Independent Assessment of Safety System Management of Cell Equipment Blast Door Interlocks at the Pantex Plant

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Office of Enterprise Assessments
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Acronyms

BDI	Blast Door Interlock
CFR	Code of Federal Regulations
CGD	Commercial Grade Dedication
CNS	Consolidated Nuclear Security, LLC
CSE	Cognizant System Engineer
DCP	Design Change Proposal
DIS	Design Information Summary
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EWR	Engineering Work Request
ISI	In-service Inspection
LCO	Limiting Condition for Operation
MEL	Master Equipment List
NNSA	National Nuclear Security Administration
NPO	NNSA Production Office
NQA	Nuclear Quality Assurance
OFI	Opportunity for Improvement
Pantex	Pantex Plant
PT	Production Technician
QA	Quality Assurance
QAP	Quality Assurance Program
S/CI	Suspect/Counterfeit Item
SAR	Safety Analysis Report
SC	Safety Class
SR	Surveillance Requirement
SS	Safety Significant
SSCs	Structures, Systems, and Components
SSO	Safety System Oversight
TOPIC	Tools for Opportunities – Process Improvement and Communication
TSR	Technical Safety Requirement
WI	Work Instruction

INDEPENDENT ASSESSMENT OF SAFETY SYSTEM MANAGEMENT OF CELL EQUIPMENT BLAST DOOR INTERLOCKS AT THE PANTEX PLANT

Executive Summary

The U.S. Department of Energy Office of Enterprise Assessments (EA) conducted an independent assessment of safety system management of the cell equipment blast door interlocks (BDIs) at the Pantex Plant from December 2022 to January 2023. The cell equipment BDI systems are safety class systems that ensure that at least one blast door is closed and latched with the floor gasket in a lowered position to mitigate effects of analyzed accidents in the cell. Pantex Plant is managed and operated by Consolidated Nuclear Security, LLC (CNS) for the National Nuclear Security Administration (NNSA) and overseen by the NNSA Production Office (NPO). This assessment evaluated the effectiveness of CNS's programs and processes for engineering design, quality assurance, safety system surveillance and testing, operations, cognizant system engineering, feedback and improvement, and safety basis evaluation for the cell door interlocks. EA also reviewed NPO oversight of CNS's management of the cell equipment BDI systems. This assessment was part of an ongoing review of the management of safety systems at hazard category 1, 2, and 3 facilities across the DOE complex.

EA identified the following strengths, including a best practice:

- CNS manages stock items and replacement parts, including replacement parts for the cell equipment BDI systems, in the warehouse by applying color-coded stickers that provide a visual indicator of acquisition level, controlled expiration date, critical spare indicator, property-controlled items, and storage level. (Best Practice)
- In general, CNS and NPO personnel responsible for management and oversight of the cell equipment BDIs have appropriate experience; receive effective, rigorous training; and understand the potential impacts of their work on nuclear safety.
- CNS has established and implemented an appropriate safety basis for the cell equipment BDI systems.
- NPO has implemented an effective oversight program while maintaining sufficient knowledge of cell equipment BDIs.

EA also identified several weaknesses, including one finding, as summarized below:

- CNS did not accurately or completely include technical safety requirements' immediate actions in the pre-operational checklists for failure of a BDI functional test, which could lead to delayed mitigation of the risk of the accidents for which the systems are credited. (Finding)
- CNS has not documented system requirements and design criteria, including codes and standards, for the cell equipment BDI systems, limiting the ability to adequately evaluate replacement components for equivalency.
- CNS has not established acceptance criteria for the required annual visual inspections of cell equipment BDI systems. Without established acceptance criteria, the operability and quality of safety structures, systems and components (SSCs) cannot be ensured.
- CNS has not developed a master equipment list that identifies the cell equipment BDI SSCs that are part of the safety basis.
- CNS's suspect/counterfeit items procedure lacks key requirements to preclude such items from

entering the site and from procured commercial grade dedication items, and to properly disposition those items.

- CNS BDI system surveillance and maintenance procedures contain errors of editorial and performance nature that were not identified through the procedure development, validation, training, implementation verification review, use, or periodic review processes.
- CNS allowed an unqualified production technician and an unqualified carpenter to perform demonstrations of shift and annual surveillances of the BDI systems without a qualified instructor present.
- CNS did not provide formal training for workers tasked with implementing actions for technical surveillance requirement limiting conditions of operation.

In summary, CNS appropriately designed and monitors the cell equipment BDI systems to ensure that they perform their required safety functions to prevent and mitigate associated analyzed accidents. NPO has performed effective oversight of CNS BDI activities. However, the assessment identified a number of specific weaknesses in safety management processes and safety controls that merit further analysis and corrective actions by CNS. Particular attention should focus on the identified weakness related to providing technical safety requirement immediate actions in the pre-operational checklists for failure of a BDI system. Resolution of the weaknesses identified in this report will enhance the management and overall reliability of the cell equipment BDIs in use at the Pantex Plant.

INDEPENDENT ASSESSMENT OF SAFETY SYSTEM MANAGEMENT OF CELL EQUIPMENT BLAST DOOR INTERLOCKS AT THE PANTEX PLANT

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), assessed the effectiveness of safety system management for the cell equipment blast door interlocks (BDIs) at the Pantex Plant (Pantex). Assessment planning and document collection began in December 2022, and onsite activities were conducted January 9-12, 2023. This assessment was part of an ongoing review of the management of safety systems at hazard category 1, 2, and 3 facilities across the DOE complex.

Pantex is managed and operated by Consolidated Nuclear Security, LLC (CNS) for the National Nuclear Security Administration (NNSA) and is overseen by the NNSA Production Office (NPO). Consistent with the *Plan for the Independent Assessment of Safety System Management of Cell Door Interlocks at Pantex Plant, January 2023,* this assessment evaluated the effectiveness of CNS programs and processes for engineering design, quality assurance (QA), safety system surveillance and testing, operations, cognizant system engineering, feedback and improvement, and safety basis evaluation for the cell equipment BDI systems. EA also reviewed NPO oversight of the BDIs.

Pantex is the nation's primary center for assembly, disassembly, retrofit, and life extension of nuclear explosives and includes facilities for the assembly and disassembly of these explosives. Cells are one type of facility at Pantex. Each cell has an equipment access point with two sequential interlocked equipment blast doors. The cell equipment BDI systems are safety class (SC) systems that ensure that at least one blast door is closed and latched with the floor gasket in a lowered position and serves to mitigate the effects of internal or external events.

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, the criteria used to guide this assessment were based on objectives SS.1, SS.2, and SS.5 through SS.9 of EA Criteria and Review Approach Document (CRAD) 31-15, Rev. 1, *Safety Systems Management Review*. Additional criteria for the review of the safety basis evaluation were included in appendix B of the assessment plan. EA also used elements of CRAD EA-30-07, Rev. 0, *Federal Line Management Oversight Processes*, to collect and analyze data on NPO oversight activities. EA examined key documents, such as safety analysis reports (SARs), the technical safety requirement (TSR) document, design information summaries (DISs), work packages, procedures, work instructions, manuals, analyses, policies, desk aids, and training and qualification records. EA interviewed key personnel responsible for developing and executing the associated programs; observed pre-operational checks and surveillance activities; and walked down significant portions of the selected facilities, focusing on the equipment BDI systems. The members of the assessment team, the Quality Review Board, and the 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 Engineering Design

This portion of the assessment evaluated CNS's design products, documentation of design requirements, and design verification, as they relate to the cell equipment BDI systems, for technical adequacy and consistency with the TSR document, RPT-SAR-199801, *Technical Safety Requirements for Pantex Facilities*, Revision 481.

Design Products

EA examined engineering work requests (EWRs), commercial grade dedication (CGD) packages and their related design change proposals (DCPs), and equipment drawings for the cell equipment BDI systems. CNS reported that no design modifications have been implemented to the engineered cell equipment BDI structures, systems, and components (SSCs) within the past 10 years. To review the design modification process, EA examined one physical modification DCP related to a seismically qualified system in Building 12-104.

MNL-352199, *Pantex Projects Engineering Design Manual*, app. B, *EWR Process Checklist for Infrastructure Design*, provides an effective process for ensuring the identification, development, and maintenance of the technical baseline documents. EWR-1113, *12-44 Equipment Door Magnet Assessment*, submitted in 2017, is generally adequate in documenting the evaluation of a potential replacement critical spare part for an obsolete equipment door electromagnet lock (an SC component). Although the Project Engineering group started preparing a technical design package in 2022 based on the design requirements and expectations provided by the cognizant system engineer (CSE) in EWR-1113, the EWR has not been completed to date. (See **OFI-CNS-1**.)

EA also reviewed three CGD packages and associated DCPs for other SC BDI systems because none were available for the BDI systems within the scope of this review due to the infrequent need for replacement parts. These design products appropriately address part number changes and defined critical characteristics for affected SC components, including specific testing needed to confirm the functionality of components. The CGD packages were prepared by procurement engineers and reviewed/approved by system engineers. The associated DCPs also demonstrate that design changes received proper engineering review and approval, and affected documents were appropriately updated or are being tracked for update.

Further, DCP 2100116 for remounting a manometer to meet seismic mounting requirements is adequate. This DCP demonstrates an appropriate technical design package prepared by Project Engineering, including a seismic calculation, a completed unreviewed safety question review, and proposed design changes to meet the seismic mounting requirements of the manometer. The DCP included the required design change notice, DCN 2100116-1, ensuring that all relevant documents were revised to reflect the as-built configuration.

Finally, 23 reviewed cell equipment BDI equipment drawings were consistent with as-built configurations. These drawings generally adhere to CNS's engineering process, which uses sound engineering and scientific principles and appropriate standards. These drawings also adequately demonstrate that the installed system configuration will provide the safety functional requirements

assumed by the safety analysis during normal, abnormal, and accident conditions (e.g., high explosive detonation and dispersion event, and propagation of an external event into the assembly cell). During facility walkdowns, EA observed adequate alignment of the installed equipment BDI SSCs with the CNS drawings for Buildings 12-44 and 12-85. An observed daily pre-operational check of the pneumatic door pin actuation, performed for Building 12-85 per PX-2987, *FPC-Building 12-85, 12-96, and 12-98 Cells Pre-Operational Checklist*, appropriately demonstrated validation of the functional requirements.

Documentation of Design Requirements

Engineering evaluations EE-04-007, *SAR Detail Validation 12-85, 12-96, and 12-98 Equipment Blast Door Interlock System*, and EE-04-012, *SAR Detail Validation 12-44 Equipment Blast Door Interlock System*, adequately document the basis for system design features, including lists of subsystems, subcomponents, performance characteristics, and functional requirements, and therefore appropriately document the validity of the technical data provided in AB-SAR-314353, *Sitewide Safety Analysis Report* (Sitewide SAR). However, contrary to DOE Order 420.1C, att. 2, ch. V, sec. 3.c.(2)(a), CNS has not documented system requirements for the cell equipment BDIs. (See **Deficiency D-CNS-1**.) Without documented system requirements, replacements of components cannot be adequately evaluated for equivalency. An example of an undocumented system requirement is the ability of the floor gasket to provide adequate protection against leakage. SB-MIS-941145, *Calculation of Off-Site Dose Consequences from Sub-Design Basis Explosions*, sec. 7.2.4, states that "The equipment doors have a number of gaps that have been measured, including a universal assumption that there is no more than 4 square inches of leak area on the bottom of the door below the guillotine seal." The corresponding design documents do not include material specifications or performance criteria for the floor gasket (such as design compressibility), which would be needed if a floor gasket had to be replaced.

In addition, contrary to 10 CFR 830, subpart B, app. A, G.6.(5), CNS has not established the acceptance criteria to be met by surveillance requirements (SRs) 4.1.1.4 and 4.1.1.5 for annual visual inspections of the blast door floor gasket assembly specified in the TSR document limiting conditions for operation (LCOs) 3.1.1, *12-44 Cell Equipment Blast Door Interlock System*, and 3.1.2, *12-85, 12-96, and 12-98 Cell Equipment Blast Door Interlock System*. (See **Deficiency D-CNS-2**.) Without established acceptance criteria, the operability and quality of safety SSCs cannot be ensured.

Design Verification

CNS appropriately verified the adequacy of reviewed design products by individuals or groups other than those who performed the work, prior to approval and implementation of the design, as described in the QA program (QAP). The system and project design engineers for the reviewed design products demonstrated a thorough knowledge of their relevant engineering disciplines during interviews. Qualification records demonstrate that the primary and backup CSEs are appropriately trained and qualified. Three of the reviewed engineering DCPs were properly signed by independent checkers and adequately met documentation completeness requirements, such as the identification of all design inputs and references to design standards and sources, prior to approval or implementation of the design. However, EA identified one error in DCP 2200367, *Updated TP-22-003 Issue 003 to Issue 004 via an update to Test 18B*. Although the attached/updated procedure was correct, the associated "Contractor Nuclear Explosive Safety Change Evaluation Review," section 2, *Description of Proposed Change, NI, EI, or Document*, incorrectly stated the new Test 18B requirement was to open a switch instead of close it.

Engineering Design Conclusions

Design products and analyses are generally technically adequate and demonstrate adherence to CNS's engineering process, which uses sound engineering and scientific principles and appropriate standards. The reviewed engineering design products appropriately incorporate applicable requirements from the facility safety design basis and received appropriate verification by independent engineers. However, weaknesses were identified in some technical baseline documents, including a lack of system requirements and acceptance criteria for the floor gasket assembly.

3.2 Quality Assurance

This portion of the assessment evaluated CNS's QAP, including training and qualification, nonconforming items, identification and control of items, procurement verification, and suspect/ counterfeit items (S/CIs).

Quality Assurance Program

CNS has established a DOE-approved QAP meeting the QA criteria specified in 10 CFR 830.122, *Quality assurance criteria*. CNS has established a QA organization with an assigned QA manager responsible for implementing, assessing, maintaining, and improving the QAP as documented in E-SD-0002, *Quality Assurance Program Description*, and detailed in the QA organization chart. The QAP describes an adequate graded approach applying increased quality control of work and equipment associated with safety class/safety significant (SC/SS) SSCs as documented in E-SD-0002, section 2.9. The QAP implements an appropriate consensus standard, American Society of Mechanical Engineers Nuclear Quality Assurance (NQA)-1-2008, *Quality Assurance Requirements for Nuclear Facility Applications*, with the NQA-1a-2009 and NQA-1b-2011 addenda for nuclear facilities. CNS reviews the QAP annually, updates it as needed, and seeks the required DOE approval as demonstrated for the last two years by the *Approval of Revised Consolidated Nuclear Security, LLC Quality Assurance Program Description*, dated September 20, 2021, and *Contract DE-NA0001942, Approval of Revised Consolidated Nuclear Security, LLC Quality Assurance Program Description*, dated September 14, 2022. The QAP provides for flowing down DOE QA requirements, to the extent necessary, to sub-tier contractors, vendors, and suppliers, to ensure their compliance with requirements and the safe performance of work. For example, *CNS Quality Assurance Program Audit Report for SQA-240412-19-06* documents Xymat Engineering's adoption of QA requirements into its program and provided a thorough review of the subcontractor's implementation of the requirements.

Training and Qualification of QA Personnel

CNS effectively trains and qualifies QA personnel to perform quality functions. The reviewed *CNS Training Lesson Plan for Quality at Pantex & Y-12 – Initial* provides an effective training and qualification approach that satisfies the general training requirements of NQA-1, including personnel selection, initial training, continuing training, qualification, and certification. Sixteen reviewed personnel training/qualification records demonstrated adequate completion of training in performing independent qualification assessments. This training also appropriately addresses NQA-1 lead auditor criteria using the ten-point qualification requirements documented in E-PROC-3004, *Enterprise Assessments Process*. The reviewed *Curriculum Data* outlining course requirements for assurance inspection technicians, QA engineering specialists, QA supplier specialists, and Pantex procurement engineers demonstrated an appropriate collection of training courses and practical demonstrations to ensure requisite expertise. Fourteen reviewed training records for assurance inspection technicians, QA engineering specialists, and QA supplier specialists conformed to the training requirements. A QA engineer and two QA managers demonstrated during interviews that they were knowledgeable of roles, responsibilities, and authorities in

performing QA field inspections, procurement reviews, receipt inspections, storage facility inspections, nonconformance functions, and S/CI evaluations.

Nonconforming Items

CNS has implemented an effective nonconformance reporting program through E-PROC-0050, *Control of Nonconforming Items*. E-PROC-0050 adequately addresses the attributes of NQA-1, part I, requirement 15, including identification, segregation, and disposition. CNS has adequately implemented E-PROC-0050 to ensure that nonconforming items are dispositioned based on proper engineering evaluations, as demonstrated in seven closed nonconformance reports. A walkdown of the nonconforming item storage area revealed that the items were effectively tagged and appropriately segregated.

Identification and Control of Items

CNS has implemented a generally effective process for the identification and control of items through MNL-352182, *General Stores Department Operations Manual*. Two interviewed warehouse personnel were knowledgeable of storage and handling requirements, and CNS has an effective sticker system that provides information on the stored items. The system uses color-coded stickers to provide warehouse personnel a visual indicator of acquisition level, controlled expiration date, critical spare indicator, items falling under property controlled, and storage level, and is cited as a **Best Practice**. The observed stock items were in a clean, well-organized warehouse and were properly marked with category identification numbers to support item traceability. CNS provides an effective level "B" temperature and humidity-controlled storage environment for items, along with climate monitoring. However, the observed secure warehouse space is near its capacity, as almost every bin was full. The interviewed engineering personnel explained that CNS is still acquiring critical spare parts. CNS may find it difficult to accommodate them. The nonconformance storage area is small, and larger items must be stored in an unsecured segregated area in the common storage area, exposing these items to inadvertent use.

Procurement Verification

CNS effectively procures SC/SS SSCs through qualified suppliers selected in accordance with E-SD-2015, *Procurement Process Description*. One reviewed supplier qualification report of Xymat Engineering demonstrated a thorough onsite review of the supplier, addressing the supplier's history of providing technical and quality capabilities. The reviewed training records for nine QA supplier assessors demonstrate that they were appropriately qualified to perform supplier qualification assessments.

SSCs not available from qualified suppliers were adequately procured using CNS's CGD program to provide reasonable assurance that SSCs can perform their intended safety function. E-SD-2015 provides an effective CGD process that meets NQA-1, part II, subpart 2.14. Four reviewed CGD packages specifically for BDI components (i.e., ball switches, electromagnetic locks, limit switches, and pushbutton switches) adequately identified critical characteristics with attributes and acceptance criteria appropriate for the item's safety function. Two interviewed Procurement Engineering Group personnel were knowledgeable of CGD requirements.

During a walkdown of the receipt inspection area, CNS receipt inspectors were observed using the proper procurement acceptance criteria and a tagging system that provides effective visual assurance that received items were properly inspected. EA also observed the proper storage of 16 components in accordance with vendor or engineering requirements.

Suspect/Counterfeit Items

CNS provides generally appropriate control for S/CIs. E-PROC-3111, *Suspect Counterfeit Items Process*, appropriately assigns responsibilities for S/CI to QA, engineering, procurement, and receipt inspection personnel. E-PROC-3111 also appropriately specifies requirements for procurement personnel to include contractual S/CI clauses in purchase orders to prevent acquisition of S/CIs. The defined program includes generally effective process controls for preventing S/CIs from entering the site, inspection, identification protocols, reporting of items, disposition, and storage area/inventory inspections of S/CIs. CNS training lesson plan #D&Q: 190.74, *Suspect/Counterfeit Items*, adequately addresses key attributes of the program. S/CI SMEs also participate in industry meetings that share the latest S/CI incidents across the complex. However, contrary to DOE Order 414.1D, *Quality Assurance*, att. 3, sec. 2.i, E-PROC-3111 lacks key requirements to collect, maintain, disseminate, and use the most accurate, up-to-date industry information on S/CIs and suppliers, including evaluating whether vendors being considered for CGD procurements had previously supplied components with S/CIs to Pantex. (See **Deficiency D-CNS-3**.)

Quality Assurance Conclusions

CNS has established a DOE-approved QAP that meets DOE requirements and effectively trains and qualifies QA personnel to perform quality functions. CNS has implemented effective processes for nonconforming items and procurement verification, as well as generally effective processes for identifying and controlling items and S/CIs. CNS's use of color-coded stickers that provide warehouse personnel useful item control information is cited as a best practice. However, CNS's S/CI procedure lacks key requirements to reduce the likelihood of S/CIs entering the site.

3.3 Safety System Surveillance and Testing

This portion of the assessment evaluated whether TSR surveillance procedures and performance demonstrate that the cell equipment BDI system can satisfy its safety functions.

Surveillance and Testing

Procedures and practices for surveillance and testing appropriately implement the TSR SRs and generally ensure that operability requirements for the cell equipment BDI systems are met. SRs are divided between two procedures for "shiftly" (defined in the TSR as "Performed prior to beginning initial ACTIVE OPERATIONS within a shift or every 24 Hours for continuous operations") and annual periodicity. PX-2977, *FPC-Building 12-44 Cells 2, 3, 4, 5, and 6 Pre-Operational Checklist*, and PX-2987, *FPC-Building 12-85, 12-96, and 12-98 Cells Pre-Operational Checklist*, are used effectively to conduct numerous checks, including the SR for shiftly functional tests of the BDI systems and other TSR inspections and in-service inspections (ISIs) managed through the safety control implementing database. Production technicians perform these checklists for each operating facility and record completion in the facility operating logs. During cell walkdowns, EA noted that each reviewed logbook recorded completion of the applicable checklist. An observed portion of the checklist for Building 12-96 implementation of the BDI surveillance was competently performed. However, weaknesses associated with the personnel training and LCO actions in PX-2977 and PX-2987 are discussed in section 3.4 of this report. A review of selected completed surveillance tests confirmed that tests were timely and the BDI system test results either met their acceptance criteria or led to appropriate corrective maintenance.

Under SR 4.1.1.4, LCOs 3.1.1 and 3.1.2 adequately require annual visual inspections of credited components within the cell equipment BDI system. Procedures for annual surveillances of the floor gaskets and latching air cylinders are adequate to confirm the functional requirements of these subsystems for Building 12-44 cells 2-6, Building 12-85, Building 12-96, and Building 12-98 cells 1-4. However, the

following discrepancies were observed during the partial performance demonstration of TP-MN-03181, *Functional Test of Blast Door Interlocks, Latching, And Floor Seal Cell 12-96*:

- The interior indicating light for door #1 was out of service. A review of prior surveillance performances and door lubrication preventive maintenance found the same light to be out of service on 6/1/2020, 7/14/2020, 1/27/2021, 7/9/2021, 1/11/2022, and 7/8/2022. CNS does not typically include corrective maintenance initiation as part of the Work Performance Record (PX-3170) and in this current case did not provide a work request to correct the light deficiency. (See **OFI-CNS-2**.)
- The infrastructure craftsman found two of six lights inoperable, but the data sheet was marked satisfactory with an asterisk and note explaining the inoperable lights. The information on the historical data sheet records ranged from no indication of failure (noted only in closure comments) to detailed annotation on the data sheet. Data sheets generally lack clear acceptance criteria, such as "three lights illuminate," or specify acceptable results for "Visual inspection of latching air cylinder." (See **OFI-CNS-3**.)

A review of selected completed surveillance tests confirmed that the tests were accomplished in a timely manner and that the cell equipment BDI system test results met their respective acceptance criteria or that appropriate corrective maintenance was performed. For each operating facility, CNS facility representatives (personnel who coordinate operations and maintenance for their cells) appropriately maintain a tracking board that includes facility and installed process equipment, surveillance and ISI requirements, frequencies, applicable procedures, completion date, and the next due date. This tracking does not include the ISIs/SRs accomplished shiftly or prior to use in the process; these are directed and executed by pre-operational checklists. EA noted during walkdowns that completion of the shiftly surveillances is recorded in the facility's operating logs.

CNS facility representatives appropriately schedule and authorize maintenance, surveillance, and ISIs so that they are conducted as close to the scheduled date as possible, and within the allowed intervals defined in the TSRs. Training and qualification record reviews show that personnel who perform the surveillances and support system operability are appropriately qualified, with the exception of one of the two carpenters who demonstrated the annual surveillance for Building 12-96, as discussed in section 3.4 of this report.

Safety System Surveillance and Testing Conclusions

TSR surveillances generally demonstrate that the cell equipment BDI systems can satisfy their credited safety functions. The surveillances are completed in a timely manner and are appropriately logged with minor exceptions.

3.4 Operations

This portion of the assessment evaluated CNS's implementation of conduct-of-operations principles, including operator training and qualification and procedure development, use, and adherence, to ensure the availability and functionality of cell equipment BDI systems.

Conduct of Operations

CNS's implementation of conduct of operations provides sufficient assurance that credited SSCs are operated and configured to maintain operability. Operating practices are established by MNL-00040, *Conduct of Operations Manual*, and were observed to be adequately implemented to ensure that CNS facility representatives are attentive to duties, aware of equipment status, and operate or direct the

operation of equipment properly. The status of the cell equipment BDI systems is adequately maintained by CNS facility representatives using electronic status boards. However, the responsibility for responding to LCO violations is ambiguous based on actions assigned to PTs in facility pre-operational checklists (see discussion under Procedure Development, Use, and Adherence below).

Operator response to off-normal and emergency conditions is adequately pre-planned and executed based on interviews and record reviews. The observed cells had current copies of the response procedure, MNL-00068, *Personnel Response Procedures for Zone 12 South Material Access Area*. This procedure does not contain response actions relative to cell equipment BDI system, as it does not have a manual override alarm function, unlike the other types of blast doors. Procedure F7-5001, *Facility Procedure*, requires that all deficiencies or operability concerns associated with critical safety SSCs (such as the cell equipment BDI systems) be reported to the CNS facility representative immediately, so that the CNS facility representative can ensure that TSR-required actions are completed. Procedure F7-5001 includes an appendix that contains all the facility-related LCOs and acts as a user guide in the event that an LCO is entered. Reporting of events is appropriate and timely based on interviews with the CNS facility representative.

BDI system alignment is checked shiftly by the functional test performed as part of the pre-operational checklists for each operating facility, and completion is logged in the facility logbooks. During walkdowns, EA noted that a current copy of the operator aid for logging, PTX-OPA-124*, Log Entries and Shift Turnover Procedures*, was appropriately included in the facility logbooks.

Operator Training and Qualification

CNS facility representatives, PTs who perform shiftly pre-operational checks, and carpenters who perform annual cell equipment BDI system surveillances were found to be in general adequately trained and qualified to perform tasks supporting TSR implementation. However, a demonstration of the shiftly surveillance tests by PTs working in a cell was performed with one qualified and one unqualified PT, and a demonstration of the annual surveillance tests using an actual work order was performed by one qualified and one unqualified carpenter. The individuals were neither identified as unqualified nor overseen for on-shift training. Contrary to E-PROC-3028, *Enterprise Training and Qualification Program*, sec. 7.10, a qualified instructor was not present during performance demonstrations. (See **Deficiency D-CNS-4**.) Use of unqualified personnel for SC work without a qualified instructor can impact the quality of the work performed and the training received.

Initial, requalification, and continuing training programs are maintained and effectively implemented, based on record reviews and interviews. Training and qualification records similarly confirm that classroom and on-the-job training provide adequate knowledge and operational experience to ensure that cell equipment BDI systems are operated in a manner that ensures the functional capability of the system. However, PTs who perform pre-operational checks per PX-2977 and PX-2987 are not trained to implement TSR actions beyond notification of the production manager and CNS facility representative. These PTs are tasked in the checklists with the TSR action of implementing administrative control of the doors after discovery of failed equipment or personnel door interlocks. DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, att. 1, ch. I, sec. 4.b.(3)(a) requires that "All technicians and maintenance personnel must be qualified to perform the tasks associated with their specialty, or work under the direct supervision of personnel qualified to perform the activity or task." (See **Deficiency D-CNS-5**.) Lack of formal training on expected LCO actions could lead to PTs omitting or incorrectly performing actions.

Procedure Development, Use, and Adherence

Procedures and processes for surveillance and inspection provide adequate controls to maintain operability of the cell equipment BDI system. However, numerous errors were identified in procedure sequence, editorial aspects, and instruction steps.

Annual surveillance requirements generally accomplish the TSR surveillance requirements, as implemented by procedures TP-MN-03146, *Functional Test of Blast Door Interlocks, Latching, and Floor Seal, Cells 12-44*; TP-MN-03159, *Functional Test of Blast Door Interlocks, Latching, and Floor Seal, Building 12-98, Cells 1-4*; TP-MN-03180, *Functional Test of Blast Door Interlocks, Latching, and Floor Seal, Cell 12-85*; and TP-MN-03181, *Functional Test of Blast Door Interlocks, Latching, and Floor Seal, Cell 12-96*. However, the procedures contain the following errors:

- Data sheets for the performance of the annual surveillance procedure for the Building 12-44 cells (TP-MN-03146) do not show which cell was surveilled. After completion, the information is attached to a work record for a particular cell, but there is no place to include that on the data sheet itself.
- Data sheets for the annual surveillances do not specify how many lights are checked or are operable.
- In procedures TP-MN-3159, -3180, and -3181, the steps in 5.1.1 and 5.1.2 for interlock testing were not in a proper sequence. The procedures instruct the worker to verify the #1 door (outer) light check when the inner door is open, not the outer door. Likewise, the procedures instruct the worker to verify the #2 lights (inner) when the outer door is open. Additionally, step 5.1.1(3) restores the outer door to "Blast Resistant" mode instead of the inner door. The data sheet does not specify inner or outer for restoration in step 5.1.2(3)
- In procedures TP-MN-3159, -3180, and -3181, the procedures contain two notes concerning door open indicating lights that refer to the "bay side" location instead of the cell. Further, the notes do not identify that lights illuminate in three locations, requiring three personnel when two are normally assigned. (See **OFI-CNS-4**.)

Implementation of the procedure management processes did not identify and correct the editorial and flow errors noted above. Records of performance for these four procedures show markings in the margins for place keeping, indicating that the procedure step was read and performed; however, no procedure change was subsequently processed to correct errors that should have been evident when the procedure was used. Contrary to work instruction (WI) 02.03.03.02.15, *Create and Revise Preventive Maintenance and Utility Procedures*, the procedure errors were not identified through the procedure development, validation, training, implementation verification review, use, or periodic review processes. (See **Deficiency D-CNS-6**.) Incorrect procedures can lead to incorrect performance of tasks that maintain operability of safety systems.

Additionally, BDI system maintenance procedures TP-MN-03721, *Functional Test of Blast Door Interlocks and PM on Blast Doors, Building 12-98, Cells 1-4;* TP-MN-03723, *Functional Test of Blast Door Interlocks and PM on Blast Doors, Building 12-96;* TP-MN-03724, *Functional Test of Blast Door Interlocks and PM on Blast Doors, Building 12-85;* and TP-MN-03727, *Functional Test of Blast Door Interlocks and PM on Blast Doors, Building 12-44*, were not adequate. These procedures are not credited for TSR surveillance and further note that "Action steps in Section 5, Task Instructions, are for guidance and **ARE NOT** intended to be performed step-by-step." The procedures contain the following errors:

- In procedures TP-MN-03721, -03723, and -03724, the task instructions for performance of a BDI system verification after maintenance of the doors do not correctly test the inner door (e.g., Step

5.2.2(1) states, "Attempt to open the inner door while the inner equipment door is open to ensure the outer equipment door is in the BLAST RESISTANT mode and the interlock is operable"). Data sheets for accomplishment describe conditions accurately (TP-MN-03727 for Building 12-44 is correct in this regard).

- Section 3 of TP-MN-03723 refers to the facilities in Building 12-44 as bays instead of cells in one location.
- The sequence of procedure steps for SR 4.1.2.1 is flawed in that it checks whether the Outer Door Open light illuminates when the inner door is open; similarly, the inner door test is followed by verification that the inner door light illuminates when it should not open due to the interlock.

EA reviewed completion records for several of the procedures and noted that the procedures had been marked in the margins for place keeping, indicating that the procedure step was read and performed. However, contrary to WI 02.03.16.01, the errors were not identified and corrected through document revision. (See **Deficiency D-CNS-7**). Inaccurate procedures may lead to procedure noncompliance and unsafe operation.

The two facility pre-operational checklists (PX-2977 and PX-2987) were developed under WI 02.03.03.02.05, *Creating and Revision Technical Procedures*, Issue 12, but the controls for procedure development and maintenance have not been applied with necessary rigor. These checklists include TSR immediate actions for conditions when the BDI LCO (3.1.1A or 3.1.2A) is not met, but do not include all the immediate actions. Parallel immediate actions to place nuclear material and explosives in a safe and stable condition and prohibit movement of these material are omitted. If the facility is in continuous operations and the checklist is performed daily, the condition exists where the interlocks may fail the surveillance and operations need to be ceased and materials made safe and stable. The checklists direct the PTs to control the doors and make notifications that the doors are under administrative control. Procedure F7-5001, (U) *Safety Requirements For Nuclear And Explosive-Only Facilities*, section 8.4 tasks the CNS facility representative, once notified of the BDI failure by the PTs, with TSR implementation which includes all three immediate actions in Appendix 4 of the procedure. Contrary to the definition of immediately in the TSR, the checklists do not direct the required actions to be initiated without delay and continuously pursued until completed. (See **Finding F-CNS-1**.) These actions are designed to mitigate the risk of the accidents for which the cell equipment BDI systems are credited, so if they are not performed immediately, the risk may remain elevated longer than necessary. Additionally, EA observed PTs performing the check with the form in hand; however, contrary to MNL-293084, the checklist forms do not identify the level of use for the checklist. (See **Deficiency D-CNS-8**.) If the level of use is not marked, a PT may choose to perform the task with the form at a lower level of procedure use rigor than appropriate, increasing the risk of human error.

MNL-293084, *Pantex Writer's Manual for Technical Procedures*, does not address TSR surveillance implementation. Process document (PD) 02.01.06.03, *Technical Safety Requirement Surveillance Requirements/In-Service Inspections*, assigns responsibility to the Authorization Basis Department to ensure that an implementation verification review is conducted for non-editorial changes to the TSR document. DOE Guide 423.1-1B, *Implementation Guide for Use in Developing Technical Safety Requirements*, att. C, sec. 3.3 recommends reverification of control implementation every three to five years as part of the assessment program. (See **OFI-CNS-5**.)

Operations Conclusions

Overall, CNS operational activities involving safety systems are performed effectively. Operators understand the potential impacts of their work on nuclear safety. Initial, continuing, and requalification training programs for operators are well developed, rigorous, and systematically maintained in accordance

with DOE Order 426.2; however, a training gap was identified for TSR actions. Two reviewed facility pre-operational checklists do not include required TSR immediate actions, and several CNS surveillance and maintenance procedures lack precision, and some steps are not executable.

3.5 Cognizant System Engineer Program

This portion of the assessment evaluated CNS's CSE program implementation, system design documents, and CSE system assessments of the cell equipment BDI systems.

CSE Program Implementation

PD 02.03.12.02, *Process for System Engineering Program*, accurately describes the actions performed by CSEs and by system engineering management, which are in accordance with the requirements of DOE Order 420.1C, att. 2, ch. V. CNS has appropriately assigned both a primary and a backup CSE to the cell equipment BDI systems. Both CSEs had completed the system engineering qualification card, which includes training requirements tailored to the specific system assigned to the engineer. The experience and training requirements covered by the qualification card fully capture the requirements of DOE Order 420.1C, att. 2, ch. V, sec. 3.e. The CSEs are highly knowledgeable of the cell equipment BDI systems and failure modes, review completed test records, and actively engage in troubleshooting and repairs.

CMD-006, *Structure, System, Component/Equipment Configuration Management Data*, is a controlled Microsoft Excel spreadsheet that lists all facility SSCs and identifies those that are subject to DOE Order 420.1C requirements, as well as the CSEs assigned to them. CNS established form PC-3584, *Master Equipment List*, to identify SSCs that are part of the safety basis, per DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*, att. 2, sec. 2.c. However, contrary to DOE Order 433.1B, att. 2, sec. 2.c, CNS has not used form PC-3584 to develop a master equipment list (MEL) that identifies the cell equipment BDI SSCs that are part of the safety basis. (See **Deficiency D-CNS-9**.) Without a MEL, the SSCs that are credited as part of the safety basis may not be effectively managed and maintained. The interviewed CSEs stated that although no MEL exists, the BDI system component-level details are generally available on drawings in various bills of materials. However, component-level details on drawings do not provide an effective mechanism for ensuring that all BDI SSCs addressed by the safety basis are properly identified for effective management. CSEs stated that they are in the process of implementing a new maintenance management system that can address this need.

System Design Descriptions

E-PROC-3048, *System Design Descriptions*, states that at Pantex a DIS is equivalent to a system design description, and that for existing facilities, DISs will be maintained and revised in accordance with WI 02.03.12.02.05, *Originate and Control Design Information Summaries*, and DESKAID-0138, *Design Information Summaries*. DESKAID-0138 conforms to the methodology of DOE-STD-3024-2011, *Content of System Design Descriptions*, and the requirements of DOE Order 420.1C, att. 2, ch. V, sec. 3.c.(2), by appropriately establishing criteria and guidance for the content and organizational structure of DISs.

DIS-004, *Blast Door Interlock System Design Information Summary*, partially follows the requirements in DESKAID-0138. DIS-004, section 4.4, *Applicable DOE Orders, DOE Guides, DOE Manuals*, and section 4.5, *Industry Codes and Standards*, lacks any content. Limited code-related information is identified on drawings, such as D12-05E20, *Blast Door Interlock System Schematic Diagram*. Also, some general information about applicable codes is included in DIS-004, section 5, *System Evaluation/Backfit*. However, overall, CNS has not documented the design criteria, including codes and standards, associated with the BDI systems, contrary to DOE Order 420.1C, att. 2, ch. V, sec. 3.c.(2)(a).

(See **Deficiency D-CNS-10**.) Without documented design criteria, component replacements cannot be adequately evaluated for equivalency. Additionally, although referenced in EE-04-007 and EE-04-012, several sketches and drawings labeled "SDD" – indicating system design documentation – have not been incorporated into DIS-004. For example, DIS-004 does not contain sketch BDI-4, *12044 Blast Door Interlock System (BDI022-BDI062) System Diagram & Boundary*, which is the one-line diagram that defines the boundaries of the system. (See **OFI-CNS-6**.) Without this information, the system design documentation is not adequately consolidated as required by DOE Order 420.1C.

CSE System Assessments

Each quarter, the CSE completes a combined tracking and trending report for the BDI systems, including the systems for the bays and the cells. EA reviewed the tracking and trending reports since 2020. Although the reviewed reports did not identify any negative trends for the cell equipment BDI systems, they did accurately identify trends for some of the other systems addressed in the same reports, and successfully addressed those trends. The reviewed tracking and trending reports thoroughly aggregate information about the cell equipment BDI systems and monitor appropriate metrics for the system, including the frequency of use of the doors, because changes in mission affect how often the doors are used. The reviewed tracking and trending reports all included references to EWR 1113, which requested the replacement of obsolete components for one design of the cell equipment BDI systems.

Cognizant System Engineer Conclusions

Overall, CNS effectively implements the CSE program for the cell equipment BDI systems, including adequate training and experience levels for the primary and backup CSEs. The CSEs are highly knowledgeable of the cell equipment BDI systems, and the tracking and trending reports thoroughly aggregate information about the cell equipment BDI systems. However, CNS has not developed a MEL identifying the cell equipment BDI SSCs that are part of the safety basis, and the DIS for the BDI systems is missing required information about design criteria.

3.6 Feedback and Improvement

This portion of the assessment evaluated CNS's collection, analysis, and use of feedback information to promote safety SSC engineering, operations, and maintenance improvements for the cell equipment BDI systems.

Feedback Information Collection

CNS has established and implemented an effective process for acquiring quality worker feedback through proactive interactions. E-PROC-3116, *Quality Assurance Oversight of Facilities and Projects*, provides an integrated quality support model to promote an effective, "right-the-first-time" approach, rather than focusing on lagging reviews. The process effectively aids workers in understanding the quality requirements; promotes participation in kickoff meetings to determine the quality requirements that apply to the work execution; institutes facility walkdowns to provide support for ongoing maintenance activities; and defines other activities to ensure quality.

CNS effectively conducts assessments to identify performance deficiencies and areas in need of improvement. E-PROC-3004 provides an adequate process for scheduling, planning, and conducting management and independent assessments. E-PROC-3004, section 6.0, ensures that personnel involved in performing management and independent assessments are adequately trained. The reviewed assessment schedule printed from the electronic tracking system, *Tools for Opportunities – Process Improvement and Communication* (TOPIC), dated January 12, 2023, appropriately includes topics

addressing engineering, operations, and maintenance related to the blast doors. Six reviewed assessments conducted by engineering, operations, and maintenance personnel demonstrated a performance-based approach and reviewed work documentation for evidence of compliant work performance. Six reviewed independent assessments performed by the CNS Enterprise Assessment organization demonstrated self-critical evaluations. The deficiencies and opportunities for improvement identified through these assessments were appropriately entered into CNS's issues management system.

Feedback Information Analysis

CNS effectively uses feedback information to identify needed improvements in safety SSC engineering, operations, and maintenance. E-SD-2062, *Enterprise Feedback and Improvement Program*, provides an adequate process for CSEs to analyze and report the results of collected feedback information, including operational events. The interviewed BDI CSE was knowledgeable of feedback information relevant to the assigned safety SSCs. Twenty reviewed Occurrence Reporting and Processing System reports from July 2019 to November 2022 demonstrated that events related to safety SSCs are properly investigated, analyzed, and reported. Nine reviewed trend reports from July 2020 to September 2022 demonstrated the CSE's appropriate use of feedback information and performance indicators to identify adverse trends on a quarterly basis, report results to management, and ensure prompt mitigation and corrective actions. The reviewed safety system failures that were documented in trend reports and the identified issues in the issues management system exhibited no notable trends in cell equipment BDI systems.

Performance Improvement

CNS uses feedback information effectively to implement corrective actions and develop and disposition lessons learned to improve safety SSC engineering, operations, and maintenance performance. E-PROC-0006, *CNS Issues Management Process*, provides an adequate process for managing identified issues in accordance with DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*. CNS has not recently identified any cell equipment BDI-related issues, so EA reviewed six safety SSC-related issues identified from June 2021 to November 2022; these issues demonstrated clear and complete issue statements with a concise description of the issue, appropriate significance determinations, causal analyses, corrective action plans, objective evidence of completed actions, and completed effectiveness reviews.

Further, CNS effectively generates and dispositions lessons learned applicable to safety SSC engineering, operations, and maintenance performance. E-SD-2062, *Enterprise Feedback and Improvement Program*, provides an adequate process for managing lessons learned under the leadership of the CNS Enterprise Feedback and Improvement organization. E-SD-2062, section 6.3, adequately addresses the identification of lessons learned from external and internal sources; dissemination of lessons learned to appropriate engineering, operations, and maintenance personnel; and methods for ensuring that the appropriate CNS staff understand and apply applicable lessons learned. Nine reviewed trend reports (June 2021 to November 2022) and one issued corrective action appropriately dispositioned the associated lessons learned.

Feedback and Improvement Conclusions

CNS has established and implemented an adequate feedback and improvement program through worker feedback mechanisms, management and independent assessments, and an adequate process for managing identified issues. The performance attributes of cell equipment BDI systems are appropriately trended on a quarterly basis; no trends have been noted in the cells. The lessons-learned program is well documented, and notifications are dispositioned.

3.7 Safety Basis Evaluation

This portion of the assessment evaluated CNS's approved safety basis for the cell equipment BDI systems, including control derivation, safety control classification, facility design, and TSRs.

Control Derivation and Description

CNS has appropriately evaluated the cell equipment BDI systems against a complete set of hazard events and accident environments, as addressed in chapter 3 of the Sitewide SAR. The types of accidents that were considered appropriately include operational accidents, natural events, and manmade external events. The cell equipment blast doors are relied on to protect the contents from the effects of external events and are relied upon to mitigate the effects of an internal event so that the consequences are less than the evaluation guidelines. This consequence could be triggered by such hazard scenarios as a fire external to the facility, an external explosion that could impact an explosive assembly inside the facility, or an aircraft crash into the facility.

Chapter 4 of the Sitewide SAR provides detailed descriptions of both types of cell equipment BDI systems, including the safety function, control (or system) description, functional requirements, and performance criteria. The Building 12-44 BDI systems are older, and the design differs slightly from that of the BDI systems in the Building 12-85, Building 12-96, and Building 12-98 cells. The cell equipment BDI system safety function adequately ties directly to the hazards analysis and evaluation in chapter 3 of the Sitewide SAR. The safety function of the cell equipment BDI systems is to support the critical safety function of the facility structure by ensuring that at least one blast door in the equipment interlock remains closed and latched with the floor gasket in a lowered position. The safety function is the same for both types of cell equipment BDI systems.

In addition to the safety function, chapter 4 of the Sitewide SAR provides an adequate, detailed description of the cell equipment BDI system and the basic principles by which it performs its safety function. The control description includes a generally complete discussion of four subsystems (i.e., electronic control subsystem, pneumatic control subsystem, blast door floor gasket assembly, and blast door latching assembly) and identifies how the subsystem components relate to the system functional requirements. However, the boundary conditions for the cell equipment BDI system are not well-defined. For example, each cell equipment BDI system ties into both the electrical distribution system and the compressed air system. The electrical distribution system is classified as general service, but the compressed air system is SC. Neither system is required to be SC in support of the cell equipment BDI systems, but the chapter 4 control description does not note that the SC designation is not required.

The cell equipment BDI system functional requirements identify 14 requirements for both types of systems in order to ensure that the cell equipment BDI system will fulfill the safety function in all accident scenarios. Chapter 4 of the Sitewide SAR adequately describes the performance criteria necessary for the cell equipment BDI systems to meet their functional requirements.

Safety Control Classification

The Sitewide SAR appropriately classifies the cell equipment BDI systems as SC. Each accident sequence is appropriately analyzed for potential consequences to the public by comparing the radiation dose at the nearest site boundary to an evaluation guideline of 25 rem total effective dose equivalent specified in DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, appendix A. The SC classification of the cell equipment BDI systems is correctly based on those accident scenarios that could result in an internal explosion with both equipment doors open that exceeds the evaluation guideline. The cells are designed (and tested) to ensure

that the effects of an internal explosion will be largely contained if the amount of high explosive and nuclear material is constrained and the blast doors are closed and latched. SB-MIS-941154, *Calculation of Off-Site Dose Consequences Resulting from Sub-Design Basis Explosions*, provides an adequate basis for concluding that the cell blast door can fulfill its safety function. This calculation parametrically evaluates the consequences of an explosion, based on the quantity of explosives, inside a cell. However, this calculation was issued in 2006 and has not been reanalyzed or revalidated using more modern methods and/or computer models. (See **OFI-CNS-7**.)

Facility Design

The facility, an SC design feature, and the BDI systems (SC SSCs) provide adequate protection for a complete set of hazards and accident environments. The first Pantex cell was designed and tested in the 1950s. Through full- and half-scale tests, the facility design was verified to function under the effects of a design basis explosion. The design to meet explosive criteria ensures that the facility will survive design basis natural phenomena hazard events. The capability of the facility to perform during and after such an event is documented in the Sitewide SAR. Similarly, the cell equipment BDI systems will perform their safety function when called upon, as documented in the Sitewide SAR. As stated earlier, the cell equipment BDI system is designed to fail safe, and if any subsystem fails during or after an accident scenario, the latched blast doors will continue to provide protection as designed.

Technical Safety Requirements

In the Sitewide SAR, chapter 5, CNS effectively evaluated and appropriately derived the cell equipment BDI systems as TSRs. The cell equipment BDI systems are appropriately divided into two distinct LCOs: LCO 3.1.1 and LCO 3.1.2. Both LCOs have appropriate conditions, required actions, and completion times, and surveillances are conducted to ensure operability on a daily and annual basis. The Bases appendix, B3/4.1, *Interlock Systems*, provides the linkage to the safety basis and adequately describes the LCO requirements necessary for the safe operation of the nuclear facility.

Current TSR limits for explosives and nuclear materials inside the cells are higher than those analyzed in calculation SB-MIS-941154. However, these limits are reduced in weapon program hazard analysis reports, and although they vary by program, all hazard analysis report limits are less than the analyzed quantity. Dissimilar limits could lead to confusion between TSR material limits and program material limits. (See **OFI-CNS-8**.) The cell equipment blast doors have the capability to fulfill their safety functions for the accidents of concern, and the BDI systems are designed to fail safe if one or more subsystem components fail.

Safety Basis Evaluation Conclusions

CNS has established and implemented an adequate safety basis for the cell equipment BDI systems. The system is adequately described in the Sitewide SAR and appropriately evaluated to ensure that it will meet its safety function when called upon. The TSRs are properly derived from the Sitewide SAR and contain appropriate conditions, required actions, completion times, and surveillances.

3.8 Federal Oversight

This portion of the assessment evaluated NPO's oversight of activities at Pantex, with a specific focus on oversight activities relating to the cell equipment BDI systems.

Consistent with DOE Order 226.1B, NPO maintains sufficient technical capability and knowledge of site and contractor activities to make informed decisions about hazards, risks, and resource allocation. NPO

has implemented an effective safety system oversight (SSO) program, and the functions, qualification requirements, and roles and responsibilities of SSO personnel are adequately described in NPO-3.1.3.2, *Safety System Oversight Program*, which incorporates the requirements of DOE Order 426.1B, *Department of Energy Federal Technical Capabilities*. The training and qualification process for SSO personnel is further detailed in NPO-Desk-Aid-0021, *Job Specific Qualification Standard for NPO-10 Technical Qualification Program Positions*, and follows the applicable requirements of DOE-STD-8000-2021, *Safety System Oversight Functional Area Qualification Standard*. Due to staff turnover, NPO assigned an engineer to the BDI systems who began the SSO qualification process before issuance of the most recent version of the qualification standard, DOE-STD-8000-2021. This engineer was in the process of completing the latest requirements to become fully qualified at the time of this assessment. While not yet fully qualified as an SSO, the engineer holds and maintains other technical qualifications and demonstrated a high level of knowledge and awareness of the BDI systems. Nuclear safety specialists within NPO were highly knowledgeable of the safety basis for the BDI systems.

NPO has established and implemented a mature oversight program as described in NPO-3.4.1.1, *NPO Oversight Planning and Implementation Process*. Oversight personnel, including SSOs and NPO Facility Representatives, conduct a variety of oversight activities. These activities include formal assessments, walkdowns, and field observations of contractor activities associated with maintenance, operations, and training and qualification of contractor personnel. Operational awareness (OA) activities are documented and tracked in the TOPIC system and are included in a monthly OA report. Four reviewed records of various OA activities relating to the cell equipment BDI systems contained an appropriate level of detail to demonstrate understanding and awareness of facility and system status and contractor activities. Formal assessment activities are planned, scheduled, and conducted in accordance with NPO-3.4.1.1. A 2021 assessment of the CNS CSE program was comprehensive, was guided by formally documented criteria, and appropriately evaluated the performance of the CSE program, including observations and performance problems.

Federal Oversight Conclusions

NPO meets the requirements of DOE Order 226.1B and has implemented an effective oversight program while maintaining sufficient technical capability and knowledge of site and contractor activities. Oversight activities are varied and well documented, and the implementation of the NPO SSO program provides adequate oversight of the BDI system and the CNS CSE program.

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:

- Stored items in the warehouse are labeled with color-coded stickers to provide warehouse personnel a visual indicator of acquisition level, controlled expiration date, critical spare indicator, property-controlled items, and storage level.

5.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and

implement corrective action plans for findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 226.1 to manage the corrective actions and track them to completion.

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Finding F-CNS-1: CNS did not accurately/completely implement TSR immediate actions in the two facility pre-operational checklists for failure of a BDI functional test. (RPT-SAR-199801)

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-CNS-1: CNS has not documented system requirements for the cell equipment BDI systems. (DOE Order 420.1C, att. 2, ch. V, sec. 3.c.(2)(a))

Deficiency D-CNS-2: CNS has not established the acceptance criteria for the required annual visual inspections of the cell equipment BDI systems. (10 CFR 830, subpart B, app. A, G.6.(5))

Deficiency D-CNS-3: CNS procedure E-PROC-3111 lacks key requirements to preclude S/CIs from entering the site, preclude S/CIs from procured CGD items, and properly disposition S/CIs. (DOE Order 414.1D, att. 3, sec. 2.i)

Deficiency D-CNS-4: CNS allowed an unqualified PT and an unqualified carpenter to perform demonstrations of the shiftly and annual surveillance of the BDI systems without a qualified instructor present. (E-PROC-3028, sec. 7.10).

Deficiency D-CNS-5: CNS did not provide formal training for workers tasked with implementing TSR LCO actions. (DOE Order 426.2, att. 1, ch. I, sec. 4.b.(3)(a))

Deficiency D-CNS-6: CNS BDI system surveillance procedures contain errors of editorial and performance nature that were not identified through the procedure development, validation, training, implementation verification review, use, or periodic review processes. (WI 02.03.03.02.15)

Deficiency D-CNS-7: CNS procedures for maintenance of the cell equipment blast doors contain several errors that were neither identified during performance nor corrected. (WI 02.03.16.01)

Deficiency D-CNS-8: CNS procedures PX-2977 and PX-2987 are not marked as to level of use. (WI 02.03.03.02.05, MNL-293084)

Deficiency D-CNS-9: CNS has not developed a MEL that identifies the cell equipment BDI SSCs that are part of the safety basis. (DOE Order 433.1B, att. 2, sec. 2.c)

Deficiency D-CNS-10: CNS has not documented the design criteria, including codes and standards, associated with the BDI systems. (DOE Order 420.1C, att. 2, ch. V, sec. 3.c.(2)(a))

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-CNS-1: Consider establishing management-level workflow monitoring for EWR priorities related to SC systems.

OFI-CNS-2: Consider including a place on PX-3170, *Work Performance Record*, to record corrective work order numbers initiated in response to issues identified during the surveillance to ensure that corrective actions are taken.

OFI-CNS-3: Consider including more detailed acceptance criteria, such as the number of lights that should light, in the cell equipment BDI system TSR surveillance procedures.

OFI-CNS-4: Consider specifying the number of qualified personnel required for the performance of surveillances.

OFI-CNS-5: Consider performing reverification of TSR control implementation to help identify procedure deficiencies.

OFI-CNS-6: Consider updating DIS-004 to reference all sketches and drawings that describe the boundaries of the system.

OFI-CNS-7: Consider reanalyzing the offsite dose consequences from a sub-design basis explosion or revalidating calculation SB-MIS-941154.

OFI-CNS-8: Consider revising material limits for explosives to ensure consistency between the TSRs, weapon hazard analysis report limits, and the calculational basis.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: January 9-12, 2023

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