

Douglas R. Gipson  
Senior Vice President, Nuclear Generation

Fermi 2  
6400 North Dixie Hwy., Newport, Michigan 48166  
Tel: 313.586.5201 Fax: 313.586.4172



April 12, 2000  
NRC-00-0026

U S Nuclear Regulatory Commission  
Attention: 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. 00-003

Pursuant to 10 CFR 50.73(a)(2)(v)(D), Detroit Edison is submitting the enclosed, LER No. 00-003, High Pressure Coolant Injection System Inoperable due to an Unexpected High Reactor Water Level Trip During a Channel Functional Test.

No new commitments are being made in this LER.

Should you have any questions or require additional information, please contact Mr. Norman K. Peterson of my staff at (734) 586-4258.

Sincerely,



cc: J. Dyer  
A. J. Kugler  
M. A. Ring  
M. V. Yudasz, Jr.  
NRC Resident Office  
Region III  
Wayne County Emergency Management Division

*DFot*  
*TE02*

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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TITLE (4)  
High Pressure Coolant Injection System Inoperable due to High Reactor Water Level Trip During Channel Functional Test

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 NAME	DOCKET NUMBER
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OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
1	97	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	X 50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME  
Jerome Flint – Licensing

TELEPHONE NUMBER (Include Area Code)  
(734) 586-5212

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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 15 single-spaced typewritten lines) (16)

On March 15, 2000, at approximately 1036 hours, during performance of a surveillance procedure for the High Pressure Coolant Injection (HPCI) system [BJ] high reactor water level trip logic, an unexpected HPCI system high water level (Level 8) trip signal was generated. The HPCI Level 8 trip logic requires both the division 1 and division 2 Level 8 signals to complete the trip. The surveillance test in progress produced a division 2 level 8 signal. An apparently momentary division 1 Level 8 trip signal, completed the HPCI Level 8 trip logic. Because HPCI was not operating the Level 8 trip had no effect on HPCI system valves or components. Except for the short period of time both the division 1 and 2 Level 8 signals were present, a HPCI initiation on low reactor water level would have overridden the unexpected Level 8 trip allowing HPCI to perform its intended function. The surveillance procedure was exited, HPCI conditions monitored, Level 8 signals verified clear, and the Level 8 trip logic reset. Subsequent investigation was unable to conclusively determine a cause or duration of the division 1 Level 8 signal. Consequently, it must be conservatively assumed that both the division 1 and division 2 Level 8 signal were present until reset. Because a HPCI initiation signal could not override the completed Level 8 trip logic, HPCI was considered inoperable during this period. 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.

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Initial Plant Conditions:

Mode 1 (Power Operation)  
 Reactor Power 97 Percent  
 Reactor Pressure 1023 psig  
 Reactor Temperature 540 Degrees Fahrenheit

Description of the Event:

On March 15, 2000, at approximately 1036 hours, during performance of surveillance procedure 44.030.254, "ECCS-Reactor Vessel Water Level, Division 2, Channel D Functional Test," while testing the High Pressure Coolant Injection (HPCI) system [BJ] high reactor water level trip logic, an unexpected HPCI system high water level (Level 8) trip signal was generated. When the surveillance test inserted a single Level 8 trip signal, a spurious division 1 Level 8 signal or relay [RLY] contact closure completed the HPCI Level 8 trip logic, generating a unexpected HPCI turbine trip signal. The Level 8 turbine trip signal was automatically sealed in by the HPCI system trip logic. Control Room alarm [ALM] 2D89, HPCI system Turbine Trip Solenoid Energized, annunciated and the HPCI Level 8 "sealed in" light [LT] in the control room [NA] illuminated. Because the HPCI system was shutdown, energizing the trip solenoid had no effect on HPCI system valves or components (i.e., they did not actuate).

The HPCI Level 8 trip logic requires one division 1 and one division 2 Level 8 signal to simultaneously close contacts, in series, to energize the Level 8 trip relay, K11, and complete a seal in circuit. The K11 relay causes the HPCI trip relay, K12, to energize. Testing of the Level 8 logic that was in progress when the unexpected trip signal was generated consisted of inserting a test signal at testability panel H11-P083 (Auxiliary Building 4th floor) [NF] and verifying the division 2 Level 8 relay contact (B21-K203D) closes at panel H11-P620 (Auxiliary Building 2<sup>nd</sup> floor, Relay Room).

Personnel performing the surveillance 44.030.254 notified the Nuclear Assistant Shift Supervisor of the unexpected trip condition. The shift team monitored HPCI system indications, discussed the condition, and determined the best course of action was to direct the test personnel to exit the procedure. The surveillance procedure sections for return to normal and independent verification were completed. HPCI was declared inoperable and Reactor Core Isolation Cooling [BN] was verified operable in accordance with Technical Specification 3.5.1, Required Action E.1. Operations contacted the Probabilistic Safety Assessment group and determined the risk classification for this emergent condition is "low" in accordance with the Maintenance Rule Program Manual, Chapter 12, "Equipment Out of Service Risk Management." At approximately 1112 hours on March 15, 2000, the HPCI Level 8 seal in signal was reset. The division 1 and 2 Level 8 trip relay contacts were verified open. The HPCI system was verified in standby and declared operable.

A work request was issued for troubleshooting. Troubleshooting activities were performed in accordance with procedure MOP04, "Shift Operations," to attempt to determine the cause of the trip and verify the condition of the

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HPCI Level 8 trip logic. The Level 8 trip logic functional test, surveillance procedure 44.030.254 for division 2, was performed satisfactorily. A Level 8 trip did not occur. The Level 8 trip logic functional test, surveillance procedure 44.030.253 for division 1, was performed satisfactorily. A Level 8 trip did not occur. The Level 8 trip condition could not be repeated.

The HPCI Level 8 trip logic requires both a division 1 and a division 2 Level 8 signal. When both signals are received this "seals in" the Level 8 trip logic. If the HPCI system were required to operate, when reactor water level drops below the Level 8 setting the trip contacts open, but the HPCI system remains shutdown (tripped) due to the "seal in" feature of the logic. This shutdown condition would remain until overridden by a low reactor water level initiation signal (Level 2). Upon receipt of a Level 2 initiation signal the trip logic would automatically reset and the HPCI system would start.

Although thirty six minutes elapsed between the Level 8 logic trip and reset from the control room, the amount of time a low level initiation signal could not override the seal in was much less. The division 2 Level 8 trip was removed when the surveillance was exited and the division 1 Level 8 trip relay contacts were most likely only closed momentarily. With either Level 8 trip signal not present a Level 2 initiation signal would have overridden the trip logic and started the HPCI system, if required.

The HPCI system Level 8 trip function is used to prevent water overflow into the Main Steam Lines and is not assumed in the Fermi 2 accident and transient analysis. Since the HPCI high reactor water level trip is not considered an engineered safety feature (ESF) actuation, this event is not reportable in accordance with 10CFR50.73(a)(2)(iv) which requires reporting any event or condition which resulted in manual or automatic actuation of any ESF.

It is conservatively assumed that both the division 1 and division 2 Level 8 signal were present for the duration of the surveillance test. Because a HPCI initiation signal could not override the completed Level 8 trip logic, HPCI was considered inoperable during this period. 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 March 15, 2000 at 1415 hours. This event is considered to be a Safety System Functional Failure under the Revised Reactor Oversight Process.

Cause of the Event:

A walkdown of the surveillance by the Maintenance department Human Performance Coordinator, an I&C Supervisor, a Shift Technical Advisor, and I&C technicians was conducted to determine possible human performance activities that could have caused the Level 8 trip. Several failure methods were considered.

Multimeter [MTR] connected across incorrect terminals. The surveillance performer would have seen 130 volts versus 0 volts at an earlier step. This was not observed.

Multimeter left connected and selected to resistance measurement function. This scenario would have caused

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the HPCI Level 8 turbine trip as soon division 2 Level 8 test trip signal was generated. The meter was turned off and removed prior to performing this step, thus this did not occur.

Multimeter left selected to resistance function and used after the division 2 Level 8 trip signal was generated. Connecting the multimeter while still selected to the resistance function would have completed the Level 8 trip logic by bypassing the division 1 Level 8 trip relay contact. However, relays were heard to change state in the relay room prior to reconnecting the multimeter, thus this failure method did not occur.

Multimeter failure causing completion of the Level 8 trip logic. The multimeter was subsequently used to successfully perform this surveillance. Relays were heard to change state in the Relay Room prior to reconnecting the multimeter.

Division 1 Level 8 trip relay bumped while performing contact checks. Personnel were not near the division 1 Level 8 relay when relays were heard to change state. During the walkdown it did not seem likely the relay could be bumped while performing contact checks.

Procedural adequacy. The surveillance procedure does not have steps for removal of the multimeter or switching out of the resistance functions, however, the meter had not been left installed, nor had it been left selected to the wrong function.

Improper techniques used during surveillance performance. The walkdown demonstrated that proper techniques were used. The multimeter was disconnected when required, the meter functions were selected as required. There were no technique weaknesses observed.

While the walkdown found opportunities to improve the surveillance procedure, it was concluded none of the above failure methods caused or contributed to the event.

Other failure methods considered were:

Contamination build up on the division 1 Level 8 trip relay contacts. This failure method requires a buildup of contamination on contacts that would cause arcing across the contacts when the surveillance applies 130 volts across these contacts. This is unlikely because the relay is covered and is tested on a monthly basis.

A spurious signal from the division 1 level transmitter [LT]. This failure method could be caused by an intermittent failure of the transmitter or trip unit. While the division 1 Level 8 trip relay contact had been verified open (no trip present) per the surveillance procedure prior to the trip occurring, momentary failure of the transmitter or trip unit could have caused this event. A momentary level 8 trip signal by a single division would not be indicated or annunciated in the control room. Therefore, it is inconclusive whether a momentary spike coincident with performance of the surveillance caused this event. However, industry information indicates that this is a possibility; an industry event was identified where a similar transmitter could have been causing intermittent high readings, and a General Electric Service Information Letter indicates potential problems with setpoint potentiometers on similar trip units that may have caused

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intermittent spiking. The transmitter and trip unit are being investigated as possible causes and may be replaced.

Noise induced into the division 1 level transmitter. This failure method could result from noise induced into the trip circuit by an outside source such as a radio or welding. A walkdown of the area near the reactor water level transmitter was performed several hours after the trip. The transmitter is located in an out of the way area and is surrounded by a cage to prevent unauthorized access.

A failure method to cause the HPCI Level 8 trip logic to energize could not be conclusively determined.

Analysis of the Event:

The purpose of the HPCI system is to provide emergency core cooling in the event of an accident involving loss of coolant from a relatively small break. Reactor steam is used to drive a turbine, which in turn drives a main and booster pump to provide a source of high pressure water to the reactor. HPCI has a high reactor water level trip (Level 8) to prevent damage to the turbine from water entrained in the steam supply. The Level 8 setpoint is chosen to be a value low enough to prevent turbine damage from water carryover, but high enough to prevent false high reactor water level signals from tripping the HPCI turbine. The Level 8 trip logic automatically resets when reactor water level decreases to the HPCI initiation setting, Level 2.

Although thirty six minutes elapsed between the Level 8 logic trip and reset from the control room, the amount of time a low level initiation signal could not override the seal in was much less. The division 2 Level 8 trip was removed when the surveillance was exited and the division 1 Level 8 trip relay contacts were most likely only closed momentarily. With either Level 8 trip signal not present a Level 2 initiation signal would have overridden the trip logic and started the HPCI system, if required.

The RCIC system (600 gallons per minute) and Standby Feedwater system (1300 gallons per minute) remained available for high pressure injection. Additionally, the Automatic Depressurization system was available to reduce reactor pressure to within the capabilities of low pressure Emergency Core Cooling Systems.

In accordance with the Maintenance Rule the HPCI system is considered a risk significant system. During the thirty six minutes the HPCI system was potentially not operable, Emergency Diesel Generator 13 was also not available due to a planned maintenance outage. The combined HPCI and EDG 13 unavailability resulted in a core damage probability (CDP) increase which is well within the low risk classification (less than 1E-6 CDP increase) in accordance with the Fermi 2 Configuration Risk Management Program (CRMP). The CRMP was in effect during the EDG 13 outage prior to and overlapping the HPCI system unavailability. The health and safety of the public were not adversely affected.

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Corrective Actions:

This event was documented in the Fermi 2 Corrective Action Program. The status of the HPCI high RPV level trip logic relays was verified correct and the Level 8 trip reset, ensuring HPCI would be available, if needed. Troubleshooting was performed in accordance with procedure MOP04, "Shift Operations," to provide further verification the HPCI RPV high level logic was operable. No repeatable cause was identified for this event. Further corrective actions relating to this event, such as reactor water level transmitter and trip unit replacement, are being considered for implementation commensurate with established priorities and processes of the Fermi 2 Corrective Action Program.

Additional Information:

A. Previous Similar Events

No similar LERs were identified within the past two years.