

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Duane Arnold Energy Center										DOCKET NUMBER (2) 0 5 0 0 0 3 3 1 1										PAGE (3) 1 OF 0 1 2			
TITLE (4) HPCI Turbine Reversing Chamber Problems																							
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 None			DOCKET NUMBER(S) 0 5 0 0 0											
0	2	2	1	8	5	8	5	0	0	7	0	0	0	5	0	6	8	5	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) 0 1 0 0		20.402(b)				20.406(c)				50.73(a)(2)(iv)				73.71(b)									
		20.406(a)(1)(i)				50.36(a)(1)				50.73(a)(2)(v)				73.71(c)									
		20.406(a)(1)(ii)				50.36(a)(2)				50.73(a)(2)(vi)				☒ OTHER (Specify in Abstract below and in Text, NRC Form 366A)									
		20.406(a)(1)(iii)				50.73(a)(2)(i)				50.73(a)(2)(viii)(A)													
		20.406(a)(1)(iv)				50.73(a)(2)(ii)				50.73(a)(2)(viii)(B)													
		20.406(a)(1)(v)				50.73(a)(2)(iii)				50.73(a)(2)(ix)													
LICENSEE CONTACT FOR THIS LER (12)												TELEPHONE NUMBER											
NAME James R. Probst, Technical Support Engineer												AREA CODE 3 1 1 9 8 1 5 1 1 - 1 7 4 1 5 1 8											
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																							
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC													
B	B	J	T	R	B	T	1	4	7	No													
SUPPLEMENTAL REPORT EXPECTED (14)												EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR							
☐ YES (If yes, complete EXPECTED SUBMISSION DATE)												☒ NO											

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

During disassembly of the High Pressure Coolant Injection (HPCI) turbine for overhaul and inspection on February 21, 1985, while in a refuel outage, damage and missing parts were noted in several of the ten steam reversing chambers. Three chambers had cracks, one with a small piece missing, and a fourth had a linear indication. Several mounting bolts were missing and several bolt locking tabs were missing or found cracked and/or eroded.

Cracking of the reversing chambers has been discovered in the HPCI turbine during previous refueling outages. Between each outage no HPCI system operability degradation has been noted due to reversing chamber problems. Plant operating experience, and the turbine manufacturer, indicates these problems do not affect the ability of the HPCI system to perform its design function. Reversing chambers are being inspected prior to installation, and a new locking tab design will be installed. The turbine will be internally inspected during the next refuel outage.

This LER is being submitted to document continuing efforts to resolve problems with HPCI turbine reversing chambers.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Duane Arnold Energy Center	0 5 0 0 0 3 3 1	8 5	— 0 0 7	— 0 0	0 2	OF 0 2

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

During disassembly of the High Pressure Coolant Injection (HPCI) turbine for overhaul and inspection on February 21, 1985, while in a refuel outage, damage and missing parts were noted in several of the ten steam reversing chambers which serve to redirect steam back into the turbine blades following its initial injection. The turbine is a Terry Corporation (T147) type CS. Three of the chambers (#4, 5, and 9) had cracks, with one of these (#5) having a piece of approximately 1.5 square inches missing out of its vane. A fourth chamber (#7) had a linear indication. Two reversing chamber mounting bolts were missing on chamber #4, and three were missing on chamber #5. On six of the ten reversing chambers (#3, 4, 5, 6, 7, and 8), locking tabs for one or more of the mounting bolts were missing or found cracked and/or eroded. Cracking of the reversing chambers has been discovered in the HPCI turbine during previous refueling outages. (See Unique Reports 78-1, 80-1, 81-3, and Iowa Electric letter DAEC-83-681.) During the last outage, in 1983, all ten reversing chambers were replaced with new chambers which had passed a radiographic examination, and Duane Arnold Energy Center's intention to examine the in-service HPCI reversing chambers during the present outage was noted in letter DAEC-83-681.

The reversing chambers which were found with cracks or indications are four of five which receive inlet steam at turbine full load. Historically, these five reversing chamber locations have experienced cracking problems. The cause of this cracking is believed to be pressure pulsing fatigue and thermal fatigue from the cyclic duty experienced by the HPCI turbine. Metallurgical properties of the reversing chambers are also a factor.

Between each outage the HPCI system (ETIS code BJ) has performed satisfactorily, with no system operability degradation noted as a result of cracked chambers or bolt and locking tab problems. As indicated by operating experience at Duane Arnold Energy Center, and in the opinion of the manufacturer, cracks in reversing chambers or small pieces breaking out of the chambers will not affect the ability of the HPCI system to perform its design function. As a corrective measure, in-service and warehouse stock reversing chambers will continue to be liquid-penetrant and radiograph-tested prior to installation in the turbine. The location and history of each reversing chamber within the turbine will be noted, and the turbine will be internally inspected at the next refuel outage to determine their status. Engineering review of reversing chamber problems is continuing.

The missing reversing chamber mounting bolts and the missing, cracked and eroded bolt locking tabs discovered during the turbine inspection are not believed to be a cause of, or a direct result of, the cracked reversing chambers. Each locking tab secures three bolts. The cause of the locking tab failure appears to be steam flow across an unsupported span between the bolts. Failure of a locking tab allows bolts to loosen and work their way out. Broken bolts have been found during past inspections. As indicated by plant operating experience, these problems do not affect the ability of the HPCI system to perform its design function. Previous analysis by General Electric has indicated loose parts from the HPCI turbine will not enter the reactor vessel. A design modification consisting of individual locking tabs for each bolt, with no unsupported span, will be used when the reversing chambers are reinstalled. These also will be checked during the internal turbine inspection planned for the next refuel outage.

This LER is being submitted to document continuing efforts to resolve problems with HPCI turbine reversing chambers.

Iowa Electric Light and Power Company

May 6, 1985

DAEC-85-363

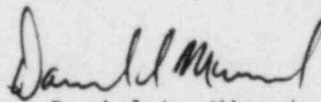
U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Subject: Duane Arnold Energy Center
Docket No. 50-331
Op. License DPR-49
Licensee Event Report No. 85-007

Gentlemen:

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

Very truly yours,



Daniel L. Mineck
Plant Superintendent - Nuclear
Duane Arnold Energy Center

DLM/JRP/kp

attachment

cc: Mr. James G. Keppler
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NRC Resident Inspector - DAEC

File A-118a

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11