Detroit Edison

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Nuclear Operations

10CFR50.73

June 3, 1997
NRC-97-0059

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

Reference: Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: Licensee Event Report (LER) No. 97-010

Pursuant to 10CFR50.73(a)(2)(v)(D) Detroit Edison is submitting the enclosed LER No. 97-010, High Pressure Coolant Injection System Auxiliary Oil Pump Failure to Start.

There are no specific commitments being made in this LER.

If you have any questions, please contact Mari J. Jaworsky at (313) 586-1427.

Sincerely,

P. Fessler

IE22/1

cc: A. B. Beach
G. A. Harris
M. J. Jordan
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Region III
Wayne County Emergency Management Division

030093

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Fermi 2	0 5 0 0 0 3 4 1	1 OF 5

TITLE (4) High Pressure Coolant Injection Auxiliary Oil Pump Failure to Start

EVENT DATE (5) MON	DAY	YR	LER NUMBER (6) YR	SEQUENTIAL NUMBER	REVISION NUMBER	REPORT DATE (7) MON	DAY	YR	OTHER FACILITIES INVOLVED (8) FACILITY NAMES	DOCKET NUMBER (S)
										0 5 0 0 0
05	04	97	97	- 0 1 0 -	0 0	06	03	97		0 5 0 0 0

OPERATING MODE (9): 2

POWER LEVEL (10): 0 0 8

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)

X 10 CFR 10CFR50.73(a)(2)(v)(D)

OTHER - (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	
Mari Jaworsky - Compliance Engineer	313	586-1427

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
X	BJ	CNTR	G182	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

[ ] YES (If yes, complete EXPECTED SUBMISSION DATE) [X] NO

EXPECTED SUBMISSION DATE (15) MONTH DAY YEAR

ABSTRACT (16)

On May 4, 1997 during the performance of a High Pressure Coolant Injection (HPCI) Pump Time Response and Operability Test the HPCI auxiliary oil pump (AOP) failed to start and run during the coastdown of the turbine. The AOP started after the operator cycled the control switch. During the shutdown of the HPCI turbine, the turbine was inadvertently restarted. The AOP cycled off and on approximately four times during the second coastdown. Based on the performance of the AOP the HPCI system was then declared inoperable. This event is being reported as any event or condition that alone could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

The cause of this event was a failure of an auxiliary contact used for seal-in purposes in the start circuitry for the AOP. During the initial event the seal-in contact did not close. The cause of the repetitive AOP cycling was a pressure switch which was out of calibration. This pressure switch controls the starting and stopping of the AOP.

The failed auxiliary contact used for seal-in purposes was replaced. Following the replacement of this contact the AOP was started and the circuit performance monitored. The AOP start circuit functioned properly. The pressure switch was also replaced and subsequently functioned properly.

Initial Plant Condition:

Operational Condition: 2 (Startup)
Reactor Power: 8 Percent
Reactor Pressure: 950 psig
Reactor Temperature: 121 degrees Fahrenheit

Description of the Event:

A. Background

The high pressure coolant injection (HPCI) system [BJ] is provided to ensure that the reactor core is adequately cooled to meet the design bases in the event of a small break in the nuclear system and loss of coolant that does not result in rapid depressurization of the Reactor Pressure Vessel (RPV) [AD][RCT]. Liquid breaks up to approximately 0.1 ft^2 break area and steam breaks up to approximately 0.5 ft^2 break area are within the capability of the HPCI system alone. This permits the plant to be shut down while maintaining sufficient RPV water inventory until the RPV is depressurized. The HPCI system continues to operate until RPV pressure is below the maximum pressure at which low pressure coolant injection (LPCI) [BO] operation or core spray (CS) [BM] system operation can maintain core cooling.

The HPCI system consists of a steam turbine assembly [BJ][TRB] driving a constant flow pump assembly and system piping, valves, controls, and instrumentation. On receipt of an HPCI initiation signal, the auxiliary oil pump (AOP) [BJ][P] starts and provides hydraulic pressure to open the turbine stop valve [BJ][SHV] and the turbine control valve [BJ][PCV]. The AOP also provides lubrication for the turbine bearings and the overspeed trip system. As the turbine gains speed, the shaft-driven oil pump [BJ][P] begins to supply hydraulic pressure. Should the turbine-driven oil pump malfunction or the turbine coastdown thus causing oil pressure to drop, the AOP restarts.

B. Event Description

On May 4, 1997 during the performance of a HPCI Pump Time Response and Operability Test, the HPCI AOP failed to start and run during the coastdown of the turbine. The operator noted that the "RUN" light flashed on and off, followed by the "OFF/RESET" light which remained on. Within about twelve seconds of the turbine trip, the alarm for HPCI low oil pressure initiated and then cleared within about two seconds. Subsequently, this alarm stayed in for approximately 43 seconds. During this time, the HPCI turbine coasted to a stop. The operator then placed the control switch [BJ][JS] for the AOP to "OFF/RESET" and then back to "RUN". The AOP successfully started and continued to run.

During the shutdown of the HPCI turbine, the turbine was inadvertently restarted. This was due to the fact that the steam admission valve was still open with the AOP running when the "TRIP" push-button was released. Within five seconds, the operator tripped the turbine for the second time. This time the operator noted the AOP "OFF/RESET" and "RUN" lights cycled rapidly approximately four times. Near the end of this sequence, the HPCI low oil pressure alarm initiated for about one second and cleared. Based on the performance of the AOP the HPCI system was then declared inoperable and the proper action statement was entered.

On May 5, 1997 the HPCI system was operated for post maintenance testing following replacement of the AOP pressure switch and the replacement of the auxiliary seal-in contact in the AOP start circuitry. Upon startup of HPCI the AOP functioned as expected.

Since HPCI is a single train system this event is reportable in accordance with 10CFR50.73(a)(2)(v)(D) as any event or condition that alone could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident. An Event Notification was made on May 4, 1997 at 1134 EDT.

Cause of the Event:

The cause of this event is a failure of a seal-in contact in the AOP start circuitry. The AOP start circuitry is designed to step-start the pump motor [BJ][MO]. Contacts [BJ][CNTR] from the two time delay relays [BJ][2] are arranged in series to energize the starter for the AOP motor. An auxiliary contact on the motor starter is in parallel with the time delayed contact pair to seal-in the motor starter. During this event, the seal-in contact did not close. Because the seal-in contact failed to function, the AOP motor starter de-energized when the first time delay relay timed out and stopped the AOP.

Normal circuit operation with the AOP running results in both time delay relays becoming de-energized after they reach their time delay settings. An additional auxiliary contact from the motor starter closes to start the time delay circuit and opens during operation. This additional auxiliary contact closed when the motor starter de-energized before the second time delay relay timed out. The misoperation effectively sealed-in the time delay circuit in a condition preventing AOP operation until the operator broke the seal-in by placing the AOP control switch in "OFF/RESET".

A functional test of the auxiliary contact block found it to be operating correctly, although the contact resistance of the normally open contact was higher than the normally closed contact.

The cause of the repetitive AOP cycling was due to the pressure switch [BJ][PS] being out of calibration. This was indicative of a deficiency of the pressure switch. Field data indicated that the switch was closing at 73.7 psig and opening at 82.9 psig. The pressure switch should start the AOP when the lube oil pressure is at about 35 psig, decreasing. The switch should open its contact on an increasing pressure at about 92.5 psig. The off-on cycling of the AOP observed during the second trip

of the HPCI turbine was caused by a lack of adequate switch differential. A failure analysis of the pressure switch did not yield any conclusive evidence as to why the switch was out of calibration.

Analysis of the Event:

The HPCI system is provided to assure that the reactor core is adequately cooled to limit fuel clad temperature in the event of a small break in the reactor coolant system and loss of coolant which does not result in rapid depressurization of the reactor vessel. The HPCI system permits the reactor to be shut down while maintaining sufficient reactor vessel water level inventory until the vessel is depressurized. The HPCI system continues to operate until reactor vessel pressure is below the pressure at which CS system operation or LPCI mode of the Residual Heat Removal (RHR) [BS] system operation maintains core cooling. With the HPCI system inoperable, adequate core cooling is assured by the operability of the redundant and diversified automatic depressurization system (ADS) [AD] and both the CS and LPCI systems.

Upon failure of the HPCI system to function properly after a small break loss-of-coolant accident, the ADS automatically causes selected safety/relief valves to open, depressurizing the reactor so that flow from the low pressure core cooling systems can enter the core in time to limit fuel cladding temperature to less than 2200°F. ADS is conservatively required to be operable whenever reactor vessel pressure exceeds 150 psig. This pressure is substantially below that for which the low pressure cooling systems can provide adequate core cooling for events requiring ADS.

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

Corrective Actions:

A configuration verification test of the AOP start circuitry was performed. This check included verification of the tightness of connections; resistance checks of contacts; proper operation of relays, contactor, and auxiliary contacts; and the operation of the AOP. No anomalies were found.

The auxiliary contact used for seal-in purposes in the start circuitry was replaced. Following the replacement of this contact the AOP was started and the circuit performance monitored. The AOP start circuit functioned properly. The pressure switch was also replaced and subsequently functioned properly.

A search of Fermi 2 history for failures of this type of contact found only one other event suspected to be similar in nature. However, a different component of the HPCI start circuitry appeared to have failed at that time. An industry search yielded no similar events.

Previous calibration data for this pressure switch and for other similar pressure switches used in the plant were checked. The review of calibration data showed no similar trends. Industry experience was also reviewed for similar problems and no similar trends were found in the industry.

In an effort to determine if any damage was sustained by the HPCI system due to a potential loss of adequate lubrication, turbine vibration measurements and oil samples were taken. The vibration data of the HPCI run on May 4, 1997 were compared with the HPCI vibration data taken on May 5, 1997. The results of this comparison show that the vibration had not changed. Therefore, it can be concluded that there was no measurable clearance change to the bearings as a result of the failure of the HPCI AOP to start.

An oil sample was taken after the HPCI run on May 4, 1997. This sample analysis showed all monitored parameters were within expected values. Another oil sample was obtained after the HPCI run on May 5, 1997. Again, the oil analysis showed all monitored parameters within expected values. The analysis of the oil samples showed that there was no excessive wear as a result of the failure of the HPCI AOP to start.

Additional Information:

A. Failed Components

Component:	Auxiliary contact
Description:	Holding Interlock Assembly
Manufacturer:	ITE/Gould
Model Number:	F11NOC

B. Previous LERs on Similar Problems

None