

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8903210164 DOC.DATE: 89/03/08 NOTARIZED: NO DOCKET #  
 FACIL:50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina 05000400  
 AUTH.NAME AUTHOR AFFILIATION  
 HOWE,A.J. Carolina Power & Light Co.  
 WATSON,R.A. Carolina Power & Light Co.  
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 89-003-00:on 890206,reactor trip on low steam generator level occurred due to main feedwater pump shaft failure.  
 W/8 ltr.

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

NOTES:Application for permit renewal filed. 05000400 /

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INTERNAL:	ACRS	MICHELSON	1	1	ACRS	MOELLER	2	2	
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	NRR/DEST/RSB	8E	1	1	NRR/DEST/SGB	8D	1	1	
	NRR/DLPQ/HFB	10	1	1	NRR/DLPQ/QAB	10	1	1	
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	RGN2 FILE	01	1	1					
EXTERNAL:	EG&G	WILLIAMS, S	4	4	FORD	BLDG HOY, A	1	1	
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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) <b>SHEARON HARRIS NUCLEAR POWER PLANT - UNIT ONE</b>	DOCKET NUMBER (2) <b>0 5 0 0 0 4 0 0 1</b>	PAGE (3) <b>1 OF 0 3</b>
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TITLE (4) **REACTOR TRIP ON LOW STEAM GENERATOR LEVEL DUE TO MAIN FEEDWATER PUMP SHAFT FAILURE**

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	2	0	8	9	8	9	0	0	3	0	0	3	0	8	8	9			0	5	0	0	0		

OPERATING MODE (9) **1**

POWER LEVEL (10) **11010**

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	<input checked="" type="checkbox"/>	60.73(e)(2)(iv)	73.71(b)
20.405(a)(1)(i)	<input type="checkbox"/>	60.73(e)(2)(v)	73.71(c)
20.405(a)(1)(ii)	<input type="checkbox"/>	60.73(e)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	<input type="checkbox"/>	60.73(e)(2)(viii)(A)	
20.405(a)(1)(iv)	<input type="checkbox"/>	60.73(e)(2)(viii)(B)	
20.405(a)(1)(v)	<input type="checkbox"/>	60.73(e)(2)(ix)	
20.405(c)	<input type="checkbox"/>		
50.36(c)(1)	<input type="checkbox"/>		
50.36(c)(2)	<input type="checkbox"/>		
60.73(a)(2)(i)	<input type="checkbox"/>		
60.73(a)(2)(ii)	<input type="checkbox"/>		
60.73(a)(2)(iii)	<input type="checkbox"/>		

LICENSEE CONTACT FOR THIS LER (12)

NAME <b>Andrew J. Howe - Senior Specialist</b>	TELEPHONE NUMBER
	AREA CODE <b>919</b>   <b>362</b>   <b>212</b>   <b>719</b>

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
A	SJ	I   P	I   075	Y					
A	SJ	C   P   L   G	Z   010	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)  NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

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

On February 6, 1989, with the plant operating at 100% power, at 0008 the shaft of the A Main Feedwater Pump (MFP) sheared, causing a sudden reduction in feedwater flow to the steam generators. Within seconds the MFP tripped, causing a turbine runback. The operators took manual control of the feedwater regulating valves and attempted to raise steam generator levels, but the reactor tripped on low steam generator level approximately one minute after the transient began. The plant response to the reactor trip was normal, with all auxiliary feedwater pumps automatically starting to maintain steam generator levels, and the operator manually closing the main steam isolation valves to control the primary plant cooldown. The main generator exciter field breaker did not trip open, and was observed to be smoking. The breaker was locally opened and an extinguisher used on the breaker to prevent ignition. The exciter field breaker was found to have a burned out trip coil which was subsequently repaired.

The MFP shaft was found to be sheared near the coupling between the pump and the coupling. The damaged shaft was sent to a company laboratory, and the preliminary cause was determined to be long term cyclic fatigue. The event caused internal damage to the pump motor, as well as minor missile damage to components in the near vicinity.

Prior to plant restart, the undamaged B MFP shaft keyway was examined and found to be in satisfactory condition. The plant was restarted and brought to approximately 60% power on February 9. Repairs were completed to the A MFP and the nearby components on February 14, and the plant was returned to full power operations. The final results of the examination of the failed shaft will be used to determine any necessary long term corrective actions.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1	DOCKET NUMBER (2) 0 5   0   0   0   4   0   0	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 9	- 0   0 3	- 0 0	0   2	OF 0   3

TEXT (If more space is required, use additional NRC Form 368A's) (17)

EVENT DESCRIPTION

On February 6, 1989, the plant was operating at full power, 885 net MWe. At 0008:57, main control room alarms were received indicating a steam/feedwater flow mismatch, and a loud explosive sound was heard in the main control room, followed by the sound of the unloading of an electric motor. Within seconds, the A Main Feedwater Pump (MFP) (EIIS:SJ:P) (Manufacturer Ingersoll-Rand, model number 16X19CA) tripped, initiating a runback of the main turbine (EIIS:TA). The operators in the control room took manual control of the main feedwater regulating valves (EIIS:SJ) to maximize feedwater flow from the operating B MFP in order to control steam generator levels. At 0009:24, approximately one half minute after the transient began, one of the two heater drain pumps (EIIS:SN) tripped, and at 0010:05, a reactor trip occurred on low steam generator level.

The plant response to the reactor trip was as expected. The B MFP tripped shortly after the reactor trip due to low flow occurring when the main feedwater regulating valves automatically closed on interlock at a Reactor Coolant System average temperature of 564°F. All three auxiliary feedwater pumps (EIIS:BA) started automatically to control steam generator levels, and the operator manually closed the main steam isolation valves (EIIS:SB) to limit the cooldown of the primary. The main generator exciter field breaker (EIIS:TL) failed to trip open, and was found to be smoking. The breaker is located in the Turbine Building switchgear room, and an operator discovered the situation while entering the room to locally trip the A MFP lube oil pump breaker. No safety related equipment is located in that area. The operator tripped the breaker and used a hand-held extinguisher to ensure no ignition occurred. Upon investigation, the breaker was found to have burned out trip coil. The plant was stabilized in Mode 3 at approximately 557°F.

Shortly after the transient began, an operator locally observed smoke and steam in the vicinity of the A MFP motor to pump coupling (EIIS:SJ:CPLG). Minor missile damage was apparent to piping and conduit in the area. The pump shaft was stopped and the motor was turning rapidly. After coastdown, the pump began to turn slowly due to recirculation flow; this flowpath was isolated and the pump was secured. Damage to the pump motor occurred due to its rotation with an unbalanced, unsupported coupling.

The shaft between the MFP coupling and pump was sheared and a crack beginning at the root of the keyway that attaches the pump shaft to the coupling was observed. The shearing of the shaft caused the coupling to come loose, which subsequently generated missiles, causing minor damage to components in the local vicinity. The high motor vibration sheared a lubrication oil line to the rear motor bearing (EIIS:SK), and caused further piping damage. There were no personnel injuries as a result of these events, and the damage was confined to the local vicinity.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) SHEARON HARRIS NUCLEAR POWER PLANT - UNIT ONE	DOCKET NUMBER (2) 0   5   0   0   0   4   0   0   8   9	LER NUMBER (8)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8   9	-   0   0   3	-   0   0	0   3	OF	0   3

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

CAUSE

The shaft and coupling were removed and sent to a company laboratory for examination. The preliminary results indicated that a crack covering approximately 2/3 of the shaft cross-sectional area had existed for a period of time prior to the sudden failure. This area showed discoloration due to corrosion. The cause of this crack is believed to be long term cyclic fatigue. Vibration readings from the pump are routinely obtained, and these readings showed no adverse trends prior to this event.

The B MFP was subsequently examined to ensure that no similar cracks existed. The results of this examination were satisfactory, and the B MFP was returned to service. The plant was restarted and brought to approximately 60% power on February 9. Repairs to the A MFP and other components damaged by the shaft failure were completed on February 14, and the plant resumed normal full power operation.

SAFETY SIGNIFICANCE

There were no safety consequences as a result of this event. The plant responded as designed following the reactor trip, with the actuation of auxiliary feedwater to maintain steam generator levels.

This event is reportable as an actuation of the reactor protection system and engineered safeguards systems per 10CFR50.73(a)(2)(iv). There have been no previous similar events involving the shearing of a pump shaft due to cyclic fatigue.

CORRECTIVE ACTIONS

1. The B MFP shaft keyway was inspected to ensure no similar faults existed prior to returning the pump to service on February 9.
2. The A MFP and damage to local components in its vicinity were repaired and the new shaft keyway examined, and the pump was returned to service on February 14.
3. Upon completion of the investigation to determine the failure mechanism of the sheared shaft, long term actions to prevent recurrence will be determined and implemented as necessary.



Carolina Power & Light Company

MAR 8 1989

HARRIS NUCLEAR PROJECT  
P.O. Box 165  
New Hill, NC 27562

File Number: SHF/10-13510C  
Letter Number: HO-890028 (O)

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SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1  
DOCKET NO. 50-400  
LICENSE NO. NPF-63  
LICENSEE EVENT REPORT 89-003-00

Gentlemen:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed Licensee Event Report is submitted. This report fulfills the requirement for a written report within thirty (30) days of a reportable occurrence and is in accordance with the format set forth in NUREG-1022, September 1983.

Very truly yours,

R. A. Watson  
Vice President  
Harris Nuclear Project

AJH:tbb

Enclosure

cc: Mr. R. A. Becker (NRR)  
Mr. W. H. Bradford (NRC - SHNPP)  
Mr. S. D. Ebnetter (NRC - RII)

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