



Independent Assessment of Conduct of Operations at the Paducah Depleted Uranium Hexafluoride Conversion Facility

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Acronyms

CFR	Code of Federal Regulations
ConOps	Conduct of Operations
CRO	Control Room Operator
CSY	Cylinder Storage Yard
DOE	U.S. Department of Energy
DUF6	Depleted Uranium Hexafluoride
EA	Office of Enterprise Assessments
FM	Facility Manager
HF	Hydrofluoric Acid
KOH	Potassium Hydroxide
LOTO	Lockout/Tagout
MCS	Mid-America Conversion Services, LLC
MFO	Management Field Observation
MSWord	Microsoft® Word
OFI	Opportunity for Improvement
PA	Public Address
PPPO	Portsmouth/Paducah Project Office
PSO	Production Support Operations

INDEPENDENT ASSESSMENT OF CONDUCT OF OPERATIONS AT THE PADUCAH DEPLETED URANIUM HEXAFLUORIDE CONVERSION FACILITY

Executive Summary

The U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) conducted an independent assessment of selected elements of the conduct of operations program implemented by Mid-America Conversion Services, LLC (MCS) at the Paducah depleted uranium hexafluoride (DUF6) conversion facility from August 22 to 26, 2022. The assessment also evaluated the effectiveness of Portsmouth/Paducah Project Office's oversight of the MCS conduct of operations program.

EA identified the following strength:

- MCS has established and implemented a comprehensive conduct of operations program in accordance with DOE Order 422.1, *Conduct of Operations*, exhibiting the management and staff's strong commitment to conduct of operations.

EA also identified several weaknesses, as summarized below:

- MCS did not ensure that all work instructions integrate cautions or warnings as action steps to ensure that workers use hazard controls at the appropriate time.
- Operators conducting daily equipment walkdowns (rounds) did not identify several general housekeeping or material condition deficiencies on the round sheet; e.g., a ladder was blocking an egress route and an electrical junction box was missing a cover.
- The cylinder storage yard Facility Manager's electronic logkeeping approach of using a Microsoft® Word file presents a vulnerability to maintaining an unalterable historical record, as MCS cannot ensure that, at any time during a shift, previous entries were not altered.
- The potassium hydroxide building's primary access doors were not posted for required radio use even though the building is recognized as an area where public address announcements are inaudible or cannot be clearly heard.
- MCS uses an administrative method to place temporary holds on hazardous energy lockout/tagout activities that is not specifically addressed in its procedure.

In summary, the MCS conduct of operations program is generally well established and effectively implemented. Resolution of the specific weaknesses identified by this assessment will improve the reliability of the DUF6 conversion operations and eliminate conditions that could impact safe work performance.

INDEPENDENT ASSESSMENT OF CONDUCT OF OPERATIONS AT THE PADUCAH DEPLETED URANIUM HEXAFLUORIDE CONVERSION FACILITY

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 selected elements of the conduct of operations (ConOps) program implemented by Mid-America Conversion Services, LLC (MCS) at the Paducah depleted uranium hexafluoride (DUF6) conversion facility. The assessment also evaluated the effectiveness of Portsmouth/Paducah Project Office (PPPO) oversight of the MCS ConOps program. EA conducted the onsite portion of this assessment on August 22 to 26, 2022.

The Paducah Site includes an operating DUF6 conversion facility and associated cylinder storage yard (CSY) staging thousands of robust cylinders containing DUF6. The DUF6 conversion facility converts DUF6, left behind from legacy enrichment operations, into hydrofluoric acid (HF) for commercial reuse and more chemically stable depleted uranium oxide for storage, reuse, or disposal. After an extended shutdown due to COVID-19 and maintenance, the DUF6 conversion facility restarted operations in November 2021. Just prior to the onsite assessment, a failed valve resulted in the internal radioactive contamination of some processing equipment and temporary shutdown of the DUF6 conversion facility to perform decontamination activities. Thus, normal conversion operations could not be observed. This assessment was conducted in accordance with the *Plan for the Independent Assessment of Conduct of Operations at the Paducah Depleted Uranium Hexafluoride Conversion Facility, August 2022*.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which is implemented 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, the criteria used to guide this assessment were based on portions of objectives and criteria from sections CO.1 through CO.4, CO.8, CO.9, CO.11, CO.12, CO.13, CO.17, CO.18, and CO.19 of EA Criteria and Review Approach Document (CRAD) 31-39, Rev. 0, *Conduct of Operations*. In addition, EA used elements of CRAD EA-30-07, Rev. 0, *Federal Line Management Oversight Processes*, to collect and analyze data on PPPO oversight activities. EA examined key documents, such as the documented safety analysis, technical safety requirements, manuals, work packages, procedures, and training and qualification records. EA also interviewed key personnel responsible for establishing and implementing the ConOps program; observed routine operational activities; and walked down significant portions of the DUF6 conversion facility. The members of the assessment team, the Quality Review Board, and management responsible for this assessment are listed in appendix A.

There were no previous findings for follow-up addressed during this assessment.

3.0 RESULTS

3.1 Organization and Administration

This portion of the assessment evaluated MCS's operations organization and administration.

MCS has established and implemented a comprehensive ConOps program in accordance with DOE Order 422.1, *Conduct of Operations*. DUF6-U-CON-0001, *Conduct of Operations Manual*, defines expectations for performance, and a thorough ConOps implementation matrix, DUF6-PLN-257, *Conduct of Operations Applicability Matrix*, specifies a suite of detailed implementing procedures for all 18 elements of DOE Order 422.1. Roles, responsibilities, authorities, and accountability for the operations organization personnel are clearly defined. Observed engagement by personnel from multiple organizations during such activities as pre-job briefings demonstrated strong support of continuous improvement with regard to the ConOps program.

MCS has established appropriate staffing for each shift for all operator, engineering, and support positions. The shift staffing plan consists of four rotating shifts and specifies the necessary staffing levels for all positions. All positions, including relief positions, were fully staffed during EA's observations. Interviews with control room operators (CROs), facility managers (FMs), and operations managers confirmed that they clearly understood their roles, responsibilities, and reporting requirements (e.g., proper notification of system status changes) and were appropriately knowledgeable of the DUF6 system. Reviewed training and qualification records for two operations managers, two facility managers, and two control room operators confirmed full qualification status in accordance with DUF6-TRN-0001, *Training and Qualification*. However, the Conversion Operations Manager qualification card did not contain any requirements for knowledge, performance, or final evaluation, in contrast to the CSY Operations Manager's qualification card, which contained attributes for knowledge and performance and required a final examination. (See **OFI-MCS-1**.)

MCS conducts adequate monitoring and self-assessments of ConOps. Independent assessments of ConOps are appropriately required by DUF6-U-QAP-0012, *Independent Assessments*. Three reviewed independent assessments regarding lockout/tagout (LOTO), logkeeping, and procedures demonstrated an appropriate and thorough review of each area. Management observation of ConOps is adequately governed by DUF6-U-GFP-0218, *Management Field Observation* [MFO]. A review of the ten MFOs conducted during the prior three months by four different managers showed that MFOs are being conducted as required. MCS also effectively tracks and trends MFOs and the issues they identify. However, DUF6-U-GFP-0218 does not specify a frequency for the conduct of MFOs. (See **OFI-MCS-2**.) MCS managers expressed the value of the management visibility and interaction with the workforce they experience through the MFO process.

Organization and Administration Conclusions

MCS has established and implemented a comprehensive ConOps program. All positions, including relief positions, were fully staffed during observations. Interviewed personnel confirmed a thorough understanding of their roles and responsibilities. The engagement by personnel from multiple organizations during pre-job briefings demonstrated strong pursuit of continuous improvement by MCS management. However, EA identified weaknesses associated with the Conversion Operations Manager's qualification card and the lack of frequency requirements for the conduct of MFOs.

3.2 Shift Routines and Operating Practices

This portion of the assessment evaluated MCS's established shift routines and operating practices.

MCS has established and implemented effective shift routines as specified in DUF6-U-CON-0001. DUF6-U-CON-0001 appropriately requires operators to be alert and informed of conditions and to operate equipment properly. These requirements are properly flowed into DUF6-C-OPS-4501, *Routine Operational Tasks*, and include requirements for inspections, equipment checks, and round sheets (data sheets that identify important equipment and acceptable equipment instrumentation readings). DUF6-C-OPS-4501 provides adequate instructions and data recording forms for all facility equipment rounds and surveillances to ensure system functionality, the collection of data for performance trends, and the appropriate response to out-of-tolerance equipment indicators. Interviews with CROs, equipment and utility operators, and FMs confirmed their understanding of the requirements for shift routines and cognizance of the current facility conditions.

During observed operator rounds for the DUF6 facility, operators demonstrated strict compliance with round sheet instructions. However, the operators did not note several material condition/housekeeping issues, including the following (see **OFI-MCS-3**):

- A 10-foot step ladder in the equipment room was blocking egress.
- A pressure gauge contained approximately one inch of water inside the gauge.
- An electrical junction box was missing a cover plate.
- Two large sections of piping and valves had been removed and were abandoned, lying on the equipment room floor.
- A manual pump start switch did not have a label indicating what function it performed.
- Spare breakers on the motor control centers exhibited signs of being deficient (trouble indicator lights were flashing).

MCS personnel took prompt action to correct these EA-identified issues when brought to their attention.

Shift Routines and Operating Practices Conclusions

MCS has established and implemented effective shift routines and operating practices through operating procedures. Facility equipment rounds and surveillances are appropriately required by procedure and were adequately performed during observed activities. However, some material condition/housekeeping issues were not identified by operators during observed rounds.

3.3 Control Area Activities

This portion of the assessment evaluated MCS's practices regarding control area operations.

MCS has established and implemented appropriate practices for the control area and control room operations in accordance with procedure DUF6-U-CON-0001. DUF6-U-CON-0001 appropriately and thoroughly addresses control area access, specifying which personnel positions have unencumbered access. All DUF6 system operations are governed and conducted by operating procedures that limit concurrent operations to those specified by the procedure. During an observed surveillance test of the HF detectors, all personnel appropriately followed the procedural instructions specified in DUF6-C-MNT-0050, *Testing and Maintenance of HF Storage Tanks Detectors and Interlocks*. EA observed excellent formal and disciplined behavior during field work performance, including reader/worker and step repeat-backs during performance of DUF6-C-MNT-0050. Control area operators appropriately performed the required periodic surveillance of equipment conditions, as specified in DUF6-C-MNT-0050. All

observed personnel entering the control room throughout the assessment properly demonstrated an audible request for permission to enter, as required. All observed CROs performed their at-the-controls activities with formality and discipline.

Control Area Activities Conclusions

MCS has established and implemented appropriate control area and control room operations practices. All personnel not assigned to the control room properly requested permission to enter, and formal and disciplined conduct was observed at all times in the control room and at-the-controls area.

3.4 Communications

This portion of the assessment evaluated MCS's operator communication practices.

MCS has established adequate operator communications practices as addressed in DUF6-U-CON-0001. DUF6-U-CON-0001 comprehensively addresses the requirements of DOE Order 422.1, att. 2, sec 2.d, including attachments for approved system and equipment acronyms, the industry standard phonetic alphabet, and attributes of verbal communications. Operator and worker training on communications, the responsibility of the Conversion Operations Manager, is adequately addressed in DUF6-U-CBT-CON-001A, *Introduction to Conduct of Operations*.

MCS generally implements operator communications practices as addressed in DUF6-U-CON-0001. Specified types of communications equipment (the public address [PA] system, radios, and horns used to communicate during emergency and normal operations) were adequately demonstrated during walkdowns and work evolutions. The interviewed Conversion Operations Manager and Production Support Operations (PSO) Manager were knowledgeable of their responsibility to ensure that radio-required areas were appropriately defined and marked. Entry doors to one observed area, the Scrubber Room, were properly posted for required radio communication. Interviewed CROs were adequately knowledgeable of administrative controls for the PA system, recognizing that only the Conversion FM is authorized to make announcements over this system. The CROs also demonstrated their familiarity with and use of DUF6-C-OPS-0601, *Upset Conditions*, which provides detailed instructions on emergency response communications during various accident scenarios (e.g., chemical spills, radiological exposures).

Observed control area operators effectively communicated with the control room and other operators. Such effective communications included sender/receiver identifications and the use of authorized abbreviations and acronyms for facilities and equipment, the standard phonetic alphabet, and proper attributes of verbal communications, such as repeat-backs and confirmation in accordance with DUF6-U-CON-0001. Interviewed control area supervisors and operators knew how to inform the CROs of any emergency by using the red button (channel 16, which is constantly monitored by the CROs) on their radio.

While most observed communications were adequate, EA identified two weaknesses:

- Contrary to DUF6-U-CON-0001, sec. 4.3, subsec. 1.c.1, which specifies that the potassium hydroxide (KOH) building is an area where "PA announcements are inaudible or cannot be clearly heard," the primary access doors of the KOH building were not posted for required radio use. (See **Deficiency D-MCS-1.**) The proximity of the KOH building to the HF area and adjacent sources of uranium presents a high-level hazard upon catastrophic release, giving little time for onsite workers to respond. An EA-requested test announcement over the PA system determined that the speakers inside the KOH building could not be heard with only a floor fan producing background noise. However, the results of the PA system quarterly communications equipment testing for March 19 and

June 17, 2022, show that the KOH building PA system passed but identified other locations with PA system problems, which had not been addressed. The responsible manager explained that the PA testing is performed on backshifts, when operational background noise is minimal. Testing the PA system without regard to ambient noise levels for normal operations could result in workers missing important information announcements. MCS immediately posted the main KOH building access doors and initiated work orders to address the other identified PA system problems.

- As a Level 1 procedure (an in-hand procedure performed as specified in the required sequence), DUF6-C-OPS-0601 instructs CROs to make an emergency notification before providing instructions to a worker that could reduce the health impact of an HF exposure. Delays in instructing workers on response to accidental chemical exposures can result in increased health impacts. After CROs expressed this concern, EA observed the operators and the Conversion FM discussing the needed changes to DUF6-C-OPS-0601 to resolve this issue.

Communications Conclusions

MCS has established adequate operator communications practices. With the exception of two identified weaknesses, communication systems are well defined and controlled and the observed operator communications adhered to established practices.

3.5 Control of Equipment and System Status

This portion of the assessment evaluated MCS's operator practices for equipment control and system status.

MCS has established and implemented adequate practices for initial equipment lineups and subsequent changes to ensure that facilities operate with known and proper configuration, as designed. DUF6-U-CON-0001 adequately addresses the requirements of DOE Order 422.1, att. 2, sec. 2h. Interviews with control room personnel and observations of control room activities confirmed continuous awareness of facility equipment status, which included the use of status boards to monitor system deviations and LOTOs. Operations and maintenance personnel appropriately coordinate with engineering personnel to maintain configuration control of system alignment. CROs and control room supervisors were aware of inoperable alarms and alarms with temporary set points, such as one alarm associated with the HF storage tank vapor detectors, which was appropriately entered into the work control systems for replacement. As a compensatory measure for this out-of-service detector, the operators posted the area, and CROs conducted sitewide announcements to alert workers of this condition.

MCS defines a rigorous process for authorizing any work on safety structures, systems, and components. The interviewed CROs and operations management clearly understood their responsibilities for maintaining proper configuration and authorizing status changes for major equipment. Interviewed operations personnel and maintenance personnel were knowledgeable of the work authorization process and demonstrated the ability to access engineering documents and acquire support from engineering, as needed. Field observations of work performed in accordance with DUF6-G-OPS-0406, *HF Storage Valve and Switch Line-Ups*, confirmed the use of formal checklists to guide initial equipment alignments and rechecks, including equipment identification matching installed labels, required component position, data entry space for actual position and any deviations, functional testing, documentation of alignment or recheck, and supervisory review and approval. The reviewed work package for a deficient HF storage tank vapor detector demonstrated appropriate work authorization by a control room operations supervisor (Operations FM), post-maintenance testing, and approved return to service.

Control of Equipment and System Status Conclusions

MCS has established and implemented adequate practices for initial equipment lineups and subsequent changes to ensure that facilities operate with known and proper configuration. CROs manage equipment deficiencies, maintenance activities, post-maintenance testing, and return to service adequately.

3.6 Lockout and Tagouts

This portion of the assessment evaluated MCS's operator practices for installing and removing LOTOs and caution tags.

MCS has established and generally implemented effective practices for installing and removing LOTOs to protect personnel from hazardous energy sources. DUF6-U-GFP-0216, *Control of Hazardous Energy (Lockout/Tagout)*, adequately addresses the procedures, roles, and responsibilities associated with the development, documentation, review, installation, and removal of a LOTO consistent with the requirements of DOE Order 422.1, att. 2, sec. 2.i; *Occupational Safety and Health Administration Rules*; 29 CFR Part 1910, *Occupational Safety and Health Standards*, and 29 CFR Part 1926, *Safety and Health Regulations for Construction*; and National Fire Protection Association Standard 70E®, *Standard for Electrical Safety in the Workplace*®. Supervisors appropriately verified that only authorized, qualified personnel perform LOTOs, and EA observed work crew supervisors properly confirming worker qualifications to conduct LOTOs at pre-job briefings. An observed LOTO performed by conversion operators for drain piping/repair (C-1-POS-VA-601A1, *Lockout/Tagout Work Permit*) in the C-1300 Scrubber Room demonstrated proper control of the tags, locks, lockboxes, chains, and other components in accordance with DUF6-U-GFP-0216. The associated work package containing the observed LOTO confirmed proper authorization to perform the work.

During EA's observation of the LOTO group key lock box area, five red plastic cards were observed wedged into the glass window of the group key lock boxes bearing the following statement, "Partial Permit Removed for Testing." These red plastic cards are used to signify a temporary hold in LOTO activities to accommodate additional testing or other administrative actions. However, contrary to DOE Order 422.1, att. 2, sec. 2.i.(1)(d), use of red plastic cards on the lock boxes to place temporary holds on LOTO activities is not addressed in DUF6-U-GFP-0216. (See **Deficiency D-MCS-2.**) This condition could result in confusion about LOTO status if the wedged cards were inadvertently moved (e.g., knocked loose or fallen from position and replaced in another LOTO box), potentially putting workers at risk of working on a system that is not fully authorized for work to progress. MCS operations management subsequently removed these cards after their inquiry of the EA observation.

DUF6-U-GFP-0216 also adequately addresses installation and removal of administrative control tags for equipment protection or operational control. DUF6-U-GFP-0216 adequately addresses development, documentation, review, installation, and removal of administrative control tags to convey operational information or equipment alignments for protection of equipment. During a walkdown, EA identified several administrative control tags that were notated with the proper information specified by DUF6-U-GFP-0216; none were used in lieu of more appropriate administrative controls, LOTO equipment corrective maintenance. Interviewed operations and maintenance personnel understood the importance of not relying on administrative control tags for personnel protection.

Lockout and Tagouts Conclusions

MCS has established and generally implemented adequate practices for installing and removing LOTOs to protect personnel from hazardous energy sources and for the use of caution tags. However, the use of cards to place temporary holds on LOTO activities is not addressed in the MCS LOTO procedure.

3.7 Independent Verification

This portion of the assessment evaluated MCS's operator practices for verifying that critical equipment configuration is in accordance with controlling documents.

MCS has effectively established and implemented a critical equipment configuration process. DUF6-U-CON-0001 and DUF6-C-GFP-0010, *System and Equipment Alignment*, adequately address the requirements of DOE Order 422.1, att. 2, sec. 2.j. DUF6-U-CON-0001 and DUF6-C-GFP-0010 adequately identify components for which positions must be independently verified, including safety-related equipment for structures, systems, and components. DUF6-C-GFP-0010 appropriately permits exemption from independent verification in specific situations (e.g., when significant radiation or HF exposure is likely). DUF6-C-GFP-0010 appropriately requires independent verification during specific situations, such as lineups to take equipment out of service or return it to service (e.g., isolation boundaries, equipment under maintenance or repair, instrumentation lineups for testing and their restoration) and discovery of mispositioned alignment. Reviewed training material for operators and maintenance personnel provides adequate instruction on how to verify the facility's components (e.g., system alignment, valve position, operational status) and the differences between independent verification and concurrent dual verification. Interviewed operations personnel involved in the independent verification of HF storage tank valve lineup appropriately knew the differences between independent verification and concurrent dual verification. Observed HF detector surveillances demonstrated proper independent reviews in accordance with DUF6-C-OPS-0406, *HF Storage*. A completed work package for work order 2202149 adequately documented the performance of independent verification, including component identification; normal or expected position, desired position, and final position; identification and signature or initials of positioners and verifiers for each item; and supervisory review.

Independent Verification Conclusions

MCS has effectively established and implemented adequate independent verification practices for verifying that critical equipment configuration is in accordance with controlling documents.

3.8 Logkeeping

This portion of the assessment evaluated MCS's practices for verifying the recording of thorough, accurate, and timely equipment information.

MCS has established adequate logkeeping practices, as addressed in DUF6-U-CON-0001, to record thorough, accurate, and timely equipment information that supports performance analysis and trend detection. DUF6-U-CON-0001, sec. 11, adequately identifies key positions required to maintain narrative logs per DOE Order 422.1, att. 2, sec. 2.k, including the Conversion FM, CRO, and CSY FM. DUF6-U-CON-0001 appropriately requires prompt and accurate recording of information; type, scope, and format for log entries; a method for recording late entries and correcting erroneous entries without obscuring the original entry; periodic supervisory reviews for accuracy, adequacy, and trends; and document retention requirements.

Reviewed logs and interviews demonstrated adherence to DUF6-U-CON-0001. The Conversion FM and CRO June 2022 logs adequately demonstrated proper changes (e.g., adding late entries and using a single lineout through an incorrect entry without obscuring it and writing the correct entry in a nearby space with the date and initials of the person making the correction). The Conversion FM and CRO logs also adequately addressed the required information on 11 topics specified by DUF6-U-CON-0001 (e.g., facility mode/changes, abnormal facility/system configurations, starting and completing surveillance

tests), though some entries contained words or phrases that were illegible. The reviewed control room logs exhibited appropriate review by the Conversion FM once each shift, and the Conversion FM's log was appropriately reviewed by the Conversion Operations Manager each week, in accordance with DUF6-U-CON-0001. Interviewed CROs adequately confirmed the use of process control system data, some of which is identified in the CRO logbooks, to conduct equipment performance analysis and trend detection. Logs older than 30 days are properly scanned electronically, and the electronic file is sent to MCS records management personnel for retention in accordance with National Archives and Records Administration requirements and the assigned document retention schedule (ENV1.E6; 75-year retention).

During two observed shift turnovers, EA noted the following two examples of duplicated logbook entries, which are prone to human error (see **OFI-MCS-4**):

- The oncoming Conversion FM must transcribe selected turnover information documented on the DUF6 Form 9019, *Paducah Conversion Facility Manager Turnover Checklist* (DUF6-U-CON-0001, sec. 12.3, 1.a.) into the Conversion FM log.
- The CRO log contains the same information displayed on the Watchbill (an uncontrolled sheet on a clipboard hanging on the control room wall near the entrance with names for two CROs and the Conversion FM). CROs explained that the Watchbill is an unnecessary duplication of what they record in the logbook.

Such practices are contrary to DUF6-U-CON-0001, sec. 12.3, 1.c., which states, "Log entries need not duplicate information logged in other permanent records."

Also, during an interview, the CSY FM demonstrated logkeeping using a standardized electronic Microsoft® Word (MSWord) table, which contains the requisite information specified in DUF6-U-CON-0001. The CSY FM explained that throughout the shift, he enters log information on each row of the table with the proper time of entry. A hard copy is then printed at shift change to allow for signatures of outgoing and oncoming personnel and maintained in a three-ring binder. A review of previous hard copy records demonstrated appropriate logkeeping and that the PSO Manager reviewed the CSY FM logs at least weekly to ensure entries were accurate, legible, complete, and timely. However, this logkeeping approach creates a vulnerability to maintaining a defensible historical record, as MCS cannot ensure that, at any time during a shift, previous entries were not altered. (See **OFI-MCS-5**.)

Logkeeping Conclusions

MCS has established and implemented an adequate process to record thorough, accurate, and timely operational information. However, the duplication of some records is prone to transcribing errors, and the use of a MSWord electronic log by the CSY FM presents a vulnerability in maintaining a defensible historical record.

3.9 Turnover and Assumption of Responsibilities

This portion of the assessment evaluated MCS's operational shift and operator relief turnover processes.

MCS operations personnel adequately performed turnovers (transfer of information) during observed shift changes and operator relief. Procedure DUF6-U-CON-0001 adequately defines all key positions and the process for formal turnover of operations from one shift to another and from one person to another to ensure thorough understanding of equipment status and in-progress or planned activities. DUF6-U-CON-0001 also includes the defined content of turnover checklists, ensuring comprehensive communication and documentation of current operations. All interviewed operations personnel were familiar with the

expectations for turning over activities in progress. During observed shift turnovers, operations personnel demonstrated effective transfer of equipment status from the outgoing shift to the oncoming shift in accordance with DUF6-U-CON-0001 and properly recorded turnover information. Observed shift turnovers between FMs and CROs also demonstrated that sufficient time is allowed for oncoming operations personnel to review logbooks and other document updates and discuss any information contained in the turnover documentation. The reviewed operator log at the DUF6 control room properly reflected the turnover checklist content.

Turnover and Assumption of Responsibilities Conclusions

MCS operations personnel adequately performed turnovers during observed shift changes and operator relief. Procedure DUF6-U-CON-0001 defines an adequate process to ensure the transfer of information between outgoing and oncoming shift personnel. Observed shift turnovers were consistent with the requirements of DUF6-U-CON-0001.

3.10 Technical Procedures

This portion of the assessment evaluated MCS's practices for developing and maintaining accurate, understandable written technical procedures.

MCS has established and implemented generally effective processes for developing and maintaining accurate, understandable written technical procedures that ensure safe facility and equipment operation. DUF6-U-CON-0001 and DUF6-U-GFP-0015, *Technical Procedure Development*, adequately address the requirements of DOE Order 422.1, att. 2, sec. 2.p, including procedure content, such as format and use of terms (e.g., prerequisites, warnings, cautions, notes, hold points), detail sufficient for accomplishing the operation, technically accurate procedures capable of performance as written, and procedure conformance with the facility design and manufacturer documentation. Six reviewed procedures, and two work observations requiring a work pause for procedure revision, demonstrated adherence to DUF6-U-GFP-0015 and proper procedure changes (pen and ink or page changes) and complete revisions. Interviewed FMs explained the ease and timeliness of making procedural changes in accordance with DUF6-U-GFP-0015. A review of the two observed evolutions requiring work pause confirmed an effective and timely procedure change process. Interviewed workers involved in observed evolutions understood the DUF6-U-GFP-0015 requirement to perform work as written or stop work and notify management when procedures cannot be executed as written.

Observed evolutions all employed current procedures and proper procedure use (reader-worker method and in-hand use, as required). For example, DUF6-C-OPS-0406 adequately defined precautions/limitations and initial conditions; identified hazards and controls; specified tools, equipment, and materials; identified hold-points requiring independent verification for valve alignment and line capping; and stated one action per step, including the critical steps of signature/initial checkoff blocks and instrument readings and tolerances (where required). However, EA observed two work evolutions associated with HF storage activities that involved noise hazards associated with DUF6-C-MNT-0050 (alarm testing) and radiological hazards associated with worker entry into an area potentially radiologically contaminated (HF Storage Pit) during system alignment associated with DUF6-C-OPS-0406. Contrary to DUF6-U-GFP-0015, MCS did not integrate cautions or warnings as action steps into the work instructions (e.g., DUF6-C-MNT-0050 and with DUF6-C-OPS-0406) to ensure that workers use hazard controls at the appropriate time. (See **Deficiency D-MCS-3**.) This condition could result in missed or misapplied hazard controls and/or potential worker exposures.

Technical Procedures Conclusions

MCS has established and implemented generally adequate practices for developing and maintaining accurate, understandable written technical procedures. However, MCS has not ensured that potential hazards and requisite controls are integrated into the instructions of some procedures, contrary to DUF6-U-GFP-0015.

3.11 Operator Aids

This portion of the assessment evaluated MCS's practices to manage and use operator aids.

MCS has established and implemented an adequate process to provide accurate, current, and approved operator aids. DUF6-U-CON-0001 adequately addresses the requirements of DOE Order 422.1, att. 2, sec. 2.q. The Conversion Operations organization only uses operator aids in the conversion facility control room; no operator aids are used in the facility, which is more appropriately operated in accordance with formal procedures. Conversion CRO aids were annotated with the approved operator aid number and were close to the point of use; none were observed obscuring control room equipment. A review of the operator aid file (which lists all approved operator aids) in the control room confirmed that all operator aids observed in the control room were properly reviewed and approved. The PSO is the only other DUF6 organization that uses operator aids. The PSO organization identifies one authorized operator aid (DUF6-U-OSU-001, *Operator Aid for Cylinder Yard Technicians*) that is also integrated as a table in procedure DUF6-C-CYP-2402, *In-Storage Inspection of 12-inch, 30-inch, 48-inch, and CV UF6 Cylinders at Paducah*; the only reason PSO maintains this table as an operator aid is to maintain parity with the DUF6 facility at Portsmouth.

Operator Aids Conclusions

MCS has established and implemented an adequate process to manage and use operator aids.

3.12 Component Labeling

This portion of the assessment evaluated MCS's practices for clear, accurate equipment labeling.

MCS has established and implemented an adequate process for equipment labeling. DUF6-U-CON-0001 adequately addresses the requirements of DOE Order 422.1, att. 2, sec. 2.r. The interviewed Conversion FM was aware of his responsibility for the integrity of component labels, including performing inspections as required by DUF6-U-CON-0001 primarily through the LOTO process, i.e., DUF6-U-GFP-0216, *Control of Hazardous Energy (Lockout/Tagout)*. Interviewed operators, engineers, and maintenance personnel understand their responsibility to identify and report missing or damaged labels to the FM. Observed operations personnel carefully checked component labeling to accurately identify process equipment before beginning work evolutions in accordance with work package instructions. For example, during the HF storage area valve alignment, operators appropriately identified a missing component tag and annotated the procedure with a note indicating the need to replace the tag. Also, during the KOH valve alignment evolution, the operators' walkdown of the electrical circuitry identified a mismatch between the label and the procedure, and they appropriately paused the work for an engineering determination.

Observed facility equipment demonstrated that labels are properly applied, are durable, and contain the required information, enabling facility personnel to accurately identify equipment. For example, walkdowns of each DUF6 facility demonstrated that observed safety and non-safety equipment exhibited legible and durable labels and tags. Walkdowns also confirmed adequate maintenance of component

labels, ensuring that lost or damaged labels are promptly identified and replaced, as all observed component labels were in good condition except the missing tag from the component in the HF storage area discussed above and one shut-off button at the HF storage tank facility had no identifying label.

Component Labeling Conclusions

MCS has established and implemented an adequate process for equipment labeling. Operations personnel effectively used component labeling to accurately identify observed process equipment. Observed equipment labeling was durable, properly placed, and contained the required information. However, a tag was missing from a component in the HF storage area and one shut-off button at the HF storage tank facility had no identifying label.

3.13 DOE Field Element Oversight

This portion of the assessment evaluated PPPO's establishment and implementation of oversight processes related to the MCS ConOps program.

Routine oversight of day-to-day DUF6 conversion facility operations is primarily conducted by one Facility Representative and one backup Facility Representative and supported by technical staff from Enterprise Technical Assistance Services, a support services contractor. PPPO staff assigned to the DUF6 conversion facility were highly knowledgeable and engaged in frequent, open, and constructive communication with MCS during observed oversight activities. In accordance with DOE Order 422.1, sec. 4.e, PPPO reviewed and approved the current MCS *Conduct of Operations Applicability Matrix* in April 2021, which was previously reviewed and approved in July 2019.

Oversight of contractor activities related to ConOps is adequately conducted as a cross-cutting element when performing routine oversight activities and assessments. For example, quality assurance program assessments and two recent independent surveillances regarding labeling and control room activities and LOTO demonstrated a thorough review of each area. Corrective actions resulting from reviews, assessments, observations, surveillances, and other oversight activities are effectively tracked using PPPO's Management Tracking System. PPPO procedures were adequate to maintain operational oversight; however, contrary to PPPO-M-414.1-7, *Controlled Document Management Procedure*, some PPPO procedures (e.g., PPPO-M-414.1-2, *Assessment and Surveillance Process*, Rev. 3, August 2017 and PPPO-2691323, *Facility Representative Program Plan*, Rev. 4, January 2018) were not being periodically reviewed (typically on a 3-year cycle) to ensure that changes in process and/or DOE requirements are incorporated. (See **Deficiency D-PPPO-1**.)

DOE Field Element Oversight Conclusions

PPPO is meeting the oversight requirements of DOE Order 422.1 and has implemented effective oversight of the MCS ConOps program. PPPO effectively conducts oversight of DUF6 operational activities and provides the results to MCS management to improve safety and mission performance. However, some PPPO procedures are not being periodically reviewed.

4.0 BEST PRACTICES

No best practices were identified during this assessment.

5.0 FINDINGS

No findings were identified during this assessment.

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.

Mid-America Conversion Services, LLC

Deficiency D-MCS-1: MCS did not ensure that the KOH building's two primary entry doors were posted for required radios. (DUF6-U-CON-0001, sec. 4.3, subsec. 1.c.1)

Deficiency D-MCS-2: MCS did not address the use of red plastic LOTO cards to place temporary holds on LOTO activities in the LOTO procedure DUF6-U-GFP-0216. (DOE Order 422.1, att. 2, sec. 2.i.(1)(d))

Deficiency D-MCS-3: MCS did not integrate cautions or warnings as action steps into the work instructions (e.g., DUF6-C-MNT-0050 and with DUF6-C-OPS-0406) to ensure that workers use hazard controls at the appropriate time. (DUF6-U-GFP-0015, att. B)

Portsmouth/Paducah Project Office

Deficiency D-PPPO-1: 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. (PPPO-M-414.1-7, sec. 8.3)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified five 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.

Mid-America Conversion Services, LLC

OFI-MCS-1: Consider improving the level of detail of the Conversion Operations Manager qualification card similar to that included in the CSY Operations Manager qualification card.

OFI-MCS-2: Consider specifying frequency goals for the conduct of MFOs by managers.

OFI-MCS-3: Consider increasing the rigor of operator rounds to include equipment and conditions not specifically identified on the round sheet.

OFI-MCS-4: Consider eliminating duplicate logkeeping entries to reduce the potential for human error and acquiring employee feedback to identify additional duplicate records that could be streamlined.

OFI-MCS-5: Consider integrating additional capabilities into the existing MSWord CSY FM logkeeping file to time stamp log entries and prevent alterations. Alternatively, the electronic logkeeping system used by Battelle Energy Alliance, LLC at the Idaho National Laboratory Advanced Test Reactor may provide a useful benchmark.

Appendix A Supplemental Information

Dates of Assessment

Remote data collection: July – August 2022

Onsite Assessment: August 22-26, 2022

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