October 23, 2003

Mr. Mark Peifer
Site Vice-President
Duane Arnold Energy Center
Nuclear Management Company, LLC
3277 DAEC Road
Palo, IA 52324

SUBJECT: DUANE ARNOLD ENERGY CENTER
NRC INTEGRATED INSPECTION REPORT 5000331/2003005

Dear Mr. Peifer:

On September 30, 2003, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Duane Arnold Energy Center. The enclosed report documents the inspection findings which were discussed on October 3, 2003 with Mr. J. Bjorseth and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and to 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 two self-revealing findings of very low safety significance, all of which were determined to involve violations of NRC requirements. However, because of their very low safety significance and because these issues were entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations in accordance with Section VI.A.1 of the NRC's Enforcement Policy. Finally, the licensee identified two violations listed in Section 4OA7 of this report.

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 a 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, 801 Warrenville Road, Lisle, Il 60532-4351; 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.

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Sincerely,

/RA/

Bruce L. Burgess, Chief
Branch 2
Division of Reactor Projects

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

Enclosure: Inspection Report 5000331/2003005

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-331
License No:	DPR-49
Report No:	5000331/2003005
Licensee:	Alliant, IES Utilities Inc.
Facility:	Duane Arnold Energy Center
Location:	3277 DAEC Road Palo, Iowa 52324-9785
Dates:	July 1, 2003 through September 30, 2003
Inspectors:	G. Wilson, Senior Resident Inspector S. Caudill, Resident Inspector K. Stoedter, Senior Resident Inspector H. Peterson, Senior Operations Engineer R. Schmitt, Reactor Health Physics Inspector
Observers:	Magdalena Dziedzic, NRC Intern
Approved by:	Bruce L. Burgess, Chief Branch 2 Division of Reactor Projects

Enclosure

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SUMMARY OF FINDINGS

IR 5000331/2003005, 07/01/2003-09/30/2003; Duane Arnold Energy Center; Maintenance Effectiveness, Operability Evaluations, Post Maintenance Testing, and Other Activities.

This report covers a 3-month period of baseline resident inspection and announced baseline inspections on radiation protection. The inspection was conducted by Region III inspectors and the resident inspectors. This inspection identified four Green findings of which two were considered self-revealing. All of these findings involved Non-Cited Violations (NCVs). 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: Mitigating Systems

- Green. A finding of very low safety significance was self-revealed during temperature indicating switch failures. An inadequate design resulted in failures of temperature indicating switches due to a power surge from the HFA relays. Once identified, the licensee redesigned the circuit to place the surge suppressor in line with the HFA relays and also to place a metal oxide varistor across the relay coil to eliminate any effects from the power surge.

  The finding was more than minor, since the modified circuit was returned to service with an incorrect design. This finding was determined to be of very low safety significance, since multiple channels were working in a fail-safe manner to maintain the capability for a Group 1 main steam line isolation. An NCV of 10 CFR 50, Appendix B, Criterion III, was identified for an inadequate design of the temperature indicating circuit. (Section 1R19)

- Green. A finding of very low safety significance was identified by the inspectors for the licensee’s failure to demonstrate that the performance of the reactor building crane was being effectively controlled through appropriate maintenance. Once identified, the licensee placed the reactor building crane in (a)(1) status and developed a performance improvement plan to return the crane to (a)(2) status.

  The finding was more than minor, since categorization of the reactor building crane’s performance did not meet the criteria for 10 CFR 50.65(a)(2) categorization, due to numerous failures of the crane’s electrical and mechanical systems. This finding was determined to be of very low safety significance since there were no loads dropped by the crane. An NCV of 10 CFR 50.65(a)(2) for the failure to place the reactor building crane in the increased monitoring category as required by 10 CFR 50.65(a)(1) was identified by the inspectors. (Section 1R12)

- Green. The inspectors identified a finding of very low safety significance and an associated Non-Cited Violation (NCV) of 10 CFR 55.46(d)(1), "Continued Assurance of Simulator Fidelity." The inspectors identified that the facility licensee failed to conduct two particular performance tests in accordance with the committed testing requirements of ANSI/ANS 3.5 - 1985, "Nuclear Power Plant Simulators for Use in Operator Training." In addition, the licensee failed to adequately conduct performance testing following the November 2001 power uprate. The simulator was tested using the old thermal power rating of 1658 MW_{th} (megawatts thermal) rather than the plant's actual thermal power of 1790 MW_{th} (total authorized thermal power rating for the actual plant was 1912 MW_{th}; however, thermal power was limited to 1790 MW due to plant equipment).

  This finding was considered more than minor because of the realistic potential of providing negative training based on significant simulator deficiencies compared to the actual plant. This resulted from inadequate testing of the simulator to assure that the simulator appropriately replicated the actual power plant and would not negatively affect operator actions on the actual plant. The finding was determined to be of very low safety significance because the discrepancy was on the simulator and the power plant functioned properly. Furthermore, no actual plant emergency occurred and there was no actual impact on equipment or personnel safety. (Section 4OA5)

Cornerstone: Public Radiation Safety

- Green. A finding of very low safety significance was identified through a self-revealing event related to the failure to follow the procedure for sampling gaseous effluent systems. The primary cause of this violation was related to the cross-cutting area of Human Performance, since the licensee failed to reopen a sample inlet valve, in accordance with procedures, after a leak check for a Reactor Building Gaseous Effluent Monitor. This resulted in the monitor being inoperable. Once identified, the licensee opened the sample inlet valve to restore operability. In addition, the licensee placed verification steps in the associated chemistry procedures to ensure proper equipment lineups

  The finding was more than minor since the monitor was returned to service and considered operable, although it would not have performed its function. The finding was determined to be of very low safety significance since redundant monitors were still operable, the finding did not impair the ability to assess the dose, and there were no releases greater than regulatory limits. An NCV of Technical Specification 5.4.1.a for procedural non adherence was identified. (Section 1R15)

B. Licensee-Identified Violations

Violations of very low safety significance, which were identified by the licensee have been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. These violations and corrective action tracking numbers are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Duane Arnold Energy Center operated at full power for the entire assessment period except for brief downpowers to accomplish rod pattern adjustments and conduct planned surveillance testing activities with the following exceptions:

- On August 22, 2003, a reactor recirculation pump runback occurred due to a failed relay in the motor generator logic control circuit. Power was reduced to approximately 62 percent. The relay was replaced and full power operation was restored on August 23, 2003.

1. REACTOR SAFETY

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

1R04 Equipment Alignment (71111.04)

.1 Partial Walkdowns

a. Inspection Scope

The inspectors performed three partial walkdowns of the following equipment trains to ensure operability and proper equipment lineup. These systems were selected based upon risk significance, plant configuration, system work or testing, or inoperable or degraded conditions.

- ‘B’ Control Building Chiller, during the week of June 30, 2003;
- ‘B’ Standby Gas Treatment System (SBGTS) during the week of July 28, 2003; and
- Electric fire pump during the week of August 16, 2003.

The inspectors verified the position of critical redundant equipment and looked for any discrepancies between the existing equipment lineup and the required lineup, which could affect train function. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding. The inspection consisted of the following activities:

- a review of plant procedures (including selected abnormal and emergency procedures), drawings, and the Updated Final Safety Analysis Report (UFSAR) to identify proper system alignment;
- a review of outstanding or completed temporary and permanent modifications to the system; and
- an electrical and mechanical walkdown of the system to verify proper alignment, component accessibility, availability, and current condition.

b. Findings

No findings of significance were identified.

.2 Complete Walkdown

a. Inspection Scope

On July 10 and 11, 2003, the inspectors performed a complete system alignment inspection of the emergency alternating current (AC) power system, which included the 'A' and 'B' Standby Diesel Generator (SBDG) systems. This system was selected because it was considered both safety-significant and risk-significant in the licensee's probabilistic risk assessment. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding. The inspection consisted of the following activities:

- a review of plant procedures (including selected abnormal and emergency procedures), drawings, and the UFSAR to identify proper system alignment;
- a review of outstanding or completed temporary and permanent modifications to the system; and
- an electrical and mechanical walkdown of the system to verify proper alignment, component accessibility, availability, and current condition.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

.1 Quarterly Fire Zone Inspections

a. Inspection Scope

The inspectors walked down the following risk-significant areas looking for any fire protection issues. The inspectors selected areas containing systems, structures, or components (SSCs) that the licensee identified as important to reactor safety.

The following areas were inspected by walkdowns for a total of 9 samples:

During the week of July 19, 2003:

- Area Fire Plan (AFP) 69, "Main Transformer 1X1";
- AFP-28, "Pump House, ESW/RHRSW Pump Rooms and Main Pump Room";
- AFP-29, "Pump House, Fire Pump and Fire Pump Day Tank Rooms";
- AFP-30, "Pump house, Safety Related Piping Area";
- AFP-20, "Turbine Building, Emergency Diesel Generators";
- AFP-74, "Switchyard";
- AFP-31, "Intake Structure, Pump Rooms"; and
- AFP-32, "Intake Structure, Traveling Screen Areas.

During the week of August 23, 2003:

- AFP-13, “Refuel Floor”.

The inspectors reviewed the control of transient combustibles and ignition sources, fire detection equipment, manual suppression capabilities, passive suppression capabilities, automatic suppression capabilities, and barriers to fire propagation. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

The inspectors reviewed the licensee's flooding mitigation plans and equipment to determine consistency with design requirements and the risk analysis assumptions for internal flooding in the Northwest Corner Room area during the week of August 2, 2003. The Northwest Corner Room was chosen since it contains the “B” Residual Heat Removal (RHR) pump, the “D” RHR pump, and the “B” Core Spray pump. Walkdowns and reviews considered design measures, seals, drain systems, contingency equipment condition, availability of temporary equipment and barriers, performance and surveillance tests, procedural adequacy, and compensatory measures. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification (71111.11)

a. Inspection Scope

On August 27, 2003, the inspectors observed a training crew during a simulator scenario of Simulator Exercise Guide (SEG) 2003C4-5, which included a hotwell tube rupture and a Reactor SCRAM. Licensed operators’ performances in mitigating the consequences of events were reviewed by the inspectors.

The inspectors evaluated crew performance in the areas of:

- clarity and formality of communications;
- timeliness of actions, prioritization of activities;
- procedural adequacy and implementation;
- control board manipulations;

- managerial oversight, emergency plan execution; and
- group dynamics.

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 0;
- ACP 101.01, “Procedure Use and Adherence,” Revision 0; and
- ACP 101.2, “Verification Process and SELF/PEER Checking Practices,” Revision 5.

The inspectors assessed whether the crew completed the critical tasks listed in the above guidelines. The inspectors also compared simulator configurations with actual control board configurations. For any weaknesses identified, the inspectors verified that licensee evaluators also noted the same issues and discussed them during the end of session critique. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors reviewed the licensee's implementation of the Maintenance Rule (10 CFR 50.65) to ensure requirements were met for the selected systems for a total of four samples. The following four systems were selected based on their being designated as risk significant under the Maintenance Rule, or were designated as being in Maintenance Rule category a(1) requiring increased monitoring:

- Off-site Power, during the week of July 26, 2003;
- Control Rod Drive, during the week of August 9, 2003;
- Control Building Heating, Ventilation and Air Conditioning during the week of August 30, 2003; and
- Reactor Building Crane, during the week of September 13, 2003.

The inspectors evaluated the licensee's categorization of specific issues, including the evaluation of performance criteria. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding. The inspectors reviewed the licensee's implementation of the Maintenance Rule requirements, including a review of scoping, goal-setting, and performance monitoring; short-term and long-term corrective actions; functional failure determinations associated with the condition reports reviewed; and current equipment performance status.

b. Findings

Introduction. A finding of very low safety significance (Green) and an associated Non-Cited Violation (NCV) of 10 CFR 50.65(a)(2) in that the licensee failed to adequately demonstrate the performance or condition of the reactor building crane was identified by the inspectors.

Description: Over the past year, there have been numerous instances in which the reactor building crane has ceased to operate. The failures to operate properly were due to problems in the mechanical and electrical control systems. Electrical problems included failures of the main and auxiliary field weakening cards, the main field diodes and transfer switches, the main armature fan, and identification of wire debris in the main motor armature resistor bank and dirt in the main hoist motor. Mechanical problems involved the emergency drum brake cable, flex coupling speed sensing cable, and the electric clutch coupling. These failures and problems have resulted in the inability of the crane to move loads and in loads being left suspended on the crane.

Although the reactor building crane was scoped within the Maintenance Rule, the licensee failed to consider the movement of loads when evaluating system performance. Further, the number and nature of problems associated with the crane clearly indicate that the licensee failed to demonstrate effective control of the performance or condition of the reactor building crane through appropriate preventive maintenance, as provided in 10 CFR 50.65(a)(2). Therefore, the performance and/or condition of the crane should have been monitored as required by 10 CFR 50.65(a)(1). However, despite all of the problems with the reactor building crane, it was not considered for (a)(1) monitoring under the Maintenance Rule although several opportunities occurred to do so.

Further investigation revealed that the reason for not including these problems was because the licensee did not consider them to be functional failures under the maintenance rule. The licensee’s practice was to evaluate as Maintenance Rule functional failures those issues that would produce a reportable event under 10 CFR 50.73. The licensee's established reliability criterion would not allow effective performance monitoring of the crane or provide adequate demonstration of control of crane performance or condition as evidenced by the problems noted above. The licensee’s approach would defeat a principal purpose of the Maintenance Rule program to improve maintenance effectiveness and thereby improve reliability and availability of SSCs.

The inspectors concluded that failures serious enough to cause the crane to cease functioning and suspend loads, thereby creating potential safety hazards, should have been considered functional failures under the Maintenance Rule program. The inspectors determined that although the reactor building crane had ceased to operate on multiple occasions, no loads were ever dropped; therefore, this finding was determined to be of very low safety significance.

Analysis: The inspector determined that licensee’s failure to adequately evaluate the reactor building crane for (a)(1) status is a performance deficiency. Since a performance deficiency existed, the inspectors reviewed this issue against the guidance contained in Appendix B, “Issue Dispositioning Screening,” of Inspection Manual

Chapter (IMC) 0612, “Power Reactor Inspection Reports.” In particular, the inspectors compared this finding to the findings identified in Appendix E, “Examples of Minor Issues,” of IMC 0612 to determine whether the finding was minor. Following that review, the inspectors concluded that the guidance in Appendix E, Section 1, Example F, was applicable for the specific finding. Since an (a)(2) demonstration could not be justified, the issue is more than minor.

The inspectors reviewed this issue in accordance with IMC 0609, “Significance Determination Process (SDP)," Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations." The inspectors determined that the finding affected the fuel barrier cornerstone and screened out as Green.

Enforcement: 10 CFR 50.65 (a)(2) states, in part, that monitoring as specified in 10 CFR 50.65 (a)(1) is not required where it has been demonstrated that the performance or condition of a structure, system, or component is being effectively controlled through the performance of appropriate preventive maintenance, such that the SSC remains capable of performing its intended function. Based on the numerous problems with the reactor building crane over the past year, the licensee failed to demonstrate effective control of the performance or condition of the crane through appropriate preventive maintenance, yet the licensee failed to set goals and monitor the performance or condition of the reactor building crane as required by 10 CFR 50.65(a)(1), and did not have adequate justification for not doing so. Therefore, a Non-Cited Violation (NCV 5000331/2003005-01) of 10 CFR 50.65(a)(2) was identified by the inspectors. This issue was entered into the licensee's corrective action program as Corrective Action Plan (CAP) 029021.

Corrective actions taken included placing the reactor building crane in (a)(1) status on September 12, 2003, and the development of a performance improvement plan to return the crane to (a)(2) status.

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. The inspectors also evaluated the performance of maintenance associated with planned and emergent work activities to determine if they were adequately managed. In particular, the inspectors reviewed the licensee’s program for conducting maintenance risk safety assessments and to ensure that the licensee’s planning, assessment and management of on-line risk was adequate. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding. The inspectors also reviewed licensee actions to address increased on-line risk during these periods, such as establishing compensatory actions, minimizing the duration of the activity, obtaining appropriate management approval, and informing appropriate plant staff, to ensure they were accomplished when on-line risk was increased due to maintenance on risk-significant SSCs. The following activities were reviewed:

- The inspectors reviewed the maintenance risk assessment for work planned during the week of August 2, August 9, August 23, September 6, and September 27, 2003 for a total of 5 samples.

b. Findings

On September 25, 2003, while stroking motor-operated valve (MOV) 2004, which is the “A” RHR outboard injection valve, the control room received the annunciator for breaker 1B4402 being tripped. Breaker 1B4402 is the supply feeder breaker from division two power and by means of another in-line breaker, IB4401, provides power to the low pressure coolant injection (LPCI) swing bus, which supplies power to all of the RHR LPCI injection valves. The LPCI swing bus is equipped with power control logic that ensures that the bus has power from an operable diesel generator and it does this by the breaker interactions between 1B4401 and 1B3401. When either breaker 1B4401 or 1B3401 trips, the associated breaker automatically closes in to ensure power is maintained to the bus. The LPCI swing bus was being powered from division two power prior to the breaker trip. An electrical transient tripped breaker 1B4402, and since breaker 1B4401 did not trip, breaker 1B3401 did not close; therefore, power was lost to the LPCI swing bus. This resulted in the plant without automatic operation of the LPCI mode of either train of RHR since no power was available to the injection valves. The plant still had both divisions of core spray operable and available and the ability to manually operate the RHR injection valves to ensure that the safety function of low pressure injection was maintained.

The licensee began troubleshooting the issue and found that the “C” phase power cable from breaker 1B3494 to MOV 2004 had a hole in the insulation, which exposed the bare conductor. The hole in the insulation was the result of the cable being routed across the edge of a metal structural support member and the movement of the cable due to thermal expansion and contraction as current was passed through it. When the “A” RHR outboard injection valve was stroked, an arc was drawn from the cable to the structural support resulting in a phase to ground short. The phase to ground short resulted in copper splatter and ionizing gases that resulted in a phase to ground short at the stabs on breaker 1B3490, which is the “A” recirculation pump suction valve, due to the proximity of the cable fault to the breaker stabs. The additional phase to ground short at the breaker stabs severed all three phase cables on breaker 1B3490. When breaker 1B4402 opened on over current, the faults were removed from the bus. In addition, the severe electrical transient resulted in breaker 1B4402 failing after it opened appropriately to the over current transient.

The licensee made all the necessary repairs on the LPCI swing bus with the exception of replacing breaker 1B4402. The replacement of breaker 1B4402, which is hard wired into bus 1B44, would result in the removal of bus 1B44 from service and the majority of division 2 safety-related equipment. Entry into technical specification (TS) 3.8.7.a for loss of a safety bus would be required when bus 1B44 was removed from service. In addition, a safety function determination process would have to be performed in accordance with TS 3.0.6 to evaluate the loss of safety function because of the loss of safety related equipment. The licensee was already in TS 3.5.1.b for declaring RHR inoperable due to the loss of power to the LPCI injection valves. The removal of bus 1B44 would cause the “B” core spray system to be lost and result in the loss of two low pressure injection systems. The loss of two low pressure injection systems mandated entry into TS 3.5.1.n, which required entry into TS 3.0.3. TS 3.0.3 required the plant to be shutdown within 9 hours.

On September 28, 2003, the licensee entered the TS 3.0.3 and replaced breaker 1B4402. The replacement and restoration was completed in approximately 2 hours and 17 minutes. After the restoration, the bus was restored to normal and all associated TS's were exited.

Since the issue happened at the end of the inspection period, there was not adequate time to properly address this issue. This issue is being treated as an Unresolved Item (URI 5000331/2003005-01) pending review of the licensee's determination of the root cause and the overall effect on MOV 2004. The licensee has entered this issue into their corrective action program under CAP 029168.

1R14 Personnel Performance During Non-routine Plant Evolutions and Events (71111.14)

.1 Quarterly Control Rod Sequence Exchange

a. Inspection Scope

During the week of July 26, 2003, inspectors observed portions of the licensee's planned power reduction and various surveillance test procedures. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding. The inspectors observed operator performance in the control room during portions of both the power reduction and subsequent power escalation. In addition, inspectors observed surveillance testing associated with the main steam isolation valves and main turbine control system.

b. Findings

No findings of significance were identified.

.2 Initial Loading of Dry Storage Spent Fuel Cask

a. Inspection Scope

The inspectors observed the preparations for and management of the initial loading of the first dry storage spent fuel cask during the week of August 30, 2003. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding. A review of the licensee's applicable procedures, licensing commitments, compensatory actions, personnel briefings, and CAP's generated to understand and resolve the details of this preplanned evolution was performed by the inspectors. In particular, the inspectors reviewed the operators' contingency actions to verify that they were appropriate for the evolution and in accordance with procedures and training. Detailed walkdowns of the job sites and activities were performed by the inspectors to ensure that all licensing commitments were met. The inspectors had several discussions with the evolution coordinator during the week to ensure that the control of work was maintained, and that resolution of work delays were done safely.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors assessed the following operability evaluations for a total of five samples :

- CAP 028067 "Operability Evaluation for MO-1935 Residual Heat Removal (RHR) Minimum Flow Valve," during the week of July 5, 2003;
- OPR 000238, "Temperature Indicating Switch 4478 for "B" main steam line failure to trip," during the week of August 30, 2003;
- CAP 028121, "TC7000A is inoperable," during the week of August 30, 2003;
- CAP 028735, "Kaman 8 inlet valve mispositioned," during the week of August 30, 2003; and
- CAP 028732, "Incorrect grease used to lubricate Emergency Diesel Generator air inlet check valve," during the week of August 30, 2003.

The inspectors reviewed the technical adequacy of the evaluation against the Technical Specification, UFSAR, and other design information; determined whether compensatory measures, if needed, were taken; and determined whether the evaluations were consistent with the requirements of the licensee's ACP-114.5, "Action Request System;" Revision 32. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding.

b. Findings

Introduction: A finding of very low safety significance (Green) and an associated NCV of Technical Specification 5.4.1, related to the failure to follow the procedure for sampling gaseous effluent systems in accordance with Regulatory Guide 1.33 was identified through a self-revealing event.

Description: On August 22, 2003, a Chemistry Shift Technician was reviewing Kaman alarms for shift turnover and noticed that an unexpected Kaman alarm for process to sample flow ratio was present for the Reactor Building Gaseous Effluent Monitor. The technician went to investigate the alarm and identified that the sample inlet valve was shut for the Kaman 8, which is a reactor building gaseous effluent monitor, thereby making the monitor inoperable. Upon finding the sample valve shut, the licensee restored the monitor to operable status by opening the sample inlet valve. In addition, the licensee investigated the issue and discovered that the valve should have been reopened on August 21, 2003, after the leak check was performed in accordance with Plant Chemistry Procedures (PCP) 2.8, "Collection and Analysis of Particulate and Iodine Filters From Gaseous Effluent Monitors," Section 5.2 Step (4)(d). The valve had been inappropriately shut for approximately 24 hours following the sample collection activity. The failure to follow the procedure steps for returning the monitor to service, as described in PCP 2.8, resulted in the sample valve being left closed for Kaman 8, thereby resulting in an inoperable monitor that was being used for compliance with the

Offsite Dose Assessment Manual (ODAM). Failure to follow procedures is a human performance deficiency. The inspectors determined that although the Kaman 8 was inoperable, Kamans 4 and 6 were still monitoring reactor building releases in accordance with the ODAM; therefore, this finding was determined to be of very low safety significance.

Analysis: The inspectors determined that the licensee's failure to follow procedures and ensure that the sample valve was opened is a performance deficiency. Since a performance deficiency existed, the inspectors reviewed this issue against the guidance contained in Appendix B, "Issue Dispositioning Screening," of IMC 0612, "Power Reactor Inspection Reports." In particular, the inspectors compared this finding to the findings identified in Appendix E, "Examples of Minor Issues," of IMC 0612 to determine whether the finding was minor. Following that review, the inspectors concluded that the guidance in Appendix E, Section 5, Example b, was applicable for the specific finding. Since the monitor was returned to service and considered operable with the sample inlet valve closed, which would not let the monitor perform its function, the issue was more than minor.

The inspectors reviewed this issue in accordance with IMC 0609, "Significance Determination Process (SDP)," Appendix D, "Public Radiation Safety Significance Determination Process." The inspectors determined that the finding affected the Public Radiation Safety Cornerstone; however, the finding was not a radioactive material control issue. The finding affected the effluent release program and, since the finding did not impair the ability to assess dose and was less than the 10 CFR 20.1301(d) limit, it was screened as Green.

Enforcement: TS 5.4.1.a and Regulatory Guide 1.33, Revision 2, Appendix A, Section 7.d.4 requires that activities associated with sampling gaseous effluent systems be properly pre-planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Contrary to this requirement, the licensee failed to follow the documented work instructions of PCP 2.8 related to the collection and analysis of filters from the gaseous effluent monitors on August 21, 2003, by leaving the sample inlet valve closed for the Kaman 8 monitor. The sample inlet valve was opened approximately 24 hours later on August 22, 2003. The failure to follow the procedure, as described in PCP 2.8, to reopen the sample inlet isolation valve for the Kaman 8 monitor, was an example where the requirements of Technical Specification 5.4.1.a, were not met and was a violation. However, because of its low safety significance and because it was entered into the corrective action program, the NRC is treating this issue as a Non-Cited Violation (NCV 5000331/2003005-02), in accordance with Section VI.A.1 of the NRC's Enforcement Policy. This issue was entered into the licensee's corrective action program as CAP028735.

Corrective actions taken included the placement of verification steps in the associated chemistry procedures to ensure proper equipment lineups.

1R16 Operator Workarounds (OWA) (71111.16)

a. Inspection Scope

The inspectors reviewed two operator workarounds, CAP 027921, "Gasket Leak on Excitation Rectifiers Cooling Water Filter," and CAP 028804, "Temperature Indicating Switch (TIS) 4446 Failed to trip," during the week of September 6, 2003, to identify any potential adverse impact on the function of mitigating systems or the ability to implement an abnormal or emergency operating procedure. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding.

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the following post-maintenance activities for a total of seven samples. Activities were selected based upon the SSC's ability to impact risk.

- CWO A63515, "Repair Leak on Control Building Chiller Valve V-069-0268," during the week of July 12, 2003;
- CWO A51493, "Replace Main Steam Line Tunnel Leakage Temperature Switch," during the week of July 19, 2003;
- CWO A62941, "Repair West Torus Spray Header Nitrogen Supply Inboard Isolation," during the week of July 19, 2003;
- CWO A58714, "Replace Existing (RHR Pump) Seal Water Cooler with New," during the week of August 4, 2003;
- CWO A72212, "Diesel Fire Pump," during the week of August 16, 2003;
- PWO 1124742, "SBDG 1G-31 Complete Mechanical Inspection," during the week of September 22, 2003; and
- CWO A63800, "Replace Breaker, Found Tripped- Will Not Reset," during the week of September 27, 2003.

The inspectors ensured by witnessing the test or reviewing the test data that post-maintenance testing activities were adequate for the above maintenance activities. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding. The inspectors reviews included, but were not limited to, 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, TS applicability, system restoration, and evaluation of test data. Also, the inspectors reviewed that maintenance and post-maintenance testing activities adequately ensured that the equipment met the licensing basis and UFSAR design requirements.

b. <u>Findings</u>

Introduction: A finding of very low significance (Green) and an associated NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control," related to the failure to adequately design the modification of the Chromolax temperature indicating switches (TIS) circuit was identified through a self-revealing event.

Description: Starting on July 30, 2003, a series of spurious half Group 1 signals were received from the "B" channel for turbine building high temperature. In addition, there were several different problems exhibited by the TIS such as failing to trip, failing to reset, and local indications of locking up. During the troubleshooting, surge suppressors and TIS were replaced with new ones. In addition, supplemental cooling was provided to evaluate the environmental conditions on the switches.

The initial TIS4478 which failed, was part of the B1 channel for turbine building high temperature, was sent to the original manufacturer for failure analysis. The vendor indicated that the likely cause of the failure was inductive kick from the HFA relay. An additional failure analysis was performed by an independent vendor, who indicated that the problems with the TIS were eliminated when a line filter/surge suppressor was placed on the relay coil line side. The placement of the surge suppressor on the line side eliminated the power surge from the relay. During the discussions with the independent vendor, the licensee realized that the surge suppressors were not installed correctly to eliminate the power surge. In addition, the licensee decided to install metal oxide varistors across the relay coil to further reduce the power surge in the circuit. The licensee performed a root cause analysis on this issue. The analysis concluded that the licensee failed to properly design the placement of the surge suppressors. The failure to properly evaluate the placement of the surge suppressors in the circuit was an example of inadequate design control due to the adverse impact of the power surge on the circuit operation. The inspectors determined that although the design and installation of the temperature indicating switches circuit was inadequate, multiple channels were available to ensure a Group 1 main steam line isolation would occur and were working in a fail safe manner; therefore, this finding was determined to be of very low safety significance.

Analysis: The inspectors determined that licensee's failure to adequately design the temperature indicating circuit by failing to properly place the surge suppressor is a performance deficiency. Since a performance deficiency existed, the inspectors reviewed this issue against the guidance contained in Appendix B, "Issue Dispositioning Screening," of IMC 0612, "Power Reactor Inspection Reports." In particular, the inspectors compared this finding to the findings identified in Appendix E, "Examples of Minor Issues," of IMC 0612 to determine whether the finding was minor. Following that review, the inspectors concluded that the guidance in Appendix E, Section 5, Example b was applicable for the specific finding. Since the modified circuit was returned to service with an improper design, the issue is more than minor.

As a result, the inspectors reviewed this issue in accordance with IMC 0609, "Significance Determination Process (SDP)." The inspectors determined that the finding affected the Mitigating Systems Cornerstone; however, since the incorrect placement of the surge suppressor was not a design deficiency that resulted in a loss of function per

Generic Letter (GL) 91-18, did not represent the actual loss of a safety function, did not exceed the TS Allowed Outage Time (AOT), did not represent an actual loss of safety function for non-Tech Spec train, and was not risk significant due to seismic, fire, flooding or severe weather, that the finding was screened as Green.

Enforcement: 10 CFR 50, Appendix B, Criterion III, “Design Control,” requires, in part, that design changes, including field changes, are subject to the design control measures commensurate with the original design. The failure to specify the proper placement of the surge suppressor for the TIS circuit is an example of where this modification to the TIS switches did not receive design control measures commensurate with those used in the original design, resulting in their placement in the TIS circuitry in a manner that adversely impacted the reliability of the circuit, which is an appendix B system. Improper placement of the surge suppressors resulted in the TIS circuitry failing due to the power surge from the HFA relay. The original modification of the new chromolax temperature indicating circuit was designed and installed on January 7, 2002. The design of the surge suppressor was changed to the line side of the HFA relay on September 3, 2003, thereby eliminating the power surge. The failure to subject the placement of the surge suppressor to design control measures commensurate with those applied to the original design to eliminate the effect of HFA relay power surges was an example where the requirements of 10 CFR 50, Appendix B, Criterion III, were not met and was a violation. However, because of its low safety significance and because it was entered into the corrective action program, the NRC is treating this issue as a Non-Cited Violation (NCV 5000331/2003005-03), in accordance with Section VI.A.1 of the NRC’s Enforcement Policy. This issue was entered into the licensee’s corrective action program as CAP028804.

Corrective actions taken included the rewiring of the surge suppressors to be on the line side of the HFA relay and the placement of a metal oxide varistor across the relay coil to eliminate inductive kick from the HFA relay.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors selected the following surveillance test activities for review for a total of five samples. Activities were selected based upon risk significance and the potential risk impact from an unidentified deficiency or performance degradation that a system, structure, or component could impose on the unit if the condition were left unresolved.

- STP 3.8.1-04, “ ‘B’ Standby Diesel Generators Operability Test,“ during the week of July 19, 2003;
- STP 3.3.5.1-13, “Calibration of LPCI Loop Select - Reactor Steam Dome Pressure - Low Instrumentation,” during the week of August 9, 2003;
- STP 3.8.1-04, “ ‘A’ Standby Diesel Generators Operability Test,“ during the week of August 16, 2003;
- STP 3.3.3.6.1-44, “High Pressure Coolant Injection (HPCI) Steam Line High DP Instrument Channel Calibration,” during the week of September 6, 2003; and
- STP 3.5.1-05, “HPCI System Operability Test,” during the week of September 13, 2003.

The inspectors observed or reviewed the performance of surveillance testing activities, including reviews 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 reporting, and evaluation of test data. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding.

b. Findings

No findings of significance were identified.

1EP6 Emergency Preparedness Drill Evaluation (71114.06)

a. Inspection Scope

On September 17, 2003, the inspectors observed an operating crew participate in an emergency preparedness drill. The inspectors monitored the operations crews' response to a fuel handling accident, loss of feedwater heating, a hydraulic Anticipated Transient Without SCRAM (ATWS), an Automatic Depressurization System (ADS) steam line leak, and an eventual fuel failure with an off-site radiation release. In addition, the inspectors verified that appropriate actions were taken by the operators, the proper emergency procedures were implemented, and that the crew made the proper emergency classifications in a timely manner. The inspectors also attended the licensee's critique to verify that personnel adequately evaluated the crew's emergency plan implementation. As part of this inspection, the documents in the Attachment were utilized to evaluate the potential for an inspection finding.

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

2OS1 Access Control to Radiologically Significant Areas (71121.01)

.1 Plant Walkdowns, Radiological Boundary Verifications, and Radiation Work Permit Reviews

a. Inspection Scope

The inspectors conducted walkdowns of the radiologically controlled area (RCA) to verify the adequacy of radiological boundaries, postings, and locking devices. Specifically, the inspectors walked down several radiologically significant work area boundaries (i.e., High Radiation Areas (HRA), and Locked High Radiation Areas (LHRA)) with radiation levels greater than 1,000 mr/hr, in the Reactor Building, Torus Catwalks, RadWaste Building, and Refuel Floor/Spent Fuel Pool areas. Additional areas reviewed included the low level radwaste building and the independent spent fuel storage installation (ISFSI).

Confirmatory radiation measurements were taken to verify that these areas were properly posted and controlled in accordance with 10 CFR Part 20, licensee procedures, and Technical Specifications. The inspectors reviewed radiation work permits (RWPs) (i.e., for routine plant tours, Drywell Coolers Removal/Replacement, Inservice Inspection, Reactor Vessel Disassembly/Re-assembly, and Recirc Pump Seal Replacement) for engineering, operations, and maintenance activities, in support of Refueling Outage 18 (RFO 18). The RWPs were evaluated for protective clothing requirements, respiratory protection concerns, electronic dosimetry alarm set points, and radiation protection hold points, to verify that work instructions and controls had been adequately specified and that electronic dosimeter set points were in conformity with survey indications. In addition, workers were interviewed to verify that they were aware of the actions required when their electronic dosimeters noticeably malfunctioned or alarmed (this represents five samples completed).

b. Findings

No findings of significance were identified.

.2 Job-In-Progress Reviews, Observations of Radiation Worker Performance, and Radiation Protection Technician Proficiency

a. Inspection Scope

The inspectors observed the following high radiation area work activities performed during the inspection and evaluated the licensee’s use of radiological controls:

Local Leak Rate Test in the Torus.
Loading of spent fuel into Dry Storage Canister (DSC);
Decontamination of Transfer Cask (TC);
Welding of DSC Inner Top Cover;
Transport of TC to ISFSI pad; and
Transfer of DSC into Horizontal Storage Module (HSM) at ISFSI.

The inspectors attended the pre-job briefing for the work evolution, reviewed the radiological job requirements for the activity and assessed job performance with respect to those requirements. The inspectors reviewed survey records, including radiation, contamination, and airborne surveys to verify that appropriate radiological controls were effectively utilized. The inspectors also reviewed in-process surveys and applicable postings and barricades to verify their accuracy. The inspectors observed radiation protection technician and worker performance during the work evolution at the job site to verify that the technicians and workers were aware of the significance of the radiological conditions in their workplace, RWP controls/limits, and that they were performing adequately, given the level of radiological hazards present and the level of their training (this represents two samples completed).

b. Findings

No findings of significance were identified.

.3 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed licensee Action Requests (ARs) written since RFO 18 (March 2003) to the date of the current assessment, which focused on access control to radiologically significant areas (i.e., problems concerning activities in HRAs, radiation protection technicians performance, and radiation worker practices). The inspector also reviewed the 1st and 2nd Quarter 2003 Action Request Radiological Occurrence Trend Reports. The inspector reviewed these documents to verify the licensee's ability to identify repetitive problems, contributing causes, the extent of conditions, and then implement other corrective actions in order to achieve lasting results. For repetitive deficiencies and/or significant individual deficiencies in problem identification and resolution, the inspectors verified that the licensee's self-assessment activities were capable of identifying and addressing these deficiency (this represents two samples completed).

b. Findings

No findings of significance were identified.

4 High Risk Significant, High Dose Rate HRA and VHRA Controls

a. Inspection Scope

The inspectors discussed with RP supervisors the controls that were in place for special areas that had the potential to become very high radiation areas during certain plant operations (i.e., spent fuel movements), to determine if these plant operations required communication beforehand with the RP group, so as to allow corresponding timely actions to properly post and control the radiation hazards (this represents one sample completed).

b. Findings

No findings of significance were identified

.5 Radiation Worker Performance

a. Inspection Scope

During job performance observations, the inspectors evaluated radiation worker performance with respect to stated radiation protection work requirements and evaluated whether workers were aware of the significant radiological conditions in their workplace, the RWP controls and limits in place, and that their performance had accounted for the level of radiological hazards present (this represents two samples completed).

b. Findings

No findings of significance were identified.

.6 Radiation Protection Technician Proficiency

a. Inspection Scope

During job performance observations, the inspectors evaluated RPT performance with respect to radiation protection work requirements and evaluated whether they were aware of the radiological conditions in their workplace, the RWP controls and limits in place, and if their performance was consistent with their training and qualifications with respect to the radiological hazards and work activities (this represents two samples completed).

b. Findings

No findings of significance were identified.

2OS2 As-Low-As-Is-Reasonably-Achievable (ALARA) Planning and Controls (71121.02)

.1 Radiological Work and ALARA Planning

a. Inspection Scope

The inspectors examined the station's procedures for radiological work/ALARA planning and scheduling and evaluated the dose projection methodologies and practices implemented for RFO 18, to verify that sound technical bases for dose estimates existed. The inspectors reviewed the station's collective exposure histories from 1990 to the present, current exposure trends from ongoing plant operations, and completed radiological work activities for RFO 18 to assess current performance and outage radiation exposure challenges. The inspectors evaluated the licensee's effectiveness in exposure tracking for the outage to verify that the licensee could identify problems with its collective exposure and take actions to address them. Additionally, the inspectors reviewed a representative sampling of radiologically significant RWP/ALARA planning packages to verify that adequate person-hour estimates, job history files, lessons learned, and industry experiences were utilized in the ALARA planning process. As part of the reviews of the planning packages, the inspectors reviewed Total Effective Dose Equivalent (TEDE) ALARA evaluations developed for: (1) drywell cooler removal/replacement; and, (2) recirculation pump seal removal/replacement. The inspectors examined the TEDE ALARA evaluations to assess the licensee's analysis for the potential use of respiratory protection equipment and to verify the adequacy of the licensee's internal dose assessment processes/program for the aforementioned work evolutions (this represents two samples completed).

b. Findings

No findings of significance were identified.

.2 Source Term Reduction and Control

a. Inspection Scope

The inspectors evaluated the licensee's source term reduction program in order to verify that the licensee had an effective program in place and was knowledgeable of plant source term reduction opportunities and that efforts were being taken to address them. Work control mechanisms for RFO 18 were evaluated to ensure that source term reduction plans had been appropriately implemented (this represents one sample completed).

b. Findings

No findings of significance were identified.

.3 Radiological Work and ALARA Implementation

a. Inspection Scope

The inspectors selected the following RFO 18 work activities that were of highest exposure significance, or were otherwise conducted in the drywell, and assessed the adequacy of the radiological controls and work planning:

- Reactor disassembly/reassembly and refuel floor activities;
- In-service inspections; and
- Drywell A/B cooler replacements.

The inspectors reviewed the RWPs, the pre- and in-progress job ALARA Reviews, and post job ALARA reviews which were developed for each of the aforementioned jobs. The inspector examined the radiological engineering controls and other dose mitigation techniques specified in these documents and reviewed job dose history files to verify that licensee and industry lessons learned were adequately integrated into each work package. The inspectors reviewed the exposure results for the selected activities to evaluate the accuracy of exposure estimates in the ALARA plan (this represents two samples completed).

b. Findings

No findings of significance were identified.

.4 Verification of Exposure Goals and Exposure Tracking System

a. Inspection Scope

The inspectors evaluated the licensee's effectiveness in exposure tracking for RFO 18 to verify that the licensee could identify problems with its collective exposure and take actions to address them. The inspectors reviewed the exposure history for each outage activity to determine if management was monitoring the exposure status, if in-progress ALARA job reviews were being properly performed, if additional engineering/dose controls needed to be established, and if required corrective documents had been generated. The inspectors compared exposure estimates, exposure goals, job dose rates, person-hour estimates, and post work final radiation exposure date for consistency. The inspectors examined job dose history files and dose reductions anticipated through the licensee's implementation of lessons learned, from RFO 18, to verify that the licensee could accurately forecast exposure dose goals. The inspectors examined the actual RFO 18 radiation dose exposure data i.e., 94.4 person-Rem versus the projected dose 105 person-Rem (this represents two samples completed).

b. Findings

No findings of significance were identified.

.5 Identification and Resolution of Problems

a. Inspection Scope

The inspectors examined the licensee's lessons learned from RFO 18 refueling outage dose goal estimation process and its' subsequent effect on the planning for upcoming RFO 19 planning activities. The inspectors evaluated selected outage generated ARs, which focused on ALARA planning and controls. The inspectors examined the contents of a briefing package from a recent Combined Department Clock Resets, Multiple Personnel contamination while performing Local Leak Rate Test (LLRT) on SV43334, which was held for all plant employees. Additionally, the inspectors reviewed the licensee's CY 2003 Radiation Protection Organization Effectiveness summary report. The inspectors evaluated the effectiveness of the licensee's problem identification and resolution program to verify that the licensee could adequately identify individual problems/trends, determine contributing causes, extent of conditions, and develop corrective actions to achieve lasting results (this represents one sample completed).

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

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

.1 Reactor Safety Strategic Area

a. Inspection Scope

The inspectors reviewed the licensee submittals for a total of three samples of performance indicators (PIs). The inspectors used PI guidance and definitions contained in Nuclear Energy Institute (NEI) Document 99-02, Revision 2, "Regulatory Assessment

Performance Indicator Guideline," to verify the accuracy of the PI data. As part of the inspection, the documents listed in Appendix 1 were utilized to evaluate the accuracy of PI data. The inspectors' review included, but was not limited to, conditions and data from logs, licensee event reports, condition reports, and calculations for each PI specified.

The following PIs were reviewed:

- Reactor Coolant System Leakage, from January 2002 through May 2003, during the week of August 2, 2003;
- Emergency AC Power Systems Unavailability, from January 2002 through May 2003, during the week of August 9, 2003; and
- Reactor Coolant System (RCS) Specific Activity, from April 2002 through May 2003.

b. Findings

No findings of significance were identified.

.2 Radiation Safety Strategic Area

a. Inspection Scope

The inspectors reviewed the licensee submittals for two samples of performance indicators (PIs). The inspectors used PI guidance and definitions contained in Nuclear Energy Institute (NEI) Document 99-02, Revision 2, "Regulatory Assessment Performance Indicator Guideline," to verify the accuracy of the PI data. As part of the inspection, the documents listed in Appendix 1 were utilized to evaluate the accuracy of PI data. The inspectors' review included, but was not limited to, conditions and data from logs, licensee event reports, condition reports, and calculations for each PI specified.

- Radiological Effluent Technical Specification (RETS)/Offsite Dose Calculation Manual (ODCM) Radiological Effluent Occurrence, from April 2002 through May 2003; and
- Occupational Exposure Control Effectiveness, from October 2002 through May 2003.

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

As discussed 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 licensee's corrective action system 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 licensee's corrective action system as a result of the inspectors' observations are generally denoted in the report.

b. Findings

No findings of significance were identified.

.2 Other (OTH) 027685; Local Power Range Monitor (LPRM) 32-17 A & B detectors appear to have swapped connections

Introduction: The inspectors observed an increase in problems related to incorrect wiring of components. The inspectors noticed this trend during routine daily reviews of CAP reports. Accordingly, the inspectors selected the licensee's lifted leads and verification process for a more detailed review with respect to problem identification and resolution. During the week of September 13, 2003, the inspectors searched the licensee's CAP database for the prior 12 month period for problems with incorrect wiring and found additional examples. In particular, the inspectors reviewed the corrective actions associated with the incorrect wiring of the LPRM 32-17 A & B detectors due to the potential significance of the issue.

a. Effectiveness of Problem Identification

(1) Inspection Scope

The inspectors evaluated whether the licensee's identification of the problem was complete, accurate, and timely, and that the consideration of extent of condition, generic implications, common cause and previous occurrences was adequate.

(2) Issues

The inspectors reviewed the licensee's corrective actions to address the improper wiring that was found for LPRM 32-17 A & B detectors. On April 18, 2003, with the reactor in Start-up MODE and power approximately 5 percent, operators noted that the signal levels from LPRMs 32-27 A & B seemed inappropriate. The detectors signals were compared to those at a mirror image core location. Based on that information, the reactor engineers determined that the detectors, which were replaced during the outage, appeared to have swapped connectors. The signals from the associated LPRMs were then bypassed to ensure that improper signals would not be fed into the Average Power Range Monitors (APRMs). During troubleshooting activities associated with the detectors, the connectors were verified to be swapped and were then connected to the correct detector. An Apparent Cause Evaluation (ACE) was performed on the issue. A review of available information associated with the work identified that the issue was caused by human performance errors and potential weaknesses in the licensee's verification process.

The inspectors performed a review of the swapped LPRM connectors to ensure that no adverse effects on events which rely on LPRM signals had occurred. In addition, the inspectors also verified that the LPRM settings for the new detectors were conservative during the startup to verify that additional safety margin was present. The inspectors then reviewed the corrective action data base for additional examples of improperly wired components in the plant. The search found additional examples of improperly wired components found in the plant within the last year. The most significant of these issues was the improperly wired solenoid valve for one of the ADS valves, which was previously discussed in inspection report 5000331/2003004. The inspectors concluded that a majority of the wiring deficiencies were caused by improper verification techniques. The licensee performed an evaluation of all the issues related to wiring deficiencies and concluded that they were due to human performance errors and procedure inadequacies. ACP 1408.22, "Electrical Termination Sheet," was changed to incorporate a verification process for cables that input into the reactor protection system. In addition, an increased emphasis was placed on human performance especially those involving the verification and checking process.

.3 CAP028247; Evaluate the effectiveness of the "Quality Control (QC) Department"

Introduction: While observing maintenance activities, the inspectors observed problems associated with the performance of QC verifications. Accordingly, the inspectors selected the licensee's QC process for a more detailed review with respect to problem identification and resolution. In particular, the inspectors reviewed the corrective actions associated with the effectiveness of the Quality Control (QC) Department, during the week of September 27, 2003.

a. Effectiveness of Problem Identification

(1) Inspection Scope

The inspectors evaluated whether the licensee's identification of the problem was complete, accurate, and timely, and that the consideration of extent of condition, generic implications, common cause and previous occurrences was adequate.

(2) Issues

The inspectors reviewed the licensee's corrective actions to address the methods of quality control verification. On July 15, 2003, the inspectors observed hold points and verifications being performed by the licensee's QC inspector during the installation of a HILTI bolt in accordance with "General Maintenance Procedure (GMP)-Construction (CNST)-01; KWIK BOLT/Super KWIK Bolt/KWIK Bolt II Installation." The bolt was being installed to incorporate the Chromolax temperature indicating switch modification in accordance with CWO A51493. The inspectors questioned the licensee's QC inspector after watching him verify the bolt alignment was within 3 degrees of being perpendicular with a ruler, especially after the procedure indicated that the measurement could be made with a protractor. Based on the conversation with the inspectors, the licensee's QC inspector obtained a protractor and verified that the bolt was properly aligned. A conversation was then held with licensee management by the inspectors to describe their observations of the QC inspector. In particular, a detailed description of the verification technique utilized by the QC inspector was described by the inspectors. The inspectors also questioned the independence of the verification activities that was performed by the licensee's QC inspector, due to the way some of the verifications were performed. In particular, verifications were not always performed separately by the licensee's QC inspector. Licensee management wrote CAP 028233 to evaluate the bolt alignment and CAP 028247 to evaluate the effectiveness of the QC department.

After performing an initial review of the QC process, licensee management changed the way verifications were being performed. All measurements, which were able to be quantified in degrees and inches, were to be measured and quantified by utilizing the appropriate measuring devices such as protractors and rulers. QC inspectors previously performed some measurements by using visual acuity and estimation, thereby injecting a possible human performance deficiency. In addition, a focused self-assessment was performed by the licensee. Additional guidance was given to the licensee's QC inspectors following the assessment to reemphasize not getting involved in the work and to ensure that independence is maintained.

4OA3 Event Follow-up (71153)

.1 (Closed) LER 50-331/03-04: "Unplanned High Pressure Coolant Injection (HPCI) Limiting Condition for Operation (LCO) caused by HPCI Seal Water Line Crack and Class 2 Leakage"

On April 20, 2003, while performing a surveillance test procedure, the licensee discovered a small leak on the seal water line from the main HPCI system pump. Visual inspection confirmed that the leak was due to a narrow through wall opening at the root of the pipe thread. The pipe appeared to have failed due to excessive bending stresses, which could have been caused by applying torque to the pipe unions to vent the system or by stepping on the piping system. The unions were broken apart to ensure that the seal water system was properly vented. The venting is performed in accordance with Operating Instruction 152, "High Pressure Coolant Injection System" and Turbin-T147-01, "Repair of Byron Jackson Main Coolant Pump". The procedures were changed to vent the systems at the pipe unions as part of the corrective actions of an earlier seal failure that was caused by overheating due to improper venting of the seal water system. The unions were not designed for use as a vent for the seal chamber, so by utilizing the union for that purpose the original design of the system was changed. In addition, the breaking of the unions results in high stresses at the threaded connections between the piping and the pump case that will result in leaks or pipe breaks, and it also challenges the sealing integrity of the coupling and surrounding pipe joint. The breaking of the unions has resulted in additional pipe leaks. Since the piping is American Society of Mechanical Engineers (ASME) Code Class 2, it results in the isolation of the system. The isolation of the seal water system renders HPCI unavailable. Corrective actions included replacing the associated piping and the future installation of vent valves. The inspectors reviewed the LER and associated documents to verify that the cause was identified and that corrective actions proposed by the licensee were reasonable and appropriate. The issue is greater than minor since it effected the mitigating system cornerstone objective of equipment performance due to HPCI being made unavailable. The issue affects the Mitigation Systems Cornerstone and was considered to have a very low safety significance (Green) using Appendix A of the SDP since HPCI was unavailable for less than 3 days and Reactor Core Isolation Cooling (RCIC), core spray system, LPCI system, and ADS were always available during this time. A licensee identified violation associated with 10 CFR 50, Appendix B, Criterion III, “Design Control,” for this issue is documented in Section 4OA7 of this report. The licensee documented the issue in CAP 026970. This LER is closed.

4OA4 Cross-Cutting Aspects of Findings

.1 A finding described in Section 1R15 of this report had, as its primary cause, a human performance deficiency, in that, the licensee failed to perform procedure steps described in PCP 2.8, “Collection and Analysis of Particulate and Iodine Filters From Gaseous Effluent Monitors,” section 5.2 step (4)(d) for opening the sample inlet valve for KAMAN 8, thereby rendering the monitor inoperable.

4OA5 Other Activities

1 (Closed) Unresolved Item (URI) 50-331/02-07-01 Adequacy of Medical Examinations

The inspectors identified a potential violation of medical requirement regulations, 10 CFR 55.21, “Medical Examination,” and 10 CFR 55.23, “Certification,” in that the licensee’s medical evaluations appeared to have questionable conditions that may be outside the criteria of ANSI/ANS-3.4-1983, “Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants.”

On October 30, 2002, during review of six licensed operators’ medical records, the inspectors identified conditions noted in the medical records that were not readily identifiable as meeting the ANSI/ANS-3.4-1983 requirements. Of the six records reviewed, the inspectors noted two questionable conditions associated with the type of medications being taken and abnormal electro-cardiogram (ECG) results. Based upon further review by the NRC contract physician, no additional restrictions to the operators’ licenses were deemed necessary at this time. URI 50-331/2002-07-01 is considered closed.

a. Inspection Scope

(Closed) Unresolved Item (URI) 50-331/02-07-02 Adequacy of the Plant-Referenced Simulator to Conform With Simulator Requirements Specified in 10 CFR 55.46

Introduction: One Green finding involving a Non-Cited Violation (NCV) of the simulator fidelity regulation, 10 CFR 55.46(d)(1), “Continued Assurance of Simulator Fidelity,” was identified for the failure to adequately conduct the required performance testing to maintain simulator fidelity.

Description: On October 31, 2002, the inspectors identified an issue concerning the failure to comply with 10 CFR 55.46. Specifically, the issue concerned the adequacy of the licensee’s periodic simulator performance testing conducted in accordance with 10 CFR 55.46(d)(1). The licensee was committed to operate and maintain the plant-referenced simulator and conduct periodic performance tests in accordance with ANSI/ANS-3.5-1985, “American National Standard Nuclear Power Plant Simulators for Use In Operator Training.”

ANSI/ANS-3.5-1985 required periodic testing under Sections 5.4.1, "Simulator Performance Testing," and 5.4.2, "Simulator Operability Testing." In Section 5.4.1, the licensee was required to conduct simulator performance testing if simulator design changes resulted in significant simulator configuration or performance variations. Also, in Section 5.4.2, the licensee was required to annually conduct a verification of simulator performance against the steady state criteria of Section 4.1, "Steady State Operation," and the transient criteria of Section 4.2, "Transient Operation." In accordance with Section 4.2, the licensee was required to conduct testing of the simulator to prove the capability of the simulator to perform correctly under the limiting cases of those evolutions identified in Section 3.1.1, "Normal Plant Evolutions," and Section 3.1.2, "Plant Malfunctions."

The inspectors identified that the licensee's simulator testing procedure, Simulator Operating Instructions (SOI) No. 8.0, "Certification Testing," Revision 6, specifically exempted the testing of two test items within Section 3.1.1 of the ANSI/ANS-3.5-1985 standard. The two test items in question were as follows: (1) Item No. 4, "Reactor trip followed by recovery to rated power; and (2) Item No. 9, "Core performance testing such as plant heat balance, determination of shutdown margin, and measurement of reactivity coefficients and control rod worth using permanently installed instrumentation."

In addition, the inspectors noted that the previously conducted annual simulator performance test was performed following the actual plant's power uprate from 1658 to 1912 MW_{th} (megawatts thermal) during November 2001. Although the authorized power uprate was 1912 MW_{th}, due to limitations of plant equipment, the licensee only operated the actual plant to 1790 MW_{th}. The inspectors noted that the licensee specifically documented the fact that the annual simulator certification testing was completed at the original 1658 MW_{th}. Although the licensee adequately conducted the annual steady state simulator test, the simulator change based on the power uprate resulted in significant simulator configuration or performance variations and therefore the simulator should have been tested based on the actual thermal power of 1790 MW_{th} rather than 1658 MW_{th}.

<u>Analysis</u>: The inspectors reviewed this issue against the guidance contained in Appendix B, "Issue Dispositioning Screening," of Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports." This finding affected the mitigating system cornerstone objective because it could affect the capability of the simulation facility to adequately meet the requirements to administer initial operator license examinations and provide continuing training of licensed operators in accordance with 10 CFR Part 55, "Operators' Licenses." The safety significance of this issue was more than minor due to potential negative training. The realistic potential of providing negative training based on significant simulator deficiencies compared to the actual plant, including inadequate testing of the simulator to assure that the simulator appropriately replicates the actual plant (thermal power), could potentially affect operator actions on the actual plant.

The inspectors reviewed this issue in accordance with Manual Chapter 0609, "Significance Determination Process (SDP)," Appendix I, "Operator Requalification Human Performance Significance Determination Process (SDP)." Based on this SDP, the inspectors determined that this finding was of very low safety significance (Green) because although the potential for negative training was apparent, the discrepancy was on the simulator and the actual plant responded as expected, and no event occurred on the actual plant due to the potential negative training.

Enforcement: Title 10 of the Code of Federal Regulations, Part 55.46 (d)(1) required the licensee to periodically conduct simulator performance testing throughout the life of the simulator. The licensee committed to follow ANSI/ANS-3.5-1985 as the way they would meet Part 55.46 (d)(1). Contrary to the above, the inspectors identified that the licensee's simulator testing procedure, Simulator Operating Instructions (SOI) No. 8.0, "Certification Testing," Revision 6, specifically exempted the testing of two test items within Section 3.1.1 of the ANSI/ANS-3.5-1985 standard. The inspectors also identified that the licensee inadequately tested the simulator during the annual performance test using the old thermal power rating of 1658 MW_{th}. The testing was conducted following the actual plant's power uprate from 1658 MW_{th} to 1912 MW_{th} during November 2001. The inspectors determined that the simulator change, based on the power uprate, resulted in sufficient simulator configuration or performance variations and therefore the simulator should have been tested based on the actual thermal power of 1912 MW_{th}, or at least the limited thermal power of 1790 MW_{th} in place due to equipment limitations, rather than 1658 MW_{th}.

This finding is considered a violation of 10 CFR 55.46. Because of the very low safety significance, this violation is being treated as a Non-Cited Violation (5000331/2003005-04) consistent with Section VI.A.1 of the NRC Enforcement Policy. This issue was in the licensee's corrective action program as AR 33396, "Potential Violation of Simulator Testing Requirements." The licensee completed the changes to the procedure and satisfactorily performed the two incorrectly omitted simulator tests. In addition, the licensee was planning to test the simulator using the appropriate data for the power uprate. URI 50-331/2002-07-02 is closed.

4OA6 Meetings

.1 Exit Meeting

The inspectors presented the inspection results to Mr. J. Bjorseth and other members of licensee management at the conclusion of the inspection on October 3, 2003. 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:

- Radiation Protection inspection with Mr. J. Bjorseth, Plant Manager on July 18, 2003.
- Reviewing URIs 2002-07-01 and 2002-07-02 with Mr. Curt Kress, Training Manager, on September 18, 2003.
- Radiation Protection inspection with Mr. J. Bjorseth, Plant Manager on September 19, 2003.

4OA7 <u>Licensee-Identified Violations</u>

The following violations of very low significance were identified by the licensee and are violations of NRC requirements which meets the criteria of Section VI of the NRC Enforcement Manual, NUREG-1600, for being dispositioned as NCVs.

Cornerstone: Mitigating Systems

.1 As discussed in Section 4OA3.1 of this report, 10 CFR 50, Appendix B, Criterion III, "Design Control," requires that the structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions. When Operating Instruction 152, "High Pressure Coolant Injection System" and Turbin-T147-01, "Repair of Byron Jackson Main Coolant Pump" procedures were changed to vent the seal water system through the unions, no analysis was performed to evaluate the effects of breaking the unions for venting. The unions were not designed to be a vent for the seal chamber so by utilizing the union for that purpose the original design of the system was changed. The additional bending stress from breaking the unions have resulted in pipe damage that requires isolation thereby rendering HPCI unavailable. Contrary to these requirements, the licensee changed the procedures to vent the seal water system through the pipe unions. Since HPCI was unavailable for less than 3 days and LPCI, ADS, RHR, and core spray were always available, this violation is not more than very low safety significance, and is being treated as an NCV. The licensee documented the issue in CAP 026970.

Cornerstone: Occupational Radiation Safety

.2 Title 10 CFR 20.1301 requires that each licensee shall conduct operations so that no individual member of the public receive any exposure >100 mRem/yr. The licensee's procedure (ACP 1411.17, "Occupational Dose Limits and Upgrades," Revision 15) that controls radiation exposure, in part, was found to govern public radiation exposure to a limit of 200 mRem/yr. This procedure is not in compliance with the requirements of 10 CFR 20.1301. Thus, there is a potential violation.

However, this was a licensee-identified violation with very low safety significance. Licensee staff had evaluated the deficiency and had initiated corrective actions. The problem was described in CAP028208. The inspectors reviewed licensee exposure records, and other documentation, to verify that no member of the public had received greater than 100 mRem exposure. Records indicated that the highest individual public exposure had been approximately 50 mRem, during the last 4 calender years. The licensee's procedure has been revised to control visitors (public) exposure to 100 mRem/yr. Additionally, the inspectors examined the procedure that plant staff utilizes when evaluating visitor (public) or worker (occupational) exposure limits. These facts, as reviewed by the inspectors, provided a reasonable assurance that any public exposure, above regulatory limits, had not occurred. Thus, the issue was determined to be of very low safety significance. Consequently, it is being treated as an NCV.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
M. Peifer, Site Vice-President Nuclear
J. Bjorseth, Plant Manager
D. Curtland, Director Engineering
T. Evans, Operations Manager
A. Johnson, Operations Training Manager
B. Kindred, Security Manager
C. Kress, Training Manager
J. Windschill, Acting Manager, Radiation Protection
S. Catron, Manager Regulatory Affairs
W. Simmons, Maintenance Manager
D. Wheeler, Chemistry Manager
R. Morrell, Regulatory Assurance
J. Newman, Radiation Protection Manager (Acting)
B. Richmond, Health Physics Supervisor

Nuclear Regulatory Commission
D. Hood, Project Manager, NRR
B. Burgess, Chief, Reactor Projects Branch 2

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

5000331/2003005-01	NCV	Failure to adequately demonstrate the performance or condition of the reactor building crane (Section 1R12)
5000331/2003005-01	URI	Loss of the LPCI swing bus (Section 1R13)
5000331/2003005-02	NCV	Failure to follow PCP 2.8 procedure for returning KAMAN 8 to service (Section 1R15)
5000331/2003005-03	NCV	Failure to adequately design the Chromolax TIS circuit (Section 1R19)
5000331/2003005-04	NCV	Failure to meet the requirements of 10 CFR 55.46 with regard to assuring maintenance of plant referenced simulator fidelity (Section 4OA5.2).

Closed

5000331/2003005-01	NCV	Failure to adequately demonstrate the performance or condition of the reactor building crane (Section 1R12)
5000331/2003005-02	NCV	Failure to follow PCP 2.8 procedure for returning KAMAN 8 to service (Section 1R15)
5000331/2003005-03	NCV	Failure to adequately design the Chromolax TIS circuit (Section 1R19)
5000331/2003-004	LER	Unplanned HPCI LCO caused by HPCI Seal Water Line Crack and Class 2 Leakage (4OA3)
50-331/02-07-01	URI	Identified medical conditions that may be outside the criteria of ANSI/ANS-3.4-1983 (Section 4OA5.1).
50-331/02-07-02	URI	Failure to meet the requirements of 10 CFR 55.46 with regard to assuring maintenance of plant referenced simulator fidelity (Section 4OA5.2).
5000331/2003005-04	NCV	Failure to meet the requirements of 10 CFR 55.46 with regard to assuring maintenance of plant referenced simulator fidelity (Section 4OA5.2).

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.

1R04 Equipment Alignment

Operating Instruction (OI) 324, Standby Diesel Generator System (SBDG), Revision 57
OI 324, Attachment 1, SBDG 1G-31 System Electrical Lineup, Revision 1
OI 324, Attachment 8, SBDG 1G-21 Control Panel Lineup, Revision 0
OI 324, Attachment 2, SBDG 1G-21 Electrical Lineup, Revision 1
OI 324, Attachment 4, SBDG 1G-21 System Valve Lineup, Revision 2
OI 324, Attachment 3, SBDG 1G-31 System Valve Lineup, Revision 2
OI 324, Attachment 7, SBDG 1G-31 Control Panel Lineup, Revision 0
OI 324, Attachment 10, SBDG Standby/Readiness Condition Checklist, Revision 2
List of Open Work Orders on the Standby Diesel Generators, July 9, 2003
List of Degraded Instruments for the Standby Diesel Generators, July 9, 2003
List of CAPs associated with Equipment Alignment Issues, July 10, 2003
OI 324, Attachment 3, SBDG 1G-31 System Valve Lineup, Revision 2
OI 324, Attachment 7, SBDG 1G-31 Control Panel Lineup, Revision 0
OI 324, Attachment 10, SBDG Standby/Readiness Condition Checklist, Revision 2
OI 454A4, "B ESW System Valve Lineup and Checklist," Rev. 3
OI 730, "Control Building HVAC System," Rev. 58
OI 730A4, "Plant Chilled Water System Valve Lineup," Rev. 2
OI 170A1, "SBGT System Electrical Lineup," Rev. 2
OI 170A4, "B SBGT Valve Lineup and Checklist," Rev. 0
OI 170 Attachment 6, "SBGT System Control Panel Lineup," Rev. 1
STP NS13B010, "Electric Driven Fire Pupm Monthly Operability Tests," Rev. 6 (Test results for 5/19/03, 6/18/03, 7/17/03)
P&ID BECH —133, "Fire Protection System"
OI 513 Attachment 2, "Fire Protection System Valve Lineup," Rev. 7

1R05 Fire Protection

AFP-13, Refueling Floor, Rev. 22
AFP-20, Turbine Building, Emergency Diesel Generators, Rev. 24
AFP-28, Pump House, ESW/RHRSW Pump Rooms and Main Pump Room, Rev. 25
AFP-29, Pump House, Fire Pump and Fire Pump Day Tank Rooms, Rev. 25
AFP-30, Pump house, Safety Related Piping Area, Rev. 24
AFP-31, Intake Structure, Pump Rooms, Rev 22
AFP-32, Intake Structure, Traveling Screen Areas, Rev. 24
AFP-69, Main Transformer 1X1, Rev. 2
AFP-74, Switchyard, Rev 1
CAP 028121; "TC7000A is inoperable;" July 8, 2003
CAP 028322; "Area Fire Plans issued While on Hold Status," July 22, 2003

1R06 <u>Flood Protection Measures</u>

Individual Plant Examination Section 3.3.6;Internal Flooding Analysis; November 1992
AOP 902; Flood; Revision 19
EOP 3; Secondary Containment Control; Revision 10
General Maintenance Procedure (GMP)-Mechanical (Mech)-20; Sect “A” Repair; Revision 7
GMP-Mech-20; Sect “B” Checking Doors for Air Leaks; Revision 1
Planned Work Order 1125714; Inspect Watertight Doors; Revision 0
STP NS13F002; Fire Door and Frame Inspection; Revision 14
STP NS13F004; Fire Door Inspection; Revision 10

1R11 <u>Licensed Operator Requalification Program</u>

SEG 2003C4-5; “Hotwell Tube Rupture;” Revision 0
Abnormal Operating Procedure (AOP) 639; “
Integrated Plant Operating Instruction (IPOI) 3; “Power Operations;” Revision 61
IPOI 4; “Shutdown;” Revision 60
IPOI 5; “Reactor SCRAM;” Revision 38
Emergency Action List (EAL) Table 1; Revision 2
ACP 110.1; Conduct of Operations; Revision 0
ACP 101.01; Procedure Use and Adherence; Revision 19
ACP 101.2; Verification Process and SELF/PEER Checking Practices; Revision 5

1R12 <u>Maintenance Effectiveness</u>

NEI 93-01; "Nuclear Energy Institute Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants; Revision 2
Performance Criteria Basis Document for Offsite Power, Rev 2, June 20, 2003
Performance Criteria Basis Document for Offsite Power, Rev 1, September 10, 1997
Maintenance Rule Criteria Calculation Reports for Offsite Power
List of Corrective Action Program Documents for Startup Systems 1, 3, 86, and 87 from January 1, 1999 to July 25, 2003
CAP 013868, “CB4290 (‘I’ Breaker Determined to be a Maintenance Preventable Functional Failure,” July 3, 2002
CAP 027725, “Switchyard Maintenance Rule Review,” June 6, 2003
CAP 027132, “The ‘I’ Breaker Failed to Synchronize During Startup,” April 22, 2003
CAP 011391, “CB8490 Lost Air Supply,” December 14, 2002
CAP 019809, “Following Maintenance, CB5550 Failed to Close,” November 14, 2002
Maintenance Rule Data; Control Rod Drive System; August 3, 2003
Performance Criteria Basis Document for Control Rod Drive, Revision 2
CAP014185; Unable to “Withdraw” 1R215; August 14, 2002
CAP025550; Control Rod 30-31 inlet scram valve; February 11, 2003
CAP026538; During STP 3.3.1.1-22 found blown fuse for SV18-03; March 30, 2003
Performance Criteria Basis Document for Control Building Heating Ventilation and Air-Conditioning System, Revision 5
CAP 010857; RE6101B(Control Building Intake Area Radiation Detector) Will Not Calibrate; June 12, 2001
CAP 009776; 95-K0041A (SFU Auxiliary Relay) Determined Inoperable During PWO; April 3, 2001
CAP 011195; Review Maintenance Rule Data for Chiller and SFU; August 3, 2001

CAP 012074; Maintenance Rule Performance Criteria Basis Document Review per MR Module 5; November 14, 2001
CAP 028747; 'A' Chiller Load Control Flow Valve Sometimes Prevents Chiller from Loading; August 23, 2003
CAP 028279; Control Building Chiller 'A' Failed to Respond Properly; July 17, 2003
CAP 028082'; 'A' Control Building Chiller Developed Oil Leak, Declared Inoperable; July 5, 2003
Maintenance Rule Data; Reactor Building Crane; September 8, 2003
Performance Criteria Basis Document for Reactor Building Crane, Revision 0

1R13 Maintenance Risk Assessments and Emergent Work Control
Work Planning Guide - 2; On-Line Risk Management Guideline; Revision 12
Online Look-Ahead Agenda; Week of August 2, 2003
Online Look-Ahead Agenda; Week of August 9, 2003
Online Look-Ahead Agenda; Week of August 23, 2003
Online Look-Ahead Agenda; Week of September 6, 2003
Online Look-Ahead Agenda; Week of September 27, 2003
On-line Risk Analysis for De-energizing Bus 1B44; September 27, 2003
CWO A66811, Troubleshooting Instruction Form for 1B34A and 1B44A; September 25, 2003
ACE 001280; LPCI Swing Bus Failure; September 28, 2003
CAP 029168; LPCI Swing Bus 1B34A/1B44A de-energized; September 25, 2003

1R14 Personnel Performance During Nonroutine Plant Evolutions and Events
Level A Plan, Downpower Plan, July 14, 2003
Instructions for Sequence Exchange, July 26-27, 2003
Pre-Rod Move Briefing, Sequence Exchange, July 26-27, 2003
Expected Power Profile Graph for Sequence Exchange, July 26-27, 2003
Reactor Engineering Sequence Exchange Checklist, July 23, 2003
DFS 201, Dry Shielded Canister/Transfer Cask Preparation for Fuel Loading Operations, Rev. 2
DFS 203, Dry Shielded Canister Sealing Operations, Rev. 5
DFS 301, Loaded Dry Shielded Canister/Transfer Cask From Refueling Floor to ISFSI Operations, Rev. 4
DFS 302, Dry Shielded Canister From Transfer Cask to Horizontal Storage Module Transfer Operations, Rev. 3
DFS 801, Fuel Selection, Rev. 1
SPF 164, Container Plan List
Health Physics Dry Cask Storage Project Job Coverage and Work Plan, July 2003
CAP 028841, Wrong Fuel Bundle Moved in the Spent Fuel Pool, August 29, 2003
CAP 028797, ISFSI Technical Specification Surveillance Monitoring, August 27, 2003
WO 1125203, Provide Dry Storage of Spent Fuel Into Horizontal Storage Module Number HSM-001, August 25, 2003

1R15 Operability Evaluations
ACP-114.5, "Action Request System;" Revision 32
"Operability Evaluation for MO1935 RHR Min Flow, CAP 028067," July 1, 2003
OPR000238; "TIS 4478 Main Steam Line Temperature monitoring failure to trip;" August 5, 2003

CAP 028121; “TC7000A is inoperable;” July 8, 2003
CAP 028735; “Kaman 8 inlet valve mispositioned;” August 22, 2003
PCP 2.8; Collection and Analysis of Particulate and Iodine Filters from Gaseous Effluent Monitors;” Revision 11
CAP 028732; “Incorrect grease used to lubricate Emergency Diesel Generator air inlet check valves;” August 22, 2003

1R16 Operator Workarounds
Operations Department Instructions 004; Identification, Tracking and Resolution of Equipment issues; Revision 8
CAP027921; “Gasket leak on Excitation Rectifiers Cooling Water Filter;” June 21, 2003
Annunciator Response Procedure (ARP) 1C-83A A-6; “Water Tank Level Low;” Revision 7
Operating Instruction (OI) 697; “Generator Stator Cooling Water System;” Revision 32
Integrate Plant Operating Instruction (IPOI) 4; “Shutdown;” Revision 60
IPOI 5; “Reactor SCRAM;” Revision 38
CAP028804; “TIS4446 failed to trip during STP 3.3.6.1-04;” August 27, 2003
ARP 1C-05A D-8; “Channel A High Condenser Backpressure or Turbine Building High Temperature;” Revision 4
Emergency Operating procedure (EOP) 3; “Secondary Containment Control;” Revision 15

1R19 Post-Maintenance Testing
Work Order A63515, “Repair Leak in Tubing at V69-0268 (Control Building Chiller),” July 8, 2003
STP 3.7.5-01, “Control Building Chiller Operability,” Rev. 2
CWO A51493; “Replace Main Steam Line Tunnel Leakage Temperature Switch,” July 15, 2003
STP 3.3.6.1-04; “Main Steam Lines High Temperature Channel Calibration,” Revision 3
ACP 101.2; “Verification Process and Self/Peer Checking Practices,” Revision 5
ACP 101.01; “Procedure Use and Adherence;” Revision 21
GMP-CNST-01, “KWIK Bolt/Super KWIK Bolt/KWIK Bolt II Installation,” Revision 6
CAP 028247; “Evaluate the effectiveness of the “QC Department;” July 16, 2003
CAP 028233; “Method of QC Verification of Acceptable Bolt Alignment;” July 15, 2003
CWO A62941; “Repair West Torus Spray Header Nitrogen Supply Inboard Isolation;” July 15, 2003
STP 3.6.1.1-08; “Containment Isolation Leak Tightness Test Type C Penetrations - Orphan Valves;” Revision 10
CWO A58714, “Replace Existing (RHR Pump) Seal Water Cooler with New,” August 4, 2003
CWO A72212, “Diesel Will Not Start,” August 13, 2003
Troubleshooting Instruction Form(TIF) A72212, August 12, 2003
Engineered Maintenance Action A72212, August 15, 2003
NS13B009, “Diesel Driven Fire Pump Operability Tests and Fuel Oil Supply Verification,” Rev. 15, test completed on August 15, 2003

PWO 1124742, “SBDG 1G-31 Complete Mechanical Inspection,” September 21, 2003
PWO 1124744, “SBDG 1G-31 Electrical Inspection,” September 21, 2003
PWO 1124898, “Calibrate PS3241A,” September 22, 2003
CWO A64079, “Replace TC7000A,” September 22, 2003 9/22/03
PWO 1125106, “Megger Motor (IR Test),” September 22, 2003 9/22/03
PWO 1124945, “Calibrate TS3276A,” September 22, 2003 9/22/03
CWO A60725, “Install New Indicator and Resistor at TI3213,” September 22, 2003
CWO A60820, “Replace Damper Operator,” September 23, 2003
CWO A63827, “Adjust Timing Chain,”September 23, 2003
CWO A72766, “Replace Solenoid Valve,” September 24, 2003
OI324, “SBDG Operating Checklist,” Rev. 9, September 25, 2003
STP 3.8.1-06, “SBDG Operability Test,” Rev. 16, September 25, 2003
STP 3.8.1-06, “1G-31 Post-STP Completion Checklist,” Rev. 16, September 25, 2003
CAP 029157, “A SBDG LCO Issues,”September 24, 2003
CAP 029146, “Parts and Contingencies for Work on Diesel Generators,” September 24, 2003
CAP 029142, “A SBDG Exhaust Bolt Stripped,” September 24, 2003
CWO A63800, “Replace Breaker, Found Tripped - Will not Reset,” September 27, 2003

1R22 Surveillance Testing

STP 3.8.1-04, “Standby Diesel Generators Operability Test (Slow Start from Norm Start Air), Revision 10 (test results for 4/21/03, 5/17/03, 6/4/03, 7/16/03, and 8/17/03)
0I 324A9, “SBDG Operating Checklist,” Revision 5
OI 324A10, “SBDG Standby/Readiness Condition Checklist,” Revision 2
STP 3.8.1-03, “SBDG Diesel Oil Fuel Test (Viscosity and Water Sediment), Rev. 1 (Test results for 7/10/03)
CAP 028295, “Lube Oil Temperature Requirements During Standby Diesel Generator STP,” July 18, 2003
STP 3.3.5.1-12, “Channel Functional Test of Reactor Steam Dome Pressure (LPCI Loop Select) Low Instrumentation,” Rev. 1, (test results for 3/11/03, 5/12/03, 6/10/03, and 8/6/03)
STP 3.3.5.1-13, “Calibration of LPCI Loop Select - Reactor Steam Dome Pressure - Low Instrumentation,” Rev.4, (test results for 4/19/03 and 7/9/03)
STP 3.3.6.1-44; “HPCI Steam Line High DP Instrument Channel Calibration;” Revision 2
STP 3.5.1-05; “HPCI System Operability Test;” Revision 19

1EP6 Drill Evaluation

2003 White Team Training Drill Scenario; September 17, 2003
Emergency Plan Implementing Procedure (EPIP) 1.1; Emergency Plan Implementing Procedure; Revision 19
EPIP 2.5; “Control Room Emergency Response Operation;” Revision 14
EAL; “Determination of Emergency Action Levels;” Revision 2
ATWS/RPV Control; Revision 12
EOP 3; “Secondary Containment Control;” Revision 10
AOP 646; “Loss of Feedwater Heating;” Revision 13
IPOI 4; “Shutdown;” Revision 60

IPOI 5; “Reactor SCRAM;” Revision 38
RFP 402; “Fuel Movement Within the Spent Fuel Pool;” Revision 14

<u>20S1</u> <u>Access Control to Radiologically Significant Areas</u>
CAP 27300; Personnel Contaminated During Performance of LLRT; May 6, 2003
CAP 026927; Unanticipated dose Rate Alarm Received in CV 4639 work; April 12, 2003
CAP 027166; Unposted Neutron Radiation Area Found; April 24, 2003
ACP 1411.13; Control of Locked High Radiation Areas; Revision 10
ACP 1411.22; Control of Access to Radiological Areas; Revision 15
GMP-Test-54; Leak Rate Monitoring (LRM) operating Instructions; Revision 2
NG-03-0307; 1st Quarter 2003 Action Request Radiological Occurrence Trend Report; April 8, 2003
NG-03-0510; 2nd Quarter 2003 Action Request Radiological Occurrence Trend Report; July 11, 2003
RWP 253; Performance of LLRT Functions in Clean Radiation Areas; Revision 0
2003-001-1-009; Nuclear Oversight Observation Report, Radiation Protection; March 17, 2003
WO A62941; Disassembly/Inspect/Refurbish internals of SV4333A; July 15, 2003
Duane Arnold Energy Center, Radiation Protection Focused Self-Assessment, Radiation Protection Organization Effectiveness, Contamination Controls and Control HRA/LHRA; July 10, 2003
CAP 028550; Ventilation Flowpath on Refuel Floor is Challenging Clean Area Boundary; dated August 11, 2003.

CAP 029026; Refueling Personnel Contaminated During Bridge Crane Operations; dated September 15, 2003.

ACP 1411.13; Control of Locked High Radiation Areas; Revision 10

ACP 1411.22; Control of Access to Radiological Areas; Revision 16

DFS 301; Dry Fuel Storage Procedure, Loaded Dry Shielded Canister/Transfer Cask from Refueling Floor to ISFSI Operations; Revision 4

DFS 302; Dry Fuel Storage Procedure, Dry Shielded Canister from Transfer Cask to Horizontal Storage Module Transfer Operations; Revision 3

HPP 3104.05; Discrete Radioactive Particle Controls; Revision 8

HPP 3104.09; Personnel Dosimetry for External Exposure; Revision 14

HPP 3104.13; Dry Cask Storage Job Coverage and Decontamination; Revision 1

NG-02-0590; 2nd Quarter 2002 Action Request Radiological Occurrence Trend Report; dated July 11, 2002

NG-02-0919; 3rd Quarter 2002 Action Request Radiological Occurrence Trend Report; dated October 7, 2002

NG-03-0032; 4th Quarter 2002 Action Request Radiological Occurrence Trend Report; dated January 14, 2003

NG-03-0307; 1st Quarter 2003 Action Request Radiological Occurrence Trend Report; dated April 8, 2003

NG-03-0510; 2nd Quarter 2003 Action Request Radiological Occurrence Trend Report; dated July 11, 2003

RWP 249; Dry Cask Storage Project; Revision 4

ALARA Review 03-007; Independent Spent fuel Storage Installation; Revision 1

Daily Focus, DAEC at a glance; dated September 16, 2003

2OS2 ALARA Planning and Control

CAP 027312; Evaluate NRC Performance Indicator Relevance due to Recent LHRA Key Control Issues; April 4, 2003
CAP 028179; Bag of Radioactive Debris Left on Floor in RadWaste Building; July 19, 2003
CAP 028208; Discrepancy between ACP 1411.17 and 10 CFR 20 on Dose Limits to Public
CAP 028259; Inadvertent Failure to Don Proper Protective Clothing; July16, 2003
CAP 028278; Personnel Contamination Event on Refuel Floor in Clean Area; July 17, 2003
ACP 1411.17; Occupational Dose Limits and Upgrades; Revision 15
HPP 3102.02; ALARA Job Planning; Revision 14
HPP 3102.02; ALARA Job Planning, Attachment 3, Respiratory Protection Evaluation Worksheet; March 14, 2003
HPP 3103.04; Hot Spot Tracking; Revision 8
HPP 3104.02; Personnel Contamination Monitoring, Whole Body Counting and Decontamination; Revision 17
HPS-1.2; Providing Radiological Briefings; Revision 8
RP-10, NG-00-0081, NG-01,0030, NG-02-0030, and A-89a, NG-03-0060, Annual Visitor Exposure Verification, CY 1999-2002
RPM 01/2003; Radiation Protection Manual; Revision 4
ALARA Review 03-001; Disassembly/Reassembly of Reactor Vessel and Fuel Shuffle; March 10, 2003
ALARA Review 03-001; Disassembly/Reassembly of Reactor Vessel and Fuel Shuffle, Post Task summary; April 22, 2003
ALARA Review 03-002; Drywell Cooler Replacement, Post Task summary; April 18, 2003
ALARA Review Summary 03-002; DW Coolers 1VCC001-6 A/B Replacement ECP 1650; March 29, 2003
ALARA Review Summary 03-003; In Service Inspection; April 9, 2003
ALARA Review 03-003; Inservice Inspections, Post Task summary; April 22, 2003
ALARA Review 03-004; 1P201B Recirc Sump Seal Replacement, Post Task summary; April 17, 2003

ALARA Review Summary 03-005; 1P201B Recirc Sump Seal Replacement; March 31, 2003
RWP 30009; R1 All Support Work for RFO 18 on the RX 855 Elevation; Revision 8
RWP 40150; Pump Maintenance Work for RFO 18; Revision 3
RWP 40210; ISI/FAC and Support Work for Refuel Outage; Revision 7
RWP 40503; Drywell Cooler Replacement; Revision 1
Form HP-27; DAEC Personnel/Clothing Contamination Record; May 5, 2003
Refueling Outage 18, Post Outage Radiation Protection Summary
Graphic of 757 Contact Dose Rates, RFO #10-#18
Graphic of DAEC Radiation Exposure, 3 Year Rolling Average

4OA1 Performance Indicator Verification

NEI 99-02; Regulatory Assessment Performance Indicator Guideline; Revision 2
Memo; DAEC2nd Quarter 2003 PI Summary; July 20, 2003
Memo; DAEC 1st Quarter 2003 PI Summary; April 21, 2003
Memo; DAEC 4th Quarter 2002 PI Summary; January 21, 2003
Memo; DAEC 3rd Quarter 2002 PI Summary; October 21, 2002
Memo; DAEC 2nd Quarter 2002 PI Summary; July 19, 2002
Memo; DAEC 1st Quarter 2002 PI Summary; April 20, 2002
ACP 1402.4; NRC Performance Indicators Collection and Reporting; Revision 3
PCP 2.1; Plant Chemistry Sampling Program Guidelines; Revision 8
Duane Arnold Energy Center Chemistry Report, Rx Filter sample; dated September 17, 2003
Duane Arnold Energy Center Chemistry Report, Rx Crud sample; dated September 17, 2003
Fm 321; Reactor Water-Counting; Revision 7
Performance indicator data for the 2nd, 3rd, 4th quarters of 2002 and 1st and 2nd quarters of 2003.
Performance indicator for the 2nd, 3rd, 4th quarters of 2002 and 1st and 2nd Quarters of 2003.
Performance indicator for 4th quarter of 2002 and 1st and 2nd Quarters of 2003.

4OA2 Identification and Resolution of Problems

ACP 102.1; External Operating Experience; Revision 19
ACP 114.4; Corrective Action Program; Revision 12
ACP 114.3; Root Cause and Apparent Cause Analysis; Revision 12
ACP 102.18; DAEC Self Assessment; Revision 4
ACP 101.2; Verification Process and Self/Peer Checking Practices; Revision 5
ACP 101.01; Procedure Use and Adherence; Revision 21
ACP 1408.22; Electrical Termination Sheet; Revision 7
OTH027685; Local Power Range Monitor (LPRM) 32-17 A & B detectors appear to have swapped connections; May 2,2003
CWO 1124968; Replace LPRM detector string; March 25, 2003
CAP027086; LPRM 32-17 A&B detectors appear to have swapped connections; April 18, 2003
Apparent Cause Evaluation (ACE) 001158; LPRM 32-17 A&B detectors appear to have swapped connections; April 18, 2003

ACE 001159; Main Steam Line “C” ADS Relief Valve lost indication; April 18, 2003
CWO 1119848; Remove Pilot Valve and Install Spare for Main Steam “C” ADS Relief Valve; April 15, 2003
STP 3.4.3-03; Manual Opening of the ADS and LLS Relief Valves; Revision 5
CAP027087; Main Steam Line “C” ADS Relief Valve lost indication; April 18, 2003
CAP027335; Found “field wires” at TE4241 Landed Incorrectly; May 8, 2003
CAP026081; Configuration of Refueling Mast Grapple; March 12, 2003
CAP025228; Requirements of ACP 1408.22 not being meet; January 17, 2003
CAP028247; Evaluate the effectiveness of the “Quality Control (QC) Department”; July 16, 2003
CAP028233; Method of QC Verification; July 15, 2003
CWO A51493; Replace Indicator with new model; July 15, 2003
General Maintenance Procedure (GMP)-Construction (CNST)-01; KWIK BOLT/Super KWIK Bolt/KWIK Bolt II Installation; Revision 6
Focused Self-Assessment on QC Department; September 25, 2003

4OA3 Event Follow-up

LER 2003-004; Unplanned High Pressure Coolant Injection (HPCI) Limiting Condition for Operation (LCO) caused by HPCI Seal Water Line Crack and Class 2 Leakage; June 19, 2003.
OI 152; HPCI System; Revision 54
TURBIN-T147-01; Repair of Byron Jackson Main Coolant Pump; Revision 8
CAP026970; Install Vent Valves on HPCI ; April 14, 2003

4OA5 Other Activities

AR 33396; Potential Violation of Simulator Testing Requirements; dated November 7, 2002

Simulator Operating Instructions (SOI) No. 8.0; Certification Testing; Revision 6

LIST OF ACRONYMS USED

AC	Alternating Current
ACE	Apparent Cause Evaluation
ACP	Administrative Control Procedures
ADAMS	NRC's Document System
ADS	Automatic Depressurization System
AFP	Area Fire Plan
ALARA	As Low As Reasonably Achievable
ANS	American National Standard
AOP	Abnormal Operating Procedures
AOT	Allowable Outage Time
APRM	Average Power Range Monitors
AR	Action Request
ASME	American Society of Mechanical Engineers
ATWS	Anticipated Transient Without a SCRAM
AR	Action Request
CA	Corrective Action
CAP	Corrective Action Plan
CFR	Code of Federal Regulations
CWO	Corrective Work Order
CY	Calender Year
DAEC	Duane Arnold Energy Center
DRS	Division of Reactor Safety
DSC	Dry Storage Cask
GL	Generic Letter
GMP	General Maintenance Procedure
GPM	Gallons Per Minute
HPCI	High Pressure Coolant Injection
HRA	High Radiation Area
IMC	Inspection Manual Chapter
LER	Licensee Event Report
LCO	Limited Condition Of Operation
LHRA	Locked High Radiation Areas
LLRT	Local Leak Rate Test
LPCI	Low Pressure Coolant Injection
LPRM	Local Power Range Monitor
MW_{th}	Megawatts Thermal
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
ODAM	Offsite Dose Assessment Manual
OWA	Operator Work Arounds
PCP	Plant Chemistry Procedures
PI	Performance Indicator
PWO	Preventive Work Order
QC	Quality Control
RCA	Radiologically Controlled Area
RCIC	Reactor Core Isolation Cooling

RCS	Reactor Coolant Sample
RETS/ODCM	Radiological Effluent Technical Specification/Offsite Dose Calculation Manual
RFO	Refueling Outage
RHR	Residual Heat Removal
RP	Radiation Protection
RPT	Radiation Protection Technician
RWP	Radiation Work Permit
SBGTS	Standby Gas Treatment System
SCBA	Self Contained Breathing Apparatus
SCP	Simulator Control Procedure
SDP	Significance Determination Process
SEG	Simulator Exercise Guide
SSCs	Structure, System, or Components
STP	Surveillance Test Procedure
TC	Transfer Cask
TEDE	Total Effective Dose Equivalent
TIS	Temperature Indicating Switch
TMOD	Temporary Modification
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
USNRC	U.S. Nuclear Regulatory Commission
VHRA	Very High Radiation Area