Fermi 2
6400 North Dixie Hwy., Newport, MI 48166

**Detroit Edison**

10CFR50.73

May 8, 2000
NRC-00-0035

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

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: Licensee Event Report (LER) No. 00-005

Pursuant to 10 CFR 50.73(a)(2)(i)(B), Detroit Edison is submitting the enclosed LER No. 00-005. The LER documents a condition prohibited by Technical Specifications for an inboard Residual Heat Removal/Low Pressure Coolant Injection System pressure isolation valve which did not meet the required leakage limits.

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,

W. T. O'Connor
Asst. VP, Nuclear Assessment

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

IE22

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

# LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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.

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| Fermi 2 | 05000341 | 1 of 4 |

TITLE (4)
Pressure Isolation Valve Leak Test Failure

| 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 |
| | | | | | | | | | | 05000 |
| 04 | 07 | 00 | 00 | --0 0 5-- | 00 | 05 | 08 | 00 | FACILITY NAME | DOCKET NUMBER 05000 |

| OPERATING MODE (9) | 5 |
|---|---|
| POWER LEVEL (10) | 0 |

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 20.2201(b) | | 20.2203(a)(2)(v) | X | 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) | | 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 | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| Peter W Smith, Supervisor - Compliance | (734) 586-4271 |

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 |
|---|---|---|---|---|---|---|---|---|---|
| B | BO | ISV | A391 | | | | | | |
| | | | | | | | | | |

| 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 April 7, 2000, leak testing of Pressure Isolation Valve (PIV) E1100F050A, Division 1 Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI) System injection line inboard isolation check valve, was performed in accordance with Technical Specification (TS) Surveillance Requirement SR 3.4.5.1. The resultant leak rate was determined to be in excess of the specified leakage criteria of 10 gpm. The valve was disassembled and inspected. The cause of the failure was determined to be degradation of the elastomer soft seat. The soft seat was replaced and the valve was successfully leak rate tested. The opposite division counterpart, E1100F050B, successfully passed its as-found leak test; however, it was disassembled, inspected, and its soft seat was replaced, because of the degree of degradation observed for E1100F050A. With new soft seats, historical performance indicates that both valves would be expected to pass the as-found leak rate tests at the end of the next operating cycle. Further corrective actions relating to this event to obviate the need for periodic soft seat replacement are being considered, and will be developed and implemented commensurate with established priorities and processes of the Fermi 2 corrective action program.

Initial Plant Conditions:

| | |
|---|---|
| Mode | 5 (Refueling) |
| Reactor Power | 0 Percent |
| Reactor Pressure | 0 psig |
| Reactor Temperature | 111 Degrees Fahrenheit |

Description of the Event:

On April 7, 2000, leak testing of Pressure Isolation Valve (PIV)[ISV] E1100F050A, Division 1 Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI)[BO] System injection line inboard isolation check valve, was performed in accordance with Technical Specification (TS) Surveillance Requirement SR 3.4.5.1. The resultant leak rate was determined to be in excess of the specified leakage criteria of 10 gpm. While attempting to pressurize the inboard side of the valve, the test pressure could not be achieved and, therefore, leakage past the PIV was categorized as through seat leakage. During the testing, Division 1 systems were out of service for maintenance activities on that Division; therefore, there was no impact on the plant in the refueling configuration. The upstream RHR/LPCI System injection line outboard isolation motor-operated valve, E1150F015A, was successfully leak tested and met its specified leakage criteria.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by TS Limiting Condition for Operation (LCO) 3.4.5, RCS Pressure Isolation Valve Leakage. LCO 3.4.5 requires PIV leakage to be with the specified limits during plant operation in Modes 1 and 2.

Cause of the Event:

Valve E1100F050A was disassembled to determine the cause of the excessive leakage. Examination revealed that the valve disk soft seat (elastomer seal) had become degraded and would not provide the necessary sealing of the disk at the valve seat. During disassembly, the elastomer seal ring appeared dessicated and crystallized. Fragments of the elastomer remained adhered to the valve disc and body seat surfaces. However, the metallic seat hard faces of the disc and valve body exhibited no signs of wear on the hard seating surfaces. The condition of the soft seat material was more severely degraded than had previously been experienced. The probable cause of the condition is that the temperature at the location of the valve was higher than expected at some time during the past two cycles of operation.

The valve is located in a horizontal section of RHR/LPCI System injection line approximately ten feet from where the line connects to the Reactor Recirculation System [AD] piping. During plant operation there is no flow through this section of pipe and approximately ten feet of stagnant water separates the check valve from the 545 degree Fahrenheit water in the active recirculation loop. The line is insulated and with no back flow through the line heat losses to ambient are expected to maintain the valve at acceptable temperatures. Simplified heat balance calculations indicate that a small amount of back flow from the reactor recirculation

loop will cause an appreciable increase in temperature at the valve.

The check valve has an air operated test actuator. The actuator was removed before the valve was disassembled to determine if the actuator could have caused the valve to hang up. There was some minor wear indicated on the shaft and gear locating spacers; however, these indications were on valve components outside the valve stuffing box, and based on the condition and configuration of internal valve components, could not account for the failed Local Leak Rate Test (LLRT) or condition of the soft seat. Investigation of past maintenance determined that an actuator mounting bracket upper bolt had not been shimmed. The shim was later installed and the bolt tightened. This could have been the cause of the wear indications on the external shaft and gear spacers.

The packing gland did not show signs of wear. There were signs that the valve did have a packing leak at some time based on the amount of contamination present. However, reactor coolant system operational leakage over the past two operating cycles since this soft seat was last replaced was not of the magnitude indicated by the simplified heat balance calculation necessary to create a high temperature condition at the valve.

Analysis of the Event:

The purpose of the PIVs is to provide isolation at the interfaces between high pressure and low pressure systems. The affected check valve is one of two valves in series in the LPCI System injection line. The valve provides the isolation of the high pressure Reactor Coolant System from the low pressure LPCI System. The other valve in the injection line, a motor-operated valve, E1150F015A, was successfully tested and met its leakage criteria. Therefore, isolation of the high pressure to low pressure interface was maintained during power operation when the injection line check valve, E1100F050A, may not have been capable of sealing.

The 24 inch diameter RHR/LPCI injection check valves, E1100F050A, and its opposite division counterpart, E1100F050B, have both hard metallic seats as well as soft seats. The hard metallic seats are provided for the PIV function of the valves and are designed to seat against reactor pressure of approximately 1000 psig. Under these conditions, the hard seats perform the pressure isolation function as the soft seats are compressed and are not part of the pressure boundary in this condition. Thus, regardless of the condition of the soft seat, it is likely that the valve would have performed its PIV function provided that the soft seat failure did not prevent hard seat contact. The soft seats were intended to permit the valves to pass the 10 CFR 50, Appendix J, Type C air test when these valves were classified as containment isolation valves prior to the fourth refueling outage (RFO4) in 1994. This test was conducted at approximately 55 psig. At this pressure the hard seats would likely not have sealed well enough to pass this test. The 10 CFR 50 Appendix J air test was eliminated by Amendment 98 to the Fermi 2 Operating License in April, 1994. Amendment 98 revised the TS to reflect that the RHR/LPCI system injection line inboard isolation check valves were no longer classified as containment isolation valves. This eliminated the requirement to perform the Appendix J air test. Amendment 98 also increased the TS 3.4.3.2 allowed leakage limit for E1100F050A and B to 10 gpm. The PIV test is currently performed by pressurizing the test volume between the check valve and a downstream closed manual isolation valve, E1100F060A/B, with a positive displacement pump of approximately 10 gpm capacity. Any leakage by

the soft seat which exceeds the test pump capacity will prevent the test volume from being pressurized sufficiently to compress the soft seat, thereby preventing demonstration that the hard seat meets the leak rate acceptance criteria.

The E1100F050A check valve had its soft seat replaced during RFO3, following failure of the 10 CFR 50, Appendix J air leakage test, and again in RFO5, following failure of the PIV leakage test. The primary failure mechanism of the E1100F050A during RFO5 was due to seal degradation, exacerbated by slight misalignment of the check valve disk. This was corrected by machining the hinge arm and replacing the soft seat. The repair of E1100F050A during RFO5 was deemed effective in correcting the failure as it passed its as-found leak rate test in RFO6. Based on past operating experience, it was expected that the soft seat would last two full cycles of operation.

Notwithstanding the soft seat failure, this event had no impact on the health and safety of the public. The upstream PIV, E1150F015A remained closed during plant operation and successfully passed it leakage rate test. In addition, there was no degradation of the E1100F050A hard seat; therefore, it likely would have performed its the pressure isolation function.

Corrective Actions:

Valve E1100F050A was refurbished with a new soft seat. Post maintenance leak rate was within Technical Specification acceptance limits.

Check valve E100F050B, the Division 2 counterpart to E1100F050A, successfully passed its as-found leak rate test. It was last refurbished during RFO6 and had been in service for one operating cycle. Historically, this valve has passed its as found leak rate test after two operating cycles; however, due to the unexpected degree of degradation of the E1100F050A soft seat, E1100F050B was disassembled, inspected, and found to be in good condition. Nonetheless, a new soft seat was installed. With new soft seats installed in both valves during this refueling outage, historical performance indicates that both valves would be expected to pass the as-found leak rate tests at the end of the next operating cycle.

Temperature monitoring instrumentation was installed on check valves E1100F050A and E1100F050B to monitor operating conditions for these valves during the next operating cycle.

This event was documented in the Fermi 2 corrective action program (CARD 00-13873). Further corrective actions relating to this event to obviate the need for periodic soft seat replacement are being considered, and will be developed and implemented commensurate with established priorities and processes of the Fermi 2 corrective action program.

Additional Information:

A. Failed Components

Component: Division 1 Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI) System Inboard Isolation Testable Check Valve (E1100F050A)
Description: 24"-900# Full Exercisable Air Operated Swing Check Valve
Manufacturer: Anchor Darling
Type: Model 2229-3

B. Previous LERs On Similar Problems

LER 98-008, LER 98-008-01 Pressure Isolation Valve Leak Test Failure

LER 98-008 and its supplement document previous failures of the as-found leak rate tests for E1100F050A/B which occurred during RFO5 and RFO6. In 1998, E1100F050B failed its as-found LLRT in RFO6 due to degradation of the soft seat and was reported in LER 98-008. During the investigation for this LER, it was discovered that E1100F050A had failed its as found leak rate test in RFO5 in 1996, but was not reported. LER 98-008-01 was submitted to document this failure. This failure was caused by the degradation of the soft seat which was exacerbated by a minor misalignment of the valve disc.