UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE RD. SUITE 210
LISLE, IL 60532-4352

May 8, 2017

Mr. Dean Curtland
Duane Arnold Energy Center
3277 DAEC Road
Palo, IA 52324–9785

SUBJECT: DUANE ARNOLD ENERGY CENTER NRC INTEGRATED INSPECTION REPORT 05000331/2017001

Dear Mr. Curtland:

On March 31, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Duane Arnold Energy Center. On April 13, 2017, the NRC inspectors discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

Based on the results of this inspection, the NRC has identified three issues that were evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has also determined that three violations are associated with these issues. Because you initiated condition reports to address these issues, these violations are being treated as Non-Cited Violations (NCVs), consistent with Section 2.3.2 of the Enforcement Policy. These NCVs are described in the subject inspection report.

If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555–0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, and the NRC Resident Inspector at the Duane Arnold Energy Center.

If you disagree with the cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555–0001; with copies to the Regional Administrator, Region III; and the NRC Resident Inspector at the Duane Arnold Energy Center.

This letter, its enclosure, and your response, (if any), will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with 10 CFR 2.390, “Public Inspections, Exemptions, Requests for Withholding.”

Sincerely,

/RA/

Karla Stoedter, Chief
Branch 1
Division of Reactor Projects

Docket No. 50–331
License No. DPR–49

Enclosure:
Inspection Report 05000331/2017001

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Letter to Dean Curtland from Karla Stoedter dated May 8, 2017

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50–331
License No:	DPR–49
Report No:	05000331/2017001
Licensee:	NextEra Energy Duane Arnold, LLC
Facility:	Duane Arnold Energy Center
Location:	Palo, IA
Dates:	January 1 through March 31, 2017
Inspectors:	C. Norton, Senior Resident Inspector J. Steffes, Resident Inspector B. Bergeon, Acting Resident Inspector J. Wojewoda, Reactor Engineer J. Cassidy, Senior Health Physicist G. Hansen, Senior Emergency Preparedness Inspector
Approved by:	K. Stoedter, Chief Branch 1 Division of Reactor Projects

Enclosure

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SUMMARY

Inspection Report 05000331/2017001, 01/01/2017 – 03/31/2017; Duane Arnold Energy Center; Maintenance Effectiveness, Operability Determination and Functionality Assessments, and In-Plant Airborne Radioactivity Control and Mitigation.

This report covers a 3–month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. Three Green findings were identified by the inspectors. These findings involved Non-Cited Violations (NCVs) of the U.S. Nuclear Regulatory Commission (NRC) requirements. The significance of inspection findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG–1649, "Reactor Oversight Process," Revision 6.

Cornerstone: Barrier Integrity

Green: A Green finding and an associated NCV of Technical Specification (TS) 3.6.1.3 was self-revealed due to the failure to ensure the outboard containment purge valve was operable when the rector was placed in Mode 2 on October 30, 2016. Specifically, the licensee performed maintenance on the outboard containment purge valve during the refueling outage using procedures which failed to contain acceptance criteria to ensure critical dimensions necessary for reliable containment purge valve sealing could be re-established following valve stroking. The licensee entered the issue into the corrective action program as Condition Report (CR) 2181838. Corrective actions included establishing the critical dimensions necessary to actuate the drywell purge valve seals, revising the procedure for containment isolation valve maintenance, developing a new test procedure for containment isolation valve testing and developing just-in-time training to be used during future containment isolation valve maintenance.

The inspectors determined that the failure to have the outboard containment purge valve operable while operating in Modes 1 and 2 as required by TS 3.6.1.3 was a performance deficiency. This performance deficiency is more than minor because it is associated with the Structure, System, and Component (SSC) and barrier performance attribute of the Barrier Integrity cornerstone and affected the cornerstone objective to provide reasonable assurance that physical design barriers (e.g., containment) protect the public from radionuclide releases caused by accidents or events. This finding was of very low safety significance because it did not represent an actual open pathway in the physical integrity of the reactor containment, containment isolation system, or heat removal components, nor did it involve an actual reduction in function of hydrogen igniters in the reactor containment. This finding has a cross-cutting aspect in the Human Performance area of Resources, because NextEra personnel did not ensure that procedures were adequate to support nuclear safety. Specifically, maintenance procedures for the drywell purge valves did not contain steps to ensure that a critical dimension for valve operability was re-established following valve stroking. [H.1] (Section 1R12)

Green: The inspectors identified a finding of very low safety significance and an associated NCV of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36(c)(2)(i) for the licensee's failure to enter TS 3.6.1.3 for an inoperable outboard drywell purge valve. Specifically, as a result of a deficient immediate operability determination (IOD), the licensee failed to declare the outboard drywell containment purge valve inoperable when it failed to satisfy surveillance requirement (SR) 3.6.1.3.4, "perform leakage rate testing for each primary containment purge valve with resilient seals." The licensee entered this issue into the Corrective Action Program (CAP) as CR 2183505. Corrective actions included licensed operator training to share lessons learned.

This performance deficiency is more than minor because it impacted the Barrier Integrity cornerstone attribute of SSCs and barrier performance, and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events. The finding was screened as very low safety significance because it did not represent an actual open pathway in the physical integrity of reactor containment, containment isolation system, and heat removal components, nor did it involve an actual reduction in function of hydrogen igniters in the reactor containment. This finding has a cross-cutting aspect of consistent process in the Human Performance cross-cutting area because the licensee used T–seal pressure and non-accident drywell conditions which are not related to the primary containment isolation valve (PCIV) specified safety function to declare the outboard drywell purge valve operable. [H.13] (Section 1R15)

Cornerstone: Occupational Radiation Safety

Green: The inspectors identified a finding of very low safety significance and associated NCV of 10 CFR 20.1703, "Use of Individual Respiratory Protection Equipment," for the licensee's failure to develop and maintain written procedures regarding the maintenance and testing that incorporated all of the visual and functional tests specified by the manufacturer. This issue has been entered into the licensee's CAP as CR 02183134. Corrective actions included an evaluation of that the self-contained breathing apparatus (SCBA) available for use would perform as expected.

The performance deficiency was determined to be more than minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, the inadequate testing of the SCBA could have resulted in a functional failure during use. The removal of the SCBA in this occurrence could have led the individual to be exposed to radiological airborne hazards and more importantly atmospheres that are immediately dangerous to life and health. The finding was determined to be of very low safety significance because it was not an as-low-as-reasonably-achievable planning issue, there were no overexposures, nor substantial potential for overexposures, and the licensee's ability to assess dose was not compromised. The inspectors determined that the cause of the issue had a cross-cutting aspect of evaluation in the problem identification and resolution area. Specifically, the licensee did not thoroughly evaluate the issue to ensure the resolution addressed the extent of conditions from a previously identified discrepancy between the manufacturer's manual and licensee procedures. [P.2] (Section 2RS3)

REPORT DETAILS

Summary of Plant Status

Duane Arnold Energy Center (DAEC) operated at full power at the beginning of the inspection period. On February 10, 2017, the licensee lowered power to approximately 78 percent to perform a control rod sequence exchange, and returned to full power on February 13, 2017. The licensee then lowered power on February 15, 2017, to approximately 86 percent to perform a load line adjustment and returned to full power on February 17, 2017. The plant remained at power for the remainder of the inspection period with the exception of brief down-power maneuvers to accomplish rod pattern adjustments or planned surveillance testing activities.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity and Emergency Preparedness

1R01 Adverse Weather Protection (71111.01)

.1 Readiness for Impending Adverse Weather Condition—Severe Thunderstorm Watch

a. Inspection Scope

Since thunderstorms with potential tornados and high winds were forecast in the vicinity of the facility for March 7, 2017, the inspectors reviewed the licensee's overall preparations/protection for the expected weather conditions. On March 7 and 8, 2017, the inspectors walked down the standby diesel generators (SBDGs), offsite power, river water supply, and condensate storage and transfer system(s), in addition to the licensee's emergency alternating current power systems, because their safety-related functions could be affected or required as a result of high winds or tornado-generated missiles or the loss of offsite power. The inspectors evaluated the licensee staff's preparations against the site's procedures and determined that the staff's actions were adequate. During the inspection, the inspectors focused on plant-specific design features and the licensee's procedures used to respond to specified adverse weather conditions. The inspectors also toured the plant grounds to look for any loose debris that could become missiles during a tornado. The inspectors evaluated operator staffing and accessibility of controls and indications for those systems required to control the plant. Additionally, the inspectors reviewed the Updated Final Safety Analysis Report (UFSAR) and performance requirements for systems selected for inspection, and verified that operator actions were appropriate as specified by plant specific procedures. The inspectors also reviewed a sample of CAP items to verify that the licensee identified adverse weather issues at an appropriate threshold and dispositioned them through the CAP in accordance with station corrective action procedures. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one readiness for impending adverse weather condition sample as defined in Inspection Procedure (IP) 71111.01–05.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

.1 Quarterly Partial System Walkdowns

a. Inspection Scope

The inspectors performed partial system walkdowns of the following risk-significant systems:

- 'A' SBDG while 'B' residual heat removal (RHR) and 'B' RHR systems were unavailable for maintenance;
- high pressure coolant injection (HPCI) system while reactor core isolation cooling (RCIC) system was unavailable for maintenance;
- 'B' control building (CB) heating, ventilation, and air conditioning (HVAC) while 'A' CB HVAC was unavailable for maintenance; and
- 'A' CB chiller while 'B' CB chiller was out of service.

The inspectors selected these systems based on their risk significance relative to the Reactor Safety cornerstones at the time they were inspected. The inspectors attempted to identify any discrepancies that could impact the function of the system and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, UFSAR, Technical Specification (TS) requirements, outstanding work orders (WOs), condition reports (CRs), and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have rendered the systems incapable of performing their intended functions. The inspectors also walked down accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the CAP with the appropriate significance characterization. Documents reviewed are listed in the Attachment to this report.

These activities constituted four partial system walkdown samples as defined in IP 71111.04–05.

b. Findings

No findings were identified.

.2 Semi-Annual Complete System Walkdown

a. Inspection Scope

On March 22 through March 26, 2017, the inspectors performed a complete system alignment inspection of the Standby Liquid Control System (SBLC) to verify the functional capability of the system. This system was selected because it was considered both safety significant and risk significant in the licensee's probabilistic risk assessment. The inspectors walked down the system to review mechanical and electrical equipment lineups; electrical power availability; system pressure and temperature indications, as appropriate; component labeling; component lubrication; component and equipment

cooling; hangers and supports; operability of support systems; and to ensure that ancillary equipment or debris did not interfere with equipment operation. A review of a sample of past and outstanding WOs was performed to determine whether any deficiencies significantly affected the system function. In addition, the inspectors reviewed the CAP database to ensure that system equipment alignment problems were being identified and appropriately resolved. Documents reviewed are listed in the Attachment to this report.

These activities constituted one complete system walkdown sample as defined in IP 71111.04–05.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Routine Resident Inspector Tours (71111.05Q)

a. Inspection Scope

The inspectors conducted fire protection walkdowns which were focused on availability, accessibility, and the condition of firefighting equipment in the following risk-significant plant areas:

- reactor building elevation 786;
- reactor building elevation 716;
- control building elevation 757;
- turbine building elevation 734;
- low level radwaste processing and storage facility elevation 757 and 773; and
- radwaste and machine shop building elevation 757.

The inspectors reviewed areas to assess if the licensee had implemented a fire protection program that adequately controlled combustibles and ignition sources within the plant, effectively maintained fire detection and suppression capability, maintained passive fire protection features in good material condition, and implemented adequate compensatory measures for out-of-service, degraded or inoperable fire protection equipment, systems, or features in accordance with the licensee's fire plan. The inspectors selected fire areas based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events with later additional insights, their potential to impact equipment which could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event. Using the documents listed in the Attachment to this report, the inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's CAP. Documents reviewed are listed in the Attachment to this report.

These activities constituted six quarterly fire protection inspection samples as defined in IP 71111.05–05.

b. Findings

No findings were identified.

.2 Annual Fire Protection Drill Observation (71111.05A)

a. Inspection Scope

On February 17, 2017, the inspectors observed a fire brigade activation for a simulated fire in the 1XL31 supply transformer room. Based on this observation, the inspectors evaluated the readiness of the plant fire brigade to fight fires. The inspectors verified that the licensee staff identified deficiencies, openly discussed them in a self-critical manner at the drill debrief, and took appropriate corrective actions. Specific attributes evaluated were:

- proper wearing of turnout gear and self-contained breathing apparatus;
- proper use and layout of fire hoses;
- employment of appropriate firefighting techniques;
- sufficient firefighting equipment brought to the scene;
- effectiveness of fire brigade leader communications, command, and control;
- search for victims and propagation of the fire into other plant areas;
- smoke removal operations;
- utilization of pre-planned strategies;
- adherence to the pre-planned drill scenario; and
- drill objectives.

Documents reviewed are listed in the Attachment to this report.

These activities constituted one annual fire protection inspection sample as defined in IP 71111.05–05.

b. Findings

No findings were identified.

1R07 Annual Heat Sink Performance (71111.07)

.1 Heat Sink Performance

a. Inspection Scope

The inspectors reviewed the licensee's testing of 'C' reactor building closed cooling water system heat exchangers to verify that potential deficiencies did not mask the licensee's ability to detect degraded performance, to identify any common cause issues that had the potential to increase risk, and to ensure that the licensee was adequately addressing problems that could result in initiating events that would cause an increase in risk. The inspectors reviewed the licensee's observations as compared against acceptance criteria, the correlation of scheduled testing and the frequency of testing, and the impact of instrument inaccuracies on test results. Inspectors also verified that test acceptance criteria considered differences between test conditions, design conditions, and testing conditions. Documents reviewed for this inspection are listed in the Attachment to this document.

This annual heat sink performance inspection constituted one sample as defined in IP 71111.07–05.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program (71111.11)

.1 Resident Inspector Quarterly Review of Licensed Operator Requalification (71111.11Q)

a. Inspection Scope

On March 13, 2017, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator requalification training. The inspectors verified that operator performance was adequate, evaluators were identifying and documenting crew performance problems, and that training was being conducted in accordance with licensee procedures. The inspectors evaluated the following areas:

- licensed operator performance;
- crew's clarity and formality of communications;
- ability to take timely actions in the conservative direction;
- prioritization, interpretation, and verification of annunciator alarms;
- correct use and implementation of abnormal and emergency procedures;
- control board manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions and Emergency Plan actions and notifications.

The crew's performance in these areas was compared to pre-established operator action expectations and successful critical task completion requirements. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one quarterly licensed operator requalification program simulator sample as defined in IP 71111.11–05.

b. Findings

No findings were identified.

.2 Resident Inspector Quarterly Observation during Periods of Heightened Activity or Risk (71111.11Q)

a. Inspection Scope

On February 10 and 11, 2017, the inspectors observed a reactor down power for rod sequence exchange as well as turbine valve testing in the control room. This was an activity that required heightened awareness or was related to increased risk. The inspectors evaluated the following areas:

- licensed operator performance;
- crew's clarity and formality of communications;

- ability to take timely actions in the conservative direction;
- prioritization, interpretation, and verification of annunciator alarms (if applicable);
- correct use and implementation of procedures;
- control board (or equipment) manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions and Emergency Plan actions and notifications (if applicable).

The performance in these areas was compared to pre-established operator action expectations, procedural compliance and task completion requirements. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one quarterly licensed operator heightened activity/risk sample as defined in IP 71111.11–05.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Routine Quarterly Evaluations

a. Inspection Scope

The inspectors evaluated the following degraded performance issues involving risk-significant systems:

- 'A' control rod drive pump failed to start; and
- drywell purge valve local leak rate test (LLRT) failure.

The inspectors reviewed events such as where ineffective equipment maintenance had resulted in valid or invalid automatic actuations of engineered safeguards systems and independently verified the licensee's actions to address system performance or condition problems in terms of the following:

- implementing appropriate work practices;
- identifying and addressing common cause failures;
- scoping of systems in accordance with 10 CFR 50.65(b) of the maintenance rule;
- characterizing system reliability issues for performance;
- charging unavailability for performance;
- trending key parameters for condition monitoring;
- ensuring 10 CFR 50.65(a)(1) or (a)(2) classification or re-classification; and
- verifying appropriate performance criteria for structures, systems, and components (SSCs)/functions classified as (a)(2), or appropriate and adequate goals and corrective actions for systems classified as (a)(1).

The inspectors also performed a quality review for drywell purge valve LLRT failure. Specifically, the inspectors performed a quality control verifications in the work packages for worked performed on the valves during the last refueling outage prior to the LLRT failure, as discussed in IP 71111.12, Section 02.02.

The inspectors assessed performance issues with respect to the reliability, availability, and condition monitoring of the system. In addition, the inspectors verified maintenance effectiveness issues were entered into the CAP with the appropriate significance characterization. Documents reviewed are listed in the Attachment to this report.

This inspection constituted two quarterly maintenance effectiveness samples and one quality control sample as defined in IP 71111.12–05.

b. Findings

Inadequate Maintenance Instructions for Containment Purge Valves Led to Violation of Technical Specification 3.6.1.3

Introduction: A Green finding and an associated violation of TS 3.6.1.3 was self-revealed due to the failure to ensure the outboard containment purge valve was operable when the reactor was placed in Mode 2 on October 30, 2016. Specifically, the licensee performed maintenance on the outboard containment purge valve during the refueling outage using procedures which failed to contain acceptance criteria to ensure critical dimensions necessary for reliable containment purge valve sealing could be re-established following valve stroking. This resulted in an inoperable outboard containment purge valve and a violation of TS 3.6.1.3.

Description: During Refuel Outage 25, NextEra staff rebuilt the inboard and outboard containment purge valves using WOs 40389727, 40389728, 40389729, and 40389730. The work included rebuilding the actuators, replacement of the T–seal pneumatic relays that port and bleed air from the valve's resilient seal, and diagnostic testing. The valve design was a butterfly style valve and instrument air was ported to a resilient seal or "T–seal" that surrounds the valve which provided two functions. The first function of the T–seal was to hold the valve closed and the second function was to seal the area around the valve to prevent or limit leakage per TS requirements. The replacement of the T–seal pressure switch for each containment purge valve included steps to adjust and lock in position a hex nut on the end of a lever that rotates with the valve stem so that when the valve is closed, the hex nut depresses an actuating plunger on a pneumatic relay to port instrument air to the T–seal to seal the edge of the butterfly valve disc.

After the valve work was completed on October 25, 2016, the licensee pressurized the volume between the inboard and outboard purge valves and performed a LLRT that demonstrated the integrity of both purge valves. On October 26, 2016, the licensee stroked and timed both purge valves. On October 30, 2016, DAEC entered Mode 2 and placed the plant in a mode where the operability of both the inboard and outboard containment purge valves was required. On December 16, 2016, the licensee identified that because the containment purge valves were stroked on October 26, 2016, after the LLRT, a subsequent LLRT was required per TS within 92 days of opening the valves. This was documented in CR 2175536. A LLRT was scheduled before a late date of January 30, 2017.

On January 25, 2017, the licensee attempted to perform the required LLRT but was unable to achieve the required test pressure between the inboard and outboard containment purge valves. The inspectors reviewed the work packages for the work performed on the containment purge valves during Refueling Outage 25.

WO 40389727–Task 11 for the maintenance of the inboard containment purge valve, which contained tasks similar to WO 40389729 for the outboard containment purge valve, stated in Step 4, “INSTALL new Neumatics T–seal switch 3–way valve while installing limit switches. (See Appendix 3, VALVE–F130–01).” VALVE–F130–01, “Repair of 9200 Series T–Ring butterfly Valves,” described in two places the adjustment of the hex bolt. In section 5.4, “Valve/Actuator Installation,” it stated in Step 16, “To ensure proper operation of the T–seal pressure switch adjust the actuation distance of the hex head screw to engage the plunger of the switch when the valve is fully closed. The distance the plunger is to be depressed is 0.11 inch.” In section 6.0, “Acceptance Requirements and Restoration,” it stated in step 2, “Test the T–seal pressure switch for proper operation. Verify the switch actuates when the valve is closed.” VALVE–F130–01, however, did not require verification that the dimension was re-established following valve stroking. Therefore, the inspectors determined that outboard containment purge valve remained inoperable after maintenance in Refueling Outage 25. On October 30, 2016, DAEC entered Mode 2 and TS 3.6.1.3 became applicable. Without recognizing one containment purge valve was inoperable, the license failed to meet TS 3.6.1.3. This condition was not recognized until January 25, 2017.

Analysis: The inspectors determined that the failure to have the outboard containment purge valve operable upon entering Mode 2 as required by TS 3.6.1.3 was a performance deficiency that was reasonably within the licensee’s ability to foresee and correct and was therefore a finding. This finding was more than minor because it was associated with the SSC and barrier performance attribute of the Barrier Integrity cornerstone and affected the cornerstone objective to provide reasonable assurance that physical design barriers (e.g., containment) protect the public from radionuclide releases caused by accidents or events. Specifically, because valve maintenance failed to ensure that critical dimensions for valve operability could be re-established after valve stroking, the outboard containment purge valve failed to meet leak rate criteria for greater than 90 days in violation of TS 3.6.1.3. In accordance with Inspection Manual Chapter (IMC) 0609.04, “Initial Characterization of Findings,” and the Barrier Integrity cornerstone screening questions provided in Exhibit 3 of IMC 0609, Appendix A, “The Significance Determination Process (SDP) for Findings At-Power,” issued June 19, 2012, the finding screened as very low safety significance (Green) because it did not represent an actual open pathway in the physical integrity of reactor containment, containment isolation system, and heat removal components, nor did it involve an actual reduction in function of hydrogen igniters in the reactor containment.

This finding has a cross-cutting aspect in the human performance area of resources, because NextEra personnel did not ensure that procedures were adequate to support nuclear safety. Specifically, maintenance procedures for the containment purge valves did not contain steps to ensure that a critical dimension for valve operability was re-established following valve stroking. [H.1]

Enforcement: Technical Specification 3.6.1.3, “Primary Containment Isolation Valves,” requires in part, that each primary containment isolation valve shall be operable when the reactor is operating in Mode 1, 2 or 3. The outboard containment purge valve is a containment isolation valve.

Technical Specification 3.6.1.3, Condition E, states that with one or more penetration flow paths with one or more containment purge valves not within leakage limits the

affected flow path must be isolated by the use of at least one closed and deactivated automatic valve within 24 hours and the leakage must be restored to within limits within 72 hours.

Technical Specification 3.6.1.3, Condition F, states that if the Required Action and associated Completion Time of Condition E is not met the reactor must be placed in Mode 3 within 12 hours and in Mode 4 within 36 hours.

Contrary to the above, between October 30, 2016, and January 25, 2017, each primary containment isolation valve was not operable when the reactor was operating in Modes 1 and 2. Specifically, the outboard containment purge valve was not within the required leakage limits due to inadequacies with the procedures used to perform maintenance on the valve during the October 2016 refueling outage. These procedural inadequacies resulted in the failure to ensure reliable containment purge valve sealing could be re-established following valve stroking. In addition, the affected penetration flow path was not isolated within 24 hours, the leakage was not restored to within limits with 72 hours, and the reactor was not placed in Mode 3 or Mode 4 as required by TS.

The licensee entered this issue into the CAP as CR 2181838, "CV 4303 Leakage Rate Exceeds Allowance." Corrective actions included establishing the critical dimensions necessary to actuate the containment purge valve seals, revising the procedure for containment isolation valve maintenance, developing a new test procedure for containment isolation valve testing, and developing just-in-time training to be used during future containment isolation valve maintenance. Because this violation was of very low safety significance and was entered into the licensee's CAP, the violation is being treated as a Non-Cited Violation NCV, consistent with Section 2.3.2a of the U.S. Nuclear Regulatory Commission (NRC) Enforcement Policy.
(NCV 05000331/2017001–01, Inadequate Maintenance Instructions for Containment Purge Valves Led to Violation of Technical Specification 3.6.1.3)

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

a. Inspection Scope

The inspectors reviewed the licensee's evaluation and management of plant risk for the maintenance and emergent work activities affecting risk-significant and safety-related equipment listed below to verify that the appropriate risk assessments were performed prior to removing equipment for work:

- work week 1706 risk with 'B' residual heat removal (RHR), 'B' residual heat removal service water, 'B' emergency service water and 'B' standby diesel generator (SBDG) systems unavailable or inoperable;
- high pressure coolant injection (HPCI) system while reactor core isolation cooling (RCIC) system was unavailable;
- 'B' control building (CB) chiller while 'A' CB chiller was unavailable;
- 'A' and 'B' reactor building closed cooling water (RBCCW) risk while 'C' RBCCW heat exchanger was unavailable;
- 'A' general service water (GSW) pump while 'B' GSW pump is unavailable; and
- UPS097 electrolytic capacitor replacement.

These activities were selected based on their potential risk significance relative to the Reactor Safety Cornerstones. As applicable for each activity, the inspectors verified that risk assessments were performed as required by 10 CFR 50.65(a)(4) and were accurate and complete. When emergent work was performed, the inspectors verified that the plant risk was promptly reassessed and managed. The inspectors reviewed the scope of maintenance work, discussed the results of the assessment with the licensee's probabilistic risk analyst or shift technical advisor, and verified plant conditions were consistent with the risk assessment. The inspectors also reviewed TS requirements and walked down portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met. Documents reviewed during this inspection are listed in the Attachment to this report.

These maintenance risk assessments and emergent work control activities constituted six samples as defined in IP 71111.13–05.

b. Findings

No findings were identified.

1R15 Operability Determinations and Functional Assessments (71111.15)

.1 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the following issues:

- drywell equipment sump timer failure;
- 'B' control building chiller internal memory battery failure;
- drywell purge valve local leak rate test failure;
- containment purge operability determination;
- ‘B’ air ejector room ventilation duct separated; and
- battery charger capacity.

The inspectors selected these potential operability issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the evaluations to ensure that TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TS and Updated Final Safety Analysis Report (UFSAR) to the licensee’s evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations. Additionally, the inspectors reviewed a sampling of corrective action documents to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the Attachment to this report.

This operability inspection constituted six samples as defined in IP 71111.15–05.

b. Findings

Failure to Enter Technical Specification 3.6.1.3 for an Inoperable Outboard Containment Purge Valve

Introduction: The inspectors identified a finding of very low safety significance and an associated NCV of 10 CFR 50.36(c)(2)(i) for the licensee's failure to enter TS 3.6.1.3 for an inoperable outboard containment purge valve when the valve was discovered to be inoperable on January 25, 2017. Specifically, as a result of a deficient immediate operability determination (IOD), the licensee failed to declare the outboard containment purge valve inoperable when it failed to satisfy Surveillance Requirement (SR) 3.6.1.3.4.

Description: On January 25, 2017, the licensee performed surveillance test procedure (STP) 3.6.1.3–01, "Containment Purge and Vent Valve Leakage Integrity Test." The purpose of this STP was to satisfy TS SR 3.6.1.3.4 which required the licensee to perform leakage rate testing for each primary containment purge valve with resilient seals to ensure the leakage was within limits." The test procedure setup in STP 3.6.1.3–01, required both the inboard and outboard containment purge valves to be shut with their T–seals pressurized. A leak rate monitor was attached to pressurize the volume between the two valves to approximately 46 pounds per square inch gauge (psig). Once the test pressure was established, the licensee was required to measure the leakage every 15 minutes until a stable leak rate was obtained. Although the procedure provided a leakage limit of less than 22,000 standard cubic centimeters per minute, the licensee was unable to complete the surveillance test because the required test pressure could not be established and the leakage rate could not be measured.

As documented in ARs 02181809 and 02181822, the licensee made an IOD that the inboard containment purge valve was inoperable and the outboard containment purge valve was operable but degraded. To support their conclusion, the licensee stated that the inboard purge valve "T–seal air pressure was at 10 psig and should have been at 90 psig," that "drywell pressure trends are unchanged which would indicate that the outboard [containment purge valve] was holding drywell pressure" and that "based upon the T–seal pressure of the inboard containment purge valve found at 10 psig and the T–seal pressure of the outboard containment purge valve found at 40 psig, sound engineering judgement would indicate that the leakage path for the test nitrogen was through the inboard containment purge valve."

The inspectors reviewed the licensee's logs, ARs, operability determinations and their associated justifications. The inspectors determined that the IOD was deficient based on the following:

- nominal drywell nitrogen pressure was approximately 1 psig, whereas accident drywell pressure was approximately 46 psig;
- the licensee, historically, did not calibrate, functionally test, monitor, record or otherwise maintain the T–seal pressure indicators;
- the T–seal indicators are not described in design basis documentation as a measure of ensuring primary containment isolation valve (PCIV) function;

- the licensee did not have an engineering evaluation to relate the minimum T–seal pressure required to ensure PCIV function; and

- the licensee failed the local leak rate test.

Therefore, there were no evidence that either one of the containment purge valves were operable. As a result, the licensee should have also declared the outboard containment purge valve inoperable.

On January 26, 2017, the licensee performed STP 3.6.1.3–01 as a post maintenance test for the repair activities on the inboard containment purge valve. Once again, the licensee was unable to establish the required pressure, unable to measure leakage and was therefore, unable to complete the required surveillance. At that time, the licensee declared the outboard containment purge valve inoperable and repaired the valve on the same day. Troubleshooting and a subsequent root cause analysis determined that the outboard containment purge valve was inoperable due to inadequate instrument air pressure being applied to the T–seal which led to excessive valve leakage. Conversely, the inboard containment purge valve was operable at all times because the licensee demonstrated that the leakage from this valve was within limits even though this valve's T–seal pressure was significantly reduced.

Analysis: The inspectors determined that the failure to declare the outboard containment purge valve inoperable when it failed to meet surveillance testing acceptance criteria on January 25, 2017, represented an issue of concern. The inspectors determined the issue of concern represented a performance deficiency because it resulted in the licensee's failure to implement TS required actions for the outboard containment purge valve, and the cause was reasonably within the licensee's ability to foresee and should have been prevented. The performance deficiency was determined to be more than minor and a finding because it impacted the Barrier Integrity cornerstone attribute of structures, systems and components and barrier performance, and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events.

In accordance with IMC 0609, Attachment 4, "Initial Characterization of Findings," issued June 19, 2012, the inspectors answered "No" to all questions within Table 3, "Significance Determination Process Appendix Router", and transitioned to IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012. The finding screened as very low safety significance (Green) because it did not represent an actual open pathway in the physical integrity of reactor containment, containment isolation system, and heat removal components, nor did it involve an actual reduction in function of hydrogen igniters in the reactor containment.

This finding has a cross-cutting aspect of consistent process in the Human Performance cross-cutting area, and involved individuals use a consistent, systematic approach to make decisions. Specifically, the licensee failed to implement EN–AA–203–1001, "Operability Determination/Functionality Assessments," Revision 24, Section 4.3, "Immediate Operability Determination," and Attachment 2, "Immediate Operability Determination Guideline," which states, in part, that "a [structure, system and component] SSC must be capable of performing the specified safety functions of its design, within the required range of physical conditions, initiation times, and mission

times assumed in the [Current Licensing Basis]." The guideline goes on to further say that "a SSC that does not meet a surveillance requirement must be declared inoperable because the limiting condition for operation (LCO) operability requirement(s) are not met." Instead, the licensee used T–seal pressure and non-accident drywell conditions which are not related to the PCIV specified safety function to declare the outboard containment purge valve operable. [H.13]

Enforcement: Title 10 CFR 50.36(c)(2)(i), states in part, "When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specification until the condition can be met." Contrary to the above, on January 25, 2017, the licensee failed to follow the remedial actions permitted by the technical specifications when the limiting condition for operation specified in TS 3.6.1.3 was not met. Specifically, as the result of a deficient IOD, the licensee failed to declare the outboard containment purge valve inoperable when it failed to satisfy SR 3.6.1.3.4. The licensee entered this issue into the CAP as CR 2183505. Corrective actions included repairing the valve and performing licensed operator training to share lessons learned. Because this violation was of very low safety significance and was entered into the licensee's CAP as ARs 02181809 and 02181822, the violation is being treated as a NCV, consistent with Section 2.3.2a of the NRC Enforcement Policy. **(NCV 05000331/2017001–02, Failure to Enter Technical Specification 3.6.1.3 for an Inoperable Outboard Containment Purge Valve)**

1R18 Plant Modifications (71111.18)

a. Inspection Scope

The inspectors reviewed the following modifications:

- engineering change (EC) 286738, modification for adding oil to the lube make up tanks (1T114A/B); and
- proposed modification to Eberline source.

The inspectors reviewed the configuration changes and associated 10 CFR 50.59 safety evaluation screening against the design basis, the UFSAR, and the TS, as applicable, to verify that the modification did not affect the operability or availability of the affected systems. The inspectors, as applicable, observed ongoing and completed work activities to ensure that the modifications were installed as directed and consistent with the design control documents; the modifications operated as expected; post-modification testing adequately demonstrated continued system operability, availability, and reliability; and that operation of the modifications did not impact the operability of any interfacing systems. As applicable, the inspectors verified that relevant procedure, design, and licensing documents were properly updated. Lastly, the inspectors discussed the plant modification with operations, engineering, and training personnel to ensure that the individuals were aware of how the operation with the plant modification in place could impact overall plant performance. Documents reviewed are listed in the Attachment to this report.

This inspection constituted two plant modification samples as defined in IP 71111.18–05.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the following post-maintenance activities to verify that procedures and test activities were adequate to ensure system operability and functional capability:

- 'B' CB chiller;
- RCIC work window;
- drywell nitrogen compressor replacement;
- SBDG air receiver relief valve replacement;
- technical support center (TSC) diesel generator engine inspection;
- 'B' GSW pump 5kV wetted cable replacement; and
- 1K10C diesel air compressor drain valve replacement.

These activities were selected based upon the structure, system, or component's ability to impact risk. The inspectors evaluated these activities for the following (as applicable): the effect of testing on the plant had been adequately addressed; testing was adequate for the maintenance performed; acceptance criteria were clear and demonstrated operational readiness; test instrumentation was appropriate; tests were performed as written in accordance with properly reviewed and approved procedures; equipment was returned to its operational status following testing (temporary modifications or jumpers required for test performance were properly removed after test completion); and test documentation was properly evaluated. The inspectors evaluated the activities against TSs, the UFSAR, 10 CFR 50 requirements, licensee procedures, and various NRC generic communications to ensure that the test results adequately ensured that the equipment met the licensing basis and design requirements. In addition, the inspectors reviewed corrective action documents associated with post-maintenance tests to determine whether the licensee was identifying problems and entering them in the CAP and that the problems were being corrected commensurate with their importance to safety. Documents reviewed are listed in the Attachment to this report.

This inspection constituted seven post-maintenance testing samples as defined in IP 71111.19–05.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors reviewed the test results for the following activities to determine whether risk-significant systems and equipment were capable of performing their intended safety function and to verify testing was conducted in accordance with applicable procedural and TS requirements:

- STP 3.5.1–05; HPCI system operability test (Routine);
- drywell purge valve LLRT (Isolation Valve);
- Operating instruction (OI) 150; RCIC system (Routine);

- STP 3.5.3–12A; core spray operability and comprehensive pump test (IST);
- STP 3.1.7–01; standby liquid control (SBLC) pump operability test (IST); and
- STP 3.3.5.1–17B; functional test of 'B' core spray pump and B/D RHR pump discharge pressure – high instrumentation; revision 1 (Routine).

The inspectors observed in-plant activities and reviewed procedures and associated records to determine the following:

- did preconditioning occur;
- the effects of the testing were adequately addressed by control room personnel or engineers prior to the commencement of the testing;
- acceptance criteria were clearly stated, demonstrated operational readiness, and were consistent with the system design basis;
- plant equipment calibration was correct, accurate, and properly documented;
- as-left setpoints were within required ranges; and the calibration frequency was in accordance with TSs, the UFSAR, procedures, and applicable commitments;
- measuring and test equipment calibration was current;
- test equipment was used within the required range and accuracy; applicable prerequisites described in the test procedures were satisfied;
- test frequencies met TS requirements to demonstrate operability and reliability; tests were performed in accordance with the test procedures and other applicable procedures; jumpers and lifted leads were controlled and restored where used;
- test data and results were accurate, complete, within limits, and valid;
- test equipment was removed after testing;
- where applicable for inservice testing activities, testing was performed in accordance with the applicable version of Section XI, American Society of Mechanical Engineers code, and reference values were consistent with the system design basis;
- where applicable, test results not meeting acceptance criteria were addressed with an adequate operability evaluation or the system or component was declared inoperable;
- where applicable for safety-related instrument control surveillance tests, reference setting data were accurately incorporated in the test procedure;
- where applicable, actual conditions encountering high resistance electrical contacts were such that the intended safety function could still be accomplished;
- prior procedure changes had not provided an opportunity to identify problems encountered during the performance of the surveillance or calibration test;
- equipment was returned to a position or status required to support the performance of its safety functions; and
- all problems identified during the testing were appropriately documented and dispositioned in the CAP.

Documents reviewed are listed in the Attachment to this report.

This inspection constituted three routine surveillance testing samples, two in-service test samples, and one containment isolation valve sample as defined in IP 71111.22, Sections–02 and–05.

b. Findings

No findings were identified.

1EP2 Alert and Notification System Evaluation (71114.02)

a. Inspection Scope

The inspectors reviewed documents and held discussions with Emergency Preparedness (EP) staff regarding the operation, maintenance, and periodic testing of the primary and backup Alert and Notification System (ANS) in the plume pathway Emergency Planning Zone. The inspectors reviewed monthly trend reports and siren test failure records from February of 2015 to February 2017. Information gathered during document reviews and interviews were used to determine whether the ANS equipment was maintained and tested in accordance with Emergency Plan commitments and procedures. Documents reviewed are listed in the Attachment to this report.

This ANS evaluation inspection constitutes one sample as defined in IP 71114.02.

b. Findings

No findings were identified.

1EP3 Emergency Response Organization Staffing and Augmentation Testing (71114.03)

a. Inspection Scope

The inspectors reviewed and discussed with plant EP management and staff the Emergency Plan commitments and procedures that addressed the primary and alternate methods of initiating an Emergency Response Organization (ERO) activation to augment the on-shift staff as well as the provisions for maintaining the plant's ERO team and qualification lists. The inspectors reviewed reports and a sample of CAP records of unannounced off-hour augmentation drills and pager tests, which were conducted from February 2015 to February 2017, to determine the adequacy of the drill critiques and associated corrective actions. The inspectors also reviewed a sample of the training records of approximately twenty ERO personnel, who were assigned to key and support positions, to determine the status of their training as it related to their assigned ERO positions. Documents reviewed are listed in the Attachment to this report.

This ERO augmentation testing inspection constitutes one sample as defined in IP 71114.03.

b. Findings

No findings were identified.

1EP5 Maintenance of Emergency Preparedness (71114.05)

a. Inspection Scope

The inspectors reviewed the nuclear oversight staff's 2016 audit of the Duane Arnold Energy Center (DAEC)'s EP program to determine that the independent assessments met the requirements of 10 CFR 50.54(t). The inspectors reviewed samples of CAP

records associated with the 2016 biennial exercise, as well as various EP drills conducted in 2015 and 2016, in order to determine whether the licensee fulfilled drill commitments and to evaluate the licensee's efforts to identify and resolve issues. The inspectors reviewed a sample of EP items and corrective actions related to the station's EP program, and activities to determine whether corrective actions were completed in accordance with the site's CAP. Documents reviewed are listed in the Attachment to this report.

This maintenance of EP inspection constitutes the completion of one sample as defined in IP 71114.05.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06)

.1 Emergency Preparedness Drill Observation

a. Inspection Scope

The inspectors evaluated the conduct of a routine licensee emergency drill on March 1, 2017, to identify any weaknesses and deficiencies in classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the TSC to determine whether the event classification, notifications, and protective action recommendations were performed in accordance with procedures. The inspectors also attended the licensee drill critique to compare any inspector-observed weakness with those identified by the licensee staff in order to evaluate the critique and to verify whether the licensee staff was properly identifying weaknesses and entering them into the corrective action program. As part of the inspection, the inspectors reviewed the drill package and other documents listed in the Attachment to this report.

This emergency preparedness drill inspection constituted one sample as defined in IP 71114.06–06.

b. Findings

No findings were identified.

2. REACTOR SAFETY

Cornerstone: Occupational Radiation Safety

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03)

.1 Use of Respiratory Protection Devices (02.03)

a. Inspection Scope

The inspectors reviewed records of air testing for supplied-air devices and self-contained breathing apparatus (SCBA) bottles to assess whether the air used met or exceeded

Grade D quality. The inspectors evaluated whether plant breathing air supply systems satisfied the minimum pressure and airflow requirements for the devices.

The inspectors reviewed training curricula for use of respiratory protection devices to assess whether individuals are adequately trained on donning, doffing, function checks, and how to respond to a malfunction.

The inspectors observed the physical condition of respiratory protection devices ready for issuance and reviewed records of routine inspection for selected devices. The inspectors reviewed records of maintenance on the vital components for selected devices and assessed whether onsite personnel assigned to repair vital components received vendor-provided training.

These inspection activities supplemented those documented in NRC Inspection Report (IR) 05000331/2016004 and constituted one complete sample as defined in IP 71124.03–05.

b. Findings

Failure to Develop and Maintain Written Procedures Regarding the Maintenance and Testing of Individual Respiratory Protection Equipment that Incorporated All of the Visual and Functional Tests specified by the Manufacturer

Introduction: The inspectors identified a finding of very-low safety significance (Green) and an associated NCV of 10 CFR 20.1703, "Use of Individual Respiratory Protection Equipment," for the licensee's failure to develop and maintain written procedures regarding the maintenance and testing that incorporated all of the visual and functional tests specified by the manufacturer.

Description: A SCBA is a type of respirator that utilizes a pressurized air cylinder carried by the user and a full face respirator mask. These types of respirators may be used for various reasons including firefighting and entry into areas that are immediately dangerous to life and health. These respirators utilize regulators to reduce the high pressure (>2000 psi) in the cylinder to a much lower pressure suitable for breathing. This is accomplished through a series of regulators, hoses, connections, and electronic components.

The licensee utilizes the FireHawk M7 Air Mask SCBA, manufactured by Mine Safety Appliance, for entries into atmospheres that are potentially immediately dangerous to life or health and other situations to ensure that the radiological exposure to control operators are maintained below regulatory limits. This SCBA is certified by the National Institute of Occupational Safety and Health.

The manufacturer provided an operation and instructions manual for this SCBA. The inspectors noted that the cover of the manual stated, "Changes and modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment." This manual contained, among other items, a procedure for visual inspection that are to be conducted before use, after each use, and monthly and functional tests that are also to be conducted before use, after each use, and monthly.

The inspectors observed a qualified technician perform the monthly inspections of the SCBA units using procedure HPP 3106.04, "Inspection, Maintenance and Quality

Assurance of Respiratory Protection Equipment", Revision 32. The inspectors identified that the steps contained some, but not all, of the actions specified in the "Functional Test" section of the user manual. Additionally, the inspectors noted that some of the activities observed were not included in the licensee procedure although were part of the functional tests specified by the manufacturer. Furthermore, the inspectors determined that the actions specified in the "Component Inspection" section of the manufacturer's manual were neither performed nor included in the licensee procedure.

Analysis: The inspectors determined that not maintaining and testing the SCBA in accordance with manufacturer requirements was a performance deficiency, the cause of which was reasonably within the licensee's ability to foresee and correct, and should have been prevented. The finding was not subject to traditional enforcement since the incident did not result in a significant safety consequence, did not impact the NRC's ability to perform its regulatory function, and was not willful.

The performance deficiency was determined to be of more than minor safety significance in accordance with Inspection Manual Chapter (IMC) 0612, Appendix B, "Issue Screening," dated September 7, 2012, because, if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, the inadequate testing of the SCBA could have resulted in a functional failure during use. The removal of the SCBA in this occurrence could have led the individual to be exposed to radiological airborne hazards and more importantly, atmospheres that are immediately dangerous to life and health. The inspectors also reviewed IMC 0612, Appendix E, "Examples of Minor Issues," dated August 11, 2009, but did not identify any similar examples. The finding was assessed using IMC 0609, Appendix C, "Occupation Radiation Safety Significance Determination Process," dated August, 19, 2008, and determined to be of very low safety significance (Green) because it was not an as-low-as-reasonably-achievable planning issue, there were no overexposures, nor substantial potential for overexposures, and the licensee's ability to assess dose was not compromised.

The inspectors determined that the cause of the issue had a cross-cutting aspect of evaluation in the problem identification and resolution area. Specifically, the licensee did not thoroughly evaluate the issue to ensure the resolution addressed the extent of conditions from a previously identified discrepancy between the manufacturer's manual and licensee procedures. [P.2]

Enforcement: Title 10 of the CFR, Section 20.1703(c)(4) states, in part, that the licensee shall implement and maintain a respiratory protection that includes written procedures regarding maintenance and testing of respiratory protection equipment. Contrary to the above, procedure HPP 3106.04, "Inspection, Maintenance and Quality Assurance of Respiratory Protection Equipment", Revision 32 contained some, but not all, of the actions specified in the "Functional Test" section of the user manual. Additionally, the inspectors noted that some of the activities observed were not included in the licensee procedure although were part of the functional tests specified by the manufacturer. Furthermore, the inspectors determined that the actions specified in the "Component Inspection" section of the manufacturer's manual were neither performed nor included in the licensee procedure. Corrective actions included an evaluation of that the SCBAs available for use would perform as expected. Since the finding was of very low safety significance (Green) and was entered into the licensee's CAP as CR 2183134, this

violation is being treated as a NCV, consistent with Section 2.3.2a of the NRC Enforcement Policy, dated November 1, 2016. **(NCV 05000331/2017001–03; Failure to Incorporate Aspects of Vendor Manual into Self-Contained Breathing Apparatus Maintenance Procedure)**

.2 Self-Contained Breathing Apparatus for Emergency Use (02.04)

a. Inspection Scope

The inspectors reviewed the status and surveillance records for select SCBAs. The inspectors evaluated the licensee's capability for refilling and transporting SCBA air bottles to and from the control room and operations support center during emergency conditions.

The inspectors assessed whether control room operators and other emergency response and radiation protection personnel were trained and qualified in the use of SCBAs and evaluated whether personnel assigned to refill bottles were trained and qualified for that task.

The inspectors assessed whether appropriate mask sizes and types were available for use. The inspectors evaluated whether on-shift operators had no facial hair that would interfere with the sealing of the mask and that appropriate vision correction was available.

The inspectors reviewed the past two years of maintenance records for selected inservice SCBA units used to support operator activities during accident conditions. The inspectors assessed whether maintenance or repairs on an SCBA unit's vital components were performed by an individual certified by the manufacturer of the device to perform the work. The inspectors evaluated the onsite maintenance procedures governing vital component work to determine whether there was any inconsistencies with the SCBA manufacturer's recommended practices. The inspectors evaluated whether SCBA cylinders satisfied the hydrostatic testing required by the U.S. Department of Transportation.

These inspection activities constituted one complete sample as defined in IP 71124.03–05.

b. Findings

No findings were identified.

.3 Problem Identification and Resolution (02.05)

a. Inspection Scope

The inspectors assessed whether problems associated with the control and mitigation of in-plant airborne radioactivity were being identified by the licensee at an appropriate threshold and were properly addressed for resolution. Additionally, the inspectors evaluated the appropriateness of the corrective actions for selected problems involving airborne radioactivity documented by the licensee.

These inspection activities constituted one complete sample as defined in IP 71124.03–05.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04)

.1 Source Term Characterization (02.02)

a. Inspection Scope

The inspectors evaluated whether the licensee had characterized the radiation types and energies being monitored and that the characterization included gamma, beta, hard-to-detect, and neutron radiation.

The inspectors assessed whether the licensee had developed scaling factors for including hard-to-detect nuclide activity in internal dose assessments.

These inspection activities constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

.2 External Dosimetry (02.03)

a. Inspection Scope

The inspectors evaluated whether the licensee's dosimetry vendor was National Voluntary Laboratory Accreditation Program accredited and if the approved irradiation test categories for each type of personnel dosimeter used were consistent with the types and energies of the radiation present and the way the dosimeter was being used.

The inspectors evaluated the onsite storage of dosimeters before their issuance, during use, and before processing/reading. For personal dosimeters stored on-site during the monitoring period, the inspectors evaluated whether they were stored in low-dose areas with control dosimeters. For personal dosimeters that are taken off-site during the monitoring period, the inspectors evaluated the guidance provided to individuals with respect to care and storage of the dosimeter.

The inspectors evaluated the calibration of active dosimeters. The inspectors assessed the bias of the active dosimeters compared to passive dosimeters and the correction factor used. The inspectors also assessed the licensee's program for comparing active and passive dosimeter results, investigations for substantial differences, and recording of dose. The inspectors assessed whether there were adverse trends for active dosimeters.

These inspection activities constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

.3 Internal Dosimetry (02.04)

a. Inspection Scope

The inspectors reviewed procedures used to assess internal dose using whole body counting equipment to evaluate whether the procedures addressed methods for differentiating between internal and external contamination, the release of contaminated individuals, the route of intake and the assignment of dose. The inspectors assessed whether the frequency of measurements was consistent with the biological half-life of the nuclides available for intake. The inspectors reviewed the licensee's evaluation for use of portal radiation monitors as a passive monitoring system to determine if instrument minimum detectable activities were adequate to detect internally deposited radionuclides sufficient to prompt additional investigation. The inspectors reviewed whole body counts and evaluated the equipment sensitivity, nuclide library, review of results, and incorporation of hard-to-detect radionuclides.

The inspectors reviewed procedures used to determine internal dose using in vitro analysis to assess the adequacy of sample collection, determination of entry route and assignment of dose.

The inspectors reviewed the licensee's program for dose assessment based on air sampling, as applicable, and calculations of derived air concentration. The inspectors determined whether flow rates and collection times for air sampling equipment were adequate to allow lower limits of detection to be obtained. The inspectors also reviewed the adequacy of procedural guidance to assess internal dose if respiratory protection was used.

The inspectors reviewed select internal dose assessments and evaluated the monitoring protocols, equipment, and data analysis.

These inspection activities constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

.4 Special Dosimetric Situations (02.05)

a. Inspection Scope

The inspectors assessed whether the licensee informs workers of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process to be used for declaring a pregnancy. The inspectors selected individuals who had declared pregnancy during the current assessment period and evaluated whether the monitoring program for declared pregnant workers was technically adequate to assess the dose to the embryo/fetus. The inspectors assessed results and/or monitoring controls for compliance with regulatory requirements.

The inspectors evaluated the licensee’s methods for calculating shallow dose equivalent from distributed skin contamination or discrete radioactive particles.

The inspectors evaluated the licensee's program for neutron dosimetry, including dosimeter types and/or survey instrumentation. The inspectors reviewed select neutron exposure situations and assessed whether dosimetry and/or instrumentation was appropriate for the expected neutron spectra, there was sufficient sensitivity, and neutron dosimetry was properly calibrated. The inspectors also assessed whether interference by gamma radiation had been accounted for in the calibration and whether time and motion evaluations were representative of actual neutron exposure events.

For the special dosimetric situations reviewed in this section, the inspectors assessed how the licensee assigned dose of record. This included an assessment of external and internal monitoring results, supplementary information on individual exposures, and radiation surveys and/or air monitoring results when dosimetry was based on these techniques.

These inspection activities supplemented those documented in NRC IR 05000331/2016004 and constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

.5 Problem Identification and Resolution (02.06)

a. Inspection Scope

The inspectors assessed whether problems associated with occupational dose assessment were being identified by the licensee at an appropriate threshold and were properly addressed for resolution. The inspectors assessed the appropriateness of the corrective actions for a selected sample of problems documented by the licensee involving occupational dose assessment.

These inspection activities constituted one complete sample as defined in IP 71124.04–05.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, and Occupational Radiation Safety

4OA1 Performance Indicator Verification (71151)

.1 Unplanned Scrams per 7000 Critical Hours

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Scrams per 7000 Critical Hours performance indicator (PI) for the period from the first quarter of 2016 through the fourth quarter of 2016. To determine the accuracy of the PI data reported during those

periods, PI definitions and guidance contained in the Nuclear Energy Institute (NEI) Document 99–02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, dated August 31, 2013, were used. The inspectors reviewed the licensee's operator narrative logs, condition reports, event reports and NRC Integrated Inspection Reports for the period of January 1, 2016, through December 31, 2016, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's condition report database to determine if any problems had been identified with the PI data collected or transmitted for this and none were identified. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one unplanned scrams per 7000 critical hours sample as defined in IP 71151–05.

b. Findings

No findings were identified.

.2 Unplanned Scrams with Complications

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Scrams with Complications PI for the period from the first quarter of 2016 through the fourth quarter of 2016. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99–02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, dated August 31, 2013, were used. The inspectors reviewed the licensee's operator narrative logs, condition reports, event reports and NRC Integrated Inspection Reports for the period of January 1, 2016, through December 31, 2016, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's condition report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator and none were identified. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one unplanned scrams with complications sample as defined in IP 71151–05.

b. Findings

No findings were identified.

.3 Unplanned Power Changes per 7000 Critical Hours

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Transients per 7000 Critical Hours PI for the period from the first quarter of 2016 through the fourth quarter of 2016. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99–02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, dated August 31, 2013, were used. The inspectors reviewed the licensee's operator narrative logs, condition reports, Maintenance Rule records, event reports and NRC Integrated Inspection Reports for the period of January 1, 2016, through December 31, 2016, to validate

the accuracy of the submittals. The inspectors also reviewed the licensee's condition report database to determine if any problems had been identified with the PI data collected or transmitted for this indicator and none were identified. Documents reviewed are listed in the Attachment to this report.

This inspection constituted one unplanned transients per 7000 critical hours sample as defined in IP 71151–05.

b. Findings

No findings were identified.

.4 Drill and Exercise Performance

a. Inspection Scope

The inspectors sampled licensee submittals for the Drill and Exercise Performance (DEP) Indicator for the period from the second quarter of 2016 through the fourth quarter of 2016. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in the NEI Document 99–02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the DEP indicator, in accordance with relevant procedures and NEI guidance. Specifically, the inspectors reviewed licensee records and processes, including procedural guidance on assessing opportunities for the PI; assessments of PI opportunities during pre-designated control room simulator training sessions; performance during the 2016 biennial exercise; and performance during other drills. Documents reviewed are listed in the Attachment to this report.

This inspection constitutes one DEP sample as defined in IP 71151.

b. Findings

No findings were identified.

.5 Emergency Response Organization Drill Participation

a. Inspection Scope

The inspectors sampled licensee submittals for the Emergency Response Organization (ERO) Drill Participation PI for the period from the second quarter 2016 through the fourth quarter 2016. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in NEI Document 99–02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the indicator, in accordance with relevant procedures and NEI guidance. Specifically, the inspectors reviewed licensee records and processes, including procedural guidance on assessing opportunities for the PI; participation during the 2016 biennial exercise and other drills; and revisions of the roster of personnel assigned to key ERO positions. Documents reviewed are listed in the Attachment to this report.

This inspection constitutes one ERO drill participation sample as defined in IP 71151.

b. Findings

No findings were identified.

.6 Alert and Notification System Reliability

a. Inspection Scope

The inspectors sampled licensee submittals for the Alert and Notification System (ANS) PI for the period from the second quarter of 2016 through the fourth quarter of 2016. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in NEI Document 99–02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, were used. The inspectors reviewed the licensee's records associated with the PI to verify that the licensee accurately reported the indicator, in accordance with relevant procedures and NEI guidance. Specifically, the inspectors reviewed licensee records and processes, including procedural guidance on assessing opportunities for the PI and results of periodic ANS operability tests. Documents reviewed are listed in the Attachment to this report.

This inspection constitutes one ANS sample as defined in IP 71151.

b. Findings

No findings were identified.

4OA2 Identification and Resolution of Problems (71152)

.1 Routine Review of Items Entered into the Corrective Action Program

a. Inspection Scope

As discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify they were being entered into the licensee's Corrective Action Program (CAP) at an appropriate threshold, adequate attention was being given to timely corrective actions, and adverse trends were identified and addressed. Some minor issues were entered into the licensee's CAP as a result of the inspectors' observations; however, they are not discussed in this report.

These routine reviews for the identification and resolution of problems did not constitute any additional inspection samples. Instead, by procedure they were considered an integral part of the inspections performed during the quarter.

b. Findings

No findings were identified.

4OA3 Follow-Up of Events and Notices

.1 (Closed) Licensee Event Report 05000331–001: Condition Prohibited by Technical Specification-Containment Vent and Purge Valve Leakage

a. Inspection Scope

On January 25, 2017, at 1800 CST, while operating at 100 percent power during planned surveillance testing, the volume between the containment purge valves was found to exceed its leakage integrity test limits. The licensee initially determined that the inboard containment purge valve was the likely source of the leakage and was the focus of repair efforts. After completion of repairs, post maintenance testing showed that the outboard containment purge valve was exceeding its valve leakage limits, and therefore, was declared inoperable at 0300 CST on January 26, 2017. This resulted in an apparent containment penetration flow path not within purge valve leakage limits and was reported pursuant to 10 CRF 50.72 (b)(3)(v)(C), any event or condition that at the time of discovery could have prevented the fulfillment of the safety function of structures or systems that are needed to control the release of radioactive material (EN 52511).

The inspectors reviewed maintenance work documents, surveillance testing results and discussed maintenance and testing activities with licensee personnel. Documents reviewed during this inspection are listed in the Attachment to this report.

This event follow-up review constituted one sample as defined in IP 71153.

b. Findings

A finding of very low safety significance and a non-cited violation of Technical Specification (TS) 3.6.1.3 are documented in Section 1R12 of this report.

4OA5 Other Activities

.1 (Closed) NRC Temporary Instruction 2515/192, “Inspection of the Licensee’s Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems"

a. Inspection Scope

The objective of this performance based Temporary Instruction is to verify implementation of interim compensatory measures associated with an open phase condition (OPC) design vulnerability in electric power system for operating reactors. The inspectors conducted an inspection to determine if the licensee had implemented the following interim compensatory measures. These compensatory measures are to remain in place until permanent automatic detection and protection schemes are installed and declared operable for OPC design vulnerability. The inspectors verified the following:

- The licensee had identified and discussed with plant staff the lessons-learned from the OPC events at the US operating plants including the Byron station OPC event and its consequences. This includes conducting operator training for promptly diagnosing, recognizing consequences, and responding to an OPC event.

- The licensee had updated plant operating procedures to help operators promptly diagnose and respond to OPC events on off-site power sources credited for safe shutdown of the plant.

- The licensee had established and continue to implement periodic walkdown activities to inspect switchyard equipment such as insulators, disconnect switches, and transmission line and transformer connections associated with the offsite power circuits to detect a visible OPC.

- The licensee had ensured that routine maintenance and testing activities on switchyard components have been implemented and maintained. As part of the maintenance and testing activities, the licensee assessed and managed plant risk in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.65(a) (4) requirements.

b. Findings and Observations

No findings of significance were identified. The inspectors verified the criteria were met.

4OA6 Management Meetings

.1 Exit Meeting Summary

On April 13, 2017, the inspectors presented the inspection results to Mr. D. Curtland, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

.2 Interim Exit Meetings

Interim exits were conducted for:

- The inspection results for the Radiation Safety Program review with Mr. D. Curtland, Director of Site Operations, on February 2, 2017; and
- The results of the Emergency Prepardness (EP) Program inspection with Mr. D. Curtland, Director of Site Operations, on February 9, 2017.

The inspectors confirmed that none of the potential report input discussed was considered proprietary. Proprietary material received during the inspection was returned to the licensee.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

D. Curtland, Site Director
P. Hansen, Site Engineering Director
M. Davis, Licensing Manager
M. Fritz, Emergency Preparedness Manager
J. Karrick, Quality Assurance Supervisor
M. Strope, Operations Director
R. Spading, Assistant Operations Manager
D. Morgan, Radiation Protection Manager
M. Casey, Chemistry Manager
J. Schwertfeger, Security Manager
C. Hill, Training Manager
B. Murrell, Licensing Senior Engineer
L. Swenzinski, Licensing Senior Engineer
T. Weaver, Senior Licensing Engineer
G. Hawkins, Site Engineering Manager
B. Lawrence, Site Engineering Manager
D. Westendorf, Engineering Supervisor
A. LaGrange, Senior Engineer
T. Moore, Associate Engineer

U.S. Nuclear Regulatory Commission

K. Stoedter, Chief, Reactor Projects Branch 1
M. Chawla, Project Manager, NRR

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000331/2017001–01	NCV	Inadequate Maintenance Instructions for Containment Purge Valves Led to Violation of Technical Specification 3.6.1.3 (Section 1R12)
05000331/2017001–02	NCV	Failure to Enter Technical Specification 3.6.1.3 for an Inoperable Outboard Containment Purge Valve (Section 1R15)
05000331/2017001–03	NCV	Failure to Incorporate Aspects of Vendor Manual into Self-Contained Breathing Apparatus Maintenance Procedure (Section 2RS3)

Closed

05000331/2017001–01	NCV	Inadequate Maintenance Instructions for Containment Purge Valves Led to Violation of Technical Specification 3.6.1.3 (Section 1R12)
05000331/2017001–02	NCV	Failure to Enter Technical Specification 3.6.1.3 for an Inoperable Outboard Containment Purge Valve (Section 1R15)
05000331/2017001–03	NCV	Failure to Incorporate Aspects of Vendor Manual into Self-Contained Breathing Apparatus Maintenance Procedure (Section 2RS3)
05000331/2017001–01	LER	Condition Prohibited by Technical Specification-Containment Vent and Purge Valve Leakage (Section 4OA3)
TI 2515/192		Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems (Section 4OA5)

Discussed

None.

LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspector reviewed the documents in their entirety, but rather that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

1R01 Adverse Weather Protection

- Abnormal Operating Procedure (AOP) 903; Severe Weather; Revision 59
- AOP 304; Grid Instability; Revision 45
- Operating Procedure (OP)-AA-102-1002; Seasonal Readiness; Revision 16
- ACP 101.16; Midwest ISO: Communication and Mitigation Protocols for Nuclear Plant/Electric System Interfaces (DAEC Site-Specific Information for RTO-OP-03); Revision 8
- ACP 1408.39; Severe Weather and Fires – Shelters, Evacuation, and Drills; Revision 6
- NG-269K; Tornado Missile Hazard Inspection; Revision 6
- CR 2187822; PDA Meteorology Rain Gauge Not Working
- CR 2189849; Grid Disturbance During Severe Weather
- CR 2189857; Entry in AOP 903 for Severe Thunderstorm Warning
- CR 2189870; Empty Cardboard Box on Admin Building Vestibule Roof

1R04 Equipment Alignment

- OI 730A4; Plant Chilled Water System Valve Lineup; Revision 17
- Drawing BECH-M169<3>; P.&I.D. Control BLDG. Chillers 1VCH001A and 1VCH001B; Revision 14
- Drawing BECH-M169<2>; P.&I.D. Control Building Cooling Chilled Water System; Revision 23
- CR 01688971; Trend – TCV6924A-O Hyd Fluid Present Around Actuator Shaft
- CR 02054695; TCV6924A-O: Hydraulic Fluid at Add Line
- CR 02074748; A Chiller TCV6924A-O Actuator Shaft Oil Leak
- CR 02099747; Upper Thrust Shaft Seal Assembly Leaking Oil
- OP-AA-102-1003; Guarded Equipment; Revision 7
- OI 324A1; SBDG 1G-31 System Electrical Lineup; Revision 3
- OI 324A3; SBDG 1G-31 System Valve Lineup and Checklist; Revision 12
- OI 454A2; 'A' Emergency Service Water System Valve Lineup and Checklist; Revision 16
- Drawing BECH-M132<1>; P. & I. D. Diesel Generator Systems; Revision 16
- Drawing BECH-M132<2>; P. & I. D. Diesel Generator Systems; Revision 16
- Drawing BECH-M132<3>; P. & I. D. Diesel Generator Systems; Revision 18
- Drawing BECH-M113; P. & I. D. RHR Service Water & Emergency Service Water Systems; Revision 76
- Drawing BECH-M146; P. & I. D. Service Water System Pumphouse; Revision 89
- OI 152; HPCI System; Revision 115
- OI 152A1; HCPI System Electrical Lineup; Revision 6
- OI 152A2; HCPI System Electrical Lineup; Revision 20
- Drawing BECH-M122; P. & I.D. HPCI System Steam Side; Revision 65
- Drawing BECH-M123: P. & I.D. HPCI System Water Side; Revision 46
- OI 730; CB HVAC System; Revision 121
- OI 730A1; Control Building HVAC System Electrical Lineup; Revision 3
- OI 730A2; Control Building Ventilation Compressed Air System Valve Lineup; Revision 4
- OI 730A3; Control Building Ventilation System Valve Lineup; Revision 7

- OI 730A6; Control Building HVAC System Control Panel Lineup; Revision 9
- Drawing BECH-M151; Control Building & TSC Air Flow Diagram; Revision 23
- Drawing BECH-M161; P. & I.D. Air Conditioning System Control Building; Revision 53
- OI 153; Standby Liquid Control System; Revision 43
- OI 153 QRC 1; SBLC Initiation; Revision 4
- OI 153A1; SBLC System Electrical Lineup; Revision 4
- OI 153A2; SBLC System Valve Lineup; Revision 6
- Drawing BECH-M126; P. & I.D. Standby Liquid Control System; Revision 26
- System Health Report; 52.00 – High Pressure Coolant Injection; Q1-2017
- CR 2193010; Packing Leak on 1P230B Standby Liquid Control Pump

1R05 Fire Protection

- ACP 1203.53; Fire Protection; Revision 11
- ACP 1412.4; Impairments to Fire Protection Systems; Revision 74
- ACP 1412.2; Control of Combustibles; Revision 46
  FHA-400; Fire Protection Program-Fire Hazards Analysis; Revision 17
- Pre-Fire Plan (PFP)-RB-786; Pre-Fire Plan Reactor Building Elevation 786; Revision 4
- PFP-CB-757; Pre-Fire Plan Reactor Building Elevation 757; Revision 3
- PFP-TB-734; Pre-Fire Plan Turbine Building Elevation 734; Revision 4
- PFP-RB-716; Pre-Fire Plan Reactor Building Elevation 716; Revision 3
- PFP-LL-757; Pre-Fire Plan LLRPSF Elevation 757; Revision 2
- PFP-MS-757; Pre-Fire Plan Machine Shop Building Elevation 757; Revision 0
- PFP-RW-757; Pre-Fire Plan Radwaste Building Elevation 757; Revision 0
- Fire in the 1XL31 Supply Transformer Room NG-002D; Revision 1

1R07 Annual Heat Sink Performance

- ER-AA-115; Balance of Plant Heat Exchangers; Revision 0
- WO 40407584; Perform [‘C’ RBCCW Heat Exchanger] Eddy Current Examination on Designated Tubes
- WO 40419657; MA Inspect & Clean Online for Eddy Current PMAR D
- CR 2191423; Tube Plugging Required 1E035C [‘C’ RBCCW Heat Exchanger]
- CR 2191298; Excessive Scale and Debris Found 1E035C [‘C’ RBCCW Heat Exchanger]
- Drawing BECH-M112; P.&I.D. Reactor Building Cooling Water System; Revision 35

1R11 Licensed Operator Requalification Program

- OP-AA-100-1000; Conduct of Operations; Revision 20
- OP-AA-103-1000; Reactivity Management; Revision 5
- AD-AA-100-1006; Procedure and Work Instruction Use and Adherence; Revision 12
- Reactivity Management Plan for February 2017
- Simulator Evaluation Guide 2017B-01E-A; Evaluated Scenario “A”

1R12 Maintenance Effectiveness

- ER-AA-100-2002; Maintenance Rule Program Administration; Revision 3
- NUMARC 93-01; Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants; Revision 4A
- PI-AA-104-1000; Condition Reporting; Revision 12
- CR 02179260; Breaker Did Not Close When Alternating Pumps
- CR 02179576; Level One Assessment: 1P209A Failure to Start

- DAEC Performance Criteria Basis Document Control Rod Drive (SUS 55.00, 56.01); Revision 2
- ER-AA-204-2006-10001; Functional Importance Determination and ER Scoping; Revision 0
- WO 40389727; CV4302: Replace T-Seal, O Rings and Numatics Valve
- WO 40389728; CV4302-0: Rebuild Valve Operator
- WO 40389729; CV4303: Replace T-Seal, O Rings and Numatics Valve
- WO 40389728; CV4303-0: Rebuild Valve Operator
- MA-AA-203-1001; Work Order Planning; Revision 8
- STP 3.3.3.1-06; Valve Position Indicator Verification-Shutdown; Revision 10
- MA-AA-203-1000; Maintenance Testing; Revision 7
- Valve-F-1301-01; Repair of 9200 Series Butterfly Valves; Revision 11
- CR 02165277; CV4302 Position Indicator Not Indicating Correctly
- CR 02175536; Potential for Missed Surveillance
- CR 02181809; Abnormal Leakage Discovered During STP 3.6.1.3-01
- CR 02181822; CV4303 T-Seal Pressure is at 40 psig Versus 90 psig
- CR 02181838; CV 4302 / CV 4303 Containment Purge Valves Exceeded Leakage Rate Allowance During Surveillance
- CR 02181838-02; Past Operability Review; CV 4302 / CV 4303 Containment Purge Valves Exceeded Leakage Rate Allowance During Surveillance

1R13 Maintenance Risk Assessments and Emergent Work Control

- Work Planning Guideline (WPG)-1; Work Process Guideline; Revision 65
- WPG-2; Online Risk Management Guideline; Revision 69
- WPG-4; Conduct of Readiness Challenge Reviews for Online Risk Activities; Revision 2
- WM-AA-100-1000; Work Activity Risk Management; Revision 9
- WM-AA-100-F01; Work Activity Risk Management; Revision 2
- OP-AA-104-1007; Online Aggregate Risk; Revision 4
- OP-AA-102-1003; Guarded Equipment; Revision 20
- AOP 411; GSW Abnormal Operation; Revision 29
- WO 40388168; UPS097: Replace Electrolytic Capacitors
- EC 285778; Temporary Power to IL097; Revision 0

1R15 Operability Determinations and Functionality Assessments

- EN-AA-203-1001; Operability Determinations/Functionality Assessments; Revision 20
  OP-AA-105-1000; Operational Decision-Making; Revision 1
- MA-AA-100-1011-F01; Initial Troubleshooting Investigation for CR 02064123 for MO2239 Loss of Position Indication; August 1, 2015
- ACP 1410.2; LCO Tracking and Safety Function Determination Program; Revision 33
- Drawing BECH-M151; P. & I. D. Control Building & TSC Air Flow Diagram; Revision 23
- CR 2189051; NRC Question TSC Doors Positive Pressure and Habitability
- CR 02179753; TC6924B Internal Memory Protection Battery Bad
- CR 02179967; TC6924B Battery Check
- I.ZC-M430-02; Siemens Moore Model 353 Process Automation Controllers; Revision 15
- CR 02182304; 1VEF013B Discharge Ductwork Separated
- CR 02182006; T-Seal Pneumatic Valve Plunger Found Not Fully Depressed
- CR 02185781; Battery Charger Capacity
- CR 02073455; 1D22 Float Equalize Switch Intermittent
- CR 02077420; Evaluate Appropriate Method to Verify SR 3.8.4.6-15 is Met
- WO 40412300; Repair 1D22 Float Equalize Switch

- BATTRY-P319-01; Battery Charger Test; Revision 40
- BATTRY-P319-01; Battery Charger Test; Revision 41

1R18 Plant Modifications

- EC 286738; Modification for Adding Oil to the Lube Make-Up Tanks (1T114A/B); Revision 0
- WO 40480908; V32-0276/7 Installed for 1T114B per EC 286738
- Drawing BECH-M132<1>; P. & I.D. Diesel Generator Systems; Revision 16
- OI 324A3; SBDG 1G-31 System Valve Lineup; Revision 13
- OI 324A4; SBDG 1G-21 System Valve Lineup; Revision 17
- HPP-3109.91; Operation of the J. L. Shepard Model 89 Calibrator; Revision 9

1R19 Post-Maintenance Testing

- STP 3.7.5-01B; 'B' Control Building Chiller Operability; Revision 5
- WO 40175066-01; Rebuild Operator, Replace Packing and Perform Post Maintenance Testing
- WO 40425379-01; AV6134B – Replace Based on Extent of Condition Review
- MA-AA-203-1000; Maintenance Testing; Revision 7
- MD-024; Post Maintenance Testing Program; Revision 83
- MD-062; Work Order Task(s); Revision 15
- WO 40462412; STP NS500001 RCIC System Leakage Inspection Walkdown
- WO 40482713; STP 3.5.3-02 RCIC System Operability Test – Null Voltage Test
- WO 40463712; STP 3.5.3-08 RCIC Water Keep Fill Test
- STP NS500001; RCIC System Leakage Inspection Walkdown; Revision 5
- STP 3.5.3-02; RCIC System Operability Test – Null Voltage Test; Revision 51
- STP 3.5.3-08; RCIC Water Keep Fill Test; Revision 7
- WO 40356037; 1K14 Compressor Auto Drain is Leaking Oil
- WO 40361424; 1K014: Inspect N2 Filters and Drain Valve
- BLOWER-I075-02 Section A; Inspection; Revision 13
- BLOWER-I075-02 Section B; Lubrication; Revision 11
- GMP-MECH-11; General Guidelines for Belt and Chain Drives; Revision 10
- WO 40409470; 1T117B Air Receiver Relief Valve
- STP NS590006; ASME OM Code Pressure Relief Valve Testing; Revision 20
- GMP-TEST-35 Section E; Relief Valve Test Bench Calibrating Instructions; Revision 2
- WO 40467505; 1G100/ENG: Inspect Engine
- GENERA-C170-01 Section A; Caterpillar TSC Standby Diesel Generator Engine Inspections; Revision 27
- WO 40457150; Replace 5kV Power Cable to 1P089B-M B GSW Pump Motor
- WO 40425689; 1A409: Inspect and Lube Breaker Only
- EC 287941; 'B' General Service Water Wetted Cable Replacement; Revision 0
- GMP-ELEC-09; Electrical Insulation Resistance Testing; Revision 26
- MOTOR-G080-02 Section D; General Electric Vertical Induction Motor Testing; Revision 4
- Drawing BECH-E005; Single Line Meter/Relay Diagram 4160; Revision 16
- CR 2193365; "B" GWS Baker Test Results
- WO 40212368; SUP: OPS Perform PMT V32-0097 Replacement
- OI 324; Standby Diesel Generator System; Revision 119

1R22 Surveillance Testing

- STP 3.5.1-05; HPCI System Operability Test; Revision 73
- CR 02179437; Unidentified Oil Leak on HPCI Stop Valve

- STP NS520001; HPCI System Leakage Inspection Walkdown; Revision 23
- STP 3.6.1.3-01; Containment Purge and Vent Valve Leakage Integrity Test; Revision 7
- ACP 107; Surveillance Tests; Revision 19
- OI 150; Reactor Core Isolation Cooling System; Revision 84
- STP 3.5.1-01A; 'A' Core Spray (CS) System Operability Test; Revision 23
- STP 3.5.1-12A; 'A' CS System Operability Test and Comprehensive Pump Test; Revision 19
- STP NS510002A; 'A' CS System Leakage Inspection Walkdown; Revision 9
- STP 3.1.7-01; SBLC Pump Operability Test; Revision 39
- STP NS530001; SBLC System Leakage Inspection; Revision 10
- GMP-TEST-48; Thermography Monitoring of DAEC Equipment; Revision 50
- STP 3.3.5.1-17B; Functional Test of 'B' Core Spray Pump and B/D RHR Pump Discharge Pressure – High Instrumentation; Revision 1

1EP2 Alert and Notification System Evaluation

- FEMA REP-10 Design Report Appendix P; Duane Arnold Energy Center Outdoor Warning System ANS Upgrade Project; January 6, 2009
- FEMA-43/REP-10 An Offsite Emergency Plan Prompt Alert and Notification System Addendum for Duane Arnold; November 1985
- FEMA Letter; Duane Arnold Route Alerting Approval Letter; December 17, 2012
- EPDM 1013; Emergency Siren ANS and Siren Sign Program; Revision 14
- GMP-ELEC-34; Annual Siren Inspection and Testing; Revision 5
- Annual Siren Inspection and Maintenance Records; 2015-2016
- Monthly Siren Test Results; February 2015 – February 2016
- CR 02023260; Siren 17E (2039) Reported Full Off; February 4, 2015
- CR 02038300; No Siren Reports First Quarter of 2015 – Siren Engineer; April 6, 2015
- CR 02129925; Siren 15E (2106) Reported Full Off; May 4, 2016
- CR 02158573; Siren 23R (2133) Has Been Overtaken by the Flood; September 27, 2016
- CR 02165590; Siren 23F (214) Reported Full Off; October 26, 2016
- CR 02177989; 3 Sirens Non-Functional During Monthly EP Siren Test; January 4, 2017

1EP3 Emergency Response Organization Staffing and Augmentation System

- NextEra Energy Duane Arnold On-Shift Staffing Analysis; December 20, 2012
- EPIP 6.1; Drill and Exercise Program; Revision 7
- EPDM 1016; ERO Augmentation Drill and Testing Program; Revision 21
- EPDM 1022; Manual ERO Callout Process; Revision 5
- EPDM Form EP-001; EP Communication Checks; July 2016 – December 2016
- EPDM Form EP-002; EP Facility Inventory and Administrative Checks; 1st Quarter – 4th Quarter 2016
- EPDM Form EP-006ERDS; ERDS Test Documentation; 1st Quarter – 4th Quarter 2016
- EPDM Form EP-006CR; Control Room Computer Checks; 1st Quarter – 4th Quarter 2016
- EPDM Form EP-006EOF; EOF Computer Checks; 1st Quarter – 4th Quarter 2016
- EPDM Form EP-006SIM; Simulator Control Room Computer Checks; 1st Quarter – 4th Quarter 2016
- EPDM Form EP-006JIC; JIC Computer Checks; 1st Quarter – 4th Quarter 2016
- EPDM Form EP-006TSC; TSC Computer Checks; 1st Quarter – 4th Quarter 2016
- TPD; Emergency Preparedness Training Program Description PDA EPR; Revision 2
- ERO Augmentation Call in Drill Reports; January 2015 – December 2016
- DAEC ERO Team Roster; January 31, 2017
- ERO Member Training/Qualification Records (Sample – 20 Records)
- CR 02099175; 2 Duty Personnel Did Not Call in for 4Q Call in Drill; December 23, 2015

- CR 02116737; EP Staff Augmentation LAR (TSCR-149); March 11, 2016
- CR 02147661; Ops Individual Has Not Met Proficiency Enhancing Drill/Exercise Requirement; August 3, 2016

1EP5 Maintenance of Emergency Preparedness

- DAEC Emergency Plan; Revision 37
- EP-AA-100-1001; Guidelines for Maintaining Emergency Preparedness; Revision 9
- EPIP 6.1; Drill and Exercise Program; Revision 7
- EPIP 6.2; Maintenance of Emergency Response Facilities and Equipment; Revision 5
- KLD-TR-529; Duane Arnold Energy Center Evacuation Time Estimate Study; Revision 1
- KLD Memorandum; Duane Arnold Energy Center Annual Population Update – 2016; October 12, 2016
- Emergency Action Plan, NextEra Energy Duane Arnold Energy Center (Public Information Notice); January 2017
- Emergency Action Plan For Visitors and Guests (Public Information Notice); January 2017
- PDA 15-017; DAEC Nuclear Oversight Report - Emergency Preparedness; July 24, 2015
- CR 2175497; Apparent Cause Evaluation Report: NRC Green Finding – Failure to Control an Emergency Preparedness Table Top; January 13, 2017
- NEP 2015-015; 2015 ERO Off-Year Evaluated Exercise Final Report; May 27, 2015
- NEP 2015-022; 2015 ERO Training Drill #2; October 2, 2015
- NEP 2015-023; 2015 ERO Training Drill #3; November 25, 2015
- NEP 2016-010; ERO Training Drill #1 Final Report; March 29, 2016
- NEP 2016-011; 2016 ERO Dress Rehearsal Drill Final Report; April 26, 2016
- NEP 2016-013; 2016 ERO Ingestion Pathway Exercise Final Report; June 2, 2016
- NEP 2016-015; 2016 ERO Training Drill #2 Final Report; September 26, 2016
- NEP 2016-019; 2016 ERO Training Drill #3 Final Report; December 22, 2016
- CR 2079828; Took Greater Than Five Minutes to Initiate ERO Activation; October 7, 2015
- CR 2079739; EP Inventory Checks Unsatisfactory Items; October 7, 2015
- CR 2057882; ERO Drill Attendance Tracking Issues; July 1, 2015
- CR 2064901; ERO Position Rad Support Staff Less Than Three for Staffing; August 5, 2015
- CR 2070153; Multiple Members of ERO Drill Team Didn't Attend TSC Brief; August 28, 2015
- CR 2094494; ERO Drill Report Not Issued Within 30 Days of the Drill; December 14, 2015
- CR 2103433; Boundary Change to the Emergency Planning Zone; January 18, 2016
- CR 2106860: EP Communications Checks Not Timely and EOF All Call Issue; February 1, 2016
- CR 2144625; EP Annual Performance Review Identified Weakness; July 19, 2016

1EP6

- Emergency Response Organization Training Drill; 17TD1; Revision 0
- CR 2188898; 17TD1 EOF Cat 1 Facility Performance
- CR 2190100; 17TD1 Unplanned E PAR Change

2RS3 In-Plant Airborne Radioactivity Control and Mitigation

- CR 2177208; Level 1 Assessment – NRC IP 71124.03 Inspection; January 24, 2017
- CR 2003044; SAQH & Preps for NRC Inspection Under IP 71124.03; December 16, 2015
- CR 2143785; AMS-4 Alarm During HPCI Surveillance; August 8, 2016
- CR 2164577; CAM Alarm on Refuel Floor; October 28, 2016
- CR 2056826; NRC Identified – Discrepancies Between User Manual and Site; January 21, 2016

- RP-AA-106; Respiratory Protection Program; Revision 0
- HPP 3106.03; Description and Issuance of Respiratory Protection Equipment; Revision 18
- HPP 3106.05; Breathing Air Quality Assurance Test; Revision 25
- STP NS180001; Instrument Air Quality Test; Revision 21
- ACP 1411.20; Respiratory Protection; Revision 38
- RP-AA-104-1000; ALARA Implementing Procedure; Revision 11
- LMS ID; PDA RENG 30005 01; Respiratory Protection Program; Revision 9
- LMS ID; PDA RENG 3005 02; Use, Maintenance, and Quality Assurance of Respiratory Devices; Revision 9
- LMS ID; PDA RENG 3005 03; Engineered Controls; Revision 8
- ProCheck3 Test Results; SCBA Unit 13; July 28, 2015
- ProCheck3 Test Results; SCBA Unit 13; August 18, 2016
- ProCheck3 Test Results; SCBA Unit 21; August 14, 2015
- ProCheck3 Test Results; SCBA Unit 21; August 23, 2016
- Operation and Instructions Manual; Mine Safety Appliance FireHawk M7 Air Mask; Revision 7
- HPP 3106.04; Inspection, Maintenance and Quality Assurance of Respiratory Protection Equipment. Revision 32
- CR 2183134; NRC Identified All Aspects of Vendor Manual Not in SCBA Procedure; February 1, 2017

2RS4 Occupational Dose Assessment

- CR 2116748; TLD to ED Dose Variance 2015-PDA Remains Top Quartile; June 8, 2016
- CR 2028468; Discrepancy Identified in 2013 REIRS Report; April 6, 2015
- CR 2180288; Verification of Scaling Factors per Upcoming NRC Inspection; January 25, 2017
- RP-AA-100; Radiation Protection Administrative Program; Revision 6
- RP-AA-101; Personnel Monitoring Program; Revision 2
- RP-AA-101-1001; Personnel Monitoring Device Issue; Revision 2
- HPP 3105.09; Personnel Dosimetry for External Exposure; Revision 31
- HPP 3105.06; Committed Effective Dose Equivalent Determinations Form DAC-Hours; Revision 6
- HPP 3104.02; Personnel Contamination Monitoring, Whole Body Counting and Decontamination; Revision 48
- RP-AA-102-1000; Alpha Monitoring; Revision 3
- HPP 3105.03; Shallow Dose Equivalent Assessment; Revision 15
- HPP 3105.02; Exposure Evaluation, Investigation, and Reporting; Revision 25
- Radiological Engineering Calculation NG-93-1691; Passive Internal Monitoring Program at the DAEC Revised; April 21, 1993
- Radiological Engineering Calculation NG-93-1692; Prospective Evaluation of the Need for Internal Monitoring at the DAEC Revised; April 21, 1993
- Radiological Engineering Calculation 02-001-A; Periodic Evaluation of the Passive Internal Monitoring Program at the Duane Arnold Energy Center; June 4, 2002

4OA1 Performance Indicator Verification

- DAEC MSPI Basis Document; Revision 17
- EPDM 1010; EP Department Performance Indicators; Revision 26
- NEI 99-02; Regulatory Assessment PI Guideline; Revision 7
- NRC Performance Indicator Data; Emergency Preparedness – Drill/Exercise Performance; 2nd Quarter 2016 through 4th Quarter 2016
- NRC Performance Indicator Data; Emergency Preparedness – ERO Readiness; 2nd Quarter 2016 through 4th Quarter 2016

- NRC Performance Indicator Data; Emergency Preparedness – Alert and Notification System Reliability; 2nd Quarter 2016 through 4th Quarter 2016

4OA2 Identification and Resolution of Problems

- OP-AA-100-1002; Plant Status Control Management; Revision 6
- PI-AA-100-1005; Root Cause Analysis; Revision 12
- PI-AA-100-1006; Common Cause Evaluation; Revision 9
- PI-AA-100-1007; Apparent Cause Evaluation; Revision 11
- PI-AA-103; Human Performance Program; Revision 4
- PI-AA-103-1000; Human Performance Program Error Reduction Tools; Revision 3
- PI-AA-104-1000; Corrective Action; Revision 5
- OP-AA-101-1000; Clearance and Tagging; Revision 10

4OA3 Follow-up of Events and Notices

- NUREG-1022; Event Report Guidelines; Revision 3
- Licensee Event Report 2017-001

4OA5 Other Activities

- AOP 301; Loss of Essential Electrical Power; Revision 71
- Lesson Plan 50008 2012B-01L; Large Transformer Reliability and AOP 301 Loss of Essential Electrical Power; Revision 1
- Auxiliary Logs; Revision 29
- GMP-Test-48; Thermographic Monitoring of DAEC Equipment; Revision 49
- IER 12-14; Automatic Reactor Scram Resulting from a Design Vulnerability in the 4.16-kv Bus Voltage Protection Scheme; Revision 1
- NG-12-0279; NextEra Energy Duane Arnold Response to IER L2-12-14 “Automatic Reactor Scram Resulting from a Design Vulnerability in the 4.16-kv Bus Voltage Protection Scheme”
- NG-14-0032; NextEra Energy Duane Arnold, LLC Response to Request for Additional Information Regarding NRC Bulletin 2012-01, Design Vulnerability in Electric Power System
- NG-12-0447; NextEra Energy Duane Arnold, LLC Response to NRC Bulletin 2012-01 Design Vulnerability in Electric Power System
- OI 304.2; 4160V/480V Essential Electrical Distribution System; Revision 96
- CR 01733532 Prompt Operability Determination: Potential Design Vulnerability in Switchyard, Plant Instrumentation Cannot Reliably Detect an Open Phase in the Supply to Startup and Standby Transformers; Revision 0

LIST OF ACRONYMS USED

ACP	Administrative Control Procedure
ADAMS	Agencywide Documents Access and Management System
ANS	Alert and Notification System
AOP	Abnormal Operating Procedure
CAP	Corrective Action Program
CB	Control Building
CFR	*Code of Federal Regulations*
CR	Condition Report
CS	Core Spray
DAEC	Duane Arnold Energy Center
DEP	Drill and Exercise Performance
DRP	Division of Reactor Projects
EC	Engineering Change
EP	Emergency Preparedness
ERO	Emergency Response Organization
GSW	General Service Water
HPCI	High Pressure Coolant Injection
HVAC	Heating, Ventilation, and Air Conditioning
IMC	Inspection Manual Chapter
IOD	Immediate Operability Determination
IP	Inspection Procedure
IR	Inspection Report
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LLRT	Local Leak Rate Test
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
OI	Operating Instruction
OP	Operating Procedure
OPC	Open Phase Condition
PCIV	Primary Containment Isolation Valve
PFP	Pre-Fire Plan
PI	Performance Indicator
psig	Pounds Per Square Inch Gauge
RBCCW	Reactor Building Closed Cooling Water
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
SBDG	Standby Diesel Generator
SBGT	Standby Gas Treatment
SBLC	Standby Liquid Control
SCBA	Self-Contained Breathing Apparatus
SDP	Significance Determination Process
SR	Surveillance Requirement
SSC	Structure, System, and Component
STP	Surveillance Test Procedure
TS	Technical Specification
TSC	Technical Support Center
UFSAR	Updated Final Safety Analysis Report

WO	Work Order
WPG	Work Planning Guideline