Peter Dietrich
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DTE

June 23, 2023
NRC-23-0038

10 CFR 50.73

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Fermi 2 Power Plant
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: Licensee Event Report (LER) No. 2023-001-01

DTE Electric Company (DTE) is submitting LER No. 2023-001-01, "Loss of Mechanical Draft Cooling Tower Fan Brakes during High Speeds Leads to Loss of Safety Function and Inoperability". This report was previously submitted on May 22, 2023, in accordance with Title 10 Code of Federal Regulations (10 CFR) 50.73(a)(2)(v)(A), (B), and (D), and 10 CFR 50.73(a)(2)(i)(B). This supplement is being provided to include the "Reporting of Defects and Noncompliance" requirements under 10 CFR 21.2(c) and 10 CFR 50.73(a)(2)(vii) as a common cause inoperability of independent trains or channels.

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Mr. Eric Frank, Manager – Nuclear Licensing, at (734) 586-4772.

Sincerely,

Peter Dietrich
Senior Vice President and Chief Nuclear Officer

Enclosure: Licensee Event Report No. 2023-001-01, "Loss of Mechanical Draft Cooling Tower Fan Brakes during High Speeds Leads to Loss of Safety Function and Inoperability"

cc: NRC Project Manager
NRC Resident Office
Regional Administrator, Region III

Enclosure to
NRC-23-0038

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

Licensee Event Report (LER) No. 2023-001-01
"Loss of Mechanical Draft Cooling Tower Fan Brakes during High Speeds Leads to Loss of Safety Function and Inoperability"

NRC FORM 366 (03-14-2023) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2023

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Library, and Information Collections Branch (T-6 A10M), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by email to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; email: oira_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R 3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. Facility Name		2. Docket Number	3. Page
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4. Title

Loss of Mechanical Draft Cooling Tower Fan Brakes during High Speeds Leads to Loss of Safety Function and Inoperability

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved		
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	☐ 050	Docket Number
03	02	2023	2023	- 001 -	01	06	25	2023	N/A		
									Facility Name: N/A	☐ 052	Docket Number

9. Operating Mode	10. Power Level
1	100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*

10 CFR Part 20	☐ 20.2203(a)(2)(vi)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.1200(a)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	☐ 73.1200(b)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	☐ 73.1200(c)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)	☐ 73.1200(d)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☐ 50.46(a)(3)(ii)	☑ 50.73(a)(2)(v)(A)	**10 CFR Part 73**	☐ 73.1200(e)
☐ 20.2203(a)(2)(ii)	☑ 21.2(c)	☐ 50.69(g)	☑ 50.73(a)(2)(v)(B)	☐ 73.77(a)(1)	☐ 73.1200(f)
☐ 20.2203(a)(2)(iii)		☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(2)(i)	☐ 73.1200(g)
☐ 20.2203(a)(2)(iv)		☑ 50.73(a)(2)(i)(B)	☑ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(ii)	☐ 73.1200(h)
☐ 20.2203(a)(2)(v)		☐ 50.73(a)(2)(i)(C)	☑ 50.73(a)(2)(vii)		

☐ **OTHER** (Specify here, in abstract, or NRC 366A).

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include area code)
Eric Frank - Manager, Nuclear Licensing	734-586-4772

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to IRIS		Cause	System	Component	Manufacturer	Reportable to IRIS
B	CC	SIS	D283	Y						

14. Supplemental Report Expected		15. Expected Submission Date	Month	Day	Year
☑ No	☐ Yes (If yes, complete 15. Expected Submission Date)				

16. Abstract (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

At 1145 Eastern Daylight Time (EDT) on March 23, 2023, it was determined that all Mechanical Draft Cooling Tower (MDCT) fan brakes would not perform their design function during a tornado due to the speed switch not functioning over its published voltage range. The MDCT fan brakes are required to prevent fan over speed from a design basis tornado. The MDCT fans are required to support operability of the Ultimate Heat Sink (UHS), and the service water subsystems. At the time of discovery, the provisions of Limiting Condition for Operation 3.0.9 were being utilized for loss of the "D" MDCT fan brakes (barrier loss) thus the 24-hour allowance for restoration of at least one division was entered. This supplement expands the report to include applicability of 10 CFR 21.2(c).

Corrective actions were taken to develop a design change and install a potentiometer on each MDCT fan speed control system returning the MDCT fans, UHS and the service water subsystems to service on March 24, 2023. The fan brake system is only required for a tornado. No tornado watches or warnings occurred during the timeframe when all MDCT fan brakes were nonfunctional. Since there was no credible threat of a tornado, the MDCT fans and associated UHS would have been capable of performing cooling for the service water subsystems.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

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NARRATIVE

INITIAL PLANT CONDITIONS

Mode – 1
Reactor Power – 100

There were no structures, systems, or components (SSCs) that were inoperable at the start of this event that contributed to this event.

DESCRIPTION OF THE EVENT

At 0923 Eastern Daylight Time (EDT) on March 13, 2023, the Division II Residual Heat Removal Service Water (RHRSW) System [BI] Mechanical Draft Cooling Tower (MDCT)[CTW] Fan "D" Brake [BRK], was declared inoperable due to loss of speed indication at high speeds, which was discovered during an over-speed protection system calibration. The loss of speed indication also affects the fan brake operability during a design basis accident (DBA) tornado event. Limiting Condition for Operation (LCO) 3.0.9 was invoked for loss of the MDCT fan brake (barrier loss) for fan "D". LCO 3.0.9 allows 30 days before declaring the supported system(s) inoperable and the LCO(s) associated with the supported system(s) not met.

The MDCT fans are required to support operability of the Ultimate Heat Sink (UHS) [BS], and the brakes prevent the fans from experiencing over-speed from a design basis tornado as described in Updated Final Safety Analysis Report (UFSAR) Section 9.2.5.2.2. Technical Specification (TS) 3.7.2 requires the UHS reservoir to be operable in MODES 1, 2, and 3. The UHS operability requirements in MODES 4 and 5 are determined by the systems the UHS supports. The UHS reservoir is divided into two, one-half capacity reservoirs, corresponding to Division I and Division II. Each reservoir is the cooling source for that division's service water subsystem (e.g., the Emergency Diesel Generators (EDGs) [DG] cooling water [LG], Emergency Equipment Cooling Water (EECW) system [CC], Emergency Equipment Service Water (EESW), RHR [BO] system, Core Spray [BG] system). UHS Safety Functions are as follows: (1) Remove the heat rejected by the RHR heat exchangers after reactor shutdown, (2) Remove the heat rejected by the RHR heat exchangers after an accident, (3) Remove the heat rejected by the EECW heat exchangers and the diesel generator heat exchangers, and (4) Provide sufficient cooling water for at least 7 days to permit safe shutdown and cooldown of the reactor without makeup water and to maintain the reactor in a safe shutdown condition. A two-cell MDCT is located above each of the one-half capacity reservoirs. Each cell is equipped with a MDCT fan. Two MDCT fans above each one-half capacity reservoir are required for it to be considered operable. The "A" and "C" MDCT fans are in Division I and the "B" and "D" fans are in Division II.

Troubleshooting determined the Dynalco speed switch [SIS] (model SST-2400A-1) did not function over its full voltage range. Vendor-published data shows the speed switch voltage range is 0 to 50 root-mean-square Voltage (Vrms) (0 to 141.42 Volts Direct Current (VDC)). The actual field voltage measured during troubleshooting was approximately 8.5 VDC; therefore, the range of the speed switch fully encompassed the field condition and should have performed and activated the brakes during an overspeed event. Based on vendor discussion and troubleshooting during the event, a load resistance had to be installed for the switch to function over the operating voltage range of the circuit. The Dynalco speed switch is found on all four MDCT fans.

During the cause analysis performed on May 25, 2023, it was determined that Engine Systems, Inc. (ESI), who purchased and assembled the Dynalco speed switch (model SST-2400A-1), had added a load resistor to the four speed switches during vendor testing to allow it to function over the full range. This modification was not tracked as a nonconformance to the purchase order.This modification was applied to all four of the controllers; thus, caused a common failure mode for all four of the MDCT Fans. ESI originally qualified and documented the switch with the additional load resistor, but mock-up testing by Fermi, ESI and Dynalco in March 2023 could not duplicate the qualification results. The switch with the added load resistor did not function over its full voltage range. As a result, this event is reportable under 10 CFR 21.2(c).

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NARRATIVE

Immediately after the condition with the speed switch was verified, at 1145 EDT on March 23, 2023, the Division I and II RHRSW System MDCT fan brakes (A, B, C) were declared inoperable due to the fan brakes not being capable of performing their design function during a tornado. When the condition was identified to be common to all MDCT Fan brakes, a 24-hour allowance per LCO 3.0.9 to restore a division fan brake to operable status was entered. At 2045 EDT on March 23, 2023, the UHS was declared inoperable invoking LCO 3.7.2 (requiring 72 hours to get UHS operable) to work on the fan brake circuits. On March 24, 2023 (Division II at 0200 EDT, Division I at 1335 EDT), a potentiometer was installed on all four fan brake circuits and the MDCTs were returned to service.

A past operability review concluded that the speed switches were installed on December 9, 2020 (Division I) and September 14, 2022 (Division II). The condition did not exist prior to December 9, 2020 and is assumed that Division I was not operable since December 9, 2020. Since only one division of cooling towers are required to support the safety function, UHS safety function was maintained between the period between December 9, 2020 and September 14, 2022, except for when Division II UHS was inoperable for maintenance or when Division II Emergency Diesel Generators (EDGs) [DG], Division II RHR/RHRSW, Division II EECW, Division II EESW, and Division II Core Spray were out of service for maintenance or testing. The Division II EDGs provide power to the Division II MDCT Fans during a loss of offsite power which would occur during a DBA tornado event. Division II UHS was inoperable due to maintenance on the following dates: 08/22/2022 – 08/23/2022, 10/21/2021, 09/21/2021 – 09/24/2021, 02/22/2021 – 02/24/2021. Division II EDGs were out of service due to testing or maintenance for a total of 405.6 hours (not including dates the UHS was already inoperable) between December 9, 2020 and September 14, 2022. Division II RHR/RHRSW were out of service for maintenance on 7/22/2021 for 2 hours (not including dates the UHS was already inoperable). Division II EECW was out of service for surveillances for 94.6 hours (not including dates the UHS was already inoperable) between December 9, 2020 and September 14, 2022. Division II EESW was out of service for maintenance operability tests for 28.4 hours (not including dates the UHS was already inoperable) between December 9, 2020 and September 14, 2022. Division II Core Spray was out of service for maintenance operability tests for 28.5 hours (not including dates the UHS was already inoperable) between December 9, 2020 and September 14, 2022. After September 14, 2022, both reservoir divisions were inoperable until Division I and II were returned to operable status following implementation on March 24, 2023 (Division II at 0200 EDT, Division I at 1335 EDT) to correct the condition.

Per TS 3.7.2 CONDITION A, one inoperable division of reservoir is required to be returned to operable status within 72 hours. Failure to meet the 72-hour COMPLETION TIME, invokes TS 3.7.2 CONDITION C, which requires the plant be in MODE 3 within 12 hours and MODE 4 within 36 hours. Returning Division I to operable status (December 9, 2020), resulted in exceeding the necessary 72-hour COMPLETION TIME and thus not complying with the REQUIRED ACTIONs and corresponding COMPLETION times of TS 3.7.2 CONDITION C. This condition existed from December 9, 2020 until September 14, 2022 when Division II was made inoperable by installing the same switches.

Per TS 3.7.2 CONDITION C, both divisions (UHS) being inoperable requires being in MODE 3 within 12 hours and MODE 4 in 36 hours. Both Division I and Division II were inoperable from September 14, 2022 to March 24,2023 as well as on 08/22/2022 – 08/23/2022, 10/21/2021, 09/21/2021 – 09/24/2021, 02/22/2021 – 02/24/2021, and 405.6 hours, resulting in failure to comply with TS 3.7.2 REQUIRED ACTIONs within the corresponding COMPLETION TIME.

Additionally, TS 3.7.2 requires entering applicable Conditions and Required Actions of LCO 3.8.1 for EDGs and LCO 3.4.8 for the RHR.

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SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

An 8-hour event notification (EN 56429) was made to the NRC based on meeting the reporting criteria of Title 10 Code of Federal Regulations (10 CFR) 50.72(b)(3)(v)(A), (B), and (D) as an event or condition that at the time of discovery could have prevented the fulfillment of the safety function of a system needed to shut down the reactor and maintain it in a safe shutdown condition, remove residual heat, and mitigate the consequences of an accident, as listed in paragraph (b)(3)(v)(A), (B), and (D). This Licensee Event Report (LER) is being made under the corresponding requirement in 10 CFR 50.73(a)(2)(v)(A), (B), and (D) as a condition that could have prevented fulfillment of a safety function. Also, this LER is made due to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by TS and 10 CFR 50.73(a)(2)(vii) as a common cause inoperability of independent trains or channels.

Per the TS definition, a component is operable when it can perform its specified function and when all necessary attendant auxiliary equipment that is required for the component to perform its function is also capable of performing its support function. The RHRSW MDCT fan brakes are necessary to maintain functionality of the fans during a DBA tornado event. The fans can perform their function during all other circumstances, including the DBA without the brakes. Therefore, except during a tornado, the brakes are not necessary support equipment for the fans.

An analysis at the worst-case outdoor environmental conditions when both divisions of UHS were unable to perform the post-tornado design function from December 9, 2020 through March 24, 2023, determined the RHR Reservoir and Suppression Pool temperature. The RHR Reservoir temperature exceeded the analyzed limit (101-degree Fahrenheit) at approximately 14.5 hours post-scram. Had there been a Design Basis tornado after 14.5 hours the site would have relied on Flex and Severe accident mitigation strategy procedures.

In any case, the fans would be able to perform their design function with the brakes inoperable under all conditions except a DBA tornado scenario. No tornado watches or warnings occurred during the timeframe when all MDCT fan brakes or the Division II EDGs, RHR/RHRSW, EECW, or EESW were nonfunctional. Since there was no credible threat of a tornado, the MDCT fans and associated UHS would have been capable of performing cooling for the service water subsystems (e.g., the EDGs cooling water, EECW system, EESW, RHR, Core Spray) throughout the period described above.

CORRECTIVE ACTIONS

On March 24, 2023 (Division II at 0200 EDT, Division I at 1335 EDT), a potentiometer was installed on all four fan brake circuits and the MDCTs were returned to service.

PREVIOUS OCCURRENCES

Previous occurrences of HPCI inoperability due to non-functionality of the MDCT fan brake system were reported in LERs 2016-006, 2017-005, and 2018-005. However, the instances described in LER 2016-006 were associated with inadequate procedural guidance related to the fan brake systems and were all the result of problems with the nitrogen pressure supply. The condition described in this LER is not a result of inadequate procedural guidance and was not due to problems with the nitrogen pressure supply. Therefore, the corrective actions previously performed in LER 2016-006 could not have prevented the occurrence described in this LER as they could not have prevented the speed switch from failing to meet specifications.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2023

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The instance described in LER 2017-005, “Non-Functional Mechanical Draft Cooling Tower Fan Brakes Leads to HPCI Being Declared Inoperable and Loss of Safety Function”, was a result of the loss of inverter output. Therefore, the corrective actions previously performed in LER 2017-005 could not have prevented the speed switch from failing to meet specifications.

The instance described in LER 2018-005, “Non-Functional Mechanical Draft Cooling Tower Fan Brakes Leads to HPCI Being Declared Inoperable and Loss of Safety Function”, was a result of the loss of inverter output and a blown fuse. Therefore, the corrective actions previously performed in LER 2018-005 could not have prevented the speed switch from failing to meet specifications.

Note: The modification to the fan brake circuit design was made to fix the issues that caused LER 2017-005 and LER 2018-005.

CAUSE OF THE EVENT

The cause of the event was due to the Dynalco speed switch (model SST-2400A-1) not functioning over its published voltage range.