Independent Assessment of the Fire Protection Program at the Portsmouth Site

March 2025

U.S. DEPARTMENT of ENERGY | Office of Enterprise Assessments

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Acronyms

AHJ	Authority Having Jurisdiction
BNA	Baseline Needs Assessment
CAHJ	Contractor AHJ
CAP	Corrective Action Plan
CFR	Code of Federal Regulations
CRAD	Criteria and Review Approach Document
CSE	Cognizant System Engineer
CY	Calendar Year
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
ESO	Engineering Service Order
ETAS	Enterprise Technical Assistance Services, Inc.
FBP	Fluor-BWXT Portsmouth, LLC
FCM	Fire Control Measure
FHA	Fire Hazards Analysis
FPA	Fire Protection Assessment
FPE	Fire Protection Engineer
FPP	Fire Protection Program
FR	Facility Representative
HPFWS	High-Pressure Fire Water System
ITM	Inspection, Testing, and Maintenance
MEL	Master Equipment List
MTS	Management Tracking System
NFPA	National Fire Protection Association
OFI	Opportunity for Improvement
PIP	Pre-incident Plan
PORTS	Portsmouth Site
PPPO	Portsmouth/Paducah Project Office
RBCL	Recommended Base Coverage Level
SFWS	Sanitary Fire Water System
SSCs	Structures, Systems, and Components
TFHA	Transitional Fire Hazards Analysis
TQP	Technical Qualification Program
VSS	Vital Safety System

INDEPENDENT ASSESSMENT OF THE FIRE PROTECTION PROGRAM AT THE PORTSMOUTH SITE

Executive Summary

The U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) conducted an independent assessment of the fire protection program (FPP) at the Portsmouth Site Building X-333 in September and October 2024. Building X-333, a hazard category 2 nuclear facility, is one of two remaining large process buildings previously used for uranium enrichment at the former Portsmouth Gaseous Diffusion Plant and is slated for demolition in 2025. Fluor-BWXT Portsmouth, LLC (FBP) is the decontamination and decommissioning contractor at the Portsmouth Site. This assessment evaluated the effectiveness of FBP in managing and maintaining the FPP and included fire and related safety hazards analyses; transitional fire hazards analysis (TFHA) and documented safety analysis integration; fire prevention and protection design requirements; inspection, testing, and maintenance (ITM); and contractor self-assessment. Federal oversight by the Portsmouth/Paducah Project Office (PPPO) relating to fire protection was also evaluated.

EA identified the following strengths, including one best practice:

- PPPO enters quarterly fire hydrant impairment data into a local geospatial information system to create a more usable map representation for PPPO oversight purposes. The fire hydrant locations are color-coded by status and priority, allowing PPPO staff to more intuitively analyze and assess which physical areas within Portsmouth Site facilities should be prioritized for addressing impairments. (Best Practice)
- FBP has completed construction of a new live fire and technical rescue training facility that provides enhanced onsite training capabilities.
- FBP has initiated installation of a new fire pump house and the abandonment of aged fire pumps and water tower.

EA also identified several weaknesses, including two findings, as summarized below:

- FBP did not submit its FPP and wildland fire management plan to PPPO for approval. (Finding)
- PPPO did not approve the FBP FPP and the wildland fire management plan. Possible contributing factors include a lack of corresponding lines of inquiry in recent PPPO FPP assessments, a lack of DOE-qualified fire protection engineer involvement in oversight activities, and PPPO's omission of the delegation of these responsibilities in its management plan. (Finding)
- FBP has not developed a qualification standard for fire protection engineers (employees or subcontracted personnel) or provided evidence that the subcontracted fire protection engineer is adequately trained and qualified for this technical support position.
- FBP did not evaluate the introduction and use of cargo containers within Building X-333 to encapsulate combustible waste materials in TFHA documents.
- FBP did not ensure that the calendar year 2022, 2023, and 2024 Building X-333 fire protection assessments were performed by, or under the direction of, a qualified fire protection engineer.
- FBP has not performed all required ITM for Building X-333 dry-pipe sprinkler and standpipe systems.
- FBP did not implement corrective maintenance for Building X-333 emergency lighting and battery equipment that did not meet acceptance criteria during the most recent semiannual ITM cycle.
- FBP has not resolved fire protection system impairments in a timely manner.

In summary, FBP has established a generally effective FPP, and PPPO is generally adequately performing Federal oversight relating to fire protection. However, this assessment identified weaknesses related to

documentation, fire protection engineer staffing and qualification, TFHA evaluation of fire hazards, ITM performance, corrective maintenance, and impairments. Resolution of the weaknesses identified in this report will enhance the effectiveness of FBP's FPP at the Portsmouth Site.

INDEPENDENT ASSESSMENT OF THE FIRE PROTECTION PROGRAM AT THE PORTSMOUTH SITE

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the fire protection program (FPP) at the Portsmouth Site (PORTS) Building X-333. Assessment activities were conducted in September and October 2024. This assessment was part of an ongoing review of FPPs at hazard category 1, 2, and 3 nuclear facilities across the DOE complex.

In accordance with the *Plan for the Independent Assessment of the Fire Protection Program at the Portsmouth Site, October 2024*, this assessment evaluated the FPP, including policies, procedures, and fire and related safety hazards analyses; transitional fire hazards analysis (TFHA) and documented safety analysis (DSA) integration; fire prevention and protection design requirements; inspection, testing, and maintenance (ITM); contractor self-assessment; and Federal oversight relating to fire protection. The scope of this assessment focused on Building X-333, which is a hazard category 2 nuclear facility, and one of two remaining large process buildings previously used for uranium enrichment at the former Portsmouth Gaseous Diffusion Plant. Building X-333 was the first process building in the cascade of facilities used for enriching uranium and contained the largest process gas equipment on site. Activities characterizing Building X-333 enrichment equipment have been completed, and the building is slated for demolition in 2025.

The decontamination and decommissioning (D&D) project at PORTS involves deactivation, demolition, and disposal of approximately 415 facilities, including Building X-333, and is managed by Fluor-BWXT Portsmouth, LLC (FBP) for the DOE Office of Environmental Management. Federal oversight is provided by the Portsmouth/Paducah Project Office (PPPO) and Enterprise Technical Assistance Services, Inc. (ETAS), a technical support service contractor.

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 the order.

As identified in the assessment plan, this assessment considered requirements related to 10 CFR 830, *Nuclear Safety Management*; DOE Order 420.1C, Change 3, *Facility Safety*; and DOE-STD-1066-2016, *Fire Protection*. EA used objectives 4.1, 4.2, 4.3, 4.4, 4.5, and 4.6 of EA CRAD 31-12, Revision 2, *Fire Protection Program*.

EA examined key documents, such as system descriptions, work packages, procedures, manuals, analyses, policies, and training and qualification records. EA also interviewed key personnel responsible for developing and executing the associated programs; observed fire protection-related activities; and walked down significant portions of Building X-333, focusing on aspects of the FPP. The members of the assessment team, the Quality Review Board, and the management responsible for this assessment are listed in appendix A.

EA conducted previous assessments at PORTS in 2021 (documented in EA report *Independent Assessment of Work Planning and Control for Deactivation and Demolition Work at the Portsmouth Site, March 2022*) and at the Paducah Site in 2023 (documented in EA report *Independent Assessment of Work Planning and Control at the Paducah Gaseous Diffusion Plant, June 2023*). This current assessment examined the completion and effectiveness of corrective actions for the EA findings related to PPPO oversight identified in the previous assessments. Results of the corrective action review are included in section 3.7 of this report.

3.0 RESULTS

3.1 Fire Protection Program

This portion of the assessment evaluated the effectiveness of FBP's FPP policy and administration, staffing, implementing procedures, equivalencies, the fire hazards analysis (FHA) program, the building fire protection assessment (FPA) program, the emergency services baseline needs assessment (BNA), pre-incident plans (PIPs), and the wildland fire management plan.

Fire Protection Program Policy and Administration

FBP has established and implemented a generally adequate sitewide FPP as defined in POEF-FBP-020, *Safety Management Program Descriptions for Fluor-BWXT Portsmouth Decontamination and Decommissioning Project*, section 11.5; FBP-FP-PDD-00001, *Fire Protection Program Description Document*; and FBP-FP-PRO-00004, *Fire Protection Program*. The FPP is appropriately based on the FBP contract; DOE Order 420.1C; DOE-STD-1066-2016 (invoked by the FBP contract and FBP-FP-PDD-00001, section 3.1.3); and applicable National Fire Protection Association (NFPA) codes and standards. Interviewed facility, Emergency Services, engineering, and maintenance management personnel demonstrated an adequate understanding of the FPP; required directives, codes, and standards; and approved equivalencies.

FPP authority having jurisdiction (AHJ) roles and responsibilities delegated to FBP (in an acting capacity since 2016) are adequately documented in FBP-FP-PDD-00001 and FBP-FP-PRO-00004. The interviewed designated contractor AHJ (CAHJ) and personnel from the Emergency Services and Engineering Management organizations described no concerns about the enduring acting CAHJ designation in support of FPP implementation. However, interviews also revealed that the FBP-FP-PDD-00001 CAHJ responsibilities (sections 5.5.8 and 6.1.A) for fire protection systems were inaccurately documented in the procedure as being assigned to the FBP Fire Services Manager but were being appropriately performed by the designated CAHJ. The process for performing delegated CAHJ evaluations and determinations is adequately described in FBP-FP-PRO-00101, *Requests for Equivalencies and Exemptions*.

While the FPP is generally adequate, contrary to DOE Order 420.1C, attachment 2, chapter II, section 3.b.(1), FBP did not submit its FPP to PPPO for approval. (See **Finding F-FBP-1**.) Not submitting the FPP to PPPO as required inhibits DOE line management from ensuring that applicable FPP objectives, requirements, and performance expectations are appropriately identified, reviewed, and implemented.

Fire Protection Program Staffing

FBP has established and manages a generally adequate FPP organization as defined in FBP-FP-PDD-00001, consisting of staffing, resources, and roles and responsibilities. FBP fire protection professional staffing is generally adequate and consists of personnel in the Fire Services organization as well as the subcontracted CAHJ team, with the CAHJ serving as the primary fire protection engineer (FPE).

FBP-TRN-PL-00002, *Training Implementation Matrix* [TIM], appropriately designates FPEs as nuclear facility technical support personnel subject to education and experience requirements, training, and qualification in accordance with DOE Order 426.2, Change 1, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*. FBP-TRN-PL-00001, *Training Program Plan*, section 5.1, appropriately describes qualification requirements for FBP technical staff, including contractors to support TIM implementation, but does not include specific requirements for a qualified FPE. Furthermore, contrary to DOE Order 426.2, attachment 1, chapter I, sections 4.b.(4), 5.b, and 5.c; FBP-TRN-PL-00001, section 5.1; and FBP-TRN-PL-00002, tables 2 and 3, FBP has not developed a qualification standard for FPEs (employees or subcontractor personnel) or provided evidence that the subcontracted FPE is adequately trained and qualified for this technical support position. (See **Deficiency D-FBP-1**.) Without a defined FPE qualification standard and evidence of completion, FBP cannot demonstrate support by qualified FPEs to ensure adequate FPP implementation consistent with safety basis requirements. In addition, the FBP-FP-PDD-00001, section 6.1.G, definition of a qualified FPE is inconsistent with and less rigorous than the DOE-STD-1066-2016, section 1.5, definition with respect to education and professional experience requirements. (See **OFI-FBP-1**).

Fire Protection Program Implementing Procedures

FBP has established and implemented a generally adequate set of sitewide FPP implementing procedures for the use, handling, and storage of combustible, flammable, and hazardous materials in accordance with DOE Order 420.1C, DOE-STD-1066-2016, and the requirements of applicable NFPA codes and standards, including:

- FBP-FP-PRO-00071, *Flammable and Combustible Liquids*, for the management and control of flammable and combustible liquids, including fuel-fired vehicles
- FBP-OS-PRO-00034, *Storing, Handling, and Using Compressed Gases*, for the use, handling, and storage of compressed gases
- FBP-OS-PRO-00041, *Housekeeping*, and FBP-FP-PRO-00005, *Combustible Control Program*, for the management and control of combustible materials.

The FBP hot work control program is adequately defined at the site level by FBP-FP-PRO-00072, *Welding, Burning, and Hot Work*, and is appropriately based on DOE Order 420.1C; DOE-STD-1066-2016; and NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*. A review of six designated hot work weld shop permits and the fiscal year 2024 hot work permit log demonstrated adequate procedure performance. FBP has appropriately implemented additional controls for ignition sources, including smoking (FBP-IH-PRO-00078, *Smoking Program*), space heaters, and temporary electrical and heating equipment, consistent with DOE-STD-1066-2016 and associated NFPA codes and standards. The use and control of space heaters and temporary heating equipment is adequately described in FBP-FS-PL-00002, *Portsmouth Gaseous Diffusion Plant (PORTS) Decontamination and Decommissioning (D&D) Fire Safety Program Plan*. No designated hot work areas or operations or temporary heating devices were observed to be active in Building X-333 during this assessment.

FBP has developed an adequate facility-level FPP for Building X-333, as required by POEF-FBP-024, *Documented Safety Analysis for Decontamination and Decommissioning of the X-330 and X-333 Process Buildings*, section 5.5.4.6 (administrative control); POEF-FBP-020; FBP-FS-PL-00002; DOE-STD-1066-2016; NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*; and NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*. FBP-FS-PL-00002 appropriately invokes sitewide FPP policies, programs, and procedures for implementation at the facility level, including procedures for hot work and control of other ignition sources, ITM and impairment control of fire protection and life safety features, the emergency response program, the

pre-incident planning program, and FPAs and inspections. In addition, FBP-FS-PL-00002 adequately describes and implements facility-specific requirements for employee training, access, emergency alarm initiation and response, evacuation, and fire reporting consistent with NFPA 241 and NFPA 801 requirements. The last two Building X-333 after-action reports documented the completion of semiannual building evacuation drills in accordance with calendar year (CY) 2024 *Transitional Fire Hazards Analysis Addendum* fire control measure (FCM) #1.

Collectively, FBP-FS-PL-00002, FBP-FP-PRO-00005, the Building X-333 TFHA (FBP-TFHA-PORTS-X-333, *Transitional Fire Hazards Analysis Portsmouth Gaseous Diffusion Plant Building X-333*), and the CY 2024 TFHA addendum comprehensively describe and implement Building X-333 facility-specific requirements for using, handling, and storing flammable and combustible liquids; controlling vehicles and mobile equipment; and managing transient combustible materials in accordance with NFPA 241 and NFPA 801 requirements. Observed staging and storage locations for combustible materials and vehicle/equipment battery charging locations in Building X-333 were, in general, appropriately managed in accordance with CY 2024 TFHA addendum FCM #2 and #3 requirements, respectively. Two reviewed upcoming D&D phase work packages appropriately included applicable fire safety-related controls as specified by CY 2024 TFHA addendum FCM #7. The Facility Manager demonstrated familiarity with established requirements during the observed weekly fire safety and combustible loading inspection for one quarter of the upper floor of Building X-333 (Units 33-2 and 33-7). However, during Building X-333 walkdowns, some inconsistencies were observed with the CY 2024 TFHA addendum FCM #1 requirement to "place combustibles stored in the facility (required for operations) [in] noncombustible containers or lockers, with closing doors or lids" (e.g., idle batteries awaiting release, radiological personal protective clothing in fire-retardant fabric bins covered with fire-retardant plastic sheeting).

FBP-FS-PL-00002, section 3.18, and the CY 2024 TFHA addendum (FCMs #1 and #6) appropriately establish a weekly (NFPA 241 inspections by facility management) and monthly (NFPA 801 inspections by Fire Services) periodicity for Building X-333 fire safety and combustible loading inspections. Nine weekly inspection reports (performed between May and August 2024) and the last five monthly inspection reports documented generally adequate inspection completion. However, contrary to NFPA 241, section 4.1.13; NFPA 801, section 4.4(6); FBP-FS-PL-00002, sections 3.18.11 and 3.18.12; and CY 2024 TFHA addendum FCMs #1 and #6, FBP was not conducting the two types of fire inspections as required. (See **Deficiency D-FBP-2**.) Untimely and/or incomplete Building X-333 fire safety and combustible loading inspections could prevent the prompt identification and mitigation of emergent deficiencies, hazards, or safety equipment requiring corrective maintenance. Specifically:

- NFPA 241 facility management inspections were being completed by performing surveys of one-quarter of Building X-333 each week such that the entire structure was inspected over a calendar month, instead of a complete building inspection weekly.
- NFPA 801 monthly inspections performed by Fire Services were being completed of only the ground floor (approximately half the building).

Equivalencies

FBP has appropriately developed and submitted nine FPP-related equivalencies for Building X-333, which were approved by PPPO as required by DOE Order 420.1C. Equivalency bases, commitments, compensatory measures, and PPPO conditions of approval for Building X-333 are, in general, accurately described within the TFHA and periodically assessed during TFHA updates. A review of the four most recent (post-CY 2017) equivalencies for Building X-333 showed adequate implementation of compensatory measures and PPPO conditions of approval, with one identified inconsistency. The TFHA Recommendation 2013-01 equivalency addressing the test or replacement of 50-year-old, dirty, or painted sprinklers was based on CY 2018 testing of a sample set of sprinklers from Buildings X-700 and X-705,

whereas the TFHA, section 4.2.1, stated that the sprinkler sample set was retrieved from Buildings X-326 and X-330.

Fire Hazards Analysis

FBP-FP-PRO-00006, *Fire Hazard Analysis (FHA)*, describes an adequate FHA program that applies to PORTS nuclear facilities and those facilities that represent unique fire safety risks appropriately based on the graded approach of DOE Order 420.1C, DOE-STD-1066-2016, and NFPA 801. The TFHA and CY 2024 TFHA addendum are current (three years or less) and, in general, adequately describe and analyze the subject facility consistent with DOE-STD-1066-2016, section 7.1.1 and appendix B, and NFPA 801, sections 4.3 and 8.3. The TFHA is adequately integrated and coordinated with the Building X-333 DSA. The TFHA and CY 2024 TFHA addendum were approved by the PPPO FPP AHJ as required.

The TFHA and the CY 2024 TFHA addendum adequately describe the available fire protection systems and recent and pending changes to the facility, fire protection features, and control measures as Building X-333 D&D programming proceeds. The TFHA and CY 2024 TFHA addendum, in general, adequately evaluate Building X-333 fire hazards and derive appropriate FCMs in support of D&D transition. However, contrary to NFPA 801, section 4.3.2.2(3), and FBP-FP-PRO-00006, sections 1.3, 3.3, 3.6, and 3.7, FBP did not evaluate the introduction and use of cargo containers within Building X-333 to encapsulate combustible waste materials in the TFHA documents. (See **Deficiency D-FBP-3**.) The introduction of new, potentially large fire hazards within Building X-333 could challenge bounding TFHA fire scenario analyses, resulting in a lack of appropriate controls to effectively manage fire risk. Specifically, the TFHA documents did not evaluate the fire hazards introduced by the 8-foot by 20-foot by 8-foot cargo containers, or derive corresponding controls (e.g., location and separation criteria, material movement equipment, door closure verification, and surveillance requirements within routine inspections) for their deployment in Building X-333.

Collectively, FBP-FS-PL-00002, the TFHA, and the CY 2024 TFHA addendum comprehensively describe review and approval criteria and processes for the permanent impairment (abandon in-place) of sprinkler and standpipe systems based on the status of D&D operations, elimination or reduction of fire hazards, and the implementation of a specific set of compensatory FCMs. Reviewed email records adequately demonstrated that FBP provided PPPO with the directed 7-day notice of intent to isolate the south and east segments of the high-pressure fire water system (HPFWS), resulting in the permanent impairment of the Building X-333 south-side fire suppression systems on September 5, 2024. PPPO acknowledged the FBP notification by email receipt, and subsequently performed several walkdowns of Building X-333 between September 14 and 27, 2024, documenting 15 CY 2024 TFHA addendum FCM implementation deficiencies that continue to be monitored for closure. There was no evidence, such as a management assessment as described in FBP-QP-PRO-00010, *Management Assessment*, section 3.1, to demonstrate that FBP had affirmed full implementation of the applicable CY 2024 TFHA addendum FCMs and readiness to isolate Building X-333 south-side fire suppression systems. (See **OFI-FBP-2**.)

With the south segment of the HPFWS isolated, 43 (of the original 86) sprinkler systems and 8 (of the original 15) standpipe systems for the south side of Building X-333 were observed during walkdowns to be permanently impaired, with facility conditions consistent with POEF-FBP-020, chapter 11, and CY 2024 TFHA addendum FCMs for their impairment. The reviewed September 2024 fire protection system impairment spreadsheet accurately identified that an additional seven north-side sprinkler systems and one north-side standpipe system were also impaired and appropriately subject to fire patrols every three hours as a compensatory measure in accordance with FBP procedures. Observed Building X-333 north-side locations where impaired fire protection systems were present were adequately managed in accordance with CY 2024 TFHA addendum FCMs.

Previously identified TFHA and CY 2024 TFHA addendum FPP compliance issues and deficiencies have been appropriately addressed through equivalencies and other mitigating actions. While no new FPP compliance issues or deficiencies were identified in either document, FBP-FP-PDD-00001 lacks direction on entry and tracking of FHA/TFHA compliance issues and deficiencies in the FBP issues management system for tracking to closure as described in FBP-QP-PRO-00020, *Problem Reporting and Issues Management*, and DOE-STD-1066-2016, section B.2.7. (See **OFI-FBP-3**.) Entry of FHA/TFHA compliance issues and deficiencies into the issues management system can improve the adequacy, effectiveness, and timeliness of the evaluation, mitigation, and resolution of identified FPP issues.

Building Fire Protection Assessments

FBP-FP-PRO-00042, *Fire Protection Facility Assessments*, describes a generally adequate building FPA program that periodically evaluates the status of FPP implementation at PORTS facilities appropriately based on DOE Order 420.1C, attachment 2, chapter II, section 3.f.(2), and DOE-STD-1066-2016, section 7.2. FBP-FP-PDD-00001, FBP-FS-PL-00002, and FBP-FP-PRO-00042 appropriately require FPAs of Building X-333 to be completed annually, in accordance with DOE Order 420.1C. The reviewed Building X-333 FPAs for CYs 2022, 2023, and 2024 appropriately provided a complete list of impaired fire suppression systems and features and the supporting rationale. However, the following weaknesses were identified:

- Contrary to DOE-STD-1066-2016, section 7.2.2, and FBP-FP-PRO-00042, section 6.1.9.C/D, FBP did not ensure that the Building X-333 FPAs for CYs 2022, 2023, and 2024 were performed by, or under the direction of, a qualified FPE. (See **Deficiency D-FBP-4**.) Not ensuring that FPAs are performed by or under the direction of a qualified FPE compromises the credibility of the assessment results. Additionally, while FBP-FP-PRO-00042, section 6.1.9.C/D, specifies that FPAs are to be provided to the CAHJ for concurrence (and concurrently performed under the direction of a qualified FPE), the reviewed FPAs lacked evidence of CAHJ review or concurrence.
- Contrary to FBP-FP-PRO-00042, section 6.1.5, FBP did not fully assess Building X-333 sprinkler, standpipe, fire alarm, and water supply systems ITM; fire hazards; pre-incident planning; TFHA controls implementation; and emergency response capabilities during the CYs 2022 and 2023 facility FPAs. (See **Deficiency D-FBP-5**.) Incomplete assessment of these FPP elements could prevent the identification of improvements needed to support effective emergency response to a significant fire event. The CY 2024 Building X-333 FPA used a newer checklist that documented acceptable fire system ITM, pre-incident planning, TFHA controls implementation, and emergency response capabilities, but lacked a discussion or other objective evidence to support the assessment conclusions. (See **OFI-FBP-4**.)
- Contrary to FBP-FP-PRO-00042, section 6.1.7, and FBP-QP-PRO-00020, section 6.1.8, FBP did not enter all new and recurring deficiencies from the CYs 2022, 2023, or 2024 Building X-333 FPAs into the issues management system for tracking to closure. (See **Deficiency D-FBP-6**.) Not entering FPA compliance deficiencies into the issues management system could hinder the evaluation, mitigation, and resolution of identified FPP issues.
- While the CY 2023 Building X-333 FPA was performed on schedule in April 2023, the reviewed document was not approved until August 2024.

Baseline Needs Assessment

FBP has developed and maintains an adequate and current BNA approved by PPPO. FBP-FS-BNA-00001, *Emergency Response Baseline Needs Assessment for Portsmouth Fire Services*, is appropriately based on DOE Order 420.1C, DOE-STD-1066-2016, and the applicable requirements of NFPA codes and standards, such as NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression*

Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments. PPPO's approval of the BNA specified that FBP was to provide an implementation schedule for open BNA recommendations by May 31, 2023. FBP provided the directed implementation schedule for the BNA on-shift Fire Services staffing recommendation in May 2023, and the reviewed organization chart demonstrated completion of the recommended action.

The BNA-specified minimum Fire Services and emergency response staffing, apparatus and equipment requirements, tactics, and procedures are appropriately based on bounding response scenarios as described within DOE-STD-1066-2016 and NFPA 1710, and appropriately modified for emergency medical responses as specified by the State of Ohio. FBP-FP-PRO-00004, section 6.1.3, accurately specifies nine personnel for routine on-shift staffing (five firefighters, two emergency medical technicians [EMTs] with at least one paramedic, one firefighter staffing the fire alarm center, and one officer), aligning with the BNA staffing recommendation. The reviewed State of Ohio emergency medical services verification website confirmed that all on-shift personnel depicted on the Fire Services organization chart were at least Firefighter II and EMT qualified, with multiple individuals further qualified as paramedics on each shift. The BNA clearly defined and affirmed emergency response mutual aid agreements in support of the PORTS emergency management program.

Walkdowns of the PORTS fire station (Building X-1007) confirmed that station staffing, apparatus inventory, and equipment were consistent with the BNA descriptions. Improvement actions to recommendations identified in the approved BNA were actively managed and completed by FBP. The BNA-recommended new live fire and technical rescue training facility (Building X-106D) has been completed and provides enhanced onsite training capabilities for FBP Fire Services and emergency response personnel. New trench rescue, hazardous material/spill response, and electric vehicle disable devices have been obtained and are being deployed to enhance response capabilities and effectiveness.

Pre-incident Plans

FBP-FP-PRO-00102, *Development of Pre-Incident Plans*, describes an adequate pre-incident planning program appropriately based on DOE-STD-1066-2016, section 6.3; NFPA 1620, *Standard for Pre-Incident Planning*; and NFPA 1660, *Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response, and Recovery*, that enhances the effectiveness and safety of emergency response operations. As described in FBP-FP-PRO-00102 and FBP-EM-PRO-00036, *Development, Maintenance, and Inspection of Facility Emergency Packets and Emergency Action Plans*, facility emergency packets (FEPs) that are referenced by PIPs are appropriately subject to input and review by facility management representatives and criticality safety staff for moderator-controlled areas to enhance the safety and effectiveness of firefighting operations. Firefighting guidance for Building X-333 moderator-controlled areas is comprehensively detailed in FBP-EM-FEP-00018, *Facility Emergency Packet for the X-333 Process Building*, section 9.4, as referenced in the *Site Building Pre-Incident Plan X-333.*

The Building X-333 PIP is current (revised in September 2024) and adequate with respect to facility configuration, D&D activities, and available fire protection features as specified by CY 2024 TFHA addendum FCM #5. Impaired Building X-333 north-side sprinkler and standpipe systems that will not be returned to service prior to permanent impairment were being tracked separately on the FBP fire protection system impairment spreadsheet. Physical access and equipment for manual firefighting were consistent with descriptions in the Building X-333 PIP and verified during facility walkdowns. As observed during walkdowns, Emergency Services personnel effectively monitored and provided communications related to physical access to Building X-333, which is subject to frequent changes (e.g., security fence changes, perimeter utility service disconnects, and perimeter water retention berms) as D&D activities continue. Fire Services personnel appropriately completed Building X-333 initial facility

access training, and through periodic fire protection system ITM, periodic drills and exercises, and frequent briefings maintain familiarization of facility conditions.

Wildland Fire Management

FBP-FS-PL-00001, *Fluor-BWXT Portsmouth Wildland Fire Management Plan*, is appropriately based on the *Federal Wildland Fire Management Policy* as required by DOE Order 420.1C and DOE-STD-1066-2016, section 8, and implemented in accordance with the applicable portions of NFPA 1143, *Standard for Wildland Fire Management*. The wildland fire exposure risk to Building X-333 has been adequately described and evaluated within the current TFHA documents. No adverse wildland fire exposure concerns were observed during walkdowns of the Building X-333 perimeter. However, contrary to DOE Order 420.1C, attachment 2, chapter II, section 3.g, FBP did not submit its wildland fire management plan to PPPO for approval. (See **Finding F-FBP-1**.) Not submitting the wildland fire management plan to PPPO as required inhibits DOE line management from ensuring that applicable plan objectives, requirements, and performance expectations are appropriately identified, reviewed, and implemented.

Fire Protection Program Conclusions

FBP has established and implemented a comprehensive sitewide policy and FPP, assigned an appropriate individual as the CAHJ, developed an appropriate set of sitewide and Building X-333 facility-specific FPP procedures, and received approval for Building X-333 FPP-related equivalencies. Also, FBP has implemented generally adequate FHA and building FPA programs, and maintains a BNA, PIP program, and wildland fire management plan. However, weaknesses were identified in the areas of submittals of the FPP and wildland fire management plan for PPPO approval, FPE staffing and qualification, TFHA evaluation of fire hazards, FPE engagement and efficacy of objective evidence supporting building FPA conclusions, and the use of the issues management system for FHA and FPA deficiencies.

3.2 Transitional Fire Hazards Analysis and Documented Safety Analysis Integration

This portion of the assessment evaluated the effectiveness of FBP's integration of the Building X-333 TFHA into associated safety design basis documentation and fire protection controls, as described in the facility safety bases.

FBP has appropriately integrated the TFHA into the facility DSA to ensure that analyzed fire hazards are sufficiently mitigated through controls for normal, abnormal, and accident conditions. The TFHA and DSA appropriately evaluate fire sprinkler and standpipe suppression systems and associated fire scenarios. The evaluated fire scenarios and supporting conclusions in the TFHA are adequately included in the DSA hazard evaluations and accident analyses sections in accordance with FBP-NSE-PRO-00121, *Control and Maintenance of the Safety Basis Documents*. The Building X-333 defense-in-depth fire sprinkler systems and combustible material control are adequately based on fire hazard identification and supporting accident analyses to ensure the protection of workers, the public, and the environment in accordance with DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, and 10 CFR 830. FBP has appropriately submitted the revised DSA for PPPO approval in support of the next phase of D&D operations for Building X-333.

Transitional Fire Hazards Analysis and Documented Safety Analysis Integration Conclusions

FBP has appropriately integrated the TFHA into the facility DSA. The DSA evaluates and analyzes accidents to adequately support the implementation of the safety bases.

3.3 Fire Protection Structures, Systems, and Components Design

This portion of the assessment evaluated design requirements, engineering, and design verification for fire protection structures, systems, and components (SSCs).

Design Requirements

FBP's fire protection design requirements are adequate. Reviewed procedures used to operate, test, and inspect the fire protection SSCs contained design requirements that were aligned with corresponding calculations. FBP FPEs and cognizant system engineers (CSEs) demonstrated during interviews that they are familiar with the design requirements of these procedures.

Engineering

FBP's conduct of engineering program establishes an appropriate design change process to implement design changes for fire protection SSCs. Requirements for fire protection design, design control, review, approval, acceptance, and configuration management are adequately defined in FBP-NSE-PRO-00050, *Design Verification and Technical Reviews*; FBP-NSE-PRO-00081, *Design Control*; FBP-NSE-00095, *Conduct of Engineering*; and FBP-PM-PDD-00001, *Integrated Safety Management System.* FBP-NSE-PRO-00053, *Request for Engineering Services*, adequately implements applicable engineering program and design criteria requirements. FBP-NSE-PRO-00053 provides an adequate process for implementing regulatory requirements as they apply to initiating, screening, processing, and executing requests for engineering assistance through the issuance of an engineering service order (ESO).

Three reviewed ESOs (i.e., ESO E8048, *X-333 Facility Isolation of Utilities*; ESOs E8405 and E8SO9, *Design for the New X-6645 Pump House*; and ESO E2592, *Convert the X-333 Sprinkler System from a Wet to Dry System)* appropriately included unreviewed safety question (USQ) determinations, identification of affected documents, engineering instructions detailing the scopes of work, SSC grade levels, materials for installation, and design requirements with NFPA code references. The USQs supporting the three ESOs included adequate descriptions of the proposed activities, justifications, and screening, as required by FBP-NSE-PRO-00114, *Unreviewed Safety Question Process*.

The D&D of Building X-333 requires the removal of the HPFWS loop around the building. The *X-333 Facility Isolation of Utilities* design appropriately isolates the HPFWS on the south and east sides of Building X-333 and includes an air gapping process for adequate pump house isolation. The north and west sides of the Building X-333 fire sprinkler supply loop remain operational until phase two of the fire sprinkler supply isolation. Isolations on the affected piping systems have been sufficiently tested to ensure that the operational capability of the utility is preserved after isolation/air gap installation. Fire safety controls are appropriately defined in support of modifications to the HPFWS supply loop as described in the CY 2024 TFHA addendum.

The *Design for the New X-6645 Pump House* includes a new electric motor-driven fire pump, diesel motor-driven fire pump, and two jockey pumps to maintain adequate system pressure. The new fire pump house and equipment will replace the functionality of aged fire pumps and water tower to maintain the operational needs and safety basis requirements. The new fire pumps and high-density polyethylene supply line appropriately tie into the existing HPFWS loop, meeting applicable NFPA design requirements.

The concern about maintaining fire sprinkler systems above freezing temperatures was appropriately addressed, given the scheduled D&D activities of building heat removal, by implementing the *Convert the X-333 Sprinkler System from a Wet to Dry System* design. The design modification converted the existing wet sprinkler system into a dry sprinkler system using most of the existing piping and alarm circuits. The

system design and installation included dry-pipe valves, associated accelerators and instrumentation for interfacing with existing supervisory and trouble alarm (transmitted for low air pressure), low enclosure temperature, or loss of power, meeting applicable NFPA requirements. Drains were strategically located at system low points to effectively allow for manual sprinkler header drainage.

Vital safety systems (VSSs) are appropriately identified, and CSEs perform VSS walkdowns as directed in FBP-NSE-PL-00008, *Cognizant System Engineer Plan*. FBP-ENG-SDD-00006, *Portsmouth Deactivation Project System Design Description for the High Pressure Fire Water System*, was adequately documented in accordance with FBP-NSE-GUI-00049, *Guide for System Design Descriptions.* Interviewed CSEs for the Building X-333 sprinkler systems and standpipes were qualified and knowledgeable of their systems, including the status of current maintenance activities, fire pump upgrades, and ongoing challenges to system operability and reliability. FBP establishes appropriate training and qualification requirements for CSEs through FBP-NSE-PRD-00002, *System Engineer Qualification Standard*, in accordance with DOE Orders 420.1C and 426.2.

During interviews, CSEs demonstrated a high level of knowledge of their assigned systems. CSEs adequately document and monitor the condition and performance of fire protection SSCs. Two reviewed system health reports for the credited HPFWS, defense-in-depth sprinkler and standpipe systems in Building X-333 appropriately included a detailed system status using a color-rating approach (red, green, yellow, and white), metrics for system reliability, trends of key parameters such as system availability, summaries of preventive and corrective maintenance, tracking of corrective action commitments, and identification of ongoing performance issues.

Design Verification and Configuration Management

FBP has established and implemented effective design verification and configuration management processes. FBP-NSE-PRO-00050 and FBP-NSE-PDD-00002, *Configuration Management Program Description*, appropriately require CSEs to be involved in design development and design changes. FBP engineering personnel adequately verified the fire protection design of the three reviewed ESOs discussed above. These three ESOs appropriately documented the adequacy of the fire protection designs and their verification by individuals and groups other than those who performed the work.

FBP-NSE-PDD-00002 appropriately establishes the configuration management program for fire protection SSCs. System boundaries and component lists are sufficiently defined in accordance with FBP-NSE-PRO-00093, *Establishing and Controlling Quality Boundaries*. Labeling of the new fire pumps and equipment components was consistent with design drawings and implemented as required by FBP-NSE-PRO-00073, *Identification of Equipment and Piping System*. Tagging and labeling of fire panels, fire sprinkler system risers, and other fire protection components were appropriate. However, contrary to DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*, attachment 2, section 2.c, FBP does not have a Master Equipment List (MEL) for the safety significant HPFWS. (See **Deficiency D-FBP-7**.) The absence of a MEL and available spare parts for credited fire protection SSCs could impact facility operations and require limiting condition for operation actions for extended durations.

Fire Protection Structures, Systems, and Components Design Conclusions

FBP's fire protection design requirements are adequate. Completed system design records and supporting calculations demonstrate that the HPFWS is adequate to meet system demands. Further, FBP has established and implemented an adequate change control and comprehensive engineering process, along with design verification. However, a weakness was identified associated with not establishing a MEL for credited fire protection SSCs.

3.4 Fire Protection System Inspection, Testing, and Maintenance

This portion of the assessment evaluated whether FBP has developed and implemented comprehensive and adequate ITM and impairment control programs for fire protection and life safety systems and equipment.

Fire Protection System Inspection, Testing, and Maintenance Programs

FBP has established and implemented a generally adequate ITM program for fire protection and life safety systems and equipment. FBP-FP-PDD-00001, section 5.6.2; FBP-FS-PRO-00012, *Fire Services Inspection and Testing Frequency*; and subordinate system/equipment-specific procedures document a generally adequate fire protection and life safety system ITM program for Building X-333 based on the contract, DOE Order 420.1C, DOE-STD-1066-2016, and applicable NFPA codes and standards. The ITM program for Building X-333 adequately incorporates approved equivalencies for the periodic operation of the HPFWS sectional control valves, full flow trip testing of dry-pipe sprinkler systems, and an alternative testing approach for emergency and exit lighting. Reviewed ITM procedures for the HPFWS fire pumps, water supplies, dry-pipe sprinkler systems, dry standpipes, fire alarm systems, and portable fire extinguishers have appropriate acceptance criteria, including actions defined when acceptance criteria are not met.

The HPFWS distribution provides adequate fire protection water to the two PORTS process buildings, including Building X-333. The water supply consists of two water storage tanks with redundant fire pump houses, each with two electric motor-driven pumps and one diesel motor-driven pump to ensure that the POEF-FBP-001, *Basis or Interim Operations of Former Uranium Enrichment Facilities*, design basis flow and pressure requirement of 4,000 gallons per minute at 125 pounds per square inch is met. The HPFWS distribution consists of the underground piping, sectional control valves, and the lead-in piping and control valves for each of the sprinkler system risers within the respective process buildings. HPFWS ITM results are appropriately incorporated into the annual VSS system health reports as part of the CSE program for applicable SSCs.

The HPFWS storage tanks, pumps, and underground distribution system are adequately subject to routine ITM consistent with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, including the following:

- Exterior and interior inspections are adequately performed every five years on the water storage tanks, and condition reports are sufficiently documented and evaluated by the CSE in accordance with FBP-NSE-PL-00008.
- Fire pumps are subject to weekly, monthly, and annual inspection and testing. The most recent annual tests confirmed flow test performance consistent with the manufacturer's certified test curve per NFPA 25 and FBP-SM-PRO-000872, *Annual Fire Pump Capacity Test*, requirements. Six reviewed fire pump house daily logs demonstrated that required NFPA inspections are being adequately documented, including diesel tank fuel level, fire water storage level, diesel battery charger output, and pump house room temperature in accordance with FBP-SM-PRO-00E73, *Routine Operation and Testing.*
- The sanitary fire water system (SFWS) supplies the underground distribution system for the Building X-333 fire hydrants and includes a loop of 10, 12, and 18-inch water mains that are subject to routine flushing and flow testing per NFPA 25. The most recent (within the last five years) fire hydrant flow tests confirmed that the available water supply was adequate to support manual firefighting efforts in Building X-333, and that flow tests are performed in accordance with FBP-FS-PRO-00028, *Test and Inspection of Fire Hydrants.*

- Underground distribution system control and sectional valves have been exempted (FBP-19-0375, *Sectional Control Valve IT&M Request for Equivalency*) from the annual NFPA 25 test requirements due to their age, condition, and potential to subsequently become impaired when exercised. Required monthly inspections are adequately performed to ensure that alignment is maintained.

Building X-333 dry-pipe sprinkler systems were subject to routine ITM through implementation of FBP-FS-PRO-00033, *Cold Weather Inspection*, and FBP-FS-PRO-00034, *Dry Pipe Sprinkler Inspection and Alarm Test*, which were derived from NFPA 25 requirements and modified by an approved ITM equivalency. Twelve reviewed ITM records for CYs 2022, 2023, and 2024 Building X-333 dry-pipe sprinkler systems demonstrated adequate performance in accordance with the procedures. Building X-333 dry-pipe standpipe systems and associated hose carts were subject to adequate routine ITM through implementation of FBP-FS-PRO-00024, *Inspection and Testing of Fire Hose*; FBP-FS-PRO-00033; FBP-FS-PRO-00034; FBP-FS-PRO-00075, *Standpipe and Hose Station Inspection and Maintenance*; and FBP-FS-PRO-00077, *Inspection and Testing of X-333 Standpipe Systems*, which were derived from NFPA 25 requirements. Six reviewed records for recent ITM performed for three standpipe systems demonstrated adequate performance in accordance with the procedures. Three reviewed records for the annual inspection and testing of three hose carts also demonstrated adequate performance in accordance with the ITM procedures and NFPA 1962, *Standard for the Care, Use, Inspection, Service, Testing, and Replacement of Fire Hose, Couplings, Nozzles, and Fire Hose Appliances*. At the time of the assessment, 43 of the 86 sprinkler systems and 8 of the 15 standpipe systems had been permanently impaired (abandoned in-place), with the balance of sprinkler and standpipe systems (and associated hose carts) scheduled to be permanently impaired in the fourth quarter of CY 2024 in support of D&D transition.

The Building X-333 fire alarm system consisting of manual pull boxes was adequately subject to routine ITM through implementation of FBP-FS-PRO-00052, *Fire Alarm Box Inspection and Test*, consistent with applicable NFPA 72, *National Fire Alarm and Signaling Code*, requirements. This includes, but is not limited to, periodic visual and functional tests, and verification of remote alarm transmission to the Building X-1007 fire alarm room. Review of the last annual ITM records demonstrated adequate performance with the procedure. Occupant notification in Building X-333 is provided by the sitewide public address system and radios with messaging originating from the Plant Shift Supervisor's alarm monitoring station in Building X-300. The Building X-333 fire alarm system is scheduled to be permanently impaired in the fourth quarter of CY 2024.

Building X-333 portable fire extinguishers were adequately subject to routine inspection through implementation of FBP-FP-PRO-00039, *Monthly Inspection of Portable Fire Extinguishers*, and consistent with NFPA 10, *Standard for Portable Fire Extinguishers*, requirements. This includes, but is not limited to, monthly visual inspections, annual inspections, 6-year maintenance, and periodic hydrostatic testing of approximately 225 units deployed within the facility. Seventeen reviewed field inspection records covering the previous 11 months for Building X-333 documented adequate performance with the inspection procedure. Six portable fire extinguishers (units 717259, 722311, 722704, 723792, 723793, and 723811) with expired 6-year maintenance (per an internal inspection) and/or 12-year hydrostatic test dates were within the allowable retention interval of FBP-FP-PRO-00039, sections 8.3.2.D and 8.3.2.H, to remain deployed in the facility. The Building X-333 Facility Manager explained that the portable fire extinguishers will be permanently removed from the facility in the fourth quarter of CY 2024, with a small cache of units available for future activities.

Building X-333 emergency and exit lighting devices and associated battery equipment were adequately subject to routine semiannual inspection and testing of the approximately 350 lighting devices and 4 battery systems consistent with NFPA 101, *Life Safety Code*, as modified by an approved equivalency. Exterior door exit sign operability was appropriately included in the scope of NFPA 241 facility

management weekly inspections, although these inspections were being incompletely performed as discussed in section 3.1, subsection *Fire Protection Program Implementing Procedures*, of this report.

While ITM performance was generally adequate, the following weaknesses were identified:

- Contrary to DOE Order 420.1C, attachment 2, chapter II, section 3.d.(1)(c); DOE-STD-1066-2016, section 5.1.3.1; and NFPA 25, section 8.3.2.2, the weekly fire pump test procedure required using the manual start as opposed to simulating a low-pressure automatic start condition. (See **Deficiency D-FBP-8**.) Testing the fire pump by manually starting it, rather than simulating an automatic start condition, does not ensure that the low-pressure switch is operable or that the fire pump is functional and will operate upon demand.
- Contrary to FBP-FS-PRO-00028, section 9.9, FBP is not reviewing or maintaining fire hydrant flow test data for tracking and trending adverse flow conditions. (See **Deficiency D-FBP-9**.) By not tracking and trending fire hydrant flow data, unobstructed pathways, design flow rates, and the reliability of the underground distribution system cannot be verified.
- Contrary to DOE Order 420.1C, attachment 2, chapter II, section 3.d.(1)(c), and DOE-STD-1066-2016, section 5.1.3.1, FBP has not performed all required NFPA 25 ITM for Building X-333 dry-pipe sprinkler and standpipe systems. (See **Deficiency D-FBP-10**.) Sprinkler and standpipe systems not subject to comprehensive routine ITM may not reliably operate as intended. Specifically, the following activities were not performed:
    - Daily/weekly inspections of dry-pipe valve riser enclosures during cold weather per NFPA 25, section 13.4.5.1.1, and monthly inspections per FBP-FS-PRO-00012, appendix B
    - Annual visual inspections of sprinklers, pipe and fittings, and hangers and supports, per NFPA 25, sections 5.2.1, 5.2.2, and 5.2.3, respectively
    - Annual visual inspections of sprinkler system spare sprinklers and head wrenches per NFPA 25, section 5.2.1.4
    - Three-year piping system air leakage testing per NFPA 25, section 13.4.5.2.9
    - Five-year standpipe flow testing per NFPA 25, section 6.3.1
    - Five-year system gauge calibration or replacement per NFPA 25, section 13.2.7.2
    - Five-year interior inspection, cleaning, and maintenance of system check valves per NFPA 25, section 13.4.2
    - Five-year hydrostatic testing of fire department connection piping per NFPA 25, section 13.8.5.
- Contrary to NFPA 101, sections 4.5.3.3, 4.5.8, and 7.9.2.7, and CY 2024 TFHA addendum FCM #1, FBP did not implement corrective maintenance for Building X-333 emergency lighting devices and battery equipment that did not meet acceptance criteria during the most recent semiannual ITM cycle. (See **Deficiency D-FBP-11**.) Inadequate or inoperable emergency lighting may inhibit prompt and safe egress of building occupants during an emergency. The most recent (May, August, and September 2024) semiannual ITM records documented that 3 of the 4 battery systems did not meet acceptance criteria, 83 of the 347 lighting units were not tested, and 123 of the 347 lighting units did not meet acceptance criteria or were not tested.
- FBP has not identified initiatives to address the aging infrastructure, specifically the HPFWS and SFWS isolation valves and piping. (See **OFI-FBP-5**.) The *Portsmouth Gaseous Diffusion Plant Utilities Infrastructure Plan* states in part that the "current condition of the system is fair and numerous underground piping leaks have been repaired, but some remain to be fixed, mainly around X-330, and that a major water leak on the HPFWS could have environmental consequences

depending on where the leak occurred." The performance criteria measuring system availability for HPFWS and SFWS isolation valves has been rated as poor (red) for the last 16 consecutive months, as documented in EVAL-SE-2024-0074, *X-Site System Engineering Annual System Overview and System*.

Fire Protection Impairment Control Program

FBP-FS-PRO-00057, *Placing Fire Protection Systems and Components Out-of-Service*, adequately documents the FBP fire protection impairment control program, which is appropriately based on DOE Order 420.1C, DOE-STD-1066-2016, and applicable NFPA codes and standards. This program appropriately applies to fire protection water supplies, fire hydrants, sprinkler and standpipe systems, and fire detection and alarm systems at PORTS, including Building X-333. FBP-FS-PRO-00057 adequately describes the coordination, communication, and approval requirements for planned and emergency outages and impairments, including the determination and assignment of compensatory actions (e.g., implementation of FBP-FP-PRO-00020, *Fire Patrol*).

Fire protection impairments, including compensatory actions, are adequately tracked (e.g., using the impairment spreadsheet) until the return to service by the Fire Services organization in accordance with FBP-FS-PRO-00057. A review of the September 13, 2024, FBP open fire protection impairment spreadsheet showed that 5 (of approximately 20) fire hydrants at the perimeter of Building X-333 were out of service. Four of the fire hydrants had been impaired for greater than 1,200 days, with 2 greater than 3,000 days. The impairment spreadsheet also documented that 8 of the 43 active remaining Building X-333 sprinkler systems were impaired/out of service, with half ranked as having high risk/consequences, and 1 of the 7 active remaining standpipe systems was also impaired. The duration of these fire suppression system impairments ranged from 250 days to more than 2,000 days, with the primary compensatory action of an enduring fire patrol completed by the Fire Services organization every three hours.

During a walkdown of the active fire suppression system impairments in Building X-333, adequate implementation of the FBP impairment control program, including assigned compensatory actions, was observed. Combustible materials were adequately controlled in the areas covered by the impaired systems and CY 2024 TFHA addendum FCM #2. The observed equipment check and fire patrol every three hours in Building X-333 was competently performed, with all visual inspections adequately completed from non-radiologically controlled areas.

PPPO previously identified (PORT-23-IA-101894) the lack of timeliness for resolving fire protection impairments as Management Tracking System (MTS) Report/Issue 10069. MTS 10069 was closed (February 29, 2024) on the basis that corrective work orders had been generated and adequate compensatory measures implemented. A related PPPO MTS Report/Issue #10403 remains open and requires FBP to periodically report to PPPO the status of impairments and corrective actions. Although appropriately identified by PPPO as an emergent concern, the continued long duration FPP impairments are a remaining FPP vulnerability. (See **OFI-FBP-6**.) Long duration fire hydrant impairments have the potential to inhibit effective emergency response, which is increasingly important as building fire suppression systems are permanently impaired in support of D&D activities and increasing reliance is placed on exterior fire suppression operations. Enduring reliance on fire patrols (an administrative control) in response to long-duration impairments could become increasingly ineffective and does not provide an equivalent level of protection to an engineered feature, contrary to the hierarchy of controls as described in DOE-STD-3009-94. Furthermore, a large inventory of impairments that each require a fire patrol every three hours as a compensatory action has the potential to challenge Fire Services resources and the timeliness of an effective fire response.

Fire Protection System Inspection, Testing, and Maintenance Conclusions

FBP has implemented generally adequate ITM and impairment control programs for fire protection and life safety SSCs and features for PORTS facilities and Building X-333. Fire alarm devices and portable fire extinguishers in Building X-333 were subject to adequate routine ITM. However, weaknesses were identified in the areas of the weekly HPFWS fire pump tests, the utility of fire hydrant flow test data, replacement of aged water distribution equipment, Building X-333 sprinkler and standpipe systems ITM, and corrective maintenance of Building X-333 emergency lighting devices and battery equipment. The lack of timely resolution of fire protection system impairments at PORTS is a recurring FPP weakness.

3.5 Contractor Fire Protection Program Self-Assessment

This portion of the assessment evaluated whether FBP has completed an adequate FPP self-assessment for continued strengthening of implementation through critical review and the identification and correction of weaknesses and vulnerabilities.

CM-MA-FY22-10895, *Fire Protection Program Assessment*, documents completion of an FPP self-assessment within the last three years, as required by DOE Order 420.1C and DOE-STD-1066-2016, section 3.2. The reviewed assessment, performed in accordance with FBP-QP-PRO-00010, consisted primarily of document and procedure reviews and was performed with engagement of a qualified FPE, as specified by DOE-STD-1066-2016, section 3.2.1. The one issue resulting from the FPP self-assessment was appropriately entered into FBP's issues management system for tracking until closure. However, the FPP self-assessment was not fully comprehensive as it did not include interviews, ITM data record reviews, observations of work activities, and exercises as recommended by FBP-QP-PRO-00010, sections 3.2, 6.1, and 6.4, or review of the efficacy of FPP requirements (e.g., ITM procedures, FPA program) as recommended by DOE-STD-1066-2016, section 3.2.2. (See **OFI-FBP-7**.) The finding and deficiencies, such as lacking PPPO approvals of DOE Order 420.1C deliverables (see Finding F-FBP-1 in section 3.1), building FPA process shortcomings (see deficiencies D-FBP-4 and D-FBP-5 in section 3.1), and incomplete fire protection system ITM procedures with respect to NFPA requirements (see deficiencies D-FBP-8 and D-FBP-10 in section 3.4) identified during this EA assessment are indicative of a lack of critical self-assessments.

Contractor Fire Protection Program Self-Assessment Conclusions

FBP completed an FPP self-assessment as required within the last three years and entered the identified needed improvement action into its issues management system. However, the self-assessment did not identify important FPP weaknesses.

3.6 Federal Oversight

This portion of the assessment evaluated the effectiveness of PPPO's oversight of FBP's FPP implementation at Building X-333, including program and field oversight of FPP-related activities.

PPPO has established and implements its oversight program through PPPO-M-226.1-2, *Oversight Program Plan*. Examples of oversight activities listed in this plan include independent assessments, surveillances, field observations, and document reviews. Requirements relating to the performance of PPPO assessments and surveillances are provided in PPPO-QA-PRO-2, *Assessment and Surveillance Process*. PPPO produces an annual integrated assessment schedule that details planned assessments and surveillances for each upcoming fiscal year. Issues identified during PPPO oversight are tracked using the MTS issues management system.

PPPO functions, responsibilities, and accountabilities are assigned in PPPO-M-413.1-1, *Management Plan*. Appendix D of this plan provides a crosswalk table that links individual requirements from DOE directives to the corresponding responsible PPPO organizational managers and lead support positions. However, since PPPO-M-413.1-1 was last revised in August 2017, many DOE directives have been updated and are not reflected in the crosswalk. EA report *Independent Assessment of Conduct of Operations at the Paducah Depleted Uranium Hexafluoride Conversion Facility, December 2022* identified the following deficiency: "PPPO does not periodically review oversight procedures (e.g., PPPO-M-414.1-2 and PPPO-2691323) to ensure that changes in process and/or DOE requirements are incorporated." In May 2024, PPPO developed and approved a corrective action plan (CAP) to address this deficiency. The CAP states that all PPPO-controlled documents will undergo revision within two years of the CAP's approval, and a reviewed revision schedule showed that PPPO-M-413.1-1 is due to be revised by March 31, 2026.

The PPPO Nuclear Safety Oversight Lead serves as the functional lead for fire protection, as well as the PORTS AHJ. PPPO does not staff a full-time DOE technical qualification program (TQP) qualified FPE (or retain a matrixed one) but does retain the support of a remote support service contractor FPE who has extensive experience in both the government and commercial sectors and is a licensed FPE in 25 states. PPPO assigns this FPE as needed to defined tasks, such as review of site events or near misses, major document or design reviews, and resolution of fire protection technical issues or questions. This FPE is also available for periodic site visits to review field conditions. A Facility Representative (FR) provides routine field oversight of Building X-333, including for fire protection issues, and is qualified per DOE-STD-1151, *Facility Representative Functional Area Qualification Standard*. PPPO supplements its Federal workforce with a support service contractor, ETAS, which provides technical and oversight support services, including in the functional areas of fire protection, emergency management, and industrial safety.

Reviewed PPPO oversight products demonstrate generally adequate FPP oversight. PPPO's most recent full assessment of the FBP FPP was performed in 2020, and the six-person team consisted of PPPO staff as well as ETAS staff, although no DOE TQP-qualified FPEs participated. This assessment incorporated select DOE Order 420.1C, attachment 2, chapter II requirements into review criteria and clearly listed assessment results, including three findings that were entered into MTS and subsequently resolved by FBP. The PPPO fiscal year 2023 integrated assessment schedule included another assessment of the FBP FPP, for which fieldwork was completed during May 2023. Due to competing priorities, the assessment report's completion was delayed, and ultimately PPPO staff attrition in January 2024 led to the assessment being cancelled in accordance with PPPO-M-226.1-2, section 6.2.2. However, during February 2024, ETAS staff identified six findings from the May 2023 fieldwork, which were documented, entered into MTS, and subsequently addressed by FBP.

In addition to formal FPA activities, PPPO effectively performs fire protection-related field oversight, document reviews, and interpretation of data from FBP. The Building X-333 FR and ETAS staff provide operational fire protection oversight through facility walkdowns. From October 2023 through September 2024, the Building X-333 FR identified and entered 88 fire protection-related issues into MTS for tracking and disposition by FBP, a significant contribution from an FR to a single functional area's oversight. Fifteen of those issues were notable non-compliances with the CY 2024 TFHA addendum that were identified by the FR shortly after the TFHA addendum became effective in September 2024. FBP has subsequently resolved 11 of those non-compliances, while 4 remain to be resolved and are tracked in MTS. PPPO reviews of the first two TFHA addendum submittals from FBP during 2024 were performed by multiple PPPO and ETAS personnel and generated many substantive comments, which FBP incorporated into the final submittal to PPPO. ETAS staff enters quarterly fire hydrant impairment data into a local geospatial information system to create a more usable map representation for PPPO oversight purposes. The fire hydrant locations are color-coded by status and priority, and PPPO staff analyzes this

map to assess which physical areas around PORTS facilities should be prioritized for addressing impairments. This approach is considered a **Best Practice** because it allows PPPO to more intuitively analyze and perform routine oversight of FBP's fire hydrant impairment status and historical performance, thereby improving PPPO's communications of expectations to FBP.

While overall PPPO oversight of FBP's FPP-related activities is adequate, issues were identified with respect to PPPO FPP administration and required approvals. Contrary to DOE Order 420.1C, section 4.a, PPPO did not approve the FBP FPP and wildland fire management plan. (See **Finding F-PPPO-1**.) Lack of DOE approval diminishes assurance that the FPPs under PPPO's purview have been adequately reviewed to ensure contractors appropriately incorporate established DOE safety requirements. Possible contributing factors to this issue include: a lack of corresponding lines of inquiry in the PPPO FPP assessments during 2020 and 2023; a lack of DOE TQP-qualified FPE involvement with FPP oversight activities, such as formal assessments; and the omission of the delegation of these PPPO responsibilities in PPPO-M-413.1-1, appendix D, attachment A. (See **OFI-PPPO-1**.)

Federal Oversight Conclusions

Overall, PPPO generally adequately performs Federal oversight of FBP's FPP-related activities. PPPO's planning and execution of fire protection-related field oversight, document reviews, and interpretation of data from FBP is effective. The creation of a more usable map representation of fire hydrant impairment data for PPPO oversight purposes is considered a best practice. However, a weakness was identified relating to required documentation of PPPO approvals of key FBP FPP documents.

3.7 Follow-up on Previous EA Findings

This portion of the assessment examined the status of corrective actions for three findings assigned to PPPO that were documented in EA reports *Independent Assessment of Work Planning and Control for Deactivation and Demolition Work at the Portsmouth Site, March 2022* and *Independent Assessment of Work Planning and Control at the Paducah Gaseous Diffusion Plant, June 2023.*

The three EA findings and their status are described below:

Finding F-PPPO-1 of the March 2022 report stated that PPPO had not implemented a formal continuous training program for personnel in the TQP, periodically requalified TQP qualified personnel, or conducted periodic self-assessments of the TQP for effectiveness, as required by DOE Order 426.1B, *Department of Energy Federal Technical Capabilities*.

Status: This finding remains open and is not resolved. PPPO is developing plans and procedures for the TQP to bring the program into compliance with DOE Order 426.1B requirements and to enhance program performance. The PPPO Quality Assurance Lead, who is responsible for the TQP, articulated a strong vision for the future state of the program. However, PPPO currently does not have formal TQP plans and procedures, does not currently track continuous training for TQP participants, and has not completed a periodic self-assessment of the TQP. The Quality Assurance Lead stated that a January 2025 TQP self-assessment is scheduled in anticipation of TQP plans and procedures being developed and issued by that time. Once all PPPO corrective actions have been completed, EA will re-assess this finding.

Finding F-PPPO-2 of the March 2022 report stated that PPPO had not conducted an FR staffing analysis, analysis of quarterly FR performance indicators consistent with DOE-STD-1063, *Facility Representatives*, or triennial self-assessments of the FR program, as required by DOE-STD-1063-2017.

Status: This finding is resolved. Since the completion of EA fieldwork supporting the March 2022 report, DOE-STD-1063-2021 was issued. In accordance with this standard, PPPO has conducted an FR staffing analysis, analysis of quarterly FR performance indicators, and a triennial self-assessment of the FR program. PPPO provided documentation to demonstrate the completion of these program documents. However, this assessment identified weaknesses in the completion of the FR staffing analysis (see Finding F-PPPO-1 below).

Finding F-PPPO-1 of the June 2023 report stated that PPPO had not conducted an accurate FR staffing analysis or a triennial self-assessment of the FR program, as required by DOE-STD-1063-2021.

Status: This finding is not resolved. Although PPPO did perform a triennial self-assessment of the FR program, an issue was noted with respect to the accuracy of the FR staffing analysis. There are multiple instances in the FR staffing analysis where the recommended base coverage level (RBCL) for PORTS and Paducah Site facilities do not align with the prescribed DOE-STD-1063-2021 methodology in table C-2 of appendix C. For example, the X-300 series of PORTS facilities includes eight facilities. In the FR staffing analysis, the RBCL for three of these facilities are assigned correctly, the RBCL for two are assigned lower than prescribed, and the RBCL for three are assigned higher than prescribed. In addition, contrary to DOE-STD-1063-2021, all combinations of a facility hazard categorization of "Radiological" (column b) and a facility activity level of "Low" (column c) are assigned an RBCL of "Seldom," whereas the standard does not prescribe any FR coverage for this combination. Similarly, the FR staffing analysis also assigns FR coverage to "Administrative" facilities, which is not prescribed by DOE-STD-1063-2021. These deviations alter many of the final FR full-time employee coverage levels assigned to each facility and potentially the total final FR full-time employee coverage level of the FR staffing analysis. Once PPPO addresses this issue of FR staffing analysis accuracy, EA will re-assess this finding.

Follow-up on Previous EA Findings Conclusions

For the March 2022 findings, PPPO is in the process of implementing TQP corrective actions to address Finding F-PPPO-1 and has adequately addressed Finding F-PPPO-2. However, for the June 2023 finding, accuracy issues remain in the FR staffing analysis.

4.0 BEST PRACTICES

Best practices are safety-related practices, techniques, processes, or program attributes observed during an assessment that may merit consideration by other DOE and contractor organizations for implementation. The following best practice was identified as part of this assessment:

- Staff from PPPO's support service contractor, ETAS, enters quarterly fire hydrant impairment data into a local geospatial information system to create a more usable map representation for PPPO oversight purposes. The fire hydrant locations are color-coded by status and priority, and PPPO staff analyzes this map to assess which physical areas within PORTS facilities should be prioritized for addressing impairments.

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 CAPs 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.

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Finding F-FBP-1: FBP did not submit its FPP and wildland fire management plan to PPPO for approval. (DOE Order 420.1C, att. 2, ch. II, secs. 3.b.(1) and 3.g)

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Finding F-PPPO-1: PPPO did not approve the FBP FPP and the wildland fire management plan. (DOE Order 420.1C, sec. 4.a)

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.

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Deficiency D-FBP-1: FBP has not developed a qualification standard for FPEs (employees or subcontracted personnel) or provided evidence that the subcontracted FPE is adequately trained and qualified for this technical support position. (DOE Order 426.2, att. 1, ch. I, secs. 4.b.(4), 5.b, and 5.c; FBP-TRN-PL-00001, sec. 5.1; and FBP-TRN-PL-00002, tables 2 and 3)

Deficiency D-FBP-2: FBP was not conducting the Building X-333 NFPA 241 and NFPA 801 fire inspections as required. (NFPA 241, sec. 4.1.13; NFPA 801, sec. 4.4(6); FBP-FS-PL-00002, secs. 3.18.11 and 3.18.12; and CY 2024 TFHA addendum FCMs #1 and #6)

Deficiency D-FBP-3: FBP did not evaluate the introduction and use of cargo containers within Building X-333 to encapsulate combustible waste materials in the TFHA documents. (NFPA 801, sec. 4.3.2.2(3), and FBP-FP-PRO-00006, secs. 1.3, 3.3, 3.6, and 3.7)

Deficiency D-FBP-4: FBP did not ensure that the Building X-333 FPAs for CYs 2022, 2023, and 2024 were performed by, or under the direction of, a qualified FPE. (DOE-STD-1066-2016, sec. 7.2.2, and FBP-FP-PRO-00042, sec. 6.1.9.C/D)

Deficiency D-FBP-5: FBP did not fully assess Building X-333 sprinkler, standpipe, fire alarm, and water supply systems ITM; fire hazards; pre-incident planning; TFHA controls implementation; and emergency response capabilities during the CYs 2022 and 2023 facility FPAs. (FBP-FP-PRO-00042, sec. 6.1.5)

Deficiency D-FBP-6: FBP did not ensure that all new and recurring deficiencies from the CYs 2022, 2023, or 2024 Building X-333 FPAs were entered into the issues management system for tracking to closure. (FBP-FP-PRO-00042, sec. 6.1.7, and FBP-QP-PRO-00020, sec. 6.1.8)

Deficiency D-FBP-7: FBP does not have a MEL for the safety significant HPFWS. (DOE Order 433.1B, att. 2, sec. 2.c)

Deficiency D-FBP-8: FBP did not perform the required weekly fire pump tests in accordance with NFPA 25. (DOE Order 420.1C, att. 2, ch. II, sec. 3.d.(1)(c); DOE-STD-1066-2016, sec. 5.1.3.1; and NFPA 25, sec. 8.3.2.2)

Deficiency D-FBP-9: FBP is not reviewing or maintaining fire hydrant flow test data for tracking and trending adverse flow conditions. (FBP-FS-PRO-00028, sec. 9.9)

Deficiency D-FBP-10: FBP has not performed all required NFPA 25 ITM for Building X-333 dry-pipe sprinkler and standpipe systems. (DOE Order 420.1C, att. 2, ch. II, sec. 3.d.(1)(c); DOE-STD-1066-2016, sec. 5.1.3.1; NFPA 25, chaps. 5, 6, and 13; and FBP-FS-PRO-00012, app. B)

Deficiency D-FBP-11: FBP did not implement corrective maintenance for Building X-333 emergency lighting devices and battery equipment that did not meet acceptance criteria during the most recent semiannual ITM cycle. (NFPA 101, secs. 4.5.3.3, 4.5.8, and 7.9.2.7, and CY 2024 TFHA addendum FCM #1)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the OFIs shown below 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.

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OFI-FBP-1: Consider defining education, experience, and training requirements for staff FPEs in FBP-FP-PDD-00001 consistent with DOE-STD-1066-2016 criteria.

OFI-FBP-2: Consider performing an assessment of the implementation of CY 2025 TFHA addendum FCMs prior to future phases of permanent fire protection system impairments in Building X-333 to affirm the readiness to proceed.

OFI-FBP-3: Consider including the expectation in FBP-FP-PRO-00006 to enter and track FHA/TFHA compliance issues and deficiencies in the FBP issues management system for effective tracking and closure of identified issues.

OFI-FBP-4: Consider including the expectation in FBP-FP-PRO-00042 to provide an evaluative narrative for facility FPA topical elements that have a performance periodicity (e.g., fire and other hazards, fire protection and life safety system ITM, pre-incident planning, emergency response readiness) to provide objective evidence in support of assessment report conclusions.

OFI-FBP-5: Consider the replacement of aged HPFWS and SFWS isolation valves and piping to enhance system reliability.

OFI-FBP-6: Consider initiatives to accelerate the resolution/restoration of Building X-333 fire hydrant and other PORTS building sprinkler system impairments to shorten the remaining duration of the substandard level of protection.

OFI-FBP-7: Consider developing and implementing an FPP self-assessment instruction that aligns FBP-QP-PRO-00010 and DOE-STD-1066-2016 scope and performance objectives to ensure a comprehensive evaluation.

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OFI-PPPO-1: Consider planning and conducting an FPP administration-focused assessment with one or more DOE-qualified FPEs on the assessment team.

Appendix A
Supplemental Information

Dates of Assessment

September 11 to October 16, 2024

Office of Enterprise Assessments (EA) Management

John E. Dupuy, Director, Office of Enterprise Assessments
William F. West, Deputy Director, Office of Enterprise Assessments
Kevin G. Kilp, Director, Office of Environment, Safety and Health Assessments
David A. Young, Deputy Director, Office of Environment, Safety and Health Assessments
Thomas E. Sowinski, Director, Office of Nuclear Safety and Environmental Assessments
Kimberly G. Nelson, Director, Office of Worker Safety and Health Assessments
Jack E. Winston, Director, Office of Emergency Management Assessments
Brent L. Jones, Director, Office of Nuclear Engineering and Safety Basis Assessments

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Kevin G. Kilp, Chair
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EA Site Lead for Portsmouth Site

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