Independent Assessment of Configuration Management at the Pantex Plant

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Office of Enterprise Assessments
U.S. Department of Energy

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Acronyms

AIR	Compressed Air System
CFR	Code of Federal Regulations
CM	Configuration Management
CNS	Consolidated Nuclear Security, LLC
CRAD	Criteria and Review Approach Document
CSE	Cognizant System Engineer
DCP	Design Change Proposal
DIS	Design Information Summary
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
FPS	Deluge Fire Suppression System
NNSA	National Nuclear Security Administration
NPO	NNSA Production Office
OFI	Opportunity for Improvement
Pantex	Pantex Plant
PMT	Post-modification Testing
POI-3500	Mass Properties Measurement Machine
P&ID	Piping and Instrumentation Diagram
SAR	Safety Analysis Report
SC	Safety Class
SSCs	Structures, Systems, and Components
TOPIC	Tools for Opportunities – Process Improvement and Communication
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
WO	Work Order

INDEPENDENT ASSESSMENT OF CONFIGURATION MANAGEMENT AT THE PANTEX PLANT

Executive Summary

The U.S. Department of Energy Office of Enterprise Assessments (EA) conducted an independent assessment of configuration management at the Pantex Plant on July 10-13, 2023. The 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). The assessment evaluated the effectiveness of CNS in managing and maintaining configuration management of the deluge fire suppression, mass properties, and compressed air safety class systems. This assessment also evaluated the effectiveness of NPO's oversight of configuration management at the Pantex Plant.

EA identified the following strengths:

- The observed physical configuration of system components was consistent with CNS approved design requirements.
- CNS design change proposals are detailed and appropriately specify post-modification testing.
- CNS cognizant system engineers are engaged in maintenance work order reviews and testing acceptance.
- The CNS tracking and trending reporting process is used to proactively identify issues.
- The CNS causal analyses and identification of extent of conditions for reviewed issues were of appropriate depth and scope.
- NPO effectively performs and documents baseline oversight activities for configuration management.
- NPO personnel maintain operational awareness and knowledge of safety systems and processes.

EA also identified the weakness summarized below:

- CNS did not adhere to a work order for an air compressor replacement in Building 12-123. Not adhering to procedures may result in inadequate work performance, which could adversely impact operability of safety structures, systems, and components or pose worker hazards.

In summary, CNS has a strong configuration management program that has been effectively implemented at the Pantex Plant for the evaluated systems. Further, NPO provides effective oversight of configuration management. The identified weakness does not substantially detract from the overall effectiveness of the program. Addressing the weakness identified by EA in this report will further strengthen the effectiveness of CNS in managing and maintaining configuration management at the Pantex Plant.

INDEPENDENT ASSESSMENT OF CONFIGURATION MANAGEMENT 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), conducted an assessment of configuration management (CM) at the Pantex Plant (Pantex). Onsite assessment activities were conducted on July 10-13, 2023.

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 Configuration Management at the Pantex Plant, July 2023*, this assessment evaluated the effectiveness of CNS in managing and maintaining CM associated with the deluge fire suppression, mass properties, and compressed air safety class (SC) systems. This assessment also evaluated the effectiveness of NPO's oversight of CM at Pantex.

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. The deluge fire suppression system (FPS) is designed to mitigate the effects of fire by providing a significant volume of water, through all sprinklers, over an entire design area. FPSs are provided in various bays, operation/staging areas, and cells throughout several facilities. The mass properties measurement machines (POI-3500s) are used to identify the magnitude and location of static and dynamic imbalances to ensure acceptable flight performance of both nuclear and non-nuclear explosive units. The compressed air system (AIR) supplies compressed air to facility systems, tooling, and process equipment. The AIR is composed of two primary air compressors, a backup diesel compressor, two supplementary compressors, valves, other appurtenances, and miles of piping with supply drops in ramps, equipment rooms, bays, and cells.

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.3 and SS.8 of EA Criteria and Review Approach Document (CRAD) 30-11, Revision 0, *Safety Systems Management Review*. EA also used elements of CRAD EA-30-07, Revision 0*, Federal Line Management Oversight Processes*, to collect and analyze data on NPO oversight activities.

EA examined key documents, such as design information summaries (DISs), drawings, work packages, procedures, work instructions, manuals, desk aids, and training and qualification records. EA also interviewed key personnel responsible for developing and executing the associated programs; observed an issues management board meeting and maintenance activities; and walked down significant portions of the selected systems, focusing on system configuration. 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 Configuration Management Processes

This portion of the assessment evaluated CNS's CM processes to maintain consistency among system requirements, documents, and physical configuration, which ensure that the SC structures, systems, and components (SSCs) can reliably perform their intended safety functions.

CNS has established and implemented adequate CM processes that ensure consistency among system requirements and performance criteria, document control, and physical configuration for the SSCs. MNL-00054, *System Engineering and Configuration Management Program*, adequately integrates system requirements and performance criteria identified in the safety analysis report (SAR), design change proposals (DCPs), unreviewed safety questions (USQs), temporary modification work control, change control, document control, and system assessments in accordance with DOE-STD-1073-2016, *Configuration Management*. CNS procedure E-PROC-3028, *Enterprise Training and Qualification Program*, adequately establishes the training requirements for technical support personnel in accordance with DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, and DOE Order 420.1C, *Facility Safety*, attachment 2, chapter V, paragraphs 3.a.(4) and 3.e.

CNS personnel responsible for SC configuration management processes are appropriately trained. During interviews, the Senior Engineering Director of CM, Senior Program Manager for CM, Technical Advisor for CM, Pantex Director of Facility Engineering, and Mechanical/Process Equipment Manager adequately demonstrated knowledge of the CM program. Three interviewed cognizant system engineers (CSEs) demonstrated adequate knowledge of their assigned safety system and status. Three interviewed USQ evaluators also demonstrated their understanding of the USQ process. Reviewed training records for three CSEs demonstrated appropriate training and qualification in accordance with E-PROC-3028.

CMD-006, *SSC Configuration Management Data*, clearly identifies the FPS, POI-3500s, and AIR as SC SSCs with credited controls subject to CM as well as the basis and justification for their selection. The reviewed DISs for the FPS, POI-3500s, and AIR accurately describe the SC SSCs and integrate the reviewed design documentation consistent with the SAR. The DISs appropriately include system requirements and performance criteria essential to performance of the system's safety functions, a clear basis for system requirements, and a description of how the current system configuration satisfies the system requirements and performance criteria. For example, the DIS for the POI-3500 mass properties measurement machines appropriately includes system functional requirements, technical safety requirement (TSR) surveillances, configuration information, critical spare parts requirements, and post-maintenance requirements needed to conduct performance measurements of components.

The physical configurations of labeled SC system components of the Building 12-84 mass properties measuring system, Bay 9 FPS in-progress upgrades, and the Building 12-123 compressor plant were consistent with approved piping and instrumentation diagrams (P&IDs) specified in the DISs and as-built drawings. However, EA observed the following weaknesses:

- Contrary to E-PROC-3122, *Enterprise Integrated Work Control Manual*, section 5.1, which implements in part DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*, CNS did not adhere to work order (WO) 56221353, *12-123 Compressor #4 (2.b)*. (See **Deficiency D-CNS-1**.) Not adhering to procedures may result in inadequate work performance, which could adversely impact safety SSC operability or pose worker hazards. Specifically, in the Building 12-123 compressor plant, the installed compressor #1 (non-safety related) was not labeled. A review of the WO, for which the field activity was completed in March 2023, revealed that the step

to apply a label was not performed, not all steps were appropriately marked as completed, the WO was missing completed forms (craft work performance records), and some forms were missing supervisor signatures. In response, CNS applied the component label to compressor #1 but has not closed the WO.

- An out-of-service SC air system line (shown on the drawing as capped) entering a Building 12-84 bay pit, which contains a POI-3500 under a steel plate, was still pressurized as indicated on the attached air pressure regulator. The systems engineer, Pantex Director of Systems Engineering, and Mechanical/Process Equipment Manager confirmed the out-of-service status. While in compliance with the DSA, isolating the air system line would place it in a safer configuration. (See **OFI-CNS-1**.)

Configuration Management Processes Conclusions

CNS has established and implemented adequate CM processes that meet the requirements of DOE Order 420.1C and DOE-STD-1073-2016. Observed system configurations were consistent with design requirements. However, EA identified that a CNS work crew did not adhere to a WO in Building 12-123 and an out-of-service SC air system line entering a Building 12-84 bay pit was still pressurized.

3.2 Configuration Management of System Changes

This portion of the assessment evaluated changes to the evaluated systems to ensure that applicable requirements and design bases are incorporated; that system changes are formally designed, reviewed, approved, implemented, and documented; and that consistency is maintained among requirements and physical configuration.

Reviewed system modification documentation of the FPS, POI-3500s, and AIR demonstrated effective change control and implementation of the USQ process to ensure that systems continue to meet their functional requirements. System design documents and supporting documents for 34 reviewed DCPs were appropriately identified and kept current in accordance with MNL-00054. These modifications included the installation of a new FPS in Building 12-84 Bay 9, a new POI-3500 replacement in Building 12-84, and the installation of a new compressor to replace compressor #4. The system changes, which included changes to system requirements, documents, and installed components, were appropriately designed, reviewed, approved, implemented, tested, and documented in a timely manner. For example, DCP 2200068.4, *12-84 2, 4, 6, 8 HPFL Lead-In Replacement/FDS Project (Installation DCP)*, included upgrades to the above-ground FPS in Bays 2, 4, 6, and 8 of Building 12-84. This DCP adequately included hydraulic calculation revisions, as-built drawings, commercial grade items for system components, nuclear quality assurance certified components, torque reports, tool calibration certificates, and test procedures required to complete the upgrades. In addition, this DCP included appropriate revision to DIS-019, *Fire Suppression System*, to denote upgraded deluge valve models and associated components.

Further, the 34 DCPs appropriately included proposed system changes described in design change notices (DCNs) with sufficient detail to enable a thorough understanding of the design, component specifications, and potential impacts. All associated DCNs were appropriately revised by all necessary organizations to ensure that system requirements and performance criteria are not affected in a manner that adversely impacts the ability of the system to perform its intended safety function. Documents (e.g., P&IDs, engineering evaluations, calculations, installation instructions, post-modification testing [PMT] instructions and acceptance criteria) affected by the proposed changes were appropriately identified and included in the reviewed DCPs. No positive USQs were outstanding for the reviewed DCPs. Also, six inspection reports associated with the DCPs demonstrated adequate independent inspections of SC systems, which included appropriately identified hold points during the system design changes.

One reviewed DCP (DCP 2300106.2, *Tie in temporary air compressor/dryer and generator*) documented a temporary modification (TM). The DCP included appropriate changes to install a temporary diesel generator for maintaining electrical power to keep the electric-powered compressor in Building 12-123 running while installing a new compressor to keep the AIR operational. The DCP was appropriately evaluated by nuclear safety specialists using the USQ process, which did not involve a positive USQ. The modification was verified to be within the allowable timeframe for a TM specified in MNL-00054. During a walkdown of the TM, the work was confirmed to be conducted in accordance with the DCP.

Configuration Management of System Changes Conclusions

Reviewed system modification documentation demonstrated effective change control and implementation of the USQ process to ensure that systems continue to meet their functional requirements. Independent inspections of system modifications were adequately conducted, including hold points.

3.3 Work Control and Post-modification Testing

This portion of the assessment evaluated whether configuration management processes adequately integrate work control and whether systems are tested following modification to ensure that safety systems continue to meet safety basis requirements.

CNS adequately implemented work control processes and conducted appropriate PMT associated with corrective maintenance and modifications to fulfill system requirements and functional requirements identified in the safety basis. CNS has an adequate procedure, E-PROC-3122, for planning, defining, scheduling, coordinating, performing, reviewing, and approving maintenance activities in accordance with DOE-STD-1073-2016. E-PROC-3122 appropriately includes analyzing and controlling the job hazards; planning the work, including walkdowns; executing the work, including documentation; and performing acceptance activities, PMT, closeout, and performance feedback. The specified PMT process is adequate to verify that safety SSCs perform their intended function when returned to service.

Reviewed training and qualification records for two maintenance planners, a maintenance manager, and a work planning manager were current. They included adequate work control-related qualification topics, such as work planning and scheduling, hazard identification, use of planner checklists, and pre-job briefs, which demonstrated their adequate qualifications to plan, schedule, and coordinate maintenance work.

CNS effectively planned and controlled 18 reviewed corrective maintenance/modification WOs in accordance with E-PROC-3122 for the FPS, POI-3500s, and AIR. The reviewed CNS area mechanics integrated maintenance schedule demonstrated adequate prioritization and management of maintenance planning and scheduling and was sufficiently detailed to coordinate activities and track progress. The reviewed WOs, which were developed from standard work package templates, were specific to the planned maintenance and were clear, concise, properly sequenced, and sufficiently detailed to enable safe work performance. Hazards and identified controls were appropriately tailored to the work scopes. Testing parameters and acceptance criteria were adequately identified. The PMT sections of the WOs demonstrated that testing results were properly documented, and the resulting data met the acceptance criteria. The test results were formally reviewed and accepted for return to service. CSE signatures on WOs, hold points, and acceptance tests, which are documented in the CNS computerized maintenance management system (CMMS), demonstrated appropriate CSE involvement. Interviewed work planners and CSEs confirmed effective coordination in developing the PMT scope, initial conditions and prerequisites, job instructions, hold points, test requirements, acceptance criteria, and post-test restoration. Additionally, 5 of the 18 reviewed maintenance WOs required quality control involvement and demonstrated appropriate quality control review and approval of the commercial grade dedication critical

characteristics for replacement parts, commercial grade item testing performance criteria, and PMT that were completed during repair, installation, and testing of SC SSCs in the FPS and AIR.

Effective work performance associated with the semi-annual inspection, functional testing, and maintenance of the wet pipe fire protection system in Building 12-131 in accordance with WO 56241818, *12131 FPS*, was observed. The WO contained detailed steps for performing and documenting the work requirements and was adequate for verifying the operability of this SC SSC based on well-defined acceptance criteria aligned with National Fire Protection Association requirements. The observed pre-job brief was thorough and adequately addressed the work and hazards. The observed work demonstrated effective operational coordination and teamwork to integrate and execute the scheduled maintenance. The work was performed by trained operations personnel and supported by qualified CSEs.

Work Control and Post-modification Testing Conclusions

CNS adequately implemented work control processes and conducted appropriate PMT to fulfill system requirements and functional requirements identified in the safety basis. CNS has an adequate PMT process to properly maintain safety SSCs and return SSCs to service.

3.4 Configuration Assessments and Issues Management

This portion of the assessment evaluated whether feedback and improvement processes are effective in identifying, addressing, and preventing the recurrence of CM issues.

CNS adequately performs system assessments of active SC SSCs and other systems important to safety, addressing system operability, reliability, and material condition. Forty-seven reviewed material condition walkdown reports for physical configuration assessments performed by CSEs over the past 12 months adequately demonstrated consistency between the physical configuration and the facility documentation. These walkdowns were adequately conducted to review drawings and field conditions, component wear and degradation, physical damage to SSCs, system leaks, labeling and calibration stickers, electrical system issues, and discrepancies between design and configuration in the field. Twenty-four reviewed tracking and trending reports (TTRs) prepared by CSEs adequately demonstrated that system data performance assessments were conducted to verify that systems and components continue to meet design and performance criteria in their current configurations. The quarterly reports for each reviewed system appropriately included data for system configuration, active WOs, deficiencies, availability of systems, and recommendations for system upgrades. System performance assessment results were adequately consolidated, analyzed, and communicated in reviewed quarterly TTRs for fiscal years 2022 and 2023, which provided an effective mechanism for communicating any adverse performance trends. For example, trending of moment of inertia values for the mass properties system allowed for proactive troubleshooting that identified loose bolts before they impacted system function, preventing downtime.

CNS conducted a management assessment of CM at both Pantex and the Y-12 National Security Complex in 2021. That assessment was properly conducted in accordance with the process laid out in E-PROC-3004, *Enterprise Assessments Process*. The management assessment identified one finding and two weaknesses for Pantex. These issues were accurately entered into CNS's issues management system, Tools for Opportunities – Improvement and Communication (TOPIC), and appropriate corrective actions were identified. At the time of that assessment, the corrective actions for the weaknesses had been completed and the issues closed out in a timely manner. For the finding, all corrective actions had been completed, and the effectiveness review was appropriately scheduled for November 2023 to allow time to verify corrective action effectiveness.

In addition to enterprise-wide assessments, CNS also conducts TSR control review assessments. For the FPS, the most recent TSR control review assessment was conducted from October to December 2019. The review was of appropriate depth and identified two issues (one finding and one weakness). These issues were appropriately entered into TOPIC. For the AIR, the most recent TSR control review assessment was conducted in March 2021. Because the AIR TSR control had not changed since the previous review in 2016, an assessment of appropriate scope and rigor was chosen. The review confirmed that all issues identified by the 2016 review were resolved, and no new issues were identified. The FPS and AIR TSR control review assessments were both conducted by the Facility Engineering group; however, the responsibility for the TSR control owner reviews has since transitioned to the Readiness Assurance group.

E-PROC-0006, *CNS Issues Management Process*, adequately directs managing issues in accordance with DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*. For three reviewed issues connected to events entered into TOPIC (two for the FPS and one for the AIR), CNS appropriately determined the causes and took effective corrective actions to address the causes. Notably, both the FPS and AIR are large systems with numerous components, and CNS conducted thorough extent-of-condition reviews for the identified issues.

Configuration Assessments and Issues Management Conclusions

CNS appropriately conducts physical configuration assessments and self-assessments related to CM. Issues are successfully identified through events and trending. Causal analyses and identification of extent of conditions for reviewed issues were of the appropriate depth and scope.

3.5 Federal Oversight

This portion of the assessment evaluated NPO's oversight of CM.

NPO has established and implemented an oversight program as described in NPO-3.4.1.1, *NPO Oversight Planning and Implementation Process*. Formal assessment activities, including those required by DOE orders and regulations, are planned, scheduled, and conducted in accordance with NPO-3.4.1.1 and are adequately integrated into the site integrated assessment plan. Additionally, a 2021 shadow assessment of the CNS CM program was guided by formally documented criteria, and appropriately evaluated the contractor's assessment and implementation of the CM program. The assessment identified performance problems and observations that were subsequently communicated to CNS. The performance of the 2021 assessment aligned with the baseline oversight activities identified by 10 CFR 830, *Nuclear Safety Management*, and DOE Order 420.1C.

In addition to formal assessments, NPO personnel routinely conduct operational awareness activities, including walking down facilities, observing contractor activities associated with maintenance and operations, and attending issues management board meetings. The results of these activities are documented in TOPIC. NPO personnel were observed to be knowledgeable of facility systems and processes and have constructive interactions with contractor personnel.

Federal Oversight Conclusions

NPO has appropriately planned and conducted CM oversight activities in accordance with DOE Order 226.1B and uses knowledgeable personnel to maintain operational awareness of contractor CM activities.

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

Consolidated Nuclear Security, LLC

Deficiency D-CNS-1: CNS did not adhere to WO 56221353. (DOE Order 433.1B, and E-PROC-3122, sec. 5.1)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the OFI 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. This OFI is offered only as a recommendation for line management consideration; it does not require formal resolution by management through a corrective action process and is not intended to be prescriptive or mandatory. Rather, it is a suggestion that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

Consolidated Nuclear Security, LLC

OFI-CNS-1: Consider isolating the out-of-service AIR in a Building 12-84 bay pit to reduce potential fragmentation hazards to items being tested.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: July 10-13, 2023

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