

April 25, 2002  
NG-02-0344

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 #2002-001-00

File: A-120

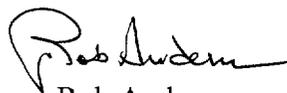
Dear Sirs:

Please find attached the subject Licensee Event Report (LER) submitted in accordance with 10CFR50.73. The following commitments have been made for this report:

1. An evaluation for a more positive method of preventing nut rotation as an alternative to the setscrew for this type of valve will be performed.
2. Follow-up maintenance will be performed as necessary on similar valves to prevent recurrence. The maintenance will include removal of the operator cover and internal inspection that includes the security of the nut and it's setscrew and lubrication of the gears. Security of the valve hand wheel and proper engagement of the cover bolts should also be verified. This will be accomplished during normal, scheduled system windows and during the next refuel outage.

Should you have any questions regarding this report, please contact this office.

Sincerely,



Rob Anderson,  
Plant Manager - Nuclear

April 25, 2002  
NG-02-0344

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

NRC Resident Inspector - DAEC  
DOCU

<b>NRC FORM 366</b> (1-2001)	<b>U.S. NUCLEAR REGULATORY COMMISSION</b>	<b>APPROVED BY OMB NO. 3150-0104</b> Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.
<b>LICENSEE EVENT REPORT (LER)</b> (See reverse for required number of digits/characters for each block)		<b>EXPIRES 6-30-2001</b>

<b>FACILITY NAME (1)</b> Duane Arnold Energy Center	<b>DOCKET NUMBER (2)</b> 05000331	<b>PAGE (3)</b> 1 of 4
--------------------------------------------------------	--------------------------------------	---------------------------

**TITLE (4)**  
 Unplanned Mode Change While Re-Aligning the RHR System from Shutdown Cooling (SDC) Mode to Low Pressure Coolant Injection (LPCI) Standby Readiness During Reactor Startup

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
03	08	2002	2002	- 001	- 00	04	25	2002		

<b>OPERATING MODE (9)</b>	4	<b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)</b>								
<b>POWER LEVEL (10)</b>	000	20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
		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)			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)			X	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)**

<b>NAME</b> Bill McVicker, Operating Experience Coordinator	<b>TELEPHONE NUMBER (Include Area Code)</b> 319-851-7478
----------------------------------------------------------------	-------------------------------------------------------------

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	BO	V	A391	N					

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

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

In preparing to transition from Mode 4 to Mode 3, the Control Room Operators had secured Shutdown Cooling (SDC). The running recirculation pump and decay heat were raising Reactor Coolant System (RCS) temperature as expected. During the realignment of Low Pressure Coolant Injection (LPCI), Residual Heat Removal (RHR) Crosstie Valve, V19-0048, could not be opened. The inability to open this valve prevented the restoration of LPCI to standby readiness. The inability to place LPCI in standby readiness meant that the transition to Mode 3 would result in a violation of Technical Specification 3.0.4 and a failure to meet Technical Specification Surveillance Requirement 3.5.1.2. Operators were unable to restore SDC in time to prevent the transition to Mode 3 as RCS temperature momentarily exceeded 212 degrees Fahrenheit. The cause of this event is the failure of a setscrew in the manual operator of the RHR Crosstie Valve V19-0048. The setscrew did not hold the yoke sleeve nut in place. The yoke sleeve nut had backed off its threads and fallen onto the valve stem preventing normal operation of the valve. Recommended corrective actions include inspection of V19-0048 and similar manual valves to ensure that the setscrews are secure. There were no actual safety consequences associated with this event.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Duane Arnold Energy Center	05000331	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 of 4
		2002	- 001	- 00	

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

**I. Description of Event:**

The startup package was complete and preparations were being made to start the plant after a planned maintenance outage. On 3/8/02, At 0053, as part of securing Shutdown Cooling (SDC) and re-aligning to LPCI mode, the operator closed MO2004, the "A" LPCI outboard inject valve, and within a few seconds secured the "C" RHR pump. Coolant temperature at this time was 155 degrees Fahrenheit. Right after securing the RHR pump the Control Room received a low pressure header alarm. Since LPCI is required to be operable in Mode 3 and routine heat up from Cold Shutdown (Mode 4) conditions was in progress, the OSS declared the "A" LPCI subsystem inoperable due to a prolonged low-pressure condition. The required action for this condition is to fill and vent the system. At 0150, following the filling and venting, the "A" LPCI subsystem was declared operable. The delay in restoring LPCI to standby readiness condition due to depressurization consumed some of the available time to boil and is considered a contributing factor to this event.

After the filling/venting process, the next step was to open V19-0048. The operator opening V19-0048 felt binding in the valve and stopped with the valve slightly open. He then discovered that one of the four cap screws that secure the valve operator cover was missing and two others were loose. Two mechanics were dispatched to investigate. Upon removal of the cover and stem protector it was discovered that the yoke sleeve nut had come loose and had dropped onto the stem. The nut resting on the stem prevented the stem from traveling through the cover and the stem protector, thereby preventing the valve from opening. After installing the yoke stem nut, the mechanics told the Control Room that the valve could be opened but another half hour would be needed to complete needed repairs. At this time (about 0240), the Operations Shift Manager decided instead to shut V19-0048 and restore SDC operation. The cover was then reinstalled and the valve was closed.

At the time the decision was made to return to shut down cooling the time to boil was 36 minutes. Without the ability to open the crosstie, LPCI could no longer be considered operable. Realignment of "A" RHR for SDC commenced. This required re-establishing the correct flow path for pump start, restarting RHRSW, and some SDC tagging activities. The "A" SDC was established at 0315. The reactor coolant bulk temperature exceeded 212 degrees Fahrenheit at 0313 and Mode 3 was entered for a period of approximately 6 minutes.

Subsequently, Mechanical Maintenance personnel removed the cover, then removed, smoothed, and reinstalled the nut. Later that day SDC mode of RHR was exited; V19-0048 successfully opened and plant startup resumed.

**II. Cause of Event:**

Failure of yoke sleeve nut setscrew to prevent the nut from loosening was the root cause of this event. A lack of preventive maintenance was a potential cause but based on discussions with the vendor, no maintenance other than what was historically done was recommended. Additionally, poor design was considered as a potential cause (lack of securing the set screw) but it was concluded that the original design requirements were followed.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Duane Arnold Energy Center	05000331	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 of 4
		2002	- 001	- 00	

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

**II. Cause of Event (continued) :**

Technical Specifications permit entry into Mode 3 while still in SDC if RHR can be realigned to LPCI mode. Depressurization of RHR while securing from SDC delayed discovery of the V19-0048 problem. Had this not occurred, a longer time to boil would have been available to restore SDC. This is therefore considered a contributing factor.

**III. Assessment of Safety Consequences :**

This event had no safety consequences. Although SDC was not re-established in time to prevent the mode change, it was started in a deliberate, controlled manner in accordance with procedures. Since both Core Spray subsystems were operable, no loss of safety function occurred. Forced circulation through the core was maintained by continuous operation of the running recirculation pump throughout the event. The failure of V19-0048 at no time prevented the restart of shutdown cooling. If V19-0048 could not have been closed, the motor-operated crosstie, MO-2010, could have been closed instead.

A review of similar valve designs was conducted and revealed twenty-three bevel gear manual operator valves similar to V19-0048. All of these valves are used as pressure boundary in safety-related applications. These valves are operated only for maintenance or surveillance testing. Only V19-0048 is routinely realigned as part of normal system operation. Failure of any of these valves has a potential to cause or extend an LCO, however, none has an active function to realign.

**IV. Corrective Actions:**

1. Mechanical Maintenance personnel removed the cover of V19-0048, then removed, smoothed, and reinstalled the nut. The nut setscrew was installed with Loctite to prevent loosening. The gears were lubricated and the cover was reinstalled with 1/4"-20 x 1" capscrews (vs. the 1/4"-20 x 7/8" removed) for thread engagement into the gearbox. (WO#A57740, completed 3/8/2002)
2. Evaluation of a more positive method of preventing nut rotation as an alternative to the setscrew for this type of valve will be performed. (AR#30532, due to be completed by 5/10/2002)
3. Follow-up maintenance will be performed as necessary on similar valves to prevent recurrence. The maintenance will include removal of the operator cover and internal inspection that includes the security of the nut and its set screw and lubrication of the gears. Security of the valve hand wheel and proper engagement of the cover bolts should also be verified. This will be accomplished during normal, scheduled system windows and during the next refuel outage. (AR#30494, due to be completed by 5/31/2003)
4. Procedural guidance is to be developed for securing SDC and preventing depressurization of the RHR system during plant startup. (AR#30106, due to be completed by 6/14/2002)

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Duane Arnold Energy Center	05000331	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 of 4
		2002	- 001	- 00	

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

**V. Additional Information:**

V-19-0048 Maintenance History:

A review of maintenance history revealed that the last work performed on the operating mechanism of V19-0048 was in May 1985 when the stem was replaced. The valve was disassembled to correct a seat leakage problem in July 1985. In both of these cases the operator would have been disassembled. Neither of these work orders contains any instructions regarding the setscrew or any mention of problems with the setscrew. The Anchor Darling vendor manual for the valve and operator contains no mention of the locking device for the yoke stem nut in either the disassembly or assembly instructions. The setscrew does appear on the vendor drawing. One other related work order was the replacement of two socket head cap screws that hold the stem housing in place.

Anchor Darling has employed a number of methods to prevent loosening of the yoke sleeve nut. The setscrew as in V19-0048 is an early design that was later changed to staking the yoke sleeve nut to the yoke sleeve. Later still, the nut and bevel gear were drilled and a roll pin installed. They were not aware of cases in which the setscrew design actually failed to retain the yoke sleeve nut.

EIIS System and Component Codes:

Low Pressure Coolant Injection System: BO  
V19-0048 RHR Crosstie Valve, Anchor Darling Valve Company (A391), Model 1889-3

This report is being submitted pursuant to 10CFR50.73(a)(2)(i)(B).