

October 31, 2007

Mr. Richard L. Anderson  
Vice-President  
Duane Arnold Energy Center  
3277 DAEC Road  
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER  
NRC INTEGRATED INSPECTION REPORT 05000331/2007004

Dear Mr. Anderson:

On September 30, 2007, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Duane Arnold Energy Center. The enclosed integrated inspection report documents the inspection findings which were discussed on October 11, 2007, 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, there were two NRC-identified and one self-revealed findings of very low safety significance, all three of which involved violations of NRC requirements. However, because these violations were of very low safety significance and because the issues were entered into your corrective action program, the NRC is treating these findings and issues as Non-Cited Violations in accordance with Section VI.A.1 of the NRC's Enforcement Policy.

If you contest the subject or severity of a Non-Cited Violation, 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.

R. Anderson

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Sincerely,

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Kenneth Riemer, Chief  
Branch 2  
Division of Reactor Projects

Docket No. 50-331; 72-032  
License No. DPR-49

Enclosure: Inspection Report 05000331/2007004  
(w/Attachment: Supplemental Information)

cc w/encl: J. Stall, Senior Vice President, Nuclear and Chief  
Nuclear Officer  
R. Helfrich, Senior Attorney  
M. Ross, Managing Attorney  
W. Webster, Vice President, Nuclear Operations  
M. Warner, Vice President, Nuclear Operations Support  
R. Kundalkar, Vice President, Nuclear Engineering  
J. Bjorseth, Site Director  
D. Curtland, Plant Manager  
S. Catron, Manager, Regulatory Affairs  
Chief Radiological Emergency Preparedness Section,  
Dept. Of Homeland Security  
M. Rasmusson, State Liaison Officer

R. Anderson

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DATE	10/31/07		10/30/07		10/30/07		

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Letter to R. Anderson from K. Riemer dated October 31, 2007

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NRC INTEGRATED INSPECTION REPORT 05000331/2007004

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**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION III**

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

Report No: 05000331/2007004

Licensee: FPL Energy Duane Arnold, LLC

Facility: Duane Arnold Energy Center

Location: Palo, Iowa

Dates: July 1 through September 30, 2007

Inspectors: R. Orlikowski, Senior Resident Inspector  
R. Baker, Resident Inspector  
N. Shah, Project Engineer  
R. Jickling, Sr. Emergency Preparedness Analyst  
C. Moore, Operations Engineer  
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T. Go, Health Physicist  
R. Winter, Reactor Inspector

Observers: None

Approved by: K. Riemer, Chief  
Branch 2  
Division of Reactor Projects

Enclosure

## SUMMARY OF FINDINGS

IR 05000331/2007004; 07/01/2007 - 09/30/2007; Duane Arnold Energy Center. Inservice Inspection Activities, Event Follow-up, and Other Activities.

This report covers a three month period of baseline resident inspection and announced baseline inspections of inservice inspection, emergency preparedness, maintenance effectiveness, and radiation protection. The inspections were conducted by Region III reactor inspectors, an emergency preparedness analyst, a health physicist, and the resident inspectors. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

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

#### Cornerstone: Initiating Events

- Green. The inspectors identified a non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion V for the licensee's failure to follow an ultrasonic examination procedure used to examine recirculation riser safe-end to nozzle weld RRF-F002. Specifically, the licensee's contracted ultrasonic data analyst failed to achieve adequate search unit contact with the weld surface in accordance with the procedure, prior to analyzing and accepting this weld examination in April of 2005. Because the licensee failed to achieve adequate ultrasonic search unit contact, an undetected intergranular stress corrosion crack was returned to service for one operating cycle, which placed the reactor coolant pressure boundary at increased risk for weld failure resulting in leakage. The licensee confirmed that this examination procedure and equipment had not been used for examination of other welds at the Duane Arnold Energy Center. In March of 2007, the licensee completed a weld overlay repair on RRF-F002 to mitigate this cracked weld.

This finding was of more than minor significance because the finding could be reasonably viewed as a precursor to a significant event involving an undetected weld crack that propagates to weld failure. This increased risk of weld failure and leakage adversely affected the Initiating Events cornerstone attribute of "Equipment Performance," and affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. The inspectors applied the IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for the At-Power Situation," to this finding. The inspectors answered "yes" to Question 1 "Loss of Coolant Accident (LOCA) Initiators" of the Initiating Events Cornerstone column of the Phase 1 worksheet, which asked, "Assuming worst case degradation, would the finding result in exceeding the Technical Specification (TS) limit for identified reactor coolant system leakage?" For this

finding, the worst case degradation would result from propagation of this weld crack under operating pressure and residual weld stresses causing leakage or failure at the 13-inch diameter recirculation nozzle weld RRF-F002, which would exceed the TS limit of no pressure boundary leakage. The Phase 1 worksheet required a significance determination process Phase 2 analysis for this type of finding. Because the increase in initiating event likelihood for LOCAs was not known, it was conservatively increased by one order of magnitude in accordance with Step 1.2 of Attachment 2 of Appendix A of IMC 0609. The inspectors completed the Phase 2 worksheets assuming that the initiating event frequency for small, medium and large break LOCAs had increased by one order of magnitude. Based on this Phase 2 evaluation, the NRC determined that this finding was of very low safety significance. (Section 1R08)

### **Cornerstone: Mitigating Systems**

- Green. A finding of very low safety significance and an associated NCV of TS 5.4.1a, associated with Regulatory Guide 1.33, Revision 2, Appendix A, Section 8 were identified through a self-revealing event when the licensee failed to properly implement procedures for configuration control during planned surveillance activities which resulted in the loss of a required safety feature. Specifically, during performance of STP 3.3.6.1-02, "Main Steam Line Low Pressure Instrument Calibration," maintenance personnel incorrectly installed a relay jumper on the relay for PS1014, Primary Containment Isolation System (PCIS) channel A1 instrument, and subsequently isolated PS1016, PCIS channel A2 instrument, for the calibration check. During the period of time that the jumper was installed on the channel A1 instrument and the channel A2 instrument was isolated and pressurized, a Group 1 isolation would not have occurred if an actual main steam line low pressure condition had occurred. The primary cause of this violation was related to the cross-cutting area of human performance. Specifically, personnel work practices failed to use human performance prevention tools, commensurate with the risk of the task being performed, to ensure work activities are performed safely. The failure to use proper concurrent verification and place keeping techniques resulted in the test jumper being installed on the relay for a previously tested channel instead of the relay for the pressure instrument which was being tested. (H.4.a)

This finding was more than minor because it is associated with the Mitigating Systems cornerstone attribute of equipment performance, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. (IMC 0612 Appendix B, "Issue Screening.") The inspectors performed a Phase 1 analysis of this finding in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." Since this issue was not a design or qualification deficiency, involved the loss of a safety feature and did not result in a loss of safety function, and was not considered potentially risk significant to a seismic, flooding, or severe weather initiating event, the issue was of very low safety significance. (Section 4OA3.2)

- Green. The inspectors identified a finding having very low safety significance and an associated non cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to verify the adequacy of design calculations performed to verify the acceptability of a steam void in the High Pressure Coolant Injection (HPCI) pump discharge piping. Following discovery, the licensee performed informal analyses to show that the HPCI system remained operable. The primary cause of this violation was related to the cross-cutting area of human performance. Specifically, the licensee failed to use conservative assumptions in decision making and appeared to adopt a requirement to demonstrate that continued presence of a steam void was acceptable rather than to analyze the effects of a steam void of the size and under the conditions which the licensee originally determined existed. (H.1.b)

This issue was more than minor because it fit the more than minor example from Appendix E, "Examples of Minor Issues," example 3j, in that the licensee had to perform additional informal analyses to demonstrate the acceptability of the formal calculations and to show that the HPCI system remained operable. This performance deficiency impacted the Mitigating Systems Cornerstone objective of ensuring the operability and reliability of the HPCI system because it affected the design control attribute of structural integrity.

The issue was of very low safety significance based on a Phase I analysis performed in accordance with IMC 0609, "Significance Determination of Reactor Inspection Findings for At-Power Situations," Appendix A. (Section 40A5.1)

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

No findings of significance were identified.



## REPORT DETAILS

### Summary of Plant Status

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

#### 1. REACTOR SAFETY

##### **Cornerstone: Initiating Events, Mitigating Systems, Barrier Integrity, and Emergency Preparedness**

#### 1R01 Adverse Weather (71111.01)

##### .1 Situational Preparation

###### a. Inspection Scope

The inspectors performed a detailed review of the licensee's procedures and a walkdown of areas to observe preparations for adverse weather, in particular, high winds and/or tornadoes, for a total of one sample. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. During the inspection, the inspectors focused on plant specific system design features and implementation of procedures for responding to or mitigating the effects of adverse weather. Inspection activities included, but were not limited to, a review of the licensee's adverse weather procedures, and a review of analysis and requirements identified in the Updated Final Safety Analysis Report (UFSAR). The inspectors also verified that operator actions specified by plant specific procedures were appropriate.

###### b. Findings

No findings of significance were identified.

#### 1R04 Equipment Alignment (71111.04)

##### .1 Partial Walkdown

###### a. Inspection Scope

The inspectors performed partial walkdowns of accessible portions of trains of risk-significant Mitigating Systems equipment. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. Equipment alignment was reviewed to identify any discrepancies that could impact the function of the system and potentially increase risk. Redundant or backup systems were selected by the inspectors during times when the trains were of increased importance due to the redundant trains of other related equipment being unavailable.

Inspection activities included, but were not limited to, a review of the licensee's procedures, verification of equipment alignment, and an observation of material condition, including operating parameters of in-service equipment. Identified equipment alignment problems were verified by the inspectors to be properly resolved.

The inspectors selected the following equipment trains to verify operability and proper equipment line-up for a total of four samples:

- 'B' Residual Heat Removal Service Water (RHRSW) System with 'A' RHRSW Out-of-Service (OOS);
- HPCI System Because it Was Considered a Risk-significant Single-train System;
- 'A' RHRSW System with 'B' RHRSW OOS; and
- Standby Liquid Control (SBLC) system following planned maintenance.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

.1 Quarterly Fire Zone Walkdowns

a. Inspection Scope

The inspectors walked down risk-significant fire areas to assess fire protection requirements. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. Various fire areas were reviewed 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 had implemented adequate compensatory measures for OOS, degraded or inoperable fire protection equipment, systems or features. Fire areas were selected based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events, their potential to adversely impact equipment which is used to mitigate a plant transient, or their impact on the plant's ability to respond to a security event. Inspection activities included, but were not limited to, the control of transient combustibles and ignition sources, fire detection equipment, manual suppression capabilities, passive suppression capabilities, automatic suppression capabilities, compensatory measures, and barriers to fire propagation.

The inspectors selected the following areas for review for a total of nine samples:

- Area Fire Plan (AFP) 02; Reactor Building South Corner Rooms, Elevations 716'4"-747'11.75";
- AFP 07; Reactor Building Laydown Area, Corridor and Waste Tank Area and Spent Resin Tank Room, Elevation 786'0";
- AFP 13; Reactor Building Refueling Floor, Elevation 855'0";
- AFP 16; Turbine Building Condensate Pump Room, Elevation 734'0";
- AFP 69; Yard, Main Transformer 1X1;

- AFP 70; Yard, Standby Transformer 1X4;
- AFP 71; Yard, Startup Transformer 1X3;
- AFP 72; Yard, Auxiliary Transformer 1X2; and
- AFP 74; Yard, Switchyard.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

The inspectors performed a semi-annual review of flood protection barriers and procedures for coping with internal flooding in the pump house for a total of one sample. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. Inspection activities focused on reviewing flood mitigation plans and equipment to verify that they were consistent with design requirements and risk analysis assumptions. Inspection activities included, but were not limited to, a review and/or walkdown to assess design measures, seals, drain systems, contingency equipment condition and availability of temporary equipment and barriers, performance and surveillance tests, procedural adequacy, and compensatory measures.

b. Findings

No findings of significance were identified.

1R08 Inservice Inspection (ISI) Activities (71111.08)

Piping Systems ISI

a. Inspection Scope

In February of 2007, intergranular stress corrosion cracks (IGSCC) were identified in recirculation riser safe-end to nozzle welds RRF-F002 and RRC-F002 (reference Section 4.O.A.3 and Licensee Event Report (LER) 05000331/2007-003-00). To determine if cracks were present during past ultrasonic examinations (UT) of these welds, the NRC contracted Pacific Northwest National Laboratories (PNNL) to review UT data collected from prior examinations of these welds. Similarly, the licensee requested the Electric Power Research Institute (EPRI) to independently review past UT data collected for these welds.

From July 9-11, 2007, the inspectors conducted a review of the implementation of the licensee's ISI program focused on UT records and procedures used for examination of the recirculation riser safe-end to nozzle welds RRF-F002 and RRC-F002 during UT dating back to 1999, to evaluate compliance with American Society of Mechanical Engineers (ASME) Code and licensee procedures. Additionally, the inspectors reviewed

independent assessments of the automated UT data collected during past examinations of these welds documented in Technical Reports from PNNL and EPRI.

b. Findings

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion V, for the licensee's failure to follow a UT procedure used to examine recirculation riser safe-end to nozzle weld RRF-F002. Specifically, the licensee's contracted ultrasonic data analyst failed to achieve adequate search unit contact with the weld surface in accordance with the procedure prior to analyzing and accepting this weld examination in April of 2005.

Description: On July 10, 2007, the inspectors determined that the licensee's contract ultrasonic data analyst failed to follow procedure UT-103, "Automated Ultrasonic Examination of Dissimilar Metal Piping Welds," during examination of recirculation riser safe-end to nozzle weld RRF-F002 completed in April of 2005.

In March of 2007, EPRI documented the results of a review of UT data collected during examination of recirculation riser safe-end to nozzle welds RRF-F002 and RRC-F002 in report No. IR-2007-265, "Evaluation of Dissimilar Metal Weld Examinations Performed at Duane Arnold Unit 1 During Refueling Outage 20 (RFO 20)." For the UT data collected by licensee contractors in 2005 on weld RRF-F002, EPRI identified that a flaw signal was present in this data, but overall response was compromised and would not be obvious to the examiner. Specifically, EPRI identified gaps in the flaw response signals (Figure 5-4 of IR-2007-265) where the UT search unit had lifted off the weld surface. EPRI concluded that the weight of the UT search unit coupled with a small amount of surface roughness allowed the search unit to pull away from the surface (e.g., loss of search unit contact with the weld surface), causing less than optimum flaw response.

On June 18, 2007, PNNL documented the results of a review of UT data collected during examination of recirculation riser safe-end to nozzle welds RRF-F002 and RRC-F002 in a Technical Evaluation Report from PNNL JCN-J3218 Task 6, TAC MD4680, "Review of Ultrasonic Data for Flaws Detected at Duane Arnold Energy Center, Unit 1." For the UT data collected by licensee contractors in 2005 on weld RRF-F002, PNNL identified that UT coupling (e.g., loss of search unit contact with the weld surface) significantly degraded the quality of the UT data and was most likely the cause of the cracks being missed. PNNL stated that even with the poor quality of the 2005 data, that crack responses could be intermittently identified and that it was unclear exactly why the vendor analyst had misinterpreted these signals.

As of July 10, 2007, the licensee had not initiated any corrective actions to determine why their vendor had failed to achieve adequate search unit contact with the weld surface during the 2005 examination of weld RRF-F002 as identified by PNNL and EPRI. The inspectors' questions prompted the licensee to initiate corrective action program documents, Corrective Action Process (CAP) 051005, CAP 051004, and CAP 051016 to investigate potential UT performance deficiencies identified in the PNNL and EPRI reports.

The inspectors reviewed procedure UT-103, "Automated Ultrasonic Examination of Dissimilar Metal Piping Welds," used by the contractor to examine weld RRF-F002 in April of 2005. Based on the EPRI and PNNL reports discussed above, the inspectors identified that the licensee's contract ultrasonic data analyst failed to follow procedure Step XI.H. "Data Evaluation" which required that the analyst ensure adequate search unit contact prior to analyzing the UT data collected. Because this step was not met, the licensee's vendor analyst failed to recognize a crack signal in the UT data and consequently, an undetected IGSCC in weld RRF-F002 was returned to service for an additional operating cycle. The licensee confirmed that this examination procedure and equipment had not been used for examination of other welds at the Duane Arnold Energy Center. In March of 2007, the licensee completed a weld overlay repair on RRF-F002 to mitigate this cracked weld (reference Section 4.O.A.3 and LER 05000331/2007003-00).

Analysis: The inspectors determined that the failure of the licensee to follow procedure UT-103, "Automated Ultrasonic Examination of Dissimilar Metal Piping Welds," during examination of recirculation riser safe-end to nozzle weld RRF-F002 was a performance deficiency that warranted a significance evaluation. Because the licensee failed to achieve adequate UT search unit contact, an undetected IGSCC was returned to service for one operating cycle, which placed the reactor coolant pressure boundary at increased risk for weld failure resulting in leakage. Therefore, this finding was of more than minor significance because the finding could be reasonably viewed as a precursor to a significant event involving an undetected weld flaw that propagates to weld failure. This increased risk of weld failure and leakage adversely affected the Initiating Events cornerstone attribute of "Equipment Performance," and affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. The inspectors did not identify any cross-cutting issues associated with this finding.

The inspectors applied the IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for the At-Power Situation" to this finding. The inspectors answered "yes" to question 1 "LOCA Initiators" of the Initiating Events Cornerstone column of the Phase 1 Worksheet, which asked "Assuming worst case degradation, would the finding result in exceeding the Technical Specification (TS) limit for identified reactor coolant system leakage?" For this finding, the worst case degradation would result from propagation of this weld crack under operating pressure and residual weld stresses causing leakage or failure at the 13-inch diameter recirculation nozzle weld RRF-F002, which would exceed the TS limit of no pressure boundary leakage. The Phase 1 Worksheet required a significance determination process Phase 2 Analysis for this type of finding. Because the increase in initiating event likelihood for LOCAs was not known, it was conservatively increased by one order of magnitude in accordance with Step 1.2 of Attachment 2 of Appendix A of IMC 0609. The inspectors completed the Phase 2 Worksheets assuming that the initiating event frequency for small, medium and large break LOCAs had increased by one order of magnitude. Based on this Phase 2 Evaluation, the NRC determined that this finding was of very low safety significance (Green).

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," required in part, that activities affecting quality shall be prescribed by

documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings.

Procedure UT-103, "Automated Ultrasonic Examination of Dissimilar Metal Piping Welds," Revision 2, Step XI.H. "Data Evaluation," Revision 2 required in part, "Prior to analyzing the data, the analyst shall ensure the quality of the data by verifying the following. Adequate search unit contact has been achieved."

Contrary to the above, on April 5 and 6, 2005, during examination of weld RRF-F002 (UT report 105047), adequate search unit contact had not been achieved prior to analyzing and accepting UT data for this weld. Consequently, an IGSCC was not identified and the unrepaired weld was returned to service for an operating cycle. Failure to follow procedure Step XI.H for UT of Weld RRF-F002, is a violation of 10 CFR Part 50, Appendix B, Criterion V. Because of the very low safety significance of this finding and because the issue was entered into the licensee's corrective action program (CAP 051016), it is being treated as an NCV, consistent with Section VI.A.1 of the Enforcement Policy (NCV 05000331/2007004-01).

1R11 Licensed Operator Requalification Program (71111.11)

a. Inspection Scope

The inspectors observed three training crew performances on Simulator Exercise Guide 2007C-01 S, Revision 0, for a total of one sample. The scenario included a trip of the 'B' Standby Diesel Generator (SBDG) on overspeed followed by a loss of electrical busses due to a lightning strike, with a required manual scram due to lowering reactor vessel level following a loss of feedwater flow. The primary purpose of this scenario was to practice successful transient mitigation strategies and develop consistency between different operating crews. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. The inspection activities assessed the licensee's effectiveness in evaluating the requalification program, ensuring that licensed individuals operated the facility safely and within the conditions of their license, and evaluated licensed operators' mastery of high-risk operator actions. Inspection activities included, but were not limited to, a review of high risk activities, emergency plan performance, incorporation of lessons learned, clarity and formality of communications, task prioritization, timeliness of actions, alarm response actions, control board operations, procedural adequacy and implementation, supervisory oversight, group dynamics, interpretations of technical specifications, simulator fidelity, and the licensee critique of performance.

The crew performance was compared to licensee management expectations and guidelines as presented in the following documents:

- Administrative Control Procedure (ACP) 110.1, "Conduct of Operations," Revision 7;
- ACP 101.01, "Procedure Use and Adherence," Revision 42; and
- ACP 101.2, "Verification Process and SELF/PEER Checking Practices," Revision 7.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12)

.1 Quarterly Evaluation

a. Inspection Scope

The inspectors reviewed plant systems to assess maintenance effectiveness. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. Maintenance activities were reviewed to assess maintenance effectiveness, including maintenance rule activities, work practices, and common cause issues. Inspection activities included, but were not limited to, the licensee's categorization of specific issues including evaluation of maintenance performance criteria, appropriate work practices, identification of common cause errors, extent of condition, and trending of key parameters. Additionally, the inspectors reviewed implementation of the Maintenance Rule (10 CFR 50.65) requirements, including a review of scoping, goal-setting, performance monitoring, short-term and long-term corrective actions, functional failure determinations associated with reviewed condition reports, and current equipment performance status.

The inspectors performed the following maintenance effectiveness reviews for a total of two samples:

- An issue/problem-oriented review of the Control Room Indication Instrumentation (Annunciators) System because the system had experienced repetitive issues with spurious alarms; and
- A function-oriented review of the 125 VDC power system because it was designated as risk-significant under the Maintenance Rule.

b. Findings

No findings of significance were identified.

.2 Periodic Evaluation

a. Inspection Scope

The inspectors examined the last two Maintenance Rule periodic evaluation reports completed for the periods of April 20, 2003 to May 2, 2005, and May 3, 2005 to March 23, 2007. The inspectors reviewed a sample of (a)(1) Action Plans, Performance Criteria, Functional Failures, and Condition Reports to evaluate the effectiveness of (a)(1) and (a)(2) activities. These same documents were reviewed to verify that the threshold for identification of problems was at an appropriate level and the associated corrective actions were appropriate. Also, the inspectors reviewed the maintenance rule

procedures and processes. The inspectors focused the inspection on the following systems (samples):

- Feedwater;
- HPCI;
- RHRSW;
- Control Building Chillers; and
- Reactor Building Crane.

The inspectors verified that the periodic evaluations were completed within the time restraints defined in 10 CFR 50.65 (once per refueling cycle, not to exceed 24 months). The inspectors also ensured that the licensee reviewed its goals, monitored Structures, Systems, and Components (SSCs) performance, reviewed industry operating experience, and made appropriate adjustments to the maintenance rule program as a result of the above activities.

The inspectors verified that:

- the licensee balanced reliability and unavailability during the previous cycle, including a review of high safety significant SSCs;
- (a)(1) goals were met, that corrective action was appropriate to correct the defective condition, including the use of industry operating experience, and that (a)(1) activities and related goals were adjusted as needed; and
- the licensee has established (a)(2) performance criteria, examined any SSCs that failed to meet their performance criteria, and reviewed any SSCs that have suffered repeated maintenance preventable functional failures including a verification that failed SSCs were considered for (a)(1).

In addition, the inspectors reviewed maintenance rule self-assessments and audit reports that addressed the maintenance rule program implementation.

This review represented five triennial inspection samples.

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors reviewed the licensee's evaluation of plant risk, scheduling, and configuration control. An evaluation of the performance of maintenance associated with planned and emergent work activities was completed by the inspectors to determine if they were adequately managed. In particular, the inspectors reviewed the program for conducting maintenance risk safety assessments and to ensure that the planning, assessment and management of on-line risk was adequate. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. Licensee actions taken in response to increased on-line risk were



reviewed including the establishment of compensatory actions, minimizing activity duration, obtaining appropriate management approval, and informing appropriate plant staff. These activities were accomplished when on-line risk was increased due to maintenance on risk-significant SSCs.

The following activities were reviewed for a total of six samples:

- The inspectors reviewed the maintenance risk assessment for work planned during the weeks ending July 13 and 20, August 3 and 17, and September 7 and 28.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed the licensee's operability evaluations of degraded or non-conforming systems. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. Operability evaluations were reviewed that affected Mitigating Systems or barrier integrity cornerstones to ensure adequate justification for declaration of operability and that the component or system remained available. Inspection activities included, but were not limited to, a review of the technical adequacy of the evaluation against the TSs, UFSAR, and other design information; validation that appropriate compensatory measures, if needed, were taken; and comparison of each operability evaluation for consistency with the requirements of ACP-114.5, "Action Request System" and ACP-110.3, "Operability Determination."

The inspectors reviewed the following operability evaluations for a total of four samples:

- 'A' SBDG discovered inoperable during performance of STP 3.8.1-04 due to voltage control failure following startup of the generator;
- 'A' and 'B' River Water Supply system 8 inch piping at supports HBD-67 and HBD-68 calculated occasional stress exceeds the allowable stress limit for seismic upset conditions (Operating Bases Earthquake);
- Small Exhaust System Fires During 'B' SBDG Surveillance Test; and
- 'B' River Water Supply pump replacement discharge check valve weight exceeds equivalency evaluation criteria resulting in an operable but non-conforming condition.

b. Findings

No findings of significance were identified.

## 1R19 Post-Maintenance Testing (71111.19)

### a. Inspection Scope

The inspectors reviewed post-maintenance testing (PMT) activities. The documents listed in the Attachment were used to accomplish the objectives of the inspection procedure. Post-Maintenance Testing procedures and activities were verified to be adequate to ensure system operability and functional capability. Inspection activities were selected based upon the SSC's ability to impact risk. Inspection activities included, but were not limited to, witnessing or reviewing the integration of testing activities, applicability of acceptance criteria, test equipment calibration and control, procedural use and compliance, control of temporary modifications or jumpers required for test performance, documentation of test data, system restoration, and evaluation of test data. Also, the inspectors verified that maintenance and PMT activities adequately ensured that the equipment met the licensing basis, TS, and UFSAR design requirements.

The inspectors selected the following PMT activities for review for a total of six samples:

- Preventive Work Order (PWO) 1138305, Inspect the Diesel Fire Pump (1P049-E) Per Semiannual Section of Procedure Engine-C742-001;
- Corrective Work Order (CWO) A76179, Inspect, Test and Install Replacement Circuit Breaker for 1D203, with 1D20 Energized;
- PWO 1139315, Calibration of LE5219, "B" Condensate Storage Tank Level Switch;
- CWO A74808, Replace Rod Select Switch 18-15;
- PWO 1139444, Installation of HPCI discharge line relief valve, PSV2302; and
- PWO 1136908, Replace HPCI Flow Control Loop with digital upgrades.

### b. Findings

No findings of significance were identified.

## 1R22 Surveillance Testing (71111.22)

### a. Inspection Scope

The inspectors reviewed surveillance testing activities. Inspection procedure objectives were accomplished as indicated by the documents listed in the Attachment to this inspection report. Surveillance testing activities were reviewed to assess operational readiness and ensure that risk-significant SSCs were capable of performing their intended safety function. Surveillance activities were selected based upon risk significance and the potential risk impact from an unidentified deficiency or performance degradation that a SSC could impose on the unit if the condition were left unresolved. Inspection activities included, but were not limited to, a review for preconditioning, integration of testing activities, applicability of acceptance criteria, test equipment calibration and control, procedural use, control of temporary modifications or jumpers required for test performance, documentation of test data, TS applicability, impact of testing relative to Performance Indicator (PI) reporting, and evaluation of test data.

The inspectors selected the following surveillance testing activities for review for a total of six samples:

- STP 3.3.6.3-04, Low-Low Set Pressure Setpoint Channels Calibration (routine);
- STP 3.8.4-06, Battery Charger Capacity Test (routine);
- STP 3.4.5-01, Calibration of Equipment Drain Sump and Floor Drain Sump Flow Integrators (RCS leakage);
- STP 3.5.3-07, Reactor Core Isolation Cooling System Operability Test and Comprehensive Pump Test (inservice testing);
- STP 3.8.1-06, Standby Diesel Generators Operability Test (Fast Start) (routine); and
- STP 3.5.1-05, HPCI System Operability Test (PCIV testing).

b. Findings

No findings of significance were identified.

1EP2 Alert and Notification System (ANS) Evaluation (71114.02)

a. Inspection Scope

The inspectors discussed with Emergency Preparedness (EP) staff the operation, maintenance, and periodic testing of the ANS in the Duane Arnold Energy Center's plume pathway Emergency Planning Zone to determine whether the ANS equipment was adequately maintained and tested in accordance with Emergency Plan commitments and procedures. The inspectors reviewed records of May 2005 through June 2007 monthly trend reports and siren test failures.

These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

1EP3 Emergency Response Organization (ERO) Augmentation Testing (71114.03)

a. Inspection Scope

The inspectors reviewed and discussed with plant EP staff the emergency plan commitments and procedures that addressed the primary and alternate methods of initiating an ERO activation to augment the on-shift ERO as well as the provisions for maintaining the plant's ERO emergency telephone book. The inspectors also reviewed reports and a sample of corrective action program records of unannounced off-hour augmentation tests, which were conducted May 2005 through June 2007, to determine the adequacy of the drills' critiques and associated corrective actions. The inspectors also reviewed the EP training records of a sample of approximately 24 Duane Arnold Energy Center ERO personnel, who were assigned to key and support positions, to determine whether they were currently trained for their assigned ERO positions.

These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

1EP5 Correction of Emergency Preparedness Weaknesses and Deficiencies (71114.05)

a. Inspection Scope

The inspectors reviewed a sample of Nuclear Oversight staff's 2006 and 2007 audits of the Duane Arnold Energy Center emergency preparedness program to verify that these independent assessments met the requirements of 10 CFR 50.54(t). The inspectors also reviewed critique reports and samples of corrective action program records associated with the 2006 biennial exercise, as well as various EP drills conducted in 2006 and 2007, in order to verify that the licensee fulfilled its drill commitments and to evaluate the licensee's efforts to identify, track, and resolve concerns identified during these activities. Additionally, the inspectors reviewed a sample of EP items, CAP, and corrective actions related to the facility's EP program and activities to determine whether corrective actions were acceptably completed.

These activities completed one inspection sample.

b. Findings

No findings of significance were identified.

1EP6 Drill Evaluation (71114.06)

a. Inspection Scope

On June 27, 2007 and August 8, 2007, the inspectors observed EP training drills for a total of two samples. The June 27 drill simulated an inadvertent HPCI auto initiation along with several reactor protection system failures which resulted in failure of the fuel cladding, followed later by an unisolable steam line break in the turbine building. The August 8 drill simulated an initial earthquake that resulted in a reactor scram, followed later by an unisolable leak in the Reactor Water Cleanup system.

Inspectors evaluated the licensee's drill conduct and the adequacy of the post-drill performance critiques to identify weaknesses and deficiencies. The documents listed in the Attachment were used to accomplish the objectives of the inspection procedure. These exercises were selected to provide input to the Drill/Exercise PI. Inspection activities included, but were not limited to, the classification of events, notifications to off-site agencies, protective action recommendation development, and drill critiques. Observations were compared with the licensee's observations and corrective action program entries. Inspectors verified that there were no discrepancies between observed performance and reported PI statistics.

b. Findings

No findings of significance were identified.

**2. RADIATION SAFETY**

**Cornerstone: Public Radiation Safety**

2PS1 Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems (71122.01)

.1 Onsite Inspection

a. Inspection Scope

The inspectors reviewed the records of abnormal releases or releases made with inoperable effluent radiation monitors and reviewed the licensee's actions for these releases to ensure an adequate defense-in-depth was maintained against an unmonitored, unanticipated release of radioactive material to the environment. The inspectors noted that the licensee did not make any abnormal releases during the inspection period.

The inspectors assessed the licensee's understanding of the location and construction of underground pipes and tanks, and storage pools (spent fuel pool) that contain radioactive contaminated liquids. The inspectors evaluated the licensee's potential for unmonitored leakage of contaminated fluids to the groundwater as a result of degrading material conditions or aging of facilities. The licensee's capabilities (such as monitoring wells) of detecting spills or leaks and of identifying groundwater radiological contamination both on site and beyond the owner controlled area were reviewed along with the licensee's technical bases for its site groundwater monitoring program. The inspectors discussed with the licensee, its understanding of groundwater flow patterns for the site, and in the event of a spill or leak of radioactive material, if the licensee's staff had the capabilities necessary to estimate the pathway of a plume of contaminated fluid, both on site and beyond the owner controlled area.

These reviews represented two inspection samples.

b. Findings

No findings of significance were identified.

2PS3 Radiological Environmental Monitoring Program (REMP) And Radioactive Material Control Program (71122.03)

.1 Inspection Planning

a. Inspection Scope

The inspectors reviewed the most current Annual Radiological Environmental Operating Reports, Annual Radiological Material Release Report and licensee assessment results to determine if the REMP was implemented as required by the Radiological Effluent Technical Specifications (RETS) and the Offsite Dose Assessment Manual (ODAM). The inspectors reviewed the reports for changes to the ODAM with respect to environmental monitoring and commitments in terms of sampling locations, monitoring and measurement frequencies, land use census, interlaboratory comparison program, and data analysis.

The inspectors reviewed the ODAM and the Annual Reports for 2005 and 2006 to identify environmental monitoring stations and their locations and evaluated licensee self-assessments, audits, and the licensee's vendor laboratory interlaboratory comparison program results. The inspectors reviewed the UFSAR for information regarding the environmental monitoring program and meteorological monitoring instrumentation. The inspectors also reviewed the scope of the licensee's audit program to determine if it met the requirements of 10 CFR 20.1101c.

This review represented one sample.

b. Findings

No findings of significance were identified.

.2 Onsite Inspection

a. Inspection Scope

The inspectors walked down five of the air sampling stations (greater than 30 percent) and approximately 20 percent of the thermoluminescent dosimeter monitoring stations to determine whether they were located as described in the ODAM and to determine the equipment material condition.

The inspectors observed the collection and preparation of a variety of environmental samples including surface water and air filters. The environmental sampling program was evaluated to determine if it provided data that was representative of the release pathways as specified in the ODAM and that sampling techniques were performed in accordance with station procedures.

From direct observations and record reviews, the inspectors determined if the meteorological instruments were operable, calibrated, and maintained in accordance with guidance contained in the annual report, NRC Safety Guide 23, and licensee

procedures. The inspectors determined if the meteorological data readout and recording instruments, including computer interfaces and data loggers at the tower, were operable; if readouts of wind speed, wind direction, and atmospheric stability measurements were available on the licensee's computer system, which was available in the Control Room; and if the system was operable.

The inspectors reviewed each event documented in the Annual Radiological Environmental Operating Report which involved missed samples, inoperable samplers, lost thermoluminescent dosimeters, or anomalous measurements for the cause and corrective actions. The Annual Reports were reviewed for positive sample results (i.e., licensed radioactive material detected above the lower limits of detection) and the licensee's evaluation of the source of this material.

The inspectors reviewed the ODAM for significant changes resulting from modifications to the land use census or sampling station changes made since the last inspection. This included a review of technical justifications for changed sampling locations. The inspectors determined if the licensee performed the reviews required to ensure that the changes did not affect its ability to monitor the impacts of radioactive effluent releases on the environment.

The inspectors reviewed calibration and maintenance records for five air samplers, reviewed calibration records for radiation measurement (counting room) instrumentation that could be used for environmental sample analysis and instrumentation used for the free release of liquids or solids from the radiologically restricted area. This included the determination of the appropriate detection sensitivities for the counting samples, in that the instrumentation could achieve the RETS/ODCM required environmental lower levels of detection limits. The inspectors reviewed quality control data used to monitor radiation measurement instrument performance, and actions that would be taken if indications of degrading detector performance were observed.

The licensee did not perform radio-chemical analyses of REMP samples in-house and instead used a vendor for such analyses. The inspectors reviewed the licensee's vendor laboratory data of the analyzed samples. The inspectors also reviewed the licensee's audit of the vendor laboratory's program to determine if the vendor's analytical and quality assurance programs were adequate.

The inspectors reviewed quality assurance audit results of the program to determine whether the licensee met the TS/ODCM requirements.

This review represented six inspection samples.

b. Findings

No findings of significance were identified.

.3 Unrestricted Release of Material From the Radiologically Restricted Area

a. Inspection Scope

The inspectors observed the access control location where the licensee monitored potentially contaminated material leaving the radiologically restricted area and inspected the methods used for the control, survey, and release of material from this area. The inspectors observed the performance of personnel surveying and releasing material for unrestricted use to determine if the surveys were performed in accordance with plant procedures.

The inspectors determined if the radiation monitoring instrumentation was appropriate for the radiation types present and was calibrated with appropriate radiation sources that represented the expected isotopic mix. The inspectors reviewed the licensee's criteria for the survey and release of potentially contaminated material and determined if there was adequate guidance on how to respond to an alarm indicating the presence of licensed radioactive material. The inspectors reviewed the licensee's equipment to determine if radiation detection sensitivities were consistent with the NRC guidance contained in IE Circular 81-07 and IE Information Notice 85-92 for surface contamination and in HPPOS-221 for volumetrically contaminated material. The inspectors determined if the licensee performed radiation surveys to detect radionuclides that decay via electron capture.

The inspectors reviewed the licensee's procedures and records to determine if the radiation detection instrumentation was used at its typical sensitivity level based on appropriate counting parameters such as counting times and background radiation levels. The inspectors determined whether the licensee established a "release limit" by altering the instrument's typical sensitivity through such methods as raising the energy discriminator level or locating the instrument in a high radiation background area.

This review represented two inspection samples.

b. Findings

No findings of significance were identified.

.4 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed the licensee's self-assessments, audits, and Special Reports related to the REMP since the last inspection to determine if identified problems were entered into the corrective action program for resolution. The inspectors also determined if the licensee's self-assessment program was capable of identifying and addressing repetitive deficiencies or significant individual deficiencies that were identified by the problem identification and resolution process.

The inspectors also reviewed corrective action reports related to the REMP that affected environmental sampling and analysis and meteorological monitoring instrumentation.



Staff members were interviewed and documents were reviewed to determine if the following activities were being conducted in an effective and timely manner commensurate with their importance to safety and risk:

- Initial problem identification, characterization, and tracking;
- Disposition of operability/reportability issues;
- Evaluation of safety significance/risk and priority for resolution;
- Identification of repetitive problems;
- Identification of contributing causes;
- Identification and implementation of effective corrective actions;
- Resolution of NCVs tracked in the corrective action system; and
- Implementation/consideration of risk significant operational experience feedback.

This review represented one inspection sample.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES**

4OA1 Performance Indicator Verification (71151)

a. Inspection Scope

The inspectors sampled the licensee's PI submittals for the periods listed below. The inspectors used PI definitions and guidance contained in Revision 5 of Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," to determine if the PI data were accurate. The following PIs were reviewed:

**Cornerstone: Emergency Preparedness**

- ANS;
- ERO Drill Participation; and
- Drill and Exercise Performance.

The inspectors reviewed the licensee's records associated with the three EP PIs listed above. The inspectors verified that the licensee accurately reported these indicators in accordance with relevant procedures and Nuclear Energy Institute guidance endorsed by NRC. Specifically, the inspectors reviewed licensee records associated with PI data reported to the NRC for the period July 2006 through March 2007. Reviewed records included: procedural guidance on assessing opportunities for the three PIs; assessments of PI opportunities during predesignated Control Room Simulator training sessions, the 2006 biennial exercise, and other drills; revisions of the roster of personnel assigned to key ERO positions; and results of periodic ANS operability tests.

These activities completed three inspection samples.

### **Cornerstone: Public Radiation Safety**

- RETS/ODCM Radiological Effluent Occurrence.

The inspectors reviewed data associated with the RETS/ODCM PI to determine if the indicator was accurately assessed and reported. This review included the licensee's condition report database to identify any potential occurrences such as unmonitored, uncontrolled or improperly calculated effluent releases that may have impacted offsite dose. The inspectors also reviewed selected gaseous and liquid effluent release data and the results of associated offsite dose calculations generated over the previous four quarters. Data collection and analyses methods for PIs were discussed with licensee representatives to determine if the process was implemented consistent with industry guidance.

This review represented one inspection sample.

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

- Occupational Exposure Control Effectiveness.

The inspector reviewed the licensee's determination of the PI for the occupational radiation safety cornerstone to determine if the licensee accurately assessed the PI and had identified all occurrences. Specifically, the inspector reviewed the licensee's CAPs for 2007 and associated occupational exposure performance indicator data to ensure that there were no PI occurrences that were not identified by the licensee. Additionally, as part of plant walkdowns, the inspector selectively examined the adequacy of posting and controls for locked high radiation areas. The inspector interviewed members of the licensee's staff who were responsible for performance indicator data acquisition, verification and reporting, to determine if their review and assessment of the data was adequate.

This review represented one inspection sample.

#### b. Findings

No findings of significance were identified.

#### 4OA2 Identification and Resolution of Problems (71152)

##### .1 Routine Review of Identification and Resolution of Problems

###### a. Inspection Scope

For inspections performed and documented in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that they were being entered into the corrective action program at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. Minor issues entered

into the corrective action program as a result of the inspectors' observations are included in the attached list of documents reviewed.

b. Assessment and Observations

No findings of significance 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.

b. Assessment and Observations

No findings of significance were identified.

.3 Annual Sample: Review of Operator Workarounds (OWAs)

a. Inspection Scope

The inspectors evaluated the licensee's implementation of their process which is used to identify, document, track, and resolve operational challenges. Inspection activities included, but were not limited to, a review of the cumulative effects of the OWAs on system availability and the potential for improper operation of the system, for potential impacts on multiple systems, and on the ability of operators to respond to plant transients or accidents.

The inspectors performed a review of the cumulative effects of OWAs for a total of one sample. The documents listed in the Attachment were reviewed to accomplish the objectives of the inspection procedure. Although only one formal OWA was present in the plant, the inspectors reviewed both current and historical operational challenge records to determine whether the licensee was identifying operator challenges at an appropriate threshold, had entered them into their corrective action program and proposed or implemented appropriate and timely corrective actions which addressed each issue. Reviews were conducted to determine if any operator challenge could increase the possibility of an Initiating Event, if the challenge was contrary to training, required a change from long-standing operational practices, or created the potential for inappropriate compensatory actions. Additionally, all temporary modifications were reviewed to identify any potential effect on the functionality of Mitigating Systems, impaired access to equipment, or required equipment uses for which the equipment was not designed. Daily plant and equipment status logs, degraded instrument logs, and operator aids or tools being used to compensate for material deficiencies were also assessed to identify any potential sources of unidentified operator workarounds.

b. Assessment and Observations

No findings of significance were identified.

4 Annual Sample: Review of Stroke Time Testing of Valves Following Maintenance Activities

a. Inspection Scope

During a review of items entered in the corrective action program, the inspectors recognized a corrective action item documenting an increased stroke time for the 'A' and 'B' recirculation pump mini-purge supply isolation valves, CV1804A and CV1804B. These valves had undergone maintenance earlier in the year during the refueling outage. The inspectors recognized that these valves, CV1804A and CV1804B, were identical to the reactor recirculation system sample line outboard isolation valves, CV4639 and CV4640, that also experienced an increase in their stroke time following maintenance.

Based on this observation, the inspectors conducted an in-depth review of DAEC's stroke time testing of valves following maintenance. The inspectors assessed the adequacy of procedural requirements and compared those requirements to the applicable ASME code of record for DAEC. The inspectors also reviewed the engineering plan to correct the adverse trend of increasing stroke time for CV1804A and CV1804B. This inspection activity counts as one annual sample.

b. Assessment and Observations

No findings of significance were identified.

40A3 Event Follow-up (71153)

.1 (Closed) Licensee Event Report 05000331/2007003-00: "Linear Indications Found During UT Examination of Safe-End to Nozzle Welds"

On February 18, 2007, UT of safe-end to nozzle Weld RRF-F002 revealed a circumferentially oriented linear indication which did not meet ASME Section XI acceptance criteria. Based on this indication, the licensee performed a scope expansion which identified a second circumferentially oriented linear indication on safe-end to nozzle weld RRC-F002. Based upon a review of site specific and industry operating experience, the licensee determined that these flaws located in the Inconel weld material, were caused by IGSCC. The licensee completed a temperbead weld overlay repair on each of these welds, expanded the scope of weld inspections in accordance with requirements of the ASME Code Section XI, performed independent review of UT data, and placed the remaining susceptible recirculation riser nozzle welds on an augmented inspection schedule until final mitigation (e.g., application of overlay weld repairs or mechanical stress improvement). The licensee determined that for past operating periods with unrepaired IGSCCs no safety consequences existed, because the flaw sizes identified would have met the ASME Code Section XI requirements for structural integrity. The inspectors reviewed the licensee's corrective actions for this

issue, and found the corrective actions adequate for the identified IGSCC. However, the inspectors identified a finding related to failure to follow the UT procedure associated with the 2005 examination of safe-end to nozzle weld RRF-F002 as discussed in Section 1R08. This LER is closed.

.2 Review of Personnel Performance During Planned Surveillance Testing When a Jumper Was Installed on the Incorrect Relay Which Resulted in a Loss of a Safety Feature Required for Transient Mitigation

a. Inspection Scope

The inspectors reviewed the site response and personnel performance during an unplanned event when a jumper was installed on the wrong contacts during the performance of STP 3.3.6.1-02, "Main Steam Line Low Pressure Instrument Calibration," on August 27, 2007, which resulted in the loss of a required safety feature. The documents listed in the Attachment were used by the inspectors to accomplish the objectives of the inspection procedure. This review represented one sample.

b. Findings

Introduction: A finding of very low safety significance (Green) and an associated NCV of TS 5.4.1.a, associated with Regulatory Guide 1.33, Revision 2, Appendix A, Section 9, was identified through a self-revealing event when a failure to properly implement procedures for configuration control during planned surveillance activities resulted in the loss of a required safety feature. The licensee entered this issue into the corrective action program for resolution. This issue was also related to the cross-cutting area of human performance, and involved the safety culture aspect associated with the use of error prevention tools. Specifically, personnel work practices failed to use human performance prevention tools, commensurate with the risk of the task being performed, to ensure work activities are performed safely. The failure to use proper concurrent verification and place keeping techniques resulted in the test jumper being installed on the relay for a previously tested channel instead of the relay for the pressure instrument which was being tested.

Description: On August 27, 2007, maintenance personnel were performing STP 3.3.6.1-02, "Main Steam Line Low Pressure Instrument Calibration." The sections of the STP for PCIS channels A1 and B1 completed successfully. When maintenance personnel commenced the sections of the STP for PCIS channel A2, the personnel incorrectly installed a relay jumper on the relay for PS1014, the PCIS channel A1 instrument, and subsequently isolated PS1016, the PCIS channel A2 instrument, for the calibration check. The allowed outage time for channel A2 commenced at 11:32 a.m. when the jumper was installed. At 11:38 a.m., the control room received the expected annunciator, "PCIS CHANNEL A MAIN STEAM LINE LOW PRESSURE." The control room also received the "PCIS GROUP 1 ISOLATION INITIATED" annunciator, which had not been received during testing of the previous two channels. The maintenance personnel, unaware of the second annunciator, completed calibration of PS1016 and returned the instrument to service. When the maintenance personnel called the control room to verify the CHANNEL A annunciator was reset, they were informed that the second annunciator was received, to stop work and report to the control room.

When the maintenance personnel arrived in the control room, they were informed that the STP lacked a step to reset the "PCIS GROUP 1 ISOLATION INITIATED" annunciator, and that a CAP should be generated to correct the STP. The operators reset the "PCIS GROUP 1 ISOLATION INITIATED" annunciator, and instructed the maintenance personnel to remove the jumper and continue the STP. As the maintenance personnel went to remove the jumper, they recognized that the wrong panel door was open, and identified that the jumper had been installed on the incorrect contacts, actually bypassing the A1 channel instead of the A2 channel being tested. The maintenance personnel informed the control room supervisor of the error. Following evaluation of the situation, the control room supervisor directed the maintenance personnel to remove the jumper, and the allowed outage time ended at 12:05 p.m. and the STP was stopped.

Subsequent evaluation by the licensee determined that during the period of time that the jumper was installed on the channel A1 instrument and the channel A2 instrument was isolated and pressurized, a Group 1 isolation would not have occurred if an actual main steam line low pressure condition had occurred.

Analysis: The inspectors determined that the failure to properly implement procedures for configuration control during planned surveillance activities was a performance deficiency warranting further evaluation. The inspectors reviewed this finding using the guidance contained in Appendix B, "Issue Screening," of IMC 0612, "Power Reactor Inspection Reports." The inspectors determined this finding was not similar to any of the examples identified in IMC 0612, Appendix E, "Examples of Minor Issues." The finding was more than minor because it is associated with the Mitigating Systems cornerstone attribute of equipment performance, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

The inspectors reviewed this finding in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations." This issue screened as having a very low safety significance since this issue was not a design or qualification deficiency, was actually only a loss of a safety feature and did not result in a loss of safety function, and was not considered potentially risk significant to a seismic, flooding, or severe weather initiating event.

The inspectors also determined that the cause of this finding was related to the cross-cutting area of human performance, and involved the safety culture aspect associated with the use of error prevention tools. Personnel work practices failed to use human performance prevention tools, commensurate with the risk of the task being performed, to ensure work activities are performed safely. Specifically, the failure to use proper concurrent verification and place keeping techniques resulted in the test jumper being installed on the relay for a previously tested channel instead of the relay for the pressure instrument which was being tested. (H.4.a)

Enforcement: The DAEC TS Section 5.4 for Administrative Controls, Procedures, 5.4.1 states, in part, that:

“Written procedures shall be established, implemented, and maintained covering the following activities:

a. The applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978;...”

And Regulatory Guide 1.33, Revision 2, Appendix A, February 1978, Section 8, “Procedures for Control of Measuring and Test Equipment and for Surveillance Tests, Procedures, and Calibrations,” states, in part, that:

“b. Specific procedures for surveillance tests, inspections, and calibrations should be written (implementing procedures are required for each surveillance test, inspection, or calibration listed in the technical specifications)...”

Contrary to this requirement, on August 27, 2007, a failure to properly implement procedures for configuration control during planned surveillance activities resulted in the loss of a required safety feature. This resulted in a condition where a safety feature associated with the PCIS Group 1 isolation would not have functioned had an actual main steam line low pressure condition occurred. The STP was stopped once the system was restored to a normal lineup, and was later completed on August 30, 2007.

The licensee entered this into their corrective action program as CAP 052708. Because this violation was of very low safety significance and was entered into the licensee’s corrective action program, this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy (NCV 05000331/2007004-02).

#### 40A5 Other Activities

.1 (Closed) Unresolved Item (URI) 05000331/2006002-03. "Potential Inoperability of the High Pressure Coolant Injection System"

a. Inspection Scope

The inspectors performed an in-office review of the licensee's operability analyses of a missing bolt, spacer and nut on a HPCI system support.

b. Findings

Introduction: The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green). Specifically, the licensee’s analyses to support past operability of the HPCI system were non-conservative and did not account for conditions at the time of discovery.

Description: On September 29, 2005, the licensee attempted to vent the HPCI injection piping, but was unable to obtain a steady stream of water over a protracted period. In response to this event, the licensee performed an analysis, which was evaluated in Inspection Report 05000331/2006008. The inspectors identified a number of

deficiencies in the licensee's response; however, the unresolved item could not be closed due to the January 24, 2007, discovery that HPCI riser clamp support EBB-5-SR-9 was missing a bolt, spacer and nut. On April 6, 2007, the licensee completed its analysis to support a past operability review of this issue, as well as a March 3, 2007, discovery of incomplete welds on the support.

As discussed in Inspection Report 05000331/2006008, the inspectors determined that licensee calculations MPR-2880, "Evaluation of HPCI Piping Voiding," and 0078-0503-02, "HPCI System Transient Thermal Hydraulic Analysis," were non-conservative. The inspectors noted that the calculations artificially adjusted the pump start time and maximum pressure results from a special test in order to show a correlation existed between the test and the computer model. Additionally, the inspectors determined that the calculations non-conservatively assumed an air accumulator in the system and failed to adequately address why the special test results would bound an injection under differing plant conditions, including an insulated pipe section, and a lower condensate storage tank level. In response to the inspectors' questions, the licensee performed an informal analysis which doubled the loads and showed that considerable margin existed to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the ASME Code) Appendix F operability allowable values, even given the doubled loads. The unresolved item was not closed at that time, due to the discovery of a missing bolt, spacer and nut on a key support used in the licensee's analysis.

The licensee performed a past operability evaluation of the missing bolt, spacer and nut in calculations 0078-0702-01 through 0078-0702-04. The inspectors reviewed these calculations and determined that they also were not conservative, as the calculations did not use the results of the sensitivity analysis, but instead used a lesser value for the HPCI transient loads. Additionally, the calculations used an incorrect material property for the cotter pin, which was credited in the licensee calculations for maintaining the support's functionality. Following inspector questioning, the licensee performed another informal study to address the inspectors concerns. This informal study showed that the support loads, under the combination of a HPCI transient and an earthquake, remained within the ASME Code Appendix F operability allowable values by approximately one percent. For the case where there was not an earthquake, the licensee's informal study showed that the HPCI transient loads could have been increased by three (from the original non-conservative value) before exceeding the Appendix F allowable values.

In LER 2007001-00, the licensee concluded that the missing bolt was due to incomplete field work. The inspectors noted that prior to the January 24, 2007, inspection, the licensee had last inspected the support in 1983. At that time, the licensee found a loose lock nut and clamp nut on the west strut, and a loose clamp nut on the east strut with the east strut frozen. The only other time the support was inspected, in 1977, the licensee found a bolt vibrated out of place. The inspectors considered it very unlikely that any authorized maintenance activity would remove a bolt, spacer and nut from an active support and noted that unauthorized maintenance was improbable. Given the previous inspection results and the licensee's postulated turbulent penetration phenomena affecting the line, the inspectors determined a more likely cause was continued vibration. Because the support had not been examined in over 20 years and because previous examinations only five years apart had noted loose or missing bolts,



the inspectors concluded that it was likely that the support bolt, spacer, and nut had been missing for over a year.

Analysis: The inspectors determined that the 2006 and 2007 failure to adequately analyze the impact of a steam void in the HPCI system, once it was postulated as existing by the licensee, was a performance deficiency as it failed to meet the requirements of 10 CFR Part 50, Appendix B, Criterion III.

The inspectors reviewed the performance deficiency against NRC IMC 0612 "Power Reactor Inspection Reports" and concluded the performance deficiency fit the more than minor example from Appendix E, "Examples of Minor Issues," example 3j, in that the licensee had to perform additional informal analyses to demonstrate the acceptability of the formal calculations and to show that the HPCI system remained operable. The inspectors determined that this performance deficiency impacted the Mitigating Systems Cornerstone objective of ensuring the operability and reliability of the HPCI system because it affected the design control attribute of structural integrity.

The inspectors evaluated the finding using IMC 0609, "Significance Determination of Reactor Inspection Findings for At-Power Situations," Appendix A Phase 1 screening. The inspectors determined the issue was a design and qualification issue where the inspectors were unable to confirm that a loss of operability would not result under all conditions; however, the inspectors could not show that there was a loss of the HPCI system function, there was not an actual loss of HPCI, and there was not an actual loss of any non-TS equipment. Finally the inspectors evaluated the potential for any risk significance due to a seismic initiating event using the Seismic, Flooding and Severe Weather worksheet on Pages 1-12 of Attachment A to IMC 0609. Based on review of the three questions on the worksheet, the inspectors determined that the issue should be screened as "Green" or having very low risk significance.

The inspectors determined a contributing cause of this finding was related to the cross-cutting area of human performance. Specifically, the licensee failed to use conservative assumptions in decision making and appeared to adopt a requirement to demonstrate that continued presence of a steam void was acceptable rather than to analyze the effects of a steam void of the size and under the conditions which the licensee originally determined existed. (H.1.b)

Enforcement: The 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures be established to verify or check the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, on March 29, 2006, April 6, 2006, and April 13, 2007, the licensee accepted contractor calculations, 0078-0503-02, MPR 2880, and 0078-0034-04, without verifying the adequacy of the design. Specifically, calculations 0078-0503-02 and MPR 2880 manipulated the data from a special test in regards to both time and attained pressure in order to show a correlation with the computer model prediction of maximum output pressure. The output from these calculations, multiplied by 1.5, was then presented as being a conservative value in calculation 0078-0034-04 without

addressing how the non-conservative results from the earlier calculations were taken into account.

The licensee entered the finding into their corrective action program as CAP 052620. Because this violation was of very low safety significance and was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy.

.2 (Closed) VIO 05000331/2006009-01: "Failure of the Licensee's Exercise Critique Process"

The inspectors reviewed the licensee's corrective actions to address both the issue's root cause and contributing causes and concur with the results documented in NRC Supplemental Inspection Report 05000331/2007503. No significant issues were identified and therefore, the inspectors closed this violation.

4OA6 Meetings

.1 Exit Meeting

The inspectors presented the inspection results to Mr. R. Anderson and other members of licensee management on October 11, 2007. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

.2 Interim Exit Meetings

Interim exits were conducted for:

- Procedure 71153 and 71111.08 with Mr. D. Curtland and other members of licensee management at the conclusion of the inspection on July 11, 2007. The inspectors returned proprietary information reviewed during the inspection and the licensee confirmed that none of the potential report input discussed was considered proprietary.
- Emergency Preparedness inspection with Mr. G. Van Middlesworth on July 13, 2007.
- Maintenance Effectiveness Periodic Evaluation with Mr. G. Van Middlesworth on September 14, 2007.
- Aspects of radioactive gaseous and liquid effluent monitoring, radiological environment monitoring and radioactive material control programs, plus occupational and public radiation safety performance indicator verification with Mr. D. Curtland on September 14, 2007.
- Closure of URI 05000331/2006002-03 with Mr. D. Curtland on September 21, 2007.

ATTACHMENT: SUPPLEMENTAL INFORMATION

**SUPPLEMENTAL INFORMATION  
KEY POINTS OF CONTACT**

Licensee

R. Anderson, Site Vice President  
J. Bjorseth, Site Director  
D. Curtland, Plant Manager  
B. Eckes, NOS Manager  
S. Catron, Licensing Manager  
J. Cadogan, Engineering Director  
B. Kindred, Security Manager  
J. Morris, Training Manager  
C. Dieckmann, Operations Manager  
R. Harter, Operations Support Manager  
G. Pry, Maintenance Manager  
J. Windschill, Chemistry & Radiation Protection Manager  
P. Sullivan, Emergency Preparedness Manager  
G. Ellis, Program Owner, Fire Protection  
M. Lingenfelter, Design Engineering Manager  
S. Huebsch, System Engineering Supervisor  
J. Swales, Design Engineering Supervisor  
K. Kleinheinz, Program Engineering Manager  
J. Kuehl, Supervisor, Programs Engineering  
D. Albrecht, Radwaste Supervisor  
G. Park, ISI Program Owner  
F. Dohmen, NDE Level III  
B. Klotz, Program Engineering Supervisor  
J. Probst, Site Maintenance Rule Coordinator  
N. McKenney, General Supervisor Radiation Protection Support  
S. Funk, CHP, REMP Program Manager, Sr. Health Physics Coordinator  
D. Johnson, Radwaste Operator/Chem Tech, Rad Environmental Technician

Nuclear Regulatory Commission

K. Feintuck, Project Manager, NRR  
K. Riemer, Chief, Reactor Projects Branch 2

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened and Closed

05000331/2007004-01	NCV	Inadequate Recirculation Riser Weld Examination (Nozzle N2F) (1R08)
05000331/2007004-02	NCV	Failure to Properly Use Error Prevention Tools Results in A Loss Of Safety Function By Installing A Relay Jumper on the Incorrect Relay (4OA3.2)
05000331/2007004-03	NCV	Inadequate Design Calculations (4OA5.1)

### Closed

05000331/2007003-00	LER	Linear Indications Found During UT Examination of Safe-End to Nozzle Welds (4OA3.1)
05000331/2006002-03	URI	Potential Inoperability of the High Pressure Coolant Injection System (4OA5.1)
05000331/2006009-01	VIO	Failure of the Licensee's Exercise Critique Process (4OA5.2)

### Discussed

None.

## LIST OF DOCUMENTS REVIEWED

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

### **1R01 Adverse Weather**

CAP 049247; Integrated Plant Operating Instruction 6 Tornado Hazard Inspection/Op-031 Wind Blown Hazard Inspection  
CAP 051113; Loss of 1L130  
CAP 051114; 125 VDC System 1 Ground  
Abnormal Operating Procedure 903; Severe Thunderstorm/High Wind/Tornado; Revision 23  
Integrated Plant Operating Instruction 6; Weather Impacted Operations; Revision 40

### **1R04 Equipment Alignment**

Operating Instruction (OI) 416A4; 'B' RHRSW System Valve Lineup and Checklist; Revision 9  
OI 416A1; RHRSW System Electrical Lineup; Revision 2  
OI 416A6; RHRSW System Control Panel Lineup; Revision 4  
OI 152A1; HPCI System Electrical Lineup; Revision 2  
OI 152A2; HPCI System Valve Lineup And Checklist; Revision 13  
CAP 051871; FO-2203, HV-2201 Drain Line Flow Orifice Appears Tightened too Much on One Side  
OI 153A2; SBLC Valve Lineup and Checklist; Revision 3  
OI 416A2; 'A' RHRSW System Valve Lineup and Checklist; Revision 9  
CWO A66199; Body-To-Bonnet Leak on Common Pump Suction Header, Sodium Pentaborate has Precipitated from the Leak, Accumulating A Baseball Size Crystalline Mass  
CAP 041509; Missing Insulation from SBLC Heat Traced Line  
CAP 052169; CAQ—Several Studs are Rusted and Several Components Have Evidence of Leakage in SBLC

### **1R05 Fire Protection**

AFP 02; Reactor Building South Corner Rooms Elevations 716'4"-747'11.75"; Revision 23  
AFP 07; Reactor Building Laydown Area, Corridor and Waste Tank Area and Spent Resin Tank Room, Elevation 786'0"; Revision 28  
AFP 13; Reactor Building Refueling Floor, Elevation 855'0"; Revision 24  
AFP 16; Turbine Building Condensate Pump Room, Elevation 734'0"; Revision 25  
AFP 69; Yard, Main Transformer 1X1; Revision 2  
AFP 70; Yard, Standby Transformer 1X4; Revision 3  
AFP 71; Yard, Startup Transformer 1X3; Revision 2  
AFP 72; Yard, Auxiliary Transformer 1X2; Revision 1  
AFP 74; Yard, Switchyard; Revision 4

## **1R06 Flood Protection Measures**

CAP 052240; NCAQ - Lack of 100% Seal on Door 507 (RHRSW/Emergency Service Water Room Sub-hatch Door)

CAP 046367; What Compensatory Action is Required for in Inoperable Water-tight Door? Operable But Degraded 000278; NRC Noted a Small Amount of Air Leaking Around Watertight Door 507

PWO 1139360; Inspect Door 507 and Adjust as Needed

## **1R08 Inservice Inspection (ISI) Activities**

### Miscellaneous Documents

DAEC-22Q-301; Duane Arnold Energy Center Recirculation Inlet Nozzle Flaw Evaluation; Revision 1

IR-2007-265; Evaluation of Dissimilar Metal Weld Examinations Performed at Duane Arnold Unit 1 During Refueling Outage 20 (RFO 20); dated March 2007.

Technical Evaluation Report from PNNL JCN-J3218 Task 6, TAC MD4680; Review of Ultrasonic Data for Flaws Detected at Duane Arnold Energy Center, Unit 1; dated June 18, 2007

Procedure UT-103 "Automated Ultrasonic Examination of Dissimilar Metal Piping Welds," Revision 2

20-07-49; NIS-2 Owners Report for Repairs or Replacements RRC-F002 and RRF-F002; dated April 27, 2007

### Ultrasonic Examination Data Sheets

Report No. 199154; RRF-F002; dated November 20, 1999

Report No. 101068; RRF-F002; dated April 30, 2001

Report No. 105047; RRF-F002; dated April 5 and 6, 2005

Report No. VE-07-011; RRF-F002; dated February 19, 2007

Report No. VE-07-014; RRC-F002; dated February 19, 2007

## **1R11 Licensed Operator Requalification Program**

Simulator Exercise Guide 2007C-01 S; Revision 0

Emergency Operating Procedure 1; RPV Control; Revision 14

Emergency Operating Procedure 2; Primary Containment Control; Revision 14

Emergency Depressurization; Revision 5

Emergency Action Level Matrix - Modes 1, 2, 3; Revision 7

Abnormal Operating Procedure 301; Loss of Essential Electrical Power; Revision 46

Abnormal Operating Procedure 573; Primary Containment Control; Revision 1

Integrated Plant Operating Instruction 5; Reactor Scram; Revision 46

Integrated Plant Operating Instruction 5 - Quick Response Card 1; Reactor Scram Immediate Actions; Revision 6

Integrated Plant Operating Instruction 5 - Quick Response Card 2; Anticipated Transient Without Scram; Revision 1

ACP 110.1; Conduct of Operations; Revision 7

ACP 101.01; Procedure Use and Adherence; Revision 42

ACP 101.2; Verification Process and SELF/PEER Checking Practices; Revision 7

## **1R12 Maintenance Effectiveness**

CAP 051271; Unexpected Annunciator  
CAP 051281; Unclear Guidance  
CAP 051450; Quantify Control Room Emergency Operating Procedure Annunciator Performance Criteria Values in the Maintenance Rule Program  
CAP 051474; Spurious 125 VDC System 1 and System 2 Alarms  
Condition Evaluation (CE) 004217; Potential Adverse Trend in Spurious Control Room Alarms  
CE 004228; Spurious Annunciator Received While Performing Annunciator Checks  
DAEC System Checklist/Health Report for Annunciators and Panels; July 9, 2007  
DAEC Performance Criteria Basis Document for Annunciators (SUS 99.31); Revision 3  
DAEC Performance Criteria Basis Document for Annunciators (SUS 99.31); Attachment 1-DAEC Annunciators Which Indicate an EOP Entry Condition; Revision 2  
DAEC System Checklist/Health Report for 125 VDC; September 10, 2007  
DAEC Performance Criteria Basis Document for 125 VDC (SUS 02.00); Revision 4  
Maintenance Rule Cycle 19 Periodic Report; April 20, 2003 - May 2, 2005, dated October 5, 2005  
Maintenance Rule Cycle 20 Periodic Report; May 3, 2005 - March 23, 2007; dated August 28, 2007  
Summary of DAEC Maintenance Rule System Goals for RED (a)(1) Systems; dated September, 2007  
Maintenance Rule Criteria Values; dated August 21, 2007  
DAEC Maintenance Preventable Functional Failures for Cycle 19 from April 20, 2003 - May 2, 2005; and for Cycle 20 from May 3, 2005 - March 23, 2007  
DAEC Maintenance Rule Program, Module 0; Revision 3  
Maintenance Rule; On-Line Maintenance and Performance Criteria Assessment; dated June 1999  
Expert Panel Meeting Minutes; dated February 20, 2004  
Expert Panel Meeting Minutes; dated September 9, 2006  
CB HVAC (Chillers) System Health and Status Report; 2<sup>nd</sup> Quarter 2007  
RHRSW System Health and Status Report; 2<sup>nd</sup> Quarter 2007  
HPCI System Health and Status Report; 2<sup>nd</sup> Quarter 2007  
Feedwater System Health and Status Report; 2<sup>nd</sup> Quarter 2007  
CAP 41865; Feedwater Maintenance Rule RED 50.65 (a)(1) Declaration  
CAP 43047; Maintenance Rule RED 50.65 (a)(1) for RHRSW  
CAP 41865; Reactor Building Crane in Maintenance Rule RED 50.65 (a)(1)  
Root Cause Evaluation (RCE) 001053/CAP 042982; RHRSW Pump Motor Cooler Inoperabilities  
CAP 033228; Chillers Maintenance Rule 50.65 Repetitive MPFF  
Other 017155; Review RWS Unavailability MR PC vs. Current PRA  
OE 018258; NRC Information Notice 2007-06; Potential Common Mode Vulnerabilities in Essential Service Water Systems

### **1R13 Maintenance Risk Assessments and Emergent Work Control**

Work Procedure Guideline 2; On-Line Risk Management Guideline; Revision 33  
Maintenance Risk Evaluation for Week 27; June 29, 2007  
DAEC Online Schedule, Week 9726-9727; June 28, 2007  
Maintenance Risk Evaluation for Week 28; July 6, 2007  
DAEC Online Schedule, Week 9727-9728; July 5, 2007  
Maintenance Risk Evaluation for Week 29; July 13, 2007  
Maintenance Risk Evaluation for Week 29; Revision 1; July 17, 2007  
DAEC Online Schedule, Week 9728-9729; July 12, 2007  
CAP 051395; Daily Adherence Trending CAP for Week 9729 July 14 - 21, 2007  
STP 3.3.1.1-01; RPS High Pressure Scram Calibration; Revision 7  
Work Order A81436; Perform TIF#1 to Identify Pressure Switch Causing Alarm  
Maintenance Risk Evaluation for Week 31; July 27, 2007  
Maintenance Risk Evaluation for Week 33; August 9, 2007  
Maintenance Risk Evaluation for Week 33; Revision 1; August 10, 2007  
DAEC Online Schedule, Week 9732-9733; August 9, 2007  
Maintenance Risk Evaluation for Week 36; August 30, 2007  
DAEC Online Schedule, Week 9735-9736; August 31, 2007  
Maintenance Risk Evaluation for Week 39; September 21, 2007  
Maintenance Risk Evaluation for Week 39; Revision 1; September 24, 2007  
DAEC Online Schedule, Week 9738-9739; September 20, 2007

### **1R15 Operability Evaluations**

CAP 050803; 1G31 'A' SBDG Found Inop During Performance of STP 3.8.1-04. No Voltage Control  
Apparent Cause Evaluation 001752; 1G31 'A' SBDG Found Inop During Performance of STP 3.8.1-04. No Voltage Control  
CAP 050815; Jumper on MOP [motor operated potentiometer] for 'A' SBDG Was Pinched Under Cover to MOP  
CAP 050811; Evaluate if 1G21 is Susceptible to a Common Cause Failure  
CAP 051968; Piping Stress Does Not Meet Its Code Allowable Limit  
Operability Recommendation (OPR) 000341; Pipe Flanges Are Not Accounted for in the Piping Analysis for V29-0005  
OPR 000360; Piping Stress Does Not Meet Its Code Allowable Limit  
CAP 052044; 1G-31 Small Fire During STP  
OPR 000361; 1G-31 Small Fire During STP  
CAP 052219; Exhaust Fire on 1G-21 During STP 3.8.1-04  
CAP 051587; NCAQ - Potential Fire Hazard Encountered during STP 3.8.1-06 'B' EDG Run  
CAP 047214; Emergency Diesel Generator Assistance Visit January 15 through January 18, 2007  
CWO A68630; Replace 'B' EDG Exhaust Manifold, Extension Pipes, and Four Barrel Assemblies  
CWO A68629; Replace 'A' EDG Exhaust Manifold, Extension Pipes, and Four Barrel Assemblies  
CAP 052420; Newly Installed RWS Check Valve Weight is Greater Than Weight Considered in Original OPR



OPR 000364; Newly Installed RWS Check Valve Weight is Greater Than Weight Considered in Original OPR  
ACP 110.3; Operability Determinations; Revision 11

### **1R19 Post-Maintenance Testing**

PWO 1138305; Inspect the Diesel Fire Pump (1P049-E) Per Semiannual Section of Procedure Engine-C742-001  
CAP 051051; Lead Disconnected for Diesel Fire Pump Temperature Switch Not Documented  
CAP 051063; Unexpected Start of Diesel Fire Pump During STP NS13B001A  
CAP 051065; Diesel Fire Pump TS-3300 Disconnected and Not Verified Operable When Connected  
CWO A76179; Inspect, Test and Install Replacement Circuit Breaker for 1D203, with 1D20 Energized  
DAEC System Description-375; Plant DC Power Supply System; Revision 7  
CAP 047272; 1D203 Tripped While Recharging 1D2 After Discharge Test  
CE 004898; 1D203 Tripped While Recharging 1D2 After Discharge Test  
CAP 050987; STP 3.8.4-06 (1D22 Charger Capacity Test) vs Inoperable 1D203 (1D120 to 1D20)  
STP 3.3.5.1-24; Calibration of the Condensate Storage Tank Level (Low) Instrumentation; Revision 9  
OI 856.1; Reactor Manual Control System; Revision 34  
CWO A74808; Replace Rod Select Switch for 18-15  
PWO 1139315; Use Boroscope to Inspect LE5219, Contingency to Pull and Repair LE5219, Work with STP 3.3.5.1-24  
CAP 044973; 'B' Rod Block Monitor Problem During Downpower and Sequence Exchange  
CAP 052399; LE5219 Still Has Air Leak After Testing Completed  
CAP 052400; LE5219 Work Planning and Execution Issues  
CAP 052389; Expected Alarm was Not Identified in Work Package  
CAP 034273; Could Not Perform STP 3.3.5.1-23 for LS5219  
PWO 1139444; Install New Relief Valve, PSV2302 and Re-route Discharge to Radwaste Pipe  
PWO 1136908; Replace HPCI Flow Control Loop with Digital Upgrades  
CWO A76380; Calibrate HPCI Governor

### **1R22 Surveillance Testing**

STP 3.3.6.3-04; Low-Low Set Pressure Setpoint Channels Calibration; Revision 8  
CAP 051210; STP 3.3.6.3-04 Unavailability Not Logged  
CAP 051212; Allowed Outage Time Not Exited When Outside Allowable Value  
CAP 051147; PS-4546 Found Low Out of Tech. Specification  
CAP 051213; PS4546 Drift  
Apparent Cause Evaluation 001478; PS4547 AF Out Of Tolerance and Found Below TS as Found Tolerances  
STP 3.8.4-06; Battery Charger Capacity Test; Revision 5  
Equipment-Specific Maintenance Procedure Battery-P319-01; Power Conversion Products Incorporated Battery Charger; Revision 28  
CAP 050987; STP 3.8.4-06 (1D22 Charger Capacity Test) vs Inoperable 1D203 (1D120 to 1D20)

OPR 000359; STP 3.8.4-06 (1D22 Charger Capacity Test) vs Inoperable 1D203  
(1D120 to 1D20)  
CAP 051242; OPR 000359 Not Logged Out of Elog  
STP 3.4.5-01; Calibration of Equipment Drain Sump and Floor Drain Sump Flow Integrators;  
Revision 8  
STP 3.5.3-07; Reactor Core Isolation Cooling System Operability Test and Comprehensive  
Pump Test; Revision 3  
OI 149; Residual Heat Removal System; Revision 102  
STP 3.6.2.1-01; Suppression Pool Water Temperature Surveillance; Revision 3  
CAP 051547; CAQ - Torus Cooling was not Maximized Until After Torus  
Temperature >95 Degrees  
STP 3.8.1-06; Standby Diesel Generators Operability Test (Fast Start); Revision 35  
CAP 051580; Annunciator not Received for 1A4 Transfer Switch in Manual  
CAP 051587; Potential Fire Hazard Encountered During STP 3.8.1-06 'B' SBDG Run  
STP 3.5.1-05; HPCI System Operability Test; Revision 37  
STP 3.6.2.1-01; Suppression Pool Water Temperature Surveillance; Revision 3

### **1EP2 Alert and Notification System (ANS) Evaluation**

Federal Emergency Management Agency Approval Letter for the Proposed Upgrade of the  
DAEC Alert and Notification System; dated June 22, 2007  
FPL Energy Duane Arnold Proposed Upgrade to the Alert and Notification System Letter to  
Federal Emergency Management Agency; dated April 20, 2007  
Emergency Planning Department Manual (EPDM) 1013; Emergency Siren ANS and Siren Sign  
Program; Revision 5  
GMP-ELEC-34; Whelen High Power Voice and Siren System General Maintenance Procedure;  
Revision 0

### **1EP3 Emergency Response Organization (ERO) Augmentation Testing**

DAEC Emergency Plan, Table B-1; On-Shift Staffing and Staff Augmentation Assignments;  
Revision 27  
DAEC Emergency Plan, Table B-1; On-Shift Staffing and Staff Augmentation Assignments;  
Revision 2  
EPDM 1009; Emergency Response Organization Training and Qualification Program;  
Revision 7  
EPDM 1016; ERO Augmentation Drill and Testing Program; Revision 6  
EPDM 1017; EP Staff Training and Qualification Program; Revision 1  
DAEC Emergency Telephone Book; dated January 17, 2007  
CAP 051050; Investigate Methods and Standards for ERO Continuing Training Improvement  
CAP 050467; June 14, 2007 ERO Augmentation Call-In Drill  
CAP 050466; ERO Duty Team Scheduler Not Updated When Person Retired  
CAP 050446; Operations Support Center Mechanical Maintenance Supervisor Did Not Call-In  
for Call-Out Drill  
CAP 037277; ERO Responder Not Within 60-Minute Response Time Without Relief  
CAP 037020; Potential Trend in Failures of Duty Responders

### **1EP5 Correction of Emergency Preparedness Weaknesses and Deficiencies**

PDA-07-011; FPLE Duane Arnold Nuclear Oversight Quality Report; 2007 Emergency Preparedness Assessment; dated May 3, 2007  
Nuclear Oversight Observation Report 2006-001-1-009; Fleet Emergency Planning Assessment; dated March 30, 2006  
SA019158; Quick Hit Self-Assessments Report; NRC Inspection Readiness Review; dated June 15, 2007  
CAP 051042; DAEC Emergency Plan Table B-1 Appears to Have Incomplete Data Corrective Action (CA) 040763; Trend in DEP-PI Performance in 1st and 2nd Quarters of 2005  
CA 041477; Microwave Communication Link to Benton County Emergency Operations Center/Sheriff Office Inop

### **1EP6 Drill Evaluation**

Emergency Plan Implementing Procedure (EPIP) 1.1; Determination of Emergency Action Levels; Revision 27  
EPIP 1.2; Notifications; Revision 35  
Emergency Action Level Matrix - Modes 1, 2, 3; Revision 7  
Emergency Action Level Matrix - Modes 4, 5; Revision 7  
EPIP 6.1; Drill and Exercise Program; Revision 0  
EPDM 1008; Emergency Response Drill and Exercise Program; Revision 7  
EPDM 1010; Emergency Planning Department Performance Indicators; Revision 9  
EPDM 1015; Scenario Development Program; Revision 2  
EPDM FORM EP-035; Drill/Exercise Objective & Eval Process; Revision 5

### **2PS3 Radiological Environmental Monitoring Program (REMP) And Radioactive Material Control Program**

DAEC REMP Program Assessment SA 037140; dated June 2006  
Focused Self Assessment Plan AR No. 044344, Radiological Environmental Monitoring Program and the Implementation of the Offsite Dose Assessment Manual; dated August 2007  
PDA-07-035; Radiological Effluents Assessment; dated August 28, 2007  
Action Request 01007497; REMP Upstream Invertebrate Missed; dated December 14, 2005  
Duane Arnold Daily Quality Summary; dated July 25, 2006, through August 2, 2007  
2005 Annual Radiological Environmental Operating Report  
2006 Annual Radiological Environmental Operating Report  
Offsite Radiation Dose Assessment for January 1 through December 31, 2006  
CAP 052110; CAQ Effluent Monitor Setpoints: Consideration Given to Hard to Detect Isotopes  
CAP 044050; Update the ODAM with REMP Program Changes  
CAP 052432; Investigate the Analysis of Gaseous Effluent Particulate Filters for Iron-55  
CAP 052426; ODAM Figure 5-2, Map of Sample Locations is Missing Location Point No. 3  
CAP 052110; CAQ-Effluent Monitoring Setpoints Did Not Contain Consideration Given to Hard-To-Detect Isotopes  
CAP 052107; Strawberry Sampling Should be Added to the REMP Program  
CAP 052106; ODAM 2.1 Describes Radionuclide Reporting Requirements Less than Conservative than Practice  
CAP 047224; 2007 RP/Chem FSA-REMP and ODAM Section 2.1 Reporting Less Than LLD

CA 047226; 2007 FSA-REMP/ODAM-Document Hard-To-Detect Dose Contribution in Effluent; dated August 21, 2007  
OI 831.3; Meteorological/Plume Model System; Revision 13  
I.MIT C012-0; Climatronic Meteorological Equipment; Revision 19; dated July 7, 2007  
DAEC ODAM; Offsite Dose Assessment Manual Gaseous and Liquid Effluents, Revision 23; dated February 2007  
Environmental Sampling Procedure (ESP) 1.0; Radiological Environmental Monitoring Quality Control Program; Revision 9; dated November 13, 2006  
ESP 4.1.1.1; General Water Quality Sample Collection; Revision 12; dated February 9, 2007  
ESP 4.1.1.11; Thermal Plume Mapping; Revision 6; dated November 5, 1996  
ESP 4.3.1.1; Airborne Particulate and Iodine Sampling; Revision 27; dated April 2, 2007  
ESP 4.3.1.2; Ambient Radiation Sampling; Revision 15; dated March 15, 2006  
ESP 4.3.1.3.A; Surface Water Sampling; Revision 17; dated February 9, 2007  
ESP 4.3.1.5A; Sampling Site Monitoring Wells; Revision 2; dated June 13, 2007  
ESP 4.3.1.8; Vegetation Sampling; Revision 17; dated July 10, 2007  
ESP 4.3.1.14; Fish Sampling; Revision 9; dated November 4, 2002  
ESP 4.3.1.15; Milk Sampling; Revision 23; dated October 26, 2007  
ESP 4.4; Land Use Census; Revision 9; dated November 23, 1998  
ESP 4.5; Statistical Comparison of Thermoluminescent Dosimeters For Direct Radiation Impact; Revision 5; dated April 25, 1995

## **2PS1 Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems**

Site Specific Action Plan for the Assessment and Mitigation of Potential Inadvertent Radiological Spills and Leaks to Ground Water; Revision 1; dated July 2007  
DAEC Operations and Maintenance Activity Assessment of Unplanned Releases; Revision 0; dated April 18, 2007  
CA 043395; List of SSCs That Could Potentially Leak Radioactively Contaminated water to the Ground  
Baseline Assessment of the Risk of Radiological Impacts to Groundwater; dated August 30, 2006  
Documentation of Actions Taken and Outstanding Actions Required in Regards to Tritium at DAEC; dated March 16, 2006

## **4OA1 Performance Indicator Verification**

2005 Annual Radioactive Material Release Report  
2006 Annual Radioactive Material Release Report  
2005 Annual Radiological Environmental Operating Report  
2006 Annual Radiological Environmental Operating Report  
Offsite Dose Assessment Manual from January 1 through December 31, 2006  
RETS/ODCM Radiological Effluent, NRC PI Data Calculation, Review and Approval from the First Quarter of 2006 Through the Second Quarter of 2007  
Occupational Exposure Control Effectiveness, NRC PI Data Calculation, Review and Approval from the First Quarter of 2006 Through the Second Quarter of 2007

### **Alert and Notification System Reliability**

EPDM 1010; EP Department PIs; Revision 10  
NRC Performance Indicator Alert and Notification System Reliability and Records for July 2006 through March 2007  
CAP 038793; Disrupted Feedback Signal from Emergency Siren System

### **Emergency Response Organization Participation**

NRC Performance Indicator for Emergency Response Organization Drill and Exercise Participation Records and Documents for July 2006 through March 2007  
EPDM 1010; ERO Position Equivalency Table; Revision 2  
EPDM 1016; ERO Augmentation Drill and Testing Program; dated June 14, 2007

### **Drill and Exercise Performance**

NG-001L; NRC PI Data Collection Review and Approval; dated January 4, 2007  
NG-001L; NRC PI Data Collection Review and Approval; dated July 6, 2007  
Note 5; DAEC Emergency Action Level Notification Forms; dated July 2006 through March 2007  
EFR 040687; Effectiveness Review for Trend in DEP-PI Performance in First and Second Quarters 2005; dated August 1, 2005  
CAP 041555; 2006 EP Training Drill 2: Failed DEP Opportunities in Emergency Operations Facility  
CAP 041504; Failed DEP-PI Opportunity During LOR2006B, Week 2 Scenario  
CAP 038535; Inattention to Detail Errors While Performing Notification During LOR  
CAP 036922; Missed DEP-PI Opportunity for Protective Action Recommendation During 2005 Full Scale Drill 1; dated June 27, 2005

### **40A2 Identification and Resolution of Problems**

Operations Procedure 001; Operator Burden and Clearance Audit; Revision 38  
ACP 1410.12; Operator Burden Program; Revision 9  
ACP 1408.7; Control of Permanent Plant Instrumentation; Revision 16  
DAEC Operator Burdens Database Summary Printout; dated August 1, 2007  
OWA 07-004; Main Generator 267 Relay (Reverse Power Trip); June 29, 2007  
Operator Challenge 05-001; 1P-5A/1P-5B Condensate Pump Operations, May 6, 2005  
Operator Challenge 07-002; Chlorination and Acid Feed Systems Require Manual Operations; June 23, 2007  
Operator Challenge 07-004; Reactor Water Cleanup System Requires In-service Bed to Be Placed in Hold Prior to Placing Second Bed in Service; June 23, 2007  
Operator Challenge 07-007; SBDG Candleflame Fires in Exhaust Headers; June 23, 2007  
CAP 051947; CAQ - Stroke Time for CV1804A/B Increasing  
CAP 049769; CV4640 Failed ASME Stroke Time  
CAP 036119; CV1064 Did Not Meet ASME Opening Time  
CAP 038886; Trend in Negative Performance in CV1072  
CAP 049910; Stroke Time for CV4308 Left Near Upper Limit During RFO 20s  
CAP 049760; ASME Stroke Time for CV4639 not Re-baselined Following RFO 20 Maintenance

CAP 049734; 15% of PCIS Segments of STP Fail  
CAP 049733; PCIS Valve (CV4639 Recirculation Sample Line Inboard Isolation) Fails Stroke Time  
CAP 045297; Excessive Stroke Time for CV1064  
ACP 1407.3; ASME Section XI Pump and Valve Testing; Revision 15  
GMP-MECH-08; General guidelines for Valve Repacking; Revision 26  
ACP 1410.7; Guidelines for Primary Containment Valves and Penetrations; Revision 15

#### **40A3 Event Follow-up**

CAP 052078; During STP 3.3.6.1-02, a Jumper Was Installed on The Wrong Relay  
STP 3.3.6.1-02; Main Steam Line Low Pressure Instrument Channel Calibration; Revision 4  
ACP 101.2; Verification Process and SELF/PEER Checking Practices; Revision 7  
FPL Nuclear Division Nuclear Administrative Procedure - 403; Conduct of Maintenance; Revision 2  
ACP Nuclear Administrative Procedure - 403; Conduct of Maintenance, DAEC Specific Information; Revision 0  
RCE 001071; During STP 3.3.6.1-02, a Jumper Was Installed on The Wrong Relay; Revision 1  
CAP 045702; Implement Independent Schedule for Non-overlaid N2 Safe-end Welds  
CAP 045700; Mitigation Techniques for Safe-end Welds Shall be Completed Prior to End of RFO 22  
CAP 047600; Linear Indication Found During UT Examination of RRF-F002 Weld  
CAP 047722; Linear Indication Found During UT of RRC-F002 Weld  
CAP 047960; Sample Expansion for RRF-F002 and RRC-F002 Welds  
RCE 001062; Linear Indication Found During UT Exam of RRF-F002 Weld

#### **Corrective Action Documents as a Result of NRC Inspection**

CAP 051004; Discrepancy Between PNNL Report and Vendor UT Report  
CAP 051005; PNNL Technical Evaluation Report of DAEC UT Data from RFO 20  
CAP 051016; NRC Region Inspector has Concern over Procedure Deficiency from 2005 Exam

#### **40A5 Other Activities**

Licensee acceptance of MPR Associates Report 0078-0702-01; "Duane Arnold Energy Center HPCI Pipe Support EBB-5-SR-0 Past Operability Evaluation"; (including the following calculations) April 13, 2007  
Calculation 0078-0034-01; Pipe Riser Clamp Capacity Calculation; Revision 1; April 6, 2007  
Calculation 0078-0034-02; HPCI System Transient Structural Analysis; Revision 0; March 30, 2007  
Calculation 0078-0034-03; HPCI System Independent Support Motion Seismic Analysis, Revision 0; March 30, 2007  
Calculation 0078-0034-04; HPCI Support EBB-5-SR-0 Past Operability Summary; Revision 0; April 6, 2007  
CAP 052620; HPCI Structural Analysis

## LIST OF ACRONYMS USED

ACP	Administrative Control Procedure
AFP	Area Fire Plan
ANS	Alert and Notification System
ASME	American Society of Mechanical Engineers
CA	Corrective Action
CE	Condition Evaluation
CAP	Corrective Action Process
CFR	Code of Federal Regulations
CWO	Corrective Work Order
DAEC	Duane Arnold Energy Center
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
EDG	Emergency Diesel Generator
EP	Emergency Preparedness
EPIP	Emergency Plan Implementing Procedure
EPRI	Electric Power Research Institute
ERO	Emergency Response Organization
ESP	Environmental Sampling Procedure
GDC	General Design Criteria
HPCI	High Pressure Coolant Injection
IGSCC	Intergranular Stress Corrosion Cracking
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Inspection Report
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
ODAM	Offsite Dose Assessment Manual
ODCM	Offsite Dose Calculation Manual
OI	Operating Instruction
OOS	Out-of-service
OPR	Operability Recommendation
OWA	Operator Workaround
PAR	Protective Action Recommendation
PARS	Publicly Available Records
PCIS	Primary Containment Isolation System
PI	Performance Indicator
PMT	Post-Maintenance Testing
PNNL	Pacific Northwest National Laboratories
PWO	Preventative Work Order
RCE	Root Cause Evaluation
REMP	Radiological Environmental Monitoring Program
RETS	Radiological Effluent Technical Specifications
RFO	Refueling Outage
RHRWSW	Residual Heat Removal Service Water

## LIST OF ACRONYMS USED

SBDG	Standby Diesel Generator
SBLC	Standby Liquid Control
SDP	Significance Determination Process
SSC	Structures, Systems, Components
STP	Surveillance Test Procedure
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
UT	Ultrasonic Examination