



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION III  
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May 9, 2013

Mr. Richard L. Anderson  
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NextEra Energy Duane Arnold, LLC  
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Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER – NRC INTEGRATED INSPECTION  
REPORT 05000331/2013002

Dear Mr. Anderson:

On March 31, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Duane Arnold Energy Center. The enclosed report documents the results of this inspection, which were discussed on April 11, 2013, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, three NRC-identified and two self-revealed findings of very low safety significance were identified. The findings involved violations of NRC requirements. However, because of their very low safety significance, and because the issues were entered into your corrective action program, the NRC is treating the issues as non-cited violations (NCVs) in accordance with Section 2.3.2 of the NRC Enforcement Policy. Additionally, a licensee-identified violation is listed in Section 4OA7 of this report.

If you contest the subject or severity of any (NCV) in this report, 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 a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Duane Arnold Energy Center. In addition, if you disagree with the cross-cutting aspect assigned to any finding 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 Regional Administrator, Region III, and the NRC Resident Inspector at the Duane Arnold Energy Center.

R. Anderson

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In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Robert J. Orlikowski, Acting Chief  
Branch 1  
Division of Reactor Projects

Docket No. 50-331  
License No. DPR-49

Enclosure: Inspection Report 05000331/2013002  
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No: 50-331  
License No: DPR-49

Report No: 05000331/2013002

Licensee: NextEra Energy Duane Arnold, LLC

Facility: Duane Arnold Energy Center

Location: Palo, IA

Dates: January 1 through March 31, 2013

Inspectors: L. Haeg, Senior Resident Inspector  
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Approved by: Robert J. Orlikowski, Acting Chief  
Branch 1  
Division of Reactor Projects

Enclosure

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## SUMMARY OF FINDINGS

Inspection Report (IR) 05000331/2013002, 01/01/2013 – 03/31/2013; Duane Arnold Energy Center; Component Design Bases Inspection; In-Plant Airborne Radioactivity Control and Mitigation; Identification and Resolution of Problems; and Follow-Up of Events and Notices of Enforcement Discretion.

This report covers a three-month period of inspection by resident inspectors and announced baseline inspections by regional inspectors. Three Green findings were identified by the inspectors and two findings were self-revealed. The findings were considered NCVs of NRC regulations. 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" (SDP) dated June 2, 2011. Cross-cutting aspects are determined using IMC 0310, "Components Within the Cross Cutting Areas" dated October 28, 2011. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated January 28, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process" Revision 4, dated December 2006.

### A. NRC-Identified and Self-Revealed Findings

#### Cornerstone: Initiating Events

- Green. A finding of very low safety significance and associated non-cited violation of Technical Specification (TS) 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Required Action A, was self-revealed on December 1, 2012, for the licensee's failure to place inoperable average power range monitors (APRMs) C and D in trip within 12 hours. Specifically, the licensee failed to identify a failed mode switch contact for local power range monitor (LPRM) 32-25A that rendered Surveillance Requirement (SR) 3.3.1.1.8 not met for periods when APRMs C and/or D were in service between November 27 and December 1, 2012; a condition prohibited by TS. The licensee entered the issue into the corrective action program (CAP) as condition report (CR) 01828842. Immediate corrective actions included bypassing APRMs C and D on December 1, 2012, bypassing LPRM 32-25A, and repairing the failed mode switch. Additional corrective actions included revisions to plant operating instructions to require removal of LPRMs from service if they are found to not be tracking with other LPRMs in service.

The inspectors determined that failing to properly evaluate the APRM operability impact of LPRM 32-25A indications on November 27, 2012, represented a performance deficiency because it was the result of the licensee's failure to meet a TS requirement, and the cause was reasonably within the licensee's ability to foresee and correct and should have been prevented. The performance deficiency was determined to be more than minor and a finding because, if left uncorrected, failing to properly evaluate the operability of APRMs would have the potential to lead to a more significant safety concern. The inspectors applied IMC 0609.04, "Initial Characterization of Findings," to this finding. Because the inspectors answered "No" to questions A through E in Table 3, the inspectors referenced IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." Because the inspectors answered "No" to the applicable Section B (Transient Initiators) question under Exhibit 1 (Initiating Events Screening Questions) and "No" to applicable questions 1-3 under Section C (Reactivity

Control Systems) of Exhibit 2 (Mitigating Systems Screening Questions), the finding screened as very low safety significance (Green). The inspectors determined that the performance characteristic of the finding that was the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Human Performance, having Decision Making components, and involving the licensee making safety-significant decisions using a systematic process, especially when faced with uncertain or unexpected plant conditions, to ensure safety is maintained. Specifically, decisions regarding the operability impact of the degraded LPRM 32-35A indications were not made using the systematic operability evaluation procedure or other formal processes to include interdisciplinary input and reviews of the decision. [H.1(a)] (Section 4OA3.2)

### **Cornerstone: Mitigating Systems**

- Green. A finding of very low safety significance (Green) and associated non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was self-revealed on October 12, 2012, for the licensee's failure to meet corrective action program procedural requirements associated with the correction of a contributing cause and the evaluation of the extent of condition of potentially submerged, degraded, and non-conforming safety-related electrical cables. The licensee entered the issue into the CAP as CR 01824467. Planned corrective actions included creating a cable monitoring program, establishing periodic inspections and dewatering of embedded conduits, and establishing periodic insulation resistance testing of safety-related electrical cables located within embedded conduits.

The inspectors determined that failing to meet corrective action program procedural requirements represented a performance deficiency because it was the result of the licensee's failure to meet a regulatory requirement, and the cause was reasonably within the licensee's ability to foresee and correct and should have been prevented. The performance deficiency was determined to be more than minor and a finding because, if left uncorrected, failing to correct the contributing causes and evaluate the extent of condition of conditions adverse to quality would have the potential to lead to a more significant safety concern. The inspectors applied IMC 0609.04, "Initial Characterization of Findings," to this finding. Because the finding pertained to an event while the plant was shut down, Table 3 instructed reference of IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process." Because the finding did not require a quantitative assessment, the finding screened as very low safety significance (Green). The inspectors determined that the performance characteristic of the finding that was the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Problem Identification and Resolution, having Corrective Action Program components, and involving the licensee thoroughly evaluating problems such that the resolutions address causes and extents of conditions, as necessary, including, for significant actions, conducting effectiveness reviews of corrective actions to ensure that the problems are resolved. Specifically, the licensee inappropriately postponed, cancelled, or closed significant corrective actions that likely would have identified and promptly resolved additional instances of submerged degraded and non-conforming safety-related electrical cables. [P.1(c)] (Section 4OA2.3)

- Green. A finding of very low safety significance (Green) and associated non-cited violation 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors for the failure to ensure the low pressure coolant injection (LPCI) mode of operation of residual heat removal (RHR) would be capable of performing its mitigating function while in Mode 3 following a postulated loss of coolant accident (LOCA). The licensee documented the issue in the CAP as CRs 01625023, 01626334, and 01776321. Corrective actions included the development of mitigating actions to manually realign RHR to LPCI mode should a LOCA occur while in Mode 3 to ensure system operability.

The performance deficiency was determined to be more than minor because the finding was associated with Mitigating System Cornerstone attribute of Equipment Performance and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, under the postulated conditions, steam voiding could occur within the RHR system and impact the ability of LPCI to respond during a postulated Mode 3 LOCA. The finding required a Phase II SDP evaluation because the operability of the LPCI system was determined to be impacted. Based on the Phase II SDP risk-analyses and SAPHIRE analysis developed by the regional senior risk analyst (SRA), the inspectors determined the finding was of very low safety significance. The inspectors determined this finding had a cross-cutting aspect in the area of Problem Identification and Resolution, having Operating Experience (OE) components, and involving the licensee systematically collecting and evaluating relevant internal and external OE. Specifically, the licensee's evaluation of Information Notice 2010-11 did not result in a detailed evaluation for potential issues related to the OE. [P.2(a)] (Section 1R21)

#### **Cornerstone: Barrier Integrity**

- Green. The inspectors identified a finding of very low safety significance (Green) and associated non-cited violation of 10 CFR 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to conduct post maintenance testing in accordance with procedure Maintenance Directive (MD)-024, "Post-Maintenance Testing," following maintenance on secondary containment damper 1VAD017B1. Specifically, the testing that the licensee performed was not adequate to verify that the damper could perform its intended function and resulted in the damper subsequently failing in service. The licensee entered the issue into their CAP as CR 01862900. Immediate corrective actions included declaring secondary containment inoperable, determining if any other dampers were not fully closed (none were identified), and rebuilding and retesting damper 1VAD017B1.

The performance deficiency was determined to be more than minor because it was associated with the Barrier Integrity Cornerstone attribute of Procedure Quality and adversely affected the cornerstone objective of ensuring that physical design barriers (secondary containment) protect the public from radionuclide releases caused by accidents. The finding screened as having very low safety significance (Green) because it represented a degradation of the radiological barrier provided for the secondary containment building and the inspectors answered "No" to Questions B.1 and B.2 in IMC 0609, Appendix A, Exhibit 3, "Barrier Integrity Screening Questions." The inspectors determined that the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Problem Identification and Resolution, having Corrective Action Program Components, and involving the licensee

thoroughly evaluating problems such that the resolutions address causes and extent of conditions, as necessary. Specifically, for the damper of concern, the licensee did not implement corrective actions from root cause evaluation (RCE) 01739467, which stated "Create a maintenance procedure for rebuilding and adjusting secondary containment dampers and operators that directs the following: provide guidance on adjusting over travel of damper blades [aka stop rod adjustment]," and "limit switch verification." [P.1(c)] (Section 4OA2.4)

### **Cornerstone: Occupational Radiation Safety**

- Green. A finding of very low safety significance and associated non-cited violation of 10 CFR 20.1703 was identified by the inspectors on January 18, 2013, for the licensee's failure to implement and maintain written procedures regarding breathing air quality and self-contained breathing apparatus (SCBA) inspections. These issues were entered into the licensee's CAP as CRs 01840046, 01839697, and 01839666. Corrective actions included air quality tests that were subsequently performed resulting in Grade "D" or better, and completing breathing air and monthly SCBA inspections. Additionally, the licensee was in the process of establishing a tracking mechanism to ensure these tests and inspections were appropriately scheduled for completion.

The inspectors determined that not consistently performing the Grade "D" air quality tests or SCBA monthly inspections 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 performance deficiency was determined to be of more than minor safety significance because if left uncorrected, not performing testing of breathing air quality and SCBAs would have the potential to lead to a more significant safety concern. In accordance with IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the inspectors determined that the finding had very low safety significance (Green) because the finding did not involve: (1) as-low-as-is-reasonably-achievable (ALARA) planning and controls, (2) a radiological overexposure, (3) a substantial potential for an overexposure, or (4) a compromised ability to assess dose. The inspectors determined that the performance characteristic of the finding that was the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Human Performance, having Work Practices components, and involving the licensee ensuring supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported. Specifically, ownership and accountability to perform air quality testing was not well established or controlled within the work schedule process to ensure the tests would be performed as required. [H.4(c)] (Section 2RS3.3)

### **B. Licensee-Identified Violations**

A violation of very low safety significance that was identified by the licensee has been reviewed by inspectors. Corrective actions planned or taken by the licensee have been entered into the licensee's corrective action program. The violation and corrective action tracking numbers are listed in Section 4OA7 of this report.



## **REPORT DETAILS**

### **Summary of Plant Status**

Duane Arnold Energy Center (DAEC) operated at full power for the entire inspection period except for brief down-power maneuvers to accomplish rod pattern adjustments or to conduct planned surveillance testing activities.

#### **1. REACTOR SAFETY**

##### **Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity**

##### **1R01 Adverse Weather Protection (71111.01)**

###### **.1 Readiness for Impending Adverse Weather Condition – Heavy Snowfall Conditions**

###### **a. Inspection Scope**

On March 5, 2013, a winter weather advisory was issued for expected heavy snow fall in the vicinity of the plant. The inspectors observed the licensee's preparations and planning for the significant winter weather potential. The inspectors reviewed licensee procedures and discussed potential compensatory measures with control room personnel. The inspectors focused on plant management's actions for implementing the station's procedures for ensuring adequate personnel for safe plant operation and emergency response would be available. The inspectors conducted a site walkdown including walkdowns of various plant structures and systems to check for maintenance or other apparent deficiencies that could affect system operations during the predicted significant weather. The inspectors also reviewed CAP items to verify that the licensee was identifying adverse weather issues at an appropriate threshold and entering them into their 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 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:

- Core spray system during 'C' and 'D' RHR pump maintenance;
- 'A' standby diesel generator (SBDG) and 'A' emergency service water (ESW) during reactor core isolation cooling (RCIC) maintenance;
- Fuel pool cooling system with time-to-boil less than 72 hours; and

- Division I and II 4160/480/120 VAC essential power systems with LPCI 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, the Updated Final Safety Analysis Report (UFSAR), TS requirements, outstanding work orders (WOs), 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 inspections constituted four quarterly 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 January 17, 2013, the inspectors performed a complete system alignment inspection of the fire protection system 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.

This inspection constituted one semi-annual 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:

- Area Fire Plan (AFP) 03; Reactor Building High Pressure Coolant Injection (HPCI), RCIC & Radwaste Tank Rooms;
- AFP 04; North CRD Module Area, and CRD Repair Room EL. 757'-6";
- AFP 05; South CRD Module Area, Off-Gas Recombiner Room, and Railroad Airlock EL. 757'-6";
- AFP 06; Reactor Building RHR Valve Room EL. 757'-6"; Revision 24; and
- AFP 09; Reactor Building Closed Cooling Water (RBCCW) Heat Exchanger Area, Equipment Hatch Area, and Jungle Room EL. 812'-0".

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. 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 inspections constituted five quarterly fire protection 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 March 5, 2013, the inspectors observed a fire brigade activation for an announced fire drill. 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 fire fighting 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.

This inspection constituted one annual fire protection drill observation sample as defined in IP 71111.05-05.

b. Findings

No findings were identified.

1R06 Flooding (71111.06)

.1 Internal Flooding

a. Inspection Scope

The inspectors reviewed selected risk important plant design features and licensee procedures intended to protect the plant and its safety-related equipment from internal flooding events. The inspectors reviewed flood analyses and design documents, including the UFSAR, engineering calculations, and abnormal operating procedures to identify licensee commitments. In addition, the inspectors reviewed licensee drawings to identify areas and equipment that may be affected by internal flooding caused by the failure or misalignment of nearby sources of water, such as the fire suppression or the circulating water systems. The inspectors also reviewed the licensee's corrective action documents with respect to past flood-related items identified in the corrective action program to verify the adequacy of the corrective actions. The inspectors performed a walkdown of the following plant area to assess the adequacy of watertight doors and verify drains and sumps were clear of debris and were operable and that the licensee complied with its commitments:

- Reactor building, with focus on areas containing automatic fire suppression systems.

Documents reviewed are listed in the Attachment to this report.

This inspection constituted one internal flooding sample as defined in IP 71111.06-05.

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 February 12 and 19, 2013, the inspectors observed crews of licensed operators in the plant's simulator during licensed operator requalification training to verify that operator performance was adequate, evaluators were identifying and documenting crew performance problems, and training was being conducted in accordance with licensee procedures. The inspectors evaluated the following areas of the crew:

- licensed operator performance;
- 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 of Heightened Activity or Risk (71111.11Q)

a. Inspection Scope

On March 25 and 26, 2013, the inspectors observed the control room operators during an infrequently performed test or evolution; 'A' primary containment isolation system (PCIS) groups 2 and 4 logic system functional test (LSFT), and 'A' SBDG fast start surveillance test procedure (STP), respectively. These were activities that required heightened awareness or were related to increased risk. The inspectors evaluated the following areas of the crew:

- licensed operator performance;
- 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 procedures;
- control board manipulations;
- oversight and direction from supervisors; and
- ability to identify and implement appropriate TS actions.

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 (71111.12Q)

a. Inspection Scope

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

- Reactor protection system;
- Neutron monitoring system; and
- SBDG lube oil heat exchanger tube bundle replacements.

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 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 three quarterly maintenance effectiveness samples as defined in IP 71111.12-05.

b. Findings

(1) Unresolved Item (URI) 05000331/2013002-01: 'A' Standby Diesel Generator Lube Oil Heat Exchanger Gasket Failure

Introduction: An unresolved item was identified by the inspectors for issues of concern associated with the catastrophic failure of the 'A' SBDG lube oil heat exchanger gasket on March 8, 2013. Specifically, during a maintenance run on March 7, 2013, with the 'A' SBDG considered inoperable for embedded cable inspections, the lube oil heat exchanger channel head gasket developed an initial 2-3 drop-per-minute (dpm) lube oil leak that increased to 60 dpm. Following completion of the maintenance run, the licensee verified minimum acceptable torque of the channel head fasteners and re-started the 'A' SBDG with the intention of increasing the torque on the fasteners in an attempt to minimize or eliminate the leak. Within minutes of starting the 'A' SBDG, the gasket catastrophically failed and resulted in a significant oil leak that required local manual shutdown of the engine.

At the end of the inspection period, the licensee was in the process of investigating the cause of the gasket failure. In order to close this URI, the inspectors need to determine whether a performance deficiency existed associated with the issues of concern, i.e. whether the cause of the 'A' SBDG gasket condition was the result of the failure to meet a requirement or standard, and whether the issue of concern was within the licensee's ability to foresee and correct, and should have been prevented.

Description: During the Duane Arnold fall 2012 refueling outage, a licensee vendor performed replacements of the 'A' and 'B' SBDG lube oil heat exchanger tube bundle assemblies as part of preventive maintenance activities under WOs 40132858 and 40132849, respectively. These activities included disassembly of the lube oil heat exchangers, removal of the existing tube bundles, installation of the new tube bundles, and reassembly of heat exchangers. Both SBDGs successfully passed TS surveillance testing as part of the work coming out of the refueling outage.

On March 7, 2013, the licensee removed the 'A' SBDG from service to perform embedded cable inspections associated with the SBDG. Following these inspections, the licensee performed a required one hour post-maintenance run on March 8, 2013, and identified a 2-3 dpm leak from the lube oil heat exchanger to channel head flange. Because small leaks are not abnormal until engine temperatures normalize after the engine is loaded, the licensee continued with the maintenance run. Throughout the course of the maintenance run, the leak increased to approximately 60 dpm and was constant at the time the engine was secured. Following completion of the maintenance run, the licensee verified minimum acceptable torque of the channel head fasteners and re-started the 'A' SBDG with the intention of increasing the torque on the fasteners to attempt to minimize or eliminate the leak. Within a few minutes of starting the 'A' SBDG, the gasket catastrophically failed, resulting in a significant lube oil leak and spray, and requiring a local manual shutdown of the engine. The licensee declared the 'A' SBDG unavailable and remained in the seven day shutdown limiting condition for operation (LCO), performed an evaluation to rule out a common cause concern for the 'B' SBDG (no prior leaks, acceptable visual inspection, review of past assembly and torque

application). On March 9, 2013, the licensee replaced the 'A' SBDG lube oil heat exchanger gasket and declared the engine operable on March 10, 2013, following a successful maintenance run and TS surveillance test. The licensee generated CR 01855032 to evaluate the past operability, reportability, and root cause of the 'A' SBDG lube oil heat exchanger gasket failure.

The inspectors noted several issues of concern associated with the as-installed gasket material, adequacy of the gasket installation work order performed during the fall 2012 refueling outage, bolting/torque practices and training, and vendor oversight. However, the licensee's evaluation of the cause of the gasket failure was not complete at the end of the inspection period. Based on the unresolved questions surrounding the cause of the gasket failure, the inspectors did not have enough information at the end of the inspection period to screen the issues of concern using IMC 0612, Appendix B, "Issue Screening." The inspectors presented the unresolved item to the licensee at the exit meeting. Once the licensee determines the cause of the gasket failure, the inspectors will be able to determine whether any performance deficiencies existed and close this URI (**URI 05000331/2013002-01, 'A' Standby Diesel Generator Lube Oil Heat Exchanger Gasket Failure**).

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:

- 161 kV west bus lockout planned work and testing;
- Offgas system pressure transient;
- 'B' moisture separator drain tank drain valve found closed, feedwater temperature transient, and troubleshooting;
- Work Week 1305; and
- 'A' SBDG lube oil heat exchanger gasket repair.

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 are listed in the Attachment to this report.

These inspections constituted five maintenance risk assessments and emergent work control 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:

- Failure of CV-4300, drywell nitrogen vent/purge valve t-seal to fully inflate during testing;
- Impending failure of rod position indication system power supply;
- Failure of 'B' control building chiller to start; and
- 'C' RHR pump upper bearing oil particulates.

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 the 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.

These inspections constituted four operability evaluation samples as defined in IP 71111.15-05.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

a. Inspection Scope

The inspectors reviewed the following modification:

- Replacement of 1B4206, 'A' SBDG room fan breaker.

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 one permanent plant modification sample 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:

- HPCI operability test following planned maintenance;
- Testing of 'B' SBDG following receipt of generator field ground annunciator;
- Testing of 'B' SBDG room fan following breaker replacement;
- RCIC operability test following planned maintenance; and
- 'C' RHR pump upper bearing replacement.

These activities were selected based upon the SSCs 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 the TS, the UFSAR, 10 CFR Part 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.

These inspections constituted five post-maintenance testing samples as defined in IP 71111.19-05.

b. Findings

No findings were identified.

1R21 Component Design Bases Inspection (71111.21)

a. Inspection Scope

The inspectors reviewed URI 05000331/2011009-04 opened during the 2011 Component Design Bases Inspection (CDBI) following receipt of further evaluations performed by the licensee pertaining to the issue of concern.

This review did not constitute an additional component design bases inspection sample as defined in IP 71111.21-05.

b. Findings

(1) (Closed) Unresolved Item (05000331/2011009-04(DRS)): Failure to Ensure Operability of Low Pressure Coolant Injection Following a Postulated LOCA in Mode 3

Introduction: A finding of very low safety significance (Green) and associated NCV 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified by the inspectors for the failure to ensure that the LPCI mode of operation of RHR would be capable of performing its mitigating function in Mode 3 following a postulated LOCA.

Description: During the 2011 CDBI, the inspectors identified that the RHR system could experience flash evaporation during a rapid system depressurization while in Mode 3. The inspectors were concerned this condition could lead to steam binding the safety-related RHR pumps and/or an adverse water hammer event following RHR system realignment from shutdown cooling to the LPCI mode of operation. Because the analysis required to resolve the concern was not completed prior to the end of the CDBI inspection, the inspectors opened a URI in order to track the resolution of this issue.

Technical Specification 3.5.1 required the emergency core cooling systems, including LPCI, to be operable during Mode 3. The TS also stated the LPCI system may be considered operable during alignment and operation for decay heat removal in Mode 3, if it was capable of being manually realigned and not otherwise inoperable.

As part of the scenario review for the postulated LOCA during Mode 3 operation, the inspectors reviewed Operating Instruction (OI) 149, "Residual Heat Removal System," and observed a simulator exercise requiring the operators to transfer a portion of the LPCI/RHR System from decay heat removal mode to LPCI injection mode per OI 149, Section 5.2, "LPCI Initiation While in Shutdown Cooling." Based on this review, the inspectors noted this operational sequence would involve isolation of the LPCI/RHR pumps being used for decay heat removal followed by the realignment of the LPCI/RHR system for injection. Based on review of OI 149 and discussions with operations department personnel, the inspectors also determined that this isolation and realignment would be performed whether the LPCI/RHR pumps were required for injection or not. The inspectors determined that this portion of the LPCI/RHR system, including two RHR pumps, could be isolated while at elevated pressure and temperature (potentially greater than 100 psig and 300°F). The realignment of the LPCI/RHR system for injection following a postulated LOCA could result in steam voiding of the piping and/or pumps

when the isolation valves were reopened under lower pressure conditions. Steam voiding could potentially cause damage to the LPCI system suction and discharge piping, as well as the pumps.

The inspectors noted that at the time of the CDBI, operating experience associated with this issue was discussed in Information Notice 2010-11, "Potential for Steam Voiding Causing Residual Heat Removal System Operability," and had recently been issued based on similar concerns at several pressurized water reactors. The licensee's review, however, did not result in a detailed evaluation of this potential issue. This was a missed opportunity for the licensee to evaluate this condition.

As a result, the inspectors questioned if the LPCI system would actually be operable under the aforementioned conditions. In response to this concern, the licensee performed preliminary analyses and concluded that the trapped fluid could contain sufficient energy to form steam within the system. However, this analysis did not evaluate the potential impact of steam voiding on system operability. The licensee initiated CR 01625023 to perform additional evaluations to determine if the potential steam voiding could cause damage to the system and/or impact system operability.

As a result of the original URI, the licensee performed additional evaluations, including CAL-M12-019, "DAEC [Duane Arnold Energy Center] LOCA in Shutdown Cooling Mitigating Actions Evaluation." The inspectors reviewed the results of the above mentioned evaluation and discussed with the licensee their current and pending actions to resolve the inspector's concerns. Based on the result of the evaluation, the licensee implemented necessary mitigating actions to manually realign RHR to LPCI mode during a postulated Mode 3 LOCA to ensure system operability. Procedure OI 149 was also revised to include these mitigating actions. Because the issue was common to other BWRs, further analyses and actions are being coordinated through the BWR Owners Group.

Analysis: The inspectors determined that the failure to ensure that the LPCI mode of operation of RHR would be capable of performing its mitigating function while in Mode 3 was contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," and was a performance deficiency. The performance deficiency was determined to be more than minor because the finding was associated with the Mitigating System Cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the design of RHR did not ensure that the LPCI mode of operation would be capable of performing its mitigating function during a postulated Mode 3 LOCA. Steam voids would likely form when transitioning from shut down cooling to the LPCI mode of operation in Mode 3, and could result in air binding the pumps and/or water-hammer events. This condition was not analyzed.

The inspectors used IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process," Checklist 5, "BWR Hot Shutdown: Time to Boil < 2 Hours RHR in Operation" to evaluate the significance of the finding. The finding required a Phase II SDP evaluation because it degraded the licensee's ability to add RCS inventory when needed since the RHR train in operation was presumed to fail if realigned from the shutdown cooling mode to the RCS injection mode. The exposure time for this finding was assumed to be less than 3 days.

An NRC Region III SRA performed a Phase II SDP evaluation using IMC 0609, Appendix G, Attachment 3, Worksheet 1, "SDP Worksheet for a BWR Plant – Loss of Inventory in POS 1 (Head On)." The SRA determined that the manual low pressure injection function was potentially affected by the finding. However, the SRA determined that since one full train of RHR and the low pressure core spray system were unaffected, credit for manual injection would remain unchanged. The initiating event frequency was determined to be a "4" given the short exposure period. The affected sequences were solved and the result was a delta core damage frequency (CDF) less than 1.0E-6/yr. The dominant sequence was a loss of inventory followed by a failure of manual injection of low and high pressure injection systems.

The SRA also performed the analysis using SAPHIRE Version 8.0.7.18 and the Duane Arnold Standardized Plant Analysis Risk (SPAR) model (Version 8.18). The increase in CDF was analyzed assuming the safety function of LPCI during design basis LOCAs was lost. The SRA performed a bounding assessment for the change in CDF by setting all four RHR/LPCI pumps fail-to-run values to "True" (i.e., failed) and solving the LOCA scenarios. The resultant delta CDF was 8.9E-8/yr for an exposure time of one year.

Based on the risk-analyses described above, the inspectors determined that the finding was of very low safety significance (Green).

The inspectors determined this finding had a cross-cutting aspect in the area of problem identification and resolution because the licensee did not thoroughly evaluate relevant external operating experience. Specifically, the licensee's evaluation of IN 2010-11 did not result in a detailed evaluation for potential issues related to the OE. [P.2(a)].

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control" requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2 and as specified in the license application, for those SSCs to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions. In addition it states, the design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program.

Contrary to the above, prior to July 16, 2012, the licensee failed to verify or check for adequacy the design of the RHR system to ensure potential flashing and subsequent water hammer events would not prevent the LPCI system from meeting its designed safety function. Because of this, the licensee did not correctly translate applicable regulatory requirements and the design basis into specifications and procedures. Specifically, the safety-related design function of ensuring that LPCI would be capable of responding during a postulated Mode 3 LOCA, as required by TS 3.5.1, were not translated into Procedure OI 149, "Residual Heat Removal System." The licensee implemented corrective actions as described above. Because this violation was of very low safety significance and it was entered into the licensee's CAP as CR 01625023, CR 01626334, and CR 01776321, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy  
**(NCV 05000331/2013002-02, Failure to Ensure Operability of Low Pressure Coolant Injection Following a Postulated LOCA in Mode 3).**

## 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 3.6.4.3-03B; 'B' Standby Gas Treatment System High-Efficiency Particulate Air (HEPA) and Charcoal Filter Efficiency Tests (Routine);
- STP 3.3.6.1-06; PCIS Main Steam Line Isolation LSFT (Routine);
- STP 3.3.5.1-37; RHR LSFT – Operating (Routine);
- STP 3.3.8.1-02A; 1A3 4kV Emergency Bus Degraded Voltage Calibration (Routine); and
- STP NS590009; American Society of Mechanical Engineers (ASME) Operation and Maintenance Code Thermal Relief Valve Testing; (Inservice Test).

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 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 the TS, 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, ASME 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.

These inspections constituted four routine surveillance testing samples, and one inservice surveillance testing sample as defined in IP 71111.22, Sections -02 and -05.

b. Findings

No findings were identified.

## 2. **RADIATION SAFETY**

### **Cornerstone: Occupational Radiation Safety**

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

This inspection constituted one complete in-plant airborne radioactivity control and mitigation sample as defined in IP 71124.03-05.

#### .1 Inspection Planning (02.01)

##### a. Inspection Scope

The inspectors reviewed the UFSAR to identify areas of the plant designed as potential airborne radiation areas and any associated ventilation systems or airborne monitoring instrumentation. Instrumentation reviewed included continuous air monitors, (continuous air monitors, and particulate-iodine-noble-gas-type instruments) used to identify changing airborne radiological conditions such that actions to prevent an overexposure may be taken. The review included an overview of the Respiratory Protection Program and a description of the types of devices used. The inspectors reviewed the UFSAR, TS, and emergency planning documents to identify location and quantity of respiratory protection devices stored for emergency use.

The inspectors reviewed the licensee's procedures for maintenance, inspection, and use of respiratory protection equipment including SCBA as well as procedures for air quality maintenance.

The inspectors reviewed reported Performance Indicators (PIs) to identify any related to unintended dose resulting from intakes of radioactive material.

##### b. Findings

No findings were identified.

## .2 Engineering Controls (02.02)

### a. Inspection Scope

The inspectors reviewed the licensee's use of permanent and temporary ventilation to determine whether the licensee used ventilation systems as part of its engineering controls (in lieu of respiratory protection devices) to control airborne radioactivity. The inspectors reviewed procedural guidance for use of installed plant systems, such as containment purge, spent fuel pool ventilation, and reactor building ventilation, and assessed whether the systems are used, to the extent practicable, during high-risk activities (e.g., using containment purge during cavity floodup).

The inspectors selected installed ventilation systems used to mitigate the potential for airborne radioactivity, and evaluated whether the ventilation airflow capacity, flow path (including the alignment of the suction and discharges), and filter/charcoal unit efficiencies, as appropriate, were consistent with maintaining concentrations of airborne radioactivity in work areas below the concentrations of an airborne area to the extent practicable.

The inspectors selected temporary ventilation system setups (high-efficiency particulate air/charcoal negative pressure units, down draft tables, tents, metal "Kelly buildings," and other enclosures) used to support work in contaminated areas. The inspectors assessed whether the use of these systems was consistent with licensee procedural guidance and the ALARA concept.

The inspectors reviewed airborne monitoring protocols by selecting installed systems used to monitor and warn of changing airborne concentrations in the plant and evaluated whether the alarms and setpoints were sufficient to prompt licensee/worker action to ensure that doses were maintained within the limits of 10 CFR Part 20 and the ALARA concept.

The inspectors assessed whether the licensee had established trigger points (e.g., the Electric Power Research Institute's "Alpha Monitoring Guidelines for Operating Nuclear Power Stations") for evaluating levels of airborne beta-emitting (e.g., plutonium-241) and alpha-emitting radionuclides.

### b. Findings

No findings were identified.

## .3 Use of Respiratory Protection Devices (02.03)

### a. Inspection Scope

For those situations where it was impractical to employ engineering controls to minimize airborne radioactivity, the inspectors assessed whether the licensee provided respiratory protective devices such that occupational doses were ALARA. The inspectors selected work activities where respiratory protection devices were used to limit the intake of radioactive materials, and assessed whether the licensee performed evaluations concluding that further engineering controls were not practical and that the use of respirators was ALARA. The inspectors also evaluated whether the licensee had established means (such as routine bioassay) to determine if the level of protection



(protection factor) provided by the respiratory protection devices during use was at least as good as that assumed in the licensee's work controls and dose assessment.

The inspectors assessed whether respiratory protection devices used to limit the intake of radioactive materials were certified by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration or had been approved by the NRC per 10 CFR 20.1703(b). The inspectors selected work activities where respiratory protection devices were used. The inspectors evaluated whether the devices were used consistent with their National Institute for Occupational Safety and Health/Mine Safety and Health Administration certification or any conditions of their NRC-approval.

The inspectors reviewed records of air testing for supplied-air devices and SCBA bottles to assess whether the air used in these devices met or exceeded Grade D quality. The inspectors reviewed plant breathing air supply systems to determine whether they met the minimum pressure and airflow requirements for the devices in use.

The inspectors selected several individuals qualified to use respiratory protection devices and assessed whether they had been deemed fit to use the devices by a physician.

Due to limited in-field observations, the inspectors reviewed training curricula for users of respiratory protection devices and requested a demonstration of device use (donning, doffing, functional checks, and device malfunction) from selected individuals.

The inspectors selected multiple respiratory protection devices staged and ready for use in the plant or stocked for issuance for use. The inspectors assessed the physical condition of the device components (mask or hood, harnesses, air lines, regulators, air bottles, etc.) and reviewed records of routine inspection for each. The inspectors selected several of the devices and reviewed records of maintenance on the vital components (e.g., pressure regulators, inhalation/exhalation valves, hose couplings). The inspectors reviewed the Respirator Vital Components Maintenance Program to ensure onsite personnel assigned to repair the vital components had received the appropriate manufacturer-approved training.

b. Findings

(1) Failure to Implement and Maintain Procedures Regarding Breathing Air Quality

Introduction: A finding of very low safety significance (Green) and NCV of 10 CFR 20.1703 was identified by the inspectors on January 18, 2013, for the licensee's failure to implement and maintain written procedures regarding breathing air quality and SCBA inspections.

Description: The licensee used an air compressor to provide breathing air to its SCBAs and an instrument air system to supply air line respirators. It may be necessary that these units/systems be utilized by plant personnel in the event of a radiological incident in order to reduce the amount of internal radiation exposure. The air compressor was required to produce Grade "D" or better air quality in accordance with 10 CFR 20.1703.

Licensee procedure Health Physics Procedure (HPP) 3106.05, "Breathing Air Quality Assurance Test," Revision 20, required the SCBA charging system and the instrument air system to be tested semi-annually (not to exceed 7.5 months).

During the inspection, the inspectors identified issues with the licensee's air quality testing as follows:

The inspectors identified that instrument air was not tested for air quality from September 16, 2010 to October 12, 2011 and from April 10, 2012 to January 7, 2013. The SCBA charging system was not tested for air quality from April 10, 2012 to January 7, 2013. These issues were entered into the licensee's CAP as CRs 01840046 and 01839697. The licensee's corrective action was to establish a tracking mechanism to ensure these tests were appropriately scheduled and completed.

Additionally, during the inspection, the inspectors identified that the SCBA monthly inspections were not consistently being performed. Licensee procedure HPP 3106.04, "Inspection, Maintenance and Quality Assurance of Respiratory Protection Equipment," Revision 23, specified monthly SCBA inspections. During the inspection, the inspectors identified that the inspections for October and December of 2012 were not completed. The inspection for January 2013 was completed satisfactorily. This issue was entered into the licensee's CAP as CR 01839666. The licensee's corrective action was to also establish a tracking mechanism to ensure these inspections were appropriately scheduled and completed.

Analysis: The inspectors determined that not consistently performing the Grade D air quality tests or SCBA monthly inspections 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 performance deficiency was determined to be of more than minor safety significance in accordance with IMC 0612, Appendix B, "Issue Screening," because if left uncorrected, not performing testing of breathing air quality would have the potential to lead to a more significant safety concern. Specifically, continued failure to test for breathing air quality could have resulted in unknowingly having un-breathable air in the licensee's SCBA or the instrument air systems. The failure to perform required inspections could result in SCBAs with degraded components remaining in service, and the use of degraded SCBAs could impair the users such that they could be unable to perform their intended functions.

In accordance with IMC 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the inspectors determined that the finding had very low safety significance (Green) because the finding did not involve: (1) ALARA planning and controls, (2) a radiological overexposure, (3) a substantial potential for an overexposure, or (4) a compromised ability to assess dose.

The inspectors determined that the performance characteristic of the finding that was the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Human Performance, having Work Practices components, and involving the licensee ensuring supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported. Specifically, ownership and accountability to perform air quality testing was not well established or controlled within the work schedule process to ensure the tests would be performed as required. [H.4(c)]

Enforcement: Title 10 CFR 20.1703(c) requires, in part, that the licensee implement and maintain a Respiratory Protection Program that includes written procedures regarding breathing air quality and respiratory protection equipment inspection.

Licensee procedures HPP 3106.05, "Breathing Air Quality Assurance Test," and HPP 3106.04, "Inspection, Maintenance and Quality Assurance of Respiratory Protection Equipment," in part, implement the requirements of 10 CFR 20.1703(c).

Contrary to the above, between September 16, 2010 and October 12, 2011, and April 10, 2012 and January 7, 2013, the licensee did not complete tests for breathing air quality in accordance with HPP 3106.05. Additionally, in October and December of 2012, the licensee did not perform required SCBA inspections in accordance with HPP 3106.04. Corrective actions included air quality tests that were subsequently performed resulting in Grade "D" or better, and completing breathing air and monthly SCBA inspections. Additionally, the licensee was in the process of establishing a tracking mechanism to ensure these tests and inspections were appropriately scheduled for completion.

Because the violation was of very low safety significance, was entered into the licensee's CAP as CRs 01840046, 01839697, and 01839666, and was not willful, the violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (**NCV 05000331/2013002-03, Failure to Implement and Maintain Procedures Regarding Breathing Air Quality**).

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

a. Inspection Scope

Based on the UFSAR, TS, and emergency operating procedure requirements, the inspectors reviewed the status and surveillance records of SCBAs staged in-plant for use during emergencies. The inspectors reviewed 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 selected several individuals on control room shift crews and from designated departments currently assigned emergency duties (e.g., onsite search and rescue duties) to assess whether control room operators and other emergency response and radiation protection personnel (assigned in-plant search and rescue duties or as required by emergency operating procedures or the emergency plan) were trained and qualified in the use of SCBAs (including personal bottle changeout). The inspectors evaluated whether personnel assigned to refill bottles were trained and qualified for that task.

The inspectors determined whether appropriate mask sizes and types were available for use (i.e., in-field mask size and type match what was used in fit-testing). The inspectors determined whether on-shift operators had no facial hair that would interfere with the sealing of the mask to the face and whether vision correction (e.g., glasses inserts or corrected lenses) were available as appropriate.

The inspectors reviewed the past two years of maintenance records for select SCBAs used to support operator activities during accident conditions and designated as "ready for service" to assess whether any maintenance or repairs on any SCBA vital

components were performed by an individual, or individuals, certified by the manufacturer of the device to perform the work. The vital components typically were the pressure-demand air regulator and the low-pressure alarm. The inspectors reviewed the onsite maintenance procedures governing vital component work to determine any inconsistencies with the SCBA manufacturer's recommended practices. For those SCBAs designated as "ready for service," the inspectors determined whether the required periodic air cylinder hydrostatic testing was documented and up to date, and the retest air cylinder markings required by the U.S. Department of Transportation were in place.

b. Findings

No findings were identified.

.5 Problem Identification and Resolution (02.05)

a. Inspection Scope

The inspectors evaluated 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 in the licensee CAP. The inspectors assessed whether the corrective actions were appropriate for a selected sample of problems involving airborne radioactivity and were appropriately documented by the licensee.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04)

This inspection constituted one complete occupational dose assessment sample as defined in IP 71124.04-05.

.1 Inspection Planning (02.01)

a. Inspection Scope

The inspectors reviewed the results of radiation protection program audits related to internal and external dosimetry (e.g., licensee quality assurance audits, self-assessments, or other independent audits) to gain insights into overall licensee performance in the area of dose assessment and focus the inspection activities consistent with the principle of "smart sampling."

The inspectors reviewed the most recent National Voluntary Laboratory Accreditation Program accreditation report on the vendor's most recent results to determine the status of the contractor's accreditation.

A review was conducted of licensee procedures associated with dosimetry operations, including issuance/use of external dosimetry (routine, multibadging, extremity, neutron, etc.), assessment of internal dose (operation of whole body counter, assignment of dose based on derived air concentration-hours, urinalysis, etc.), and evaluation of and dose

assessment for radiological incidents (distributed contamination, hot particles, loss of dosimetry, etc.).

The inspectors evaluated whether the licensee had established procedural requirements for determining when external and internal dosimetry was required.

b. Findings

No findings were identified.

.2 External Dosimetry (02.02)

a. Inspection Scope

The inspectors evaluated whether the licensee's dosimetry vendor, National Voluntary Laboratory Accreditation Program, was accredited and if the approved irradiation test categories for each type of personnel dosimeter used was consistent with the types and energies of the radiation present and the way the dosimeter was being used (e.g., to measure deep dose equivalent, shallow dose equivalent, or lens dose equivalent).

The inspectors evaluated the onsite storage of dosimeters before their issuance, during use, and before processing/reading. The inspectors also reviewed the guidance provided to radiation workers with respect to care and storage of dosimeters.

The inspectors assessed whether non-National Voluntary Laboratory Accreditation Program accredited passive dosimeters (e.g., direct ion storage sight read dosimeters) were used according to licensee procedures that provided for periodic calibration, application of calibration factors, usage, reading (dose assessment) and zeroing. The licensee did not use non-National Voluntary Laboratory Accreditation Program accredited passive dosimeters.

The inspectors assessed the use of active dosimeters (electronic personal dosimeters) to determine if the licensee used a "correction factor" to address the response of electronic personal dosimeters as compared to passive dosimeters for situations when electronic personal dosimeters had to be used to assign dose. The inspectors also assessed whether the correction factor was based on sound technical principles.

The inspectors reviewed dosimetry occurrence reports or CAP documents for adverse trends related to electronic personal dosimeters, such as interference from electromagnetic frequency, dropping or bumping, failure to hear alarms, etc. The inspectors assessed whether the licensee had identified any trends and implemented appropriate corrective actions.

b. Findings

No findings were identified.

.3 Internal Dosimetry (02.03)

Routine Bioassay (In Vivo)

a. Inspection Scope

The inspectors reviewed procedures used to assess the dose from internally deposited nuclides using whole body counting equipment. The inspectors evaluated 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 reviewed the whole body count process to determine if the frequency of measurements were 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 determine the potential for internally deposited radionuclides sufficient to prompt additional investigation.

The inspectors selected several whole body counts and evaluated whether the counting system used had sufficient counting time/low background to ensure appropriate sensitivity for the potential radionuclides of interest. The inspectors reviewed the radionuclide library used for the count system to determine its appropriateness. The inspectors evaluated whether any anomalous count peaks/nuclides indicated in each output spectra received appropriate disposition. The inspector's reviewed the licensee's 10 CFR Part 61 data analyses to determine whether the nuclide libraries included appropriate gamma-emitting nuclides. The inspectors evaluated how the licensee accounted for hard-to-detect nuclides in the dose assessment.

b. Findings

No findings were identified.

Special Bioassay (In Vitro)

a. Inspection Scope

There were no internal dose assessments using in vitro monitoring for the inspectors to review. The inspectors reviewed and assessed the adequacy of the licensee's program for in vitro monitoring (i.e., urinalysis and fecal analysis) of radionuclides (tritium, fission products, and activation products), including collection and storage of samples.

The inspectors reviewed the vendor laboratory quality assurance program and assessed whether the laboratory participated in an industry recognized cross-check program including whether out-of-tolerance results were resolved appropriately.

b. Findings

No findings were identified.

Internal Dose Assessment – Airborne Monitoring

a. Inspection Scope

The inspectors reviewed the licensee's program for airborne radioactivity assessment and dose assessment, as applicable, based on airborne monitoring 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.

b. Findings

No findings were identified.

Internal Dose Assessment – Whole Body Count Analyses

a. Inspection Scope

The inspectors reviewed several dose assessments performed by the licensee using the results of whole body count analyses. The inspectors determined whether affected personnel were properly monitored with calibrated equipment and that internal exposures were assessed consistent with the licensee's procedures.

b. Findings

No findings were identified.

.4 Special Dosimetric Situations (02.04)

Declared Pregnant Workers

a. Inspection Scope

The inspectors assessed whether the licensee informed workers, as appropriate, 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 (voluntarily) declaring a pregnancy.

There were no individuals who had declared pregnancy during the current assessment period. The inspectors evaluated whether the licensee's Radiological Monitoring Program (internal and external) for declared pregnant workers was technically adequate to assess the dose to the embryo/fetus. The inspectors reviewed monitoring controls employed by the licensee with respect to the requirements of 10 CFR Part 20.

b. Findings

No findings were identified.

Dosimeter Placement and Assessment of Effective Dose Equivalent for External Exposures

a. Inspection Scope

The inspectors reviewed the licensee's methodology for monitoring external dose in non-uniform radiation fields or where large dose gradients existed. The inspectors evaluated the licensee's criteria for determining when alternate monitoring, such as use of multi-badging, was to be implemented.

The inspectors reviewed dose assessments performed using multi-badging to evaluate whether the assessment was performed consistently with licensee procedures and dosimetric standards.

b. Findings

No findings were identified.

Shallow Dose Equivalent

a. Inspection Scope

The inspectors reviewed shallow dose equivalent dose assessments for adequacy. The inspectors evaluated the licensee's method (e.g., VARSKIN or similar code), for calculating shallow dose equivalent from distributed skin contamination or discrete radioactive particles.

b. Findings

No findings were identified.

Neutron Dose Assessment

a. Inspection Scope

The inspectors evaluated the licensee's Neutron Dosimetry Program, including dosimeter types and/or survey instrumentation.

The inspectors reviewed neutron exposure situations (e.g., independent spent fuel storage installation operations or at-power containment entries), and assessed whether, (a) dosimetry and/or instrumentation was appropriate for the expected neutron spectra, (b) there was sufficient sensitivity for low dose and/or dose rate measurement, and (c) 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, as applicable.

b. Findings

No findings were identified.

Assigning Dose of Record



a. Inspection Scope

For the special dosimetric situations reviewed in this section, the inspectors assessed how the licensee assigned dose of record for total effective dose equivalent, shallow dose equivalent, and lens dose equivalent. This included an assessment of external and internal monitoring results, supplementary information on individual exposures (e.g., radiation incident investigation reports and skin contamination reports), and radiation surveys and/or air monitoring results when dosimetry was based on these techniques.

b. Findings

No findings were identified.

.5 Problem Identification and Resolution (02.05)

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 in the licensee's CAP. The inspectors assessed the appropriateness of the corrective actions for a selected sample of problems documented by the licensee involving occupational dose assessment.

b. Findings

No findings were identified.

4. **OTHER ACTIVITIES**

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

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 PI for the period from the first quarter 2012 through the fourth quarter 2012. To determine the accuracy of the PI data reported during those periods, PI definitions and guidance contained in Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6, dated October 2009, was used. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports and NRC Integrated Inspection Reports for the period of January 1, 2012 through December 31, 2012, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's CAP 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 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 2012 through the fourth quarter 2012. 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 6, dated October 2009, was used. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports and NRC Integrated Inspection Reports for the period of January 1, 2012 through December 31, 2012, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's CAP 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 Transients per 7000 Critical Hours

a. Inspection Scope

The inspectors sampled licensee submittals for the Unplanned Transients per 7000 Critical Hours PI the period from the first quarter 2012 through the fourth quarter 2012. 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 6, dated October 2009, was used. The inspectors reviewed the licensee's operator narrative logs, issue reports, maintenance rule records, event reports and NRC Integrated Inspection Reports for the period of January 1, 2012 through December 31, 2012, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's CAP database to determine if any problems had been identified with the PI data collected or transmitted for this indicator. The inspectors did not identify any more than minor violations (i.e., instances where inaccurate or incomplete submittal of PI data to the NRC would have caused the PI to change from green to white). 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.

4OA2 Identification and Resolution of Problems (71152)

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

a. Inspection Scope

As part of the various baseline inspection procedures 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 CAP at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. Attributes reviewed included: identification of the problem was complete and accurate; timeliness was commensurate with the safety significance; evaluation and disposition of performance issues, generic implications, common causes, contributing factors, root causes, extent-of-condition reviews, and previous occurrences reviews were proper and adequate; and that the classification, prioritization, focus, and timeliness of corrective actions were commensurate with safety and sufficient to prevent recurrence of the issue. Minor issues entered into the licensee's CAP as a result of the inspectors' observations are included in the Attachment to 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 and documented in Section 1 of this report.

b. Findings

No findings were identified.

.2 Daily Corrective Action Program Reviews

a. Inspection Scope

In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished through inspection of the station's daily condition report packages.

These daily reviews were performed by procedure as part of the inspectors' daily plant status monitoring activities and, as such, did not constitute any separate inspection samples.

b. Findings

No findings were identified.

.3 Selected Issue Follow-Up Inspection: Root Cause Evaluation 01824467; Wetted Cables within Embedded Conduits

a. Inspection Scope

The inspectors performed a review of RCE 01824467, "Wetted Cables within Embedded Conduits," to further understand the licensee's determination of the root and contributing causes, corrective actions to preclude repetition, extent of condition and cause, and planned effectiveness reviews. The RCE problem statement was "electrical cables embedded in the Turbine Building 734' elevation base mat, some of whose failure could result in inoperability of the Standby Diesel Generators, have been found physically degraded after the conduits were subjected to water intrusion."

This inspection constituted one selected issue follow-up inspection sample as defined in IP 71152-05.

b. Findings

(1) Corrective Actions Associated with Potential Cable Submergence Improperly Closed

Introduction: A finding of very low safety significance (Green) and NCV of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was self-revealed on October 12, 2012, for the licensee's failure to meet corrective action program procedural requirements associated with the correction of a contributing cause and the evaluation of the extent of condition of potentially submerged degraded and non-conforming safety-related electrical cables. Specifically, the licensee failed to perform a corrective action to address a contributing cause for the failure to promptly identify and correct a condition adverse to quality regarding water intrusion into the turbine building east cable vault that resulted in an NRC-identified finding and non-cited violation in February 2011; and, failed to properly evaluate and perform corrective actions to address the identified extent of condition. These failures were self-revealed to the licensee during the fall 2012 refueling outage when degraded and non-conforming submerged electrical cables were discovered while preparing for replacement of a faulted 'A' SBDG fuel oil day tank low-low level switch cable.

Description: In December 2010, the licensee performed an apparent cause evaluation (ACE) 341887 to evaluate why the site failed to promptly identify and correct water intrusion conditions adverse to quality into the turbine building east cable vault that contained submerged safety-related electrical cables; and, why the site did not question whether additional conduits were filled with water. The ACE was performed to address an NRC-identified finding and non-cited violation documented by the inspectors in February 2011, for the licensee's failure to promptly identify and correct water leakage into the turbine building east cable vault that had submerged safety-related cables not qualified for submergence. The licensee determined that the apparent cause of the NRC-identified finding was attributed to the station having a "general lack of sensitivity as to any immediate concerns related to wetted cables," that "there existed a prevailing opinion that the type of cables used at Duane Arnold Energy Center were rated for submergence," and that "maintaining cables dry was a long term and not a short term goal." The licensee created a corrective action (CA 341887-10) to address the apparent cause to: "issue a formal communication to the station to clarify the current NRC position that any failure to maintain cables important to safety in an environment for which they

were designed is considered a performance deficiency,” and “conditions with the potential to cause wetted safety related cables should be immediately assessed for impact on operability of safety related SSCs and priority should be given to determining the cause and implementing required corrective actions.” The licensee also determined that the contributing cause to the finding was that “the buried cable program scope and ownership has not been well established.” The extent of condition review identified seven condition reports going back to 2003 where water in-leakage was identified as either ongoing or as having existed prior into or from below-grade electrical cable conduits, penetrations, or junction boxes. The licensee created a corrective action CA 341887-11) to address the contributing cause: “establish a transition plan for moving the buried cable program from design engineering to a dedicated program owner in program engineering,” and to “develop a program scoping document,” and created a condition evaluation (CE 598596-01) to further investigate the extent of condition items noted in the ACE.

During the fall 2012 refueling outage, the licensee discovered several safety-related electrical cables submerged that were located within conduits buried below the turbine building base mat. The inspector’s review concerning the licensee’s first prompt operability evaluation for this issue was documented in Section 1R15 of NRC Inspection Report 05000331/2012005. Considering the history of adverse water intrusion resulting in the submergence of safety-related cables at Duane Arnold and related NRC findings and violations of regulatory requirements, the licensee performed RCE 01824467 to evaluate the causes of water intrusion into inaccessible buried electrical conduits. The licensee reviewed how water intrusion into inaccessible buried cable conduits had been dispositioned in the past and noted that several of the actions or evaluations planned from ACE 341887 were untimely, incomplete, or cancelled/closed without action. Specifically, CA 341887-11 from ACE 341887 to address the contributing cause was inexplicably closed prior to being completed. Additionally, CE 598596-01 to further investigate the extent of condition was not formally documented and corrective actions to resolve were either excessively postponed or closed altogether. Based in part on these failures, the licensee determined that the root cause for the ongoing water in-leakage and cable submergence issues was associated with the plant failing “to take corrective action, such as identifying the extent of condition for submerged safety-related cables in response to past occurrences and the transfer of buried cable program responsibilities to one individual.”

The inspectors thoroughly reviewed RCE 01824467 and determined that the licensee’s evaluation of cause and corrective actions taken or in progress appeared appropriate. However, the inspectors were concerned that the root cause determined by the licensee from RCE 01824467 represented failures to follow licensee corrective action program procedural requirements. The inspectors noted that Section 4.7 of PI-AA-205, “Condition Evaluation and Corrective Action,” stated in part that “Corrective Actions represent the highest priority actions within the Corrective Action process and shall be completed in strict compliance with the requirements of this procedure to ensure that the actions are completed in a timely, effective and complete manner.” Additionally, Section 4.10 of PI-AA-204 stated in part that “closure of corrective actions is not permitted until corrective action(s) are completed as prescribed or appropriate justification and approval for intent change or cancellation/nonperformance of the corrective action is documented in the Condition Report.” For both CA 341887-11 and the corrective actions generated from CE 598596-01, the corrective actions were not

completed as prescribed, nor were the appropriate justifications and approvals made for the cancellation/nonperformance of the corrective actions.

Analysis: The inspectors determined that failing to meet corrective action program procedural requirements represented a performance deficiency because it was the result of the licensee's failure to meet a regulatory requirement, and the cause was reasonably within the licensee's ability to foresee and correct and should have been prevented. The performance deficiency was determined to be more than minor and a finding because, if left uncorrected, failing to correct the contributing causes and evaluating the extent of condition of conditions adverse to quality would have the potential to lead to a more significant safety concern. Specifically, by not properly correcting the contributors and evaluating the extent of conditions adverse to quality, more significant safety issues could develop, or adverse behaviors could go unnoticed and affect other areas at the station.

The inspectors applied IMC 0609.04, "Initial Characterization of Findings," to this finding. Because the finding pertained to an event while the plant was shutdown, Table 3 of IMC 0609.04 instructed reference of IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process." Because the finding did not require a quantitative assessment, the finding screened as very low safety significance (Green).

The inspectors determined that the performance characteristic of the finding that was the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Problem Identification and Resolution, having Corrective Action Program components, and involving the licensee thoroughly evaluating problems such that the resolutions address causes and extent of conditions, as necessary, including, for significant actions, conducting effectiveness reviews of corrective actions to ensure that the problems are resolved. Specifically, the licensee inappropriately postponed, cancelled, or closed significant corrective actions from ACE 341887 that likely would have identified and promptly resolved additional instances of submerged degraded and non-conforming safety-related electrical cables. [P.1(c)]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented procedures and shall be accomplished in accordance with these procedures.

Contrary to this requirement, as of October 12, 2012, the licensee failed to accomplish PI-AA-205, "Condition Evaluation and Corrective Action," Revision 18, that required appropriate justification and approval for cancellation/nonperformance of corrective actions taken from ACE 341887 [note that although PI-AA-205 was revised several times since 2010, the requirements within Sections 4.7 and 4.10 of PI-AA-205 existed when CA 341887-11 and CAs from CE598596-01 were cancelled]. Corrective actions as described in RCE 01824467 included creating a cable monitoring program, establishing periodic inspections and dewatering of embedded conduits, and establishing periodic insulation resistance testing of safety-related electrical cables located within embedded conduits.

Because this violation was of very low safety significance, was entered into the licensee's CAP as CR 01824467, and was not willful, the violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (**NCV 05000331/2013002-04; Corrective Actions Associated with Potential Cable Submergence Improperly Closed**).

.4 Selected Issue Follow-Up Inspection: Root Cause Evaluation 1834595, Secondary Containment Damper Failures NRC Reportable Event

a. Inspection Scope

The inspectors performed a review of RCE 1834595, "Secondary Containment Damper Failures NRC Reportable Event," to further understand the licensee's determination of the root and contributing causes, corrective actions to preclude repetition, extent of condition and cause, and planned effectiveness reviews. The RCE problem statement was, "Secondary containment was determined to be inoperable from June 21, 2012 to November 24, 2012, based on past operability review of 1VAD017B1 which was performed under CR 1826460-01. The mission is to determine the root cause for secondary containment inoperability and actions to prevent recurrence."

This inspection constituted one selected issue follow-up inspection sample as defined in IP 71152-05.

b. Findings

(1) Failure to Conduct Adequate Post-Maintenance Testing

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated NCV of 10 CFR 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to conduct post maintenance testing in accordance with their procedure MD-024, "Post-Maintenance Testing," following maintenance on secondary containment damper 1VAD017B1. Specifically, the testing that the licensee performed was not adequate to verify that the damper could perform its intended function and the damper subsequently failed in service.

Description: On November 24, 2012, during Refueling Outage (RFO) 23, the licensee was unable to complete STP 3.6.4.1B, "Secondary Containment Integrity Using SBT Train B," because they were unable to achieve  $\geq .25$ " of water vacuum. As part of troubleshooting efforts, the licensee identified that secondary containment damper 1VAD017B1 was not completely closed and the damper was declared inoperable. The licensee had rebuilt the damper in June 2012 under WO 4019934, and investigation identified that the damper was prevented from going to the full closed position due to the position of a stop rod adjustment nut. This stop rod had been manipulated in the wrong direction when the damper was rebuilt in June 2012. Because the limit switches for the damper position indication were actuated by the damper operator (rather than actual damper position), the damper would indicate closed even though the damper was not fully closed. This condition was not revealed during post-maintenance testing of the damper because testing only included stroking and timing of the damper upon insertion of a Group 3 PCIS isolation signal. The post maintenance testing was not appropriate due to the incorrect position of stop rod adjustment nut masking the true position of the damper.

The licensee completed a RCE 01834595 in February of 2013, and determined the root cause to be that the work order did not provide adequate guidance on adjusting the stop rod (see Section 4OA7 for the documented licensee identified violation). The RCE 1834595 determined that the contributing cause was a lack of a questioning attitude and critical thinking to verify the as-left condition. Although mentioned in the RCE, the RCE did not specifically state that one of the contributing causes was that the limit switches for damper position indication were installed such that they could indicate closed when the damper was not fully closed. The licensee stated that the limit switch issue was implied in the contributing cause statement. The inspectors were satisfied with corrective action taken by the licensee because they updated the maintenance procedure for the dampers and included properly setting the limit switches with the dampers verified full closed.

The inspectors identified that the RCE 01834595 also did not specifically address the aspect of post-maintenance testing. Licensee procedure MD-024, "Post-Maintenance Testing," states, in part, that "post-maintenance testing shall verify the following: The ability of the system or component to perform its intended function and the original deficiency is corrected, and no new problems have been created." The inspectors were concerned that post maintenance testing performed for the secondary containment dampers did not meet this requirement.

Corrective actions completed by the licensee included rebuilding damper 1VAD017B1, properly setting the limit switches, and testing the dampers to verify they were fully shut when an isolation signal was present.

Analysis: The inspectors determined that the licensee's failure to conduct post maintenance testing in accordance with MD-024, "Post-Maintenance Testing Program," was contrary to the requirements of 10 CFR Part 50, Appendix B, Criterion XI, and was a performance deficiency. The performance deficiency was determined to be more than minor and a finding because it is associated with the Barrier Integrity Cornerstone attribute of procedure quality and adversely affected the cornerstone objective of ensuring that physical design barriers (secondary containment) protect the public from radionuclide releases caused by accidents. Specifically, the secondary containment dampers were returned to service in a condition which could have prevented the secondary containment isolation dampers from performing their safety function.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." The finding screened as having very low safety significance (Green) because it only represented a degradation of the radiological barrier provided for the secondary containment building and the inspectors answered "no" to questions B.1 and B.2 in Exhibit 3, "Barrier Integrity Screening Questions."

The inspectors determined that the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Problem Identification and Resolution, having Corrective Action Program Components, and involving the licensee thoroughly evaluating problems such that the resolutions address causes and extent of conditions, as necessary. Specifically, for the damper of concern, the licensee did not implement corrective actions from RCE 01739467, which stated "Create a maintenance procedure for rebuilding and adjusting secondary containment dampers and operators



that directs the following: provide guidance on adjusting over travel of damper blades [aka stop rod adjustment],” and “limit switch verification.” [P.1(c)]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XI, “Test Control,” requires, in part, that a test program be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents.

Licensee Procedure MD-024, “Post Maintenance Testing Program,” step 6.1(1) states, in part that, “Post Maintenance Testing shall be performed if appropriate following maintenance on components regardless of quality level. The post-maintenance testing shall verify the following: The ability of the system or component to perform its intended function and the original deficiency is corrected, and no new problems have been created.”

Contrary to the above, from June 21 to November 24, 2012, the licensee failed to assure that testing required to demonstrate that safety-related damper 1VAD017B1 would perform satisfactorily in service was identified and performed in accordance with written test procedures which incorporated the requirements and acceptance limits contained in applicable design documents. Specifically, on June 21, 2012, the licensee completed WO 4019934 to rebuild secondary containment damper operator 1VAD017B1. Post-maintenance testing for the work order did not ensure the damper could perform its intended safety function. On November 24, 2012, the damper failed in service (would not go fully closed). Immediate corrective actions included declaring secondary containment inoperable, determining if any other dampers were not fully closed (none were identified), and rebuilding and retesting Damper 1VAD017B1.

Because this violation was of very low safety significance, was not willful, and was entered into the licensee’s CAP as CR 01862900, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy **(NCV 05000331/2013002-05, Failure to Conduct Adequate Post-Maintenance Testing).**

#### 4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153)

##### .1 (Closed) Licensee Event Report (LER) 05000331/2012005-00 and 05000331/2012005-01: Secondary Containment Damper Inoperable, Condition Prohibited by Technical Specifications

###### a. Inspection Scope

On November 24, 2012, during RFO 23, the licensee was unable to complete STP 3.6.4.1-01B, “Secondary Containment Integrity Using SBT Train B,” because they were unable to achieve  $\geq .25$ ” of water vacuum. As part of troubleshooting efforts, the licensee identified that secondary containment damper 1VAD017B1 was not completely closed and the damper was declared inoperable. The licensee made repairs to the damper, tested it satisfactorily, and was able to complete STP 3.6.4.1-01B. The inspectors reviewed the licensee’s past operability evaluation, RCE, and LERs 05000331/2012005-00 and 05000331/2012005-01 associated with the secondary containment damper failure. The inspectors documented a finding associated with their review of the RCE in Section 4OA2.4.

Documents reviewed are listed in the Attachment to this report. These LERs are closed.

This inspection constituted one follow-up of events and notices of enforcement discretion sample as defined in IP 71153-05.

b. Findings

No findings were identified.

.2 (Closed) Licensee Event Report (LER) 05000331/2012006-00 and 05000331/2012006-01: Unplanned Inoperability of 2 Average Power Range Monitors

a. Inspection Scope

On December 1, 2012, at approximately 71 percent reactor power during startup from RFO 23, control room operators bypassed LPRM 32-25A due to indications that the output of the LPRM to the plant process computer (PPC) and rod block monitor had failed. Following the bypass of the LPRM per operating instructions, APRMs C and D indications rose approximately 4 percent reactor power (these APRMs were already bypassed per operating instructions prior to bypassing LPRM 32-25A). The inspectors reviewed the licensee's past operability evaluation, RCE, and LERs 05000331/2012006-00 and 05000331/2012006-01 associated with this condition for the LPRM and APRMs.

Documents reviewed are listed in the Attachment to this report. These LERs are closed.

This inspection constituted one follow-up of events and notices of enforcement discretion sample as defined in IP 71153-05.

b. Findings

(1) Average Power Range Monitor Condition Prohibited By Technical Specifications

Introduction: A finding of very low safety significance and associated NCV of TS 3.3.1.1, "RPS Instrumentation," Required Action A, was self-revealed on December 1, 2012, for the licensee's failure to place inoperable APRMs C and D in trip within 12 hours. Specifically, the licensee failed to identify a failed mode switch contact for LPRM 32-25A that rendered SR 3.3.1.1.8 not met for periods when APRMs C and/or D were in service between November 27 and December 1, 2012; a condition prohibited by TS.

Description: During the evening of November 26, 2012, with the plant at approximately 11 percent reactor power during plant startup, the night shift reactor engineer identified that a PPC computer point for LPRM 32-25A was downscale (all other LPRMs in service were reading as expected). This discrepancy was noted and turned over to the day shift operating crew. After a review of alternate indications and circuit schematics, and discussions with a system engineer and operating crew the morning of November 27, 2012, the licensee generated CR 01827358 stating that the LPRM input to its associated APRMs C and D was accurate and that an inconsequential fuse failure was the likely cause (the affected APRMs were considered operable). On December 1, 2012, with the plant at approximately 71 percent reactor power during startup, a different operating crew was on duty and questioned the LPRM 32-25A indication discrepancies. The

decision was made to bypass APRMs C and D associated with LPRM 32-25A (per operating instructions) and remove the LPRM from service. Following this action, indicated power for APRMs C and D increased approximately 4 percent reactor power – indicative that LPRM 32-25A had been providing a downscale signal to APRMs C and D effectively skewing the APRM averaging circuit with the other in-service LPRM inputs. The licensee generated CR 01828842 to document these issues.

Following the bypassing of LPRM 32-25A, the operating crew adjusted the gains for APRMs C and D to account for the bypassed LPRM 32-25A and to allow for returning them to service. The shift manager also requested a past operability review within CR 01828842. The past operability review concluded that due to the downscale LPRM input to APRMs C and D between November 27 and December 1, 2012, several periods of time existed where APRMs C and/or D were in service and considered operable. However, during this period of time, LPRM 32-25A would not have been in compliance with SR 3.3.1.1.8 to calibrate the LPRMs every 1000 MWD/T. Although there is not a specific TS requirement for LPRMs, they are necessary to comply with TS Table 3.3.1.1, Function 2 which requires two operable APRMs per trip system for the Neutron Flux – Upscale (Startup), Flow Biased – High, and High Value Clamp functions of the APRMs. With SR 3.3.1.1.8 not met for LPRM 32-25A, SR 3.0.1 would have required entry into TS 3.3.1.1, “RPS Instrumentation,” Condition A to place the applicable inoperable APRM channels in trip within 12 hours. The past operability review also determined that because the gain settings for APRM C and D were always in compliance with the 24 hour frequency requirement of SR 3.3.1.1.2 (APRMs adjusted to within 2 percent of core thermal power), the APRM function of providing a trip signal to the RPS would have been met throughout the time period where the LPRM 32-25A mode switch contact was failed.

The licensee also performed RCE 01828842 and determined that the apparent cause of not recognizing the inoperability of APRMs C and D on November 26, 2012, was due to “existing procedural guidance” being “inadequate to detect and remove inoperable LPRMs from service.” This was primarily due to the fact that a mode switch had failed in the LPRM 32-25A circuit which was not a typical failure mode for the discrepant indications identified on December 27, 2012. Contributing causes included “control room personnel failing to properly assess the operability of LPRM 32-25A; Control Room Personnel and the System Engineer not fully investigating the cause of the abnormal LPRM 32-25A indications and recommend immediate bypass; and post-maintenance testing of the LPRMs being conducted with the reactor shutdown which did not allow for the signal path to be tested.”

The inspectors were concerned with the operating crew and system engineer’s lack of a systematic evaluation of APRM operability on November 27, 2012, and the failure to recognize operating instruction requirements to bypass the affected LPRM leading to a condition prohibited by TS for the associated APRMs. The inspectors reviewed the past operability review and RCE and concluded that the evaluations were thorough and the corrective actions to revise procedures should be effective to preclude repetition.

Analysis: The inspectors determined that failing to properly evaluate the APRM operability impact of LPRM 32-25A indications on November 27, 2012, represented a performance deficiency because it was the result of the licensee’s failure to meet a TS requirement, and the cause was reasonably within the licensee’s ability to foresee and correct and should have been prevented. The performance deficiency was determined

to be more than minor and a finding because, if left uncorrected, failing to properly evaluate the operability of APRMs would have the potential to lead to a more significant safety concern. Specifically, by not identifying and appropriately evaluating the operability impact on APRMs from faulty LPRM inputs, operator knowledge of actual reactor power and conservative control of reactivity could potentially result in exceeding administrative or operating limits.

The inspectors applied IMC 0609.04, "Initial Characterization of Findings," to this finding. Because the inspectors answered "No" to questions A through E in Table 3, the inspectors referenced IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." Because the inspectors answered "No" to the applicable Section B (Transient Initiators) question under Exhibit 1 (Initiating Events Screening Questions) and "No" to applicable questions 1-3 under Section C (Reactivity Control Systems) of Exhibit 2 (Mitigating Systems Screening Questions), the finding screened as very low safety significance (Green).

The inspectors determined that the performance characteristic of the finding that was the most significant causal factor of the performance deficiency was associated with the cross-cutting aspect of Human Performance, having Decision Making components, and involving the licensee making safety-significant decisions using a systematic process, especially when faced with uncertain or unexpected plant conditions, to ensure safety is maintained. Specifically, decisions regarding the operability impact of the degraded LPRM 32-35A indications were not made using the systematic operability evaluation procedure or other formal processes to include interdisciplinary input and reviews of the decision. [H.1(a)]

Enforcement: Technical Specification 3.3.1.1, Action A.1 requires that inoperable APRM channel(s) be placed in trip within 12 hours.

Contrary to this requirement, on November 27, 2012, the licensee did not place APRMs C and D in a trip status within 12 hours of LPRM 32-25A failing to meet SR 3.3.1.1.8 to provide a calibrated signal to APRMs C and D. Immediate corrective actions included bypassing APRMs C and D on December 1, 2012, bypassing LPRM 32-25A, and repairing the faulty mode switch. Additional corrective actions included revisions to plant operating instructions to require removal of LPRMs from service if they are found to not be tracking with other LPRMs in service.

Because this violation was of very low safety significance, was entered into the licensee's CAP as CR 01828842, and was not willful, the violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy  
**(NCV 05000331/2013002-06, Average Power Range Monitor Condition Prohibited by Technical Specifications).**

#### 4OA6 Management Meetings

##### .1 Exit Meeting Summary

On April 11, 2013, the inspectors presented the inspection results to Mr. R. Anderson, Site Vice President, 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 areas of in-plant airborne radioactivity control and mitigation; and occupational dose assessment with Mr. G. Pry, Plant General Manager, on January 18, 2013; and
- The results of reviews associated with URI 05000331/2011009-04, "Potential for Steam Voiding and Water Hammer on RHR System During a LOCA in Mode 3" with the Acting Design Engineering Manager, Mr. S. Huebsch, on February 7, 2013.

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.

## 4OA7 Licensee-Identified Violations

The following violation of very low significance (Green) was identified by the licensee and is a violation of NRC requirements which meets the criteria of the NRC Enforcement Policy for being dispositioned as an NCV.

- Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality be prescribed by documented procedures of a type appropriate to the circumstances and be accomplished in accordance with these procedures.

Contrary to the above, on June 21, 2012, an activity affecting quality for the safety-related secondary containment damper 1VAD017B1 was not prescribed by documented procedures and accomplished in accordance with these procedures. Specifically, WO 4019934 was completed to rebuild the operator for 1VAD017B1 and did not direct the proper direction to adjust the stop rod adjusting nut and did not contain instructions for setting the open and closed limit switches. This resulted in the damper operator being set in a configuration where the damper indicated that it was fully closed when it was not. The licensee documented the issue in CR 01834595. The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," Table 4a for the Barrier Integrity cornerstone. The finding screened as having very low safety significance (Green) because it only represented a degradation of the radiological barrier provided for the secondary containment.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee

R. Anderson, Site Vice President  
G. Pry, Plant General Manager  
K. Kleinheinz, Site Engineering Director  
T. Byrne, Licensing Manager (Acting)  
G. Young, Nuclear Oversight Manager  
G. Rushworth, Operations Site Director  
R. Wheaton, Maintenance Site Director  
R. Porter, Radiation Protection Manager  
D. Olsen, Chemistry Manager  
B. Kindred, Security Manager  
B. Simmons, Training Manager  
M. Davis, Emergency Preparedness Manager  
B. Murrell, Licensing Engineer Analyst  
K. Jewett, Respiratory Protection Program Manager  
H. Giorgio, Health Physicist

#### Nuclear Regulatory Commission

K. Feintuch, Project Manager, NRR  
R. Orlikowski, Acting Chief, Reactor Projects Branch 1

## LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

### Opened

05000331/2013002-01	URI	'A' Standby Diesel Generator Lube Oil Heat Exchanger Gasket Failure (Section 1R12.1)
05000331/2013002-02	NCV	Failure to Ensure Operability of Low Pressure Coolant Injection Following a Postulated LOCA in Mode 3 (Section 1R21)
05000331/2013002-03	NCV	Failure to Implement and Maintain Procedures Regarding Breathing Air Quality (Section 2RS3.3)
05000331/2013002-04	NCV	Corrective Actions Associated with Potential Cable Submergence Improperly Closed (Section 4OA2.3)
05000331/2013002-05	NCV	Failure to Conduct Adequate Post-Maintenance Testing (Section 4OA2.4)
05000331/2013002-06	NCV	Average Power Range Monitor Condition Prohibited by Technical Specifications (Section 4OA3.2)

### Closed

05000331/2011009-04	URI	Potential Steam Voiding of Residual Heat Removal System (Section 1R21)
05000331/2012005-00	LER	Secondary Containment Damper Inoperable, Condition Prohibited by Technical Specifications (Section 4OA3.1)
05000331/2012005-01	LER	Secondary Containment Damper Inoperable, Condition Prohibited by Technical Specifications (Section 4OA3.1)
05000331/2012006-00	LER	Unplanned Inoperability of 2 Average Power Monitors (Section 4OA3.2)
05000331/2012006-01	LER	Unplanned Inoperability of 2 Average Power Monitors (Section 4OA3.2)
05000331/2013002-02	NCV	Failure to Ensure Operability of Low Pressure Coolant Injection Following a Postulated LOCA in Mode 3 (Section 1R21)
05000331/2013002-03	NCV	Failure to Implement and Maintain Procedures Regarding Breathing Air Quality (Section 2RS3.3)
05000331/2013002-04	NCV	Corrective Actions Associated with Potential Cable Submergence Improperly Closed (Section 4OA2.3)
05000331/2013002-05	NCV	Failure to Conduct Adequate Post-Maintenance Testing (Section 4OA2.4)
05000331/2013002-06	NCV	Average Power Range Monitor Condition Prohibited by Technical Specifications (Section 4OA3.2)

### 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

OP-AA-102-1002 (DAEC); Seasonal Readiness; Revision 7  
Abnormal Operating Procedure (AOP) 903; Severe Weather; Revision 39

### 1R04

OP-AA-102-1003; Guarded Equipment; Revision 3  
OP-AA-102-1003 (DAEC); Guarded Equipment (DAEC Specific Information); Revision 24  
OI 513; Fire Protection; Revision 111  
OI 513A2; Fire Protection System Valve Lineup; Revision 20  
OI 513A1; Fire Protection System Electrical Lineup; Revision 8  
AOP 913; Fire; Revision 67  
OI 151A2; "A" Core Spray System Valve Lineup and Checklist; Revision 5  
OI 151A4; "B" Core Spray System Valve Lineup and Checklist; Revision 4  
OI 454A2; "A" ESW System Valve Lineup and Checklist; Revision 14  
OI 324A10; SBDG Standby/ Readiness Condition Checklist; Revision 14  
OI 435A2; Fuel Pool Cooling System; Revision 6  
OI 304.2A1; 4160V/480V Essential Electrical Distribution System; Revision 1  
OI 317.1A4; 120 VAC Regulated AC Distribution 1D15/1Y1A and 1D25/1Y2A; Revision 2  
CR 01859781; 1B4203 Is Not Matching OI 317.1A4 Position of Off

### 1R05

Administrative Control Procedure (ACP) 1203.53; Fire Protection; Revision 17 and 18  
ACP 1412.4; Impairments to Fire Protection Systems; Revision 66  
DAEC Fire Plan – Volume 1, Program; Revision 62 and 63  
AFP 19; Turbine Building South Turbine Building Ground Floor; Revision 25  
CR 01853904; Fire Brigade Communications in Noisy Environments  
CR 01848530; Fire Brigade Members Attending Training at the Training Center  
AFP 04; North CRD Module Area, and CRD Repair Room EL. 757'-6"; Revision 28  
AFP 05; South CRD Module Area, Off-Gas Recombiner Room, and Railroad Airlock EL. 757'-6"; Revision 26  
AFP 09; RBCCW Heat Exchanger Area, Equipment Hatch Area, and Jungle Room EL. 812'-0"; Revision 27

### 1R06

CR 1842297; Sprinkler Shield for CB Chiller Chilled Water Pumps  
Letter BLIEG-84-433, dated November 15, 1984; Subject: Duane Arnold Energy Center, Bechtel Job 11186-410-403, Inadvertent Actuation of Fire Suppression System Evaluation Criteria  
Letter BLIEG-85-132, dated April 16, 1985; Subject: Duane Arnold Energy Center, Bechtel Job 11186-410-403, Inadvertent Actuation of Fire Suppression System Evaluation Report



### 1R08

WO 1282163; Remove Old MCC 1b4206 and Replace Per EC 156061  
EC 156061; 480V MCC Replacement

### 1R11

STP 3.3.6.1-09A; A Primary Containment Isolation, Groups 2 and 4, Logic System Functional Test; Revision 2  
CR 01859677; PCIS Status Board All Valves Closed for Group 4 Delayed  
CR 01859761; STP Completion Delayed Due to Lack of Procedural Guidance  
STP 3.8.1-06A; A Standby diesel Generator Operability Test (Fast Start); Revision 13

### 1R12

DAEC Performance Criteria Basis Document; Reactor Protection System and Neutron Monitoring System; Revision 3  
CR 01845249; Maintenance Rule > 80%, and Yellow, RPS Scram Input Failures  
CR 01856377; Gasket Installed in 1E053B2 Potentially Not Garlock 3200  
CR 01855570; Issues Encountered with SBDG Lube Oil Heat Exchanger Leak  
CR 01854873; 1-2 DPM Leak on A SBDG  
CR 01854872; 50-60 DPM Leak on 1G-31 Lube Oil Cooler Heat Exchanger  
CR 01855032; A SBDG Lube Oil Cooler Lube Oil leak Required Tripping A SBDG  
CR 01855020; Activated HAZMAT Team for Oil Spill at A Diesel Room  
CR 01856579; Item to Be Considered For Investigation in SBDG RCE  
WO 40132849; 1E053B2: Replace Lube Oil Cooler Tube Bundle  
WO 40132858; 1E053A2: Replace Lube Oil Cooler Tube Bundle  
General Maintenance Procedure (GMP)-MECH-01; General Bolting Requirements; Revision 26  
MD-024; Bolting Practices; Revision 10

### 1R13

Work Planning Guideline-1; Work Process Guideline; Revision 55  
Work Planning Guideline-2; Online Risk Management Guideline; Revision 61  
OP-AA-104-1007; Online Aggregate Risk; Revision 2  
WM-AA-1000; Work Activity Risk Management; Revision 13  
WM-AA-1000 (DAEC); Work Activity Risk Management (DAEC); Revision 0  
OP-AA-102-1003; Guarded Equipment; Revision 3  
OP-AA-102-1003 (DAEC); Guarded Equipment (DAEC Specific Information); Revision 24  
WO 40199436; EOR 19436/19450: West Bus Removal For Block Close Contacts  
AOP 691; Condenser High Backpressure; Revision 8  
AOP 672.1; Loss of Offgas System; Revision 30  
CR 01838246; Offgas System Perturbation Results in AOP TRM Entries  
CR 01842744; CV 1072 Found Closed. MSR Drain Tank Controlling on Dump Valve  
Work Week 1305 Work Activity Risk Management (WARM) Summary and Weekly Probabilistic Risk Analysis  
WO 40184541; 1P229C-M, Change Out Upper Motor Bearing (RHR)

### 1R15

EN-AA-203-1001; Operability Determinations/ Functionality Assessments; Revision 9  
CR 01831503; CV 4300 T Seal Did Not Inflate Fully Upon Closing Valve  
AOP 255.1; Control Rod Movement / Indication Abnormal; Revision 43  
OI 856.3; Rod Position Information System; Revision 8  
CR 01849446; "B" Chiller Did Not Start  
CR 01848829; 1P229C-M RHR Motor Upper Bearing Post Testing  
CR 01844913; C RHR Motor Oil Reservoir Found Metal Shavings  
Past Operability Review (POR) 01844913; C RHR Motor Oil Reservoir Found Metal Shavings  
Historical Vibration Data for 1P229C; RHR Pump, 1995-2013  
CR 01845754; Mistaken Understanding of RHR Motor Bearing Mounting  
WO 40146220; 1P229C-M, Obtain Lube Oil Sample for Analysis

### 1R18

WO 01282163; 1B4206 – Remove Old MCC 1B4206 and Replace Per EC 156061  
EC 156061; 480 V MCC Replacement  
ACE 1918; CAQ – Perform Aggregate Review of ECP 1871 Related CAPs

### 1R19

ACP 1408.1; Work Order Task(s); Revision 182  
MD 024; Post Maintenance Testing Program; Revision 76 and 77  
STP 3.5.1-05; HPCI System Operability Test; Revision 58  
WO 40170771; MO2247-O; Lube and Inspect Gear box and Limit Switch  
WO 40176867; MO2318-O; Inspect Lube Gearbox and Limit Switch  
WO 40175686; 1P218-M, Inspect & Perform PI Test  
STP 3.8.1-06B; B Standby Diesel Generator Operability Test (Fast Start); Revision 15  
WO 40184541; 1P229C-M, Change Out Upper Motor Bearing (RHR)  
STP 3.5.1-02; LPCI System operability Tests; Revision 37  
CR 01844913; C RHR Motor Oil Reservoir Found Metal Shavings  
WO 40107646; Replace Electrolytic Capacitors  
WO 40168715; MO 2515-O, Lube & Inspect  
WO 40173426; Calibrate TE 2406 (Maintenance Run)  
WO 40172163; FI 2509: Calibrate  
WO 40172161; FIC2509: Replace MPU Board  
WO 40172164; FT2509: Calibrate  
STP 3.5.3-02; RCIC System Operability Test; Revision 37

### 1R21

CR 01776321; LPCI Manual Realignment from S/D Cooling in Mode Three  
CR 01625023, 2011 NRC CDBI Discussion  
CR 01626334; CDBI-Potential Impact on RHR Components From Steam  
CAL-M12-019; DAEC LOCA in Shutdown Cooling Mitigating Actions Evaluations; Revision 1  
OI 149; Residual Heat Removal System; Revision 124  
BECH-M119; P&ID Residual Heat Removal System; Revision 80

## 1R22

ACP 107; Surveillance Tests; Revision 14  
STP 3.6.4.3-03B; 'B' Standby Gas Treatment System HEPA and Charcoal Filter Efficiency Tests; Revision 5  
WO 40136287; STP 3.6.4.3-03B; 'B' SBTG Sys HEPA/ Char Filter Efficiency Test  
CR 01839315; Deluge System Tagout During SBTG Charcoal Testing  
STP 3.3.5.1-37; RHR SLFT – Operating; Revision 3  
CR 01839522; SGTS Annual Filter STP Order of Performance  
CR 01839606; Carbon in the SGTS Trains Not Replaced  
STP 3.3.6.1-06; PCIS Main Steam Line Isolation Logic System Functional Test; Revision 10  
STP 3.3.8.1-02A; 1A3 4kV Emergency Bus Degraded Voltage Calibration; Revision 6  
CR 01847962; Trend CR Bus 1A3 Relay 127-B2 as Found Slightly High

## 2RS3

LP 100RES,01; Respiratory Protection; Revision 12  
HPP 3106.03; Description and Issuance of Respiratory Protection Equipment; Revision 14  
HPP 3106.05; Breathing Air Quality Assurance Test; Revision 20  
HPP3106.04; Inspection, Maintenance and Quality Assurance of Respiratory Protection Equipment; Revision 23  
Air Sample Records; dated November 16, 2012 and November 20, 2012  
SCBA Qualification Query; dated December 19, 2012  
Nuclear Oversight Report; PDA 12-003; Radiological Protection and Radwaste; dated April 5, 2012  
12-004-R; Radiological Engineering Calculation; 10 CFR 61 Data Dry Active Waste; approved September 24, 2012  
CR 01626562; Monthly SCBA Unit Checks Were not Done in February  
CR 01721646; Unable to Complete SBTG STP 3.6.4.3-02  
CR 01800957; SCBA Unit Pass Alarm Failed  
CR 01824741; PAPR Respirators Worn without Proper Authorization  
CR 01839697; Grade "D" Air Test Not Completed within the Required 9 Months  
CR 01839706; MSA M7 MMR Certified C.A.R.E Technicians Quals not in LMS  
CR 01839666; Monthly Inspection Missed on SCBA Equipment  
CR 01839722; Track the Completion of SCBA Annual Flow Test  
CR 01840046; Grade "D" Breathing Air Sample Missed in April, 2011

## 2RS4

ACP 1411.17; Occupational Dose Limits and Upgrades; Revision 22  
ACP 1411.18; Personnel Dosimetry; Revision 36  
HPP 3104.03; Radiological Air Sample Collection and Analysis; Revision 18  
HPP 3105.03; Shallow Dose Equivalent Assessment; Revision 13  
HPP 3105.05; Administration of In-Vivo and In-Vitro Bioassay; Revision 22  
SAFO 1607538; Focused Self Assessment of Dosimetry with Emphasis on Internal Dosimetry; Assessment Dates August 30 through September 1, 2011  
Internal Dose Assessment for 2011 and 2012 and Related Bioassay Data  
NVLAP Accreditation for Mirion Technologies for July 1, 2012 through June 30, 2013  
Electronic Dosimeter Dose and Dose Rate Alarm Logs for 2012  
Whole Body Counter Quality Assurance Logs; dated July through December 2012  
CR 01736845; Skyshine Dose to Workers is 3-4 Rem per Year  
CR 01724120; 2011 Site Dose vs. Goal Report Discrepancy

CR 01742438; Fastscan Whole Body Counter Out of Service  
CR 01770390; Whole Body Counter Gain Adjust Failure  
CR 01752529; Failure to Return TLDs at the end of the Monitoring Period

#### 4OA1

NRC PI Data Calculation, Review and Approval; Unplanned Scrams; dated First Quarter 2012 through Fourth Quarter 2012  
NRC PI Data Calculation, Review and Approval; Unplanned Scrams with Complications; dated First Quarter 2012 through Fourth Quarter 2012  
NRC PI Data Calculation, Review and Approval; Unplanned Power Changes; dated First Quarter 2012 through Fourth Quarter 2012  
CR 01862691; CDE Entry for Generator Ground S/D did not Carry Over to the NRC

#### 4OA2

OA-AA-100-1002; Plant Status Control Management; Revision 0  
PI-AA-101-1000; Human Performance Program Error Reduction Tools; Revision 9  
ACP 1410.2; LCO Tracking and Safety Function Determination Program; Revision 30  
ACP 1410.5; Plant Status Control Program; Revision 104  
ACP 101.01; Procedure Use and Adherence; Revision 52  
PI-AA-204; Condition Identification and Screening; Revision 19  
PI-AA-205; Condition Evaluation and Corrective Action; Revision 19  
PI-AA-100-1007; Apparent Cause Evaluation; Revision 6  
PI-AA-100-1005; Root Cause Analysis; Revision 7  
VNDR-12-35; Vessel Specimen Removal Procedure; Revision 0  
WO 40135159; STP NS620002 Nil Ductility Transition Temperature Sample Test  
ACE 341887-07; Failure to Promptly Identify and Correct a Condition Adverse to Quality Regarding Water Intrusion into the Turbine Building East Cable Vault  
CR 00598596; ID of Location of Water Intrusion into 1A2 Switchgear Room  
RCE 1834595; Secondary Containment Damper Failures NRC Reportable Event  
CR 01826680; Elevated B-SBGT Flow Required to Meet SR 3.6.4.1.3  
STP 3.6.4.1-01B; Secondary Containment Integrity Using SBGT Train B; Revisions 5, 6, 7, and RCE 1739467; Secondary Containment Damper Failures NRC Reportable Event  
MD 024; Post-Maintenance Testing Program; Revision 77  
GMP-MECH-42; General Maintenance Procedure, HVAC Dampers; Revision 0  
WO 40197767-05; Secondary Containment Failed STP 3.6.4.1-01B DP  
WO 40149934-06; 1VAD017B1: FIP Extent of Condition  
CR 01739467; 1VAD017B3 Indicates Dual While Performing A Gp 3 B STP  
CR 01842830; Lack of Secondary Containment Margin Not Being Pursued  
CR 01843566; DO7639B (1VAD019B) Fails STP 3.6.4.2-01B  
CR 01845483; 1VAD019B Secondary Containment Damper  
CR 01833678; Challenge on Ops Concerns vs. Ops Focus Item: Sec Containment  
CR 01826460; Secondary Containment Failed STP 3.6.4.1-01B DP Requirements  
Past Operability Review (POR) 01826460-01; Secondary Containment Failed STP 3.6.4.1-01B DP Requirements  
CR 01833666; RCE 1739467 CAPR Implementation  
CR 01840714; Secondary Containment Damper Operator Information

4OA3

RCE 01828842; Local Power Range Monitor 32.25-A Inoperability Not Recognized  
CR 01827358; Trend – LPRM 32-25A Computer Point Downscale  
Operations Logs November 26 – December 1, 2012  
OI 878.3; Local Power Range Neutron Monitoring System; Revision 36

## LIST OF ACRONYMS USED

ACE	Apparent Cause Evaluation
ACP	Administrative Control Procedure
ADAMS	Agencywide Document Access Management System
AFP	Area Fire Plan
ALARA	As-Low-As-Is-Reasonably-Achievable
AOP	Abnormal Operating Procedure
APRM	Average Power Range Monitor
ASME	American Society of Mechanical Engineers
CA	Corrective Action
CAP	Corrective Action Program
CDBI	Component Design Basis Inspection
CDF	Core Damage Frequency
CE	Condition Evaluation
CFR	Code of Federal Regulations
CR	Condition Report
CRD	Control Rod Drive
DAEC	Duane Arnold Energy Center
dpm	Drop-Per-Minute
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
ESW	Emergency Service Water
GMP	General Maintenance Procedure
HEPA	High-Efficiency Particulate Air
HPCI	High Pressure Coolant Injection
HPP	Health Physics Procedure
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Inspection Report
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
LPCI	Low Pressure Coolant Injection
LPRM	Local Power Range Monitor
LSFT	Logic System Functional Test
MD	Maintenance Directive
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
OE	Operating Experience
OI	Operating Instruction
PARS	Publicly Available Records System
PCIS	Primary Containment Isolation System
PI	Performance Indicator
POR	Past Operability Review
PPC	Plant Process Computer
RBCCW	Reactor Building Closed Cooling Water
RCE	Root Cause Evaluation
RCIC	Reactor Core Isolation Cooling
RFO	Refueling Outage

RHR	Residual Heat Removal
RPS	Reactor Protection System
SBDG	Standby Diesel Generator
SCBA	Self-Contained Breathing Apparatus
SDP	Significance Determination Process
SRA	Senior Reactor Analyst
SR	Surveillance Requirement
SSC	Systems, Structures, and Components
STP	Surveillance Test Procedure
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
WO	Work Order

R. Anderson

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Sincerely,

**/RA/**

Robert J. Orlikowski, Acting Chief  
Branch 1  
Division of Reactor Projects

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Letter to R. Anderson from R. Orlikowski dated May 9, 2013

SUBJECT: DUANE ARNOLD ENERGY CENTER – NRC INTEGRATED INSPECTION  
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