion modeling program is maintained for use in a primary, backup, or corroborating mode, nobody on the TSR staff was trained to use it. The PORTS EPHA identifies some analyzed scenarios as General Emergencies, requiring NARAC modeling capability for more accurate projections. FBP currently plans to train modelers on using the NARAC dispersion modeling program for future projections. (See **OFI-FBP-6**.)

Overall, the TSR staff performed a conservative initial assessment, followed by a timely initial assessment using known incident information and, finally, by adequate ongoing assessments for the scenario. The TSR staff also provided the CM an appropriately conservative recommendation to expand the areas under PAs. However, there are no capabilities for projecting particulate dispersions and performing corroborative dispersions for gas releases during a response. Further, although FBP has an ongoing effort to implement NARAC modeling, the program currently lacks NARAC modeling capability.

3.5 Emergency Response Organization

The objective of this portion of the assessment was to determine whether FBP adequately staffed the ERO to provide centralized collection, validation, analysis, and coordination of information related to an emergency and thereby provide situational awareness and a common operating picture throughout the incident.

FBP effectively activated the ERO and adequately staffed the ICP, field response sectors, and EOC. FBP also demonstrated that the EOC MCS operations advisor, who was sheltered in place at DUF6, could remotely access WebEOC to acquire incident information and perform his duty station responsibilities without being physically located in the EOC. Additionally, FBP effectively transferred command and control of the incident from the IC to the EOC CM. Finally, FBP has established adequate response procedures and checklists for the EOC cadre to obtain and maintain situational awareness and disseminate a common operating picture among response components, including relieving the field of offsite interface responsibilities.

The CM appropriately briefed the EOC cadre after EOC activation, but some weaknesses were identified in the briefing information and follow-up briefings. In accordance with procedures, the CM provided his first briefing to the EOC cadre using the CM briefing form, following the transfer of command and control with the IC, approximately 70 minutes after the incident occurred. The briefing provided information regarding the Alert declaration, the implemented PAs, and the deployment of firefighters to attend to the injured employees. However, the CM also communicated misinformation about the release location and did not provide the visual depiction of the release presented to the IC (which indicated that the plume was visible more than 100 feet downwind). More importantly, as described in Section 3.3, the CM did not validate whether the IC had implemented the required IEZ at DUF6. Therefore, the CM did not know that the IC did not follow the procedure for evacuating personnel at DUF6. (See **Finding F-FBP-1**, **OFI-FBP-1**, and **OFI-FBP-7**.)

Overall, adequate ERO staffing occurred at all observed venues, and the FBP ERO demonstrated adequate command and control of the incident. Nevertheless, the ERO did not acquire and maintain situational awareness and a common operating picture throughout the incident.

3.6 Exercise Design, Conduct, and Evaluation

The objective of this portion of the assessment was to evaluate the FBP exercise program's ability to validate the capability to respond to the hazards identified in the EPHAs.

FBP appropriately designed the initiation of the FSE and presented information that would allow the ERO to demonstrate implementation of its response procedures and satisfactorily conducted the FSE in conjunction with a DUF6 operational upset condition drill. The drill then quickly transitioned into a classified incident requiring mobilization of the ERO. FBP identified 15 objectives to be validated during the exercise and appropriately defined the ERO capabilities to be verified.

Although the scenario validated many ERO capabilities, the exercise design did not allow for thorough validation of some capabilities for responding to the hazards identified in the EPHA. Validated capabilities include the PSS completing verbal offsite notification and the CM expanding onsite PAs based on the potential for two cylinders being involved. However, the simplicity of the postulated release did not test the EOC cadre significantly because the release terminated about the same time the EOC became operational. Also, because the exercise involved only localized impacts (Alert classification), the exercise did not demonstrate FBP's capabilities for integrating the ERO response with other potentially impacted facilities or offsite organizations. Furthermore, vague or missing exercise evaluation criteria

diminished the ability to validate plans and procedures. Significantly, FBP exercise planners and evaluators did not notice that FBP and DUF6 personnel used different approaches to analyze a solid UF6 cylinder release, the lack of validation of the DUF6 evacuation procedure and field monitoring procedure, and the missing dispersion modeling capabilities. (See **OFI-FBP-8** and **OFI-FBP-9**.)

Overall, the exercise scenario did not provide the airborne consequences needed to more fully test the ERO response and realistically reflect a release caused by the initiating operational mishap. Importantly, the approved FSE package did not include evaluation criteria for validating important procedure instructions that could be demonstrated during the exercise, such as the evacuation of DUF6 and the use of plume plots.

3.7 Cross-cutting Analysis of Emergency Response

The FSE was designed to validate PORTS plans and procedures for responding to a HAZMAT incident. Although the scenario did not provide for an in-depth test of the PORTS emergency management program, it did test some PORTS operational concepts and procedures and revealed areas in need of improvement.

FBP effectively responded to several aspects of the postulated airborne release. FBP quickly staffed the ERO and classified the incident, completed timely initial offsite verbal notifications, and correctly expanded the downwind onsite protective action area. Additionally, the ERO communicated onsite protective actions to the affected workers promptly. Finally, FBP integrated an operational drill at an MCS facility into the site-level response.

The assessment team observed that ERO teams and individuals in three of the five observed venues demonstrated weaknesses in responding proficiently. Importantly, the ERO exhibited performance weaknesses at key decision-making levels that resulted in untimely and incorrect information, diminishing the situational awareness and common operating picture across the ERO. Additionally, FBP did not implement all required PAs and did not complete all stakeholder notifications as stated in procedures. These FBP performance weaknesses indicate that the training, drill, and exercise programs collectively have not fully established and maintained proficiency for some ERO members in the execution of their tasks. (See **Finding F-FBP-1**, **OFI-FBP-1**, and **OFI-FBP-7**.)

The scenario selected for the exercise also affected FBP's response because of technical differences underlying the supporting response procedures. The FBP-planned response to a breached solid UF6 cylinder under FBP responsibility (the basis of the response) is considerably different from the MCS-planned response at DUF6 (the technical basis of the EAL). The EAL for use in the exercise depicted a bounding release for a solid UF6 cylinder, which is not consistent with an inconsequential release depicted by FBP. The assessment team attributes the cause to the existing EPHAs, currently undergoing revision, prepared by two separate contractors that analyzed this type of event differently. (See **OFI-FBP-9**.)

Overall, FBP responded effectively in several areas and effectively integrated an operational drill at an MCS into the site-level response. However, responder performance weaknesses are primarily attributed to the lack of effectiveness of the collective training, drill, and exercise programs in establishing and maintaining ERO members' proficiency. Another contributor to performance weaknesses was the lack of a common technical approach to response procedures development.

3.8 Follow-up on the 2013 Finding

The objective of this portion of the assessment was to determine whether corrective actions effectively addressed Finding F-6 identified in *Independent Oversight Review of Preparedness for Severe Natural Phenomena Events at the Portsmouth Gaseous Diffusion Plant – November 2013.*

Finding F-6 states, "The FBP exercise program does not validate all elements of emergency response over a five-year period including provisions to request exercise participation from offsite organizations providing response capabilities, as required by DOE Order 151.1C." Additional key aspects of the finding identified weaknesses in completing the offsite emergency planning necessary for implementation of a response to a significant PORTS HAZMAT incident. FBP developed a corrective action plan to resolve the finding in 2014 and closed it in May 2017.

During this assessment, after discussions with the assessment team about the completed corrective actions, FBP recognized a need for additional actions in the area of offsite emergency planning. Accordingly, FBP reopened the finding and provided a draft corrective action plan intended to address the concerns. The draft corrective plan focused on revising the drill and exercise program and also added actions related to training, briefings, and meetings with state and local agencies. However, it did not address the focus of the original finding, which was to ensure planning, coordination, and integration of response activities with offsite agencies through detailed, documented planning processes. The assessment team and FBP again discussed the intent of the original finding, and, based on those discussions, FBP agreed to modify the corrective action plan to address planning, coordination, and integration with offsite agencies.

4.0 BEST PRACTICES

No best practices were identified as part of this assessment.

5.0 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 findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*, to manage the corrective actions and track them to completion.

Finding F-FBP-1: FBP has not ensured that the training, drill, and exercise programs collectively establish and maintain PORTS-specific emergency response capabilities and responder proficiency. (DOE Order 151.1C, Attachment 2, Paragraphs 5.b and 6.b)

6.0 DEFICIENCIES

Deficiencies are inadequacies in the implementation of an applicable requirement or standard. Deficiencies that did not meet the criteria for findings are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

Deficiency D-FBP-1: The FBP consequence assessment response capability does not include dispersion models for particulates or a backup/corroborating dispersion model for the projection of gas dispersions. (DOE Order 151.1C, Attachment 2, Paragraph 13)

7.0 OPPORTUNITIES FOR IMPROVEMENT

The assessment team identified nine OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in assessment reports, they may also address other conditions observed during the assessment process. These OFIs are offered 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.
All identified OFIs pertain to FBP.

OFI-FBP-1: Consider enhancing the training/drill/exercise programs to improve responder proficiency in performing emergency response functions by:

- Reviewing ERO qualification/requalification requirements, with an emphasis on demonstrating proficiency rather than simple participation.
- Assessing failure modes relative to approval hierarchies, such as the hierarchy of the IC through the EOC CM, to ensure that higher-level approval authorities detect lower-level errors (e.g., in the actual implementation of PAs).
- Conducting additional drills to supplement exercises in order to increase responder proficiency, which is defined as demonstrated skill and competency acquired from training and experience.
- Conducting additional exercises and evaluated drills to validate responder proficiency.
- Directing less-experienced responders to participate in more than the minimal requirement of one exercise or performance drill annually.
- Ensuring that responders participate in drills and exercises involving scenarios associated with a spectrum of HAZMAT facilities.
- Ensuring rigorous/critical proficiency assessments for key, high-impact ERO positions, such as the PSS and the EOC team leads and directors.
- Assessing whether newly qualified personnel require additional training, drill, and exercise opportunities to become fully proficient, and adjusting the program requirements accordingly.

OFI-FBP-2: Consider improving offsite notification efficiency by:

- Reinforcing the importance of following notification procedures and processes.
- Ensuring that written offsite notification forms are sent (i.e., by fax or email) to offsite agencies before verbally notifying them.
- Establishing processes to verify that notification forms sent to offsite agencies are correct and to confirm receipt.
- Increasing ERO proficiency and rigor in notification form review and approval to ensure that the information in the forms is accurate before sending them to offsite agencies.
- Reinforcing the necessity to activate needed ERO elements (e.g., FMT, JIC) in the early stages of an incident.

OFI-FBP-3: Consider improving communications among the ERO to provide a common operating picture of the emergency response and shared situational awareness among all teams by:

- Defining information flow processes within PORTS's response facilities and field response elements that assign specific responsibility for and ensure verification and validation of key incident information.
- Expanding the use of computerized information management systems and status boards capable of rapidly interfacing with other onsite systems that may be vital during an emergency response.
- Considering the development and use of automated processes for such functions as tracking injured personnel, geographically mapping PA zones, or assessing facility damage.
- Evaluating systems for acquiring and sharing situational awareness with Headquarters, state, and local agencies.

OFI-FBP-4: Consider improving communications by:

- Developing a briefing checklist tool that covers response priorities and objectives.
- Instituting periodic bridge calls among ERO elements (e.g., ICP, EOC, X-300, JIC) so that information is shared simultaneously.
- Instituting periodic ICP briefings with the IC and ICP support team leaders so that information is shared simultaneously.

OFI-FBP-5: Consider improving the onsite PA decision by:

- Approving the proposed revision to FBP-EM-PRO-00020.
- Implementing the proposed computer-based onsite PA determination tool.
- Conducting numerous drills and training for appropriate personnel based on the revised procedure and the new tool.
- Developing a site PA procedure.

OFI-FBP-6: To provide a more accurate and more complete consequence assessment that is consistent with the development of EALs, consider:

- Establishing pre-planned release points by latitude and longitude coordinates for analyzed incidents to help place plume origins on maps.
- Adding EPICode and Hotspot to the response capability.
- Adding airborne and deposition plots to the FMT planning process.

OFI-FBP-7: Consider improving ERO decision-making for a broad range of emergency response events by:

- Establishing and documenting, in emergency plan implementing procedures, the expected actions of the IC and ERO to ensure that they can act decisively with criteria-based decision rationale.
- Revising procedures and forms that serve as response records to require documentation of the time of occurrence and person creating the record.
- Revising existing emergency procedures to clearly define immediate and subsequent expected response actions and to provide clear direction for branching to other emergency response procedures.
- Defining expected actions for achieving and maintaining situational awareness among all teams.
- Conducting drills with the IC and ERO to demonstrate procedurally required actions for a variety of response scenarios.

OFI-FBP-8: Consider improving the design, evaluation, and conduct of exercises by:

- Ensuring that exercise injects are consistent with respect to consequences and expected response.
- Running challenging exercises with significant consequences that provide opportunities to validate all capabilities and chosen objectives.
- Ensuring that objectives thoroughly reflect key response actions, thereby fully validating an ERO capability.
- Considering using the objectives contained in the Exercise Builder software aligned with response procedures.
- Baselining exercise programs at other DOE sites with successful exercise programs, such as those at the Y-12 National Security Complex and the Pantex Plant, to identify improvement opportunities.

OFI-FBP-9: Consider improving the ERO response by using a consistent technical basis for analyzing a breached solid UF6 cylinder anywhere on site and revising the EALs and implementing procedures accordingly.

8.0 ITEMS FOR FOLLOW-UP

Portsmouth/Paducah Project Office and FBP have invested much effort with notable progress toward the final goal of transitioning the PORTS emergency management program to the requirements of DOE Order 151.1D and the integration of the two site contractors' emergency management programs. Nevertheless, FBP has not completed the transition, as demonstrated in the observed exercise. EA will continue to follow the transition to the new programmatic requirements, as well as the issues management process and implementation of corrective actions resulting from this and previous EA assessments.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: August 27 to October 31, 2019

Office of Enterprise Assessments Management

Nathan H. Martin, Director, Office of Enterprise Assessments
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Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
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