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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 88-002-00:on 880411,HPCI inoperability due to sensing line blockage of auxilliary oil pump pressure switch.

W/8 ltr.

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TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

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NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Duane Arnold Energy Center (DAEC)	0 5 0 0 0 3 3 1	1 OF 0 6

TITLE (4) High Pressure Coolant Injection Inoperability Due to Sensing Line Blockage of the Auxiliary Oil Pump Pressure Switch

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 4	1 1	8 8	8 8	0 0 2	0 0	0 5	0 6	8 8	None	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.38(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Brian K. Smith, Technical Support Specialist	AREA CODE 3 1 9 8 5 1 - 7 4 5 6

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
B	B J	P S	S 3 4 5	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 fifteen single-space typewritten lines) (16)

On April 11, 1988 at 0100 hours, the plant was operating at 100% power with a scheduled High Pressure Coolant Injection (HPCI) Operability Surveillance Test in progress. At 0206 hours, the HPCI turbine was manually tripped while returning the HPCI System to its normal standby lineup after successful operational data was obtained. During turbine coastdown, the HPCI Auxiliary Lube Oil Pump did not start as required to supply lubricating and control oil pressure for the HPCI turbine. Subsequent investigation revealed that a small piece of Teflon tape blocked the sensing bellows orifice of the Auxiliary Oil Pump pressure switch. This pressure switch, in conjunction with the control handswitch, controls the operation of the Auxiliary Oil Pump.

The appropriate Limiting Condition for Operation (LCO) was entered and, upon restoration, was exited. There was no effect on the safe operation of the plant.

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NRC Form 368

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Duane Arnold Energy Center (DAEC)	0 5 0 0 0 3 3 1	8 8	— 0 0 2	— 0 0	0 2 OF 0 6

TEXT (If more space is required, use additional NRC Form 366A's) (17)

I. DESCRIPTION OF EVENTS:

On April 11, 1988 at 0100 hours with the plant operating at 100% power, the High Pressure Coolant Injection (HPCI) (EIIS System BJ) System Operability Test was started. After successfully operating the HPCI turbine and obtaining the required test data, Operations personnel began returning the HPCI System to the normal standby mode. The HPCI turbine was manually tripped in accordance with the test at 0206 hours. The HPCI Auxiliary Lube Oil Pump (1P-218), which supplies lubricating (lube) oil pressure for the HPCI turbine during turbine coastdown, did not start as required. Attempts to manually start the HPCI Aux Oil Pump from the Control Room via the control handswitch were unsuccessful, and the handswitch was returned to the AUTO position. The HPCI System was declared inoperable at 0222 hours and a seven day Limiting Condition for Operation (LCO) was entered in accordance with Technical Specification 3.5.D.2. The required HPCI System Inoperability Test was initiated to demonstrate operability of the Reactor Core Isolation Cooling (RCIC) System (EIIS System BN), the Automatic Depressurization System (ADS) (EIIS System SB), the Low Pressure Coolant Injection (LPCI) System (EIIS System BO), and the Core Spray (CS) System (EIIS System BM). At 0230 hours, approximately twenty (20) minutes after the turbine was tripped, Operations personnel noted that the HPCI Aux Oil Pump had automatically started and was supplying oil to the HPCI turbine. However, the turbine had previously been verified as fully stopped when the HPCI System was returned to the normal standby lineup for the test and applying lube oil in this condition is unnecessary.

II. CAUSE OF EVENT:

Investigation into the cause of the inability of the HPCI Aux Oil Pump to start and operate as required revealed a failure of the HPCI Aux Oil Pump pressure switch (PS2288). PS2288, in conjunction with the control handswitch, senses the HPCI System lube oil pressure to start and stop the pump. Further investigation revealed the root cause of the HPCI Aux Oil Pump inoperability was the inlet orifice to the sensing bellows for the pressure switch was partially blocked by a small piece of Teflon tape. This was discovered on April 12, during an inspection of the pressure switch by maintenance personnel. Previously, late in the day on April 11, maintenance personnel had attempted to calibrate the pressure switch while investigating the cause of the HPCI Aux Oil Pump inoperability but were unsuccessful.

Upon receipt of a HPCI system initiation signal, the HPCI Aux Oil Pump starts and provides lube oil pressure for the HPCI turbine for bearing lubrication and for control valve operation. As the HPCI turbine increases in speed, lube oil pressure rises due to the shaft-driven lube oil pump. When lube oil pressure has increased to ninety-five (95) psig, indicating an adequate supply of lube oil due to the shaft-driven pump, the pressure switch trips to shut off the HPCI Aux Oil Pump. When

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Duane Arnold Energy Center (DAEC)	0 5 0 0 0 3 3 1	8 8	— 0 0 2	— 0 0	0 3 OF 0 6

TEXT (If more space is required, use additional NRC Form 366A's) (17)

the HPCI turbine is tripped for any reason, lube oil pressure decreases because of the reducing speed of the turbine. When lube oil pressure falls to thirty-seven and one-half (37.5) psig, PS2288 resets (trips on deadband) and again starts the HPCI Aux Oil Pump to provide the necessary lube oil pressure for coastdown of the HPCI turbine.

It appears that the small piece of Teflon tape that lodged in the pressure switch sensing orifice allowed the increasing pressure to be sensed and shut-off the Aux Oil Pump at 95 psig, but impeded bleeding-off the internal pressure of the pressure switch to allow starting of the Aux Oil Pump when lube oil pressure decreased to 37.5 psig. After an approximate 20 minute delay, the Aux Oil Pump did start. This delay was caused by the Teflon tape impeding the pressure bleed-off.

III. ANALYSIS OF EVENT:

The inoperability of the HPCI Aux Oil Pump had no effect on the safe operation of the plant. Per Technical Specification 3.5.D.2, inoperability of the HPCI System is a seven day LCO contingent upon the verified operability of the RCIC, ADS, LPCI, and CS systems. With the reactor in the Run mode, the worse case effect of a HPCI System inoperability would be the loss of the ability to maintain reactor vessel water inventory after small line breaks that do not rapidly depressurize the vessel. ADS, in conjunction with the LPCI and CS systems, provides full redundancy for HPCI. Subsequent operability testing of these systems was completed satisfactorily at 0922 hours on April 11.

The HPCI System would have operated as designed upon receipt of an automatic initiation signal. Once the HPCI turbine tripped, either manually or automatically, it would not have been able to immediately restart due to the pressure switch failure delaying the bleed-off of pressure allowing operation of the HPCI Aux Oil Pump. However, after an approximate 20 minute delay, the HPCI System would have been available. During this 20 minute time period, or an indeterminate time period if the small piece of Teflon tape completely prevented pressure bleed-off, reactor safety would have been maintained by the availability of the ADS, LPCI, and CS systems.

IV. CORRECTIVE ACTIONS:

Immediate corrective actions for the inoperability of the HPCI Aux Oil Pump were to restore the system from the test mode and commence the required HPCI System Inoperability Test. The HPCI System Inoperability Test was completed satisfactorily at 0922 hours.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Duane Arnold Energy Center (DAEC)	0 5 0 0 0 3 3 1	8 8	— 0 0 2	— 0 0	0 4 OF 0 6

TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

A corrective maintenance action was initiated to perform a calibration check of the Aux Oil Pump pressure switch. The "as found" condition was that the switch tripped once but failed to repeat. The pressure switch was replaced with a new pressure switch of the same make and model. This new switch was calibrated satisfactorily and placed into service.

Also, on the morning of April 11, chemistry technicians were directed to perform an analysis of the HPCI lube oil to check for any possible bearing failure(s) that could have been caused by the lack of lube oil pressure. An oil sample was obtained from the HPCI lube oil storage sump. The oil was drawn from the sump because damage to any of the bearings could be checked by this accumulative sample. Chemistry performed a particle count analysis by running the oil through a membrane filter and then examining the filter with a microscope. The filter is a metricel membrane filter with a 0.45 micrometer pore size. The results of the sample conclusively revealed that no metal particles were present. This indicated that no bearing failures had occurred. The turbine manufacturer had been contacted for recommendations regarding the failure and stated that since the shaft-driven lube oil pump is a positive-displacement type, it would supply some lube oil pressure until the turbine completely stopped. Also, the turbine bearings are over-sized to help reduce bearing load and therefore reduce generated heat. The chemistry analysis confirmed this statement.

Once all investigative and corrective work was complete, the HPCI System Operability Test was performed. The test was initiated on April 12 at 2100 hours and completed satisfactorily at 2215 hours. With all post-maintenance testing verified complete, the HPCI System was declared operable on April 12 at 2222 hours and the seven day LCO was exited. The total time that the HPCI System was out-of-service was forty-five (45) hours.

The Duane Arnold Energy Center restricted the use of Teflon tape in approximately mid-1985 and began using Loctite brand Nuclear Grade Pipe Sealant as a replacement. It is not possible to determine the source of this particular piece of Teflon tape concerning when and where it was applied. However, due to this recent occurrence, the Training Department will be conducting training for the Maintenance and Tech Staff training programs concerning the appropriate use of Teflon tape. This training will restate the restrictions for use including supervisory approval prior to use and the ongoing method of replacement of Teflon tape during normal work. This training will be provided as soon as possible and will also be incorporated into the normal training process for maintenance personnel.

A subsequent review revealed that no previous similar events affecting this or other plant systems have occurred or been reported.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Duane Arnold Energy Center (DAEC)	0 5 0 0 0 3 3 1	8 8	— 0 0 2	— 0 0	0 5 OF 0 6

TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

V. ADDITIONAL INFORMATION:

Investigation revealed that a normally scheduled preventive maintenance action was performed on the pressure switch on January 19, 1988. During performance of that maintenance action, the pressure switch did not perform as required. Maintenance personnel, while attempting to calibrate the pressure switch, could not get the instrument to trip even with greater that 100 psig applied (setpoint is 95 psig). "As-found" data was not obtainable. After the pressure switch was adjusted and manipulated, it functioned satisfactorily and was repeatable. It is suspected that the orifice was blocked by the piece of Teflon tape prior to this.

Affected Equipment: Pressure Switch: HPCI Auxiliary Oil Pump pressure switch mfg - Square D; Model - 9012-ACW-22

Normally scheduled Preventive Maintenance is also performed on other components/areas of the HPCI Lube Oil System. The HPCI Lube Oil Filter (1F-299) elements are replaced during each outage. Also, the HPCI Lube Oil itself is replaced during each outage. These actions help maintain proper HPCI turbine operation.

Extensive research was performed on the use of Teflon tape both on site and throughout the industry. Investigation revealed that in October 1974, the Nuclear Energy Division of General Electric via NEDE-20583, BWR Operator's Manual for Materials and Processes, provided information to nuclear utilities concerning the use of thread sealant materials.

Per section 2.8 of the aforementioned document, Fluorocarbon base tapes, of which Teflon is a part, are acceptable on joints in applications only below 300 degrees Fahrenheit and below ten thousand (10,000) rads. The cause for these considerations is that this type of tape deteriorates with high temperature and radiation exposure. Also, as a mandatory precaution, this type of tape should not be used on lines that will reenter the reactor system.

These effects are important to consider because when the tape breaks down, there is potential for a release of chlorides that will chemically contaminate the reactor systems. Another important consideration in the use of Teflon tape is mechanical failure. When applied properly, the tape provides a tight seal. However, when the connection is broken/loosened for maintenance, etc., the tape tears and small pieces break loose. These small pieces can enter the system and cause blockage. This is especially true in air system controllers that utilize small orifices. Teflon tape was widely utilized throughout the United States nuclear industry until approximately mid-1985. At that time, it's use was discontinued. The Duane Arnold Energy Center restricted the use of Teflon tape in these types of applications at that time and now utilizes Loctite brand Nuclear Grade Pipe Sealant as a replacement. It is not possible to determine the source of this

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Duane Arnold Energy Center (DAEC)	0 5 0 0 0 3 3 1	8 8	— 0 0 2	— 0 0	0 6 OF 0 6

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In accordance with 10CFR50.72, Immediate Notification Requirements for Operating Nuclear Power Reactors, subsection (b)(2)(iii), a four hour report was required for this incident. The HPCI System was declared inoperable at 0222 hours on April 11. Upon review of the incident at 0700 hours, it was identified that this report had not as yet been submitted. The condition was not immediately recognized as reportable as the failure was considered to not have affected "systems" as described in 10CFR50.72. The four hour report was made at 0707 hours when it was recognized by staff personnel that the failure constituted a "single train" system failure and was reportable per 10CFR50.72. The failure to submit the required report was identified by plant personnel and was reported by the Resident Inspector in Inspection Report 88-006 as a potential violation. Due to the inability to immediately recognize this situation as reportable, information concerning the occurrence and the associated reporting requirements was disseminated among all Operations crews. Also, the Training Department was instructed to include training on this occurrence in the Operator Initial and Requalification Programs.

This event is being reported pursuant to 10CFR50.73(a)(2)(iv).

Iowa Electric Light and Power Company

May 6, 1988
DAEC-88-0410

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License DPR-49
Licensee Event Report #88-002

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a copy of the subject Licensee Event Report.

Very truly yours,

Rick L. Hannen 5-6-88
Rick L. Hannen
Plant Superintendent - Nuclear

RLH/BKS/go

cc: Mr. A. Bert Davis
Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

NRC Resident Inspector - DAEC

File A-118a

IE22
1/1