

July 20, 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 50-331/01-05(DRP)

Dear Mr. Van Middlesworth:

On July 1, 2001, the NRC completed an inspection at your Duane Arnold Energy Center. The enclosed report documents the inspection findings which were discussed on July 3, 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.

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Sincerely,

/RA/

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

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

Enclosure: Inspection Report 50-331/01-05(DRP)

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Energy Delivery, Alliant;
President, IES Utilities, Inc.
Robert G. Anderson, Plant Manager
K. Peveler, Manager, Regulatory Performance
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.
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REGION III

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

Report No: 50-331/01-05(DRP)

Licensee: Alliant, IES Utilities Inc.

Facility: Duane Arnold Energy Center

Location: 3277 DAEC Road
Palo, Iowa 52324-9785

Dates: May 20 through July 1, 2001

Inspectors: P. Prescott, Senior Resident Inspector
M. Kurth, Resident Inspector
K. Riemer, Project Engineer

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

SUMMARY OF FINDINGS

IR 05000331-01-05(DRP), on 05/20-07/01/2001, 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 and a project 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. 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

The plant was shutdown for refueling outage (RFO) 17 at the beginning of the inspection period. On May 24, 2001, operators made the reactor critical and final synchronization of the generator to the electrical grid (marking completion of RFO 17) occurred on May 27, 2001. At the beginning of the new cycle, power was limited to approximately 70 percent, while maintenance proceeded on the "A" cooling tower. The "A" cooling tower was returned to service on June 6 and on June 7, as reactor power approached 99 percent, feedwater flow fluctuations were observed. Operators subsequently reduced power to 49 percent to allow troubleshooting to occur. Following completion of troubleshooting and maintenance activities on the controller for the "A" reactor feed pump minimum flow line valve, full power was reached on June 8, 2001. On June 15, 2001, operators reduced power to approximately 48 percent to repair a body-to-bonnet leak and controller problems associated with the "A" reactor feed pump minimum flow line valve. On June 17, operators commenced a return to full power and reached full power on June 18. The plant remained at full power for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

a. Inspection Scope

The inspectors reviewed the licensee's preparations for hot weather conditions and performed walkdowns of the reactor building, pump house, and grounds surrounding the out-buildings. Also, the inspectors reviewed the following documents:

- Integrated Plant Operating Instruction (IPOI) 6, "Cold Weather Operations," Attachment 2, "Plant Return to Normal Operation Checklist," Revision 20
- Updated Final Safety Analysis Report (UFSAR) Sections 2.3.1.1.2.2, 3.5.1.4, and 15.6.7.4

b. Findings

The inspectors reviewed the above mentioned documents and identified several loose items on the grounds surrounding the out-buildings that may damage plant equipment during a design basis tornado. In particular, a number of low level radiation waste low specific activity (LSA) boxes were in storage in the condensate storage tank (CST) pit area. The LSA boxes could become missiles generated from a natural phenomena (tornado) that may damage the CST. Based on the accident analysis condition (UFSAR 15.6.7.4) 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 high pressure coolant injection/reactor core isolation cooling (HPCI/RCIC) usage (75,000 gal.) is adequate to provide makeup during the coping period. However, if a tornado would elevate an LSA

box causing damage to the CST tanks, reserve capacity for HPCI/RCIC usage may be unavailable.

The licensee initiated Action Request 20990 to track resolution of the LSA boxes located in the CST pit which may become potential missiles during a tornado and cause irreparable damage to the reserve capacity for the HPCI/RCIC system. The issue was viewed as an unresolved item (50-331/01-005-01(DRP)) pending completion of the significance determination process.

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 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 walkdown was performed while maintenance was being conducted on the corresponding train. The following system was selected for a walkdown:

- "A" Core Spray System

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

- P&ID BECH-M121 "Core Spray System," Revision 35
- Procedure Checklist: Operating Instruction (OI) 151, "Core Spray System," Revision 34

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

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. The areas inspected were:

- Using Fire Plan Volume II, "Fire Brigade Organization," AFP-22, "Turbine Building, South Turbine Operating Deck," Revision 22
- Using Fire Plan Volume II, "Fire Brigade Organization," AFP-23, "Control Building Battery Rooms," Revision 22
- Using Fire Plan Volume II, "Fire Brigade Organization," AFP-24, "Control Building, Essential Switchgear Rooms," Revision 22

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification (71111.11)

a. Inspection Scope

The inspectors observed the emergency preparedness "Blue Team" operator performance in the simulator during the evaluated emergency preparedness exercise. The exercise was conducted on June 14, 2001.

The exercise scenario was based upon a main steam line break in the turbine building that could not be isolated. An inadvertent high pressure coolant injection (HPCI) auto injection, along with several reactor protection system (RPS) failures caused a power increase that resulted in some fuel cladding damage.

Shortly after the start of the drill, the control room received a reactor core isolation cooling room deluge initiation. The room flooded past the maximum normal water level and a declaration of an Unusual Event was made by the operators for a destructive

phenomena affecting the protected area. An HPCI auto initiation subsequently occurred that resulted in a power level increase due to injection of the HPCI system into the reactor vessel. Local power range monitors and average power range monitors spiked upscale (RPS failed). Operators inserted a manual scram. The "A" manual scram button and the mode switch failed to work; however, alternate rod insertion worked. A Group I isolation occurred; however, the "B" main steam line isolation valves failed to close. During establishment of torus cooling, the heat exchanger bypass valve failed open. The emergency classification was upgraded to an Alert, due to the failure of the automatic scram. A small leak developed in the turbine building. Reactor building and then turbine building radiation monitor alarms were noted and the safety parameter display system showed an increase in the turbine building ventilation activity. Emergency Operating Procedure 4 was entered. The emergency action level was upgraded to a Site Area Emergency, based on the radiation monitor readings.

The inspectors observed communications, procedure 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:

- "A" and "B" Control Building Chillers
- Core Spray System
- Instrument Air System

The following documentation was also reviewed:

- Duane Arnold Energy Center (DAEC) Equipment Parameter Information, “A’ and ‘B’ Control Building Chillers”
- DAEC Maintenance Rule Criteria Calculation Report, “A’ and ‘B’ Control Building Chillers”
- DAEC Performance Criteria Document, “Low Pressure Spray,” Revision 0
- DAEC Performance Criteria Document, “Instrument Air 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”
- Control Room Operators Logs

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 21 that included the plant start-up from RFO 17. Also, the risk assessment of scheduled maintenance activities associated with work week 24 were reviewed that included emergent work on the “A” minimum flow feedwater regulating valve, and work week 25 that included emergent work on the “B” control room heating ventilation and air conditioning chiller with emergent work on the post accident sampling system. 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, 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 evaluations were reviewed:

- AR 26225, "1LUPSB [Lighting Uninterruptible Power Supply] (Safe Shutdown/SBO [Station Black-Out] Lighting UPS [Uninterruptible Power Supply]) Batteries have Cracked Internal Connections"
- AR 25820, "Shunt Trip Coil Armature on 1B2001 (River Water Supply Pump 1P-117B) Sticks Occasionally when Operated by Hand"

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 operators' ability to respond to an event and implement abnormal and emergency operating procedures.

The following OWAs were reviewed during the inspection period:

- AR 26120, "Potential Seat Leakage through Either/Both CV1579/CV1621 (A/B Feedwater Regulating Valves)"
- AR 23397, "EMAs [Engineering Maintenance Actions] A46577 & 78: AN4162 A/B (Offgas Hydrogen Analyzers) Replacement"
- AR 23816, "Track Replacement of Steam Seal Header Pressure Valve, CV1104, and Closing the Manual Unloader"

b. Findings

No findings of significance were identified.

1R17 Permanent Plant Modifications (71111.17)

a. Inspection Scope

The inspectors reviewed Engineering Change Package (ECP) 1630, associated with the modification to remove and replace the primary containment electrical penetrations,

JX105A and JX105C. The inspectors reviewed the ECP documentation, including the supportive drawings, and appropriate sections of the UFSAR. The work orders associated with the EMA were reviewed. Post maintenance test data was reviewed following the modifications. Portions of the modification installation were observed. The following documents were reviewed:

- Selected portions of ECP 1630, "Penetration Replacement/Upgrade (JX105A and JX105C)"
- Conax Nuclear Report IPS2073, "Design Qualification Report for Electrical Penetration Assemblies for Duane Arnold Nuclear Power Plant," Revision B
- Modification Work Order (MWO) 1115085, "Electrical Penetrations JX105A and JX105C have Exhibited Degraded Performance, Mechanical - Outside"
- MWO 1115084, "Electrical Penetrations JX105A and JX105C have Exhibited Degraded Performance, Mechanical - Inside"
- MWO 1114675, "Electrical Penetrations JX105A and JX105C have Exhibited Degraded Performance, Electrical - Inside"
- MWO 1114682, "Electrical Penetrations JX105A and JX105C have Exhibited Degraded Performance, Electrical - Outside"

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:

- Corrective Work Order (CWO) A55795, "CB Chiller 1V-CH-1A DISCH TO ESW ISOLATION"
- CWO A54879, "RFP [Reactor Feed Pump] 1A Minimum Flow Valve: Valve is Leaking at Body to Bonnet Pressure Seal Gasket"
- CWO A55662, "Motor for the Control Building Heating and Ventilation 1VRF030B Very Hot, Tripped Breaker 1B4219"

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:

- TS 3.7.5, "Control Building Chiller (CBC) System"
- UFSAR Section 9.4.4, "Control Room Ventilation System"
- UFSAR Section 9.4.6, "Engineered Safety Feature Ventilation System"
- OI 644, "Condensate and Feedwater Systems," Revision 52
- OI 730, "Control Building HVAC System," Revision 50

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.

1R20 Refueling and Outage (RFO) Activities (71111.20)

a. Inspection Scope

The inspectors observed the performance of Duane Arnold Energy Center's RFO 17 and evaluated licensee outage activities to ensure that the licensee considered risk in developing the outage schedule; adhered to administrative risk reduction methodologies developed to control plant configuration; developed mitigation strategies for losses of key safety functions; and adhered to the operating license and TS requirements that ensured defense-in-depth. The following specific outage-related activities were accomplished:

- Outage Plan Review

The inspectors reviewed the licensee's outage control plan and verified that the licensee had appropriately considered risk, industry experience, and previous site-specific problems. The inspectors also confirmed that contingency plans for losses of key safety functions had been established.

- Licensee Control of Outage Activities

The inspectors verified that the licensee appropriately managed the configuration of equipment during the outage to ensure that a defense-in-depth commensurate with the outage risk plan for key safety functions and applicable TS was maintained. The inspectors also verified that outage activities were appropriately managed. In particular, out-of-service activities were reviewed to ensure that tags were properly hung to support the out-of-service. Reactor coolant system instrumentation was verified to be configured to provide adequate indication of reactor vessel pressure, temperature, and level. In addition, the inspectors routinely observed decay heat removal system parameters and verified that decay heat removal systems were functioning properly. The inspectors verified that the status and configuration of electrical systems met TS requirements and the licensee's outage risk plan. Switchyard activities were verified to be controlled appropriately. Flow paths, equipment configurations, and alternative means for inventory addition and decay heat removal were verified to be consistent with

the outage risk plan. The inspectors verified that the licensee controlled reactivity and maintained secondary containment in accordance with TS.

- **Monitoring of Heatup and Startup Activities**

The inspectors verified that TS, license conditions, and other prerequisites, commitments, and administrative procedure prerequisites for mode changes were met prior to changing modes or plant configurations. A walkdown of containment was conducted prior to restart; no conditions that would adversely impact plant startup or operational performance were identified.

- **Identification and Resolution of Problems**

The inspectors verified that the licensee identified problems related to refueling outage activities at an appropriate threshold and entered them into the corrective action program.

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) 3.5.1-06, "High Pressure Coolant Injection (HPCI) System Low Pressure Operability Test," Revision 6
- STP 3.5.1-05, "HPCI System Operability Test," Revision 10
- STP NS13B001, "Diesel Fire Pump Electrical Inspections," Revision 19

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. O1-023, “‘A’ Chiller Temporary Recorder”

Documents reviewed during the inspection included:

- OI 730, “Control Room HVAC [Heating, Ventilation & Air Conditioning] System,” Revision 50
- UFSAR Section 6.4, “Habitability Systems”
- System Description 73, “Control Building and Miscellaneous Building HVAC” Revision 1

b. Findings

No findings of significance were identified.

4. **OTHER ACTIVITIES**

4OA1 Performance Indicator Verification (71151)

Cornerstone: Mitigating Systems

a. Inspection Scope

The inspectors reviewed control room operator logs, monthly operating reports, licensee event reports, and performance indicator data packages for the fourth quarter of the year 2000, and the first quarter of 2001, for the unplanned scrams per 7,000 critical hours performance indicator. Appropriate licensee personnel responsible for data collection were interviewed.

b. Findings

No findings of significance were identified.

4OA6 Meeting

Exit Meeting

The inspectors presented the inspection results to Mr. R. Anderson and other members of licensee management on July 3, 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.

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 General Manager
D. Wilson, Vice President Nuclear

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-331/2001-05-01	URI	LSA Boxes Located in the CST Pit May Become Possible Missiles During a Tornado
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Closed

None

Discussed

None

LIST OF ACRONYMS USED

AFP	Area Fire Plan
AR	Action Request
CFR	Code of Federal Regulations
CST	Condensate Storage Tank
CV	Control Valve
CWO	Corrective Work Order
DAEC	Duane Arnold Energy Center
DRP	Division of Reactor Projects
ECP	Engineered Change Package
EMA	Engineering Maintenance Action
HPCI	High Pressure Coolant Injection
HVAC	Heating Ventilation & Air Conditioning
IPOI	Integrated Plant Operating Instruction
IR	Inspection Report
LSA	Low Specific Activity
MWO	Modification Work Order
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OI	Operating Instruction
OWA	Operator Workaround
P&IDs	Piping and Instrumentation Drawings
PWO	Preventive Maintenance Order
RCIC	Reactor Core Isolation Cooling
RFO	Refueling Outage
RPS	Reactor Protection System
SDP	Significance Determination Process
SSCs	Structure, System, or Components
STP	Surveillance Test Procedure
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report