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Edison

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10CFR50.73



Nuclear
Operations

May 7, 1992
NRC-92-0054

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. 92-003

Please find enclosed LER No. 92-003, dated May 7, 1992, for a reportable event that occurred on April 7, 1992. A copy of this LER is also being sent to the Regional Administrator, USNRC Region III.

If you have any questions, please contact James M. Joy, Senior Compliance Engineer, at (313) 586-1617.

Sincerely,

Enclosure: NRC Forms 366, 366A

cc: T. G. Colburn
A. B. Davis
M. P. Phillips
S. Stasek
P. L. Torpey

Wayne County Emergency
Management Division

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) **Fermi 2** DOCKET NUMBER (2) **05000341** PAGE (3) **1 OF 6**

TITLE (4) **Technical Specification Required Shutdown - Stuck Open Drywell to Torus Vacuum Breaker**

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)
04	07	92	92	003	0	05	07	92			05000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 50. (Check one or more of the following) (11)

OPERATING MODE (9) 1	20.402(b)	20.405(i)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 11010	20.405(a)(1)(ii)	50.36(a)(1)	50.73(a)(2)(v)	73.71(c)
	20.405(a)(1)(iii)	50.36(a)(2)	50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 306A)
	20.405(a)(1)(iv)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.405(a)(1)(v)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(vi)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME: **James M. Joy, Senior Compliance Engineer** TELEPHONE NUMBER: **313 586-1617**

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS
B	NH	VACB	P1070	Y					

SUPPLEMENTAL REPORT EXPECTED (14) YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15) MONTH: **04** DAY: **07** YEAR: **92**

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

On April 7, 1992, at 1105 hours, during performance of a routine surveillance on drywell and suppression chamber vacuum breaker operability, a vacuum breaker did not close after being opened. A controlled shutdown of the plant was completed in accordance with the applicable Technical Specification Action Statement.

The root cause of the failure of the vacuum breaker to close was that the actuator, which is used for surveillance testing only, bound up with the actuator cylinder in the open position. The binding resulted from an undersized piston in the vacuum breaker actuator cylinder. The undersizing and weight of the piston in combination with side loading of the piston caused the piston rod to tilt and bind against the actuator cylinder bushing which prevented completion of the piston stroke.

The actuator cylinder was replaced and successfully stroke tested. All other vacuum breaker test actuators were visually examined and found in their normal fully retracted position, not interfering with vacuum breaker seating. During the Third Refueling Outage, all twelve vacuum breakers will be stroke tested and visually observed to verify smooth operation. New vacuum breaker actuators received henceforth and actuators currently in the warehouse will be bench tested. A potential design change will be evaluated to modify the vacuum breaker actuator to reduce the effects of side loading, experienced during routine surveillance testing, on piston operation. The vacuum breaker actuator cylinder manufacturer will be contacted to determine the circumstances which led to Detroit Edison receipt of a cylinder with the incorrectly sized piston.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-330) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 0 5 0 0 0 3 4 1	LER NUMBER (6)			PAGE (3)		
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TEXT (if more space is required, use additional NRC Form 366A's) (17)

Initial Plant Conditions:

Operational Condition: 1 (Power Operation)
 Reactor Power: 100 Percent
 Reactor Pressure: 1005 psig
 Reactor Temperature: 538 degrees Fahrenheit

Description of Event:

On April 7, 1992, at 1105 hours, during the performance of routine surveillance 24,402.01, Drywell and Suppression Chamber (NH) Vacuum Breaker (VACB) Valve Operability Test, vacuum breaker T23-F400K did not close after being opened with nitrogen (through a three-way solenoid valve (PSV)) to the permanently installed vacuum breaker test actuator. This surveillance activity was being performed in accordance with Fermi 2 Technical Specification (T.S.) 4.6.4.1.b.2, which demonstrates operability of these vacuum breakers and states "At least once per 31 days by verifying both position indicators OPERABLE by observing expected valve movement during the cycling test." This test is performed by opening the vacuum breakers utilizing pneumatic actuators utilized solely for this surveillance. During normal operation, the actuator cylinder piston rod is fully retracted and does not impede the function of the vacuum breaker. The Drywell to Suppression Chamber Vacuum Breakers each have three position indicators (ZI); one which illuminates to indicate when the valve is open (circuit is non-safety grade) and two separate indicators which illuminate to indicate when the valve is closed (circuit is safety grade). The T.S. surveillance activity noted above also verifies the operability of the two closed position indicators.

During the performance of the surveillance after successfully testing the first nine vacuum breakers, the test for vacuum breaker 'K' commenced. Nitrogen was supplied through the permanently installed test line to the associated three-way solenoid valve to trigger the valve actuator and open the vacuum breaker per procedure. This action successfully opened T23-F400K. Subsequently, in accordance with the procedure, actions taken to close T23-F400K were unsuccessful and the vacuum breaker indicated open. Several attempts were made to cycle the three-way solenoid valve (by deenergizing the power supply) in an effort to close the vacuum breaker. However, T23-F400K continued to indicate open with both close indications off and the open indication on, as would be expected for an open valve.

LICENSEE EVENT REPORT (LER)
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.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 0 5 0 0 0 3 4 1	LER NUMBER (6)			PAGE (3)		
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TEXT (if more space is required, use additional NRC Form 306A's) (17)

Per Technical Specification (TS) 3.6.4.1, Action Statement (AS) b., a Limiting Condition for Operation (LCO), 92-0084, was entered at 1105 hours. Also, a Deviation Event Report (DER) was written by on shift personnel in accordance with the Fermi 2 corrective action program.

The AS requires that "With one or more suppression chamber - drywell vacuum breakers open, close the open vacuum breaker(s) within two hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours." Repeated attempts to cycle the valve closed were unsuccessful.

At 1305 hours, in accordance with the AS, the 2 hour allowable out-of-service time expired and the 12 hour to hot shutdown action was entered. To confirm that T23-F400K was actually open (i.e. not an indication only condition), a test was performed in which drywell and torus pressures were observed to decrease simultaneously while venting from the torus. Following this test, plant shutdown plans were finalized. At 1704 hours, with T23-F400K still open, a controlled plant shutdown was commenced per TS, and an UNUSUAL EVENT was declared in accordance with the Fermi 2 Emergency Plan.

Efforts to close T23-F400K during the shutdown were not successful. The orderly plant shutdown to HOT SHUTDOWN conditions was completed at 0102 hours on April 8, 1992, when the Reactor Mode Switch was placed in the "Shutdown" position. At 1313 hours on April 8, 1992, when the plant achieved the COLD SHUTDOWN condition, the UNUSUAL EVENT was terminated and the LCO was exited. There was no abnormal plant or equipment behavior observed during the plant shutdown.

Subsequent to the plant shutdown, during torus entry inspections, T23-F400K was found with the valve test actuator cylinder fully extended and the the valve in the test full open position. It appeared bound and unable to close under its own force (spring to close). The nitrogen supply was disconnected to verify it was not being held open by pneumatic pressure and the actuator did not move. The valve seat was manually lifted slightly and the actuator cylinder piston retracted after a short delay. However, it was noted that it did not smoothly retract. The vacuum breaker was then stroked once successfully both open and closed and then once again with failure to close. The vacuum breaker actuator cylinder was replaced. Following replacement, the vacuum breaker stroked successfully in a smooth fashion.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20540, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 0 5 0 0 0 3 4 1 9 2	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
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TEXT (if more space is required, use additional NRC Form 366A's) (1)

Cause of Event:

The root cause of the failure of vacuum breaker T23-F400K to close was that the actuator, which is used for surveillance testing only, bound up with the actuator cylinder piston rod extended in the open position. Following its replacement, the failed actuator cylinder for T23-F400K was disassembled and inspected to determine the reason for the binding. Lubrication, bushings, seals and spring and piston parameters were checked against manufacturer tolerances. Detroit Edison believes that the binding resulted from an undersized piston in the vacuum breaker actuator. This undersizing created a larger than normal clearance between the piston head and the inside wall of the actuator cylinder. The weight of the piston head in combination with piston rod side loading, normally experienced during surveillance testing, altered the travel plane of the piston rod by tilting the rod and causing it to bind against the actuator cylinder bushing, preventing completion of the piston stroke.

The vacuum breaker test actuators are installed for surveillance purposes only and serve no safety function. Thus, the actuators and replacement parts for the actuators are not procured as safety related material with vendor quality assurance requirements. Nevertheless, Detroit Edison is working with the vacuum breaker supplier and sub-supplier to determine the circumstances which allowed an actuator operating cylinder with the undersized piston head to be supplied to Fermi 2.

Detroit Edison does not believe the cause of the T23-F400K test actuator failure to be common to the other eleven like vacuum breaker test actuators. The actuator cylinder for T23-F400K was recently installed (May of 1991) and had been surveillance tested twelve times since installation. Ten of the remaining eleven vacuum breakers were installed as original equipment during plant construction. The remaining one actuator (T23-F400F) was installed in April of 1988.

These vacuum breaker test actuators are tested monthly during normal operation and the failure of T23-F400K actuator to retract during this event is the first at Fermi 2. In addition, two of these actuators were stroked and observed to retract smoothly during initial entry into the torus to inspect T23-F400K.

LICENSEE EVENT REPORT (LER)
 TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST, 500 HRS. FORWARD COMMENTS REGARDING NUREG ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 0 5 0 0 0 3 4 1 9 2	LER NUMBER (6)			PAGE (3)		
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TEXT (if more space is required, use additional NRC Form 366A's) (17)

Analysis of Event:

The safety function of the drywell to torus vacuum breakers is to work in conjunction with reactor building to torus vacuum breakers to limit the external pressure differential on primary containment. This is accomplished by opening a path between the drywell and torus to relieve any negative pressure in the drywell (reactor building to torus vacuum breakers open to relieve negative pressure in the torus). During normal operation, the drywell to torus vacuum breakers are closed. They must remain closed to ensure proper function of the pressure suppression design for the Fermi 2 Mark I containment.

At the time of the event, plant personnel were unable to determine the size of the bypass flow path between the drywell and torus due to the open vacuum breaker. WFSAR, Section 6.2.1.3.9, states the maximum allowable leakage area between the drywell and torus is 0.25 ft² for the limiting Loss of Coolant Accident (LOCA) break size. Subsequent to the plant shutdown, a visual inspection determined that the vacuum breaker was open and the resulting potential bypass leakage area was calculated to have exceeded the limiting allowable leakage area. With the vacuum breaker in the open position, a flow path was established that would have allowed unacceptable steam bypassing of the suppression pool in the unlikely event the limiting size LOCA occurred prior to shutting the plant down.

After a LOCA blowdown, the vacuum breaker function is to open to control the differential pressure between the drywell and torus. Since the T23-F400K vacuum breaker was already open, and the other eleven vacuum breakers were fully operable, this safety function would not have been affected.

A controlled shutdown of the plant was completed in accordance with Technical Specification requirements. No other engineered safety features were affected by this event and therefore, they were available to fulfill their safety function, as required. Thus, there was no impact on the safety of plant personnel or the health and safety of the public.

Corrective Actions:

The actuator cylinder for vacuum breaker T23-F400K was replaced. T23-F400K was then successfully stroke tested.

LICENSEE EVENT REPORT (LER)
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-800) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104) OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (8)			PAGE (3)		
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TEXT (if more space is required, use additional NRC Form 366A s) (17)

All 12 vacuum breaker actuators were visually examined and, other than T23-F400K, the actuator cylinders were found fully retracted. The actuators on two other vacuum breakers were manually stroked. One of these actuators was also cycled with nitrogen. In these three test cases, smooth operation of the actuators was observed.

New actuators cylinders received will be bench tested during receipt inspection. Stroke testing with visual observation to ensure smooth operation will be performed following future vacuum breaker actuator cylinder replacement. Actuator cylinders currently in the warehouse will be bench tested. This is expected to be completed by August 28, 1992.

The circumstances surrounding Detroit Edison being supplied a vacuum breaker actuator cylinder with the incorrectly sized piston head will be discussed with the vacuum breaker actuator supplier.

As discussed earlier, Detroit Edison does not anticipate additional failures of installed vacuum breaker actuators due to an undersized actuator piston. Nevertheless, the following actions will be taken:

- o During the Third Refueling Outage, all twelve vacuum breakers will be stroke tested and visually observed. Any actuator that does not stroke smoothly will be evaluated to determine cause and for replacement.
- o A potential design change will be evaluated to determine if the vacuum breaker actuators should be modified to reduce the effects of side loading on the piston/cylinder operation. This is expected to be completed by May 31, 1992.

Previous Similar Events:

There were no previous events regarding vacuum breaker failure in the open position at Fermi 2.

Failed Component Data:

The non-safety related test actuator which failed during this event was supplied by L&J Technologies (formerly GPE Controls), model LD-240-10.

The model number for the actuator cylinder which failed is LB-240-1040. (This part is supplied to L&J Technologies by the manufacturer, Parker Cylinder Division [Part number C2ALUS34]).