July 2, 2001
NG-01-0830

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station 0-P1-17
Washington, D.C. 20555-0001

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Licensee Event Report #2001-001-00
File: A-120

Dear Sirs:

Please find attached the subject Licensee Event Report (LER) submitted in accordance with 10CFR50.73. There are no new commitments contained within this report. Should you have any questions regarding this report, please contact this office.

Sincerely,

Rob Anderson,
Plant Manager - Nuclear

cc: Mr. James Dyer
Regional Administrator, Region III
U. S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532

NRC Resident Inspector - DAEC
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NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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TITLE (4)

Valid Reactor Protection System Actuation from High Scram Discharge Volume Water Level Due to Maintenance-Induced Equipment Problems

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	08	2001	2001	– 001	– 00	07	02	2001	FACILITY NAME	DOCKET NUMBER

		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)							
OPERATING MODE (9)	5		20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
POWER LEVEL (10)	0		20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
			20.2203(a)(1)		50.36(c)(1)(i)(A)	X	50.73(a)(2)(iv)(A)		73.71(a)(4)
			20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
			20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER
			20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		
			20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
			20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
			20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
John W. Karrick, Nuclear Licensing	319-851-7901

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	AA	FCV	G082	Y					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 8, 2001, during a refueling outage, a Reactor Protection System (RPS) actuation occurred as a result of an actual high water level condition in the scram discharge volume (SDV) of the control rod drive (CRD) hydraulic system. All controls rods were already fully inserted at the time of the actuation. No control rod motion was experienced as a result of this actuation. The SDV had been isolated due to an improperly installed solenoid valve that was discovered upon system restoration. With the SDV isolated, unexpected scram outlet valve leakage filled the SDV and resulted in the RPS actuation. The cause of the valve leakage was incorrect valve seat loading. Corrective actions included correcting the solenoid valve installation, re-performing seat adjustments on applicable scram outlet valves and inspections of other scram valves. Follow-up actions include procedural improvements, lessons learned briefings, and potential enhancements to post maintenance testing. There were no actual safety consequences from this event. There was no effect on public health and safety as a result of this event.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

I. Description of Event:

Initial Plant Conditions:

The plant was shutdown and in Mode 5 for refueling outage (RFO) 17 at the time of the event. Overhauls to 88 air-operated control rod drive (CRD) system valves had been performed during the outage as a scheduled preventive maintenance activity. Specifically, the scram inlet and outlet valves for 44 CRD Hydraulic Control Units (HCUs) had been overhauled. The overhauls had been conducted in accordance with pre-planned work orders with specific instructions from procedure CRDRVE-G082-01. The overhaul activity involved removing the air actuators, replacing the diaphragms in the actuators, and resetting the bench set and travel. Other completed system work included replacement of SV1868A/SV1869A, the dual solenoid pilot valve for the SDV vent and drain valves, with a new model valve. Also applicable to the event, the Scram Discharge Volume (SDV) Not-Drained alarm was illuminated due to electrical (1Y11) work.

Evolution Leading up to the Event:

On May 8, 2001, an operator (utility licensed operator) was assigned the task of clearing the CRD system tagout (SD-4155). The first step in restoring the system was to return the air supply portion of the system to service. The operator noticed air connections disconnected on 3 of the 88 scram valves that had been worked. Restoration of the system was halted and appropriate notifications were made. Action Request (AR) 25864 was written to document the condition of the air lines. Maintenance technicians took prompt action to connect the air lines and perform inspections of the remaining valves.

The operator resumed clearing tags and restoring the air supply portion of the system. After experiencing difficulty in obtaining adequate system air pressure (70-75 psig), the operator noticed a dual solenoid valve (SV1868A/SV1869A) venting air. Again, the appropriate notifications were made and an AR was written (AR 25531). Control Room and Work Control Center personnel (utility licensed operators) discussed the air leakage and decided to isolate the air supply to SV1868A/SV1869A and continue with system restoration. It was recognized at that time that the SDV, which is normally drained and vented, would remain isolated.

As the water portion of the CRD system was restored, unexpected leakage past scram valves began filling the isolated SDV. At approximately 1612, a rod block was received in the Control Room from the SDV 24-gallon level switch. However, the rod block was not recognized as being generated from the increasing level in the SDV. It should be noted that, at this point during the outage, rod blocks caused by refuel floor activities were not unusual. Therefore, operators treated the rod block as an expected alarm. Also, there is not a separate annunciator for the 24-gallon level in the SDV. A computer point provides indication of the source of rod blocks. At 1627, after reaching the SDV 60-gallon scram setpoint, a full RPS actuation was received. All control rods were fully inserted at the time of the trip. There was no control rod motion as a result of the trip. The RPS logic functioned as designed upon receipt of the trip signal.

I. Description of Event (continued):

Restoration:

The source of the drive water leakage (into the SDV) was later determined to be from two air-operated scram outlet valves. The identified air leak came from the newly installed solenoid valve that was installed with the air pressure supply connected to the wrong port on the valve. These discrepancies were corrected and the scram was reset at 0348 on May 9, 2001.

II. Cause of Event:

The cause of the RPS actuation was the high water level in the SDV. The high water level was caused by a combination of two separate maintenance-induced equipment problems. First, the incorrect installation of SV1868A/SV1869A left the SDV isolated (SDV vent and drain valves are held open when air is applied to their actuators) during system restoration. Secondly, unexpected and excessive water leakage past the seat of CV-1850(10-07) filled the SDV with water. These two maintenance issues are considered the causal factors to the event.

SV1868A/SV1869A Installation:

The planned outage work to SV1868A/SV1869A was to upgrade the dual solenoid valve to improve stroke times for the air-operated valves supplied by the solenoids. A valve from a different manufacturer was chosen for the upgrade. The original valve was an ASCO model HT8323A22V. The replacement valve is an AVCO model U060-GABB. Installation of the new valve was planned and evaluated under Engineered Maintenance Action (EMA) A50998.

The project engineer/planner (utility non-licensed) for the job performed a field walkdown of the existing configuration to help plan for the support brackets and tubing alignment for the new valve. During that walkdown, the planner incorrectly concluded that the air supply pressure to the valve was coming from the right hand side of the valve into port 1 on the valve body. The planner assumed the manual isolation valve on the right hand side of the solenoid was an inlet isolation when, in fact, it was an outlet isolation valve. It was later realized that supply pressure was actually coming into the existing (ASCO) valve from the left side at port 2 and that the older ASCO valve was a universal design with respect to port 1 and port 2 on the valve.

The new AVCO valve was not a universal design in that supply pressure is required to be connected to port 1 on the right hand side of the valve. Pre-installation bench testing in the shop had been performed successfully using the correct port. When looking at both valves face-on, the three ports are identified identically (port 1 to the right, port 2 to the left and port 3, the exhaust, toward the top). Based on the walkdown, the installation of the new AVCO valve was planned in the same orientation as the older ASCO valve. Functionally, the air lines were connected to the new valve backwards. Therefore, when the operator attempted to pressurize the air supply lines to the CRD valves, SV1868A/SV1869A was porting air out of its exhaust instead of directing air to the operators of the SDV vent and drain valves.

II. Cause of Event (continued):

The root cause of the installation error is the failure to properly identify the correct air supply configuration in view of the design differences between the two valves. (Human Engineering/Complex System/Knowledge-Based Decision Required).

Scram Outlet Valve Leakage:

There were two scram valves that were identified as having seat leakage after the scram signal was received. One of the valves, CV1850(10-07) had been overhauled during the outage and was considered to be the major source of leakage into the SDV. The other leaking valve, CV1850(38-35), had not been overhauled during RFO-17.

The cause of the seat leakage for CV1850(10-07) was the lack of seat loading. The coupling that joins the valve stem to the operator stem was found out of alignment (AR 25835). The root cause of the coupling misalignment can not be determined. The procedure contains a step to torque the coupling bolt during which misalignment can occur.

A post maintenance walkdown conducted after receiving the RPS trip identified other discrepancies with the overall scram valve maintenance. Causes of these other discrepancies included a need for more Quality Control inspections, procedural adequacy and adherence issues, and improvements needed in job planning/work organization. These issues are considered contributing factors to the scram outlet valve leakage. 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. This lack of post maintenance testing is considered a contributing factor.

III. Assessment of Safety Consequences :

The plant would not have been started up without detecting the solenoid valve problem. The planned post maintenance testing (which included stroke timing the SDV vent and drain valves) had not yet been performed when the event occurred. The installation error would have been detected at that time.

Scram outlet valve leakage may have gone undetected until operating at power. According to General Electric Service Information Letter (SIL) 173, Supplement 1, dated September 20, 1999, scram outlet valve leakage might have resulted in increased control rod drive temperatures. However, a control room annunciator (1C05A, E-6, "CRD DRIVE MECHANISM HI TEMP") exists that would alert operators to such a condition. The alarm setpoint is 250 degrees F, well below the temperature range (400-450 degrees F) at which, according to the SIL, performance of the control rod drive might be impacted. Also, the Annunciator Response Procedure (ARP), Revision 3, dated October 21, 1999, includes a step for an operator to check for a leaking scram discharge valve (discharge line hot to the touch). The alarms and approved procedures are considered adequate barriers to have identified the leakage had it not been detected during this event. Therefore, the potential consequences of undetected scram valve leakage are minimal.

III. Assessment of Safety Consequences (continued):

There were no systems, structures, or components that were inoperable at the start of the event that contributed to the event. Variations in plant operating mode (other than discussed above) would not have impacted the safety significance of this event. This event did not affect the availability of systems needed to maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident.

IV. Corrective Actions:

Completed Actions for SV1868A/SV1869A:

1. The air tubing to SV1868A/SV1869A was successfully re-routed to the correct ports on the valve (CWO A50998, revision 2) on May 8, 2001.

Completed Actions for Scram Outlet Valve Leakage:

2. Both leaking scram valves were adjusted and leak tested satisfactorily (CWOs A54294 and A54295) on May 10, 2001. CV1850(38-35), the valve not overhauled during RFO17, was noted as having only minor leakage.
3. The remainder of the scram valves that were overhauled during RFO-17 were satisfactorily tested for leakage using an acoustic measuring device.
4. The I-1 project (scram valve maintenance) team conducted an outage lessons learned meeting and included issues specific to scram valve maintenance for the next outage. (I-1 Project Report dated June 21, 2001).

Follow-up Actions for SV1868A/SV1869A:

1. The project engineer involved in the job planning for the solenoid valve installation will conduct a lessons learned briefing for Project Engineering staff. (AR 25798, due Sept 7, 2001).

Follow-up Actions for Scram Outlet Valve Leakage:

2. CRDRVE-G082-01 will be revised to add details for valve overhaul, add QC inspection points, and create a post-overhaul inspection checklist as needed (AR 25864 due March 21, 2002).
3. An evaluation will be completed to determine if scram valve post maintenance seat leakage tests are necessary. (AR 25799, due March 1, 2002, tied to the above procedure revision).

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V. Additional Information:

Previous similar occurrences:

A review of LERs at DAEC over the last 3 years found LER 2000-001 and LER 2000-002 that involved RPS trips. The specific corrective actions for those events are not expected to have prevented this event.

EIIS System and Component Codes:

Control Rod Drive System: AA
Solenoid Valve, Flow: FSV
Control Valve, Flow: FCV
Scram Valves: Hammel-Dahl valves on HCU models 729E950G1-G6

A 10CFR50.72(b)(3)(iv)(A) notification was made on May 8, 2001, and is listed as event number EN 37974. This report is being submitted pursuant to 10CFR50.73(a)(2)(iv)(A).