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DUKE POWER

February 13, 1992

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

Subject: Catawba Nuclear Station  
Docket No. 50-414  
LER 414/92-001

Gentlemen:

Attached is Licensee Event Report 414/92-001 concerning TURBINE/REACTOR TRIP AS A RESULT OF POSSIBLE EQUIPMENT FAILURE/MALFUNCTION DURING MAIN TURBINE HYDRAULIC OIL SYSTEM TESTING.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

W. R. McCollum  
Station Manager

/lhc

Attachment

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## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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Catawba Nuclear Station, Unit 2										0 5 0 0 0 4 1 4										1 OF 0 8									
TITLE (4)										TURBINE/REACTOR TRIP AS A RESULT OF POSSIBLE EQUIPMENT FAILURE/MALFUNCTION DURING MAIN TURBINE HYDRAULIC OIL SYSTEM TESTING																			
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITY'S INVOLVED (8)																				
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES					DOCKET NUMBER(S)															
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OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5 (Check one or more of the following) (11)																										
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POWER LEVEL (10)			20.402(b) 20.406(a)(1)(i) 20.406(a)(1)(ii) 20.406(a)(1)(iii) 20.406(a)(1)(iv) 20.406(a)(1)(v) 20.406(c) 30.36(c)(1) 30.36(c)(2) 30.73(a)(2)(i) 30.73(a)(2)(ii) 30.73(a)(2)(iii) 30.73(a)(2)(iv) 30.73(a)(2)(v) 30.73(a)(2)(vi) 30.73(a)(2)(vii) 30.73(a)(2)(viii)(A) 30.73(a)(2)(viii)(B) 30.73(a)(2)(ix) 73.71(b) 73.71(c) OTHER (Specify in Abstract below and in Text, NRC Form 306A)																										
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LICENSEE CONTACT FOR THIS LER (12)										NAME										TELEPHONE NUMBER									
R. C. Futrell, Compliance Manager										AREA CODE										8 0 3 8 3 1 - 3 6 6 5									
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																													
CAUSE	SYSTEM	COMPONENT	MANUFAC TURE	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFAC TURE	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFAC TURE	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFAC TURE	REPORTABLE TO NRC										
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SUPPLEMENTAL REPORT EXPECTED (14)										YES (If yes, complete EXPECTED SUBMISSION DATE)										X NO									
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On January 15, 1992, a Unit 2 Turbine/Reactor Trip occurred at 02:14:18 hours during Main Turbine Hydraulic Oil (LH) System testing per PT/2/B/4250/02A, Main Turbine Weekly Trip Test. Unit 2 was in Mode 1, Power Operation, at 100% power at the time of the event. At 0210 hours, the auto start test of LH Pump 2A was successfully completed. At approximately 0212 hours, the auto start test of LH Pump 2B was initiated, and during the performance of this test, a Turbine Trip occurred due to Hydraulic Fluid Low Pressure. This resulted in a Reactor Trip because Reactor power was above 69% (the P-9 Setpoint). At the time of the event, the LH System temperature was 88 degrees F. At approximately 1600 hours, with the LH System temperature at approximately 107 degrees F, attempts to reproduce the event failed. This event is attributed to Possible Equipment Failure/Malfunction. Corrective actions included corrective maintenance and troubleshooting on the LH System, the addition of a two second time delay to the Turbine Trip Logic and a procedure enhancement. Planned corrective actions include improving the LH System temperature controlling setpoints and the computer alarm setpoints and completing the LH System troubleshooting.

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TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (if more space is required, use additional NRC Form 386A's) (17)

BACKGROUND

The purpose of the Main Turbine Hydraulic Oil [EIIS:TG] (LH) System is to supply hydraulic actuating and emergency trip oil to the Main Turbine's [EIIS:TRB] steam valve [EIIS:V] actuators [EIIS:XCV]. The hydraulic actuating oil applies pressure to the actuator pistons causing them to open the steam valves against spring force. The emergency trip oil applies pressure to the disk dump valves through a series of devices in the trip and overspeed protection circuits. The disk dump valves will immediately open and trip the steam valves closed upon relief of the emergency trip oil pressure.

The LH System supplies and conditions 1600 pounds per square inch gauge (psig) hydraulic fluid for use by the steam valve actuators and the emergency trip devices. The LH System's major components are the oil reservoir, hydraulic oil pumps [EIIS:P], accumulators [EIIS:ACC], space heaters [EIIS:EHTR] and fans, air dryer [EIIS:DRY], fluid transfer and filtering [EIIS:FLT] unit, and the interconnecting piping [EIIS:PSP].

The system is equipped with two 100% variable-delivery hydraulic oil pumps. During normal system operation, one of the pumps supplies all of the main Turbine's hydraulic oil requirements while the other serves as a backup. The standby LH pump will start automatically if the hydraulic oil pressure falls to 1300 psig. Solenoid actuated test valves are provided for testing the automatic startup capabilities of the pumps.

A pressure compensator on each pump maintains its discharge pressure at 1600 psig throughout the delivery range. The LH pumps, the LH pump filters, the valves associated with the LH pumps and the associated instrumentation are components of the LH pump skid.

A Turbine trip initiates a direct Reactor trip only when Reactor power is above the P-9 setpoint of 69%. This trip provides conservatism and protection beyond that required to assure the health and safety of the public, and is included as good engineering practice and prudent design. The anticipatory Reactor trip on Turbine trip at low power levels (below 70% power) is bypassed by the P-9 interlock. A safety evaluation in support of implementing the P-9 interlock demonstrated the acceptability of bypassing the Reactor trip on Turbine trip at power levels below 70%.

EVENT DESCRIPTION

On January 15, 1992, at 0001 hours, Control Room Operator (CRO) A initiated PT/2/B/4250/02A, Main Turbine Weekly Trip Test.

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TEXT (If more space is required, use additional NRC Form 350A's) (17)

At approximately 0210 hours, a Non Licensed Operator (NLO) began Section 12.10 of PT/2/B/4250/02A to test the autostart of LH Pumps 2A and 2B. When the NLO arrived at the LH pumps, Pump 2B was operating without any apparent problems.

At 0210 hours, the NLO successfully completed steps 12.10.1 through 12.10.4 which involved testing the standby pump, in this case Pump 2A. Pump 2A made loud noise for approximately four to five seconds upon starting.

Between 0210 hours and 0215 hours, the LH System temperature was 88.37 and 88.54 degrees F, which was within the LH System operating temperature limits of 85 degrees F to 150 degrees F.

At 0212 hours, the NLO completed the substeps of 12.10.5 by requesting CRO B to place the LH pump switches in the Control Room as follows:

12.10.5.1 LH Pump 2A switch was placed to the "ON" position.

12.10.5.2 LH Pump 2B was stopped to become the standby pump.

12.10.5.3 LH Pump 2B switch was placed in the "AUTO" position.

At 0212 hours, the NLO performed step 12.10.6 to test the autostart of the standby pump (2B) by depressing "HFPM-B Test" button. Depressing Test Pushbutton (HFPM-B) causes a 3 way solenoid valve to energize changing position; blocking LH System pressure and venting the auto start pressure switch to drain, thus, causing the standby LH pump to auto start. Immediately after performing step 12.10.6, the Turbine trip and Reactor trip occurred.

At 02:14:17 hours, LH Pump 2B started and was very noisy upon starting. Both LH pumps remained operating and after 10 to 15 seconds the noise stopped.

At 02:14:18 hours per the Operator Aid Computer (OAC), the Turbine trip and Reactor trip occurred due to hydraulic fluid lo pressure Turbine trip. At the time of the event Unit 2 was in Mode 1, Power Operation, at 100% power. The Turbine trip caused the Reactor trip due to Reactor power being above the P-9 setpoint of 69%.

At 0214 hours, the Control Room Chart Recorder for the LH System pressure indicated a rapid drop in LH System pressure to 1400 psig and a rapid increase to approximately 1660 psig. The LH System pressure then stabilized at approximately 1620 psig. The Chart Recorder response was too slow to indicate the LH System pressure drop to 1100 psig, the Turbine trip setpoint.

At 02:14:29 hours, the Auxiliary Feedwater [EIIS:BA] (CA) System Motor Driven Pumps started due to one Steam Generator (S/G) with Lo Lo Level.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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

At 02:14:30 hours, the CA System Turbine Driven Pump started due to two S/Gs with Lo Lo Level.

The CROs entered EP/2/A/5000/001, Reactor Trip or Safety Injection, immediately after the Reactor trip and transitioned to EP/2/A/5000/001A, Reactor Trip Response. At 0300 hours, EP/2/A/5000/001A was completed.

At 0300 hours, Operations (OPS) issued Work Request (W/R) 60113OPS to investigate and repair the cause of the low LH pressure during performance of PT/2/B/4250/02A.

By 0400 hours, the CA System was secured. At 0400 hours, the NRC was notified of the Reactor Protection System (RPS) actuation per RP/0/B/5000/13, NRC Notification Requirements.

The unit response to the trip was normal with the exception that all four S/Gs levels dropped below the Lo Lo S/G level setpoints causing the CA System actuation.

At 1600 hours, OPS, Component Engineering (CE), and Instrument and Electrical (IAE) personnel were unable to duplicate the Turbine trip conditions. However, problems were noticed with the following LH System components:

1. LH Pump 2B compensator
2. LH Pump 2B air bleed valve (2LH11)
3. LH Pump 2A filter
4. LH fluid temperature controls (At the time of the trip the LH fluid temperature was between 88.37 degrees F and 88.54 degrees F).

At 1600 hours, CE issued W/R 5758MES to replace the compensator on LH Pump 2B, and CE issued W/R 5757MES to replace the air bleed valve (2LH11) for LH Pump 2B. Predefined W/R 91003984 was issued to replace the LH Pump 2A filter. CE issued W/R 5759MES to investigate and repair the LH System temperature controls.

At 1815 hours, IAE determined that the temperature controller, 2LHTS5270, was out of calibration on the high side (greater than 86.9 degrees F), and IAE re-calibrated the temperature controller.

At 2130 hours, the investigation and repair of the LH System temperature controls were completed per W/R 5759MES.

At 2200 hours, the LH Pump 2A filter changeout had been completed per Predefined W/R 91003984.

On January 15, the applicable LH System pressure switches were checked per W/R 60113OPS, and the setpoints were verified within tolerances.



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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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

On January 16, at 0030 hours, W/R 5757MES and 5758MES were completed for replacing the LH Pump 2B compensator and air bleed valve (2LH11).

At 1440 hours, W/R 5761MES was issued to replace the compensator on LH Pump 2A compensator.

On January 17, at 1400 hours, the LH Pump 2A compensator was replaced.

On January 20, OPS personnel noted that the pressure swing on LH Pump 2A increased to five to six minute intervals from 10 to 20 minute intervals. The pressure swing was indicative of air leakage.

On January 21, Maintenance changed the LH System reservoir air filter. The LH Pump 2A pressure swing increased to every three to four minutes. OPS placed LH Pump 2B in service.

On January 21, LH Pump 2A was tested to complete 5761MES, and OPS issued W/R 60195OPS to investigate and repair LH Pump 2A and suction strainer for air leakage.

On January 21, Maintenance replaced the o-ring seals on the LH Pump 2A suction strainer Differential Pressure (D/P) indicator per 60195OPS. OPS placed the LH Pump 2A back in service. The LH pressure swings were eliminated.

On January 23, LH Pump 2A experienced more air leakage.

On January 24, LH Pump 2A air bleed valve (2LH10) was replaced per 60195OPS.

On February 6, LH Pump 2A was operated at the request of CE, and the pump experienced more air leakage.

CONCLUSION

This event was attributed to Possible Equipment Failure/Malfunction due to several unsuccessful attempts to duplicate the event by OPS, CE, and IAE personnel. Extensive troubleshooting of the LH System has been conducted and is currently in progress. The LH System Component Engineer speculated that the Low Hydraulic Fluid Pressure may have resulted from the response of the LH Pumps 2A and 2B compensators. The LH Pump 2A compensator may have caused Pump 2A to decrease pressure to allow Pump 2B to operate. Pump 2B may have experienced a drop in pressure due to air in leakage, turbulence, or low LH System Fluid temperature. The resulting pressure drop caused the Turbine trip and subsequent Reactor trip. Due to the LH System pressure transient, Station Problem Report (SPR) CNPR06089 was issued to add a time delay block of two seconds in the Digital Turbine Control System Turbine Trip Logic for Low LH Hydraulic Pressure.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (PSJ01) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104) OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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

At the time of the event, the LH System fluid temperature was between 88.37 degrees F and 88.54 degrees F which is considered to be a contributing factor due to the slower LH System response because of the cooler fluid resulting in a pressure drop. The low LH System temperature limit for operation is 85 degrees F. Due to the low LH System temperature being a contributing factor, the LH System temperature controlling setpoints will be changed by SPR CNPR06090 to improve the LH System temperature control and to increase the OAC alarm setpoint. OPS changed PT/1(2)/B/4250/02A to require the LH reservoir temperature to be equal to or greater than 95 degrees F prior to performing this procedure.

The temperature controller, 2LHTS5270, being out of calibration had no affect on the event because the temperature controller was set in a conservative direction.

The troubleshooting of the LH System revealed a number of possible sources for air in leakage for which corrective maintenance was performed to eliminate these sources.

Due to the air in leakage on LH Pump 2A, the pump will be replaced per W/R 601950PS.

CE is continuing the investigation and is consulting with the supplier (General Electric) to identify root cause(s) of problems with the LH System.

The failure of the LH Pump Skid is reportable per Nuclear Plant Reliability Data System (NPRDS) requirements. The LH Pumps 2A and 2B compensators and air bleed valves were replaced in an effort to prevent recurrence of this event. The exact equipment failure of the LH Pump Skid was never determined.

A review of the Operator Experience Program (OEP) data base for the previous 24 months revealed one Turbine trip and Reactor trip as a result of loss of both Main Feedwater Pumps on low suction pressure. LER 413/91-015 describes the event in which the root cause was a possible Design/Construction/Installation Deficiency, and the contributing cause was Possible Equipment Failure/Malfunction. Because of the difference in equipment, this event is not considered to be recurring under Nuclear Safety Assurance guidelines.

CORRECTIVE ACTION

## IMMEDIATE

- 1) The CROs entered EP/2/A/5000/001.

## SUBSEQUENT

- 1) The CROs entered EP/2/A/5000/001A.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 305A s/ (17))

- 2) The CROs completed EP/2/A/5000/U01A.
- 3) The CROs secured the CA System.
- 4) OPS personnel issued W/R 60113OPS to investigate and repair the cause of the low LH System pressure during performance of PT/2/B/4250/02A, Step 10.12.6.
- 5) IAE personnel verified the calibration of the involved LH pressure switches (2LHPS-5180/5181) per W/R 60113OPS.
- 6) CE issued W/R 5757MES to replace air bleed valve 2LH11 on LH Pump 2B.
- 7) OPS personnel notified the NRC of the RPS actuation per RP/0/B/5000/13.
- 8) CE issued W/R 5758MES to replace the compensator on LH Pump 2B.
- 9) CE issued W/R 5759MES to investigate and repair the LH Temperature Control and Indication A0188 and to verify Space Heater Controls and the Recirculated Cooling Water [EIIS:CC] (KR) System cooling loop.
- 10) Maintenance completed W/Rs 5757MES and 5758MES.
- 11) CE issued W/R 5761MES to replace the compensator on LH Pump 2A.
- 12) IAE completed W/R 60113OPS.
- 13) Maintenance completed W/R 5761MES.
- 14) OPS issued W/R 60195OPS to investigate and repair LH Pump 2A and suction strainer for air in leakage.
- 15) Maintenance replaced o-rings on the LH Pump 2A suction strainer D/P indicator and replaced the air bleed valve (2LH10) per W/R 60195OPS.
- 16) CE issued SPR CNPR06089 and Projects issued a Variation Notice to add a time delay block of two seconds in the Digital Turbine Controls System Turbine Trip Logic for Low LH Hydraulic Pressure. This was completed per Exempt Change CE-3609 and 4615NSM.
- 17) CE issued SPR CNPR06090 to improve the LH System temperature control and to increase the OAC LH System temperature alarm setpoint.



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

- 18) Predefined W/R 91003984 was issued to replace the LH Pump 2A filter.
- 19) Predefined W/R 91003984 was completed.
- 20) IAE completed W/R 5759MES but the W/R was left open to allow IAE to monitor the LH System for future problems and to correct as necessary.

## PLANNED

- 1) A time delay block to the Unit 1 Digital Turbine Controls System will be added.
- 2) The Unit 1 and 2 LH System temperature control and alarm setpoints will be changed to improve LH System temperature control.
- 3) Troubleshooting of the LH System problems will be completed.
- 4) Replacement of LH Pump 2A and completion of W/R 60195OPS.

SAFETY ANALYSIS

The response to the Turbine trip and Reactor trip was as designed. Reactivity was controlled by the Reactor trip. Residual heat was removed from the Reactor via the ultimate heat sink via the CA System. No unusual release of radioactivity occurred. All systems functioned as designed.

A Turbine trip event on Low Hydraulic Fluid Pressure is bounded by the FSAR Sections 10.2.2, 15.2.3, and 15.2.3.2.

The health and safety of the public were not affected by this event.