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DTE Energy

10 CFR 50.73

October 4, 2004
NRC-04-0069

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. 2004-001, "Technical Specification Required Shutdown Due to Emergency Diesel Generator Failure"

Pursuant to 10 CFR 50.73(a)(2)(i)(A), Detroit Edison is hereby submitting the enclosed Licensee Event Report (LER) No. 2004-001. This LER documents the August 8, 2004 Technical Specification required shutdown due to an inoperable Emergency Diesel Generator (EDG).

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,

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

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.

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Fermi 2	05000341	1 OF 4

4. TITLE
Technical Specification Required Shutdown Due to Emergency Diesel Generator Failure

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
08	09	2004	2004	- 001 -	00	10	04	2004	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE
1

10. POWER LEVEL
100%

11. THIS REPORT SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 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)
☐ 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)
☐ 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
X	EK	BLO	F010	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

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

Emergency Diesel Generator (EDG)-12 was removed from service at 0200 hours on August 2, 2004 to perform routine maintenance, including the eighteen-month inspection, and preventive and corrective maintenance tasks. On August 6, 2004 at 1042 hours, EDG-12 was started as part of surveillance test 24.307.46, Emergency Diesel Generator 12 – Fast Start Followed by Load Reject. Following successful completion of the load reject, the EDG was being cooled down for restoration to operable status. Approximately 2.5 minutes into the cool down run, personnel in the area noted abnormal engine noise. The local operator tripped the EDG promptly at 1311 hours. Subsequent inspection determined that the scavenging air blower had failed and that the EDG could not be repaired within the remainder of the 7 day allowed out of service time.

The plant was manually shutdown on August 8, 2004 at 2201 hours in accordance with Technical Specification 3.8.1, Condition C. Plant equipment performed as expected during this reactor shutdown.

EDG-12 was surveillance tested after repair and returned to service. The plant was restarted on August 16, 2004.

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

Initial Plant Conditions:

Mode 1
Reactor Power 100 percent

Description of the Event

Emergency Diesel Generator [DG] (EDG)-12 was removed from service at 0200 hours on August 2, 2004 to perform routine maintenance, including the eighteen-month inspection, and preventive and corrective maintenance tasks. On August 6, 2004 at 1042 hours, EDG-12 was started as part of surveillance test 24.307.46, Emergency Diesel Generator 12 – Fast Start Followed by Load Reject. Following successful completion of the load reject, the EDG was being cooled down for restoration to operable status. Approximately 2.5 minutes into the cool down run, personnel in the area noted abnormal engine noise. The local operator tripped the EDG promptly at 1311 hours. Subsequent inspection determined that the scavenging air blower had failed.

Limiting Condition for Operation (LCO) 3.8.1, Condition A for the inoperable EDG-12 was entered at 0200 hours on August 2, 2004 when the EDG was removed from service for routine maintenance. Hence, the required 7-day Completion Time for Required Action A.6 was to expire at 0200 hours on August 9, 2004. Due to the extensive work necessary to inspect the engine for damage, replace the scavenging air blower, and complete post maintenance testing, this work was projected to extend beyond the current required Completion Time of 7 days. On August 8, 2004, Detroit Edison verbally requested a notice of enforcement discretion (NOED) to extend the allowed out-of-service time for one inoperable emergency diesel generator from 7 to 14 days. However, The NOED request was denied by the NRC. Therefore, Detroit Edison began the shut down of the plant as required by Technical Specification LCO 3.8.1, Action C.1 at 2201 hours on August 8, 2004. Action C.1 requires the plant be in Mode 3 (Hot Shutdown) within 12 hours. Reactor power was reduced gradually to about 21% power, and the plant was removed from the electrical grid. The reactor was manually scrammed by placing the mode switch in shutdown at 0854 hours on August 9, 2004. Thus, Mode 3 was entered within 10 hours and 54 minutes of entering Condition C which meets the 12-hour shutdown requirement of Action C.1. Technical Specification 3.8.1 Action C.2 requires the plant to be in Mode 4 (Cold Shutdown) within 36 hours of entering Technical Specification 3.8.1, Condition C. This Action was completed at 0350 hours on August 10, 2004 when Mode 4, Cold Shutdown, was entered. Thus, Mode 4 was achieved 29 hours and 50 minutes after entering Technical Specification 3.8.1, Condition C which meets the 36-hour shutdown requirement of Action C.2.

Plant equipment performed as expected during this reactor shutdown.

The NRC was notified of this event in accordance with 10 CFR 50.72(b)(2)(i) at 2215 hours EDT on August 8, 2004 (EN 40932).

The plant entered a forced outage as a result of this shutdown. The cause of the problem with EDG-12 was determined to be a catastrophic failure of the scavenging air blower [BLO]. This blower is a positive displacement, two rotor, air pump that is in series with the engine turbocharger and provides scavenging and combustion air needed to run the EDG. The blower that failed had been in service since June 2003. The previous blower on EDG-12 had been replaced during the previous 18 month preventive maintenance (PM) activity due to clearances measured that were outside of required tolerances. Blower clearances were checked during this year's

PM activity and were found to be within the established tolerances. All of the blowers on the remaining three EDGs have been inservice since the initial plant startup.

Emergent issue and root cause teams were assembled to address this failure and to determine whether the cause of the failure could be further refined. The pinion gear was removed and showed very slight wear on the teeth, and the shear pin was damaged, but not sheared. The bolts connecting the flexible drive to the engine had sheared as designed for a catastrophic blower failure. The blower was shipped to the vendor (Fairbanks Morse) for disassembly and to aid in the root cause determination. The timing gears were removed, blue checked, and determined to be within original design specifications. There were no signs of radial rotation at the interface between the timing gears and the impeller shaft. Disassembly revealed signs of rotor to rotor interference and overheating (discoloring) on the bearing end plates in the vicinity of the rotor seals on both sides of the blower. The higher temperatures appeared to have occurred on the thrust bearing side of the blower. There were no signs of foreign material during disassembly. There were no signs of damage on the blower housing. All oil, air and vent paths were inspected, and determined to be free flowing and free of foreign material. The failed blower parts have been shipped back to DTE Energy laboratories for additional analysis and testing. Component tolerances and clearances are to be measured, and further disassembly and inspection is planned. Metallurgical analyses are planned, and the adequacy of the bond between the aluminum impeller lobes and their steel shafts is to be investigated. However, given the extent of damage, it may not be possible to identify the initiating event.

The blower failure resulted in aluminum flakes entering the EDG downstream of the blower. The engine was disassembled, inspected and cleaned, as necessary. Some parts with visible signs of wear were replaced, even though they met the required specifications. The EDG-12 scavenging air blower was replaced with an unused blower obtained from another nuclear plant. The EDG-12 air path upstream of the blower was inspected and no foreign material was found. Plant personnel ensured that the replacement blower was not one of those identified by Fairbanks Morse, by serial number, on March 25, 2004, pursuant to 10 CFR 21 (2004-005-00) as having a potential manufacturing defect.

EDG-12 was surveillance tested after repair and returned to service. The plant was restarted on August 16, 2004.

Cause of the Event

EDG 12 was rendered inoperable due to a catastrophic failure of the engine's scavenging air blower. The failure involved metal to metal contact, overheating of bearing end plates, and seal failures. Due to the extent of the damage to the blower rotors and seals it has not been possible to conclusively determine the initiating event. The most probable initiating event was a seal failure (generated by a rub between the seal seat and rotating seal) that caused overheating of the bearing end plate. Thermal distortion then likely led to metal to metal contact within the blower. This metal to metal contact resulted in the release of aluminum which contributed to rotor to rotor interference. Rotor to rotor interference ultimately caused extensive damage to the rotors. Eventually additional seal failures also occurred and the blower seized. A second possible initiating event that has not yet been eliminated is rotor to rotor contact due to a manufacturing defect that allowed impeller movement on one of the two rotor shafts. The resulting damage to the rotors and seals would be expected to be similar.

Analysis of the Event

The Fermi onsite AC power sources consist of four EDGs, two in Division 1, and two in Division 2, and one combustion turbine generator (CTG) 11-1, aligned to Division 1 for station blackout purposes. Technical Specification LCO 3.8.1 permits continued plant operation for 7 days with one or more EDGs in one division inoperable when CTG 11-1 is available to supply Division 1 loads. With only EDG 12 inoperable, the remaining operable EDGs (i.e., one in Division 1 and two in Division 2) are sufficient for performing the safety functions assumed in the safety analyses. CTG 11-1 is also available for station blackout considerations and can be used to feed Division 1 emergency loads. All offsite power sources were also available throughout the event.

The plant was shut down in accordance with the plant Technical Specifications, therefore, there was no undue risk to the health and safety of the public.

Corrective Actions

Due to the introduction of aluminum flakes downstream of the scavenging air blower, EDG-12 was disassembled, inspected, and cleaned as needed prior to installing a new blower.

The EDG 12 scavenging air blower was replaced with an unused blower obtained from another utility. Fermi 2 ensured that the replacement blower was not one of those identified, by serial number, as having a potential manufacturing defect by Fairbanks Morse on March 25, 2004 pursuant to 10 CFR 21 (2004-005-01).

This event has been documented in the Fermi 2 corrective action program, CARD 04-23549. Any further corrective actions will be tracked and implemented commensurate with the established processes and priorities of the program.

Additional Information

A. Failed Components:

Component: Series Scavenge Air Blower
Function: Provides Scavenging and Combustion Air for Low Load Operation
Manufacturer: Fairbanks Morse
Model Number: 3800TD8-1/8 Scavenge Air Blower
Failure Cause: Metal to metal contact / thrust bearing end plate overheating

B. Previous LERs on Similar Problems:

There have been no previous occurrences of EDG failures due to a catastrophic failure of an EDG scavenging air blower at Fermi 2.