

# CATEGORY 1

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 FACIL: 50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina      05000400  
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 DONAHUE, J. W.      Carolina Power & Light Co.  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 97-022-00: on 970829, TS required shutdown due to  
 expiration of AFW LCO. Caused by personnel error. Completed  
 repairs TDAFW pump & returned plant to svc on 970831.  
 W/970926 ltr.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 5  
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NOTES: Application for permit renewal filed.

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SEP 26 1997

U.S. Nuclear Regulatory Commission  
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Serial: HNP-97-187  
10CFR50.73

SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1  
DOCKET NO. 50-400  
LICENSE NO. NPF-63  
LICENSEE EVENT REPORT 97-022-00

Sir or Madam:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed Licensee Event Report is submitted. This report describes a plant shutdown required by Technical Specifications due to the expiration of the Auxiliary Feedwater System Limiting Condition for Operation.

Sincerely,

J. W. Donahue  
Director of Site Operations  
Harris Plant

MV

000154

Enclosure

c: Mr. J. B. Brady (HNP Senior NRC Resident)  
Mr. L. A. Reyes (NRC Regional Administrator, Region II)  
Mr. V. L. Rooney (NRC - NRR Project Manager)

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Page 2 of 2

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<b>NRC FORM 366</b> (4-95)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>		<b>APPROVED BY OMB NO. 3150-0104</b> <b>EXPIRES 04/30/98</b> <small>ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.</small>																			
<b>LICENSEE EVENT REPORT (LER)</b> (See reverse for required number of digits/characters for each block)																							
<b>FACILITY NAME (1)</b> Harris Nuclear Plant Unit-1				<b>DOCKET NUMBER (2)</b> 50-400	<b>PAGE (3)</b> 1 OF 3																		
<b>TITLE (4)</b> Technical Specification required shutdown due to expiration of AFW limiting condition for operation.																							
<b>EVENT DATE (5)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>MONTH</th> <th>DAY</th> <th>YEAR</th> </tr> <tr> <td>8</td> <td>29</td> <td>97</td> </tr> </table>		MONTH	DAY	YEAR	8	29	97	<b>LER NUMBER (6)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>YEAR</th> <th>SEQUENTIAL NUMBER</th> <th>REVISION NUMBER</th> </tr> <tr> <td>97</td> <td>-- 022 --</td> <td>00</td> </tr> </table>		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	97	-- 022 --	00	<b>REPORT DATE (7)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>MONTH</th> <th>DAY</th> <th>YEAR</th> </tr> <tr> <td>9</td> <td>29</td> <td>97</td> </tr> </table>		MONTH	DAY	YEAR	9	29	97
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<b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)</b>																							
<b>OPERATING MODE (9)</b> 1		20.2201(b)		20.2203(a)(2)(v) <input checked="" type="checkbox"/>																			
<b>POWER LEVEL (10)</b> 100%		20.2203(a)(1)		20.2203(a)(3)(i)																			
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<b>LICENSEE CONTACT FOR THIS LER (12)</b>																							
<b>NAME</b> Michael Verrilli Sr. Analyst - Licensing				<b>TELEPHONE NUMBER (Include Area Code)</b> (919) 362-2303																			
<b>COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)</b>																							
<b>CAUSE</b>	<b>SYSTEM</b>	<b>COMPONENT</b>	<b>MANUFACTURER</b>	<b>REPORTABLE TO NPROS</b>																			
B	BA	P	I075	Y																			
<b>SUPPLEMENTAL REPORT EXPECTED (14)</b>																							
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				<b>EXPECTED SUBMISSION DATE (15)</b>																			
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<b>ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)</b>																							
<p>On August 29, 1997, following operation in mode 1 at 100% power, a plant shutdown was completed as required by the Auxiliary Feedwater System Technical Specification Limiting Condition for Operation (TS LCO 3.7.1.2). This shutdown was necessary when it became apparent that repairs to the Turbine Driven AFW (TDAFW) Pump would not be completed within the 72 hour LCO period. Specifically, on August 26, 1997, high vibration readings were recorded on the TDAFW Pump's inboard bearing during routine quarterly surveillance testing. All other test points associated with the TDAFW were acceptable and consistent with previous testing. Initial troubleshooting and mis-diagnosis of this condition resulted in a decision to replace the TDAFW pump's inboard bearing to reduce vibration levels. This bearing was successfully replaced, however during the pump re-coupling process, the pump end "shrink-fit" coupling hub was oriented incorrectly. Due to time considerations and difficulty experienced during the removal of the coupling hub, a decision was made to replace the pump's rotating element. Disassembly of the pump revealed slightly loose thrust bearings and a scratched balancing drum at the outboard end of the pump. This resulted in a slight degradation of structural stiffness at the pump's outboard end. Due to the pump's internal construction, this manifested as vibration at the pump's opposite end (inboard end) and was the actual source of high vibration.</p> <p>An additional error occurred during pump re-assembly involving installation of the casing gasket which caused excessive leakage. The combination of these errors resulted in the 72 hour LCO period expiring.</p> <p>The mis-diagnosis was caused by personnel error on the part of those involved in the troubleshooting process. The incorrect orientation of the TDAFW Pump coupling hub during repair efforts was caused by maintenance technician personnel error. The cause of the pump casing leakage issue was inadequate procedural guidance. Applicable maintenance procedures/technical manuals did not contain proper instructions for cutting the pump casing gasket.</p> <p>Corrective actions include (1) completing repairs to the TDAFW Pump and returning the plant to service on August 31, 1997, (2) development of structured troubleshooting guidance, (3) training for applicable plant personnel, (4) maintenance procedure reviews and revisions to address the pump casing gasket issue.</p>																							



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Shearon Harris Nuclear Plant - Unit #1	50-400	97	-- 022	-- 00	2 OF 3

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

**EVENT DESCRIPTION:**

On August 29, 1997, following operation in Mode 1 at 100% power, a plant shutdown was completed and Mode 3 (Hot Standby) entered at 1925 hours. The primary plant was then cooled down and Mode 4 (Hot Shutdown) was entered at 0035 hours on August 30, 1997. These actions were required to comply with the Auxiliary Feedwater System Technical Specification Limiting Condition for Operation (TS LCO 3.7.1.2), when it became apparent that repairs to the Turbine Driven AFW Pump (TDAFW, EHS Code: BA-P) would not be completed within the 72 hour LCO period.

Specifically, on August 26, 1997, high vertical vibration readings of 3.7 mils were recorded on the TDAFW Pump's inboard bearing during the performance of quarterly surveillance testing (TDAFW Pump Operability Test, OST-1411). The maximum allowed vibration for this bearing is 1.5 mils. All other test points associated with the TDAFW were acceptable and consistent with previous testing. Diagnosis of this condition determined that the probable cause for the excessive vibration levels was hydraulically induced vibration due to vane tip recirculation within the pump. Diagnosis also determined that replacement of the TDAFW Pump's inboard bearing would gain stiffness and reduce the vibration levels.

The inboard bearing was successfully replaced. However, during the pump re-coupling process, the pump end coupling hub was oriented incorrectly on the pump's shaft. Installation of this coupling hub required pre-heating to 300 degrees F and was then "shrink -fitted" into place. The maintenance individual involved ensured that the hub was handed to him in the proper orientation, but was then distracted during verification of proper keyway alignment and installed the hub onto the shaft backwards. To remove the shrink-fit hub, in-place heating and hydraulic jacking was required and during this process, the pump coupling sheath was damaged. Due to time considerations and difficulty experienced during the removal of the coupling hub, a decision was made to replace the pump's rotating element. Disassembly of the pump revealed slightly loose thrust bearings and a scratched balancing drum at the outboard end of the pump. These conditions resulted in a slight degradation of structural stiffness at the pump's outboard end, but due to the pump's internal construction, this manifested as vibration at the pump's opposite end (inboard end) and was the actual source of high vibration.

On August 28, 1997, the new rotating element was set and aligned. That night, new bearings were installed and the pump upper casing was placed and torqued. When the pump was filled with water on the next day, August 29, 1997, a leak was observed at the pump casing outboard seal area. This leak was caused by insufficient mating surface between the casing-to-casing gasket and the circumferential o-ring on the outboard seal package. This eventually required disassembly of the pump casing and installation of a new gasket with a slight over hang, such that the gasket could be trimmed flat after torquing the pump casing. The applicable maintenance procedures and technical manuals did not contain proper instructions for cutting and installing the pump casing gasket.

At approximately 1410 hours on August 29, 1997, a unit shutdown was commenced. The plant was taken off-line at 1845 and entered Mode 3 at 1925 hours. Repair efforts on the TDAFW Pump continued during the night shift. The plant entered Mode 4 at 0035 hours on August 30, 1997.

Repairs and post-maintenance testing were completed and the TDAFW Pump was declared operable at 1140 hours on August 31, 1997. The plant returned to service at 2348 hours that night. Additional inappropriate acts that occurred during the TDAFW Pump repair and testing process are being addressed and resolved accordingly within the site's corrective action program.





LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)	
Shearon Harris Nuclear Plant - Unit #1	50-400	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 3	
		97	.. 022	.. 00		

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

**CAUSE:**

The TDAFW Pump mis-diagnosis was caused by personnel error on the part of the utility Engineering personnel involved in the troubleshooting process. All important/feasible parameters associated with the TDAFW Pump were not considered during the diagnosis. Disassembly of the pump revealed that the actual source of high vibration was slight degradation of structural stiffness at the outboard end of the pump as evidenced by the slightly loose thrust bearing and scratched balancing drum. Investigation and analysis could not conclusively determine the root cause of this degradation.

The incorrect orientation of the TDAFW Pump coupling hub during repair efforts was caused by maintenance technician personnel error. These were utility maintenance personnel. Self-checking was not adequately applied during the installation process.

The cause of the pump casing leakage issue was inadequate procedural guidance, in that the applicable maintenance procedures and technical manuals did not provide guidance to ensure proper cutting and installation of the pump casing gasket.

**SAFETY SIGNIFICANCE:**

There were no safety consequences associated with this event. The plant was taken off-line to comply with Technical Specification 3.7.1.2. Repairs and post-maintenance testing were completed and the TDAFW Pump was declared operable at 1140 hours on August 31, 1997.

This condition is being reported per 10CFR50.73.a.2.i.A.

**PREVIOUS SIMILAR EVENTS:**

There have been no previous plant shutdowns reported that were related to the expiration of the 72 hour AFW LCO period.

**CORRECTIVE ACTIONS COMPLETED:**

1. Repairs to the TDAFW Pump were completed and the plant was returned to service at 2348 hours on August 31, 1997.
2. Real Time Training/Required Reading was provided on September 18, 1997 for select engineering and plant personnel pertaining to the mis-diagnosis of the TDAFW Pump vibration. This training emphasized the importance of looking at all feasible parameters on a piece of equipment to help diagnose/define the problem.

**CORRECTIVE ACTIONS PLANNED:**

1. Guidelines to ensure that a structured approach to trouble shooting will be developed and provided to appropriate lead/supervisory personnel. This will be completed by November 15, 1997.
2. A training needs analysis will be performed to determine the need for additional trouble shooting training for plant personnel. This will be completed by November 15, 1997.
3. The events experienced during the TDAFW pump repair effort will be included in the Maintenance Continuing Training Program. This will be completed by October 31, 1997.
4. Maintenance Procedures (CM-M0071, TDAFW Pump Disassembly & Maintenance and CM-M0039, Motor Driven AFW Pump Disassembly & Maintenance) will be revised to enhance gasket cutting and installation guidance. This will be completed by October 31, 1997.
5. Other Maintenance procedures involving split casing pumps will be reviewed to ensure that appropriate gasket cutting and installation guidance is provided. This review will be completed by October 31, 1997.

