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October 21, 2021
NRC-21-0051

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. 2021-002

Pursuant to 10 CFR 50.73(a)(2)(v)(D), DTE Electric Company (DTE) is submitting LER No. 2021-002, Unplanned Inoperability of High Pressure Coolant Injection System Due to an Inverter Circuit Failure.

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Mr. Ertman L. Bennett III, Manager – Nuclear Licensing, at (734) 586-4273.

Sincerely,

A handwritten signature in black ink, appearing to be "Peter Dietrich", written over a large, stylized circular flourish.

Peter Dietrich
Senior Vice President and Chief Nuclear Officer

Enclosure: Licensee Event Report No. 2021-002, Unplanned Inoperability of High Pressure Coolant Injection System Due to an Inverter Circuit Failure

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

**Enclosure to
NRC-21-0051**

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

**Licensee Event Report (LER) No. 2021-002
Unplanned Inoperability of High Pressure Coolant Injection System Due to an Inverter
Circuit Failure**



LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)
(See NUREG-1022, R.3 for instruction and guidance for completing this form
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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 e-mail to Infocollections.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: oir_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.

1. Facility Name Fermi 2	2. Docket Number 05000	3. Page 341 1 OF 4
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4. Title
Unplanned Inoperability of High Pressure Coolant Injection System Due to an Inverter Circuit Failure

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	Docket Number
8	22	2021	2021	002	0	10	21	2021	N/A	05000
									N/A	05000

9. Operating Mode 1	10. Power Level 100
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11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

<input type="checkbox"/> 10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 10 CFR Part 21	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

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

12. Licensee Contact for this LER

Licensee Contact Ertman L. Bennett III – Manager, Nuclear Licensing	Phone Number (Include area code) 734-586-4273
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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
X	N/A	N/A	N/A	N/A					

14. Supplemental Report Expected

No Yes (If yes, complete 15. Expected Submission Date)

15. Expected Submission Date

Month	Day	Year
12	17	2021

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)
At 0529 Eastern Daylight Savings Time (EDT) on August 22, 2021, while in Mode 1 at 100% power, alarms occurred for the Division 2 emergency diesel generator (EDG) load sequencer and the High Pressure Coolant Injection (HPCI) inverter circuit. These issues led to Division 2 EDGs and HPCI being declared inoperable per Technical Specification (TS) 3.8.1 and TS 3.5.1, respectively. Subsequent failures of the Division 2 battery charger and inoperability of the Division 2 direct current (DC) electrical power distribution subsystem were identified under TS 3.8.4 and TS 3.8.7, respectively. The cause of the event is unknown. However, the Division 2 battery charger was replaced with an available spare and the replacement of the power supplies for the load sequencer and HPCI inverter eliminated the problem and allowed for all the systems to be returned to service with no further issues by (or before) 0956 EDT on August 24, 2021. Other safety systems such as the Reactor Core Isolation Cooling (RCIC) system and Division 1 EDGs remained operable throughout the event. Although no violations of TS occurred, the unplanned inoperability of HPCI is a reportable condition. The safety significance of this event was determined to be very low and there were no radiological releases.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Fermi 2	05000- 341	2021	002	0

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 0529 Eastern Daylight Savings Time (EDT) on August 22, 2021, alarms [ALM] occurred for the Division 2 emergency diesel generator (EDG) [DG] load sequencer and the High Pressure Coolant Injection (HPCI) [BJ] inverter circuit. These issues led to Division 2 EDGs and HPCI being declared inoperable per TS 3.8.1, “Alternating Current (AC) Sources - Operating,” Required Action B.4 and TS 3.5.1, “Emergency Core Cooling Systems (ECCS) – Operating,” Condition E.1, respectively. Offsite power circuits and Division 1 EDGs were verified to be operable in accordance with TS 3.8.1 Required Actions B.1 and B.3.1, respectively. The Reactor Core Isolation Cooling (RCIC) [BN] system was verified operable in accordance with TS 3.5.1 Required Action E.1 .

The HPCI system and the EDG load sequencer are powered by the Division 2 battery. The initial investigation identified blown fuses associated with the power supplies of both the Division 2 EDG load sequencer and HPCI. The fuses were replaced but blew again. The blown replacement fuses were removed and additional troubleshooting activities were performed. During the subsequent troubleshooting activities, fluctuations were identified in the Division 2 battery charger [BYC] in the direct current (DC) electrical power subsystem [EI]. The Division 2 battery charger was declared inoperable at 2223 EDT on August 22, 2021, and TS 3.8.4, “DC Sources – Operating,” Condition A was entered. Shortly thereafter, at 2331 EDT, the Division 2 DC electrical power distribution subsystem was also declared inoperable due to low voltage and TS 3.8.7, “Distribution Systems – Operating,” Condition B was entered. The battery charger was replaced with an available spare battery charger. Using the spare, the Division 2 battery charger was restored to an operable status at 0046 EDT on August 23, 2021 and TS 3.8.4 Condition A was exited. Replacement of the battery charger with the spare also stabilized voltage on the Division 2 DC electrical power distribution subsystem such that TS 3.8.7 Condition B was exited at 0055 EDT on August 23, 2021. The durations of the inoperabilities of the Division 2 battery charger and DC electrical power distribution subsystem were approximately 2 hours and 1 hour, respectively which were both within the TS allowable durations of 4 hours and 2 hours, respectively. No other safety-related systems were out of service during the event.

Following replacement of the Division 2 battery charger, the power supplies for the Division 2 EDG load sequencer and HPCI Inverter were replaced. The Division 2 EDG load sequencer was restored to service and the EDGs were declared operable at 2132 EDT on August 23, 2021. The duration of the Division 2 EDG inoperability was approximately 40 hours which was within the TS 3.8.1 Condition B allowance of 72 hours since offsite power sources were available. HPCI was restored to service and declared operable at 0956 EDT on August 24, 2021. The duration of the HPCI inoperability was approximately 52 hours which was within the TS 3.5.1 Condition E allowance of 14 days since RCIC was operable. A review verified that the offsite power sources, Division 1 EDGs, and RCIC were operable during the entire event. All TS required actions were taken within the allowable times and no violation of TS occurred.



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		YEAR 2021	SEQUENTIAL NUMBER 002	REV NO. 0

NARRATIVE

An 8-hour event notification (EN 55423) was made to the NRC on August 22, 2021 based on meeting the reporting criteria of Title 10 Code of Federal Regulations (10 CFR) 50.72(b)(3)(v)(D) since an unplanned HPCI inoperability is an event or condition that at the time of discovery could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident. This LER is being made under the corresponding criteria of 10 CFR 50.73(a)(2)(v)(D); specifically, that the 52-hour unplanned inoperability of the HPCI system was an event or condition that could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

No reportability criteria were met for the EDGs, Division 2 battery charger, or Division 2 DC electrical power distribution subsystem.

SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

During the time HPCI was inoperable the RCIC system remained available for high pressure injection in the event of an emergency. The Standby Feedwater (SBFW) [S,J] system was also available for high pressure injection. Additionally, the Automatic Depressurization System (ADS) was available to reduce reactor pressure to within the capabilities of the low pressure Emergency Core Cooling Systems (ECCS) [BO][BM]. TS 3.5.1 allows HPCI to be taken out of service for up to 14 days provided that RCIC is available. The duration of the HPCI inoperability, although unplanned, was short relative to the allowable time. HPCI is required for design basis accidents such as a loss of coolant accident (LOCA). No accidents or transients requiring HPCI occurred or were in progress during the HPCI inoperability.

Offsite power was operable throughout the event, being supplied to both the 120 kV and 345 kV switchyards from the transmission network by five transmission lines. Division 1 of the onsite power sources (EDGs 11 and 12) remained operable throughout the event. Division 2 EDGs (EDGs 13 and 14) were declared inoperable due to the condition affecting the Division 2 EDG load sequencer. However, further review identified that the condition affecting the sequencer did not impact operation of the EDGs themselves. In the event of a loss of offsite power, EDGs 13 and 14 would still have started automatically and Division 2 loads would have been shed to prepare to accept the required loads. Due to failure of the sequencer, loads would not have automatically been added. However, with operator actions to close breakers (two per EDG), many of the ESF loads would then have been manually added as needed. These operator actions are performed from the Main Control Room (MCR) and are identified in existing Fermi 2 procedures which operators are trained to utilize. As a result, EDGs 13 and 14 were considered inoperable but available. In a postulated transient or accident where offsite power and the Division 1 EDGs were both lost, the Division 2 EDGs could still have been utilized with operator actions to supply power to required ESF loads.

Based on this discussion, the safety significance of this event is very low. There were no radiological releases associated with this event.



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1. FACILITY NAME Fermi 2	2. DOCKET NUMBER 05000- 341	3. LER NUMBER		
		YEAR 2021	SEQUENTIAL NUMBER 002	REV NO. 0

NARRATIVE

CAUSE OF THE EVENT

The cause of this event is unknown. During initial troubleshooting both the Division 2 EDG Automatic Load Sequencer power supply and HPCI Inverter were found to have a short between the positive and negative input terminals and the inputs remained isolated from the chassis .

During the troubleshooting of the charger's cycling voltage it was found that the phase "A" auxiliary transformer was having intermittent problems before it had a hard failure. It was turning on and off causing the silicone-controlled rectifiers (SCRs) to shut off. The voltage output of the transformer should be approximately 45v, but it was 0v while the primary side had 120v. The transformer was replaced with a new one and the battery charger functioned as expected and eventually was placed back into service.

The cause of this event is still under investigation. Failure analysis is being performed on the HPCI inverter, EDG sequencer power supply, and the 2B-2 battery charger auxiliary transformer to see what caused the failure of each device. A preliminary report for both the HPCI inverter and EDG sequencer has been completed but still waiting on the final report. The preliminary report for EDG sequencer found two switching transistors shorted and the HPCI inverter found five MOSFETs shorted and a possible capacitor disintegrated. A subject matter expert independent review will be performed to evaluate the failed components and associated 125V DC bus metering and ground fault detection circuits for possible circuit path that could result in tripped fuses.

CORRECTIVE ACTIONS

The failed components have been replaced but no cause was determined. The cause will be further explained in the final LER.

PREVIOUS OCCURRENCES

There have been previous occurrences of unplanned HPCI inoperability in the past several years, for example LERs 2018-005 and 2019-004. However, those occurrences were due to a support system, the Mechanical Draft Cooling Towers (MDCT), not being able to support operability of the Division 2 Emergency Equipment Cooling Water (EECW) system which is required for the operability of the HPCI room cooler. Therefore, the corrective actions taken to resolve those previous occurrences would not have prevented the issue described in this LER.

In addition, on 8/11/21 HPCI was declared inoperable (EN 55403) for a HPCI failure due to poor connections associated with the flow controller. EN55403 was recently retracted as HPCI was determined to be operable. The cause and corrective actions associated with EN55403 event were reviewed from the perspective of the event being report in this LER and it was determined that the two events were independent. Therefore, the corrective actions taken to resolve would not have prevented the issue described in this LER.