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DTE Energy

10 CFR 50.73

August 25, 2005
NRC-05-0057

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555-0001

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

Subject: Licensee Event Report No. 2005-005, "Potential Loss of Standby Feedwater Pumps Due to Lack of Fuse Coordination"

Pursuant to 10 CFR 50.73(a)(2)(ii)(B), Detroit Edison is hereby submitting the enclosed Licensee Event Report (LER) No. 2005-005. This LER documents a June 30, 2005 event where, under certain conditions, improper fuse coordination could adversely affect the ability to use the standby feedwater system to achieve hot shutdown from the dedicated shutdown panel in response to a fire in the control center.

No 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,

William T O'Connor

cc: D. P. Beaulieu
E. R. Duncan
NRC Resident Office
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

IE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB: No. 3150-0104 Expires 6/30/2007
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE
Potential Loss Of Standby Feedwater Pumps Due to Lack of Fuse Coordination

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
06	30	2005	2005	- 005	- 00	08	25	2005	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	11. THIS REPORT SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*			
4	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☒ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
0%	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Robert J. Salmon – Principal Licensing Engineer	(734) 586-4273

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)*	☒ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

During an NRC triennial fire protection inspection, a fuse coordination issue was identified between 130 VDC supply circuit and breaker trip circuit fuses for the standby feedwater pump switchgear. At 1931 EDT on June 30, 2005, this condition was determined to have the potential to significantly affect the ability to provide makeup water to the reactor vessel under certain scenarios which require evacuation of the main control room. The specific scenarios involved postulate that a fire occurs in the control center that affects standby feedwater related control circuitry such that a fault occurs that causes the fuse for that circuitry to isolate. Since the fuse size ratio was less than the ratio specified by Detroit Edison and the fuse manufacturer for proper fuse coordination, it was assumed that the upstream 130 VDC supply fuse also isolates. That fuse provides the power to the control circuitry for both standby feedwater pump circuit breakers and to upstream circuit breakers that provide the 4160 volt power supply to the standby feedwater pumps. If this condition were to occur in the related breaker control circuitry before the control is transferred to the dedicated shutdown panel, the standby feedwater pump breakers would not have the 130 VDC control power needed to operate. The inadequate fuse coordination was determined to be due to a design deficiency dating back to the early 1980's. The affected 10 CFR 50 Appendix R equipment was declared inoperable until a design change was prepared and implemented on July 2, 2005 to provide the proper fuse coordination.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

Initial Plant Conditions:

Mode 4

Reactor Power 0 percent

Description of the Event

During an NRC triennial fire protection inspection, a fuse coordination issue was identified between 130 VDC supply circuit and breaker control circuit fuses for the standby feedwater related pump switchgear. At 1931 EDT on June 30, 2005, this condition was determined to have the potential to significantly affect the ability to provide makeup water to the reactor vessel under certain scenarios which require evacuation of the main control room. The specific scenarios involved postulate that a fire occurs in the control center that affects standby feedwater related control circuitry such that a fault occurs that causes the fuse for that circuitry to isolate. Since the fuse size ratio (6 to 5) was less than the ratio specified by Detroit Edison and the fuse manufacturer for proper fuse coordination for the type of fuses used (2 to 1), it was assumed that the upstream 130 VDC supply fuse also isolates. That fuse provides the power to the control circuitry for both standby feedwater pump circuit breakers and to upstream circuit breakers that provide the 4160 volt power supply to the standby feedwater pumps. If this condition were to occur in the related breaker control circuitry before the control is transferred to the dedicated shutdown panel, the standby feedwater pump breakers would not have the 130 VDC control power needed to operate. If the standby feedwater pumps didn't operate due to this condition, it would take time to troubleshoot and correct the problem which would result in not being able to meet the time requirements / assumptions of the dedicated shutdown procedure.

If the control room were evacuated and standby feedwater controls transferred to the dedicated shutdown panel before a fault occurred in the standby feedwater related control center circuitry, there would be no effect on standby feedwater because the affected circuitry is isolated by the dedicated shutdown panel transfer scheme. Additionally, the standby feedwater related circuit breakers are not located in the control center area, and could be operated manually. However, there is no procedural guidance to perform this action. If the control center was not evacuated as a result of the fire, other systems (high pressure coolant injection, reactor core isolation cooling, core spray, low pressure coolant injection) would be available to keep the core covered. However, if a fire were significant enough to require evacuation of the control center by the operating crew, standby feedwater is the system relied upon to supply makeup water to the reactor vessel during the early stages of the event.

The affected Appendix R equipment was declared inoperable at the time of the event. A design change was developed and implemented to change fuse sizes for the involved breaker control circuits to meet the Detroit Edison and manufacturer recommendations for proper fuse coordination. This ensures that the upstream fuse will not isolate due to a fault in the circuitry protected by the downstream fuse which meets the requirements of 10 CFR 50 Appendix R Section III.G. After installation of the design change on July 2, 2005, the affected Appendix R equipment was declared operable. There were no actual equipment failures.

Immediate notifications were made to the NRC in accordance with 10 CFR 50.72 at 0008 EDT on July 1, 2005 (EN 41816). This event is being reported under 50.73(a)(2)(ii)(B), as an event or condition that resulted in the plant being in an unanalyzed condition that significantly degraded plant safety.

Cause of the Event

The original standby feedwater related control circuit design was deficient in that it did not ensure that the 130 VDC control power supply circuit fuse protection was properly coordinated such that only the fuse closest to a circuit fault isolates in response to a downstream circuit fault. This design deficiency occurred in the mid-1980's and remained undetected since then.

The standby feedwater system was not part of the original plant design. In response to recommendations of a Detroit Edison Three Mile Island task force, the system was added in 1983 as a non-safety related backup high pressure water source. When it was decided to use the standby feedwater system as the makeup water source for the reactor as part of the Appendix R alternative shutdown system, it was already installed as a non-safety related system. Appendix R does not require systems used in the alternative shutdown systems to meet safety related design criteria. The design criteria for non-safety related equipment were less stringent than those used for safety related equipment, and the design review process was less rigorous. Several opportunities to detect this problem occurred over the years, however, the fuse coordination design was not specifically verified, and was mistakenly considered to be correct.

Analysis of the Event

This event involves the ability to operate the standby feedwater system from the dedicated shutdown panel under circumstances where a postulated Appendix R fire occurs that forces evacuation of the main control room and shutdown of the plant from the dedicated shutdown panel. The fire would have had to cause a fault on the standby feedwater system circuitry which causes a circuit isolation of the breaker control power fuses. As a result of less than adequate fuse coordination, the fault also causes the isolation of the upstream circuits. The standby feedwater fault would also have to occur before the associated controls were isolated from the fire by operation of the dedicated shutdown panel transfer switch. It is intended that a standby feedwater pump be able to be operated from the dedicated shutdown panel under such conditions until plant cold shutdown is achieved.

For most fire scenarios that do not result in evacuation of the control center, do not involve faults to the specific circuits involved with the standby feedwater system, or do not involve faults that occur prior to the transfer of controls to the dedicated shutdown panel, there is no impact on plant safety. In those scenarios, operation of the standby feedwater system from the dedicated shutdown panel would be unaffected by this fuse coordination issue, or would not be needed because the control room wasn't evacuated. If the control center was not evacuated as a result of the fire, other systems (high pressure coolant injection, reactor core isolation cooling, core spray, low pressure coolant injection) would be available to keep the core covered..

The plant design includes provisions that provide a defense-in-depth approach to fire protection. This includes minimizing the susceptibility to fire through the use of fire retardant cables, automatic suppression systems, and limits placed on the amount of transient combustible material allowed in fire zones. These provisions minimize the chances of a fire that would result in using the alternative shutdown system, and minimize the damage that would occur as a result of such a fire. The plant is walked down monthly to ensure that combustible material is not allowed to accumulate. Fire detection, fire protection systems, and a trained fire brigade are available to mitigate the consequences of plant fires. Detection and suppression equipment is maintained and tested periodically in accordance with industry and Technical Requirement Manual specifications to ensure a high degree of reliability.

In summary, this event involves only those postulated scenarios involving an Appendix R fire in the control center that causes a fault in the control circuits associated with the supply of standby feedwater that occurs prior to the transfer of controls to the dedicated shutdown panel. For scenarios with other postulated faults, or that occur after the transfer of control to the dedicated shutdown panel, the dedicated shutdown equipment would have performed as intended. The alternative shutdown design is one of several defense-in-depth measures taken to mitigate the consequences of plant fires. The effect of this event on plant risk has been evaluated, and it has been determined to be of very low safety significance. Therefore, the health and safety of the general public was not adversely affected by this event.

Corrective Actions

The affected Appendix R equipment was declared inoperable at the time of the event. The inoperability was resolved promptly by the following action.

A design change was prepared and implemented on July 2, 2005 to provide fuse coordination that meets Detroit Edison requirements and vendor recommendations which ensures that the upstream fuse will not isolate when a fault occurs and is cleared by the standby feedwater related switchgear control circuit fuses. Thus, in the scenario where the control room is evacuated and control is transferred to the dedicated shutdown panel after a fault has occurred in standby feedwater related breaker control circuitry, 130 VDC control power will be available to the breakers used to provide power to the standby feedwater system. This ensures that the standby feedwater system will be available to provide the required makeup water to the reactor vessel.

This event has been documented and continues to be evaluated in the Fermi 2 corrective action program, CARD 05-23959. Extent of condition reviews have been performed and two other fuse coordination issues involving DC control power were identified that affected Appendix R circuits. Those deficiencies have been determined not to affect equipment operability, or to affect its use to support the alternate shutdown system. Design changes are planned to correct those conditions. Improvements in the design review process for non-safety related systems and additional corrective actions are under consideration. A review is also in progress to assess the multiple, diverse fire protection program regulatory non-compliance issues that have been identified in recent Fermi 2 licensee evaluation reports. Any further corrective actions identified as a result of these evaluations will be tracked and implemented by the corrective action program.

Additional Information

A. Failed Components: None

B. Previous LERs on Similar Problems:

LER 2005-003: On May 18, 2005 during a review of the dedicated shutdown procedure, design and operating procedure deficiencies were identified relating to 10 CFR 50 Appendix R events. Battery charger 2C-1 is relied upon to feed post fire emergency shutdown loads. Although a circuit breaker supplying power to a battery charger 2C-1 was re-closed by procedure after a trip or loss of division 1 power, an additional action was required to return the battery charger to service. The additional action was determined to involve circuitry that is not isolated from cables in the fire affected zone which is a requirement of the Appendix R circuit design. In addition to the same issues identified for battery charger 2C-1, the dedicated shutdown procedure did not provide for reclosure of the circuit breaker feeding power to battery charger 2C1-2 after a trip. Battery charger 2C1-2 is required to power 260VDC motor operated valves used by the standby feedwater system to provide reactor cooling water and to control reactor water level after a shutdown due to an Appendix R fire. In these scenarios, power would be initially supplied by the associated batteries, but the batteries are not sized to provide power for the entire duration of the Appendix R event. Therefore, a safe shutdown was not assured using the dedicated shutdown panel during all Appendix R scenarios. The cause of these problems was determined to be design and procedure coordination issues, dating back to the mid-1980's. Interim procedural changes have been put in place, and permanent design and procedure changes are planned to address this issue. LER 2005-003's BOP battery charger issue was identified during the performance of corrective actions for LER 2005-002. The root cause and corrective actions for this event were still in progress at the time of the current event.

LER 2005-002: On March 30, 2005, it was determined that applicable Appendix R success criteria could not be assured under all postulated scenarios described in the Updated Final Safety Analysis Report (UFSAR). Under certain conditions where Combustion Turbine Generator (CTG) 11-1 (the dedicated Appendix R alternate AC source) or other station CTGs (11-2, 11-3 or 11-4) are operating in parallel with the grid, availability of the dedicated alternate AC source cannot be assured. Actions to address the potentially affected Appendix R scenarios were put in place on March 7, 2005, when the deficiencies were identified. Additional scenarios were identified and additional corrective actions are being evaluated within the plant's corrective action program. The cause of these problems was determined to be a lack of coordination, dating back to the mid-1980's, between all of the parties involved in implementing the use of CTG 11-1 as the Alternate AC source for Appendix R scenarios involving a loss of offsite power. The root cause and corrective actions for this event were still in progress at the time of the current event.

LER 2003-002-01: On August 14, 2003, at approximately 1610 hours, a Loss of Offsite Power occurred as a result of the regional electric grid disturbance that affected several eastern and central states and portions of Canada and that led to blackout conditions in a large portion of the United States. Combustion Turbine Generator (CTG) 11-1 did not initially start in response to this event. The causes of the CTG 11-1 failure to start were an improper trip setpoint for the battery powered inverter and a failure to start the DC fuel oil pump due to a starter contact sticking open against its arcing horn. The improper inverter setpoint occurred because the inverter was not properly integrated into the overall system design during a 1996 modification / refurbishment. CTG 11-1 related corrective actions focused on entering the proper inverter setpoint into the design database, periodically testing the low voltage trip setpoint, maintenance to the sticking contactor, and the performance of periodic black start tests on CTG 11-1.