

**Office of Enterprise Assessments
Assessment of the Hanford Site
Waste Treatment and Immobilization Plant
Construction Quality**



March 2018

**Office of Nuclear Safety and Environmental Assessments
Office of Environment, Safety and Health Assessments
Office of Enterprise Assessments
U.S. Department of Energy**

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Acronyms

AHJ	Authority Having Jurisdiction
ASME	American Society of Mechanical Engineers
AWG	American Wire Gauge
BNI	Bechtel National, Inc.
BOF	Balance of Facilities
CA	Corrective Action
CAMP	Corrective Action Management Program
CDR	Construction Deficiency Report
CFR	Code of Federal Regulations
CGD	Commercial Grade Dedication
CM	Commercial Grade
CR	Condition Report
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EMF	Effluent Management Facility
HLW	High-Level Waste Facility
HVAC	Heating, Ventilation, and Air Conditioning
LAB	Analytical Laboratory
LAW	Low-Activity Waste Facility
LOTO	Lock Out, Tag Out
M&TE	Measurement and Test Equipment
NCR	Nonconformance Report
NEC	National Electrical Code
NQA	Nuclear Quality Assurance
NRTL	Nationally Recognized Testing Laboratory
ORP	Office of River Protection
PBQ	People-Based Quality Program
PIRB	Performance Improvement Review Board
psi	Pounds Per Square Inch
PTF	Pretreatment Facility
Q	Quality Related
QA	Quality Assurance
QAM	BNI Quality Assurance Manual
QC	Quality Control
Q2U	Quality to You
SDDR	Supplier Deviation Disposition Request
SME	Subject Matter Expert
SSCs	Structures, Systems, and Components
UL	Underwriters Laboratories
WCD	ORP WTP Construction Oversight and Assurance Division
WTCC	Waste Treatment Completion Company
WTP	Waste Treatment and Immobilization Plant

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EXECUTIVE SUMMARY

The U.S. Department of Energy Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of construction quality and the implementation of the quality assurance program at the Hanford Site Waste Treatment and Immobilization Plant (WTP) from September 11 to 14, 2017. EA performed this assessment in the broader context of an ongoing program of quarterly assessments of construction quality at the WTP construction site.

The scope of this EA assessment included observing ongoing work activities; reviewing the program that Bechtel National, Inc. (BNI) and its subcontractor, Waste Treatment Completion Company, utilizes for controlling nonconforming conditions; examining the implementation of certain requirements in the BNI quality assurance program; and following up on issues identified during previous assessments.

For the most part, construction quality is satisfactory in the areas of pressure testing of piping, leak testing of heating ventilation and air conditioning ductwork, and electrical cable-pulling reviewed during this assessment. However, EA found weaknesses in the implementation of some programs. For example, technical justifications for closure of some nonconformance reports related to the Low-Activity Waste Facility melters were either incomplete or not clear. Also, EA found that the self-assessment program in the BNI construction organization has not been effective in assessing critical project processes or work areas. Several critical work processes have not been self-assessed since 2010, including piping and instrumentation installation, electrical cable tray and conduit installation, and the performance of field engineers. Also, only 24% of the 154 surveillance reports completed by BNI between January 2016 and September 2017 included a performance-based element, seemingly indicating a preponderance of compliance-based oversight. Finally, EA reviewed the corrective action management program related to 11 closed Level B Condition Reports (Level A is the highest issue significance level of a four-level system) related to construction and procurement. Although most Level B closure packages exhibited adequate descriptive text of the issue, actions, and closure evidence, some Level B closure actions were inappropriately closed.

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1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted a focused assessment of construction quality at the Hanford Site Waste Treatment and Immobilization Plant (WTP). The onsite portion of this assessment was conducted from September 11 to 14, 2017. This EA assessment was performed within the broader context of an ongoing program of assessments of construction quality at DOE major construction projects. Because of the safety significance of WTP facilities, EA plans to continue these ongoing quarterly assessments at the WTP construction site to ensure that construction contractors meet the requirements of 10 CFR 830, Subpart A, *Quality Assurance Requirements*.

2.0 SCOPE

This quarterly assessment evaluated construction quality by observing ongoing work activities; reviewing the Bechtel National, Inc. (BNI) program for controlling nonconforming conditions, and examining the implementation of certain requirements in the BNI quality assurance (QA) program and the BNI corrective action program. Design and procurement programs were not included in this assessment.

3.0 BACKGROUND

The DOE Office of River Protection (ORP) manages the 56 million gallons of liquid or semi-solid radioactive and chemical waste stored in 177 underground tanks at the Hanford Site and WTP, an industrial complex for separating and vitrifying the radioactive and chemical waste in the underground tanks. WTP is in the design and construction phase. ORP staff members, primarily WTP Construction Oversight and Assurance Division (WCD) staff, provide oversight of construction activities at WTP.

BNI manages design and construction activities at WTP under contract to ORP. The QA program requirements for design and construction of WTP referenced in the preliminary documented safety analysis, and cited in the BNI contract, are American Society of Mechanical Engineers (ASME) Nuclear QA (NQA)-1-2000, *Quality Assurance Requirements for Nuclear Facility Applications*, and DOE Order 414.1C, *Quality Assurance*. BNI Document 24590-WTP-QAM-QA-06-001, *Quality Assurance Manual*, provides a detailed description of the application of the 18 NQA-1-2000 requirements at WTP. The BNI Quality Assurance Manual (QAM) establishes a management system of planned and systematic actions necessary to ensure that structures, systems, and components (SSCs) perform satisfactorily in service.

In March 2017, BNI Construction and AECOM, the contractor responsible for maintenance and commissioning systems after turnover from BNI Construction, formed a joint venture. The new organization, the Waste Treatment Completion Company (WTCC), is a subcontractor to BNI and is contracted to complete construction, conduct startup, and commission WTP. WTCC is required to follow the QAM. BNI construction personnel, including craft, field engineers, quality control (QC) inspectors, administrative personnel, and managers, became employees of WTCC on March 31, 2017. BNI is under contract to complete the design of the WTP complex and is responsible for delivering equipment and materials necessary for completion of WTP. Administrative changes have been implemented to transition BNI Construction procedures into WTCC construction procedures for control of site work activities.

The WTP complex consists of the Pretreatment Facility (PTF), for separating the waste into low-activity waste and high-activity waste; the High-Level Waste Facility (HLW), where the high-level waste will be immobilized in glass; the Low-Activity Waste Facility (LAW), where the low-activity waste will be immobilized in glass; the Analytical Laboratory (LAB) for sample testing; and, the balance of facilities (BOF), which will house support functions.

Construction work is essentially complete for the LAB and most BOF buildings. The majority of the electrical equipment in BOF Buildings 87 and 91 have been turned over from Construction to Startup.

Construction work activities are deferred in the PTF pending satisfactory resolution of technical questions regarding separation and processing of the waste and the design life of PTF equipment. Construction was slowed in HLW pending resolution of technical issues involving the waste treatment process; however, in late 2016 DOE later decided to curtail construction of HLW and concentrate on completing LAW and the Effluent Management Facility (EMF) in order to begin processing low-activity waste using direct feed from the Tank Farms by 2022.

Construction of EMF began in 2016 to process the effluent remaining after the low-activity waste is processed in LAW. Effluent from LAW will be transferred via buried piping to EMF, where it will be processed to separate non-radioactive liquids' byproducts from radioactive byproducts. Radioactive byproducts will be transferred from EMF, via a designated piping system back to LAW for vitrification or return to the tank farm.

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms “deficiencies, findings, and opportunities for improvement” as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also highlighted in the report and summarized in Appendix C. These deficiencies should be addressed consistent with site-specific issues management procedures.

EA conducted this assessment of WTP construction quality processes in accordance with the *Plan for the Office of Enterprise Assessments Review of the Hanford Site Waste Treatment and Immobilization Plant Construction Quality, September 2017*. This assessment considered the requirements of 10 CFR 830, Subpart A, and DOE Order 414.1C, which specify that the contractor must use appropriate national consensus standards to implement DOE QA requirements.

EA used the following Criteria and Review Approach Documents (CRADs):

- CRAD 45-52, *Construction – Piping and Pipe Supports*
- CRAD 45-53, *Construction – Mechanical Equipment Installation*
- CRAD 64-20, *Feedback and Continuous Improvement Inspection Criteria and Approach – Contractor*.

Additional CRADS are under development for installation of electrical cables and equipment, as well as instrumentation. In the interim, electrical construction and quality requirements are based on the approved BNI design criteria and specifications and national standards included in the contract.

EA reviewed procedures, specifications, drawings, and records; interviewed personnel responsible for construction and inspection work activities; and conducted site walkdowns to observe work activities and inspections of WTP components. EA conducted several walkdowns at the WTP construction site with WTCC personnel and the WCD staff to determine whether work activities were completed in accordance with the appropriate design drawings, specifications, and procedures.

EA observed three piping pressure tests; a leak test in a section of heating, ventilation, and air conditioning (HVAC) ductwork; installation of an electrical cable in LAW; and, inspections of electrical equipment in LAW. EA reviewed construction and operations nonconformance reports (NCRs), construction deficiency reports (CDRs), and selected condition reports (CRs) that WTCC identified under the BNI corrective action program. EA also reviewed justifications for closure of NCRs associated with the LAW melters and 35 Authority Having Jurisdiction (AHJ) rulings that BNI completed in accordance with its assigned AHJ role. In addition, EA reviewed the construction self-assessment program and corrective actions taken to resolve previously-identified weaknesses in the BNI QA and corrective action programs.

The members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. A list of the documents reviewed, personnel interviewed, and observations made during this assessment, relevant to the findings and conclusions of this report, is provided in Appendix B.

5.0 RESULTS

5.1 BNI Corrective Action Program

This section discusses EA's assessment of NCRs initiated by WTCC under the BNI QA program.

Criterion:

A process shall be established to identify, control, document, evaluate, and correct conditions adverse to quality. Records shall be maintained documenting the corrective action program, including documentation of objective evidence of satisfactory implementation of corrective actions. (NQA-1, Requirement 16; Policy Q-15.1, Policy Q-16.1, and Appendix A Policy Q-15.1 of the QAM; and DOE Order 414.1C)

BNI Procedure 24590-WTP-GPP-MGT-044, *Nonconformance Reporting and Control*, defines the requirements for identifying, documenting, reporting, controlling, and dispositioning nonconforming conditions associated with quality or Q (previously classified as Quality-List or QL) and commercial grade (CM) SSCs at the WTP. This procedure requires NCRs to be issued to document and disposition nonconforming conditions associated with Q SSCs, while CDRs are required to document and disposition nonconforming conditions associated with CM SSCs.

The process for determining quality levels is specified in BNI Procedure 24590-WTP-3DP-G04T-00905, *Determination of Quality Levels*. This procedure references other supporting interfacing project documents regarding identification of items/services subject to the QA program and procurement requirements. SSCs designated as Q in the design documents must be constructed or manufactured in

accordance with the WTP QA program. SSCs designated in the design documents as non-Q (i.e., CM) are constructed in accordance with CM standards, such as the Uniform Building Code, or purchased as CM items from vendors who are qualified CM suppliers.

EA reviewed the 60 construction NCRs that WTCC issued between June 15 and September 12, 2017, to ascertain the types of nonconforming issues and their apparent causes. The NCRs included four related to construction or installation errors; 21 for improper review or document evaluation of commercial grade dedication (CGD) for Q components; one for material handling issues; seven for issues involving subcontractors; and 27 for procurement/supplier deficiencies. In addition, EA reviewed a sample of 26 CDRs that WTCC issued in August and September 2017 to ascertain the types of nonconforming issues and their apparent causes. The CDRs included six related to construction or installation errors; six for design engineering issues; one for materials handling issues; six for issues involving subcontractors; and, seven for procurement/supplier deficiencies. The backlog of NCRs related to procurement or supplier deficiencies and failure to properly review or document CGD evaluations continues to challenge the BNI Design Engineering Organization.

EA also reviewed the 29 operations NCRs that WTCC issued between July 10 and September 11, 2017, to ascertain the types of nonconforming issues and their apparent causes. Operations NCRs are initiated by operations personnel to document and disposition problems identified with equipment or components that have been turned over from construction to operations. The majority of these NCRs involved equipment or components installed in BOF buildings that did not meet design requirements. Others were initiated to document damage to equipment and components, or equipment operability issues. The number and types of NCRs identified by WTCC operations personnel indicate they are performing thorough examinations of equipment and components that have been turned over from construction and identifying deficiencies that were not identified in these BOF buildings during the construction phase.

For the NCRs and CDRs reviewed during this assessment, WTCC construction and operations personnel are adequately implementing the corrective action program to identify and document deficiencies and identify the apparent causes.

5.2 Review of Closed NCRs Applicable to LAW Melters

This section discusses EA's assessment of justifications for closure of NCRs that had been initiated to document and disposition deficiencies identified during review of quality records for the LAW melters.

Criterion:

A process shall be established to identify, control, document, evaluate, and correct conditions adverse to quality. Records shall be maintained documenting the corrective action program, including documentation of objective evidence of satisfactory implementation of corrective actions. (NQA-1, Requirement 16; Policy Q-15.1, Policy Q-16.1, and Appendix A Policy Q-15.1 of the QAM; and DOE Order 414.1C)

Installation of melter 1 in LAW was completed in June 2017. LAW melter 2 installation was declared complete in October 2017, subsequent to completion of this assessment. During previous construction quality assessments, EA reviewed more than 50 open NCRs that were initiated to document and disposition deviations from the melter purchase order and/or specification requirements. The NCRs that EA had previously reviewed have since been closed. EA performed a detailed review of 16 of these closed NCRs to determine if the technical justifications for dispositioning and closing the NCRs were adequate. The justifications for closure of the NCRs fell into four categories:

- The hardware items addressed in the NCR were used as construction aids and, therefore, were not permanent plant equipment (these materials were appropriately turned over to DOE property management for disposal following their use).
- The hardware items addressed in the NCR were rejected and replaced with items that complied with the purchase specifications.
- Further review of the hardware items addressed in the NCR resulted in determination that the hardware item met specification requirements.
- NCR 24590-WTP-NCR- CON-15-0169 was initiated to document the failure of the manufacturer of the LAW melters, Petersen Incorporated, to comply with the purchase order/contract that required signed Supplier Deviation Disposition Requests (SDDRs) to be included in individual quality verification document packages that were submitted to BNI. Contrary to this requirement, the SDDRs were either not signed or were not submitted with the material receiving reports. A list of the 807 SDDRs associated with the melters was included as Attachment 1 to this NCR. The justification for closure of the NCR was that the vendor was given direction via a Technical Change Order that stated: “In lieu of incorporating completed and signed SDDR forms in the applicable quality verification packages, SELLER may provide a list of Applicable SDDRs.” The change order further stated that “SDDRs do not require signature of the SELLER after WTP disposition is approved.” Between November 4, 2015, and November 2, 2016, BNI approved the conditional release of materials involving approximately 200 individual stock numbers associated with the SDDRs in 20 conditional releases that included limitations. This NCR was closed on December 29, 2016.

Seven of the 16 NCRs reviewed by EA to verify that the justification for closure was appropriate were closed by referencing NCR 24590-WTP-NCR-CON-15-0169; however, five of these seven NCRs were closed one to two months before NCR 24590-WTP-NCR-CON-15-0169 was closed. Closure of an NCR by referencing an open NCR is contrary to the requirements of the QAM and Procedure 24590-WTP-GPP-MGT-044, *Nonconformance Reporting and Control*, which require verification of completion of all dispositions and corrective actions prior to closure of NCRs. Since the disposition and corrective actions for NCR 24590-WTP-NCR-CON-15-0169 had not been verified complete and the corrective actions for this NCR were pending, closure of the five NCRs to NCR24590-WTP-NCR-CON-15-0169 was not appropriate. **(Deficiency)**

Eleven of the 16 NCRs reviewed by EA that were initiated to document and disposition materials or hardware used for fabricating the melters that did not comply with purchase order or specification requirements were closed appropriately. The justifications for closing the five NCRs were inadequate because they were closed by referencing an open NCR.

5.3 Pressure Testing Program

This section discusses EA’s assessment of the pressure testing of piping and instrument systems performed to verify that the systems are leak tight.

Criterion:

Construction and pre-operational tests, such as pressure testing operations for piping systems, shall be conducted in accordance with methods approved by the design organization. Test procedures shall include test requirements, acceptance criteria, test prerequisites, inspection hold points, and instructions for recording data. Testing shall be observed by qualified inspection personnel. Test results shall be

recorded and evaluated by qualified personnel. (NQA-1, Requirement 11; Policy Q-11.1 of the QAM; and DOE Order 414.1C)

WTCC Construction Procedure 24590-WTP-GPP-CON-3504, *Pressure Testing of Piping, Tubing and Components*, specifies the generic work process and quality requirements for pressure testing, including the test requirements, prerequisites, sequence, hold points, inspection requirements, instructions for recording and evaluating data, and acceptance criteria. This procedure references the appropriate code requirements (ASME Code B31.3, Paragraph 345.5, *Pneumatic Testing*), and is approved by BNI design engineering for conducting pressure testing.

EA observed three pneumatic pressure tests conducted on CM instrument tubing:

- Pneumatic pressure test performed on LAW plant cooling water instrument sample line tubing, recorded on document numbers 24590-LAW-PPTR-CON-17-0030 and -0031. No leaks were observed.
- Pneumatic pressure test performed on LAW melter feed process system instrument tubing for Air Dispersal Slurry pump controls, recorded on document number 24590-BOF-PPTR-CON-17-0168. Two tubing joints had visible leaks during the initial test. After the system was depressurized, the two joints were repaired and retested, and no leaks were observed.
- Pneumatic pressure test performed on LAW Radioactive Liquid Waste Disposal system instrument air tubing, recorded on document number 24590-LAW-PPTR-CON-17-0198. No leaks were observed.

EA attended the pre-test briefings, reviewed drawings and test data sheets, examined the testing apparatus, verified that the calibration stickers on the test pressure gauges were current, and that whip restraints were installed on pressure hoses. Before the pressure tests, EA examined the instrument tubing sections within the pressure test boundaries and the valve lineup and pressure test tags attached to the valves. EA witnessed the test pressurization sequence during each pressure test and verified that the systems being tested were pressurized to the designated test pressures. EA also verified that the required test pressures were maintained for the required hold time (ten minutes) before the WTCC field engineers initiated the system walkdown to inspect the piping/tubing for leakage; and, verified that test pressure was maintained during the walkdowns.

EA observed the walkdowns and inspections that the WTCC field engineers performed. These tests were declared successful by the WTCC test engineers. EA determined that the pressure testing program was satisfactory based on the three pneumatic pressure tests reviewed by EA.

5.4 Leak Testing of HVAC Ducts

This section discusses EA's assessment of leak testing of HVAC ductwork performed by a WTCC subcontractor.

Criteria:

Construction and pre-operational tests, such as leak testing of the HVAC systems, shall be conducted in accordance with methods approved by the design organization. Test procedures shall include test requirements, acceptance criteria, test prerequisites, inspection hold points, and instructions for recording data. Testing shall be observed by qualified inspection personnel. Test results shall be recorded and evaluated by qualified personnel. (NQA-1, Requirement 11; Policy Q-11.1 of the QAM; and

DOE Order 414.1C). The procurement of purchased items and services shall be controlled to assure conformance with specified requirements. (NQA-1, Requirement 7; Policy Q- 7.1 of the QAM; and DOE Order 414.1C)

BNI subcontracted the task of design, fabrication, installation, and testing of the WTP HVAC system to Intermech, Inc. (Intermech). Intermech is responsible for performing QC inspections of the work performed by its construction workers and for maintaining a QA program that complies with NQA-1 requirements. WTCC QA and QC personnel perform surveillances of Intermech work activities to confirm that Intermech complies with the contract requirements and its QA program.

EA observed a leak rate test performed on a section of the melter C5V Q duct, location column E8/4.3 in the LAW under Work Data Package 362180C. The test method specified was the pressure decay method performed in accordance with Section 7.6 of Intermech Procedure W/IP-WTP 11.30, *HVAC Housing/Duct Structural Capability and Leak Testing*. EA verified that the instruments used in the test had current calibration stickers that identified the instruments and observed measurement of initial test pressure and temperature, as well as data recording. EA reviewed the calculated measured leakage, which was less than the allowable leakage. EA determined that the leak test met the test acceptance criteria.

EA concluded that the HVAC leak testing program was satisfactory for the reviewed sample.

5.5 Electrical Construction Activities

This section discusses EA's assessment of electrical construction activities.

Criterion:

Electrical equipment that performs a safety function shall be installed in accordance with approved procedures, design drawings, manufacturer's instructions, and other design basis documents, including applicable codes and standards. The procedures, instructions, and drawings shall include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed results have been satisfactorily attained. (NQA-1, Requirement 5; Policy Q-5.1 of the QAM; and DOE Order 414.1C)

LAW Melter Power Supplies

EA examined the LAW melter power supply rooms, the LAW melter startup power supplies, and heater connections. The power supplies for the LAW melters were removed from LAW in 2015 after BNI design engineers determined that the units were deficient. The power supplies were returned to the manufacturer in the spring of 2017 for modifications to correct the deficiencies. EA met with the DOE Facility Representative and discussed the design requirements, required modifications, and schedule for correcting the deficiencies in the melter power supplies. EA reviewed Specification No. 24590-WTP-3PS-EY00-T0007, *LAW Melter Power Supply Refurbishment*, which incorporates the necessary changes to ensure that the power supplies will be modified to comply with the design specifications and applicable codes and standards. EA determined that the specification was adequate.

Observed Work Activities

EA observed the WCD site electrical inspector touring LAW to witness in-process work activities and to inspect installed electrical equipment on each elevation of the building. Overall, the installation of the electrical equipment that EA examined was completed in a good, workmanlike manner. Most cable pulling activities are performed during the night shift, when fewer personnel are on site and there is less impact to other work activities.

EA and the WCD site electrical inspector witnessed a Q cable installation (pull) between control panel C2V-PNL-00116 and HVAC unit C2V-ACU-00003 in LAW. EA determined that the cable pull was performed satisfactorily. Prior to the pull, the craft workers verified that the cables complied with design documents and the National Electrical Code (NEC) requirements and that the raceways were properly installed and labeled. The measurement and test equipment (M&TE), used to perform Megger testing after the cable pull was completed, was within calibration, in good condition, and used correctly. The work area was properly controlled, ensuring personnel were clear of high voltages present during Megger testing.

The WCD site inspector noted that the control panel did not have a label or nameplate stating the electrical rating of the equipment. BNI document 24590-WTP-DC-E-06-001, *Design Criteria for Approval of Electrical Equipment*, states that all equipment shall be labeled in accordance with Underwriters Laboratories (UL) Standard UL 508A, *Standards for Industrial Control Panels*. This standard requires that all electrical equipment be certified by an approved UL 508A panel shop and have a nameplate that includes the electrical rating of the equipment, such as voltage and current requirements. A UL 508A panel shop is certified by UL to provide safety certification for industrial control panels.

EA observed the WCD site inspector inspect the panel and identify that the bonding jumper (grounding conductor) that connects the control panel cover to the box was undersized. The UL 508A standard requires, as a minimum, size #14 American Wire Gauge (AWG) grounding conductor for this control panel since the panel has a 15 ampere (amp) overcurrent protection. The grounding conductor between the control panel cover and box was size #18 AWG, two sizes too small.

A UL report, 24590-QL-POA-MEHX-00008-03-00012, *Field Evaluation Services Final Report for AC Units*, covered the HVAC units but did not address the control panels. Two other control panels are similar to the one in question, panels C2V-PNL-00114 and C2V-PNL-00115. WCD wrote Subtier Surveillance Report 17188-WTP-06 to document the issues associated with these panels and issued finding 17188-WTP-F02 for WTCC's process being less than adequate for identifying this non-conforming equipment.

Review of AHJ Activities

On March 2, 2017, ORP issued a letter to BNI to clarify BNI's role as the electrical AHJ. The letter describes different scenarios that require DOE approval for code interpretations, including defining an interpretation as "an explanation of the text in simpler, more concise terms that are [in] agreement with the explicit code test." The letter also states that AHJ waivers or equivalencies shall be submitted to DOE for approval. BNI has a dedicated electrical AHJ group to review questions concerning compliance with the NEC.

BNI procedure 24590-WTP-PD-RADA-DA-0001 (Rev. 2), section 4.3.1 requires that permanent plant equipment and electrical test equipment be approved by a nationally recognized testing laboratory (NRTL) or allows for a field evaluation if NRTL-approved equipment is not available. BNI generally uses UL for the field-evaluation process. UL provides a preliminary report to BNI listing any issues or discrepancies with the non-NRTL-approved equipment for BNI to resolve. After BNI addresses the issues, BNI documents their resolution and submits a response to UL, which then re-evaluates the equipment and issues a final report.

EA reviewed 35 reports that document field evaluations of electrical equipment used at the WTP site that were accepted by the BNI Electrical AHJ in 2017. UL performed 31 of the 35 field evaluation reports. Of the 35 reports reviewed, 27 of them documented evaluation of M&TE or shop equipment, and the

remaining eight reports were for permanent plant equipment.

UL Report 24590-CM-HC4-E00Z-00002-17-00069 documents an evaluation of a laser alignment system manufactured by Pruftechnik. This preliminary report stated that the equipment was acceptable except for the Lithium-ion battery pack, which was not approved. The UL preliminary report stated that the laser alignment system did not meet applicable requirements and UL did not approve the equipment for use. UL requested documentation from BNI to show that the battery packs conformed to safety standards for batteries, either UL 2054, *Standards for Household and Commercial Batteries*, or IEC/UL 62133, *Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, for Use in Portable Applications*. The intent of these safety standards is to reduce the risk of fire or explosion and injury to persons. Contrary to its purchasing procedures, BNI did not provide the requested documentation to UL, and instead approved the equipment for use at WTP by issuing the following statement, “Electrical AHJ approves the report and the associated equipment for use at WTP.” BNI’s justification for approval of the battery pack was not documented.

Based on BNI’s acceptance of the battery packs, UL issued a second report, 24590-CM-HC4-E00Z-00002-17-00088, which stated that, although the batteries could not be fully evaluated, they were approved with the statement: “Bechtel authority having jurisdiction has accepted this battery pack for use in this handheld device and without any further testing or evaluation by UL engineering. The UL Evaluation mark was not applied due to the AHJ’s acceptance without it.” There is no documentation in the second report that justifies the AHJ’s acceptance of this battery. Acceptance of the second report by the BNI AHJ is documented in an email that states “UL has labeled this tool and the attached report has been approved by the Electrical AHJ.”

Subsequent to this assessment, BNI provided the following additional information regarding the battery pack: Since the battery pack is rated 3.7 volts and falls into the low hazard category, defined as Class X.0 in the DOE Handbook for Electrical Safety, it may be labeled or identified as such and does not require field evaluation and approval. However, BNI did not follow the AHJ approval process as described in *24590-WTP-GPP-RADA-DA-0001, Authority Having Jurisdiction (AHJ) Procedure*, by not documenting their justification for accepting the battery pack, and also did not label the battery packs as low hazard. **(Deficiency)**

EA concluded that the specification for refurbishing the Melter power supplies was adequate. The cable pull observed by EA was performed satisfactorily. The WCD site electrical inspector appropriately identified deficiencies in labeling of electrical control panels and an electrical panel with undersized wiring. Similar issues with labeling of electrical panels and incorrect wiring of electrical panels have been identified during previous construction quality assessments. Additionally, of the 35 reports that document field evaluations of electrical equipment accepted by the AHJ, only one had no documentation that justifies acceptance by the AHJ.

5.6 BNI Construction Self-Assessment Program

This section discusses EA’s review of self-assessments performed by the construction organization in 2014, 2015, 2016, and 2017.

Criterion:

Self-Assessments shall be established to identify, control, document, evaluate, and correct conditions adverse to quality. Records shall be maintained documenting the corrective action program, including

documentation of objective evidence of satisfactory implementation of corrective actions. (Policy Q-02.2 of the QAM; and Criterion 9 of DOE Order 414.1C)

EA reviewed the 65 self-assessments performed by the BNI (now WTCC) Construction organization since January 2014. These self-assessments included 19 performed in 2014, 29 in 2015, 14 in 2016, and the three published to date in 2017. BNI-WTP Procedure 24590-WTP-GPP-RACA-AM-0001, *WTP Integrated Assessment Planning and Scheduling*, describes the process for planning and scheduling risk-informed assessments. The requirements for performing, documenting, reviewing and grading assessments are specified in BNI-WTP Procedure 24590-WTP-GPP-RACA-AM-0002, *WTP Assessments*.

Only four of the construction self-assessments were performed to evaluate the adequacy of construction quality. Two of these evaluated electrical work, one evaluated the M&TE program, and one evaluated non-destructive examination work activities. BNI performed two self-assessments to evaluate corrective actions implemented to resolve storage deficiencies identified by the Defense Nuclear Facilities Safety Board in April 2015, and one self-assessment to evaluate follow-up on corrective action implementation associated with a project issues evaluation report concerning electrical SETROUTE. Ten of the self-assessments evaluated the control and issue of construction site badges, while 17 evaluated construction safety areas such as pre-job briefs, floor covers, control of barricades, etc. In 2015, BNI completed 16 self-assessments that evaluated the flow down of QAM policies and requirements to implementing procedures. The remaining self-assessments evaluated administrative issues, such as area turnover, subcontract administrative controls, and completed checklists.

Based on review of the sequence of assigned self-assessment numbers, EA determined that several self-assessments had been canceled. For example, self-assessment numbers 24590-WTP-SAR-CON-16-0004, -0006, and -0007, had been assigned but were never performed. During a previous construction quality assessment, EA identified that several work disciplines have yet to be assessed or have not been assessed since 2010, including installation of electrical cable trays and conduits and associated supports, instrumentation, piping and pipe supports, adequacy of inspections performed by field engineers to accept CM work activities, and site welding activities. Some self-assessments that were planned were canceled. The reason for canceling was noted on the self-assessment log was due to “lack of manpower.” The scheduling of self-assessments since 2014 in the construction organization has not been risk-informed and has not resulted in the assessment of critical project processes or work areas.

5.7 QA Program Feedback and Improvement

This section discusses EA’s assessment of the results of corrective actions implemented by BNI and/or WTCC to resolve weaknesses in the QA program and management of corrective actions.

Criterion:

Contractor management has established a comprehensive, structured issues management system that provides for the timely and effective resolution of deficiencies and meets the requirements of DOE Order 226.1 and DOE Order 414.1C. (NQA-1, Requirement 16; Policy Q-16.1 of the QAM; and DOE Order 414.1C).

As a result of previous ORP assessments and DOE Office of Enforcement (EA-10) cases, BNI has focused considerable attention over the past four years on two systemic weaknesses: poor implementation of the QA program (issue number CR 13-1331) and the Corrective Action Management Program (CAMP) (issue number CR 13-1048). EA examined WTP implementation performance since January

2016 with regard to selected corrective actions that address or contribute to the resolution of the root causes from among 25 QA CAs, 42 CAMP CAs, and 51 Managed Improvement Plan (MIP) initiatives.

Quality Assurance (CR 13-1331)

BNI issued a quality policy (CA #2) in document 24590-WTP-G63-RAQA-QA-0001, *Project Quality Policy*, to define expected conduct of employees and managers to achieve quality as a company value. Employee expectations consist of five “Quality Absolutes” that focus employee attention on procedural adherence, pre- and post-job briefings, hold points, stopping work when unsure, and job ownership with their signature. Management expectations adequately cover promotion of quality excellence, employee motivation, encouragement, feedback, and maintenance of a quality minded work environment.

BNI implemented their Project Quality Policy at the working level through the institutionalization of the craft worker People-Based Quality Program (PBQ) (CA #6). EA’s review of the PBQ specifically focused on the craft worker implementing mechanisms, which include training, communications, recurring employee surveys, “Q2U” (Quality to You) cards, metrics, and employee PBQ Teams. All craft personnel serving on PBQ teams received the initial Quality Absolute training, which is documented in BNI training records. General Employee Training appropriately includes the Quality Absolutes to ensure institutionalization of the Quality Policy (CA #10) throughout the workforce. EA observed Quality Absolutes reminders on the BNI WTP website, on posters throughout the work place, and in all-hands email communications. A craft worker PBQ team website provides evidence of craft team representation, participation, and results, but some parts of the PBQ website and associated metrics need management attention:

- On the PBQ website, the last “Weekly Quality Message” is dated January 2, 2017, and is only an appreciation message for participants in snow removal.
- The only survey listed on the craft PBQ website is one completed in October 2014; however, the link does not work; the last “Focus Presentation” is dated August 2016; and the last Employee Feedback and Results presentation is dated October 2016.
- The Project Health Dashboard provides a metric that measures employee engagement in the Nuclear Safety and Quality Culture; this shows a declining trend, albeit still in the BNI “good” zone.
- There are no craft PBQ website listings of quality ideas, suggestions, or concerns with management’s disposition to enable all to share in craft contributions to quality improvement, and ensure management’s responsiveness. The craft PBQ Team charter “promotes the open discussion and resolution of Quality issues”, but from the observed records, information, and interviews, this initiative has not been fully effective.
- The first craft PBQ program objective listed on the craft PBQ website is to reduce rework, yet there is no metric that addresses rework. **(OFI-1)**

BNI/WTCC QA has begun to include a subject matter expert (SME) in oversight activities (CA #15) as demonstrated in each of the ten QA independent audits completed since January 2016. EA found that two WTCC QA auditors were aware of the 24590-WTP-GPP-RAQA-QA-1002, *Quality Assurance Audit* requirement 6.2.1.a.3.d to include SMEs in their audits (the inclusion of SMEs in surveillances are optional), and stated that they used a list of qualified SMEs for various audit topics. EA reviewed BNI Document 24590-WTP-LIST-RARM-RM-0001, *Designation of Requirement Area Managers and Subject*

Matter Experts, which lists subject matter areas with corresponding names of SMEs. However, of the ten QA audits reports reviewed, only one audit report named an SME from document 24590-LIST-RARM-RM-0001. EA also noted that the governing QA audit and surveillance procedures do not reference document 24590-WTP-LIST-RARM-RM-0001.

EA identified four example reports of BNI QA oversight of QC inspector field activities since EA last addressed this topic in June 2016; however, only two were available for review as one is in draft and the other was awaiting signature. Both reviewed assessment reports provided a satisfactory defined scope, descriptive investigation details, and adequately supported its conclusions.

BNI conducted a self-assessment, using external SMEs, of the QA Independent Assessment process (CA #16 and MIP-03). The independent assessment report, *WTP Final Report of the Review of Quality Department Independent Assessment Program*, stated, “audit reports are still very compliance-based” and identified some useful recommendations regarding performance-based auditing. This observation and recommendations are consistent with other DOE/ HQ and BNI independent assessment results (reference CR 13-0743, CR 16-00312). BNI established CR 15-00342 to address the independent assessment report recommendations, but did not identify any specific performance-based audit program improvement corrective actions. Of 154 BNI/WTCC QA surveillance reports completed between January 1, 2016, and September 12, 2017, 43 addressed non-record/document/process-related topics that had the potential to include a performance-based element. Of the 43 non-record/document/process-related QA surveillances, 37 addressed observed work performance and/or field condition observations. This analysis indicates that the BNI/WTCC QA organization oversight remains predominately compliance-based.

BNI implemented a sampling and grading process for self-assessments (CA #19). BNI selected the self-assessment report samples in accordance with 24590-WTP-GPP-RACA-CR-0116, *Performance Improvement Review Boards (PIRB)*, and evaluated these reports using 24590-WTP-GPP-RACA-F00107, *Self- or Management-Assessment Scorecard*. Assessment grading results are the source data for the Assessment Quality metric. BNI also tracks the self-assessment grading performance results as the Assessment Quality metric on the current Project Health Dashboard. This metric shows a consistent Assessment Quality performance level of about 73% over the past year, but the metric provides no indication of the number of evaluated assessment reports to gauge significance. A CAMP analysis indicated that a 75% quality rating meets all evaluation criteria.

BNI’s internal QA oversight program shows consistent inclusion of SMEs over the past year. The craft PBQ website information was out-of-date in some cases. Thirty-seven of 154 QA surveillances over the past 21 months involved work performance reviews indicating a preponderance of compliance-based oversight. The BNI/WTCC self-assessment of the sampling and grading process is adequate.

Corrective Action Management Program (CR 13-1048)

EA previously verified completion of the CR 13-1048 Corrective Actions with the exception of two actions needing further attention: (1) improve CAMP performance by reducing the number of open CRs, tracked as CR 15-01234 (closed in April 2017), and (2) improve management attention to CR completion quality, tracked as CR 15-01235 (pending final closure). CR 13-1048 is also pending final closure.

While the BNI/WTCC CAMP backlog metric showed an improvement leading up to CR 15-01234 closure, the metric exhibits a consistent declining trend since March 2017 as the backlog has grown to nearly 1,000 open CRs. BNI considers this metric to be in the “good” performance range, but such a rating gives an overly favorable view of performance given the enormous effort required to effectively resolve and process open CRs. WTCC’s portion of the total backlog is more manageable with about 150 open CRs, but also exhibits a slightly unfavorable trend.

EA observed some positive indication of BNI/WTCC management attention to CR closure performance. A review of all meeting minutes since WTCC implemented a Performance Improvement Review Board (PIRB) in March 2017 found consistent participation by senior construction management or official delegates. EA also noted the WTCC PIRB's consistent effort to recognize good CR processing performance. The August 28, 2017, WTCC PIRB meeting minutes provide evidence that management reviewed issue trend charts and discussed the WTCC CR backlog performance consistent with PIRB responsibilities. The WTCC CR Closure Quality metric (a measure of CR closure packages process conformance) continues to rise from 81% to 94% over the past six months indicating a growing familiarity with the CAMP closure process and expectations among staff.

All 11 Level B issues (which include 121 corrective actions) related to construction and procurement closed since January 1, 2016, provide acceptable CR descriptive text of the issue, actions, and closure evidence. Effectiveness Reviews documentation for some closed issues were generally comprehensive. However, EA identified some issues:

- 24590-WTP-GPP-RACA-CR-0114, *Condition Report Effectiveness Review*, states, “Effectiveness Reviews are not an audit of individual corrective actions.” As a result, BNI closed three CRs listed below without completing important closure actions as required by 24590-WTP-GPP-RACA-CR-0113 R6, *Condition Report Action Response, Approval, Verification, and Closure*, 11/10/17, Section 6.1.1.a, “COMPLETE action as specified.” **(Deficiency)**
 - BNI closed CR 15-0161 Action #1 with a Q supplier qualification request form for a follow-up surveillance to verify testing activities and witnessing the suppliers Commercial Grade Dedication (CGD) process; however, the WTP supplier qualification history web page shows no evidence of this follow-up surveillance.
 - BNI closed CR 14-0109 Action #2 with a CGD plan for a safety class emergency turbine generator skid that still has numerous sections “TBD [to be determined]” and a commitment to handle the seismic qualifications separately, but no CR is identified. A CGD plan with numerous “TBD” sections does not satisfy the closure requirement.
 - BNI closed CR 12-0236 with an expectation to complete a revised cathodic protection system design. Also, an independent review team found that the “mechanical integrity of some pipes must be confirmed” due to potential hazards; the CR response did not address this independent finding.
- Some incomplete corrective actions result in CR closure and the opening of another CR to address the remaining closure weakness as exemplified by CR 12-1434, 13-1329, and CR 13-1380. While this approach achieves closure of the original CR, it incurs additional administrative process burden associated with all new CRs.

In response to a February 2017 construction worker-identified lock-out/tag out (LOTO) issue, BNI searched the CRs database for key words and produced a frequency analysis resulting in 54 previous LOTO issues over a two-year period. This example indicates good use of CR data information, but was a reactive analysis in response to an Occurrence Reporting Process System (ORPS) report, not a consistent proactive data trending and analysis. While the current CR trending approach has merit, it does not provide the depth of analysis of keyword data mining that would have identified the LOTO trend. Additionally, this trending only involves the CR database, and no such trending of the NCRs/CDRs is occurring.

Overall, WTCC's portion of the total BNI/WTCC CR issue backlog is manageable with about 150 open

CRs, exhibiting a slightly unfavorable trend. WTCC management attention to CR closure performance is evident from the review of all seven WTCC PIRB meeting minutes since WTCC's inception in March 2017, which shows consistent participation by senior construction management or delegates. The WTCC CR Closure Quality metric (a measure of sampled CR closure packages process conformance) indicates a growing familiarity with the CAMP closure process and expectations among staff. All 11 Level B issues (which include 121 corrective actions) related to construction and procurement that BNI/WTCC closed since January 1, 2016, exhibited adequate descriptive text of the issue, actions, and included closure evidence. When completed, Effectiveness Reviews were comprehensive and well documented. However, there were some incomplete Level B closure actions, despite the multiple CAMP verification checks.

6.0 FINDINGS

EA identified no findings during this assessment. Deficiencies that did not meet the criteria for a finding are listed in Appendix C of this report, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified one OFI to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may also address other conditions observed during the appraisal process. EA offers OFIs 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.

- OFI-1: BNI should consider developing a metric for measuring construction-caused rework excluding design changes and procurement related issues.

8.0 ITEMS FOR FOLLOW-UP

EA plans to continue to evaluate the effectiveness of the BNI corrective action program and review the resolution of NCRs, CDRs, and CRs. EA plans to continue to review welding inspection activities, as well as activities related to piping and pipe supports, structural steel erection, pressure testing of piping, cable pulling, and installation of electrical and mechanical equipment. EA also intends to perform additional review of AHJ rulings performed by BNI and self-assessments performed by the WTCC Construction organization.

Appendix A Supplemental Information

Assessment Dates

Onsite visit: September 11-14, 2017

Office of Enterprise Assessments (EA) Management

William A. Eckroade, Acting Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Deputy Director, Office of Environment, Safety and Health Assessments
C.E. (Gene) Carpenter, Jr., Director, Office of Nuclear Safety and Environmental Assessments
Kevin G. Kilp, Director, Office of Worker Safety and Health Assessments
Gerald M. McAteer, Director, Office of Emergency Management Assessments

Quality Review Board

Steven C. Simonson
John S. Boulden III
Thomas R. Staker
William E. Miller
Michael A. Kilpatrick

EA Site Lead for Hanford Site

Samina A. Shaikh (Acting)

EA Team Composition

Ronald G. Bostic – Team Lead
James M. Boyd
Joseph J. Lenahan
Michael A. Marelli

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- WTCC Construction Procedure 24590-WTP-GPP-CON-3504, Rev. 18, *Pressure Testing of Piping, Tubing and Components*, July 26, 2017
- Specification No. 24590-WTP-3PS-PS02-T0003, Rev. 10, *Engineering Specification for Field Fabrication and Installation of Piping*, November 25, 2013
- WTCC Procedure 24590-WTP-GPP-MGT-044, Rev. 9, *Nonconformance Reporting and Control*, March 10, 2017
- Document number 24590-WTP-3DP-G041-00905, Rev. 14, *Determination of Quality Levels*, February 24, 2016
- Document number 24590-WTP-QAM-QA-06-001, Rev. 17, *Quality Assurance Manual*, August 22, 2016
- NCR numbers 24590-WTP-NCR-CON-17-0098 through -0158
- NCR numbers 24590-WTP-NCR-OPS-17-0034 through -0039 and 17-0041 through 0064. NCR OPS-17-0040 was not issued.
- Closed NCRs associated with fabrication and installation of Melters: numbers 24590-WTP-NCR-CON-15-0169, 16-0048 through 16-0051, 16-0082, 16-0083, 16-0085 through 16-0087, 16-0108, 16-0111, 16-0112, 16-0114 through 16-0116, 16-0118, 16-0128 through 16-0132, 16-0135 through 16-0140, 16-0144, 16-0146, 16-0148 through 16-0153, 16-0157 and 16-0158
- WTCC Construction Procedure 24590-WTP-GPP-CON-7101, Rev. 13, *Construction Quality Control Program*, March 9, 2017
- Intermech Work/Inspection Procedure W/IP WTP 11.30, Rev. 6, *HVAC Housing/Duct Structural Capability and Leak Testing*, March 30, 2010
- BNI-WTP Procedure 24590-WTP-GPP-RACA-AM-0001, Rev. 3, *WTP Integrated Assessment Planning and Scheduling*, March 27, 2017
- BNI-WTP Procedure 24590-WTP-GPP-RACA-AM-0002, Rev. 1, *WTP Assessments*, March 27, 2017
- National Electrical Code – National Fire Protection Association 70-1999
- Specification No. 24590-WTP-3PS-E00X-T0004, Rev. 11, *Engineering Specification for Installation of Cables*, April 13, 2017
- Specification No. 24590-WTP-3PS-E00X-T0003, Rev. 7, *Engineering Specification for Cable Terminations*, October 27, 2011
- WTCC Construction Procedure 24590-WTP-GPP-CON-3304, Rev. 5, *Electrical Cable Installation*, March 27, 2017
- Specification No. 24590-WTP-3PS-EY00-T0007, Rev. 1, *LAW Melter Power Supply Refurbishment*
- BNI document 24590-WTP-DC-E-06-001, *Design Criteria for Approval of Electrical Equipment*
- UL report, 24590-QL-POA-MEHX-00008-03-00012, *Field Evaluation Services Final Report for AC Units*
- BNI WTP Procedure 24590-WTP-GPP-RADA-DA-0001, Rev. 2, *Authority Having Jurisdiction (AHJ) Procedure*
- UL Field Report, 24590-CM-HC4-E00Z-00002-17-00069, September 1, 2016
- UL Field Report, 24590-CM-HC4-E00Z-00002-17-00088, May 22, 2017
- SETROUTE Cable Card, 24590-LAW-SCC-E-17-0690, Rev. 0
- Subtier Surveillance Report, 17188-WTP-06, Draft, *Low-Activity Waste Facility – Witnessed “Q” Cable Pull in Conjunction with DOE Office of Enterprise Assessment*
- 24590-WTP-G63-RAQA-QA-0001, Rev. 1, *Project Quality Policy*, March 27, 2017
- *General Employee Training – Quality Assurance*, 387-20, Rev. 21

- 24590-WTP-CRM-TRA-000004, Rev. 24, *Project Orientation*
- 24590-WTP-LIST-RARM-RM-0001, Rev. 24, *Designation of Requirement Area Managers and Subject Matter Experts*, August 21, 2017
- 24590-WTP-GPP-RAQA-QA-1000, Rev. 4, *Quality Assurance Surveillance*, March 27, 2017
- 24590-WTP-GPP-RAQA-QA-1002, Rev. 3, *Quality Assurance Audit*, March 27, 2017
- CCN 222765, *WTP Final Report of the Review of Quality Department Independent Assessment Program*, March 9, 2015
- 24590-WTP-GPP-RACA-CR-0116, Rev. 5, *Performance Improvement Review Boards (PIRB)*, August 7, 2017
- 24590-WTP-GPP-RACA-F00107, *Self- or Management-Assessment Scorecard*
- 24590-WTP-GPP-RACA-F00107-1, *GUIDANCE-Definitions for the Self- or Management-Assessment Scorecard*
- WTCC PIRB meeting minutes (7) since January 2017
- 24590-WTP-GPP-RACA-CR-0114, Rev. 2, *Condition Report Effectiveness Review*, October 22, 2015
- 24590-WTP-GPP-RACA-CR-0113, Rev. 2, *Condition Report Action Response, Approval, Verification, and Closure*, October 22, 2015

Interviews

- WTCC QA Director
- Craft Workers (16)
- Pipefitter Foreman
- Electrical Field Engineer
- WTCC PIRB Representative
- Craft PBQ Team Vice Chairman
- Contractor Assurance System Trend Specialist
- WTCC QA Auditors (2)
- ORP Facility Representatives
- WTCC Mechanical Field Engineers
- WTCC NEC Electrical Inspectors
- WTCC Electrical Field Engineers
- WTCC Quality Control Inspectors
- WTCC Electricians and Foremen
- WCD Site Inspectors and Facility Representatives

Observations

- Observed electricians performing a cable pull in the LAW
- Observed electricians terminating cables in low voltage electrical panels in the LAW
- Inspected the LAW melter power supply room
- Performed walkdowns in the LAW and EMF
- Observed walkdown of electrical installations in the LAW
- Observed performance of three pneumatic pressure tests performed on CM sections of instrument tubing in the LAW
- Observed performance of a leak rate test on a section of Q ductwork in the LAW

Appendix C Deficiencies

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

- BNI contracts with UL to provide field evaluation reports for equipment that does not have a factory-installed NRTL label. UL performed an evaluation of an equipment item and concluded that the battery that was part of the equipment was not approved. Further review disclosed that the battery pack falls into a low hazard category and may be labeled or identified as such and does not require field evaluation or approval. However, the BNI AHJ did not follow their AHJ approval process by accepting the battery without documenting the technical basis for acceptance and approval of the battery, and also did not label the battery pack as low hazard.
- 24590-WTP-GPP-RACA-CR-0114, *Condition Report Effectiveness Review* lacks the requirement to review all individual corrective actions of Level A and B CRs to verify that closure of the CRs is justified.
- Procedure 24590-WTP-GPP-MGT-044 and Paragraph 16.1.2.5.1 of the QAM require that completion of dispositions and corrective actions be verified prior to closure of NCRs. NCR numbers NCR 24590-WTP-NCR-CON 16-0135, 16-0172, 16-0176, 16-0180, and 16-0186 were closed without verifying completion of all dispositions and corrective actions. These NCRs were inadequately closed by referencing an open NCR with incomplete corrective actions.