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November 25, 1991
JAFP-91-0772

United States Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: 91-015-01 - HPCI Declared Inoperable Due to Reduced Response Time

Dear Sir:

This is a revision to the report originally submitted on September 18, 1991 in accordance with 10 CFR 50.73(a)(2)(v).

This supplement revises the abstract, description, cause, and corrective action sections of the LER. Further evaluation of available information and testing completed subsequent to the original submittal has changed the cause of this event. Oil draining from the duplex filter housing caused the excessive HPCI system response time. Air leaked into the filter housing while the system was shut down. The air leakage allowed oil to drain from the filter housing to the reservoir. Upon system initiation the turbine stop valve opening time was delayed by the amount of time required to refill the filter housing.

Questions concerning this report may be addressed to Mr. Michael Tallents at (315) 349-6208.

Very truly yours,

R. Converse by Direct

RADFORD J. CONVERSE

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Enclosure

cc: USNRC, Region I
USNRC Resident Inspector
INPO Records Center

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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)
JAMES A. FITZPATRICK NUCLEAR POWER PLANT	0 5 0 0 0 3 3 3	1 OF 0 5

TITLE (4)
High Pressure Coolant Injection System Inoperable Due to Slow Response Time

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 8	1 9	9 1	9 1	— 0 1 5	— 0 1	1 1	2 5	9 1		0 5 0 0 0
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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)	50.73(a)(2)(iv)	73.71(b)
		50.36(c)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
		50.36(c)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		50.73(a)(2)(i)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		50.73(a)(2)(ii)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		50.73(a)(2)(iii)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Michael Tallents, Maintenance	AREA CODE 3 1 5 — 3 4 9 — 6 2 0 8

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	

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)

UPDATED REPORT - ORIGINAL REPORT SUBMITTED SEPTEMBER 18, 1991

EIIS Codes are in []

Surveillance of the High Pressure Coolant Injection System (HPCI) [BJ], required during a reactor start-up, was performed on 8/19/91 in accordance with Technical Specification 4.5.C.1. Test data indicated that the full flow injection time of 30 seconds, specified in the Final Safety Analysis Report (FSAR) was exceeded by 0.84 seconds. The turbine stop valve opening time of 25.3 seconds specified by the Inservice Testing (IST) Program was exceeded by 2.46 seconds. Also, the main pump discharge inboard isolation valve (23MOV-19) calculated response time of 32.7 seconds exceeded the IST requirement by 2.7 seconds. HPCI was declared inoperable initiating a 7-day Limiting Condition for Operation (LCO). During the next 2 days, HPCI was subjected to 3 test runs. The extended time to full flow was caused by the excessive time period for the turbine stop valve (23HOV-1) to come off its fully shut seat Oil pressure to open the stop valve was delayed due to air in the duplex filter housing. HPCI met the IST, ST, and FSAR criteria and was declared operable on 8/21/91. HPCI was inoperable for 45.75 hours. Corrective actions include adjusting oil system pressure and placing standby filter in service. LERs 87-010, 89-019, and 89-025 are related.

UPDATED REPORT - ORIGINAL REPORT SUBMITTED SEPTEMBER 18, 1991

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Description

The surveillance test, ST-4N, "HPCI Flow Rate and Inservice Injection (IST)", was performed on August 19, 1991 at approximately 5:30 P.M. to verify proper HPCI [BJ] system operation during a reactor start-up. As part of this test, the following time intervals were measured and recorded: overall HPCI system response, main pump discharge inboard isolation valve (23MOV-19) response, and the turbine stop valve (23HOV-1) full stroke.

The IST stroke time for 23HOV-1, measured from the initiation signal to the valve indicating fully open, was 27.76 seconds. This is 2.46 seconds longer than the maximum IST criteria of 25.3 seconds.

The response time for 23HOV-1 is defined as the time from the initiation signal to where the valve moves off its fully shut seat. The 23MOV-19 calculated response time is a function of 23HOV-1 response time due to a logic interlock. Therefore, if 23HOV-1 response time is slow, 23MOV-19 calculated response time will be slow.

The main pump discharge inboard isolation valve (23MOV-19) calculated response time exceeded the IST value specified in ST-4N by 2.7 seconds. The calculated response time for 23MOV-19 was 32.7 seconds. Because 23HOV-1 was slow in opening, this resulted in 23MOV-19 exceeding its calculated response time specification. The 23MOV-19 opening time of 21.72 seconds was within the IST stroke time specification of 24.7 seconds.

The overall HPCI response time is defined as the elapsed time from system initiation to full system flow (4250 GPM). The overall system response time of 30.84 seconds exceeded the Final Safety Analysis Report (FSAR) specification of less than or equal to 30 seconds. Although the HPCI system did not meet the FSAR response time, it would have performed its required safety function. HPCI was declared to be inoperable on August 19th at 8:15 P.M. This started a 7-day Limiting Condition for Operation (LCO).

The response time for 23HOV-1 was 19.66 seconds. The normal value is approximately 12-15 seconds. A limit switch, which connects to the valve stem, initiates the start sequence for the turbine when the stop valve comes off its fully shut seat. The turbine start sequence following the turbine stop valve first movement was functioning correctly. The troubleshooting effort focused on the long response time for 23HOV-1.

Following the initial test, additional instrumentation was temporarily installed on the system to record hydraulic oil pressure, governor valve (23HOV-2) position, turbine stop valve (23HOV-1) position, and turbine stop valve balance chamber pressure. The HPCI turbine was run again on August 20th at 7:35 P.M. with a full flow time of 31.31 seconds. Based on an evaluation of the results from this run, troubleshooting focused on the auxiliary oil pump output pressure and the oil duplex filter housing.

The auxiliary oil pump relief valve was operating at the lower end of the required pressure range. The low system pressure reduced the hydraulic force available to HOV-1. The response of HOV-1 may be effected by the lower pressure.

Also, oil draining from the duplex oil filter housing during normal system standby conditions could result in longer system response time. Air leakage into the filter housing would allow oil to drain to the oil reservoir. Upon system initiation, the turbine stop valve (23HOV-1) opening time could be delayed by the amount of time required to refill the filter housing.

The auxiliary oil pump relief valve output pressure was adjusted from 85 PSIG to 90 PSIG and the standby filter housing placed into service. The HPCI turbine was tested at 6:30 A.M. on August 21st. During this test 23HOV-1 response time was 12.5 seconds, 23HOV-1 was full open in 24 seconds, the 23MOV-19 response time was 27.8 seconds, and the HPCI system response time was 23.99 seconds.

The I&C technicians then removed the temporary instrumentation and the HPCI turbine was run to demonstrate operability. The HPCI turbine total system response time as measured at 26.91 seconds with 23HOV-1 indicating fully open in 22.94 seconds, and a 23MOV-19 response time of 27.8 seconds. The HPCI system was declared operable on August 21st at 6:00 P.M.

On October 7, 1991, maintenance on valve 10MOV-70A necessarily made the HPCI system inoperable by isolating the steam supply. The valve 10MOV-70A supplies steam from the HPCI steam line to the Residual Heat Removal (RHR) system [BO] heat exchanger for operation of the RHR system in the steam condensing mode. While the HPCI system was inoperable, the HPCI turbine auxiliary oil pump and the duplex filter housing were tested to determine their effect on HPCI system response time.

The auxiliary oil pump output pressure setpoint was varied between 60-90 psig. At each setpoint the response was timed from pump initiation until the stop valve started to open. The test demonstrated that any auxiliary oil pump output pressure greater than 60 psig would not adversely affect the start-up response time of the HPCI system.

The duplex filter housing should not drain when the oil system is idle. The test on the duplex filter housing demonstrated that filter housings can drain to the reservoir when the system is idle. Temporary level gauges were installed on both filter housings. The housings were filled and vented. The filter housing with the new cover gasket remained full of oil while the other housing drained. Air had leaked into the filter housing and displaced oil. Air leakage through the filter housing cover gasket was determined to be the primary cause for oil drainage. The HPCI system response time was delayed on August 19, 1991 by the amount of time required to fill the filter housing with oil. The temporary gauges were removed and new gaskets installed.

Following completion of repairs on valve 10MOV-70A, the HPCI turbine was tested on October 10, 1991 to demonstrate operability. The HPCI turbine total system response time was measured at 24.71 seconds with 23HOV-1 indicating full open in 21.53 seconds. The HPCI system was declared operable on October 10, 1991 at 10:15 P.M.

Cause

The cause of the excessive HPCI system response time was oil draining from the filter housing. The filter housing cover gasket is the principal source for air leakage into the filter housing.

Analysis

Because the HPCI system was inoperable due to the degraded response time, it qualifies as an event reportable under 10CFR50.73(a)(2)(v) as an event or condition that alone could have prevented the fulfillment of the safety function of a system needed to remove residual heat or mitigate the consequences of an accident.

Surveillance tests verified that the backup emergency core cooling systems were operable. While HPCI was not available, core coverage was assured by the Automatic Depressurization System [AD], together with the Low Pressure Emergency Core Injection Systems [BM] [BO].

Furthermore, the HPCI system remained available except for those intervals where the system was breached to install test equipment. The effects of a slightly longer HPCI initiation time on peak clad temperature is minimal. A sensitivity study (MDE-830786) performed by the NSSS vendor states that, "A delay in HPCI start-up time does not have a significant effect on large breaks because this system is steam turbine powered and the larger breaks depressurize the vessel before the system can inject a significant amount of coolant into the vessel. For small breaks, the transient is much slower and is not sensitive to the delay time over the range studied. Furthermore, the most limiting single failures for the small breaks result in the HPCI not operating. Therefore, none of the pertinent LOCA scenarios are sensitive to HPCI

start-up time over the range studied." The range discussed above was for time to full flow between 30 and 50 seconds. The analysis for a full flow vessel injection time of 50 seconds resulted in a 5 degree fahrenheit rise in Peak Clad Temperature (PCT). Since the FitzPatrick plant calculated PCT is 1522 degrees fahrenheit, with a single failure loss of DC power, this is well within the limits prescribed by 10CFR50.46. Accordingly, the HPCI system would have fulfilled its design safety function.

Corrective Actions

1. The relief valve setpoint for the auxiliary oil pump was adjusted from 85 to 90 PSIG. (Completed 8/21/91, WR #23/087042)

2. Placed the standby filter housing into service. (Reference PTR #911826)

3. Investigated the effect of the auxiliary oil pump and filter housing oil level on turbine stop valve (23HOV-1) response time. (Completed 10/9/91, WRs #23/086825 and #23/086826)

4. Replaced filter housing cover gaskets. (Completed 10/9/91, WR #23/086825)

5. Maintenance Procedure MP-101.11, "High Pressure Coolant Injection Turbine 23TU-2 and Pump 23P-1M Lubrication System Maintenance" will be revised by January 31, 1992 to insure new filter housing cover gaskets are installed.

Additional Information

Related Events:

LERs 87-010, 89-019, and 89-025 related events in which HPCI response time was slow.