

January 8, 2002

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

SUBJECT: DUANE ARNOLD ENERGY CENTER  
NRC INSPECTION REPORT 50-331/01-09(DRP)

Dear Mr. Van Middlesworth:

On December 30, 2001, the NRC completed an inspection at your Duane Arnold Energy Center. The enclosed report documents the inspection findings which were discussed on December 27, 2001, with Mr. R. Anderson and other members of your staff.

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

No findings of significance were identified.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Sincerely,

Original signed by  
Bruce L. Burgess

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

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

Enclosure: Inspection Report 50-331/01-09(DRP)

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cc w/encl: E. Protsch, Executive Vice President -  
Energy Delivery, Alliant;  
President, IES Utilities, Inc.  
Robert G. Anderson, Plant Manager  
State Liaison Officer  
Chairperson, Iowa Utilities Board  
The Honorable Charles W. Larson, Jr.  
Iowa State Representative

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The Honorable Charles W. Larson, Jr.  
Iowa State Representative

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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

Report No: 50-331/01-09(DRP)

Licensee: Alliant, IES Utilities Inc.

Facility: Duane Arnold Energy Center

Location: 3277 DAEC Road  
Palo, Iowa 52324-9785

Dates: November 15 through December 30, 2001

Inspectors: P. Prescott, Senior Resident Inspector  
M. Kurth, Resident Inspector  
H. Peterson, Senior Operator Licensing Examiner  
R. Schmitt, Radiation Specialist

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

## SUMMARY OF FINDINGS

IR 05000331-01-09(DRP), on 11/15-12/30/2001, IES Utilities, Inc., Duane Arnold Energy Center. Routine safety inspection.

This report covers a 6-week routine inspection. The inspection was conducted by resident inspectors, a region-based emergency preparedness specialist, and a reactor engineer. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609 "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at <http://www.nrc.gov/NRC/OVERSIGHT/index.html>. Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violations.

### A. Licensee Identified Findings

Violations of very low significance which were identified by the licensee have been reviewed by the inspectors. Corrective actions taken or planned by the licensee appeared reasonable. These violations are listed in Section 4OA7 of the report.

## Report Details

### Summary of Plant Status

On November 15, 2001, the plant was operated at approximately 60 percent power to complete moisture separator reheater steam leak repairs. Upon completion of the repairs on November 16 at 10:03 a.m., the licensee increased reactor power and conducted additional power ascension testing for the recent power uprate. The licensee continued to operate the plant at 1790 MWt until future plant modifications are completed that would permit operation at the new licensed full power. On November 26 at 12:34 p.m., the licensee reached its maximum interim power level of 93.6 percent power (1790 MWt) and remained at or near that power level for the remainder of the inspection period.

### **1. REACTOR SAFETY**

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

#### 1R01 Adverse Weather Protection

##### a. Inspection Scope

The inspectors reviewed the licensee's preparations for cold weather conditions. The inspectors performed walkdowns of the reactor building, pump house, and river intake structure. Also, the inspectors reviewed the following documents:

- Integrated Plant Operating Instruction (IPOI) 6, "Cold Weather Operations," Revision 20
- Updated Final Safety Analysis Report (UFSAR) Section 2.3.1, "Regional Climatology"

##### b. Findings

No findings of significance were identified.

#### 1R04 Equipment Alignment (71111.04)

##### a. Inspection Scope

The inspectors performed a partial walkdown of accessible portions of the system listed below to verify system operability. Items reviewed in the inspectors' walkdown included the following: verification of the correct valve position of valves in the primary system flowpath using the system piping and instrumentation drawings (P&IDs) and system mechanical checklist; verification of breaker alignments using the system electrical checklist; observation of instrumentation valve configurations and appropriate meter indications; verification of lubrication and cooling of major components by direct observation of the components; observation of proper installation of hangers and

supports during the walkdown; and verification of operational status of support systems by direct observation of various parameters. Control room switch positions for the system were also observed. The inspectors also evaluated other conditions such as adequacy of housekeeping, the absence of ignition sources, and proper component labeling. The walkdown was performed while maintenance was being conducted on the corresponding train.

- “B” Emergency Service Water System

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

a. Inspection Scope

The inspectors walked down risk significant areas looking for any fire protection degraded conditions. Open fire protection impairment requests were reviewed to prioritize the inspection of plant area fire plan (AFP) zones in addition to discussions with the fire protection program engineer. During the walkdowns, emphasis was placed on the following items: control of transient combustibles and ignition sources; area material condition; operational lineup and effectiveness of the fire protection systems, equipment, and features; and the material condition and operational status of fire barriers used to prevent fire damage or fire propagation.

In particular, the inspectors verified that all observed transient combustibles were being controlled in accordance with the licensee’s administrative control procedures. In addition, the physical condition of fire detection devices were observed, including overhead sprinklers, to verify that any observed deficiencies did not impact the operational effectiveness of the system. Included in the observations were the following items: the physical condition of portable fire fighting equipment, such as fire extinguishers, to verify that the equipment was located appropriately and that access to the extinguishers was unobstructed; verification that fire hoses were installed at their designated locations and that the physical condition of the hoses were satisfactory and access unobstructed; and verification of the physical condition of passive fire protection features such as fire doors, ventilation system fire dampers, fire barriers, and fire zone penetration seals to ensure that the items were properly installed and in good physical condition. Using the Fire Plan Volume II, “Fire Brigade Organization,” the following area was inspected:

- AFP-13, “Reactor Building - Refuel Floor,” Revision 22

b. Findings

No findings of significance were identified.



1R11 Licensed Operator Requalification (71111.11)

.1 Operating Test Results

a. Inspection Scope

The inspectors reviewed the pass/fail results of individual operating tests, and simulator operating tests (required to be given per 10 CFR 55.59(a)(2)) administered by the licensee during calendar year 2001. No biennial written examination was administered.

b. Findings

No findings of significance were identified.

1R12 Maintenance Rule Implementation (71111.12)

a. Inspection Scope

The inspectors reviewed the licensee's implementation of the maintenance rule requirements for the systems or components listed below. The systems or components were selected based upon recent performance problems and the risk significance classification of the systems in the maintenance rule program. The inspectors independently verified the licensee's implementation of the maintenance rule for these systems by verifying that these systems were properly scoped within the maintenance rule in accordance with 10 CFR 50.65; that all failed structures, systems, or components (SSCs) were properly categorized and classified as (a)(1) or (a)(2) in accordance with 10 CFR 50.65; that the performance criteria for SSCs classified as (a)(2) were appropriate; and that the goals and corrective actions for SSCs classified as (a)(1) were acceptable. The inspectors also verified that issues were identified at an appropriate threshold and entered in the corrective action program. The following systems were reviewed:

- High Pressure Coolant Injection System
- Reactor Core Isolation Cooling System
- Residual Heat Removal System - Low Pressure Coolant Injection
- Residual Heat Removal System - Suppression Pool Cooling
- River Water Supply System

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessment and Emergent Work Evaluation (71111.13)

a. Inspection Scope

The inspectors reviewed the licensee's scheduling, configuration control, and performance of planned maintenance and emergent work activities. Specifically, the inspectors reviewed the risk assessment of scheduled maintenance activities associated with work weeks 46 and 48. Work week 46 included planned work on the "B" residual heat removal system, "B" residual heat removal service water system, power ascension testing, and emergent work for steam leak repairs on the moisture separator reheater second stage scavenging steam flow orifice FO1058. Work week 48 included work on the "A" emergency service water system and the "A" emergency diesel generator.

The inspectors verified that scheduled and emergent work activities were adequately managed. This included observation of the licensee's programs for conducting maintenance risk safety assessments and the assessment and management of online risk, and verification of the licensee's planning and risk management tools. Licensee actions to address increased online risk were verified during these periods, including establishing compensatory actions, minimizing the duration of the activity, obtaining appropriate management approval, and informing appropriate plant staff. These actions were accomplished when online risk was increased due to maintenance on risk-significant SSCs. Finally, portions of the maintenance activities were observed to ensure proper management oversight and return to service of the SSCs in a timely manner.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed the technical adequacy of operability evaluations to ensure that the system operability was properly justified and the system remained available, such that no unrecognized increase in risk occurred. The following operability evaluation was reviewed:

- Action Request 26499, "Request Operability Determination for 'A' Emergency Service Water Pump Due to Increasing Calculated Differential Pressure"

b. Findings

No findings of significance were identified.

1R16 Operator Workarounds (OWAs) (71111.16)

a. Inspection Scope

The inspectors reviewed operator workarounds to identify any potential effect on the function of mitigating systems, or the operator's ability to respond to an event and implement abnormal and emergency operating procedures.

b. Findings

No findings of significance were identified.

1R17 Permanent Plant Modifications (71111.17)

a. Inspection Scope

The inspectors reviewed Engineered Maintenance Action (EMA) A45620 associated with the modification to nitrogen storage tanks rupture disks. The inspectors reviewed the EMA documentation, including the appropriate sections of the Updated Final Safety Analysis Report (UFSAR). The work orders associated with the EMA were reviewed. Post maintenance test data was reviewed following the modification. Portions of the modification installation were observed.

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors observed selected post-maintenance tests and reviewed test data. The inspectors verified that the post-maintenance tests observed demonstrated that the systems and components were capable of performing their intended safety function. Included in the review were the applicable sections of Technical Specifications (TS) requirements, the Updated Final Safety Analysis Report (UFSAR), and appropriate plant procedures. Following the completion of the tests, the inspectors verified that the test equipment was removed and that the equipment was returned to a condition in which it could perform its safety function.

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 inspector conducted walkdowns of the radiologically protected area to verify the adequacy of radiological area boundaries and postings. Specifically, the inspector walked down radiologically significant work area boundaries (radiation, high and locked high radiation areas) in the Reactor Building, Radwaste Building, and the Turbine Building (interior and exterior). The inspector performed confirmatory radiation surveys in selected portions of these areas (i.e., specific locations/areas where increased radiation levels had been noted by the licensee, due to the recent power upgrade) to verify that these areas were properly posted and controlled in accordance with 10 CFR Part 20, licensee procedures, and TSs. The inspector also examined the radiological conditions of work areas within those radiation and high radiation areas, to assess contamination controls. Additionally, the inspector reviewed radiation work permits (RWPs) for general tours, access to high radiation areas (HRAs), and for the radiological characterization/weight determination of a steel liner (prior to radwaste shipment) to verify that work instructions and controls had been adequately specified and that electronic dosimeter set points were in conformity with survey indications.

###### 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 inspector observed the following locked high radiation area work activity performed during the inspection and evaluated the licensee's use of radiological controls:

- Radiological characterization of a steel liner/weight determination

The inspector 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 inspector reviewed survey records, including radiation, contamination, and airborne surveys to verify that appropriate radiological controls were effectively utilized. The inspector also reviewed in-process surveys and applicable postings and barricades to verify their accuracy. The inspector 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.

b. Findings

No findings of significance were identified.

.3 Identification and Resolution of Problems

a. Inspection Scope

The inspector reviewed licensee Action Requests (ARs) written since RFO 17 (April/May 2001) 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 4<sup>th</sup> Quarter 2000 and 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> Quarter 2001 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.

b. Findings

No findings of significance were identified.

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

.1 ALARA Planning

a. Inspection Scope

The inspector 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 the refueling outage (RFO 17) to assess current performance and outage exposure challenges. The inspector reviewed the licensees' processes for estimating job dose and the effectiveness of exposure tracking for the outage to verify that the licensee could identify problems with its collective exposure and take actions to address them. The inspector selected a number of RFO 17 refueling outage high exposure or high radiation area work activities, and evaluated the ALARA plans and the licensee's use of ALARA controls for each activity. The inspector also reviewed individual exposures of selected work groups to determine if there were any significant exposure variations which may exist among workers.

b. Findings

No findings of significance were identified.

## .2 Source Term Reduction and Control

### a. Inspection Scope

The inspector evaluated the licensee's source term reduction program in order to verify that the licensee had an effective program in place, was knowledgeable of plant source term reduction opportunities, and that efforts were being taken to address them. Work control mechanisms for RFO 17 were evaluated to ensure that source term reduction plans had been appropriately implemented. The inspector reviewed selected aspects of the licensee's source term reduction program, focusing on those initiatives completed for the outage such as hydrolazing, flushing, desludging, and prioritizing/sequencing of installation of permanent and temporary shielding packages to minimize exposure. The inspector also reviewed the station's overall source term reduction plan, which included improved water chemistry controls and cobalt reduction initiatives through stellite control. The inspector reviewed the licensee's continuing source term reduction techniques to verify that source term control strategies were ongoing and future initiatives were being explored.

### b. Findings

No findings of significance were identified.

## .3 Radiological Work Planning and ALARA Implementation

### a. Inspection Scope

The inspector selected the following RFO 17 job activities that exceeded 5 person rem or were otherwise conducted in the drywell, and assessed the adequacy of the radiological controls and work planning:

- Drywell ISI Work and Support;
- Disassembly/Reassembly of Reactor Vessel, Refuel Floor Activities, and Cavity Decontamination;
- Drywell Heat Exchanger/Cooler Maintenance and Condenser Tube Staking; and
- Torus Desludge, Inspection, and Refurbishment.

The inspector reviewed the RWPs and the ALARA Action Reviews developed for each aforementioned job. The inspector examined the radiological engineering controls, and other dose mitigation techniques specified in these documents, and job dose history files to verify that licensee and industry lessons learned were adequately integrated into each work package. The inspector discussed the ALARA planning with station staff to verify that adequate interfaces had been established between operations, chemistry, radiation protection, and maintenance groups during job planning. The inspector reviewed the exposure results for the selected activities to evaluate the accuracy of exposure estimates in the ALARA plan. The inspector compared the actual exposure results versus the initial exposure estimates, the estimated and actual dose rates, as well as the estimated and actual person-hours expended. The inspector reviewed the exposure history for each activity to determine if management had monitored the exposure status of each activity, to determine if in-progress ALARA job reviews were needed, if additional

engineering/dose controls had been established and if required corrective documents had been generated. The inspector also reviewed the licensee's dosimetry procedures and practices which included the use of multiple dosimetry for work in high radiation areas having significant dose gradients, use of extremity monitoring, and alternate dosimetry placement when necessary. The inspector examined Total Effective Dose Equivalent (TEDE) ALARA evaluations for planned personnel contamination events and intake evaluations completed by the licensee for radiologically significant high risk work, to verify technical adequacy and documentation requirements (including work in progress/post job reports, radiological survey data, and RP logs) of 10 CFR 20.1201.

b. Findings

No findings of significance were identified.

.4 Verification of Exposure Goals and Exposure Tracking System

a. Inspection Scope

The inspector reviewed the licensee's methodology and assumptions used to develop outage exposure estimates and exposure goals for RFO 17. The inspector compared exposure estimates, exposure goals, job dose rates, and person-hour estimates for consistency to verify that the licensee could project, and thus better control radiological exposure. The inspector examined job dose history files and dose reductions anticipated through lessons learned to verify that the licensee appropriately forecasted outage doses. The inspector examined the actual RFO 17 job exposure data (~94 person-rem) and compared it with exposure estimates (100-120 person rem). The inspector also reviewed the licensee's exposure tracking system to verify that the licensee's level of exposure tracking detail, exposure report timeliness, and exposure report distribution was sufficient to support control of collective exposures. The inspector evaluated how the licensee had identified problems with its exposure estimates for some jobs, the processes being utilized to revise dose estimates, and methods to improve its dose forecasting procedures to verify that the licensee could adequately track dose.

b. Findings

No findings of significance were identified.

.5 Identification and Resolution of Problems

a. Inspection Scope

The inspector reviewed the results of the Radiation Protection program self-assessment completed as part of the pre-RFO 17 activities and self-assessments completed during RFO 17. The inspector examined ALARA Post Task Summaries/Self-Assessments (i.e., from the most radiologically risk significant work) and a RFO 17 Post Outage Radiation Protection Summary follow-up self-assessment to evaluate the licensee's ability to identify and characterize problems. The inspector also reviewed outage related Nuclear Oversight Department field observations and outage generated action requests 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.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES**

4OA1 Performance Indicator Verification (71151)

a. Inspection Scope

The inspector reviewed the licensee's determination of Performance Indicators (PI) for the occupational radiation safety cornerstones (Occupational Exposure Control Effectiveness) to verify that the licensee accurately determined these performance indicators and had identified all occurrences required by these indicators. The accuracy and completeness of the data was assessed against the criteria specified in Nuclear Energy Institute 99-02, Revision 0, "Regulatory Assessment Performance Indicator Guideline." Specifically, the inspector reviewed the licensee's ARs for CY 2000-2001 and Quarterly Radiological Occurrence Trend Reports (4<sup>th</sup> Quarter 2000 through 3<sup>rd</sup> Quarter 2001) to ensure that there were no PI occurrences that were not identified by the licensee. The inspector interviewed members of the licensee's staff who were responsible for performance indicator data acquisition, verification and reporting, to verify that their review and assessment of the data was adequate. Additionally, as part of plant walkdowns (Section 2OS1.1), the inspector selectively examined the adequacy of posting and controls for locked HRAs, to verify the current Occupational Exposure Control Effectiveness performance indicator.

b. Findings

No findings of significance were identified.

4OA3 Event Follow-up (71153)

a. Inspection Scope

The inspectors reviewed Licensee Event Reports detailed below using inspection Procedure 71153. The inspectors reviewed the licensee's root cause reports and corrective actions for these events.

- .1 (Closed) Licensee Event Report 50-331/2001-004: "Unplanned High Pressure Coolant Injection [HPCI] Inoperability Due to Steam Leak in Drain Trap." On September 2, 2001, with the plant at 100 percent power, the HPCI steam supply line drain trap developed a steam leak that required the drain trap to be manually isolated. The steam leak was due to the outlet plug failing on the drain trap. After the trap was isolated, the HPCI steam supply drain pot high level alarm was received and the HPCI system was declared inoperable. The cause of the plug failure was the eroded state of the plug and the plug



threads due to flow accelerated corrosion (FAC). The FAC resulted from steam leaking by the drain trap valve seat. The root cause was inadequate preventive maintenance (PM). A contributor was less than adequate past corrective action. The immediate corrective action was the replacement of the drain plug. Radiography performed on three elbows in the drain line directly downstream of the first trap also indicated wall thinning had occurred. The licensee performed an evaluation to demonstrate that adequate piping thickness remained for continued operation until the pipe can be replaced. The inspectors found the evaluation adequate.

The vendor recommended that the trap be rebuilt every five years. The trap had been scheduled for rebuild in 1998, but the frequency was changed to "on demand." This decision was based on the use of predictive monitoring (thermography) on the drain. While the use of thermography was stated as the basis for changing the rebuild frequency, the Preventive Maintenance Action Request Input Request (PIR) did not provide justification that thermography was a suitable substitute for the 5-year rebuild.

In 2000, reactor core isolation cooling (RCIC) drain line piping downstream of a drain trap experienced a steam leak due to wall thinning. The wall thinning appeared to be due to FAC. The RCIC drain trap is very similar to the HPCI trap in both service condition and design. While action requests were initiated to replace the RCIC piping, the generic implication of this failure was not assessed. Such review may have identified the potential for similar degradation occurring in the HPCI trap. A licensee identified violation was identified for failure to take adequate corrective action and is discussed in Section 40A7 of this report.

- .2 (Closed) Licensee Event Report (LER) 50-331/2001-003: "Manual Reactor Scram Inserted due to Failed Open Feed Pump Minimum Flow Valve." On August 12, 2001, while operating at 100 percent power, operators inserted a manual reactor scram due to decreasing reactor water level. The low level was caused by the "B" reactor feedwater pump minimum flow bypass valve failing open. The "B" feed pump tripped on low suction pressure as operators attempted to restore level. This event and its safety significance were discussed in Inspection Report 50-331/2001-006. The inspectors reviewed the LER and corrective actions. This LER is closed.

#### 40A5 Other

- .1 (Closed) Unresolved Item 50-331/01-007-01 (DRP): "Evaluation of a Grouping of Greater than 300 Preventive Maintenance (PM) Changes Not Completed in Accordance With Administrative Procedures." On October 14, 1997, the licensee issued a memorandum that initiated a requested change to lengthen the time interval for over 300 preventive maintenance activities, many of which were for safety-related systems. The changes were implemented for various generic reasons which included ease of maintenance, necessity, combining of tasks, and insurance requirements.

Administrative Control Procedure 1408.3, "Preventive Maintenance Program," Revision 0, Section 3.3(1), required that valid reasons for revising a PM basis were to be documented by initiating a PMAR Input Request form and following the appropriate instructions. The instructions require, in part, a full description of the basis of the change. For the over 300 PM change activities noted above, a full description for the

changes was not completed. However, on further review, it was determined that the licensee initiated additional actions that prevented a number of the PM change activities from occurring. In particular the responsible engineers initiated additional PMAR Input Request forms to maintain the original PM task frequency for a number of the PM tasks. Also, a number of the PM tasks were verified to be deleted based on documentation that demonstrated that the tasks were repetitive and captured in other PM tasks for the system or component. In addition, a number of the PM tasks reviewed were for nonsafety-related equipment and a maintenance history review did not reveal an adverse trend regarding equipment reliability and availability. Therefore, the safety significance was minor for not completing the over 300 PM changes without providing a full description for the basis of the change. The unresolved item is closed.

#### 4OA6 Meeting

##### Exit Meeting

The inspectors presented the inspection results to Mr. R. Anderson and other members of licensee management on December 27, 2001. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

Interim exits related to the radiation protection and licensed operator requalification inspections were conducted on December 7 and 17, 2001 with Mr. R. Anderson and Mr. A. Johnson respectively. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

#### 4OA7 Licensee-Identified Violations

The following finding of very low significance was identified by the licensee and was a violation of NRC requirements which meet the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600 for being dispositioned as a Non-Cited Violation.

If you deny the Non-Cited Violation, you should provide a response with the basis for your denial, within 30 days of the date of the inspection report to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Duane Arnold Energy Center.

##### NRC Tracking Number

##### Requirement License Failed to Meet

NCV 50-331/2001-009-01

The 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," states in part that, "measures shall be established to assure that conditions adverse to quality, such as failures, deficiencies and nonconformances are promptly identified and corrected." Contrary to the above the licensee failed to take adequate corrective actions to

identify and correct flow accelerated corrosion of the HPCI drain line piping which developed a leak on September 2, 2001, and resulted in the HPCI system being declared inoperable. In 2000, RCIC drain line piping configured in the same manner experienced a steam leak due to flow accelerated corrosion. The licensee has entered this into their corrective action program as Action Requests 27529 and 27531.

## KEY POINTS OF CONTACT

### Licensee

R. Anderson, Plant Manager  
B. Bernier, System Engineer Supervisor  
J. Bjorseth, Manager, Engineering  
D. Brigl, Long Term Program Engineer  
R. Brown, Nuclear Oversight Manager  
E. Christopher, Program Engineer  
D. Curtland, Site Support Manager  
K. Dunlap, Emergency Preparedness Planner  
J. Ertman, Team Leader-Engineer  
T. Evans, Operations Manager  
L. Gibney, Emergency Preparedness Planner  
H. Giorgio, Manager, Radiation Protection  
A. Johnson, Operations Training Supervisor  
R. Johnson, Emergency Preparedness Scenario Developer  
D. Johnson, Emergency Preparedness Specialist  
J. Karrick, Licensing  
B. Kindred, Security Manager  
J. Lohman, Communications Manager  
S. McVay, System Engineer  
S. Nelson, Health Physics Supervisor  
J. Newman, Radiological Engineering Supervisor  
K. Putnam, Licensing Manager  
A. Roderick, Principal Mechanical Engineer  
W. Simmons, Maintenance Superintendent  
P. Sullivan, Emergency Planning Manager  
R. Titus, Emergency Preparedness Planner  
G. Van Middlesworth, Site Vice-President Nuclear  
C. Vogeler, Emergency Preparedness Specialist  
G. Whittier, RHR System Engineer  
K. Williams, Senior Emergency Planning Specialist

### NRC

P. Prescott, Senior Resident Inspector

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

50-331/2001-009-01 NCV Inadequate Corrective Action to HPCI Drain Line Piping

### Closed

50-331/2001-009-01 NCV Inadequate Corrective Action to HPCI Drain Line Piping

50-331/2001-007-01 URI Evaluation of a Grouping of Greater than 300 Preventive Maintenance Changes Not Completed in Accordance with Administrative Procedures

### Discussed

None

## LIST OF ACRONYMS USED

|        |                                      |
|--------|--------------------------------------|
| ADAMS  | NRC's Document System                |
| AFP    | Area Fire Plan                       |
| ALARA  | As Low As Reasonably Achievable      |
| ANS    | Alert and Notification System        |
| AR     | Action Request                       |
| CFR    | Code of Federal Regulations          |
| CWO    | Corrective Work Order                |
| CY     | Calender Year                        |
| DAEC   | Duane Arnold Energy Center           |
| DEP    | Drill and Exercise Performance       |
| DRP    | Division of Reactor Projects         |
| DRS    | Division of Reactor Safety           |
| EMA    | Engineered Maintenance Action        |
| EP     | Emergency Preparedness               |
| ERO    | Emergency Response Organization      |
| HPCI   | High Pressure Coolant Injection      |
| HRA    | High Radiation Area                  |
| MWt    | Megawatt Thermal                     |
| NRC    | Nuclear Regulatory Commission        |
| OI     | Operating Instruction                |
| P&IDs  | Piping and Instrumentation Drawings  |
| PARS   | Public Availability Records          |
| PI     | Performance Indicator                |
| RCIC   | Reactor Core Isolation Cooling       |
| RFO 17 | Refueling Outage 17                  |
| ROP    | Reactor Oversight Process            |
| RP     | Radiation Protection                 |
| RWP    | Radiation Work Permit                |
| SDP    | Significance Determination Process   |
| SSCs   | Structure, System, or Components     |
| STP    | Surveillance Test Procedure          |
| TEDE   | Total Effective Dose Equivalent      |
| TS     | Technical Specification              |
| UFSAR  | Updated Final Safety Analysis Report |

## LIST OF DOCUMENTS REVIEWED

The following documents were selected and reviewed by the inspectors to accomplish the objectives and scope of the inspection and to support any findings.

### 1R04 Equipment Alignment

|           |                                   |             |
|-----------|-----------------------------------|-------------|
| P&ID M167 | Service Water System - Pump House | Revision 67 |
| OI 454    | Emergency Service Water System    | Revision 67 |

### 1R12 Maintenance Rule Implementation

|                            |  |            |
|----------------------------|--|------------|
| DAEC Perf<br>Criteria Doc  | High Pressure Coolant Injection System<br>(HPCI) | Revision 2 |
| DAEC Perf<br>Criteria Doc  | Reactor Core Isolation Cooling (RCIC)            | Revision 2 |
| DAEC Perf<br>Criteria Doc  | Residual Heat Removal System                     | Revision 3 |
| DAEC Perf<br>Criteria Perf | River Water Supply                               | Revision 2 |

### Control Room Operators Logs

|              |  |            |
|--------------|--|------------|
| NG-01-1342   | July/August 2001 Maintenance Rule<br>Monitoring and Status Report                                |            |
| NG-00-1603   | DAEC Maintenance Rule Program Memo   |            |
| NUMARC 93-01 | Industry Guideline for Monitoring the<br>Effectiveness of Maintenance at Nuclear<br>Power Plants | Revision 3 |

### 1R16 Operator Workarounds

|          |  |                    |
|----------|--|--------------------|
| AR 25441 | During Plant Shutdowns SRMs and IRMs<br>Often Exhibit Erratic Behavior During<br>Evolutions Such as Changes in<br>Recirculation Flow and Insertions of<br>Scrams | May 20, 2001       |
| AR 27649 | Control Building Chiller Operation and<br>Operating Instruction Conflicts with the<br>Guidelines of the Tagout Administrative<br>Control Procedure               | September 17, 2001 |

1R17 Permanent Plant Modifications

|  |   |
|--|---|
| AR18577                                | “Removal of PSE4336A-H and PSE4322A/B (Rupture Disk CAD, ITOO4A-HCAD)”  |
| Safety Evaluation<br>SE00-015 (Rev. 1) | “Containment Atmosphere Dilution System Rupture Disk Removal”   |
| UFSAR Section 6.2.5.2.3                | “Containment Atmosphere Dilution System”  |
| CWO A45620                             | “Existing Rupture Desk PSE4336A not I.A.W. ASME Code. Remove PSE4336A, Plug with Blind Outlet Plug as Recommended by Vendor.” |
| CWO A46550                             | “Exiting Rupture Disk PSE4336C not I.A.W. ASME Code. Remove PSE4336B, Plug with Blind Outlet Plug as Recommended by Vendor”   |
| CWO A46555                             | “Existing Rupture Disk PSE4336H not I.A.W. ASME Code. Remove PSE4336C, Plug with Blind Outlet Plug as Recommended by Vendor”  |

1R19 Post-Maintenance Testing

|                     |   |
|---------------------|---|
| CWO A53766          | “Replace ‘A’ Emergency Service Water Pump With Spare From Warehouse”            |
| PWO 1108449         | “Calibrate Low Lube Oil Pressure Switch for the ‘A’ Emergency Diesel Generator” |
| STP NS540002        | “Emergency Service Water Operability Test,” Revision 7                          |
| TS 3.7.3            | “Emergency Service Water System”  |
| UFSAR Section 9.2.3 | “Residual Heat Removal Service Water and Emergency Service Water Systems”       |
| OI 454              | “Emergency Service Water System,”<br>Revision 36                                |
| TS 3.8.1            | “AC Sources - Operating”  |



STP 3.8.1-06 "Standby Diesel Generators Operability Test (Fast Start)," Revision 14

UFSAR 8.3.1.2.2 "Standby AC Power System"

OI 324 "Standby Diesel Generator System," Revision 52

20S1 Access Control to Radiologically Significant Areas

Action Request items

|                |   |                  |
|----------------|---|------------------|
| AR 25663       | Improper Entry into HRA on Wrong RWP  | May 15, 2001     |
| AR 25953-25955 | Tracking of Corrective Actions from AR 21057 (Improper Entry into HRAs on Wrong RWPs) | May 21, 2001     |
| AR 25642       | HRA Found in Uncontrolled Area  | June 18, 2001    |
| AR 27277       | Improper Keys in LHRA Key Control System  | August 13, 2001  |
| AR 27987       | Workers Received Accumulated Dose Alarm While Working SJAE Valve                      | October 4, 2001  |
| AR 27601       | Investigate Radiation Levels Near SJAE Valves   | October 5, 2001  |
| AR 29052       | Identified Deficiency in Posting of HRA on Turbine Building Roof                      | December 4, 2001 |

Procedures

|             |   |             |
|-------------|---|-------------|
| ACP 1411.22 | Control of Access to Radiological Areas   | Revision 9  |
| HPP 3101.05 | Administration of Radiation Work Permits  | Revision 16 |
| HPP 3103.03 | Radiological Area Surveillance and Postings                                       | Revision 14 |
| HPP 3104.01 | Control of Access to High Radiation Areas   | Revision 17 |
| HPP 3104.02 | Personnel Contamination Monitoring, Whole Body Counting and Decontamination Areas | Revision 14 |
| HPS 2.13    | Radiological Postings Associated with a Radwaste HIC Evolution                    | Revision 1  |

|                           |  |                        |
|---------------------------|--|------------------------|
| RWH 3405.8                | Inspection, Handling, and Control of Reusable Resin Liners                                   | Revision 0             |
| RWH 3406.8                | Packaging Radioactive Material for Shipment  | Revision 4             |
| RWP 5.0                   | Routine Access for Radwaste Operations in Controlled Areas, Step 8                           | Revision 22            |
| <u>Miscellaneous Data</u> |  |                        |
|                           | DAEC HP Survey Form 01-3336, Routine Semi-annual, Turbine Building Roof, W/power Uprate Data | November 27, 2001      |
|                           | Personal Contamination Record Data Sheets  | April - December, 2001 |
|                           | Personal Contamination Record Graphics   | April - December, 2001 |
|                           | Reusable Resin Liner Inspection and Control Form DAEC Shipping Container No. 01-R-014        | December 5, 2001       |

2OS2 ALARA Planning and Control

Action Request items

|          |   |                   |
|----------|---|-------------------|
| AR 19792 | Evaluate Use of Installation of Permanent Drywell Shielding                   | April 19, 2000    |
| AR 21743 | Need to Document ALARA Processes  | May 11, 2000      |
| AR 21052 | Determine Accuracy of RFO 17 Dose Estimates                                   | October 24, 2000  |
| AR 24254 | ALARA Engineering Self-Assessment   | February 26, 2001 |
| AR 24160 | Evaluate Dose Rates Associated with Flushing Core Spray and Feedwater Nozzles | February 26, 2001 |
| AR 23568 | Evaluate How Power Upgrade Will Effect Dose Rate in Drywell                   | February 28, 2001 |
| AR 24556 | Review Use of Cameras for Remote Coverage for Electrical Penetration Work     | March 3, 2001     |
| AR 24546 | Replace Steam Seal Regulator Valve with Non-stellite Components               | March 12, 2001    |

|          |   |                |
|----------|---|----------------|
| AR 24684 | Prioritize RFO 17 Projects Expected to Exceed 10 Person-rem               | March 27, 2001 |
| AR 24162 | Outage Management Group Needs RP Representative for Planning Work         | March 29, 2001 |
| AR 25345 | Evaluate RFO 17 Projects That Could Have Significant Radiological Changes | May 2, 2001    |
| AR 26895 | Develop Process for ALARA/HP Pre-job Briefings                            | July 27, 2001  |

Procedures

|                     |                                   |                |
|---------------------|-----------------------------------|----------------|
| ACP 114.5           | Action Request System             | Revision 28    |
| ALARA Review 01-004 | Torus Desludge/Coating Inspection | May 8, 2001    |
| ALARA Review 01-005 | Reactor Disassembly/Reassembly    | April 27, 2001 |
| ALARA Review 01-006 | ISI - In Service Inspections      | April 11, 2001 |
| ALARA Review 01-007 | Drywell Coolers                   | May 6, 2001    |
| ALARA Review 01-008 | Temporary Shielding Project       | May 4, 2001    |
| ALARA Review 01-013 | Condenser Repair and Maintenance  | May 6, 2001    |
| HPP 3102.02         | ALARA Planning                    | Revision 11    |

Miscellaneous Data

|             |   |                |
|-------------|---|----------------|
|             | Respiratory Protection Evaluation Worksheet, RWP #30009,  | March 15, 2001 |
|             | Respiratory Protection Evaluation Worksheet, RWP #30014, Step 5 and 6, Reactor Disassembly/reassembly | March 16, 2001 |
|             | Respiratory Protection Evaluation Worksheet, RWP #202300, Step 5, Replace Condenser Tube Supports     | April 9, 2001  |
|             | Respiratory Protection Evaluation Worksheet, RWP #2005, Step 4, Replace Steam Extraction Joints       | April 6, 2001  |
|             | Respiratory Protection Evaluation Worksheet, RWP #40070, step 6, Lead Shielding Installation          | April 20, 2001 |
| HPP 3102.02 | Respirator Usage Decision Chart, Appendix 2   | Revision 10    |

|  |                 |
|--|-----------------|
| RFO 17 Exposure Records (Cumulative)                   | May 19, 2001    |
| RFO 17 Exposure Records (Cumulative),<br>by Projects   |                 |
| RFO 17 - R1 Post Task Summary,<br>Refuel Floor Project | August 7, 2001  |
| RFO 17 - Refuel Floor "Lessons<br>Learned"             |                 |
| RFO 17 Project Planning Meeting Notes                  | August, 17,2000 |
| RFO 17, RWP Review of Estimated<br>Dose by Project     |                 |
| RFO Dose History Graphics (1990-2001)                  |                 |

Self -Assessments

|                      |   |                           |
|----------------------|---|---------------------------|
| NG-01-1242, file 277 | Focused Self-Assessment on HP<br>Planning for RFO 17        | October 27, 2001          |
|                      | ALARA Post Task Analysis, Drywell<br>Activities             | April 23, 2001            |
|                      | ALARA Post Task Analysis, Electrical<br>Penetrations        | May 23, 2001              |
|                      | ALARA Post Task Analysis, Temporary<br>Shielding Activities | May 29, 2001              |
|                      | ALARA Post Task Analysis, In Service<br>Inspections         | June 4, 2001              |
|                      | ALARA Post Task Analysis, Heat<br>Exchangers                | June 21, 2001             |
|                      | Pre-RFO 17 Outage Assessment                                | First Quarter 2001        |
|                      | RFO 17 Outage Activities                                    | April 12- May 28,<br>2001 |
|                      | RFO 17 Post Outage Radiation<br>Protection Summary          |                           |
|                      | RFO 17 Lesson learned                                       |                           |

4OA1 Performance Indicator Verification

|  |  |
|--|--|
| NG-01-0047, NG-01-0496, NG-01-0873, NG-01-1199 | Action Request Radiological Occurrence Trend report, Performance Indicator for Occupational Radiation Exposure Control Effectiveness, Documentation Packets, CY 2000 4 <sup>th</sup> Quarter, CY 2001 1 <sup>st</sup> , 2 <sup>nd</sup> , and 3 <sup>rd</sup> Quarter(s) |
|--|--|