

June 11, 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 50-331/01-04(DRP)

Dear Mr. Van Middlesworth:

On May 19, 2001, the NRC completed an inspection at your Duane Arnold Energy Center facility. The enclosed report documents the inspection findings which were discussed on May 21, 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/*

Ken Riemer, Acting Chief  
Branch 2  
Division of Reactor Projects

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

Enclosure: Inspection Report 50-331/01-04(DRP)

See Attached Distribution

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cc w/encl: E. Protsch, Executive Vice President -  
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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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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

Report No: 50-331/01-04(DRP)

Licensee: Alliant, IES Utilities Inc.

Facility: Duane Arnold Energy Center

Location: 3277 DAEC Road  
Palo, Iowa 52324-9785

Dates: April 2 through May 19, 2001

Inspectors: P. Prescott, Senior Resident Inspector  
M. Kurth, Resident Inspector  
D. Kimble, Resident Inspector, Monticello  
D. Jones, Reactor Engineer  
D. Nelson, Radiation Specialist  
R. Schmitt, Radiation Specialist

Approved by: Ken Riemer, Acting Chief  
Branch 2  
Division of Reactor Projects

## SUMMARY OF FINDINGS

IR 05000331-01-04, on 04/02-05/19/2001, IES Utilities, Inc., Duane Arnold Energy Center, Unit 1.

This report covers a 6-week routine inspection. The inspection was conducted by resident inspectors, radiation specialists, 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. Inspector Identified Findings

**Cornerstones: Initiating Events, Mitigating System, Barrier Integrity, Occupational Radiation Safety**

No findings of significance were identified.

### B. Licensee-Identified Findings

A violation of very low safety significance was identified by the licensee and has been reviewed by the inspectors. Corrective actions taken or planned by the licensee appear reasonable. The violation is listed in Section 4OA7 of this report.

## Report Details

### Summary of Plant Status

The licensee operated the plant at or near full power from April 2 until April 12, 2001. On April 12, at 9:00 a.m., the licensee commenced a scheduled, controlled shutdown to begin refueling outage number 17 (RFO 17). The main generator was removed from the grid on April 12, at 10:47 p.m. For the remainder of the report period, the reactor was shutdown for refueling and scheduled maintenance.

## **1. REACTOR SAFETY**

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

#### 1R04 Equipment Alignment (71111.04)

#### .1 Complete Walkdown: 4160 Vac Essential Switchgear System

##### a. Inspection Scope

Due to the system's risk significance, the inspectors selected the 4160 Vac essential switchgear system for a complete walkdown. The inspectors walked down the system to verify electrical equipment lineups, component labeling, component and equipment cooling, operability of support systems, and to ensure that ancillary equipment or debris did not interfere with equipment operation. Additionally, the inspectors reviewed ongoing outage maintenance and modification activities associated with the Division 1 4160 Vac essential power system and associated Division 1 120 Vac instrument power system.

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

- Tagout SD 4160, "1A3 Outage 4160 Vac Essential Switchgear"
- Tagout SD 4457, "1Y011 120 V Instrument AC Distribution Panel"
- Updated Final Safety Analysis Report (UFSAR) 8.3.1 "AC Power Systems," Revision 14
- Technical Specifications 3.8, "Electrical Power Systems & Bases"
- Operating Instruction (OI) 304.2, "4160V/480V Essential Distribution System," Revision 41
- OI 304.2A1, "4160V/480V Essential Electrical Distribution System Electrical Lineup," Revision 0
- OI 317.1, "120 Vac Instrument Control Power System," Revision 32
- Administrative Control Procedure (ACP) 1410.5, "Tagout Procedure," Revision 34
- Action Report (AR) 18487, "4160V Breaker Cycling Requirements"
- AR 19190, "1A3 Volt Recorder Has Indicated a Voltage Transient on Bus 1A3"
- AR 22796, "1A210 (General Service Water Pump 1P-89C) Failed to Close and Tripped Free When Attempting to Restore System"

- AR 25558, "Lack of Coordination Between 1A3 and "A" RHR [Residual Heat Removal] Tagouts"
- AR 25410, "Load Analysis for 1Y11 and 1Y21 (120V Instrument AC Distribution Panels) Not Current"
- BECH-E006(1), "Single Line Meter & Relay Diagram for 480V System," Revision 27
- BECH-E006(2), "Single Line Meter & Relay Diagram for 480V System," Revision 14
- BECH-E005, "Single Line Meter & Relay Diagram for 4160V System Essential Switchgear 1A3 & 1A4," Revision 12
- BECH-E029(1)-WIP, "Instrument AC Uninterruptible AC & RPS AC Distribution System," Revision 16A
- BECH-E029(2), "Instrument AC Uninterruptible AC & RPS AC Distribution System," Revision 4

b. Findings

No findings of significance were identified.

.2 Partial Walkdowns

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 - Shutdown Cooling
- North End Hydraulic Control Units

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
- Procedure Checklist: OI 149, "Residual Heat Removal System," Revision 71
- Procedure Checklist: OI 255, "Control Rod Drive Hydraulic System," Revision 46

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:

- North turbine building basement reactor feed pump area and turbine lube oil tank area using Fire Plan Volume II, "Fire Brigade Organization," AFP-14, Revision 22
- North turbine building basement lower switchgear room using Fire Plan Volume II, "Fire Brigade Organization," AFP-15, Revision 22
- South turbine building basement condensate pump area using Fire Plan Volume II, "Fire Brigade Organization," AFP-16, Revision 23

b. Findings

No findings of significance were identified.



1R06 Flood Protection (71111.06)

a. Inspection Scope

The inspectors reviewed the licensee's flooding mitigation plans and equipment to determine their consistency with design requirements and the risk analysis assumptions. Walkdowns were performed of the interior and exterior walls of the pump house, reactor building, cooling towers, turbine building, and the low level radiation waste processing and storage facility. Also, the following documents were reviewed:

- Individual Plant Examination
- Individual Plant Examination of External Events
- Abnormal Operating Procedure 902, "Flood," Revision 17
- UFSAR, Section 3.4, "Water Level (Flood) Design"

The licensee initiated corrective actions for inspector identified minor procedural discrepancies that included inadequate flood water level references designed as operator aids. Also, the licensee developed corrective actions for an inspector identified deficiency that involved the potential deterioration of rubber seals for flood doors stored in outdoor environmental conditions.

b. Findings

No Findings of significance were identified.

1R08 Inservice Inspection Activities (71111.08)

a. Inspection Scope

The inspectors evaluated the implementation of the licensee's inservice inspection program for monitoring degradation of the reactor coolant system boundary and the risk significant piping system boundaries. Specifically, the inspectors verified through observations that in-process visual inspection of the torus exterior bays 1 and 12 between the 270 and 360 degree azimuths and ultrasonic inspections of the core shroud H1 weld at the 29 degree azimuth were conducted in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements. The inspectors also reviewed inservice inspection procedures and personnel certifications.

The inspectors reviewed the disposition of a rejectable indication identified in reactor head circumferential weld HCC-B002 (Vessel Head Dollar Weld) including the IWB-3132.4 evaluation, NRC Relief Request (NDE-R041), and additional examination results. The inspectors also reviewed the NIS-2 forms for Code repairs performed during the last outage and confirmed that ASME Code requirements were met.

In addition, the inspectors reviewed reports concerning inservice inspection issues to verify that an appropriate threshold for identifying issues had been established. The inspectors also evaluated the effectiveness of the corrective actions for identified issues,

including the engineering justification for operability, if applicable. Documents reviewed are included at the end of the report.

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:

- High pressure coolant injection system
- Offsite power

The following documentation was also reviewed:

- Duane Arnold Energy Center (DAEC) Performance Criteria Document, "High Pressure Coolant Injection," Revision 2
- DAEC Performance Criteria Document, "Offsite Power," Revision 1

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors reviewed equipment out-of-service risk assessments for planned and emergent maintenance activities associated with the refueling outage (RFO) 17. Risk evaluations and plant configuration control for the maintenance activities were discussed with operations, maintenance, and work control center personnel to evaluate whether

the necessary steps were taken to control the work activities. The following documents were reviewed for RFO 17 planned and emergent maintenance activities:

- DAEC Memorandum, "Refuel Outage Seventeen Shutdown Risk Plan," Revision 0
- Outage Management Guideline 7, "Outage Risk Management Guidelines," Revision 8
- Integrated Plant Operating Instruction 8, "Outage and Refueling Operations," Revision 25
- The daily Shift Technical Assistant Risk Insight evaluations

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 shutdown risk. The inspectors also verified those licensee actions to address increased shutdown risk 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 shutdown 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.

In addition, the inspectors reviewed the following condition reports to verify that identified problems were appropriately characterized and evaluated with respect to maintenance risk assessment and emergent work evaluations.

- AR 24757, "Unexpected Reactor Level Decrease from LLRT [Local Leak Rate Testing] of FW [Feed-Water] Inlet Check Valve"
- AR 24843, "Received "B" Side ½ Scram from IRM [Intermediate Range Monitor] 45472D During Mode Switch to Shutdown Evolution"

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 24842, "The AV7602 (Reactor Building Exhaust to Standby Gas Treatment System Isolation) Damper Failed"
- AR 25426, "Incomplete Ring Girder to Torus Shell Weld"
- AR 25471, "Div. 1 125 Volt DC (1D1) Battery Cell Failed to Meet LCO Surveillance Requirement - Category 'B' Limit for Cell Voltage"

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 22927, "Track Completion of Corrective Work Order A51036: BV [Bypass Valve] #1 (Turbine Main Steam Bypass to High Pressure Condenser 1E-7B) Leaking By"
- AR 24214, "The "A" Reactor Water Cleanup Filter Demineralizer Went into Hold When the "B" Bed was Unisolated"

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) 1116767, "Standby Filter Unit Damper to Cable Spreading Room Cardox System Timer Replacement"
- Corrective Work Order (CWO) A52529, "'B' Emergency Diesel Generator - Rebuild the Lower Vertical Drive Stubshaft"
- Modification Acceptance Test for Engineering Change Package 1630 (JX105A/C), "Penetration Replacement / Replacement - Upgrade JX105A/C Drywell Cooling Components," Revision 0

- CWO A54280, “1Y30A Circuit 1 Replacement (RPS Logic Panel ‘A’ Circuit)”

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 3.8, “Electrical Power Systems”
- TS 3.3.1.1, “Reactor Protection System Instrumentation”
- UFSAR Section 8.3.1.2, “Standby AC Power System”
- OI 324, “Standby Diesel Generator System,” Revision 50
- DAEC ACP 1403.3, “Modification Acceptance Test Control Program,” Revision 8

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 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.

- Monitoring of Shutdown Activities

The inspectors observed the shutdown to RFO 17 and verified that the plant was operated in accordance with regulatory requirements and plant procedures. In particular, the inspectors verified that cooldown restrictions were followed.

- 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. The inspectors verified that flow paths, configurations, and alternative means for inventory addition and decay heat removal were consistent with the outage risk plan. The inspectors verified that the licensee controlled reactivity and maintained secondary containment in accordance with TS requirements.

- **Refueling Activities**

The inspectors verified that fuel handling operations were conducted in accordance with TS and approved procedures. The inspectors also verified that the location of fuel assemblies was tracked from core offload through core reload. In particular, the inspectors verified that the five most reactive fuel bundles were correctly loaded into the core.

- **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. The inspectors conducted a walkdown of containment prior to restart and did not identify any conditions that would adversely impact plant startup or operational performance.

- **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) NS490002, " LPCI [Low Pressure Coolant Injection] Inject Check Valve Full Flow Test," Revision 2
- STP NS730105, "CAM/PASS [Containment Air Monitoring/Post Accident Sampling System] Leakage Inspection," Revision 4
- STP 3.4.9-01, "Heatup and Cooldown Rate Log," Revision 9
- STP 3.8.1-07, "Loss of Offsite Power - Loss of Coolant Accident Test," Revision 8

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. RO-12, "Establish Alternate Water Source of Keep-fill for the 'A' and 'B' Core Spray Systems"

Documents reviewed during the inspection included:

- OI 151, "Core Spray System," Revision 33
- UFSAR 6.3, "Emergency Core Cooling Systems,"

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 and Radiation Work Permit Reviews

a. Inspection Scope

The inspectors conducted walkdowns of radiologically significant areas (radiation and high radiation areas) to verify the adequacy of the licensee's radiological controls (surveys, postings, barricades). Specifically, the inspectors reviewed surveys and walked down radiologically significant areas located in the Auxiliary Building, Reactor Building Containment, and Drywell to determine whether radiation work permit (RWP) prescribed radiological and engineering controls were in place, and whether licensee surveys and postings were complete and accurate in accordance with 10 CFR Part 20 and the licensee's procedures. The inspectors also reviewed RWPs used to access these areas to verify that work instructions and controls had been adequately specified, and that electronic pocket dosimeter set points were in conformity with survey indications.

b. Findings

No findings of significance were identified.

.2 Job-In-Progress Reviews

c. Inspection Scope

The inspectors observed the following high exposure or high radiation area work activities performed during refueling outage No. 17 (RFO 17) and evaluated the licensee's use of radiological controls:

- Torus Desludge, Recoating, and Repair;
- RHR Heat Exchanger (HX) Inspections, Testing, and Cleaning;
- Motor Operated Valve (MOV) Lube, Overhaul, and Cleaning;
- Replace JX 105 A and C Wireway Penetrations; and
- Drywell Cooler Maintenance.

The inspectors reviewed all radiological job requirements for each activity and observed job performance with respect to those requirements. The inspectors reviewed required surveys, including system breach radiation, contamination, and airborne surveys; radiation protection job coverage; and contamination controls to verify that appropriate



radiological controls were utilized consistent with the RWP. The inspectors also reviewed surveys and applicable postings and barricades to verify their accuracy. The inspectors observed radiation protection technician and worker performance at work sites to determine if the technicians and workers were aware of the significance of the radiological conditions in their workplace, the RWP controls/limits, and that they performed adequately, given the level of radiological hazards present and the level of their training.

b. Findings

No findings of significance were identified.

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

.1 Station Exposure History

a. Inspection Scope

The inspectors reviewed the station's collective exposure histories for 1998 to the present. The review also included collective exposures during the 1999 refueling outage (RFO 16) and the to-date 2001 refueling outage (RFO 17). The inspectors performed the reviews to evaluate the licensee's As-Low-As-Is-Reasonably-Achievable program's strengths and weaknesses.

b. Findings

No findings of significance were identified.

.2 Job Site Inspections and ALARA Controls

a. Inspection Scope

The inspectors selected the high exposure or high radiation area work activities described in Section 20S1.2 and evaluated the licensee's use of ALARA controls.

The inspectors reviewed ALARA plans for each activity and observed work activities associated with the Torus refurbishment, RHR HX inspections, MOV valve work, electrical Wireway penetrations work, and maintenance on the Drywell coolers. The inspectors evaluated the licensee's use of engineering controls to achieve dose reductions. The inspectors also determined if workers were utilizing the low dose waiting areas for each activity and whether the first-line supervisor for each job ensured that the jobs were conducted in a dose efficient manner. The inspectors also reviewed individual exposures of selected work groups to determine if there were any significant exposure variations which may exist among workers.

In addition, the inspectors reviewed RWP No. 50380, Job Steps 4, 9, and 10, "Weld Repairs and Inspections in the Torus Proper," for protective clothing requirements, dosimeter use including radiotelemetry dosimetry, and electronic dosimeter alarm set points for both dose rate and accumulated dose. The inspectors attended the pre-job

ALARA and work control briefings, and observed major portions of each work evolution via deck plate observation and the licensee's remote closed circuit monitoring system, in order to verify that adequate work controls were in place to maintain worker exposures ALARA.

b. Findings

No findings of significance were identified.

.3 Source Term Reduction and Control

a. Inspection Scope

The inspectors evaluated the licensee's source term reduction program in order to verify that the licensee had an effective program in place, and was knowledgeable of plant source term and techniques for its reduction. Topics reviewed included:

- Zinc Injection into Reactor Coolant;
- Hot Spot Reduction Program;
- Vessel Nozzle Flushing;
- System Flushing;
- Noble Metal Chemical Addition; And
- Feed Water Iron Control.

b. Findings

No findings of significance were identified.

.4 Radiological Work Planning

a. Inspection Scope

The inspectors selected the following RFO 17 outage job activities that were expected to exceed five person-rem to assess the adequacy of the radiological controls and work planning:

- In Service Inspections;
- Temporary Shielding Installation;
- RHR Heat Exchanger Inspections, Testing, and Cleaning;
- Motor Operated Valve Lube, Overhaul, and Cleaning;
- Replace JX 105 A and C Wireway Penetrations; and
- Drywell Cooler Maintenance.

For each job activity, the inspectors reviewed ALARA evaluations including initial reviews, in-progress reviews, and associated dose mitigation techniques and evaluated the licensee's exposure estimates and performance. The inspectors also assessed the integration of ALARA requirements into work packages to evaluate the licensee's communication of radiological work controls.

b. Findings

No findings of significance were identified.

.5 Verification of Exposure Goals and Exposure Tracking System

a. Inspection Scope

The inspectors reviewed the methodology and assumptions used for RFO 17 exposure estimates and exposure goals and compared job dose rate and man-hour estimates for accuracy. The inspectors examined job dose history files and dose reductions anticipated through lessons learned to verify that the licensee appropriately forecasted outage doses. The inspectors also reviewed the licensee's exposure tracking system to determine if the level of exposure tracking detail, exposure report timeliness and exposure report distribution was sufficient to support control of collective exposures.

b. Findings

No findings of significance were identified.

.6 Declared Pregnant Workers

a. Inspection Scope

The inspectors reviewed the controls implemented by the licensee for one worker who voluntarily declared a pregnancy within the last 18 months. Specifically, the inspectors reviewed the licensee's adherence to the requirements contained in 10 CFR 20.1208 and its procedures, and reviewed the licensee's evaluation of the dose to the individual's embryos/fetus to verify that appropriate limitations were implemented to control dose from both external and internal sources.

b. Findings

No findings of significance were identified.

.7 Identification and Resolution of Problems (71121.01 and 71121.02)

a. Inspection Scope

The inspectors evaluated the effectiveness of the licensee's self-assessment process to identify, characterize, and prioritize problems. The inspectors reviewed Pre-Outage Assessments for RFO 17 related ALARA and access control issues to determine if they were adequately addressed. The inspectors also reviewed Second Quarter Quality Assurance Assessment Reports for Outage Activities performed by the Quality Assurance Department during the early stages (first 24 days) of RFO 17 and action reports (AR) to assess the adequacy of the licensee's ability to identify problems.

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 third quarter of the year 2000, and first quarter of the year 2001, for the safety system unavailability of reactor core isolation cooling system to verify that the performance indicator reported to the NRC was accurate. Appropriate licensee personnel responsible for data collection were interviewed.

b. Findings

No findings of significance were identified.

4OA6 Management Meeting

Exit Meeting

The inspectors presented the inspection results to Mr. R. Anderson and other members of licensee management on May 21, 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.

4OA7 Licensee-Identified Violation

The following finding of very low safety significance was identified by the licensee and is a violation of NRC requirements which meets the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600, for being dispositioned as a Non-Cited Violation (NCV). If you deny this NCV, you should provide a response with the basis of your denial, within 30 days of the date of this 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.

NCV Tracking Number

Requirement Licensee Failed to Meet

(1) NCV 50-331/01-04-01

10 CFR Part 50, Appendix B, Criterion V, required, in part, that activities affecting quality shall be prescribed by documented procedures and shall be accomplished in accordance with these procedures. Administrative Control Procedure 1203.42, "Field Variances," Revision 8, Attachment 2, "Field Variance Criteria," requires, in part, that a field variance can not affect the design intent or the engineered change package (ECP) safety evaluation applicability review/safety evaluation. On May 3, 2001, the licensee determined that a field variance was performed that affected the design intent for ECP 1622, "Instrument AC Upgrade." In particular, a quality level (QL) IV terminal block was used to address an engineered design change that was to upgrade the circuit to QL I status. The issue was corrected and documented by the licensee in AR 221719. This is being treated as an NCV.

## KEY POINTS OF CONTACT

### Licensee

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

## ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

50-331/2001-04-01	NCV	Failure to Follow Procedure for Field Variance to Engineered Change Package
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### Closed

50-331/2001-04-01	NCV	Failure to Follow Procedure for Field Variance to Engineered Change Package
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### Discussed

None

## LIST OF ACRONYMS USED

ACP	Administrative Control Procedure
AFP	Area Fire Plan
ALARA	As-Low-As-Reasonably-Achievable
AR	Action Request
CFR	Code of Federal Regulations
CWO	Corrective Work Order
DAEC	Duane Arnold Energy Center
DRP	Division of Reactor Projects
ECP	Engineered Change Package
HX	Heat Exchanger
IR	Inspection Report
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OI	Operating Instruction
OWA	Operator Workaround
P&IDs	Piping and Instrumentation Drawings
PWO	Preventive Maintenance Order
QL	Quality Level
RFO	Refueling Outage
RHR	Residual Heat Removal
RWP	Radiation Work Permit
SDP	Significance Determination Process
SSCs	Structure, System, or Components
STP	Surveillance Test Procedure
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report

## LIST OF BASELINE INSPECTIONS PERFORMED

The following inspectable-area procedures were used to perform inspections during the report period. Documented findings are contained in the body of the report.

Inspection Procedure		
<u>Number</u>	<u>Title</u>	<u>Report Section</u>
71111-04	Equipment Alignment	1R04
71111-05	Fire Protection	1R05
71111-06	Flood Protection	1R06
71111-08	Inservice Inspection Activities	1R08
71111-12	Maintenance Rule Implementation	1R12
71111-13	Maintenance Risk Assessment and Emergent Work Evaluation	1R13
71111-15	Operability Evaluations	1R15
71111-16	Operator Workarounds	1R16
71111-19	Post Maintenance Testing	1R19
71111-20	Refueling Outage	1R20
71111-22	Surveillance Testing	1R22
71111-23	Temporary Plant Modifications	1R23
71121-01	Access Control to Radiologically Significant Areas	2OS1
71121-02	ALARA Planning and Controls	2OS2
71151	Performance Indicator Verification	40A1
(none)	Meetings, Including Exit	40A6
(none)	Licensee-Identified Violation	40A7



## LIST OF DOCUMENTS REVIEWED

### 1R08 Inservice Inspection

54-ISI-107-4	Remote Ultrasonic Examination of Boiling Water Reactor (BWR) Core Shroud Assembly Weld Seams	March 23, 2001
54-ISI-21-28	Administrative Procedure for the Written Practice of Personnel Qualification in Ultrasonic Examination	March 8, 2001
1211.18	NDE Procedure for Containment Inspection- Visual Exams VT-1 & VT-3	January 27, 2000
NIS-2 #16-99-26	Applied Weld Overlay	November 23, 1999
AR# 17687	Indication on Recirc Riser Nozzle NZF	November 10, 1999
AR# 25415	Linear Indication on Welds JX105A & C	April 25, 2001
AR# 17614	Disposition Nonconformance: Two Linear Indications Found in Recirculation Inlet Nozzle N2B, Weld #RRB-F002 (Nozzle to Safe-End)	November 6, 1999
AR# 25937	Indication on HCC-B002 (Vessel Head Dollar Weld)	April 24, 2001

### 20S1 Access Control to Radiologically Significant Areas

#### Station Procedures

ACP 1411.17	Occupational Dose Limits and Upgrades	June 28,2000
HHP3101.05	Administration of Radiation Work Permits	February 15, 2001
RPM	Radiation Protection Manual	March 2000
TBD #3	Area Accessibility Definition for Posting Considerations	July 7, 1998
TBD #5	Radioactive Material Labeling	August 12, 1998
TBD #6	DAEC High Radiation Area Access Controls	October 7, 1998
10 CFR Part 20	Cross Reference for Duane Arnold Energy Center	March 17, 2000

Action Reports and Associated Action Request Forms

22693	Worker Entered Posted HRA on Wrong RWP or Document	December 1, 2000
25062	Inconsistent Requirements for PC Usage	April 18, 2001
25114	Health Physics Technician Not Wearing Radiotelemetry While in Drywell.	April 15, 2001
25245	Evaluate Use of Protective Covers for Workers Hard Hat	April 17, 2001
21742	Poor Radiological Work Practices in Torus Diving Operations	April 20, 2001
25323	Failure to Post Radiation Area Barriers	April 25, 2001
25502	Worker Exceeded ED Accumulated Dose and Dose Rate	May 1, 2001
25646	Questionable ED Response	May 5, 2001

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

Station Procedures

HPP 3102.02	ALARA Job Planning (with Attachment 3, Respiratory Protection Worksheet)	February 22, 2001
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RWPs and associated ALARA Reviews

10230	Heat Exchanger and Cooler Maintenance
40033	NRC, Managers, Engineers, and Refueling Inquires or Tours
40070	Temporary Shielding Installation
40120	Motor Operated Valve Work
40210	In-Service Inspection
40230	Drywell Cooler Maintenance
40501	Electrical Penetrations Work
50380	Weld Repairs and Inspections in the Torus

Nuclear Performance Assessment Department Assessment

RFO 17, Pre-Outage Assessment	First Quarter, 2001
On-going RFO 17 Assessments,	April 12, 2001 to May 5, 2001

Other Documents

DAEC Source Term Reduction Graphics Charts	January 1980 to January 2000
DAEC Radiation Exposure Graphics Charts	Station's Two and Three Year Rolling Averages
DAEC Radiation Exposure Graphics Charts	RFO 17 Goals and Doses to Date, May 5, 2001
Declaration of Worker Pregnancy Paperwork, Copies of E-mails and Computer Records	May 9, 2001
Project Meeting Notes Pre-Outage RFO 17	
DAEC RFO 17 Questionnaire, Final Summary	
DAEC Daily Exposure Report RFO 17	May 9, 2001
DAEC Daily Focus RFO 17 Newsletter	May 10, 2000