

August 31, 2001

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 50-331/01-06(DRP)

Dear Mr. Van Middlesworth:

On August 16, 2001, the NRC completed an inspection at your Duane Arnold Energy Center. The enclosed report documents the inspection findings which were discussed on August 16, 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,

*/RA/*

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

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

Enclosure: Inspection Report 50-331/01-06(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: 50-331/01-06(DRP)

Licensee: Alliant, IES Utilities Inc.

Facility: Duane Arnold Energy Center

Location: 3277 DAEC Road  
Palo, Iowa 52324-9785

Dates: July 2 through August 16, 2001

Inspectors: P. Prescott, Senior Resident Inspector  
M. Kurth, Resident Inspector  
J. Adams, Resident Inspector  
D. Nelson, Radiation Specialist

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

## SUMMARY OF FINDINGS

IR 05000331-01-06(DRP), on 07/2-08/16/2001, IES Utilities, Inc, Duane Arnold Energy Center. Routine safety inspection.

This report covers a 6 week routine inspection. The inspection was conducted by resident and regional inspectors. 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. Inspector Identified Findings

No findings of significance were identified.

B. Licensee Identified Findings

No findings of significance were identified.

## Report Details

### Summary of Plant Status

On July 2, 2001, oscillations of the "A" feedwater regulating valve resulted in a reduction in reactor vessel level. Operators initially reduced recirculation flow to bring reactor power from 100 percent to 74 percent power, then followed by inserting control rods to bring power down to 52 percent. Licensee personnel removed the "A" feedwater pump from service and installed a rebuilt positioner and a new power supply. On July 4, licensee personnel completed temporary repairs and restored the "A" feedwater pump to service. Full power was achieved on July 5.

On July 24, the "A" feedwater pump minimum flow valve was confirmed to be drifting open. Operators lowered reactor power to 85 percent. On July 27, operators reduced power to 47 percent to remove the "A" feedwater pump from service to adjust the span ratio for the "A" feedwater pump minimum flow valve. This closed the valve and permitted return to full power on July 28.

On August 12, operators initiated an unplanned reactor scram due to the "B" reactor feedwater pump tripping on low suction pressure (refer to Section 1R14). The licensee repaired the "B" feedwater pump minimum flow valve controller. Operators took the reactor critical on August 14 and synchronized the generator to the grid on August 15. Full power operation was reached on August 16.

## **1. REACTOR SAFETY**

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

#### 1R01 Adverse Weather (71111.01)

- .1 (Closed) Unresolved Item (URI) 50-331/01-005-01: Low specific activity (LSA) boxes located in the condensate storage tank (CST) pit may become possible missiles during a tornado. During performance of the adverse weather inspection procedure for tornado preparations, the inspectors identified LSA boxes stored in the CST pit. The concern was that the LSA boxes could become missiles generated from a tornado with the potential to damage the CSTs. Based on the accident analysis condition for a station blackout, the duration of the coping period is 4 hours. During the 4-hour time period, the CST's reserve capacity for the high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) systems (75,000 gallons) is adequate to provide makeup during the coping period. However, if a tornado elevated an LSA box with the potential to damage the CSTs, reserve capacity for HPCI/RCIC usage may be unavailable.

The inspectors held discussions with the Regional Senior Reactor Analyst (SRA) and reviewed the significance determination process to determine if this issue merited further review. The licensee's root cause, documented in Action Request AR 20990, was also reviewed. The inspectors concluded that the loss of the CSTs, in conjunction with a station blackout was not considered credible because it assumed the transient had two initiators - station blackout and a tornado which was outside the scope of the

SDP. Also, the design bases accident suction source for HPCI and RCIC is the suppression pool. This item is closed.

1R04 Equipment Alignment (71111.04)

.1 Semi-annual Walkdown of the River Water Supply System

a. Inspection Scope

The inspectors performed a complete walkdown and review of the river water supply system alignment in the Mitigating Systems Cornerstone. The river water supply system has been identified as a risk-important mitigating system in the plant's probabilistic risk assessment. In addition, the inspectors also verified the configuration of the intake structure heating, ventilation, and air conditioning and the screen wash systems, both required for the long-term operability of the river water supply system. During the system walkdown, the inspectors compared the as-found mechanical and electrical configuration with the configuration specified in system operating procedure Operating Instruction (OI) 410, "River Water Supply System," Revision 36; and OI 710, "Intake Structure Heating, Ventilation, and Air Conditioning System," Revision 9. The inspectors also verified the material condition of system components, component labeling, equipment lubrication, hanger and support installation, and that system components were free from interference.

The inspectors reviewed action requests (AR) AR#21993, AR#22188, AR#22996, AR#23395, AR#27144, and AR#27145. The inspectors reviewed design change documentation for Engineered Maintenance Action (EMA) A53394; Safety Evaluation SE 01-008, "Safety Evaluation for EMA A53394"; and Operator Workaround for AR#22188. The inspectors verified there were no temporary modifications or long-term tagouts that affected the river water supply system to perform its function. The inspectors discussed system configuration, performance, maintenance, and testing with plant personnel.

b. Findings

No findings of significance were identified.

.2 Partial Equipment Alignment

a. Inspection Scope

The inspectors performed a partial walkdown of accessible portions of the following systems listed below to verify system operability. Items reviewed in the inspectors' walkdown included the following: verification of the correct valve position of all the 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 observed. The inspectors also evaluated other conditions such as adequacy of housekeeping, the absence of ignition sources, and proper component labeling. The walkdowns were performed while maintenance was being conducted on the corresponding train. The following systems were selected for a walkdown:

- “A” Residual Heat Removal System
- Reactor Core Isolation Cooling System

The following documents were reviewed and used to conduct the system walkdowns:

- P&ID M119, “Residual Heat Removal System,” Revision 74
- P&ID M120, “Residual Heat Removal System,” Revision 57
- P&ID M124, “Reactor Core Isolation Cooling System (Steam Side),” Revision 47
- P&ID M125, “Reactor Core Isolation Cooling System (Water Side),” Revision 33
- Procedure Checklist: Operating Instruction (OI) 149, “Residual Heat Removal System,” Revision 71
- Procedure Checklist: OI 150, “Reactor Core Isolation Cooling System,” Revision 41

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

.1 Area Fire Protection Inspections

a. Inspection Scope

The inspectors walked down the following risk significant areas looking for any fire protection degraded conditions. Open fire protection impairment requests were reviewed to prioritize the plant area fire plan (AFP) zones inspected, and discussions were conducted 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 operational 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 inspectors observed the physical condition of fire detection devices, such as overhead sprinklers, and verified 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; the verification that fire hoses were installed at their

designated locations and the physical condition of the hoses was satisfactory and access unobstructed; and the 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 areas were inspected:

- AFP-1, "Reactor Building Torus Area and North Corner Rooms," Revision 22
- AFP-2, "Reactor Building South Corner Rooms," Revision 22
- AFP-3, "Reactor Building HPCI [High Pressure Coolant Injection], RCIC [Reactor Core Isolation Cooling] & Radwaste Tank Rooms," Revision 22
- AFP-74, "Switchyard," Revision 0

b. Findings

No findings of significance were identified.

.2 Fire Brigade Drill Performance

a. Inspection Scope

The inspectors observed a fire brigade drill on August 10, 2001. The scenario involved a fire in the diesel fire pump room. The inspectors observed the drill to verify that: protective clothing and turnout gear was properly donned; breathing apparatus was properly worn and used; hoses were capable of reaching the location, laid out without constrictions and simulated charged; the fire area was entered in a controlled manner; sufficient equipment was brought to the scene to fight the fire; the team leader's directions were thorough and effective; radio communications were sufficient; pre-plans were used; and the drill scenario was followed and the objectives met.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance (71111.07)

a. Inspection Scope

The inspectors reviewed the flow verification surveillance test for the heat exchangers supplied by the emergency service water (ESW) system. The data was compared against the Updated Final Safety Analysis Report (UFSAR) to ensure the system design flow rates were achieved and that the system met its design basis. Discussions were held with the project engineer responsible for the heat exchanger performance program. The following documents were reviewed:

- Equipment Monitoring Procedure (EMP) 1P099-FV, "Emergency Service Water Flow Verification Test," Revision 6
- UFSAR Section 9.2.3.2.2, "Emergency Service Water"
- Duane Arnold Energy Center (DAEC) Memorandum NG-01-0134, "Completion of ESW Flow Verification Test - EMP-1P099-FV"
- UFSAR Change Request 99-030, "Change the Values of ESW Flow Requirements in UFSAR Table 9.2-1"

.b Findings

There were no findings identified.

1R11 Licensed Operator Requalification (71111.11)

a. Inspection Scope

The inspectors observed the licensed operator requalification scenario guide, "SEG 2001C4-1 PM." The exercise was conducted on August 6, 2001.

The exercise scenario was based on a loss of the ultimate heat sink at full power operation. Subsequently, a steam leak developed in primary containment leading to high drywell pressure. Drywell sprays and the safety relief valves failed. An alternate emergency depressurization path was to be used. During the course of the scenario, emergency operating procedure entries were made and event classification and reporting opportunities occurred.

The inspectors observed communications, procedural adherence, and implementation of emergency operating procedures. In addition, event classification and reporting actions were observed. The classifications were included as part of the performance indicator data for this scenario.

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. Documentation reviewed in performance of the inspection is also 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; the appropriateness of performance criteria for SSCs classified as (a)(2);

and the appropriateness of goals and corrective actions for SSCs classified as (a)(1). The inspectors also verified that issues were identified at an appropriate threshold and entered in the corrective action program. The following systems were reviewed:

- Standby Liquid Control System
- Fuel Pool Cooling System
- Containment Atmosphere Control System
- Reactor Core Isolation Cooling System

The following documentation was also reviewed:

- DAEC Performance Criteria Basis Document, "Standby Liquid Control (SBLC)," Revision 1
- DAEC Performance Criteria Basis Document, "Fuel Pool Cooling (FPC) and Cleanup System," Revision 1
- Action Request (AR) 24015, "Instrument Air Samples Taken During 1999 and 2000 Exceeded the Maintenance Rule Condition Monitoring Limit for Particles Larger Than 3 Microns in Size"
- DAEC Performance Criteria Basis Document, "Containment Atmosphere Control System," Revision 4
- Control Room Operators Logs
- DAEC Performance Criteria Basis Document, "Reactor Core Isolation Cooling System," Revision 2
- AR 16932, "Found Flow Indications on RCIC Pump Low Discharge Flow Switch FS2508"

The licensee appropriately entered the instrument air system into the 10 CFR 50.65 (a)(1) category. Air system samples taken during 1999 and 2000, exceeded the Maintenance Rule condition monitoring limit for particulate size. The inspectors reviewed the licensee's monitoring and performance criteria, root cause evaluation, and proposed corrective actions for improving the performance of the instrument air 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, and the risk assessment of scheduled maintenance activities associated with work week 28 that included work on the diesel fire pump, the "A" and "B" HPCI room coolers and emergent work on the primary containment torus vent bellows. Also, the risk assessment of scheduled maintenance activities associated with work week 29 were reviewed that

included emergent work on the startup transformer. Action Request 26896 was written by the work week manager to address the inspectors' identification of a lack of a formal risk assessment review of the emergent work on the startup transformer being included into the work week. Also, risk assessment for work week 32 was reviewed that included planned work on the capacitor bank installations in the switchyard and replacement of a refurbished 4160 volt safety-related breaker. The inspectors verified that scheduled and emergent work activities were adequately managed. This included observation of the licensee's program for conducting maintenance risk safety assessments and verification of the licensee's planning, risk management tools, and the assessment and management of online risk. Licensee actions to address increased online risk were verified during these periods, such as establishing compensatory actions, minimizing the duration of the activity, obtaining appropriate management approval, and informing appropriate plant staff. The inspectors verified that 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.

1R14 Personnel Performance During Nonroutine Plant Evolutions and Events (71111.14)

a. Inspection Scope

On August 12, 2001, reactor water level began to unexpectedly decrease. Operators took manual control of level in an attempt to regain proper level control. During that time the "B" reactor feedwater pump tripped on low suction pressure. The operators inserted a manual scram anticipating that water level would decrease below the automatic reactor scram set point for low level. All control rods inserted and neutron flux levels were decreasing. Reactor pressure began to drop as anticipated. The operators were focused on accomplishing their scram response directives, however, they were not timely in moving the mode switch out of "Run". Therefore, when reactor pressure reached 850 psig with the mode switch in "Run," the main steam isolation valves closed as designed. Operators were directed to open the low-low set safety valves to control pressure between 900 and 1020 psig. Shortly thereafter, the operators were able to maintain the reactor in a hot standby condition.

The licensee determined that a failed resistor on a flow indicator controller for the "B" reactor feedwater pump recirculation valve caused the valve to open at full power. This resulted in diverting feedwater flow to the condenser and reduced feedwater pressure.

The inspectors reviewed operator logs, plant computer data, and strip charts to determine what occurred and how the operators responded. Operator response was evaluated and the licensee is considering changes to the scram response procedure to quickly reposition the mode switch to prevent initiation of a Group 1 isolation.

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 evaluations were reviewed:

- AR 25793, "General Electric Potential Safety Concern: Thermal-Hydraulic Stability"
- AR 26575, "Expansion Bellows Dust Covers for Drywell to Torus"
- AR 23552, "Request Operability Determination for Secondary Containment Isolation Damper 1VAD13B"
- AR 26858, "Particulate Filter Erroneously Installed Instead of Coalescing Filter for 1K003 & 4 (CB/SBGTS Instrument Air Compressor)"
- AR 27155, "RHR - Torus Spray Isolation Valve MO-1933 Valve Operability"

b. Findings

No findings of significance were identified.

1R16 Operator Workarounds (OWAs) (71111.16)

.1 Routine Review of OWAs

a. Inspection Scope

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

The following OWAs were reviewed during the inspection period:

- AR 23816, "Track Replacement of Steam Seal Header Pressure Valve, CV1104, and Closing the Manual Unloader"
- AR 24341, "Replace the Mechanical Cams in 1C136 (Fuel Pool Filter/Demin Control Panel) with Programmable Logic Controllers (PLCs)"

b. Findings

No findings of significance were identified.

.2 Semi-Annual Cumulative Effect Review of Operator Workarounds

a. Inspection Scope

The inspectors performed a review of OWAs for the potential cumulative effect on the ability of operators to respond in a correct and timely manner to plant transients. Also, considered in this review were items on the licensee's longstanding equipment issues, degraded instrumentation, and long-term tagout lists.

The following ARs associated with outstanding OWAs were reviewed:

- AR 22188, "Operations Feedback on the Design/Operation of 1K016A/B (Intake Structure) HVAC [Heating Ventilation and Air Conditioning] Instrument Air Compressors"
- AR 22964, "Ensure Steam Line Drain Flow to the Condensers is Minimized during Turning Gear Operation"
- AR 23397, "EMAs [Engineering Maintenance Actions] A46557 & 78: AN4162A/B (Offgas Hydrogen Analyzers) Replacement"
- AR 23477, "Place Spurious (125 VDC) Signal Suppression Devices in Affected Annunciator Panels"
- AR 23816, "Track Replacement on Steam Seal Header Pressure Valve, CV1104, and Closing the Manual Unloader"
- AR 24214, "1T203A (Demineralizer, Filter, RWCU [Reactor Water Clean-up] Tank 1T203A) Went into Hold when the "B" Bed was Unisolated"
- AR 24341, "Replace the Mechanical Cams in 1C136 (Fuel Pool Filter/Demin Control Panel) with Programmable Logic Controllers (PLCs)"
- AR 25981, "Investigate Actions to be Taken for 1P032 (Main Condenser Mechanical Vacuum Pump) Tripping Problem"
- AR 26120, "Potential Seat Leakage Through Either/Both CV1579/CV1621 (A/B Feedwater Regulating Valves)"

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors observed the post-maintenance tests and reviewed test data for the following activities:

- Preventive Work Order (PWO) 1115831, "4160 Volt Breaker Refurbishment - Swap Breaker With Essential Switchgear Breaker 1A312 - "A" River Water Supply Essential Load"

- Corrective Work Order (CWO) A45537, "Valve [CV4312, Drywell Nitrogen Makeup Inlet Isolation Valve] Failed Leak Test. Results Were 58,050 SCCM [Standard Cubic Centimeters per Minute]. Acceptance Criteria is 15,000 SCCM"
- CWO A55350, "Circuit Breaker Closing Springs do not Automatically Charge. Makes RHRSW [Residual Heat Removal Service Water] Pump Inoperable"
- CWO A55758, "CV1569 [1A Reactor Feed Pump Min-Flow Valve] Hangs Up at 1500 GPM Flow - With Full Closed Signal From Control Room"

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 UFSAR, and the following plant procedures:

- OI 304.2, "4160 Volt - 480 Volt Essential Electrical Distribution System," Revision 41

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.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors observed surveillance testing on risk-significant equipment, verified that the SSCs selected were capable of performing their intended safety function, and verified that the surveillance tests satisfied the requirements contained in TS, the UFSAR, and licensee procedures. During surveillance testing observations, the inspectors verified the following items: the test was adequate to demonstrate operational readiness consistent with the design and licensing basis documents; the testing acceptance criteria were clear; the impact of the testing had been properly characterized during the pre-job briefing; the test was performed as written and all testing prerequisites were satisfied; and that the test data was complete, appropriately verified, and met the requirements of the testing procedure. Following the completion of the test, 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.

The following surveillance testing activities were observed:

- Surveillance Test Procedure (STP) 3.6.1.1-08, "Containment Isolation Valve Leak Tightness Test - Type C Penetrations - Orphan Valves," Revision 5 (Portions of STP pertaining to CV4312, nitrogen makeup inlet isolation valve)



- STP 3.8.1-04, “Standby Diesel Generators Operability Test (Slow Start From Normal Start Air),” Revision 9

The inspectors also reviewed documents associated with special tests developed by the licensee to identify a potential leak in the well water system and troubleshoot main generator stator cooling flow. The leakage in the well water system was in the drywell coolers portion of the system. The test required isolating the coolers to determine the source of unidentified drywell leakage. These tests were viewed as risk significant for initiating event potential (high drywell temperature and trip of the main generator). The following documents were reviewed:

- Troubleshooting Information Form (TIF) for CWO A55066, “Investigating Drywell Leak - Potential Water Leak Could be Coming From D/W Coolers”
- Maintenance Directive MD-026, “Troubleshooting Guidelines,” Revision 8
- UFSAR Section 9.2.1, “Well Water System”
- TIF for CWO A56208, “1C83A Rectifier Coolant Hi/Lo Flow Alarms Intermittently with 1P91B [Stator Cooling Water Pump] Running”
- UFSAR Section 9.2.4, “General Service Water”
- OI 697, “Generator Stator Cooling Water System,” Revision 29

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23)

a. Inspection Scope

The inspectors reviewed the below mentioned temporary modification package, safety evaluation, and installation work order associated with the core spray system. The inspectors verified revisions made to drawings and procedures and the installation of the temporary modification. The temporary modification was discussed with the system engineer.

The following temporary modification was reviewed:

- Temporary Modification Permit No. 01-30, “Install EMI [Electromagnetic Interference] Protection (Clamp-on Ferrite Beads) on SRM [Source Range Monitor] and IRM [Intermediate Range Monitor] Signal Cables to Reduce or Eliminate Noise on Detector Signals”

Documents reviewed during the inspection included:

- AR 25379, "Make Installation of Ferrite Beads on SRM/IRM Signal Cables (Temp Mod RO-21) Permanent"
- General Electric (GE) Service Information Letter (SIL) 47, "Intermediate Range Monitor Module Oscillations"
- GE SIL 47, Supplement 1, "Intermediate Range Monitor Amplifier Attenuator Module"
- Electric Power Research Institute (EPRI) Training Manual TR-102400, "Handbook for Electromagnetic Compatibility of Digital Equipment in Power Plants (Volume 2: Implementation Guide for EMI Control)"

b. Findings

No findings of significance were identified.

**2. RADIATION SAFETY**

**Cornerstone: Occupational Radiation Safety**

2OS1 Access Controls for Radiologically Significant Areas (71121.01)

.1 Problem Identification and Resolution

a. Inspection Scope

The inspector reviewed the licensee's audits and condition reports covering radiological incidents involving access controls for radiologically significant areas. Management of radiological incidents was evaluated in order to verify that the licensee could identify, track, and correct radiological problems.

b. Findings

No findings of significance were identified.

**Cornerstone: Public Radiation Safety**

2PS3 Radiological Environmental Monitoring and Radioactive Material Control Programs (71122.03)

.1 Review of Environmental Monitoring Reports and Data

a. Inspection Scope

The inspector reviewed the Annual Radiological Environmental Monitoring Report for the year 2000. Sampling location commitments, monitoring and measurement frequencies, land use census, the vendor laboratory's Interlaboratory Comparison Program, and data analysis were assessed. Anomalous results including data, missed samples, inoperable

or lost equipment were evaluated. The review of the Radiological Environmental Monitoring Program (REMP) was conducted to verify that the REMP was implemented as required by the Offsite Dose Assessment Manual (ODAM) and associated Technical Specifications, and that changes, if any, did not affect the licensee's ability to monitor the impacts of radioactive effluent releases on the environment. The most recent quality assessment of the licensee's REMP vendor was reviewed to verify that the vendor laboratory performance was consistent with licensee and NRC requirements.

b. Findings

No findings of significance were identified.

.2 Walkdowns Of Radiological Environmental Monitoring Stations and Meteorological Tower

a. Inspection Scope

The inspector conducted a walkdown of selected environmental air sampling stations and thermoluminescent dosimeters to verify that their locations were consistent with their descriptions in the ODA, and to evaluate the equipment material condition. The meteorological monitoring site was observed to validate that sensors were adequately positioned and operable. The inspector reviewed the 2000 Annual Radioactive Materials Release Report to evaluate the onsite meteorological monitoring program's data recovery rates, routine calibration and maintenance activities, and non-scheduled maintenance activities. The review was conducted to verify that the meteorological instrumentation was operable, calibrated, and maintained in accordance with licensee procedures. The inspector also verified that readouts of wind speed, wind direction, and atmospheric stability measurements were available in the Control Room and that the readout instrumentation was operable.

b. Findings

No findings of significance were identified.

.3 Review of REMP Sample Collection and Analysis

a. Inspection Scope

The inspector accompanied the licensee REMP technician to observe the collection and preparation of air filters to verify that representative samples were being collected in accordance with procedures and the ODA. The inspector observed the technician perform air sampler field check maintenance to verify that the air samplers were functioning in accordance with procedures. Selected air sampler calibration and maintenance records for 2000 were reviewed to verify that the equipment was being maintained as required. The environmental sample collection program was compared with the ODA to verify that samples were representative of the licensee's release pathways. Additionally, the inspector reviewed results of the vendor laboratory's

Interlaboratory Comparison Program to verify that the vendor was capable of making adequate radio-chemical measurements.

b. Findings

No findings of significance were identified.

.4 Unrestricted Release of Material From the Radiologically Controlled Area

a. Inspection Scope

The inspector evaluated the licensee's controls, procedures, and practices for the unrestricted release of material from radiologically controlled areas and verified that: (1) radiation monitoring instrumentation used to perform surveys for unrestricted release of materials was appropriate; (2) instrument sensitivities were consistent with NRC guidance contained in Inspection and Enforcement (IE) Circular 81-07 and Health Physics Positions in NUREG/CR-5569 for both surface contaminated and volumetrically contaminated materials; (3) criteria for survey and release conformed to NRC requirements; (4) licensee procedures were technically sound and provided clear guidance for survey methodologies; and (5) radiation protection staff adequately implemented station procedures.

b. Findings

No findings of significance were identified.

.5 Identification and Resolution of Problems

a. Inspection Scope

The inspector reviewed condition reports and the Quality Assurance group's second quarter 2000 assessment of the REMP program to determine if problems were being identified and entered into the corrective action program for timely resolution. The inspector also reviewed the licensee's overall management of the REMP, including attention to details of the sampling program and the vendor laboratory, in order to evaluate the effectiveness of the REMP in collection and analysis of samples for the detection of offsite radiological contamination.

b. Findings

No findings of significance were identified.

#### 4. OTHER ACTIVITIES

##### 4OA1 Performance Indicator Verification (71151)

###### **Cornerstone: Mitigating Systems**

##### .1 Routine Performance Indicator Verification

###### a. Inspection Scope

The inspectors reviewed control room operator logs, monthly operating reports, licensee event reports, and performance indicator data packages for the first quarter of the year 2001 for the unplanned power changes per 7,000 critical hours performance indicator. Also, the safety system functional failure performance indicator data for the last four quarters was reviewed. Appropriate licensee personnel responsible for data collection were interviewed.

The inspectors identified a minor discrepancy while reviewing maintenance rule data on the RCIC system. Unavailability time was missed when a flow indicator was reading high. However, the missed unavailability time did not result in the performance indicator reaching a threshold. The licensee documented the discrepancy in AR 26830.

Additionally, the inspector verified the licensee's assessment of performance indicators for public radiation safety and reactor coolant system specific activity. Since no reportable elements were identified by the licensee for the 4<sup>th</sup> quarter of 2000 and 1<sup>st</sup> and 2<sup>nd</sup> quarters of 2001, the inspector compared the licensee's data with those quarters' Action Requests to verify that there were no occurrences concerning the public radiation safety cornerstone and the reactor coolant system specific activity.

###### b. Findings

No findings of significance were identified.

- .2 (Closed) URI 50-331/00-002-02: Interpretation of residual heat removal (RHR) system unavailability. During the last refueling outage (RFO 16), approximately 175 hours of RHR train unavailability occurred during the common RHR shutdown cooling (SDC) suction window. At the time, the licensee concluded that these hours would not be counted against system availability. The rationale was based on the licensee's interpretation of the guidance contained in Nuclear Energy Institute (NEI) 99-02. Specifically, it was concluded that the hours were not reportable because: (1) the reactor cavity was flooded up, (2) temperatures were maintained less than 150°F, and (3) the fuel pool cooling system was in service with the fuel pool gates removed. Engineering analysis showed that pool temperatures would not increase above 150°F and, therefore, ambient losses were sufficient to offset decay heat load. The NEI 99-02 document stated that the RHR SDC system may be removed from service without incurring unavailability under the following conditions: "With fuel still in the reactor vessel, when decay heat is so low that forced flow for cooling purposes, even on an intermittent basis, is no longer required (ambient losses are

enough to offset the decay heat load), any train providing shutdown cooling may be removed from service without incurring planned or unplanned unavailable hours.”

The inspectors’ position was that during the common RHR SDC work window, the core was partially off-loaded to the spent fuel pool. Because the spent fuel pool was connected (open) to the reactor cavity, the pool of water in the spent fuel pool and reactor was common. The common pool would be cooled by the spent fuel pool cooling system. Therefore, some form of cooling would be required to offset the decay heat load. The licensee submitted a frequently asked question (FAQ), which was subsequently approved and documented in NEI 99-02, “Regulatory Assessment Performance Indicator Guideline,” Revision 1. The licensee’s question read as follows: “Are there times when RHR shutdown cooling can be removed from service without incurring unavailable hours, if allowed by Technical Specifications (i.e., reactor level and temperature requirements met).” The response to that question was: “Yes. Unavailable hours are counted only for periods when a train is required to be available for service. However, Technical Specifications that require one subsystem remain operable and in operation above a specified temperature would be counted if one subsystem were not available or an alternate method (normally specified in the Technical Specification Action Statement) were not available.” The licensee’s TS did not require a subsystem or alternate method be available. This issue is closed.

#### 4OA3 Event Followup (71153)

##### .1 Licensee Event Reports

###### a. Inspection Scope

The inspectors reviewed the corrective actions associated with the following licensee event report (LER).

###### b. Findings

(Closed) LER 50-331/2001-001: Valid reactor protection system actuation from high scram discharge volume water level due to maintenance-induced equipment problems. On May 8, 2001, during a refueling outage, a reactor protection system (RPS) actuation occurred due to an actual high water level condition in the scram discharge volume (SDV) of the control rod drive (CRD) hydraulic system. All rods were already fully inserted. The high water level was caused by a combination of two separate maintenance-induced equipment problems. First, maintenance technicians incorrectly installed a solenoid for the SDV drain valve to the reactor building equipment drain sump, which isolated the SDV. The cause of the solenoid valve being installed incorrectly was due to a lack of thorough planning. The solenoid was being replaced with a different model, with the associated intake and exhaust ports that were configured differently. The SDV was filled by leakage past an overhauled scram valve. The cause for the leakage was a lack of valve seat loading. The coupling that joined the valve stem to the operator was found out of alignment. Also, it was noted that there were no pre-planned steps to perform post maintenance testing to check for seat leakage after the scram valve overhauls. In a review of the LER, the inspectors considered the potential impact on safety due to the inadequate work order instructions and

maintenance personnel error. At the time of the event, all rods were already in. The planned post maintenance testing, which included stroke timing the SDV vent and drain valves, had not yet been performed. The solenoid installation error would have been detected at that time. The leaking scram outlet valve leakage may have gone undetected until operating at power. The valve leakage would have resulted in increased control rod drive temperatures. However, a control room annunciator exists that would have alerted operators to the condition. The annunciator response procedure directs an operator to check for a hot leaking scram discharge valve line. Therefore, this issue was of low safety significance in that the potential consequences, and likelihood the scram valve leakage would not be detected, were minimal. This LER is closed.

#### 4OA6 Meeting

##### Exit Meeting

The inspectors presented the inspection results to Mr. R. Anderson and other members of licensee management on August 16, 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.

The inspectors presented the preliminary Radiological Access Control Program and Radiological Environmental Monitoring Program inspection results to Mr. Van Middlesworth, Site General Manager, on July 20, 2001. The licensee acknowledged the issues presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

On July 2, 2001, the NRC presented the End of Cycle Assessment results to licensee management in a public meeting. Handouts used during the meeting are included as an attachment to this report.

## KEY POINTS OF CONTACT

### Licensee

R. Anderson, Plant Manager  
J. Bjorseth, Manager, Engineering  
D. Curtland, Operations Manager  
H. Giorgio, Manager, Radiation Protection  
R. Murrell, Site Assessment Manager  
B. Rowland, Security Manager  
W. Simmons, Maintenance Superintendent  
G. Van Middlesworth, Site Vice President Nuclear

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

None

### Closed

|                    |     |  |
|--------------------|-----|--|
| 50-331/2000-002-02 | URI | Interpretation of RHR System Unavailability  |
| 50-331/2001-001-00 | LER | Valid Reactor Protection System Actuation from High Scram Discharge Volume Water Level due to Maintenance-induced Equipment Problems |
| 50-331/2001-005-01 | URI | LSA Boxes Located in the CST Pit May Become Possible Missiles During a Tornado   |

### Discussed

None



## LIST OF ACRONYMS USED

|       |   |
|-------|---|
| AFP   | Area Fire Plan                                |
| AR    | Action Request                                |
| CFR   | Code of Federal Regulations                   |
| CRD   | Control Rod Drive                             |
| CST   | Condensate Storage Tank                       |
| CV    | Control Valve                                 |
| CWO   | Corrective Work Order                         |
| DAEC  | Duane Arnold Energy Center                    |
| DRP   | Division of Reactor Projects                  |
| ESW   | Emergency Service Water                       |
| EMP   | Equipment Monitoring Procedure                |
| F     | Fahrenheit                                    |
| GE    | General Electric                              |
| HPCI  | High Pressure Coolant Injection               |
| IPOI  | Integrated Plant Operating Instruction        |
| IR    | Inspection Report                             |
| LER   | Licensee Event Report                         |
| LSA   | Low Specific Activity                         |
| MWO   | Modification Work Order                       |
| NRC   | Nuclear Regulatory Commission                 |
| OI    | Operating Instruction                         |
| ODCM  | Offsite Dose Assessment Manual                |
| OWA   | Operator Workaround                           |
| P&IDs | Piping and Instrumentation Drawings           |
| PWO   | Preventive Maintenance Order                  |
| RCIC  | Reactor Core Isolation Cooling                |
| REMP  | Radiological Environmental Monitoring Program |
| RHR   | Residual Heat Removal                         |
| RPS   | Reactor Protection System                     |
| SDC   | Shutdown Cooling                              |
| SDP   | Significance Determination Process            |
| SDV   | Scram Discharge Volume                        |
| SIL   | Service Information Letter                    |
| SSCs  | Structure, System, or Components              |
| STP   | Surveillance Test Procedure                   |
| TIF   | Troubleshooting Information Form              |
| TS    | Technical Specification                       |
| UFSAR | Updated Final Safety Analysis Report          |
| URI   | Unresolved Item                               |

## LIST OF DOCUMENTS REVIEWED

### 2OS1 Access Controls for Radiologically Significant Areas

#### Action Requests

|          |   |               |
|----------|---|---------------|
| AR 25642 | Dose Rates Exceeded High Radiation Limits | June 18, 2001 |
|----------|---|---------------|

### 2PS3 Radiological Environmental Monitoring and Radioactive Material Control Programs

#### Action Requests

|          |  |               |
|----------|--|---------------|
| AR 25845 | Clipboard With a Significant Level of Contamination Found Outside of the RCA         | May 23, 2001  |
| AR 25956 | Revision of ACP 1411.23 to Include Greater than MDA Actions                          | July 20, 2001 |
| AR 26900 | Unacceptable Growth Around Environmental Air Sampler                                 | July 20, 2001 |
| AR 26901 | Unclear Definition of What Constitutes a "Missed Sample"                             | July 20, 2001 |
| AR 26069 | Routine Survey of Outside Areas During RFO17 Found One Item With Fixed Contamination | May 23, 2001  |

#### Station Procedures

|             |   |             |
|-------------|---|-------------|
| ACP 1411.23 | Equipment and Material Controls in Radiological Areas | Revision 8  |
| ESP 4.3.1.1 | Airborne Particulate and Iodine Sampling              | Revision 20 |
| ESP 4.3.1.8 | Vegetation Sampling                                   |             |

#### Calibration Records

|         |                             |                |
|---------|-----------------------------|----------------|
| QT-9413 | Precipitation Sensor        | March 22, 2001 |
| YS-9400 | 10-Meter Primary Wind Speed | March 22, 2001 |
| YS-9402 | 10-Meter Backup Wind Speed  | March 22, 2001 |
| YS-9401 | 50-Meter Primary Wind Speed | March 22, 2001 |
| TE-9403 | 50-Meter Backup Wind Speed  | March 22, 2001 |

|                |                                 |                |
|----------------|---------------------------------|----------------|
| TE-9404        | 10-Meter Primary Temperature    | March 22, 2001 |
| TE-9405        | 10-Meter Backup Temperature     | March 22, 2001 |
| TE-9406        | 50-Meter Primary Temperature    | March 22, 2001 |
| TE-9407        | 50-Meter Backup Temperature     | March 22, 2001 |
| YD-9400        | 10-Meter Primary Wind Direction | March 22, 2001 |
| YD-9401        | 50-Meter Primary Wind Direction | March 22, 2001 |
| 47, 51, 57, 59 | Low Volume Air Samplers         | March 6, 2001  |

Other Documents

|                             |  |                 |
|-----------------------------|--|-----------------|
| Technical Basis Document #1 | Release of Materials for Unrestricted Use  | July 12, 2001   |
|                             | Offsite Dose Assessment Manual   | Revision 15     |
| Study Plan                  | The Operational Radiological Environmental Monitoring Program for the Duane Arnold Energy Center | Revision 13     |
|                             | Annual Environmental Monitoring Program January 1 to December 31, 2000                           |                 |
|                             | 2000 Annual Radioactive Materials Release Report January 1 to December 31, 2000                  |                 |
| Q-04                        | Second Quarter 2000 Quality Assurance Assessment Report  | August 17, 2000 |

4OA1 Performance Indicator Verification

Station Procedures

|            |  |            |
|------------|--|------------|
| ACP 1402.4 | PI Data Calculation, Review and Approval | Revision 0 |
|------------|--|------------|

Other Documents

|                                 |   |
|---------------------------------|---|
| Reactor Coolant System Activity | 4 <sup>th</sup> Quarter 2000 and 1 <sup>st</sup> and 2 <sup>nd</sup> Quarter 2001 |
|---------------------------------|---|